



# ***Risk Factors for Violence in Psychosis:***

*Meta-Analysis and Cox Regression  
Analyses Investigating the Association of  
Established and Novel Risk Factors for  
Violence*

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# *General Abstract*

**Title:** Risk factors for violence in psychosis: Meta-analysis and Cox regression analyses investigating the association of established and novel risk factors for violence.

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**Abstract:** Current treatment practice guidelines in a number of countries mandate the assessment of violence risk in all patients diagnosed with schizophrenia. Although more than 100 different instruments have been developed to facilitate the assessment of violence risk, few have been specifically validated for use in those with schizophrenia. Recent work instead suggests that these instruments are typically associated with lower predictive validity in samples with schizophrenia when compared to that achieved in diagnostically heterogeneous samples, leading to concerns that these instruments omit risk factors that may be specific to the prediction of violence risk in this population. The present thesis therefore aimed to investigate the predictive validity of a number of risk factors for violence in those with schizophrenia. Firstly, to identify key risk factors for violence, a meta-analysis was undertaken, finding that although a number of criminal history risk factors are strongly associated with violence risk, nonetheless a number of risk factors rarely assessed by existing violence risk assessment instruments were significantly associated with violence in those with schizophrenia; most notably a history of attempted suicide. Results of this review also suggested that although the criminal history domain is most strongly associated with violence risk, nonetheless, there is considerable variability in the magnitude of association for the individual risk factors. Study two therefore aimed to investigate this variability and found that a history of violence was most strongly associated with subsequent violence. Study three aimed to identify whether suicidal behaviour, which has rarely been considered risk factors for violence in previous work, incrementally contributes to the prediction of violence. A simple risk model composed of young age, comorbid substance use disorder, previous violence, and a history of suicidal threats, explained as much predictive validity, as measured by the area under the receiver operating characteristic curve, as established risk assessment instruments such as the HCR-20, LSI-R, PCL-R, and VRAG. Current risk assessment approaches may therefore need revision in light of these findings.

# *Disclaimer*

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**Date:** 26 January, 2014.

# Table of Contents

Content	Page
GENERAL ABSTRACT	1
DISCLAIMER	2
TABLE OF CONTENTS	3
PUBLICATIONS AND CONFERENCE PRESENTATIONS	6
INDEX OF ABBREVIATIONS	7
INDEX OF FIGURES	10
INDEX OF TABLES	12
<b>Chapter 1: The Association between Mental Illness, Schizophrenia, and Violence</b>	<b>15</b>
1.0 Epidemiological work on the association between schizophrenia and violence	18
1.0.1 <i>Population-based Epidemiological Work</i>	19
1.1 Risk Factors for Violence	22
1.1.1 <i>Demographic Characteristics</i>	23
1.1.2 <i>Positive Symptoms</i>	24
1.1.3 <i>Alcohol Misuse</i>	25
1.1.4 <i>Substance Misuse</i>	27
1.1.5 <i>Impulsivity</i>	28
1.1.6 <i>Suicidal Behaviour</i>	29
1.1.7 <i>Criminal History</i>	29
1.2 Overview of the Present Research	30
<b>Chapter 2: Meta-Analysis of Risk Factors for Violence in Psychosis</b>	<b>33</b>
2.0 Abstract	33
2.1 Introduction: Previous Reviews of Risk Factors for Violence in Psychosis	34
2.1.1 <i>Narrative Reviews</i>	34
2.1.2 <i>Systematic Reviews</i>	35
2.1.3 <i>Meta-Analyses</i>	36
2.1.4 <i>Aims and Hypotheses</i>	37
2.2 Method	38
2.2.1 <i>Search Strategy</i>	41
2.2.2 <i>Inclusion Criteria</i>	41
2.2.3 <i>Study Quality</i>	42
2.2.4 <i>Data Extraction</i>	43
2.2.5 <i>Effect Size</i>	45
2.2.6 <i>Statistical Analyses</i>	46
2.2.7 <i>Risk Domain Analyses</i>	49
2.2.8 <i>Additional Analyses</i>	49
2.3 Results	50
2.3.1 <i>Demographic and Descriptive Characteristics of Included Studies</i>	51
2.3.2 <i>Demographic Domain</i>	52
2.3.3 <i>Premorbid Domain</i>	54
2.3.4 <i>Criminal History Domain</i>	54
2.3.5 <i>Psychopathological Domain</i>	56
2.3.6 <i>Positive Symptoms Domain</i>	58

*Table continued over ...*

	Content	Page
	2.3.7 <i>Negative Symptoms Domain</i>	59
	2.3.8 <i>Neuropsychological Domain</i>	59
	2.3.9 <i>Substance Misuse Domain</i>	60
	2.3.10 <i>Suicidal Behaviours Domain</i>	61
	2.3.11 <i>Treatment-Related Domain</i>	62
	2.3.12 <i>Publication Bias Analyses</i>	64
	2.3.13 <i>Risk Domain Analyses</i>	65
	2.3.14 <i>Additional Analyses</i>	67
2.4	Discussion	70
	2.4.1 <i>Demographic Domain</i>	70
	2.4.2 <i>Premorbid Domain</i>	72
	2.4.3 <i>Criminal History Domain</i>	74
	2.4.4 <i>Psychopathological Domain</i>	76
	2.4.5 <i>Positive Symptoms Domain</i>	76
	2.4.6 <i>Negative Symptoms Domain</i>	79
	2.4.7 <i>Neuropsychological Domain</i>	80
	2.4.8 <i>Substance Misuse Domain</i>	82
	2.4.9 <i>Suicidal Behaviours Domain</i>	84
	2.4.10 <i>Treatment-Related Domain</i>	85
	2.4.11 <i>Risk Domain Analyses</i>	86
	2.4.12 <i>Additional Analyses</i>	87
	2.4.13 <i>Strengths</i>	87
	2.4.14 <i>Limitations</i>	88
	2.4.15 <i>Conclusions</i>	89
<b>Chapter 3: Introduction to Survival Analysis</b>		<b>91</b>
3.0	Advantages of Survival Analysis over Traditional Regression Approaches	91
3.1	Survival Analysis Methodologies	92
	3.1.1 <i>Life Tables</i>	92
	3.1.2 <i>Kaplan-Meier Method</i>	93
	3.1.3 <i>Log-Rank Test</i>	93
	3.1.4 <i>Cox Regression</i>	94
3.2	Assumptions of Cox Regression	94
	3.2.1 <i>Proportional Hazards</i>	94
	3.2.2 <i>Multiplicativity</i>	95
	3.2.3 <i>Noninformative Censoring</i>	95
	3.2.4 <i>Absence of Tied Failure Times</i>	96
<b>Chapter 4: Longitudinal Association between Criminal History Risk Factors and Violence</b>		<b>99</b>
4.0	Abstract	99
4.1	Introduction: Association between Criminal History Risk Factors and Violence	100
	4.1.1 <i>Aims and Hypotheses</i>	103
4.2	Method	104
	4.2.1 <i>Inclusion and Exclusion Criteria</i>	104
	4.2.2 <i>Epidemiological Sources</i>	104
	4.2.3 <i>Criminal History Risk Factors</i>	106
	4.2.4 <i>Outcome Measure</i>	107
	4.2.5 <i>Statistical Analyses</i>	108
4.3	Results	110
	4.3.1 <i>Univariate Analyses</i>	111
	4.3.2 <i>Incremental Predictive Validity Analyses</i>	118
4.4	Discussion	128
	4.4.1 <i>Predictive Validity of Criminal History Risk Factors by Gender</i>	129

*Table continued over ...*

Content	Page
4.4.2 <i>Predictive Validity of Criminal History Risk Factors by Onset of Schizophrenia</i>	130
4.4.3 <i>Implications</i>	131
4.4.4 <i>Strengths</i>	132
4.4.5 <i>Limitations</i>	133
4.4.6 <i>Conclusions</i>	134
<b>Chapter 5: Longitudinal Association between Suicidal Behaviour Risk Factors and Violence</b>	<b>136</b>
5.0 Abstract	136
5.1 Introduction: The Association between Suicidal Behaviour and Violence	137
5.1.1 <i>Violence as a Risk Factor for Suicidal Behaviour</i>	138
5.1.2 <i>Suicidal Behaviours as Risk Factors for Violence</i>	143
5.1.3 <i>Aims and Hypotheses</i>	144
5.2 Method	145
5.2.1 <i>Inclusion and Exclusion Criteria</i>	145
5.2.2 <i>Overview of the CATIE Project</i>	146
5.2.3 <i>Outcome Measures of the CATIE Project</i>	154
5.2.4 <i>Suicidal Behaviour Risk Factors</i>	154
5.2.5 <i>Outcome Measure</i>	155
5.2.6 <i>Statistical Analyses</i>	156
5.3 Results	159
5.3.1 <i>Univariate Analyses</i>	159
5.3.2 <i>Multivariate Analyses</i>	161
5.3.3 <i>Incremental Predictive Validity Analyses</i>	166
5.4 Discussion	169
5.4.1 <i>Suicidal Behaviours as Risk Factors for Violence</i>	169
5.4.2 <i>Violence as a Risk Factor for Suicidal Behaviour</i>	170
5.4.3 <i>Incremental Predictive Validity Analyses</i>	171
5.4.4 <i>Implications</i>	171
5.4.5 <i>Strengths</i>	172
5.4.6 <i>Limitations</i>	173
5.4.7 <i>Conclusions</i>	175
<b>Chapter 6: General Conclusions</b>	<b>177</b>
6.0 Major Findings	179
6.0.1 <i>Meta-Analysis of Risk Factors for Violence in Psychosis</i>	179
6.0.2 <i>Longitudinal Association between Criminal History Risk Factors and Violence</i>	180
6.0.3 <i>Longitudinal Association between Suicidal Behaviour Risk Factors and Violence</i>	180
6.1 Major Implications	181
6.1.1 <i>Implications for Researchers</i>	182
6.1.2 <i>Implications for Clinicians</i>	183
6.1.3 <i>Implications for Legal Professionals</i>	184
6.2 Future Directions	184
6.2.1 <i>Investigating Confounding between Risk Factors</i>	185
6.2.2 <i>Factors that Contribute to the Inaccuracy of Violence Risk Assessments in Females</i>	186
6.2.3 <i>The Effectiveness of Pharmacological and Psychological Treatments for Violence</i>	188
6.2.4 <i>Development of Individualised Violence Risk Assessments</i>	190
6.3 Major Conclusions	192
REFERENCES	194
APPENDICES	228

# *Publications & Conference Presentations*

## *Publications*

Witt K, van Dorn R, Fazel S. Risk factors for violence in psychosis: Systematic review and meta-regression analysis of 110 Studies. *PLoS One*. 2013, 8:e55942.

Witt K, Lichtenstein P, Fazel S. Improving risk assessment in schizophrenia: An epidemiological investigation of criminal history risk factors. *Br J Psychiatry*. [Forthcoming].

Witt K, Hawton K, Fazel S. The relationship between suicide and violence in schizophrenia: Analysis of the *Clinical Antipsychotic Trials of Intervention Effectiveness (CATIE)* dataset. *Schizophr Res*. 2014, 154: 61-67.

## *Conference Presentations*

Witt K, van Dorn R, Fazel S. Risk factors for violence in psychosis: Systematic review and meta-regression analysis of 110 studies. Presented at the 2013 Annual American Psychiatric and Law Society Conference, Portland, OR, USA: 7-9 March, 2013.

Witt K, Hawton K, Fazel S. Suicidal behaviour and violence in schizophrenia: Analysis of the *Clinical Antipsychotic Trials of Intervention Effectiveness (CATIE)* dataset. Presented at the 2013 Annual British Psychological Association (Forensic Division) Conference, Belfast, Northern Ireland: 26-28 June, 2013.

Witt K, Hawton K, Fazel S. Suicidal behaviours as risk factors for violence in schizophrenia: Analysis of the *Clinical Antipsychotic Trials of Intervention Effectiveness (CATIE)* dataset. Presented at the 15<sup>th</sup> European Symposium on Suicide and Suicidal Behaviour, Tallinn, Estonia: 27-30 August, 2014.

# *Index of Abbreviations*

<b>Abbreviation</b>	<b>Definition</b>
aHR	Adjusted Hazard Ratio.
AQ	Aggression Questionnaire.
ASPD	Antisocial Personality Disorder.
AUC	Area Under the Receiver Operating Characteristic Curve.
AUD	Alcohol Use Disorder.
BDHI	Buss–Durkee Hostility Inventory.
BPRS	Brief Psychiatric Rating Scale.
CATIE	Clinical Antipsychotic Trial of Intervention Effectiveness.
CBT	Cognitive Behavioural Therapy.
CDC	Centers for Disease Control.
CDR	Cause of Death Register.
CDRS	Calgary Depression Rating Scale.
CGIS	Clinical Global Impression Scale
CHAID	Chi-Squared Automatic Interaction Detection.
CI	Confidence Interval.
COVR	Classification Of Violence Risk.
DSM	Diagnostic and Statistical Manual of Mental Disorders.
FAM–HCR–20	Female Additional Manual for the Historical, Clinical, and Risk Management–20.
FDA	Food and Drug Administration.
GRSV	Gunn and Robertson Scale of Violence.
HCR–20	Historical, Clinical, and Risk Management–20.
HDR	Hospital Discharge Register.
HIV	Human Immunodeficiency Virus.
HR	Hazard Ratio.
ICD	International Classification of Disease.
IQ	Intelligence Quotient.
IQR	Inter Quartile Range.
KM	Kaplan Meier.
LSI–R	Level of Service Inventory–Revised.
LSIV	Lion’s Scale of Inpatient Violence
MACVI	MacArthur Community Violence Instrument.

*Table continued over ...*

<b>Abbreviation</b>	<b>Definition</b>
MDD	Major Depressive Disorder.
MGR	Multi-Generation Register.
MINI	Mini International Neuropsychiatric Interview.
MINI	Mental Illness Needs Index.
MOAS	Modified Overt Aggression Scale.
MR	Migration Register.
NART	National Adult Reading Test.
NCR	National Crime Register.
NOS	Not Otherwise Specified.
NYS-LOC	New York State Level of Care Rating Scale.
OAS	Overt Aggression Scale.
OGRS	Offender Group Reconviction Scale.
OPCRIT	Operational Checklist for Psychotic Disorders.
OR	Odds Ratio.
PANSS	Positive and Negative Syndrome Scale.
PCL-R	Psychopathy Checklist –Revised.
PERI	Psychiatric Epidemiological Research Interview.
PPHS	Psychiatric and Personal History Schedule.
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses.
PSE-9	Present State Examination–9 <sup>th</sup> edition.
QoL	Quality of Life.
RAP	Record of Arrest and Prosecution.
RCT	Randomised Controlled Trial.
RDC	Research Diagnostic Criteria.
ROAS	Retrospective Overt Aggression Scale.
RoW	Rest of the World.
RM2000 [V]	Risk Management–2000 [Violence].
SARA	Spousal Assault Risk Assessment.
SCAP	Schizophrenia Care and Assessment Project.
SCAN	Schedules for Clinical Assessment in Neuropsychiatry.
SCID	Structured Clinical Interview for DSM-IV.
SCID-I/P	Structured Clinical Interview for DSM-IV–Patient Edition.
SE	Standard Error.
SOAS	Staff Observation Aggression Scale.
SPJ	Structured Professional Judgement.

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<b>Abbreviation</b>	<b>Definition</b>
START	Short-Term Assessment of Risk and Treatability.
SUD	Substance Use Disorder.
TCO	Threat Control/Override.
UK	United Kingdom.
USA	United States of America.
USD	United States Dollar.
VASA	Violence and Suicide Assessment scale.
VRAG	Violence Risk Appraisal Guide.
WAIS	Wechsler Adult Intelligence Scale.
WCST	Wisconsin Card Sorting Test.

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# *Index of Figures*

Figure	Page
<b>Figure 2.1.</b> Decision system used to determine whether studies with overlapping samples are eligible for inclusion.	44
<b>Figure 2.2.</b> PRISMA flow chart illustrating the number of records identified, number of studies screened and excluded, reasons for exclusion, and the number of studies included in this review.	51
<b>Figure 2.3.</b> Pooled odds ratio and accompanying 95% confidence interval for each of the ten psychosocial domains.	66
<b>Figure 2.4.</b> Pooled odds ratio and accompanying 95% confidence interval for each of the ten psychosocial domains for those studies which measured severe violence rather than aggression and/or hostility.	68
<b>Figure 2.5.</b> Pooled odds ratio and accompanying 95% confidence interval for each of the ten psychosocial domains for those studies based in predominately inpatient settings.	69
<b>Figure 4.1.</b> Adjusted hazard ratios, Harrell's c-index, and accompanying 95% confidence intervals for criminal history risk factors following adjustment for young age and comorbid SUD in males with schizophrenia.	121
<b>Figure 4.2.</b> Adjusted hazard ratios, Harrell's c-index, and accompanying 95% confidence intervals for criminal history risk factors following adjustment for young age and comorbid SUD in females with schizophrenia.	122
<b>Figure 4.3.</b> Adjusted hazard ratios, Harrell's c-index, and accompanying 95% confidence intervals for criminal history risk factors following adjustment for young age and comorbid SUD in males with a history of conviction for any offence prior to diagnosis with schizophrenia.	126
<b>Figure 4.4.</b> Adjusted hazard ratios, Harrell's c-index, and accompanying 95% confidence intervals for criminal history risk factors following adjustment for young age and comorbid SUD in females with a history of conviction for any offence prior to diagnosis with schizophrenia.	127
<b>Figure 5.1.</b> Participant flow during phase 1 of the <i>Clinical Antipsychotic Trials of Intervention Effectiveness (CATIE)</i> project.	147
<b>Figure 5.2.</b> Participant flow during phase 1B of the <i>Clinical Antipsychotic Trials of Intervention Effectiveness (CATIE)</i> project.	149
<b>Figure 5.3.</b> Participant flow through the efficacy and tolerability pathways during phase 2 of the <i>Clinical Antipsychotic Trials of Intervention Effectiveness (CATIE)</i> project.	151
<b>Figure 5.4.</b> Participant flow during phase 3 of the <i>Clinical Antipsychotic Trials of Intervention Effectiveness (CATIE)</i> project.	153
<b>Figure 5.5.</b> Chi-squared Automatic Interaction Detector (CHAID) dendrogram used to identify the cut-point for age that maximally discriminates between violent and non-violent individuals in the CATIE project.	158

*Table continued over ...*

Figure	Page
<b>Figure 5.6.</b> Adjusted hazard ratios, Harrell's c-index, and accompanying 95% confidence intervals following adjustment for young age and comorbid SUD, and previous violence for males and females with schizophrenia.	168
<b>Figure 6.1.</b> Schematic illustration demonstrating, at (1), a direct comparison between drug A and drug B and, at (2), an indirect comparison between drug A and drug B via their common association with drug C.	189
<b>Figure D.1.</b> Pooled OR and accompanying 95% confidence interval for each of the ten psychosocial domains.	254
<b>Figure D.2.</b> Pooled OR and accompanying 95% confidence interval for each of the ten psychosocial domains for those studies which measured severe violence rather than aggression and/or hostility.	255
<b>Figure D.3</b> Pooled OR and accompanying 95% confidence interval for each of the ten psychosocial domains for those studies based in predominately inpatient samples.	256

# *Index of Tables*

Table	Page
<b>Table 2.1.</b> The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement.	39
<b>Table 2.2.</b> Association between demographic factors and risk of violence in individuals with psychosis.	53
<b>Table 2.3.</b> Univariate and multivariate meta-regression analyses for the male gender risk factor.	53
<b>Table 2.4.</b> Association between premorbid factors and risk of violence in individuals with psychosis.	54
<b>Table 2.5.</b> Association between criminal history factors and risk of violence in individuals with psychosis.	55
<b>Table 2.6.</b> Association between psychopathological factors and risk of violence in individuals with psychosis.	57
<b>Table 2.7.</b> Association between positive symptom factors and risk of violence in individuals with psychosis.	58
<b>Table 2.8.</b> Association between negative symptom factors and risk of violence in individuals with psychosis.	59
<b>Table 2.9.</b> Association between neuropsychological factors and risk of violence in individuals with psychosis.	60
<b>Table 2.10.</b> Association between substance misuse factors and risk of violence in individuals with psychosis.	61
<b>Table 2.11.</b> Association between suicidal behaviour factors and risk of violence in individuals with psychosis.	62
<b>Table 2.12.</b> Association between treatment-related factors and risk of violence in individuals with psychosis.	63
<b>Table 2.13.</b> Publication bias analyses according to Egger's regression test.	64
<b>Table 4.1.</b> Criteria used to determine whether a replication study sufficiently matches the demographic and other characteristics of the original calibration sample to protect against the effects of shrinkage.	102
<b>Table 4.2.</b> Univariate associations between criminal history risk factors and conviction for a violent offence in males with schizophrenia.	113
<b>Table 4.3.</b> Univariate associations between criminal history risk factors and conviction for a violent offence in females with schizophrenia.	114
<b>Table 4.4.</b> Univariate associations between criminal history risk factors and conviction for a violent offence in males with a history of conviction for any offence prior to diagnosis with schizophrenia.	115

*Table continued over ...*

Table	Page
<b>Table 4.5.</b> Univariate associations between criminal history risk factors and conviction for a violent offence in females with a history of conviction for any offence prior to diagnosis with schizophrenia.	116
<b>Table 4.6.</b> Univariate associations between criminal history risk factors and conviction for a violent offence in males and females without a history of conviction for any offence prior to diagnosis with schizophrenia.	117
<b>Table 4.7.</b> Incremental validity of criminal history risk factors in predicting conviction for a violent offence in males with schizophrenia.	119
<b>Table 4.8.</b> Incremental validity of criminal history risk factors in predicting conviction for a violent offence in females with schizophrenia.	120
<b>Table 4.9.</b> Incremental validity of criminal history risk factors in predicting conviction for a violent offence in males with a history of conviction for any offence prior to diagnosis with schizophrenia.	124
<b>Table 4.10.</b> Incremental validity of criminal history risk factors in predicting conviction for a violent offence in females with a history of conviction for any offence prior to diagnosis with schizophrenia.	125
<b>Table 5.1.</b> Summary of the epidemiological work to date on the status of violence as a risk factor for suicidal behaviour in mentally healthy adults in the general population.	139
<b>Table 5.2.</b> Summary of the epidemiological work to date on the status of violence as a risk factor for suicidal behaviour in those diagnosed with schizophrenia or another psychotic disorder.	141
<b>Table 5.3.</b> Univariate hazard ratios and accompanying 95% confidence intervals for the association between suicidal behaviour risk factors and violence in both males and females with schizophrenia.	160
<b>Table 5.4.</b> Multivariate adjusted hazard ratios and accompanying 95% confidence intervals for the association between suicidal behaviour risk factors and violence in males and females with schizophrenia adjusted for categorical confounders.	163
<b>Table 5.5.</b> Multivariate adjusted hazard ratios and accompanying 95% confidence intervals for the association between suicidal behaviour risk factors and violence in males and females with schizophrenia adjusted for continuous confounders.	165
<b>Table 5.6.</b> Incremental validity of suicidal behaviour risk factors in predicting violence in males and females with schizophrenia.	167

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# *Chapter 1:*

## *The Association between Mental Illness, Schizophrenia, and Violence*

Individuals with schizophrenia are at risk of numerous adverse outcomes related their illness,<sup>1</sup> including a greater risk of premature mortality;<sup>2</sup> particularly from suicide.<sup>3</sup> The risk of violence perpetration is also elevated in this population.<sup>1</sup> For this reason, treatment practice guidelines in the UK,<sup>4</sup> Australia,<sup>5</sup> and the USA<sup>6</sup> recommend that violence risk should be assessed in all individuals diagnosed with schizophrenia. As a result of these guidelines, recent surveys of mental health trusts in England and Wales have found that violence risk is now routinely assessed in the majority of the general<sup>7</sup> and forensic<sup>8</sup> psychiatric facilities examined.

Presently, there is no consensus definition of violence.<sup>9</sup> Within the crimino-legal literature, however, distinction is often made between proactive and reactive violence.<sup>10</sup> *Proactive violence* involves the premeditated use of violence in order to achieve a goal, for example, to gain a financial advantage. *Reactive violence*, on the other hand, occurs as a result of perceived provocation and would appear to be associated with a hostile attribution bias. Within forensic psychiatry, furthermore, a third type of violence, termed *psychotic violence*, is also frequently observed in which violence is primarily driven by the positive symptoms of psychosis; particularly delusions.<sup>11</sup> Although risk factors may be differentially associated with these three forms of violence, as so few studies currently differentiate between them, the work presented in this thesis will adopt a broad definition of violence to encompass proactive, reactive, and psychotic violence.

Violence risk is typically assessed using either *actuarial* or *structured professional judgement (SPJ)* instruments. Actuarial instruments make use of probabilistic estimates of future violence risk by statistically combining scores across a number of risk factors either additively (i.e., 0 if absent and +1 if present) or using empirically derived weights.<sup>12</sup> SPJ instruments, in contrast, discourage the derivation of a probabilistic risk score.<sup>12</sup> Instead, the clinician assesses the presence and severity of several risk factors. Using their own expertise, the clinician then determines which of these factor/s should predominate in the assessment of risk, and a final, frequently trichotomous (i.e., “low risk”, “medium risk”, or “high risk”),<sup>12</sup> judgement is made. Although this approach requires the clinician to assess several core risk factors, the assessment can also be tailored to take account of idiosyncratic factors which may either attenuate or aggravate the individual’s risk of violence.

Despite differences in the formulation of violence risk, however, both approaches assess risk factors identified from epidemiological work with diagnostically heterogeneous populations. Few violence risk assessment instruments have therefore been specifically validated for use in individuals with schizophrenia.<sup>13</sup> At present, however, it is unclear whether risk factors are similarly predictive of violence across different diagnostic groups.<sup>14</sup> Additionally, psychiatric heterogeneity may also mask the contribution of important, diagnostic-specific risk factors.<sup>15</sup> Consequently, existing violence risk assessment instruments may either contain risk factors unrelated to violence risk in this population, or, they may omit other factors specific to the prediction of violence risk in those with schizophrenia.

Violence risk assessments are increasingly used within both the civil and criminal justice systems to inform decisions relating to the use of involuntary treatment in either psychiatric hospitals or in the community,<sup>16</sup> indeterminate sentencing,<sup>16</sup> selective detention

under sexually violent predator legislation,<sup>a,18,19</sup> bail and/or parole,<sup>20</sup> and, in some jurisdictions, capital sentencing.<sup>21,22</sup> In addition to these arguably punitive uses, violence risk assessment instruments are also used to identify treatment needs.<sup>12</sup> The inaccuracy of these assessments can therefore have serious consequences not only for members of the general public, but also for the individual under assessment,<sup>23,24</sup> in the form of unnecessary deprivations of liberty or life, as well as missed treatment opportunities. With the increasing use of civil litigation, moreover, inaccurate violence risk assessments can also have consequences for a clinician's professional reputation.<sup>b</sup>

Whilst more than 100 instruments have been developed to assist in the assessment of violence risk,<sup>28</sup> few have been validated in samples with schizophrenia specifically.<sup>13</sup> Instead, most have been developed from diagnostically heterogeneous samples. A recent systematic review of these instruments, however, found that where the predictive accuracy of these instruments has been investigated in samples with schizophrenia, estimates are lower compared to those found in diagnostically heterogeneous samples.<sup>13</sup> Identification of risk factors which may be specific to the association with violence in this population is therefore critical to improve the predictive validity of these instruments.

Given the problems associated with the prediction of violence risk in individuals with schizophrenia, this thesis aims to advance our understanding of the factors which increase the risk of violence in this population by exploring a number of issues concerning the clinical utility of various risk factors for the prediction of violence risk in individuals diagnosed with schizophrenia. To provide some context to this work, the remainder of this chapter will

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<sup>a</sup> This legislation, underscored by the notion of *exceptionalism* in which sexual violence is viewed as more heinous than other forms of violence,<sup>17</sup> enables offenders to be detained after they have served their sentence, provided they can be shown to have both a diagnosable mental illness and present an enduring risk of committing a violent, sexually motivated offence if they were to be released into the community.

<sup>b</sup> Following the *Tarasoff v Regents of the University of California (1976)* ruling,<sup>25</sup> mental health professionals in the USA are now legally required to protect a third party from violent, mentally ill patients. Although no such legal doctrine exists in the UK at present,<sup>26</sup> the publication of clinical guidelines which require the assessment of violence risk may raise the prospect of civil litigation in the future.<sup>27</sup>

review epidemiological work on the association between schizophrenia and violence. Then, in Section 1.1, risk factors that have been invoked as causes of the increased risk of violence in this population will be discussed. Where possible, risk factors will be compared to those identified in previous epidemiological work with both mentally-disordered and general population offenders to determine whether these factors are specific to the association with violence in those with schizophrenia.

## ***1.0 Epidemiological Work on the Association between Mental Illness, Schizophrenia, and Violence***

Many studies on the association between mental illness and violence are limited by Berkson's bias as participants have typically been recruited on the basis of a history of psychiatric treatment or a criminal record for violence.<sup>c,29</sup> Friedman (2006) illustrates the problem:

“Subjects who are arrested, incarcerated, or hospitalized are, by definition, more likely to be violent or very ill and are thus not representative of psychiatric patients in the general population.”<sup>30, p.2065</sup>

Studies which recruit only hospitalised or previously violent individuals may therefore either overestimate the strength of association between schizophrenia and violence,<sup>31,32</sup> or may find a statistical association when in fact none exists.<sup>33</sup>

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<sup>c</sup> Monahan and Steadman (1983) refer to this as the ‘treated’ rate of mental illness and violence. The ‘true’ rate of mental illness and violence, in contrast, would include all those individuals who had ever suffered from a mental illness, or committed a violent offence.

### ***1.0.1 Population-Based Epidemiological Work***

Population-based epidemiological studies, in contrast, overcome the problem of Berkson's bias,<sup>33</sup> as all individuals are eligible for inclusion regardless of whether they have a history of psychiatric treatment or a criminal record for violence. Household surveys, in which all residents within a defined catchment area are eligible for inclusion and in which 'caseness' (i.e., presence or absence of a psychiatric illness) is determined systematically, exemplify the population-based approach.<sup>34</sup>

Using a survey of 8,397 British householders, Coid and colleagues (2006), failed to find a significant association between psychosis and violence.<sup>35</sup> Over a five year period preceding the survey, respondents were asked to self-report whether they suffered from any psychiatric symptoms, including hallucinations and delusions, as well as any contact with police. Whilst those reporting symptoms consistent with alcohol misuse, drug misuse, or antisocial personality disorder (ASPD) were significantly more likely to have been in contact with police, those reporting symptoms consistent with psychosis were no more likely to have a history of police contact than mentally healthy individuals. Ascertaining caseness from self-reported symptoms is likely to have resulted in a high proportion of false-positive diagnoses.<sup>36</sup> In addition, this study measured contact with the police, and not violence specifically.

Elonheimo and colleagues (2007) therefore investigated the association between mental illness – as diagnosed by qualified psychiatrists as part of a military fitness assessment – and officially-recorded convictions for violence in a birth cohort of Finnish males.<sup>37</sup> Given that military service is compulsory in Finland, this cohort is therefore likely to be representative of the non-institutionalised male population. The authors found that males diagnosed with psychosis were not significantly more likely to be convicted of a violent

offence than their mentally healthy peers. As only 14 (0.5%) members of this cohort were diagnosed with psychosis, this finding may reflect a lack of statistical power.

Most population-based epidemiological studies, in contrast, have found a modest link between mental illness and violence. Swanson and colleagues (1990), for example, surveyed American householders to ascertain the one-year prevalence of self-reported violence. Respondents were also asked to self-report symptoms of any major psychiatric disorder.<sup>38</sup> Around one-half of those self-reporting violent behaviour in the preceding 12 months were diagnosed with a psychiatric illness, compared to just one in five of those who were not violent. Given the low base rate of violence found for the mentally healthy sample in this study, there is some concern that these individuals may have concealed the extent of their violence;<sup>39</sup> perhaps out of fear of legal or other repercussions. This, in turn, may have led to an overestimation of the association between mental illness and violence in this study.

To address this limitation, Hodgins and colleagues (1992) examined official records of convictions for violence in a Swedish birth cohort and found that, compared to males in the general population, those diagnosed with a major mental illness were four times more likely to be convicted of a violent offence.<sup>40</sup> The risk of violence was even greater in mentally ill females; a major mental illness diagnosis increased the risk of violence in females by 27 fold. In this study, major mental illness included diagnoses of schizophrenia, other psychoses, major affective disorders, and paranoia. Results of this study therefore do not provide an estimate of the increased risk attributable to schizophrenia specifically.

Tiihonen and colleagues (1997) did, however, estimate the increased risk of violence associated with schizophrenia specifically.<sup>41</sup> Compared to members of the general population without a mental illness, those with schizophrenia were seven times more likely to have been convicted on at least one occasion for a violent offence. Those diagnosed with

schizophreniform disorder, schizoaffective disorder, and other psychoses, however, were not at increased risk of violence as compared to members of the general population.

Arsenault and colleagues (2000) also found, in their study of a New Zealand birth cohort, that schizophrenia was more strongly associated with violence risk compared to other major mental illnesses, including: depression, anxiety, eating disorders, and alcohol dependence.<sup>42</sup> Compared to those without a mental illness, individuals who self-reported experiencing positive symptoms of psychosis over the preceding 12 months were seven times more likely to self-report violent behaviour and five times more likely to be convicted of a violent offence. Only those with marijuana dependence were at a greater risk of being convicted of a violent offence.

In their study of a Danish birth cohort, Brennan and colleagues (2000) found that different psychiatric disorders may be predictive of violence risk in males as compared to females.<sup>43</sup> Compared to mentally healthy males, those with schizophrenia were five times more likely to be arrested for a violent offence. Females with schizophrenia, furthermore, were 23 times more likely to be violent than females without a major mental illness. Whilst schizophrenia was associated with the greatest increase in violence risk for females the risk of violence was stronger in males with organic psychosis than in those with schizophrenia. Caution must be used when interpreting gender differences in the risk of violence, however, as the low base rate of violence in mentally healthy females is likely to exaggerate any association with violence in women with a mental illness.

Using both officially recorded and self-reported violence Corrigan and Watson (2005), in contrast, found that although psychosis was strongly associated with violence, other diagnoses, including bipolar disorder and drug dependence, were more strongly associated with this risk.<sup>44</sup> The risk of violence was three times higher in those who met DSM-III-R criteria for psychosis compared to those without a major mental illness. The risk

of violence in those with bipolar disorder or drug dependence was increased nine and 13 fold respectively.

Whilst these population-based epidemiological studies suggest that violence risk is increased in those diagnosed with psychosis,<sup>45,46</sup> particularly schizophrenia,<sup>9,47,48</sup> they are unable to reveal the extent to which this increased risk is due to the diagnosis itself, or the presence of associated risk factors such as alcohol and/or drug misuse. Although members of the general public often view a diagnosis of schizophrenia as a potent risk factor for violence,<sup>49</sup> work suggests that a psychiatric diagnosis only modestly predicts violence when compared to other factors.<sup>50</sup>

## ***1.1 Risk Factors for Violence***

A *risk factor* is any biological,<sup>d</sup> demographic, or psychopathological<sup>e</sup> characteristic that increases the probability that an outcome, such as violence, will occur. Most epidemiological studies tend to focus on a limited number of factors, including: certain demographic factors, positive symptoms, alcohol and/or substance use comorbidity, impulsivity, and criminal history factors. The relative strength of association for these risk factors, however, is unclear at present.

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<sup>d</sup> For example, functional polymorphism typology of the catechol-*O*-methyltransferase (COMT) gene.

<sup>e</sup> Throughout this thesis, the terminology *psychopathological* will be used to refer to any diagnostic or symptomatic risk factor.

### ***1.1.1 Demographic Characteristics***

A number of demographic characteristics, including age and gender, have been associated with an increased risk of violence. In psychiatric populations, moreover, work suggests that these demographic factors may be stronger predictors of violence risk than mental illness itself.<sup>51</sup>

The prevalence of violence varies considerably over the course of an individual's lifetime; typically peaking in late adolescence before declining throughout early adulthood.<sup>52</sup> It is unclear whether a similar age-related trajectory is observed in those with a mental illness, however. Instead, work demonstrates that, for many mentally disordered offenders, arrest rates for both general criminal<sup>53</sup> and violent offending<sup>54</sup> appear to peak in late adolescence and remain elevated throughout adulthood. In those with schizophrenia, moreover, recent work found a non-significant increase in annual arrest rates with age, suggesting that these individuals may be at a higher risk of offending at older ages as compared to mentally healthy offenders.<sup>55</sup>

Within the general population, male gender is frequently identified as one of the strongest predictors of violence risk in the demographic domain.<sup>56</sup> It is unclear whether male gender holds the same salience as a risk factor for violence in those with schizophrenia, however. Epidemiological work, for example, either finds no significant difference in the risk of violence between genders,<sup>48,57</sup> or alternatively, that the risk of violence is higher in females.<sup>40,43,58,59</sup> These studies generally use ratio-based measures to compare rates of violence in those with a major mental illness to mentally healthy members of the general population.<sup>60</sup> As previous work demonstrates that rates of violent recidivism are lower in mentally healthy females<sup>61</sup> than their male counterparts, comparing violence rates between mentally ill and mentally healthy females may exaggerate the increased risk of violence

attributable to mental illness.<sup>62</sup> Studies which instead investigate the association between gender and violence within psychiatric populations, in contrast, suggest that rates of violence are higher in males with schizophrenia as compared to females with schizophrenia.<sup>63</sup>

The association between young age and male gender may, however, be moderated by positive symptoms. Hodgins and Riaz (2011), for example, found that whilst young age and male gender were significantly associated with violence in those with low levels of positive symptoms,<sup>f</sup> neither demographic factor remained significantly associated with violence in those with high levels of positive symptoms.<sup>g,65</sup>

### ***1.1.2 Positive Symptoms***

The experience of psychotic-like symptoms has been associated with an increased risk of violence in mentally-healthy members of the general population.<sup>66-68</sup> Within the mentally ill population, moreover, these symptoms are frequently identified as specific risk factors for violence in those with psychosis both by members of the general population, and by psychiatrists specifically.<sup>69,70</sup>

Studies on the association between positive symptoms and violence typically compare those diagnosed with schizophrenia to mentally healthy members of the general population. Given that mentally ill individuals are, by definition, more likely to experience positive symptoms than members of the general population, it may be that positive symptoms represents a proxy for mental health status. Link and colleagues (1992), however, found that positive symptoms are significantly associated with violence in psychiatric patients as well as in mentally healthy members of the general population,<sup>71</sup> suggesting that the increased risk of

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<sup>f</sup> Defined as two or fewer positive symptoms as assessed using the Positive and Negative Symptom Scale (PANSS).<sup>64</sup>

<sup>g</sup> Defined as three or more positive symptoms as assessed using the PANSS.

violence would instead appear to be attributable to positive symptoms rather than psychosis itself.

The *principle of rationality-within-irrationality* has been invoked to explain the association between positive symptoms and violence. According to this theory, positive symptoms are experienced as real. Consequently, if these symptoms evoke a fear of harm from others, violence can be understood as a rational attempt to defend the self from the hostile intentions of others.<sup>72</sup> This theory would suggest that only those symptoms which evoke this fear should be predictive of violence. To investigate this, Link and Stueve (1994) compared scores on two separate sub-scales derived from the Psychiatric Epidemiology Research Interview (PERI; <sup>73</sup>). The first sub-scale contained only those items assessing delusions of body and/or mind control, and persecution,<sup>h</sup> whilst the second included the remaining 10 items.<sup>i,72</sup> In line with the principle of rationality-within-irrationality, only the TCO scale was independently predictive of violence.

Recent epidemiological work challenges the notion that positive symptoms are a major cause of offending in this population. Instead, this work suggests that other factors, including alcohol misuse<sup>14</sup> and impulsivity,<sup>74</sup> may be of greater relevance to the prediction of violence risk in this population.

### ***1.1.3 Alcohol Misuse***

Epidemiological work on the association between alcohol misuse and violence in the general population has typically adopted one of two approaches. The first approach, termed *aggregate level time-series analysis*, investigates the effect of changes in per capita alcohol

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<sup>h</sup> Link and Stueve (1994) refer to this as the *threat/control override* (TCO) scale.

<sup>i</sup> Referred to as the *other psychotic symptoms* scale.

consumption on violence rates at the population level. These studies generally demonstrate that violence rates change in line with alcohol consumption patterns.<sup>75-77</sup> Changes to alcohol availability<sup>78</sup> or pricing<sup>79</sup> have also been shown to affect population level violence rates.

*Individual level analyses*, on the other hand, assess the relationship between alcohol misuse and violence within members of the general or psychiatric populations. These studies suggest that alcohol misuse triggers violence independently of demographic, psychopathological,<sup>80</sup> and illicit drug misuse factors.<sup>81,82</sup> In those with schizophrenia specifically, the association with violence appears to be completely moderated by a diagnosis of comorbid alcohol use disorder (AUD).<sup>83</sup> Information on the prevalence of violence in the general population in this study was drawn from American rather than Finnish data, however. Given that the rate of homicide per 100,000 head of population in the USA is almost double that of Finland,<sup>j,84</sup> use of American general population data may have attenuated the association with violence.

Subsequent work using Finnish data to estimate the prevalence of violence in both cases and controls appears to conform the mediatory role of AUD. Males with schizophrenia without comorbid AUD were no more likely to be convicted of a violent offence than their mentally healthy counterparts. Those with comorbid AUD, in contrast, were 25 times more likely to be violent.<sup>85</sup> More recently, work in psychiatric patients with paranoid schizophrenia suggests that alcohol misuse is a stronger risk factor for violence than many demographic, personality, and psychopathological risk factors.<sup>86</sup> The combination of alcohol and illicit drug misuse may be a stronger predictor of violence than alcohol misuse in isolation, however.<sup>87</sup>

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<sup>j</sup> According to data from the 2001 United Nations Office on Drugs and Crime Survey. Please note that the USA did not begin reporting nationwide homicide statistics to the United Nations Office on Drugs and Crime survey until 2001. Data from this survey therefore represents the rate of homicide which is most contemporaneous to Eronen and colleagues' study.

#### ***1.1.4 Substance Misuse***

Most epidemiological work on the association between combined alcohol and drug misuse and violence has been conducted in psychiatric populations. Steadman and colleagues (1998), for example, found that a diagnosis of comorbid substance use disorder (SUD) increased the risk of violence in this population.<sup>88</sup> The authors compared the one year prevalence of violence in a group of discharged psychiatric patients to an age, gender, and socio-economically matched sample of general population controls. Only those patients diagnosed with comorbid SUD were significantly more likely to behave violently during the one year follow-up period, suggesting that comorbid SUD may moderate the association between mental illness and violence.

Elbogen and Johnson (2009) likewise found that comorbid SUD moderates the association with violence in this population.<sup>89</sup> As this study suffered from a number of methodological limitations,<sup>90-92</sup> a recent reanalysis of the original National Survey on Drug Use and Health dataset was undertaken, finding that although those diagnosed with comorbid SUD were significantly more likely to self-report engaging in violent behaviour over the three year follow-up period, individuals with schizophrenia in the absence of SUD were nonetheless significantly more likely to behave violently than general population controls.<sup>92</sup>

Subsequent work also suggests that although SUD moderates the association between drug-related and non-violent offending, violence nonetheless remains significantly associated with mental illness in those without comorbid SUD,<sup>59,93</sup> suggesting that factors other than substance misuse may explain the increased risk of violence in this population. Early environmental and/or genetic influences may be one such factor. Fazel and colleagues (2009), for example, estimated the risk of violence in those with schizophrenia compared to unrelated general population or mentally healthy sibling controls.<sup>94</sup> In those without comorbid SUD, schizophrenia was associated with a modest increase in violence risk regardless of which

control group was employed. For those with comorbid SUD, however, the association with violence was approximately halved when siblings were used as controls, suggesting that substance misuse may not completely moderate the association with violence. Instead heritable factors, such as impulsivity, which have been associated with both an increased risk of violence and substance misuse,<sup>95</sup> may be stronger predictors of violence risk in this population.

### ***1.1.5 Impulsivity***

Impulsivity appears to be a key driver of offending both in the mentally ill and general populations.<sup>74</sup> The strength of association between impulsivity and violence in psychosis is less clear, as much of the work in this population has been affected by a number of methodological limitations.<sup>96</sup> As an example, although one study found that violent offenders with schizophrenia score significantly higher on a self-reported measure of impulsivity than mentally healthy members of the general population, participants were excluded from the control group if they had a history of mental health treatment or a criminal record for any offence.<sup>97</sup> Given that higher levels of impulsivity have been found in those with psychosis as compared to mentally healthy controls,<sup>98</sup> as well as in offenders compared to non-offenders,<sup>99</sup> the association with impulsivity in this study may have been confounded by mental health and/or offender status.

Recently, Chamorro and colleagues (2012) used data from a nationally representative sample of American householders to examine the association between impulsivity and a number of adverse outcomes, including violence perpetration, whilst controlling for mental health status.<sup>100</sup> Self-reported impulsivity was associated with an approximate doubling in the risk of domestic violence perpetration and a trebling in the risk of starting physical fights.

This association remained significant even following adjustment for psychiatric diagnosis, as well as for various demographic factors.

### ***1.1.6 Suicidal Behaviour***

Some epidemiological work suggests that suicidal behaviours may also be associated with an increased risk of violence. Within the Danish general population, for example, Christoffersen and colleagues (2005) found that attempted suicide is associated with a six fold increase in the risk of conviction for a violent offence, and a seven fold increase in the risk of conviction for rape specifically.<sup>101</sup> The association was reduced to non-significance, however, following adjustment for risk factors including previous violence, suggesting that suicidal behaviour may reflect a generalised tendency to engage in risky behaviour rather than constituting a specific risk factor for violence.<sup>102</sup>

### ***1.1.7 Criminal History***

Despite the emphasis on positive symptoms and substance misuse as potent risk factors for violence in previous reviews,<sup>9</sup> work suggests that criminal history risk factors are stronger predictors of risk than many demographic, psychopathological, substance misuse,<sup>51</sup> and suicidal behaviour<sup>103</sup> risk factors. Within the general population, for example, work suggests that demographic and psychosocial risk factors, such as employment status, mental health status, and substance misuse, contribute little variance to the prediction of both violent and sexual reoffending risk beyond criminal history factors alone.<sup>104</sup>

In psychiatric populations, moreover, work suggests that certain criminal history factors, such as age at first offence, are associated with a similar degree of predictive

accuracy as a multivariate model composed of demographic, criminal history, psychopathological, substance misuse, and treatment-related factors,<sup>105</sup> as well as the Historical, Clinical, and Risk Management 20 (HCR–20;<sup>106</sup>) and the Psychopathy Checklist Revised (PCL–R;<sup>107</sup>) risk assessment instruments.<sup>108</sup> In males with psychosis, another criminal history factor, number of previous convictions for violent offences, has also been found to be as predictive of subsequent violence as the HCR–20, the PCL–R, the Offenders Group Reconviction Scale (OGRS;<sup>109</sup>) and the Violence Risk Appraisal Guide (VRAG;<sup>110,111</sup>).<sup>112</sup> Previous violence may not be as strongly associated with subsequent violence in those with psychosis,<sup>14</sup> or in females.<sup>100</sup>

## ***1.2 Overview of the Present Research***

Whilst a number of risk factors have been associated with the increased risk of violence in this population, the relative magnitude of these effects remains uncertain. In order to move the field forward, and to improve the identification of markers for treatment, it is necessary to determine which factors play the most important role in the prediction of violence risk. To achieve this, the present thesis will address the following aims:

- 1). To conduct a systematic review and meta-analysis in order to identify those factors that have been associated with an increased risk of offending in those with schizophrenia and other psychoses;
- 2). Given that the work summarised in section 1.1 would suggest that criminal history risk factors are most strongly associated with violence risk in psychiatric populations, the second study aims to examine which individual criminal history risk factor has the strongest association with violence in those with schizophrenia. Multivariate

regression techniques will also be used to determine to what extent these individual criminal history risk factors improve risk prediction beyond known demographic and substance misuse factors;

- 3). Last, as a number of small population studies have found that suicidal behaviour is associated with an increased risk of violence perpetration within the general population, the third study will investigate whether suicidal ideation, threats, and/or attempts are significantly associated with violence in this population. Again, multivariate analyses will also be used to investigate whether these suicidality risk factors are independently associated with violence.

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# ***Chapter 2:***

## ***Meta-Analysis of Risk Factors for Violence in Psychosis***

### ***2.0 Abstract***

Previous work on risk factors for violence in those with psychosis has not investigated the magnitude of association between these factors. A random-effects meta-analysis was therefore conducted to identify risk factors most strongly associated with violence risk in this population. A systematic search of studies indexed by 31 December, 2011 in the CINAHL, EBSCO, EMBASE, Global Health, PsycINFO, PUBMED, and Google Scholar electronic databases was undertaken. Data on 146 risk factors for violence were extracted from 110 studies. A novel meta-epidemiological approach was used to group similar factors into one of ten psychosocial domains. The criminal history domain was most strongly associated with violence (Odds Ratio [OR]=4.2, 95% CI 2.8–6.1), followed by the substance misuse (OR=2.3, 95% CI 1.8–2.8), and demographic (OR=1.8, 95% CI 1.4–2.3) domains. For studies measuring severe violence, rather than aggression and/or hostility, the same three domains emerged as most strongly associated with violence risk. A number of risk factors rarely assessed by existing violence risk assessment instruments were also found to be significantly associated with an increased risk of violence in this population, including parental criminal involvement (OR=1.8, 95% CI 1.5–2.2) and a history of attempted suicide (OR=1.6, 95% CI 1.1–2.3). On the other hand, a number of factors frequently assessed by these instruments were not associated with violence risk in this population; particularly those relating to the

symptoms of psychosis (delusions: OR=1.1, 95% CI 0.6–2.1; hallucinations: OR=1.1, 95% CI 0.8–1.5). The item content of existing violence risk assessment instruments may therefore need revision in light of these findings.

## ***2.1 Introduction: Prior Reviews of Risk Factors for Violence in Psychosis***

Recent work suggests that although more than 100 instruments have been developed to assist in the assessment of violence risk,<sup>28</sup> the predictive validity of these instruments is lower when used to predict risk in those diagnosed with schizophrenia, leading some scholars to suggest that the omission of psychosis-specific risk factors may contribute to the relatively poorer predictive validity of these instruments.<sup>13</sup> Given that recent work suggests that diagnostic-specific risk assessment instruments are associated with greater predictive validity as compared to those developed from work with diagnostically heterogeneous samples,<sup>113</sup> the identification of psychosis-specific risk factors may be critical to the development of specialised instruments for the prediction of violence risk in this population.

Literature reviews may aid in the identification of specific risk factors for violence in psychosis as they enable large amounts of information to be assimilated. These reviews typically take one of three forms: *narrative reviews*, *systematic reviews*, and *meta-analyses*.

### ***2.1.1 Narrative Reviews***

Narrative reviews synthesise literature through the reviewer's own experiential and theoretical lens.<sup>114</sup> With regards to the identification of risk factors for violence in psychosis,

narrative review work suggests that a number of factors are strongly associated with violence risk in this population, including: a previous history of violence, non-adherence with treatment, comorbid substance misuse,<sup>115</sup> and active psychotic symptoms;<sup>116</sup> particularly delusions.<sup>9</sup>

Volavaka and Citrome (2011) distinguish between *predisposing* and *precipitating* risk factors in their narrative review.<sup>117</sup> Predisposing factors create a baseline level of violence risk and may include the following: substance misuse, a tendency towards impulsiveness, non-adherence with treatment, antisocial personality disorder and/or psychopathy, hostility, and neurocognitive impairment. These factors interact with precipitating factors, such as acute positive symptoms; and particularly TCO symptoms and/or command hallucinations, to trigger violence. No one risk factor therefore appears sufficient to explain the association with violence in this population.

Narrative reviews suffer from a number of limitations. Firstly, they frequently reflect the theoretical biases of the author as literature which contradicts the researcher's own perspective may be deliberately omitted from the review.<sup>118,119</sup> Additionally, as narrative reviews do not employ systematic methods for identifying relevant literature, work may be inadvertently missed by the reviewer.

### ***2.1.2 Systematic Reviews***

Systematic reviews, in contrast, use explicit pre-determined search strategies and clear inclusion and exclusion criteria to ensure all relevant literature is located.<sup>114</sup> Additionally, as the decision to include a study is based on an assessment of methodological quality, rather than on the direction of its effect, systematic reviews reduce the role of author bias in the interpretation of the literature.<sup>120</sup>

Many systematic reviews have tended to focus on specific neurobiological or symptomatic risk factors, including: functional connectivity within the fronto-temporal circuit,<sup>121</sup> fronto-temporal grey matter volume,<sup>122</sup> delusions,<sup>123</sup> hallucinations,<sup>124</sup> or impulsivity.<sup>96</sup> As these reviews have focussed on specific risk factors for violence, they do not possess the necessary breadth to inform our understanding as to the most important factor/s for the prediction of risk. To address this, Bo and colleagues (2011) reviewed a broader range of risk factors and concluded that similar demographic factors are associated with violence in both the general and psychiatric populations. The authors therefore propose that these demographic factors may establish a baseline level of risk against which other factors, and particularly hallucinations and/or delusions, interact with to trigger violence<sup>125</sup> suggesting, once again, that positive symptoms represents a key driver of violence risk in this population. As both narrative and systematic reviews ignore the magnitude of the effect,<sup>126</sup> however, they typically provide little insight into those risk factor/s most strongly associated with violence in this population.

### ***2.1.3 Meta-Analyses***

Meta-analysis combines systematic review methodology with quantitative techniques to produce an estimate of the average effect size across similar studies and is the recommended approach for analysing both the direction and magnitude of effect for risk factors in other areas of medicine.<sup>127-129</sup> When multiple risk factors have been associated with an outcome, a quantitative synthesis can also reveal which factor/s are most strongly associated with violence. As well as producing an overall effect size for each risk factor, meta-analysis also enables reviewers to investigate the influence of demographic, clinical, and study design characteristics on the magnitude of the effect size.

In contrast to the above narrative and systematic reviews, meta-analyses typically find that no single risk factor emerges as most strongly associated with violence risk in this population.<sup>51,103</sup> Instead, a range of demographic, criminal history, psychopathological, and treatment-related risk factors have been associated with a similar magnitude of effect. Bonta and colleagues (1998) therefore organised risk factors into one of four meta-epidemiological domains: demographic, criminal history, deviant lifestyle, and psychopathological and found that the criminal history domain was most strongly associated with violence risk, followed closely by the demographic domain, and the deviant lifestyle domain.<sup>51</sup> The psychopathological domain, in contrast, was found to be protective against violence risk in this review. As this review included diagnostically heterogeneous samples, it contributes little to our understanding of the risk factors that may be specific to the risk of violence in those with psychosis.

Large and Nielssen (2011) likewise found that one of the strongest risk factors for violence in first-episode psychosis was a forensic history. A number of additional risk factors, including young age, male gender, and substance misuse also had moderate associations with violence risk in this population. This work, however, did not make use of a meta-epidemiological approach to group risk factors.<sup>103</sup> It is therefore difficult to get a clear sense of the risk domains most likely to contribute to the prediction of violence risk from this review.

#### ***2.1.4 Aims and Hypotheses***

The primary aim of the present study is therefore to investigate the range of risk factors that have been found to be associated with violence risk in those with psychosis. Meta-epidemiological analyses will also be used to group similar risk factors into one of ten

psychosocial domains to provide a clearer picture of the types of risk factors that may be most strongly associated with violence risk in this population. Based upon results summarised above, it is hypothesised that the criminal history domain will show the strongest association with violence, followed by the demographic domain. The psychopathology domain, in contrast, will have the weakest association with violence risk in this population.

## ***2.2 Method***

Several standardized checklists have been developed to improve the clarity with which both the methodology and results of a meta-analysis have been reported. One such checklist is the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; <sup>130</sup>) statement. PRISMA consists of 27 items considered by the statement's authors as essential to foster transparency throughout the meta-analytic research process. (Table 2.1). As compliance with the PRISMA checklist has been credited with improving the quality of meta-analyses in other areas of medicine,<sup>131</sup> these guidelines were followed.

**Table 2.1.**  
The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement.

Section	Topic	Item #	Description of Item
<b>TITLE</b>	Title	1	Identify the report as a systematic review, meta-analysis, or both.
<b>ABSTRACT</b>	Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.
<b>INTRODUCTION</b>	Rationale	3	Describe the rationale for the review in the context of what is already known.
	Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).
<b>METHODS</b>	Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.
	Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.
	Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.
	Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.
	Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).
	Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.
	Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.

*Table continued over ...*

Section	Topic	Item #	Description of Item
<b>METHODS (continued)</b>			
	Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.
	Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).
	Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., $I^2$ ) for each meta-analysis.
	Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).
	Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.
<b>RESULTS</b>			
	Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.
	Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.
	Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).
	Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.
	Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.
	Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).
	Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).
<b>DISCUSSION</b>			
	Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).
	Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).
	Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.
<b>FUNDING</b>			
	Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.

**Note:** Reproduced with permission from <sup>130</sup>

### **2.2.1 Search Strategy**

Given that no single electronic database indexes all publications on a given topic,<sup>132</sup> six electronic databases were searched from their start date until 31 December, 2011: CINAHL (1982–2011), EBSCO (1980–2011), EMBASE (1980–2011), Global Health (1973–2011), PsycINFO (1960–2011), and PUBMED (1960–2011). These databases were selected as they index literature from a wide range of disciplines, including: medicine (EMBASE, PUBMED), nursing (CINAHL), psychology (PsycINFO), public health (Global Health), and social science (EBSCO). Searches were repeated in the Google Scholar search engine (2004–2011) as previous work suggests that this database has better coverage of unpublished literature.<sup>133</sup>

Key words, including those pertaining to mental illness (e.g. schiz\*, psych\* and mental\*) and violence (e.g. viol\*, aggress\*, hostil\*, crim\*, offend\*, and danger\*), were used to locate relevant literature. To maximize the chances of retrieving relevant studies, all key words were truncated as per recommendations.<sup>134</sup>

### **2.2.2 Inclusion Criteria**

Studies were included in the present meta-analysis providing they met the following criteria:

- 1). Their titles and/or abstracts suggested that the work investigated risk factors for violence, aggression, and/or hostility;
- 2). A minimum of 95% of study participants were diagnosed with psychosis, defined as schizophrenia, schizophreniform disorder, schizoaffective disorder, delusional

disorder, schizotypal disorder, psychosis not otherwise specified, or bipolar disorder, and;

- 3). Diagnosis was made according to either the Diagnostic and Statistical Manual (DSM) or International Classification of Diseases (ICD) criteria.

As work suggests that the prognosis of psychosis in children may be different to that for adults, studies were limited to those conducted in adults. Studies in any language were eligible for inclusion, as were unpublished studies, including: Master's theses, doctoral dissertations, government reports, and conference presentations.

### ***2.2.3 Study Quality***

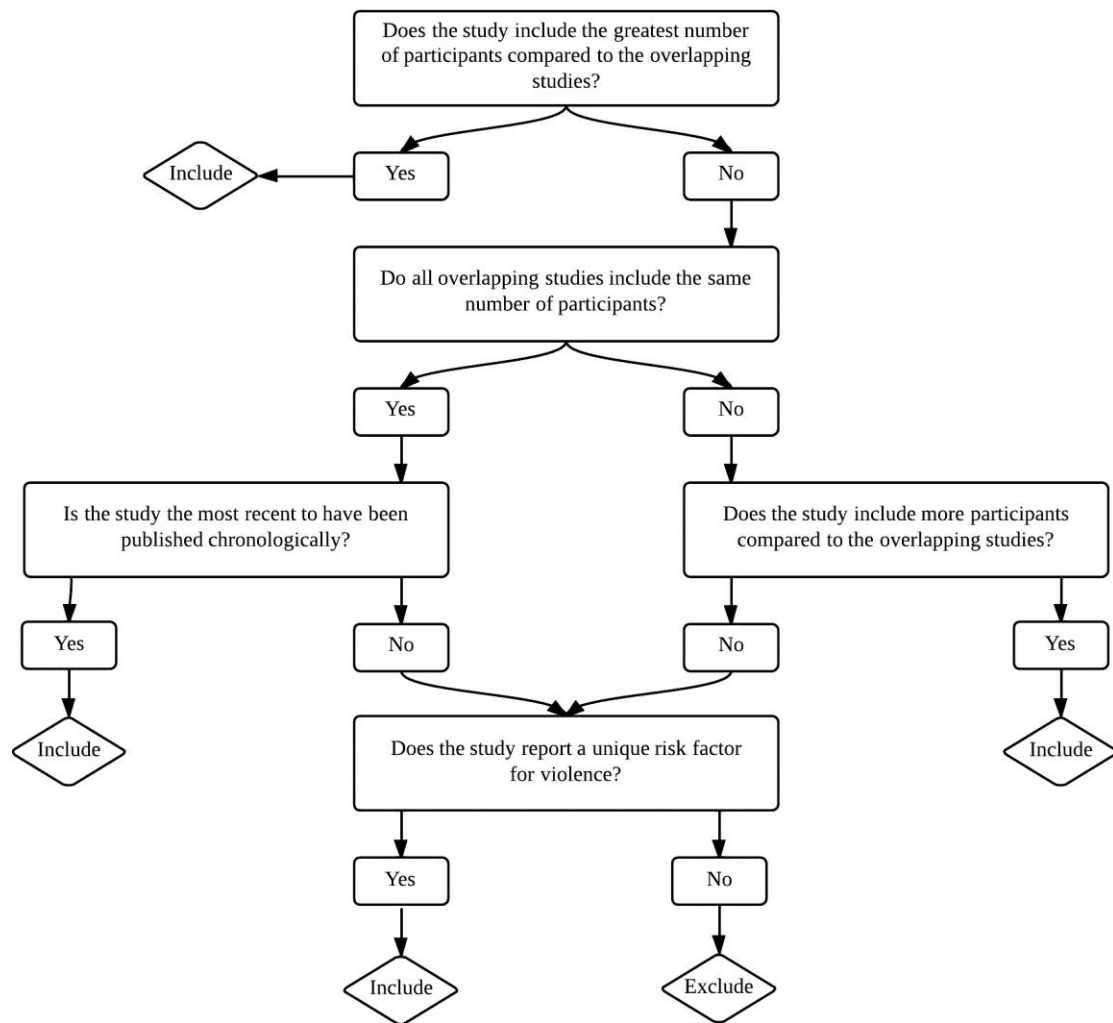
One criticism of meta-analyses concerns the combination of information from studies of varying methodological quality.<sup>135</sup> As previous work suggests that studies with poorer methodological quality are associated with higher estimates of treatment effects as compared to those of high quality,<sup>136</sup> statistically adjusting for study quality may therefore reduce this between-study heterogeneity thereby increasing the precision of the pooled estimate.<sup>137</sup>

The Khan Study Quality Criteria were used to quantify study quality in this meta-analysis owing to the clear distinction made between studies of differing research designs. The Khan Study Quality Criteria consists of 10 items assessing the quality of cohort and randomised controlled trials (RCT), and 9 items for case-control and cross-sectional studies (Appendix A).<sup>138</sup> Each criterion was coded as either present (+1) or absent (0). Where there was uncertainty as to whether the criterion had been addressed by the primary study, it was coded as absent. Studies were rated as poor quality if they satisfied three or fewer criteria, as

moderate quality if they met between four and seven criteria, and high quality if eight or more criteria were met.

#### ***2.2.4 Data Extraction***

Using a standardised form, data on risk factors for violence was extracted from each included study. Following an approach used in previous meta-analyses of risk factors for violence,<sup>127,139</sup> only those factors reported by a minimum of three independent studies will be presented in the main thesis text. Factors reported by only two studies can be found in Appendix B. During the data extraction process, it became evident that several individual studies contained overlapping samples. The system used to determine which study to preferentially include in the present study is illustrated in Figure 2.1. Data from overlapping studies was included only if a novel risk factor was reported.



**Figure 2.1.** Decision system used to determine whether studies with overlapping samples are eligible for inclusion.

Where possible, risk factors were separated into those that occurred within the previous year (denoted as “recent”) and those that occurred at any point during the individual’s lifetime (denoted as “historical”). As proximal risk factors are more likely to be dynamic in nature, this disaggregation may enable the contribution of dynamic factors to be more clearly identified.

As previous work suggests that data extraction errors are common,<sup>140</sup> one-third (31.8%) of the included studies were randomly selected for coding by a Masters-level

research assistant working independently (Ms. Katharina Seewald). Using the standardised data extraction form, descriptive information and raw data were extracted from these studies. A high level of inter-rater agreement was found (Cohen's  $\kappa = 0.93$ ).<sup>141</sup>

### ***2.2.5 Effect Size***

Previous work suggests that odds ratios (ORs) are the most appropriate effect size statistic for summarising associations between two naturally dichotomous groups.<sup>142</sup> ORs represent the increased relative risk of an outcome (e.g., violence) associated with the presence of a given risk factor.<sup>143</sup>

Data were converted to ORs for the purposes of pooling using six approaches. If data were reported as frequencies or proportions, ORs were calculated directly. If data were reported continuously, log-transformed ORs were calculated from Cohen's  $d$ .<sup>144</sup> If data were reported as correlation coefficients, these were converted to Cohen's  $d$ <sup>145</sup> and then to log-transformed ORs. If data were reported as chi-square tests, these were converted to correlation coefficients,<sup>146</sup> then to Cohen's  $d$  and finally to log-transformed ORs. If data were reported as  $z$  scores, these were converted to correlation coefficients,<sup>145</sup> then to Cohen's  $d$  and finally to log-transformed ORs. Lastly, if data was reported as a Mann-Whitney  $U$  test, these were converted to a correlation coefficient following the procedure outlined in DeCoster (2009),<sup>147</sup> then to Cohen's  $d$ , and finally to log-transformed ORs.

Where ORs are reported in text, the following qualitative descriptions of magnitude were used: weak (OR 1.0–1.5), moderate (OR=1.6–2.5), strong (OR=2.6–9.9) and very strong (OR $\geq$ 10.0).<sup>148</sup> As these descriptions may not apply to factors measured continuously, qualitative description of OR magnitude was avoided for these factors.

### 2.2.6 Statistical Analyses

Most meta-analyses typically employ one of two statistical models when estimating the pooled estimate: the *fixed effect* or the *random effects* model.<sup>149,150</sup> The fixed effect model assumes that all included studies estimate the same underlying population parameter.<sup>149</sup> Any variability in estimates between studies is therefore considered to reflect the play of chance (i.e., random sampling error).<sup>151</sup> The random effects model, in contrast, assumes that all included studies estimate slightly different population parameters.<sup>149</sup> Consequently, between-study variability in this model may be caused either by sampling variability or by true differences in the magnitude of the population parameter.<sup>151</sup>

Implicit in the assumption of the fixed effect model is the suggestion that the included studies represent the entire universe of literature that has been written on the topic.<sup>152</sup> The random effects model, in contrast, suggests that the included studies represent only a sample of all work within the topic area. Consequently, the results of random effects meta-analyses possess greater generalizability.<sup>153,154</sup> For this reason, the random effects model was chosen as the method for combining effect sizes in the present study. Specifically, the DerSimonian-Laird<sup>155</sup> random effects model was used to calculate pooled ORs for each risk factor using the *metan* command with the *random* option in Stata for Windows, version 11.<sup>156</sup>

As influential studies excessively affect the magnitude of the pooled OR,<sup>157</sup> influence was assessed prior to data analysis using the *metaninf* command which recalculates the pooled OR and 95% confidence interval (CI) excluding each study in turn.<sup>158</sup> A study was interpreted as influential when its exclusion caused the 95% CI to lie either below or above the bounds of the pooled 95% CI. Where a study was found to be influential, a sensitivity analysis was conducted to investigate the effect this had on the magnitude of the pooled OR.

The magnitude of the pooled OR may also be affected by the inclusion of a non-representative sample of studies due to the effects of publication bias. Work suggests that studies with statistically significant findings are three times more likely to be submitted for publication<sup>159</sup> and between two and five times more likely to be subsequently published.<sup>160,161</sup> Meta-analyses based only on published literature may therefore overestimate treatment effects. For example, Eyding and colleagues (2010) recently conducted a meta-analysis to investigate the effectiveness of reboxetine and found that although the drug had been trialled in 4,098 patients, data on only around one-quarter ( $n=1,065$ ) had been published. This data overestimated the treatment effect of reboxetine against placebo by 115%. When unpublished data was included in the meta-analysis, no significant benefit for reboxetine was found.<sup>162</sup>

Publication bias was therefore assessed in the present study using Peters' test<sup>163</sup> for dichotomous risk factors and Egger's test<sup>164</sup> for risk factors coded continuously; implemented using the *metabias* command specifying either the *peters* or *egger* option. Both of these regression tests investigate the association between an individual study's effect size estimate and its precision.<sup>165</sup> If studies with low precision have larger effect size estimates than those with high precision, publication bias is inferred as present.<sup>165</sup> In addition, publication bias was assessed using meta-regression by dichotomously coding studies according to their publication status (e.g., unpublished vs. published).

Lastly, although some variability in the individual study effect size estimates is to be expected in meta-analysis as studies of varying designs conducted in varying samples are statistically combined,<sup>166</sup> excessive between-study variability, termed *heterogeneity*, may lead to biased estimates of the pooled OR. The presence of heterogeneity is typically assessed using one of two measures: Cochran's  $Q$ <sup>167</sup> or the  $I^2$  statistic.<sup>166,168</sup> Specifically, Cochran's  $Q$  sums the squared deviations of each individual study's estimate from the pooled effect size.<sup>167</sup> By comparing this deviation to that of a Chi-square distribution with  $k-1$  degrees of

freedom, Cochran's  $Q$  indicates whether the pooled OR is significantly affected by heterogeneity.<sup>166</sup> This statistic does not, however, indicate the extent this variability.<sup>k,172</sup>

The  $I^2$  statistic, on the other hand, indicates the percentage of variability due to between-study factors rather than from sampling error alone.<sup>166,168</sup> The  $I^2$  statistic can therefore take any value between 0% and 100% with higher values indicative of greater variability due to between-study heterogeneity rather than random sampling error.  $I^2$  values  $\geq 75\%$  are typically interpreted as indicating high heterogeneity.<sup>166</sup> Where  $I^2 \geq 75\%$ , potential causes of this variability are typically investigated using meta-regression.<sup>173</sup>

Meta-regression investigates whether there is a relationship between one of more study-level characteristic and the pooled OR.<sup>174</sup> The random effects model<sup>175</sup> was used in preference to the fixed effect model as previous work suggests this latter model is associated with an inflated false-positive rate in circumstances where heterogeneity is high.<sup>176</sup> Random effects meta-regression can be implemented in Stata for Windows, version 11<sup>156</sup> using the *metareg* command specifying the *random* option.

As variability between individual study estimates can stem from *clinical*, *methodological*, or *statistical* factors, a number of study-level covariates were investigated to reflect these three sources of heterogeneity. Additionally, a number of markers of study quality were also investigated, including: prospective (vs. retrospective) orientation, RCT (vs. cohort or case-control) research design, total sample size, and total study quality score according to the Khan criteria. Where more than one study-level characteristic was significantly associated with heterogeneity, these characteristics were entered into a multivariate meta-regression model to investigate which independently explained heterogeneity.

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<sup>k</sup> Additionally, there is concern that Cochran's  $Q$  may lack statistical power to detect heterogeneity where a small number of studies are included.<sup>169-171</sup>

### **2.2.7 Risk Domain Analyses**

To investigate which psychosocial domain was associated with the greatest increase in violence risk in this population, risk factors were grouped into one of ten domains: demographic, premorbid, criminal history, psychopathological, positive symptoms, negative symptoms, neuropsychological, substance misuse, suicidal behaviours, and treatment-related. As with the previous analyses, the random effects model was used to produce pooled ORs for these risk domains analyses using the *metan* command with the *random* option in Stata for Windows version 11.<sup>156</sup>

### **2.2.8 Additional Analyses**

As previous work suggests that risk factors for severe violence may differ from those for aggression or hostility,<sup>177</sup> and between inpatients and outpatients,<sup>178,179</sup> two additional sub-group analyses were undertaken to investigate whether the strength of association for the ten risk domains varies as a function of differences in either the definition of violence and/or patient setting. Once again, the random effects model was used to calculate pooled ORs and 95% CIs for each risk domain.

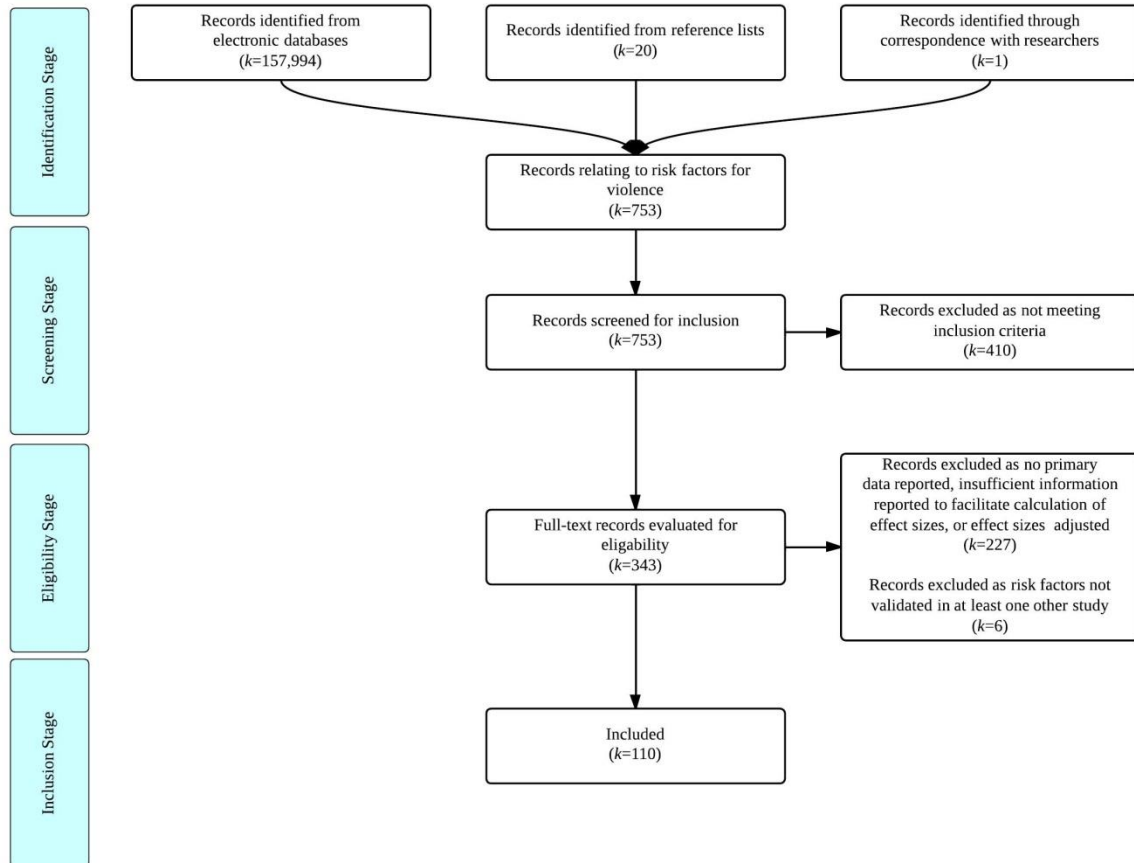
## 2.3 Results

The systematic search identified 157,994 studies. A further 20 studies were identified by hand-searching reference lists of previous reviews, and one additional study was identified following correspondence with researchers in the field. Of the 753 studies evaluated for inclusion, 410 were excluded. Reasons for exclusion, and some representative examples of excluded studies, are listed below:

- 1). Investigated risk factors for general offending rather than for violence;<sup>180-184</sup>
- 2). Risk factors were not compared between a violent and non-violent group;<sup>95,185-190</sup>
- 3). <95% of the study participants had been diagnosed with a psychotic disorder;<sup>191-195</sup>
- 4). Diagnosis was made without reference to DSM or ICD criteria,<sup>196,197</sup> or;
- 5). <95% of the study participants were 18 years or older at recruitment.<sup>198</sup>

Additionally, as an aim of this meta-analysis was to investigate proximal and modifiable risk factors for violence, studies investigating childhood risk factors for violence<sup>199</sup> as well as those concerned with the identification of genetic biomarkers for violence<sup>200</sup> were also excluded. A further 227 studies were excluded because they did not report primary data as they were reviews,<sup>178,201-203</sup> letters to the editor,<sup>204,205</sup> or editorials.<sup>206</sup> Studies were also excluded if they did not provide sufficient information for the calculation of an effect size,<sup>207,208</sup> or if they had statistically adjusted the primary effect size.<sup>191</sup> Lastly, six studies which reported risk factors that were not replicated by at least one additional study were also excluded.<sup>209-214</sup> A total of 110 studies, therefore, were included in the present meta-

analysis (Figure 2.2). A table outlining the key methodological features of each included study is provided at Appendix C.



**Figure 2.2.** PRISMA flow chart illustrating the number of records identified, number of studies screened and excluded, reasons for exclusion, and the number of studies included in this review.

### 2.3.1 Demographic and Descriptive Characteristics of Included Studies

These 110 studies included 45,533 participants from 73 independent samples. Through correspondence, new tabular data was included from the following studies: the *Clinical Antipsychotic Trials of Intervention Effectiveness (CATIE; <sup>215</sup>) Schizophrenia Care*

and Assessment Project (SCAP; <sup>216</sup>) MacArthur Prevalence, <sup>217</sup> 5 Site, <sup>218</sup> the UK-700 Study, <sup>219</sup> and one other recent study. <sup>220</sup>

Mean sample size was 413.9 ( $sd = 1,404.7$ ; range 16–13,806). A total of 27 countries were represented: USA ( $k=29$ ), <sup>215-218,220-244</sup> UK ( $k=14$ ), <sup>219,245-257</sup> Israel ( $k=9$ ), <sup>258-266</sup> Australia ( $k=5$ ), <sup>267-271</sup> South Korea ( $k=5$ ), <sup>272-276</sup> Spain ( $k=5$ ), <sup>179,277-280</sup> Sweden ( $k=5$ ), <sup>281-285</sup> China ( $k=4$ ), <sup>286-289</sup> Germany ( $k=4$ ), <sup>290-293</sup> Mexico ( $k=4$ ), <sup>294-297</sup> Austria ( $k=3$ ), <sup>298-300</sup> Finland ( $k=2$ ), <sup>85,301</sup> Turkey ( $k=2$ ) <sup>302,303</sup> and one each from Brazil, <sup>304</sup> Canada, <sup>305</sup> the Czech Republic, <sup>306</sup> Denmark, <sup>307</sup> Greece, <sup>308</sup> India, <sup>309</sup> the Republic of Ireland, <sup>310</sup> Japan, <sup>311</sup> Norway, <sup>312</sup> Singapore, <sup>313</sup> South Africa, <sup>314</sup> Taiwan, <sup>315</sup> The Netherlands, <sup>316</sup> and Tunisia. <sup>317</sup> Five studies involved international collaborations. <sup>318-322</sup>

The majority of these individuals were diagnosed with schizophrenia ( $n=39,995$ ; 87.8%), followed by other psychoses ( $n=5,329$ ; 11.8%), and bipolar disorder ( $n=209$ ; 0.4%). A total of 8,439 (18.5%) were violent.

### **2.3.2 Demographic Domain**

Violence was strongly associated with a history of violent victimisation, moderately associated with recent homelessness, a history of homelessness, and being male, and weakly associated with non-white ethnicity, and lower socio-economic status (Table 2.2).

A further eight demographic factors were replicated in only two primary studies (Appendix B). One demographic factor was associated with  $I^2 > 75\%$ : male gender. Five between-study characteristics were univariately associated with heterogeneity for this risk factor. On multivariate meta-regression, however, only two characteristics remained independently associated with heterogeneity (Table 2.3)

**Table 2.2.**

Association between demographic factors and risk of violence in individuals with psychosis.

Risk Factor	<i>k</i>	<i>n</i>	<i>N</i>	Random	<i>z</i>	<i>I</i> <sup>2</sup>	<i>p</i>
				Effects OR (95% CI)			
Historical violent victimisation during adulthood	4	609	3,034	6.1 (4.0 – 9.1)	8.7	0	***
Historical homelessness	9	910	4,254	2.3 (1.5 – 3.4)	4.0	40	***
Recent homelessness	8	752	3,546	2.3 (1.5 – 3.5)	3.7	47	***
Male gender	37	4,636	30,713	1.6 (1.2 – 2.1)	3.6	84	***
Non-white ethnicity	16	1,336	5,270	1.4 (1.2 – 1.6)	4.8	0	***
Lower SES during adulthood	12	2,596	17,325	1.4 (1.1 – 1.9)	3.0	62	**
Received a primary school education only	3	138	649	1.4 (0.9 – 2.4)	1.5	0	0.11
Lower family SES during childhood	3	209	778	1.4 (0.7 – 2.8)	1.0	50	0.28
Currently living in an urban environment	4	210	482	1.3 (0.9 – 1.9)	1.4	0	0.14
Currently living alone	9	602	2,907	1.2 (0.9 – 1.6)	1.5	18	0.13
Received a high school education only	3	278	1,128	1.2 (0.6 – 2.5)	0.6	46	0.55
Unmarried, widowed or divorced	25	3,121	20,773	1.1 (0.9 – 1.3)	1.6	18	0.11
Shorter duration of education (years)	16	845	3,194	1.1 (0.8 – 1.4)	1.0	0	0.30
Currently unemployed	21	1,020	4,644	1.1 (0.8 – 1.6)	0.7	68	0.45
Lacks formal educational qualifications	6	366	2,416	1.1 (0.7 – 1.8)	0.7	54	0.49
Young age (years)	34	1,988	10,279	1.0 (0.9 – 1.1)	0.9	0	0.36
Parent	3	1,965	14,775	1.0 (0.9 – 1.1)	0.9	0	0.35

**Note:** *k* = number of studies analysed, *n* = number of violent participants, *N* = number of total participants, *I*<sup>2</sup> = percentage of variability in effect size estimates attributable to between-study variation. Factors ranked according to pooled OR magnitude.

\*\*\* = significant to the 0.001 level;

\*\* = significant to the 0.01 level;

\* = significant to the 0.05 level.

**Table 2.3.**

Univariate and multivariate meta-regression analyses for the male gender risk factor.

Between-Study Characteristic	Univariate			Multivariate		
	exp( $\beta$ )	exp( <i>se</i> )	<i>p</i>	exp( $\beta$ )	exp( <i>se</i> )	<i>p</i>
Violence coded from register-based data	1.8	1.3	*			
% sample recruited from a forensic facility	1.3	1.1	*	1.1	1.0	*
% sample previously violent	1.0	1.0	*	1.0	1.0	*
Study country (USA v. RoW)	0.6	1.2	*			
Diagnosis made using DSM criteria	0.5	1.2	*			

**Note:**  $\beta$  = regression coefficient, *se* = standard error of the regression coefficient, *p* = probability value, RoW = Rest of World. The exponentiated meta-regression coefficient gives the ratio of the OR between categories of the between-study characteristic.<sup>323</sup>

\*\*\* = significant to the 0.001 level;

\*\* = significant to the 0.01 level;

\* = significant to the 0.05 level.

### 2.3.3 Premorbid Domain

Violence was moderately associated with childhood physical or sexual abuse, a parental history of criminal behaviour, and a parental history of alcohol misuse. All other premorbid factors were not significantly associated with violence risk (Table 2.4). Of the five premorbid factors replicated in only two primary studies, none were significantly associated with violence risk (Appendix B). None of the between-study characteristics investigated were significantly associated with heterogeneity for those factors associated with an  $I^2 > 75\%$ .

**Table 2.4.**  
Association between premorbid factors and risk of violence in individuals with psychosis.

Risk Factor	<i>k</i>	<i>n</i>	<i>N</i>	Random Effects OR (95% CI)	<i>z</i>	$I^2$	<i>p</i>
Physically abused during childhood	4	444	2,177	2.2 (1.5 – 3.1)	4.4	39	***
Sexually abused during childhood	3	384	1,924	1.9 (1.5 – 2.4)	5.3	0	***
Parental history of criminal behaviour	4	1,850	14,191	1.8 (1.5 – 2.2)	6.3	0	***
Parental history of alcohol misuse	5	1,871	14,209	1.6 (1.4 – 1.8)	6.7	0	***
Death of a parent during childhood	4	185	362	1.4 (0.7 – 2.6)	1.0	0	0.30
Higher general premorbid adjustment scores	3	66	146	1.4 (0.6 – 3.3)	0.8	0	0.39
Family history of any mental illness	3	194	756	1.3 (0.8 – 2.1)	1.3	0	0.18
Historical head injury and/or trauma	3	79	326	1.3 (0.6 – 2.5)	0.7	0	0.46
Higher childhood premorbid adjustment scores	3	66	146	1.2 (0.7 – 2.1)	0.8	0	0.40
Higher early adolescence premorbid adjustment scores	3	66	146	1.2 (0.7 – 1.9)	0.7	0	0.45
Higher late adolescence premorbid adjustment scores	3	66	146	1.0 (0.6 – 1.9)	0.2	4	0.79
Divorce/separation of parents during childhood, or, raised by a single parent	4	185	362	0.7 (0.1 – 3.1)	0.4	79	0.68

**Note:** *k* = number of studies analysed, *n* = number of violent participants, *N* = number of total participants,  $I^2$  = percentage of variability in effect size estimates attributable to between-study variation. Factors ranked according to pooled OR magnitude.

\*\*\* = significant to the 0.001 level;

\*\* = significant to the 0.01 level;

\* = significant to the 0.05 level.

### 2.3.4 Criminal History Domain

Almost all criminal history factors identified by this review were significantly associated with violence risk. A history of assault was very strongly associated with violence

(Table 2.5). A history of imprisonment for any offence was strongly associated with violence as was recent arrest for any offence, aggressive behaviour during the study period,<sup>1</sup> a history of conviction for a violent offence, a history of conviction for any offence, a history of arrest for any offence, and a history of violent behaviour specifically. Aggression scores<sup>m</sup> and verbal aggression subscale scores were also associated with violence. A total of 14 other risk factors were replicated in only two primary studies (Appendix B).

The percentage of the sample that were previously violent was significantly associated with between-study heterogeneity for both the history of assault [ $\exp(\beta)=1.1$ ,  $\exp(se)=1.0$ ,  $p=0.03$ ]<sup>n</sup> and history of conviction for a violent offence factors [ $\exp(\beta)=0.9$ ,  $\exp(se)=1.0$ ,  $p=0.03$ ].<sup>n</sup> Study country (USA vs. RoW) was significantly associated with heterogeneity for the aggressive behaviour risk factor [ $\exp(\beta)=0.1$ ,  $\exp(se)=1.5$ ,  $p=0.04$ ].<sup>n</sup>

**Table 2.5.**

Association between criminal history factors and risk of violence in individuals with psychosis.

Risk Factor	<i>k</i>	<i>n</i>	<i>N</i>	Random Effects OR (95% CI)	<i>z</i>	<i>I</i> <sup>2</sup>	<i>p</i>
Historical assault perpetration	4	420	1,808	21.4 (5.2 – 86.6)	4.3	91	***
Higher aggression against others scores <sup>§</sup>	3	170	351	20.3 (0.5–770.1)	1.6	72	0.10
Higher aggression scores	7	190	396	17.4 (2.6–117.0)	2.9	65	**
Higher verbal aggression scores	5	181	456	5.5 (1.6 – 18.9)	2.7	12	**
Historical imprisonment for any offence	6	644	2,990	4.5 (2.7 – 7.7)	5.6	62	***
Recent arrest for any offence	3	451	2,326	4.3 (2.7 – 6.7)	6.4	55	***
Aggressive behaviour during the study period	4	122	1,282	4.3 (1.2 – 15.1)	2.2	88	*
Historical conviction for a violent offence	6	2,086	16,409	4.2 (2.2 – 9.1)	4.2	86	***
Historical conviction for any offence	5	194	856	3.5 (1.2 – 10.6)	2.2	67	*
Historical arrest for any offence	4	510	2,781	3.5 (2.1 – 5.8)	4.9	72	***
Historical violent behaviour	11	463	2,626	3.1 (2.2 – 4.4)	6.6	0	***
Number of arrests for any offence	3	73	268	3.0 (0.9– 10.0)	1.8	0	0.07
Higher aggression against objects scores	4	170	436	1.9 (0.6 – 6.1)	1.1	44	0.27

*Table continued over ...*

<sup>1</sup> Aggressive behaviour during the study period is a dichotomous risk factor coded as +1 if the individual was observed by staff and/or a collateral informant to have engaged in aggressive behaviour, such as damaging property, during the study period, and 0 if otherwise.

<sup>m</sup> Aggression scores, on the other hand, is a continuous risk factor indicating total scores on a psychometric scale of aggression, such as the Overt Aggression Scale (OAS; <sup>324</sup>).

<sup>n</sup> The exponentiated meta-regression coefficient gives the ratio of the OR between categories of the between-study characteristic.<sup>323</sup>

Risk Factor	<i>k</i>	<i>n</i>	<i>N</i>	Random Effects OR (95% CI)	<i>z</i>	<i>I</i> <sup>2</sup>	<i>p</i>
Recent violent behaviour	4	89	464	1.6 (0.8 – 3.0)	1.4	3	0.15
Higher poor aggressive impulse control scores	3	114	259	1.5 (0.4 – 4.8)	0.6	29	0.50
Historical conviction for a non-violent offence	4	477	5,137	1.4 (0.8 – 2.3)	1.2	30	0.21
Young age at first criminal offence (years)	3	247	1,047	1.2 (0.7 – 2.2)	0.8	0	0.39

**Note:** *k* = number of studies analysed, *n* = number of violent participants, *N* = number of total participants, *I*<sup>2</sup> = percentage of variability in effect size estimates attributable to between-study variation. Factors ranked according to pooled OR magnitude.

§ Inspection of the *metaninf* plot suggested that two small studies were influential.<sup>270,275</sup> With these studies excluded, OR=1.5 (95% CI 0.4 – 5.9), *z*=0.6, *I*<sup>2</sup>=0%, *p*=0.31.

\*\*\* = significant to the 0.001 level;

\*\* = significant to the 0.01 level;

\* = significant to the 0.05 level.

### 2.3.5 Psychopathological Domain

Meeting criteria for psychopathy and hostile behaviour<sup>o</sup> during the study period were both strongly associated with violence risk. Additionally, higher psychopathy factor two scores, psychopathy factor one scores, total psychopathy scores, poor impulse control scores, general symptoms scores, hostility scores,<sup>p</sup> and total PANSS scores were also significantly associated with violence risk in this study. A lack of insight was strongly associated with violence (Table 2.6). A further 16 duplicated factors were not significantly associated with violence risk, however (Appendix B). No study-level characteristic was significantly associated with heterogeneity for the residual schizophrenia subtype risk factor.

<sup>o</sup> Hostile behaviour during the study period is a dichotomous risk factor coded as +1 if the individual was observed by staff and/or a collateral informant to have engaged in hostile behaviour, such as failure to comply with ward routines, during the study period, and 0 if otherwise.

<sup>p</sup> Hostility scores, on the other hand, is a continuous risk factor indicating total scores on a psychometric measure of hostility, such as the Buss-Durkee Hostility Inventory (BDHI;<sup>325</sup>).

**Table 2.6.**

Association between psychopathological factors and risk of violence in individuals with psychosis.

Risk Factor	<i>k</i>	<i>n</i>	<i>N</i>	Random Effects OR (95% CI)	<i>z</i>	<i>I</i> <sup>2</sup>	<i>p</i>
Higher psychopathy factor two scores	3	78	168	8.8 (1.6–46.7)	2.5	0	*
Higher psychopathy factor one scores	3	78	168	7.2 (1.4–35.9)	2.4	0	*
Higher psychopathy total scores	7	183	486	4.4 (1.2–15.6)	2.3	58	*
Meets criteria for psychopathy	4	69	358	3.6 (1.0–12.4)	2.0	8	*
Higher poor impulse control scores	11	475	2,451	3.3 (1.5 – 7.2)	3.1	31	**
Higher preoccupation scores	3	51	247	2.9 (0.9 – 9.5)	1.8	0	0.07
Hostile behaviour during the study period	3	318	2,724	2.8 (1.8 – 4.2)	4.9	0	***
Lack of insight	6	280	2,402	2.7 (1.4 – 5.2)	2.9	61	**
Higher lack of insight into illness scores	3	131	363	2.2 (0.8 – 6.3)	1.5	0	0.12
Diagnosed with comorbid ASPD	4	83	405	2.1 (1.0 – 4.3)	2.0	15	*
Diagnosed with delusional disorder	3	68	201	2.0 (0.2 – 19.0)	0.6	44	0.52
Higher general symptoms scores	21	1,052	4,233	1.7 (1.1 – 2.6)	2.4	13	*
Higher cognitive functioning scores	5	261	528	1.7 (0.9 – 3.3)	1.6	0	0.09
Higher hostility scores	16	701	3,290	1.5 (1.0 – 2.1)	2.2	1	*
Higher total PANSS scores	15	771	3,226	1.5 (1.0 – 2.2)	2.2	10	*
Diagnosed with undifferentiated schizophrenia	8	349	694	1.5 (0.6 – 3.9)	0.9	61	0.36
Higher total CGI <sup>§</sup> scores	3	331	1,532	1.5 (0.5 – 4.3)	0.8	44	0.38
Higher lack of insight/judgement scores	6	441	1,985	1.4 (0.9 – 2.4)	1.5	0	0.13
Higher guilt scores	4	137	354	1.4 (0.8 – 2.6)	1.2	0	0.23
Higher somatic concerns scores	5	435	2,425	1.3 (0.8 – 2.1)	1.2	0	0.22
Lower depression/anxiety scores	5	104	595	1.3 (0.7 – 2.3)	0.8	0	0.38
Higher trait anxiety scores	11	516	2,795	1.2 (0.8 – 1.8)	1.0	0	0.32
Diagnosed with bipolar disorder	3	176	487	1.2 (0.7 – 2.0)	0.8	0	0.40
Higher uncooperativeness scores	9	658	3,113	1.2 (0.8 – 1.9)	1.1	18	0.26
Higher confusion/disorientation scores	5	792	1,275	1.1 (0.8 – 1.6)	0.8	0	0.38
Higher activation scores	4	254	699	1.1 (0.7 – 1.8)	0.5	0	0.62
Higher total BPRS <sup>†</sup> scores	6	260	1,309	1.1 (0.6 – 2.0)	0.5	4	0.56
Diagnosed with paranoid schizophrenia	11	505	1,611	1.1 (0.7 – 1.7)	0.4	59	0.68
Young age at psychosis onset (years)	15	600	1,598	1.0 (0.8 – 1.3)	0.6	0	0.53
Diagnosed with catatonic schizophrenia	4	210	436	1.0 (0.3 – 3.3)	0.1	0	0.94
Higher social interest scores	3	1,051	2,382	1.0 (0.6 – 1.7)	0.2	0	0.80
Higher total MINI <sup>‡</sup> scores	4	216	760	1.0 (0.8 – 1.2)	0.0	0	0.99
Diagnosed with schizophrenia	20	1,382	5,522	0.9 (0.7 – 1.2)	0.4	48	0.68
Diagnosed with disorganised schizophrenia	6	298	587	0.9 (0.4 – 2.2)	0.1	2	0.91
Diagnosed with schizoaffective disorder	8	483	1,363	0.8 (0.3 – 1.7)	0.5	73	0.60
Diagnosed with Psychosis NOS <sup>‡</sup>	3	67	214	0.4 (0.1 – 1.2)	1.5	0	0.12
Diagnosed with residual schizophrenia	5	237	485	0.3 (0.05 – 1.7)	1.3	83	0.17

**Note:** *k* = number of studies analysed, *n* = number of violent participants, *N* = number of total participants, *I*<sup>2</sup> = percentage of variability in effect size estimates attributable to between-study variation. Factors ranked according to pooled OR magnitude.

\*\*\* = significant to the 0.001 level;

\*\* = significant to the 0.01 level;

\* = significant to the 0.05 level.

<sup>§</sup> Clinical Global Impression scale (CGIS; <sup>326</sup>).

<sup>†</sup> Brief Psychiatric Rating Scale (BPRS; <sup>327</sup>).

<sup>‡</sup> Mini International Neuropsychiatric Interview (MINI; <sup>328</sup>).

<sup>‡</sup> Not Otherwise Specified.

### 2.3.6 Positive Symptoms Domain

Only two positive symptoms risk factors were significantly associated with violence: higher excitement scores and positive symptoms scores (Table 2.7). Nine additional factors reported in two primary studies were not significantly associated with violence risk in this study (Appendix B). Univariate meta-regression suggested that no study-level characteristic was significantly associated with heterogeneity for either the paranoid thoughts or bizarre behaviour risk factors.

**Table 2.7.**

Association between positive symptom factors and risk of violence in individuals with psychosis.

Risk Factor	<i>k</i>	<i>n</i>	<i>N</i>	Random Effects OR (95% CI)	<i>z</i>	<i>I</i> <sup>2</sup>	<i>p</i>
Paranoid thoughts	3	130	503	2.0 (0.7 – 5.9)	1.3	79	0.19
Higher conceptual disorganisation scores	3	70	220	1.7 (0.7 – 3.9)	1.2	0	0.20
Higher excitement scores	9	490	1,685	1.6 (1.0 – 2.6)	2.1	0	*
Higher delusions scores	4	417	1,972	1.6 (0.6 – 4.2)	0.9	11	0.34
Persecutory delusions	4	109	448	1.6 (0.7 – 3.6)	1.1	69	0.25
Acutely symptomatic	3	158	945	1.5 (0.6 – 3.5)	1.0	74	0.31
Higher positive symptom scores	28	1,108	5,342	1.2 (1.0 – 1.5)	1.8	0	*
Higher hallucinations scores	6	492	2,490	1.2 (0.7 – 1.9)	0.9	0	0.35
Threat/control override delusions	5	584	1,849	1.2 (0.9 – 1.7)	1.5	7	0.13
Higher grandiosity scores	5	435	2,425	1.2 (0.8 – 1.8)	1.0	0	0.31
Delusions of control	4	202	514	1.2 (0.7 – 2.0)	0.6	51	0.49
Hallucinations of any type	7	567	2,017	1.1 (0.8 – 1.5)	0.9	28	0.38
Higher suspiciousness/persecution scores	8	512	2,610	1.1 (0.8 – 1.4)	0.6	0	0.54
Higher thought disorder/disturbance scores	6	385	863	1.1 (0.8 – 1.7)	0.7	0	0.43
Delusions of any type	3	90	372	1.1 (0.6 – 2.1)	0.4	0	0.65
Auditory hallucinations	3	443	1,582	1.1 (0.6 – 1.9)	0.4	74	0.66
Higher paranoia scores	3	29	256	1.1 (0.2 – 5.5)	0.1	45	0.88
Command hallucinations	3	77	283	1.0 (0.5 – 2.0)	0.1	0	0.89
Grandiose delusions	4	114	352	0.8 (0.3 – 1.9)	0.5	40	0.61

**Note:** *k* = number of studies analysed, *n* = number of violent participants, *N* = number of total participants, *I*<sup>2</sup> = percentage of variability in effect size estimates attributable to between-study variation. Factors ranked according to pooled OR magnitude.

\*\*\* = significant to the 0.001 level;

\*\* = significant to the 0.01 level;

\* = significant to the 0.05 level.

### 2.3.7 Negative Symptoms Domain

None of the negative symptom factors identified by this review were significantly associated with violence (Table 2.8). Additionally, none of the five negative symptom factors replicated in only two primary studies were significantly associated with violence risk (Appendix B). Furthermore, no study-level characteristic was associated with heterogeneity for the poor self care risk factor.

**Table 2.8.**  
Association between negative symptom factors and risk of violence in individuals with psychosis.

Risk Factor	<i>k</i>	<i>n</i>	<i>N</i>	Random Effects OR (95% CI)	<i>z</i>	<i>I</i> <sup>2</sup>	<i>p</i>
Higher poor attention span scores	6	483	2,104	1.4 (0.8 – 2.6)	1.2	0	0.22
Lower total QOL <sup>§</sup> scores	3	452	2,038	1.2 (0.7 – 2.2)	0.8	0	0.39
Comorbid depression	4	139	1,948	1.1 (0.7 – 1.7)	0.4	0	0.63
Higher blunted affect scores	3	80	367	1.1 (0.6 – 2.0)	0.3	0	0.76
Higher depression scores	13	1,449	3,629	1.0 (0.8 – 1.3)	0.3	0	0.73
Higher negative symptom scores	27	1,157	4,538	1.0 (0.9 – 1.2)	0.5	0	0.59
Higher social withdrawal scores	3	61	180	1.0 (0.6 – 1.8)	0.2	0	0.79
Lower psychosocial functioning scores	3	769	1,065	1.0 (0.8 – 1.2)	0.1	0	0.92

**Note:** *k* = number of studies analysed, *n* = number of violent participants, *N* = number of total participants, *I*<sup>2</sup> = percentage of variability in effect size estimates attributable to between-study variation. Factors ranked according to pooled OR magnitude.

<sup>§</sup> Quality of Life scale (QoL; <sup>329</sup>).

### 2.3.8 Neuropsychological Domain

None of the neuropsychological factors identified were significantly associated with violence (Table 2.9). Eight further neuropsychological factors investigated in only two primary studies were also not significantly associated with violence risk in this review (Appendix B).

**Table 2.9.**

Association between neuropsychological factors and risk of violence in individuals with psychosis.

Risk Factor	<i>k</i>	<i>n</i>	<i>N</i>	Random Effects OR (95% CI)	<i>z</i>	<i>I</i> <sup>2</sup>	<i>p</i>
Lower full-scale IQ scores on the WAIS <sup>§</sup>	9	251	513	1.5 (0.9 – 2.4)	1.7	0	0.09
Lower performance IQ scores on the WAIS <sup>§</sup>	4	86	167	1.5 (0.4 – 5.0)	0.7	28	0.47
Lower total NART <sup>†</sup> scores	4	133	471	1.2 (0.6 – 2.3)	0.6	0	0.52
Lower picture completion scores	3	72	153	1.2 (0.4 – 3.7)	0.4	16	0.66
Lower verbal IQ scores on the WAIS <sup>§</sup>	4	71	265	1.1 (0.6 – 2.1)	0.6	0	0.56
Higher preservative errors on the WCST <sup>‡</sup>	3	118	229	1.0 (0.8 – 1.2)	0.1	0	0.92

**Note:** *k* = number of studies analysed, *n* = number of violent participants, *N* = number of total participants, *I*<sup>2</sup> = percentage of variability in effect size estimates attributable to between-study variation. Factors ranked according to pooled OR magnitude.

<sup>§</sup> Wechsler Adult Intelligence Scale (WAIS; <sup>330,331</sup>).

<sup>†</sup> National Adult Reading Test (NART; <sup>332</sup>).

<sup>‡</sup> Wisconsin Card Sorting Test (WCST; <sup>333</sup>).

### 2.3.9 Substance Misuse Domain

A history of polysubstance misuse was very strongly associated with violence; comorbid substance use disorder and recent substance misuse were strongly associated with violence risk (Table 2.10). Moderate associations were found between a history of alcohol misuse, a history of substance misuse, recent alcohol misuse, recent drug misuse, and a history of drug misuse. Of the substance misuse factors identified by this review only a history of cannabis misuse was not significantly associated with violence.

Four substance misuse factors reported in only two primary studies were identified, however, violence was not significantly associated with any of them (Appendix B). Only one between study characteristic, total sample size (per 100), was associated with heterogeneity for the history of drug misuse risk factor according to univariate meta-regression analyses: [exp( $\beta$ )=1.0, exp(*se*)=1.0, *p*=0.03].<sup>9</sup>

<sup>9</sup> The exponentiated meta-regression coefficient gives the ratio of the OR between categories of the between-study characteristic.<sup>323</sup>

**Table 2.10.**

Association between substance misuse factors and risk of violence in individuals with psychosis.

Risk Factor	<i>k</i>	<i>n</i>	<i>N</i>	Random Effects OR (95% CI)	<i>z</i>	<i>I</i> <sup>2</sup>	<i>p</i>
History of polysubstance misuse	3	144	338	10.3 (2.5 – 41.5)	3.3	0	**
Comorbid substance use disorder	9	530	5,333	3.1 (1.9 – 5.0)	4.5	50	***
Recent substance misuse	5	130	476	2.9 (1.3 – 6.3)	2.6	54	**
History of alcohol misuse	19	2,907	18,549	2.3 (1.7 – 3.3)	5.1	63	***
History of substance misuse	16	1,067	5,365	2.2 (1.6 – 2.9)	5.6	46	***
Recent alcohol misuse	7	554	2,139	2.2 (1.3 – 4.0)	2.9	52	**
Recent drug misuse	7	695	3,604	2.2 (1.6 – 3.1)	5.1	38	***
History of drug misuse	14	2,809	18,561	2.1 (1.3 – 3.5)	2.9	93	**
History of cannabis misuse	4	95	315	1.3 (0.7 – 2.4)	0.8	23	0.40

**Note:** *k* = number of studies analysed, *n* = number of violent participants, *N* = number of total participants, *I*<sup>2</sup> = percentage of variability in effect size estimates attributable to between-study variation. Factors ranked according to pooled OR magnitude.

\*\*\* = significant to the 0.001 level;

\*\* = significant to the 0.01 level;

\* = significant to the 0.05 level.

### 2.3.10 Suicidal Behaviours Domain

Of the four suicidality factors identified, violence was only moderately associated with one: historical suicide attempts (Table 2.11). Of the four additional risk factors identified in only two primary studies, none were significantly associated with violence risk (Appendix B). None of the between-study characteristics investigated in this review were significantly associated with heterogeneity for the recent self-harm risk factor.

**Table 2.11.**

Association between suicidal behaviour factors and risk of violence in individuals with psychosis.

Risk Factor	<i>k</i>	<i>n</i>	<i>N</i>	Random Effects OR (95% CI)	<i>z</i>	<i>I</i> <sup>2</sup>	<i>p</i>
Historical suicidal ideation	4	347	1,803	1.7 (0.8 – 3.4)	1.6	49	0.11
Historical suicide attempts	12	1,075	4,037	1.6 (1.1 – 2.3)	2.4	42	*
Higher aggression against the self scores	3	170	351	1.4 (0.5 – 4.1)	0.6	35	0.49
Historical deliberate self-harm	3	254	807	1.0 (0.4 – 2.8)	0.1	68	0.87

**Note:** *k* = number of studies analysed, *n* = number of violent participants, *N* = number of total participants, *I*<sup>2</sup> = percentage of variability in effect size estimates attributable to between-study variation. Factors ranked according to pooled OR magnitude.

\*\*\* = significant to the 0.001 level;

\*\* = significant to the 0.01 level;

\* = significant to the 0.05 level.

### 2.3.11 Treatment-Related Domain

Only two of the treatment-related factors identified were significantly associated with violence: non-adherence with psychological therapies was strongly associated with violence whilst non-adherence with medication was moderately associated with risk (Table 2.11).

An additional four factors were replicated in only two primary studies were also significantly associated with risk (Appendix B). Although no study-level characteristic investigated was significantly associated with heterogeneity for the shorter duration of current inpatient admission factor, two study-level characteristics were significantly associated with heterogeneity for the prescribed typical/conventional rather than atypical antipsychotic medications risk factor: use of a register-based measure of violence [ $\exp(\beta)=40.4$ ,  $se=2.2$ ,  $p=0.007$ ]<sup>r</sup> and percentage of the sample detained in a forensic psychiatric facility [ $\exp(\beta)=1.0$ ,  $\exp(se)=1.0$ ,  $p=0.03$ ].<sup>r</sup> Neither characteristic was independently associated with heterogeneity on multivariate meta-regression, however.

<sup>r</sup> The exponentiated meta-regression coefficient gives the ratio of the OR between categories of the between-study characteristic.<sup>323</sup>

**Table 2.12.**

Association between treatment-related factors and risk of violence in individuals with psychosis.

Risk Factor	<i>k</i>	<i>n</i>	<i>N</i>	Random Effects OR (95% CI)	<i>z</i>	<i>I</i> <sup>2</sup>	<i>p</i>
Non-adherent with psychological therapy	3	49	118	6.7 (2.4 – 19.2)	3.6	31	***
Non-adherent with medication	9	377	1,472	2.0 (1.0 – 3.7)	2.1	63	*
Not prescribed any antipsychotic medication	7	216	579	1.7 (0.7 – 4.5)	1.2	58	0.23
Shorter duration of current inpatient admission <sup>§</sup>	4	179	411	1.6 (0.1 – 17.8)	0.3	76	0.71
Shorter duration of current outpatient treatment <sup>§</sup>	3	443	2,379	1.4 (0.7 – 2.6)	1.0	0	0.32
Young age at first inpatient admission (years)	4	95	350	1.2 (0.7 – 1.8)	0.8	0	0.38
Higher antipsychotic dosage <sup>†</sup>	8	267	619	1.1 (0.8 – 1.7)	0.8	0	0.42
Greater number of prior psychiatric admissions	10	325	1,286	1.1 (0.8 – 1.5)	0.7	0	0.49
Longer duration of untreated illness (weeks)	3	116	380	1.0 (0.7 – 1.5)	0.2	0	0.84
Shorter duration of illness (years)	19	1,240	4,621	1.0 (0.8 – 1.3)	0.5	0	0.60
Shorter duration of antipsychotic treatment <sup>§</sup>	4	312	1,506	1.0 (0.7 – 1.4)	0.3	0	0.77
Lower total extrapyramidal side effect scores	5	410	1,960	1.0 (0.5 – 2.2)	0.1	15	0.87

**Note:** *k* = number of studies analysed, *n* = number of violent participants, *N* = number of total participants, *I*<sup>2</sup> = percentage of variability in effect size estimates attributable to between-study variation. Factors ranked according to pooled OR magnitude.

\*\*\* = significant to the 0.001 level;

\*\* = significant to the 0.01 level;

\* = significant to the 0.05 level.

<sup>§</sup> Measured in months.

<sup>†</sup> Measured in chlorpromazine equivalent units.

Some treatment-related risk factors may have been confounded by indication such that violent participants were more likely to receive a particular type of treatment as a result of their previous violent behaviour. These factors included: receiving treatment as an inpatient (OR=5.2, 95% CI 1.8–15.3, *z*=3.0, *p*=0.002), being referred for treatment from the criminal justice system (OR=4.1, 95% CI 1.3–13.4, *z*=2.4, *p*=0.01), currently receiving treatment under involuntary/leveraged conditions (OR=3.8, 95% CI 2.2–6.5, *z*=4.9, *p*<0.001), a history of receiving treatment under involuntary/leveraged conditions (OR=3.6, 95% CI 2.1–6.1, *z*=4.8, *p*<0.001), being prescribed depot rather than oral antipsychotic medication formulations (OR=2.2, 95% CI 1.1–4.1, *z*=2.4, *p*=0.01), and being prescribed typical/conventional rather than atypical antipsychotic medications (OR=1.8, 95% CI 0.8–3.9,

$z=1.4, p=0.14$ ). To ensure these factors do not inflate the strength of the pooled OR for the treatment-related domain, these factors were excluded from all subsequent analyses.

### 2.3.12 Publication Bias Analyses

For risk factors measured dichotomously, Peters' regression test suggested that three may have been affected by publication bias: historical imprisonment for any offence ( $\beta=118.2, se=24.0, p=0.008$ ), historical substance misuse ( $\beta=52.7, se=20.3, p=0.02$ ), and currently receiving treatment under involuntary/leveraged conditions ( $\beta=90.4, se=29.0, p=0.01$ ). With regards to the factors measured on a continuous scale, Egger's regression test was significant for 34 risk factors (Table 2.13).

**Table 2.13.**  
Publication bias analyses according to Egger's regression test.

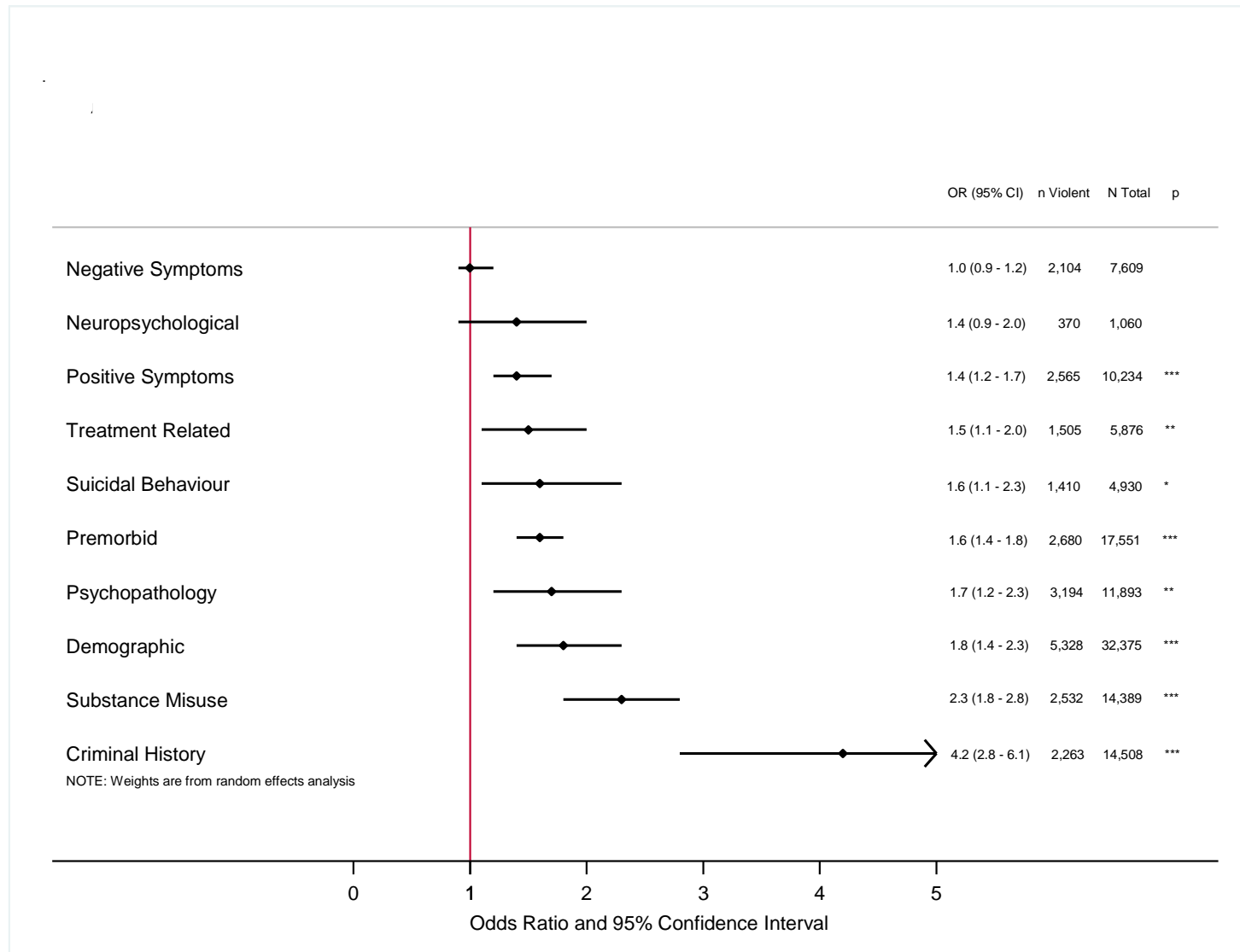
Risk Domain	Risk Factor	Egger's Publication Bias Test		
		$\beta$	$se$	$p$
<b>DEMOGRAPHIC</b>				
	Shorter duration of education (years)	0.5	0.1	**
	Young age at study enrolment (years)	0.04	0.03	***
<b>PREMORBID</b>				
	Higher premorbid adjustment in early adolescence scores	-0.2	0.01	*
<b>CRIMINAL HISTORY</b>				
	Higher aggression against others scores	-1.5	0.1	*
	Higher aggression scores	-1.3	0.03	***
	Higher verbal aggression scores	-1.7	0.1	***
	Greater number of arrests (any offence)	-0.1	0.05	*
	Higher aggression against objects scores	-1.0	0.08	**
	Higher poor hostile and/or aggressive impulse control scores	-1.6	0.05	*
	Young age at first criminal offence	0.2	0.01	*
<b>PSYCHOPATHOLOGY</b>				
	Higher psychopathy factor 1 scores	-1.9	0.1	*
	Higher psychopathy total scores	-0.4	0.1	**
	Higher hostility scores	-0.6	0.2	***
	Higher poor impulse control scores	-0.6	0.1	***
	Higher preoccupation scores	-1.2	0.01	**

*Table continued over ...*

Risk Domain	Risk Factor	Egger's Publication Bias Test		
		$\beta$	<i>se</i>	<i>p</i>
	Higher scores on the Lack of Insight Mental Disorder subscale	-0.8	0.08	*
	Higher lack of insight/judgement scores	-0.4	0.06	***
	Higher cognitive functioning scores	-0.5	0.07	**
	Higher total PANSS scores	-0.3	0.2	**
	Higher guilt scores	-0.4	0.07	**
	Higher somatic concerns scores	-0.2	0.03	***
	Higher uncooperativeness scores	-0.3	0.1	**
	Higher confusion/disorientation scores	-0.1	0.04	**
	Higher total BPRS scores	-1.1	0.1	**
	Younger age at psychosis onset (years)	0.2	0.1	*
<b>POSITIVE SYMPTOMS</b>				
	Higher excitement scores	-0.4	0.1	***
	Higher positive symptoms scores	-0.7	0.1	***
	Higher grandiosity scores	-0.2	0.04	**
	Higher suspiciousness/persecution scores	-0.3	0.1	**
	Higher paranoia scores	4.7	0.2	*
<b>NEGATIVE SYMPTOMS</b>				
	Lower total Quality of Life scores	0.3	0.03	*
	Higher negative symptoms scores	-0.1	0.07	*
<b>TREATMENT-RELATED</b>				
	Shorter duration of current outpatient treatment (months)	0.3	0.01	**
	Young age at first psychiatric inpatient admission	0.2	0.04	**

### 2.3.13 Risk Domain Analyses

For all 110 included studies, the criminal history domain was most strongly associated with violence risk (OR=4.2, 95% CI 2.8–6.1), followed by the substance misuse (OR=2.3, 95% CI 1.8–2.8), and demographic domains (OR=1.8, 95% CI 1.4–2.3). Neither the negative symptoms nor the neuropsychological domains, however, were significantly associated with violence risk (Figure 2.3). Given that both hostility and psychopathy have been conceptualised as criminal history risk factors in some work,<sup>334</sup> domain-based analyses were repeated including these factors within the criminal history domain (Figure D.1 in Appendix D).

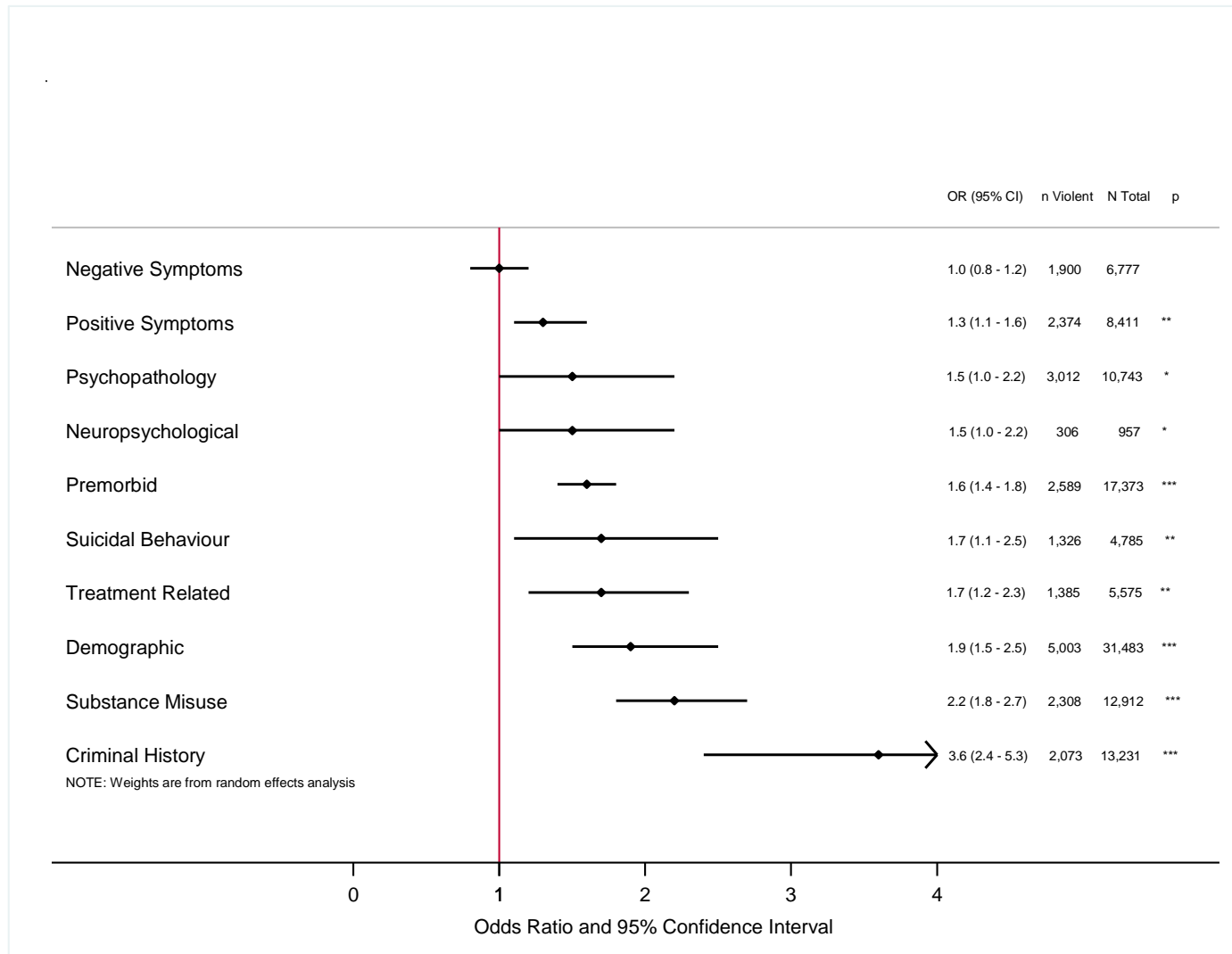


**Figure 2.3.** Pooled odds ratio and accompanying 95% confidence interval for each of the ten psychosocial domains.

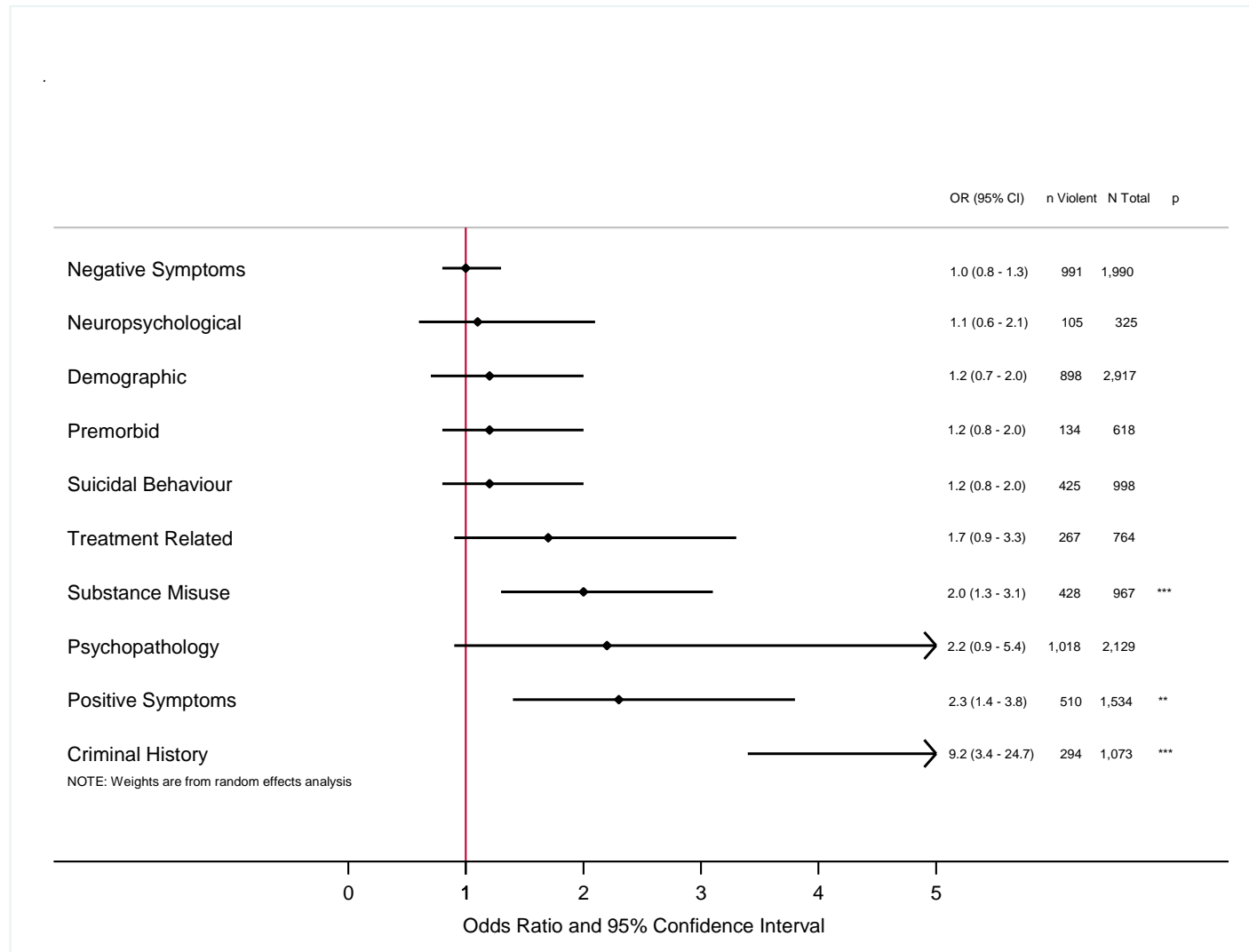
### ***2.3.14 Additional Analyses***

A total of 77 studies measured severe violence, rather than aggression and/or hostility. When domain-based analyses were restricted to these studies the suicidal behaviour domain became more strongly associated with violence risk (OR=1.7, 95% CI 1.1–2.5). As before the three strongest associations by domain for severe violence was for the criminal history (OR=3.6, 95% CI 2.4–5.3), substance misuse (OR=2.2, 95% CI 1.8–2.7), and demographic domains (OR=1.9, 95% CI 1.5–2.5) (Figure 2.4). Domain-based analyses including hostility and psychopathy within the criminal history domain are presented in Figure D.2 in Appendix D.

Thirty-four studies were conducted in predominately inpatient settings. When domain-based analyses were restricted to these 34 studies, the substance misuse domain became less strongly associated with violence risk, although it remained significant (OR=2.0, 95% CI 1.3–3.1). The psychopathology and positive symptoms domains, on the other hand, became more strongly associated with violence risk. For studies conducted in predominately inpatient samples, the two strongest associations were for the criminal history (OR=9.2, 95% CI 3.4–24.7) and positive symptoms domains (OR=2.3, 95% CI 1.4–3.8) (Figure 2.5). Domain-based analyses including hostility and psychopathy within the criminal history domain are presented in Figure D.3 in Appendix D.



**Figure 2.4.** Pooled odds ratio and accompanying 95% confidence interval for each of the ten psychosocial domains for those studies which measured severe violence rather than aggression and/or hostility.



**Figure 2.5.** Pooled odds ratio and accompanying 95% confidence interval for each of the ten psychosocial domains for those studies based in predominately inpatient samples.

## ***2.4 Discussion***

This systematic review and meta-analysis investigated risk factors for violence in psychosis. A total of 110 studies were included comprising 45,533 participants; 8,439 (18.5%) of whom were violent. From these studies, 146 factors were reported in a minimum of three studies and a further 77 were replicated in only two studies. In addition to providing the association between each factor and violence, similar factors were grouped together into one of ten psychosocial domains.

### ***2.4.1 Demographic Domain***

Violence was significantly associated with a history of violent victimisation during adulthood, recent homelessness, historical homelessness, male gender, non-white ethnicity, and lower socio-economic status. Whilst a number of reviews of risk factors for violence in psychiatric populations have emphasised the association between violence and male gender, non-white ethnicity, and/or lower socio-economic status,<sup>103,125,335-337</sup> only one has discussed the association with violent victimisation,<sup>337</sup> and none have considered the association with homelessness.

Much work on the association between victimisation experiences and the perpetration of violence has focused on the relationship in mentally healthy adolescents, even though a 2008 systematic review found that both outcomes occur with greater frequency in psychiatric populations.<sup>338</sup> Within adult psychiatric populations, however, few studies have investigated the association between violence victimisation and perpetration.<sup>338</sup> One recent narrative review did, however, conclude there is a strong association between violent victimisation and violence perpetration, not only in the general population, but also in psychiatric

populations.<sup>339</sup> ten Have and colleagues (2013), for example, found that the association between psychosis and violence became non-significant following adjustment for victimisation experiences, suggesting that violent victimisation may moderate the association with violence perpetration in this population.<sup>340</sup>

Both the experience of violent victimisation and the perpetuation of violence may share a similar aetiology. Broidy and colleagues (2006), for example, compared general population homicide victims and offenders, finding no significant differences between the two groups on a number of demographic, substance misuse, and psychiatric factors.<sup>s,341</sup> Similarly, within a sample of recently discharged psychiatric patients, Silver and colleagues (2011) found that higher psychopathy factor two scores, a greater number of changes in residence, and greater stress were significantly associated with both victimisation and violent offending. However, following statistical adjustment for these, and other factors, the association between violent victimisation and violence perpetration remained significant suggesting that, at least in psychiatric samples, violent victimisation appears to be an independent risk factor for violence perpetration.<sup>342</sup>

Homelessness has typically been associated with increased rates of minor offending, including loitering, public urination, and public drunkenness; activities which are only criminalised because they occur in public spaces.<sup>343</sup> In the general population, however, there is some suggestion that homelessness may also be associated with an increased risk of violence. de Lisi (2000) and Greenberg and Rosenheck (2008), for example, found that prisoners who were homeless in the year prior to incarceration were significantly more likely to have a history of being charged with and/or arrested for violent offences.<sup>344,345</sup> It is unclear at present whether homelessness represents a cause or a consequence of violence at

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<sup>s</sup> Offenders were, however, significantly more likely to be between 18 and 29 years of age, and to have been previously arrested for a violent offence, whilst victims were significantly more likely to be 30 or older and to have been arrested for driving whilst under the influence of alcohol.

present,<sup>346</sup> however, as violent offending may also be associated with an increased risk of homelessness.

The association between homelessness and violence may also be confounded by violent victimisation and/or substance misuse. Homeless individuals report significantly higher rates of violent victimisation than their domiciled peers.<sup>347</sup> Additionally, rates of substance misuse are also significantly higher in homeless as compared with domiciled individuals.<sup>348</sup> Nevertheless, within the general population, recent work found that living on the street significantly increases the risk of engaging in violent behaviour, even following statistical adjustment for demographic, substance misuse, and previous victimisation experiences.<sup>349</sup>

#### ***2.4.2 Premorbid Domain***

Four premorbid factors were strongly associated with violence: experiencing physical or sexual abuse as a child, a parental history of criminal involvement, and a parental history of alcohol misuse. These premorbid factors have rarely been emphasised in previous reviews. For example, only two narrative reviews note that violent individuals with schizophrenia are more likely than their non-violent peers to have experienced abuse or maltreatment as a child.<sup>117,337</sup> Neither of these reviews, however, distinguished between physical and sexual abuse.

Within the general population, a number of studies have found that experiences of childhood physical and/or sexual abuse are associated with a significantly increased risk of violence perpetration as an adult.<sup>350-357</sup> Although reviews suggest there is some evidence of an association between childhood physical and/or sexual abuse and psychosis,<sup>358,359</sup> to my

knowledge, no studies have specifically investigated the link between childhood abuse and subsequent violence in this population.

The association with childhood physical and/or sexual abuse may be confounded, however. Weiler and Windom (1996), for example, found that adult survivors of childhood maltreatment<sup>t</sup> were significantly more likely to be arrested for a violent offence as compared to age, ethnicity, gender, and family socio-economic matched controls. This association remained significant even following statistical adjustment for demographic and criminal history factors. Following adjustment for psychopathy scores, however, childhood maltreatment was no longer significantly associated with violence,<sup>360</sup> suggesting that psychopathy may mediate the association between childhood maltreatment and adult violence perpetration. More recently, White and Windom (2003) found that whilst adult survivors of childhood maltreatment<sup>q</sup> were significantly more likely than their non-maltreated peers to self-report behaving violently towards an intimate partner, the association was mediated by ASPD in males and by ASPD, hostility, and alcohol misuse in females.<sup>361</sup>

The experience of childhood physical and/or sexual abuse is theorised to lead to the development of a cycle of violence as abused children come to view violence as a ‘normal’ method of resolving conflict. However, according to a specific adaption of social learning theory, termed the *intergenerational transmission of violence* theory, even witnessing parents engaging in criminal, including violent, behaviour may be sufficient to contribute to this cycle.<sup>362</sup> The majority of work into the intergenerational transmission of violence has investigated the effect of violence between parents on behaviour in intimate relationships as adults, finding there is a significant association between witnessing parental violence and the subsequent perpetration of violence against partners in adulthood.<sup>363,364</sup> Outside of intimate partner relationships, recent work using latent class analysis found that sons whose fathers

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<sup>t</sup> Includes childhood physical and sexual abuse, as well as neglect.

were predominately convicted of violent offences were significantly more likely than those whose fathers had been convicted of exclusively property offences to be convicted of a violent offence themselves,<sup>365,366</sup> suggesting that the transmission of offending between generations may be violence-specific in the general population. Results of the present meta-analysis, in contrast, suggest that a parental history of any criminal offending may be sufficient to lead to the development of a cycle of violence.

Although few studies have investigated the association between exposure to parental alcohol misuse in childhood and the subsequent perpetration of violence in adulthood, available work within the general population suggests that adult children of alcoholic parents are significantly more likely to display antisocial<sup>367</sup> or violent<sup>368</sup> behaviour, or be convicted of violent offences,<sup>369</sup> compared to adult children of non-alcoholic parents. Using multivariate regression analyses, however, Fazel and colleagues (2009) found that a parental history of alcohol misuse was no longer significantly associated with violence in males or females once certain demographic factors, previous violence, and personal alcohol and/or drug misuse were adjusted,<sup>283</sup> suggesting that, at least within populations diagnosed with schizophrenia, the association between violence and parental alcohol misuse may be confounded.

### ***2.4.3 Criminal History Domain***

Violence was associated with many of the criminal history risk factors identified by this review, and most notably with a history of assault, a history of imprisonment, recent arrest for any offence, a history of conviction for a violent offence, a history of arrest for any offence, and previous violent behaviour. Historical criminal involvement was strongly associated with violence in a meta-analysis of the risk factors for violence in first-episode

psychosis.<sup>103</sup> Systematic reviews, in contrast, have arrived at differing conclusions as to which criminal history factors contribute to the association between violence in schizophrenia, with one review suggesting that previous violence is strongly associated with subsequent violence<sup>9</sup> whilst a second concluded that psychopathy underscores the association between past and future violent behaviour.<sup>125</sup> A third narrative review, moreover, concluded that antisocial personality disorder, psychopathy, and hostility may mediate the association between psychosis and violence.<sup>117</sup>

Within the general population, recent work has found that those arrested or convicted of assault were significantly more likely to engage in violent behaviour in prison as compared to those arrested or convicted of homicide.<sup>370</sup> No study has compared the relative magnitude of association for different categories of violent offence in those with psychosis, however.

More work has focussed on the association between a history of imprisonment and violence. Within the general population, for example, recent work suggests that offenders who receive a prison sanction are significantly more likely to be convicted of assault than offenders who received a non-custodial sanction.<sup>371</sup> A history of imprisonment has also been found to be associated with a significant increase in homicide risk amongst those diagnosed with schizophrenia specifically.<sup>284</sup>

A meta-analysis of risk factors for violence in psychiatric offenders suggested that previous violence is a stronger risk factor for subsequent violence than many demographic, psychopathological, and substance misuse factors.<sup>51</sup> Within individuals with schizophrenia, additionally, violent behaviour necessitating admission to a psychiatric hospital has been associated with a six fold increase in the risk of committing homicide up to six months post-discharge.<sup>284</sup>

#### ***2.4.4 Psychopathological Domain***

In this review, violence was associated with psychopathy factor one, two, and total scores, psychopathy, poorer impulse control, hostility, a lack of insight, and higher hostility scores. Previous reviews, however, have not found a significant association between a lack of insight<sup>103</sup> or impulsivity<sup>96</sup> in those with established psychosis.

It has been suggested that the association between violence and insight in individuals with schizophrenia may be explained by greater illness severity,<sup>222,372</sup> and that the association may be attenuated when samples of symptomatically stabilised patients are compared to one another.<sup>277</sup> A recent study, however, instead suggests lack of insight significantly distinguishes violent from non-violent individuals with schizophrenia even after statistically adjusting for positive symptom severity.<sup>373</sup>

Hostility has also been associated with violence risk in psychiatric populations. Skeem and colleagues (2006), for example, found that higher hostility scores were associated with an approximate doubling in violence risk.<sup>374</sup> The association between hostility and violence in this meta-analysis may, however, be confounded. Most included studies operationalised hostility according to scores on the PANSS hostility item. The maximum rating on this item, however, is defined by the presence of violent behaviour.<sup>117</sup> Further work is therefore necessary to investigate whether hostility in the absence of violence remains significantly associated with violence in this population.

#### ***2.4.5 Positive Symptoms Domain***

In contrast to a previous review in first-episode psychosis which found that positive symptoms are particularly associated with severe violence,<sup>103</sup> results of the present meta-

analysis suggest that violence may be only modestly associated with both higher positive symptom and excitement scores. Excitement<sup>u</sup> is rarely considered an independent risk factor for violence. Instead most studies investigate the association between total scores on a measure of positive symptoms, such as the PANSS, which includes excitement along with several other positive symptoms factors. Factor analysis of the PANSS, however, suggests that excitement shares little variance with the other positive symptoms assessed by this measure.<sup>268</sup> Excitement may therefore represent an independent factor of violence in this population.

Recent narrative and systematic reviews suggest that positive symptoms are as important to the prediction of violence risk in individuals with schizophrenia as criminal history, substance misuse, and certain demographic factors,<sup>9,117,125,335,375,376</sup> with one systematic review concluding that delusions and hallucinations in particular directly motivate violent behaviour in this population.<sup>376</sup> This review, however, found that whilst violence was significantly associated with positive symptom scores, there was no significant association with any specific type of delusion or hallucination.

There may be two distinct trajectories to violence in this population: one for those individuals with a history of violence predating illness onset, and a second for those without a history of violence.<sup>117,125,375</sup> According to this model, criminal history factors, including antisocial personality disorder and psychopathy, are stronger predictors of violence in those with a history of violence prior to the onset of schizophrenia, whereas delusions and hallucinations are only predictive of violence in those without a premorbid history of violence.<sup>117,125,375</sup> In line with this model, Swanson and colleagues (2008) compared the effect of adherence with antipsychotic medication in two groups of individuals with

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<sup>u</sup> Excitement refers to number of manic-like symptoms, including: hyperactivity, motor overactivity, emotional lability, and increased vigilance.

schizophrenia: those with a history of childhood antisocial behaviour and those without such a history. Adherence with antipsychotic medication was only associated with a significant reduction in violence in those patients without a history of childhood antisocial behaviour.<sup>242</sup>

Given that around half (median=46.5%, inter-quartile range [IQR] 18.1%–51.0%) of the participants in this meta-analysis had prior histories of violence, it may be that any association with positive symptoms risk factors in the present meta-analysis was attenuated by the inclusion of a greater number of individuals following trajectory one. As few primary studies clearly specified whether previous violent behaviour pre- or post-dated the onset of schizophrenia the effect of this characteristic could not be investigated using meta-regression. Nevertheless, heterogeneity, as measured by the  $I^2$  statistic, was only greater than 75% for one positive symptoms risk factor; paranoid thoughts.

Alternatively, recent work on the nature of the association between violence and delusions specifically suggests that certain delusions may only be significantly associated with violence when they result in anger. Coid and colleagues (2013) investigated the association between 32 types of delusion and violence in individuals with schizophrenia, and found that whilst three types of delusion<sup>v</sup> were significantly associated with major violent behaviour, when the effect of anger due to delusions was statistically adjusted in a multivariate regression model, the association between these delusions and violence became non-significant suggesting that distress may be key to the association with violence in this population.<sup>377</sup> Indeed, some work suggests that patients who act on their delusions, even in a non-violent manner, are characterised by higher levels of emotional distress.<sup>378</sup>

Of the delusional symptoms found to be associated with violence in previous work, those involving delusions of persecution coupled with delusions of control and/or thought insertion, often termed threat control/override (TCO) symptoms, have been found to be more

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<sup>v</sup> Delusions of being spied on, delusions of persecution, and delusions of conspiracy.

strongly associated with violence in individuals with a psychiatric illness compared to other types of delusions.<sup>72,191,379,380</sup> According to Link and colleagues (1999), it is the nexus between delusions of persecution and of external control and thought insertion that is critical to the association between TCO symptoms and violence.<sup>380</sup> Specifically, Link and Stueve (1994) theorise that although delusions of persecution can cause the individual to fear being attacked by others, it is only when this is coupled with an override of self-control such that any normal proscription against violent behaviour is overridden, that violence becomes likely.<sup>379,381</sup> Recent work in individuals with sub-clinical psychotic symptoms,<sup>382</sup> and in those with schizophrenia,<sup>299</sup> however, suggest that the threat dimension may be more predictive of violence than the control-override dimension.

Presently, however, there is no ‘gold standard’ measure of TCO symptoms. Consequently, the primary studies included in this meta-analysis either adapted items from other measures of psychopathology or derived a novel measure of TCO symptoms based on those symptoms the authors felt most accurately reflected the TCO symptom construct. Differences in the measurement of the threat or control-override construct between these studies may therefore underlie variability in the association with violence.

#### ***2.4.6 Negative Symptoms Domain***

Violence was not associated with any of the included negative symptom factors. Although few reviews have investigated the association between negative symptoms and violence in this population, this finding is in line with a recent systematic review and meta-analysis of risk factors for violence in first-episode psychosis.<sup>103</sup>

Douglas and colleagues (2009) theorised that negative symptoms, rather than directly motivating violent behaviour, may instead play an indirect role by eroding an individual’s

capacity to experience empathy, anxiety, or remorse which may ordinarily inhibit the expression of violence.<sup>45</sup> In line with this, previous work in offenders with psychosis detained in a high-security forensic mental health facility suggests that whilst flattened affect may be prominent at the time of the offence, other symptoms, particularly delusions, were more likely to have directly motivated the offence.<sup>383</sup> Further work is therefore necessary to determine firstly, whether negative symptoms do lead to post-morbid changes in empathic reasoning abilities, and secondly, whether these changes underlie the expression of violence in these individuals.

Alternatively, using canonical discriminate analysis, Krakowski (1999) found that the presence of negative symptoms differentiated those patients who continued to behave violently throughout the treatment period (labelled “persistently violent”) from both those whose violent behaviour was reduced following four weeks of inpatient treatment (labelled “transiently violent”) and from non-violent patients.<sup>228</sup> As around half (median=46.5%, IQR 18.1%–51.0%) of the participants in this meta-analysis had prior histories of violent behaviour, the sample may have been evenly divided between persistently and transiently violent individuals. The inclusion of a large proportion of transiently violent individuals may therefore have attenuated any association between negative symptoms and violence in this review.

#### ***2.4.7 Neuropsychology Domain***

None of the neuropsychology risk factors identified by this review were significantly associated with violence. Within the general population, reviews suggest that lower intelligence quotient (IQ) scores are associated with both criminal recidivism<sup>384</sup> and violent offending.<sup>385</sup> Recent work in a prisoner population, furthermore, suggests that lower IQ may

be more strongly associated with violence than certain demographic risk factors, including: younger age, minority ethnicity, and low educational attainment.<sup>386</sup> Compared with healthy individuals, however, those with schizophrenia demonstrate reductions in IQ both before and after illness onset.<sup>387</sup> Any association between lower IQ and violence may therefore have been attenuated in the present review.

A recent review suggests that executive dysfunction, and particularly higher-order cognitive dysfunction, may also contribute to the development of criminal behaviour in the general population.<sup>388</sup> Results of this meta-analysis, however, did not find a significant association between executive dysfunction and violence. As both studies that investigated the association with executive dysfunction in this review used higher-order measures,<sup>w</sup> it is unlikely that the inclusion of measures assessing lower-order cognition attenuated the association. Given that executive dysfunction is a core feature of schizophrenia,<sup>13</sup> however, it may be that the non-significant association with executive dysfunction found in this review results from a ceiling effect.

Lastly, a number of previous narrative and systematic reviews suggest that both structural and functional fronto-temporal abnormalities are associated with violence, and particularly with impulsive violence, in both the general population,<sup>389,390</sup> and in individuals with schizophrenia.<sup>13,121,122,391,392</sup> As no consistent measure of fronto-temporal abnormality was used in the included studies, the association between violence and dysfunction in this region could not be investigated in the present review.

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<sup>w</sup> The Controlled Oral Word Association Test, the trail making test, and the Wisconsin Card Sorting test.

#### ***2.4.8 Substance Misuse Domain***

Results of this review suggest that polysubstance misuse, diagnosis of a comorbid SUD, historical alcohol misuse, historical substance misuse, and recent drug misuse are significantly associated with violence in individuals with psychosis.

One narrative review investigated the association between polysubstance misuse and violence, concluding that polysubstance misuse is significantly associated with violence risk in the general population.<sup>393</sup> Recent work, moreover, has found that misuse of two substances approximately doubles violence risk, compared to misuse of one substance alone, even following adjustment for other socio-demographic factors. For males, furthermore, misuse of three or more substances, compared to two substances, approximately doubles violence risk again.<sup>394</sup> Within psychiatric populations, the association between polysubstance misuse and violence has rarely been specifically investigated, despite polysubstance misuse being relatively common in this population.<sup>395,396</sup>

Previous work does, however, suggest that violence risk may be highest in those with comorbid SUD.<sup>397</sup> In line with this, Steadman and colleagues (1998) investigated the association between violence, severe mental illness, and comorbid SUD in those recently discharged from psychiatric facilities, finding that the one-year prevalence of violence in those without comorbid SUD was statistically indistinguishable from the prevalence of violence in the general population. The one year prevalence of violence in those individuals with comorbid SUD, however, was significantly higher.<sup>88</sup> More recently, Fazel and colleagues (2009) investigated the role of SUD in mediating violence risk in an epidemiological study of all persons with a hospital discharge diagnosis of schizophrenia in Sweden. Whilst the increased risk of violence for individuals with schizophrenia was modest compared with the general population, the risk of violence in those with schizophrenia and

comorbid SUD was increased four fold, suggesting that comorbid SUD is a major contributor to violence risk in this population.<sup>94</sup>

Within the general population, emerging work suggests that alcohol misuse, compared to misuse of other substances, may be principally implicated in the association with violence.<sup>398,399</sup> Alcohol misuse also appears to be closely associated with triggering violence in this population,<sup>400-402</sup> suggesting that alcohol misuse may be a proximal rather than distal risk factor. Results of the present meta-analysis, however, suggest that both historical and recent alcohol misuse are significantly associated with increased risk in individuals with psychosis. Additionally, this review also found that drug misuse was as strongly associated with violence as alcohol misuse.

Several reviews link substance misuse with violence in the both the general<sup>403,404</sup> and psychiatric population,<sup>405,406</sup> including in those with schizophrenia.<sup>201</sup> Goldstein (1985) derived a tripartite model to explain the direct and indirect causal pathways from substance misuse to violence. First, substance misuse may directly impair cognitive functioning in such a way that any normal proscriptions against violence are inhibited.<sup>x</sup> Second, given that a number of individuals addicted to substances become involved in the drug distribution network, substance misuse may indirectly increase violence risk by placing these individuals in hostile environments in which violence may become necessary to survive.<sup>y</sup> Lastly, substance misuse may also indirectly increase violence risk by causing individuals to engage in economically motivated violent offences, such as robbery, in order to generate the necessary funds to support their addiction.<sup>z,407</sup> Further work, however, is necessary to

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<sup>x</sup> According to Goldstein (1985), misuse of alcohol, stimulants, hallucinogens, and barbiturates are particularly implicated in this pathway.

<sup>y</sup> Misuse of illicit drugs may be specifically associated with this pathway as alcohol and other licit drugs are readily available in non-hostile environments.

<sup>z</sup> Whilst funds are necessary to support any addiction, this pathway may be more closely associated with illicit drug misuse as there are statutorily imposed limits on the price of alcohol and other licit drugs.

determine which pathway/s substance misusing individuals with psychosis follow as this may have important treatment implications.

Cannabis misuse was not significantly associated with violence risk in this review. The association between cannabis misuse and violence may, however, be confounded. Within the general population, for example, factors such as alcohol misuse<sup>81,408</sup> and impulsivity<sup>100,409</sup> have been associated with both cannabis misuse and violence in previous work. Using fixed-effects modelling to investigate whether individual level changes in cannabis consumption leads to changes in violence, Norström and Rossow (2014) nevertheless found that increases in self-reported past year cannabis use was significantly associated with an increased risk of self-reported violence even following adjustment for alcohol misuse and impulsivity.<sup>410</sup> Additionally, use of fixed-effects modelling ensured that stable confounders, such as genetic or early environmental influences, were also statistically adjusted. Cannabis misuse is significantly associated with an increased risk of developing psychosis, however.<sup>411</sup> The lifetime prevalence of cannabis misuse is also higher in those with psychosis as compared to members of the general population.<sup>412</sup> Consequently, the association between cannabis misuse and violence may be attenuated in this population. Alternatively, as only four studies were included in this analysis, there may have been insufficient statistical power to detect an effect for this risk factor.

#### ***2.4.9 Suicidal Behaviours Domain***

This review found a moderate association between violence and a history of previous suicide attempts. Suicidal ideation and deliberate self-harm, however, were not significantly associated with violence risk in this review. As suicide and violence have traditionally been viewed as mutually exclusive outcomes, no previous review or meta-analysis of the risk

factors for violence has emphasised the role of suicidality in this population. Consequently, suicidality has rarely been considered a risk factor for violence with only three violence risk assessment instruments, the Classification of Violence Risk (COVR; <sup>413</sup>) the Female Additional Manual for the Historical, Clinical, and Risk Management–20 (FAM–HCR–20; <sup>414</sup>) and the Short-Term Assessment of Risk and Treatability (START; <sup>415</sup>), currently incorporating suicidal behaviour as a risk factor for violence perpetration.

#### ***2.4.10 Treatment-Related Domain***

This review found that violence was strongly associated with non-adherence with psychological therapies and, to a lesser extent, non-adherence with medication. Although treatment adherence has also been emphasised by some,<sup>117,125</sup> but not all,<sup>103,416</sup> previous reviews.

Most work on the association between treatment adherence and violence risk in this population has specifically investigated the role of pharmacotherapy adherence. Recent work, for example, suggests that violent offenders with psychosis are significantly more likely to be non-adherent with treatment,<sup>417</sup> suggesting that increasing medication adherence will be necessary to reduce violence risk in this population. A recent RCT, however, found that efforts to increase medication adherence in this population through the use of financial incentives does not significantly reduce violence in this population.<sup>418</sup>

Given that strategies for measuring pharmacotherapy adherence are likely to be more invasive and expensive than those for measuring adherence with psychotherapy,<sup>419</sup> and that improvements in medication compliance do not appear to result in a reduction in violence risk,<sup>418</sup> results of the present review suggest that efforts to monitor and improve adherence

with psychological therapies may be necessary to lead to a concomitant reduction in violence risk.

The association between non-adherence with treatment and violence may, however, be confounded. In a study of the reasons for non-adherence with medication, Dassa and colleagues (2010) found that individuals who were non-adherent were significantly more likely to lack insight into their mental disorder, the effects of medication, and the consequences of their mental illness.<sup>420</sup> The association between violence and medication non-adherence may also be confounded by substance misuse. The combination of medication non-adherence and substance misuse was found to be associated with an approximate doubling in the risk of violent behaviour even following adjustment for socio-demographic and clinical factors, including age, gender, diagnosis, and insight into illness in one study.<sup>421</sup>

#### ***2.4.11 Risk Domain Analyses***

Using a meta-epidemiological approach whereby similar factors were synthesised into one of ten domains, this review found that the criminal history domain was more strongly associated with violence than others. Whilst previous reviews have not compared the relative importance of these three domains, this pattern is consistent with several large-scale epidemiologic studies which have found that criminal history factors, and particularly a history of violence or arrest for any offence, are more strongly associated with future violence risk<sup>215,218</sup> than substance misuse<sup>94</sup> and demographic factors.<sup>51</sup>

### ***2.4.12 Additional Analyses***

When only studies in which the outcome was severe violence rather than aggression or hostility were examined, the relative strength of the ten meta-epidemiological risk domains was not materially different suggesting that specialised risk assessment instruments for aggression and hostility, such as the Overt Aggression Scale (OAS; <sup>324</sup>) or the Buss–Durkee Hostility Inventory (BDHI; <sup>325</sup>) may not be necessary.

When only studies assessing inpatient violence were considered, however, some differences in the relative strength of these ten risk domains did emerge with the and positive symptoms domain, in particular, becoming more strongly associated with violence. Previous work has found that the positive symptoms of psychosis are particularly associated with violence in inpatients with schizophrenia.<sup>179</sup> Amongst general psychiatric inpatients, however, certain demographic,<sup>422</sup> criminal history,<sup>422-424</sup> psychopathological,<sup>422,423</sup> neuropsychological,<sup>422,424</sup> and treatment-related<sup>422,424</sup> factors have also been found to be strongly associated with violence. Further work is necessary to investigate why demographic and treatment-related factors, in particular, appear not to be significantly associated with violence in inpatients with psychosis.

### ***2.4.13 Strengths***

The meta-epidemiological approach used in this review enabled similar risk factors to be synthesised quantitatively, enabling the relative importance of these ten risk domains to be investigated. As many of the individual risk factors that have been implicated in the aetiology of violence overlap in meaning,<sup>51</sup> focussing more broadly on domains of risk, rather than individual risk factors, may help to simplify the assessment of risk in future.

Additionally, as previously unpublished tabular data from six studies<sup>215-220</sup> were able to be incorporated in the present study, this review represents the most comprehensive synthesis of the risk factors for violence in psychosis conducted to date.

#### **2.4.14 Limitations**

As there is no agreed definition of violence within the field at present,<sup>425</sup> the studies included in this review assessed a wide range of outcomes. One limitation of meta-analyses is the synthesis of different outcomes in different populations,<sup>aa426</sup> resulting in high levels of between-study heterogeneity. This was addressed by conducting a sub-group analysis which investigated the risk domains separately in those studies which measured aggression and/or hostility versus severe violence. As no material difference in the pattern or strength of the risk domains was found, the inclusion of studies assessing a wide range of violence outcomes had little impact on the overall results.

Second, analyses suggest that publication bias was present for 37 of the 146 individual risk factors reported. The majority (91.9%) of these risk factors were measured continuously. Egger's publication bias test has been associated with inflated false-positive rates in meta-analyses of binary outcomes based on the log-OR<sup>427</sup> and indeed, when meta-regression was used to explore what impact unpublished data had on the strength of the OR for these risk factors, no significant difference in OR magnitude was found for published versus unpublished studies. Nevertheless, as observational trials are not registered on a central registry, such as *ClinicalTrials.gov*, the likelihood remains that some of the associations found in this review may have been affected by publication bias.

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<sup>aa</sup> This is frequently referred to as the *apples and oranges* limitation within the literature.<sup>426</sup>

### ***2.4.15 Conclusions***

Criminal history risk factors were most strongly associated with violence risk in individuals with psychosis. Nevertheless, there was considerable variability in the magnitude of association between individual criminal history risk factors. It is therefore possible that the magnitude of the association observed for the criminal history risk domain may be attributable to one or two key risk factors. Additionally, whilst a number of risk factors rarely assessed by existing violence risk assessment instruments were moderately associated with violence risk, including a parental history of criminal involvement and a history of attempted suicide, other factors frequently emphasised by previous reviews, including delusions and hallucinations, were not significantly associated with risk in this study. The item content of existing violence risk assessment instruments may require revision in light of these findings.

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# *Chapter 3:*

## *Introduction to Survival Analysis*

### *3.0 Advantages of Survival Analysis over Traditional Regression Approaches*

Survival analysis represents a family of techniques in which the dependent variable, time to the occurrence of an event, is related to exposure to a given risk factor/s.<sup>428</sup> Although these techniques are frequently used to investigate time until death from disease, other adverse outcomes, for example time until first conviction for a violent offence, can also be incorporated into these models.

Survival analysis is the preferred method of identifying risk factors for adverse outcomes.<sup>429</sup> First, these techniques can account for censored observations in which time until the event of interest is unknown for some individuals.<sup>430,431</sup> Although censoring is a common feature of longitudinal research,<sup>432</sup> traditional regression techniques frequently ignore this by treating censored observations as missing data and accounting for these observations using one of the available deletion or imputation strategies.<sup>433</sup> Simulation studies, however, suggest that ignoring censoring will lead to a reduction in statistical power and a concomitant underestimation of the event probability.<sup>434</sup>

Second, relating an individual's future risk of violence to factor/s measured at a single point in time may not accurately reflect the contribution of these risk factors over that individual's lifetime.<sup>435</sup> Risk factors may instead have differential effects on imminent versus long-term risk of violence or, alternatively, may have effects which change over time.<sup>435</sup> Findings from the meta-analysis reported in chapter two, for example, suggest that substance misuse in the preceding 12 months may be more strongly associated with violence risk than

historical substance misuse (Table 2.10). Survival analysis methodologies can, however, be easily extended to take into account the effect of time varying covariates.

Last, survival analysis does not assume that time to the event of interest is normally distributed.<sup>436</sup> Recent work, for example, found that the risk of violence peaks prior to first contact with psychiatric services,<sup>437</sup> suggesting that the distribution of time to violence may be positively skewed in this population.

### ***3.1 Survival Analyses Methodologies***

#### ***3.1.1 Life Tables***

This approach enables the calculation of time until the occurrence of an event when time is measured at discrete intervals rather than continuously.<sup>438</sup> This method calculates the probability of remaining event-free for each interval. These estimates can then be multiplied to determine survival function across the entire follow-up period.<sup>439</sup> This method enables censored observations to be incorporated in the calculation of the survival function, as Hosmer and colleagues (2008) illustrate:

“This estimator allows each subject to contribute information to the calculations as long as he/she is known to be [event-free]. Subjects who [experience the event] contribute to the number at risk until the time of their [event], at which point they contribute to the number of [events]. Subjects who are censored contribute to the number at risk until they are lost to follow-up.”<sup>439</sup>, p. 19.

The discretisation of time, however, leads to a loss of information, and a concomitant reduction in the efficiency of the survival estimate.<sup>438</sup>

### ***3.1.2 Kaplan-Meier Method***

The Kaplan-Meier method,<sup>440</sup> in contrast, enables the calculation of time until the occurrence of an event where time has been measured continuously.<sup>441</sup> This approach divides the follow-up period into intervals defined by the occurrence of the event of interest.<sup>438,442,443</sup> As before, the probability of remaining event-free for each of these intervals is calculated, and the product of these probabilities is then used to determine the survival function.<sup>444</sup> The survival function at each interval can then be plotted to provide a graphical representation of the cumulative probability of remaining event-free as a function of time.<sup>439</sup> Although the Kaplan-Meier method can be easily extended to calculate event-free functions for two or more groups, the method provides no indication as to whether these probabilities are significantly different from one another.

### ***3.1.3 Log-Rank Test***

The log-rank test<sup>445</sup> can be used to indicate whether the Kaplan-Meier probabilities for two or more groups are significantly different from one another across the entire follow-up period.<sup>446-449</sup> This test, based on large-sample chi-square theory, compares the number of individuals who experienced the event of interest compared with the number expected to experience the event of interest across all intervals of time,<sup>446,450</sup> assuming there is no difference in the probability of remaining event-free between groups.<sup>447</sup> This method provides no indication as to the magnitude of the difference between groups, however.<sup>451</sup> Additionally, stratification is the only method of statistically adjusting estimates to investigate the effect of potentially confounding factors.<sup>446</sup> Consequently, this method cannot be used to investigate the effect of multiple dichotomous<sup>450,452</sup> or continuous confounders.<sup>453</sup>

### **3.1.4 Cox Regression**

Cox regression,<sup>454</sup> in contrast, can be used to derive adjusted estimates, enabling the effect of both multiple dichotomous and continuous confounders to be investigated.<sup>450,453</sup> Provided that a number of *a priori* assumptions are satisfied, this method enables the relationship between event-free probabilities between groups as a function of a set of explanatory risk factors to be quantified through the *hazard ratio* (HR) which represents the ratio of the event-free probabilities between two or more groups.<sup>455</sup>

## **3.2 Assumptions of Cox Regression**

### **3.2.1 Proportional Hazards**

The *proportional hazards* assumption requires that the ratio of the hazard rate between groups is constant across the entire follow-up period.<sup>451</sup> Although a number of graphical and statistical approaches have been described to assist with the assessment of the proportional hazards assumption,<sup>456</sup> graphical methods may be preferential as they indicate not only whether a violation of the proportional hazards assumption is evident, but also what form this violation takes. Statistical methods, on the other hand, indicate only whether a violation of the proportional hazards assumption is present.

Hess (1995) compared eight graphical approaches, finding that a plot of the smoothed Schoenfeld residuals most reliably identified violations of the proportional hazards assumption.<sup>457</sup> Smoothed Schoenfeld residuals can be calculated in Stata for Windows, version 11,<sup>156</sup> by specifying the *scaledsch* option after the *stcox* command. Plots of these residuals can then be obtained using the *stphtest* command. Proportionality is inferred when the line formed by these residuals is roughly horizontal.<sup>458</sup>

### 3.2.2 *Multiplicativity*

*Multiplicativity* requires that the effect of a one unit change in any given risk factor is multiplicative with respect to the baseline hazard function.<sup>459</sup> Thus, each one unit increase in a given risk factor is assumed to affect the likelihood of the event occurring by the same factor.<sup>460</sup>

Multiplicativity is typically assessed by verifying that each risk factor conforms to a log-linear functional form.<sup>461</sup> Within Stata for Windows, version 11,<sup>156</sup> the functional form of any risk factor can be assessed graphically from a plot of the Martingale residuals. Firstly, Martingale residuals for the null Cox model<sup>bb</sup> are calculated by specifying the *mgale* option after the *stcox* or *predict* commands. The *lowess* command can then be used to plot the observed functional form of each risk factor against these residuals. Log-linearity is inferred when the line formed by these residuals increases in a linear fashion from the bottom left to the top right corner of the graph.<sup>462</sup>

### 3.2.3 *Noninformative Censoring*

The assumption of *noninformative censoring* requires that an individual's probability of being censored is unrelated to their probability of experiencing the event of interest.<sup>463</sup> Although a statistical approach has been proposed to assist in the assessment of the assumption of noninformative censoring, this test requires that the actual failure time is known for at least a random sub-sample of all those who were censored.<sup>464</sup> In the absence of this information, the assessment of the assumption of noninformative censoring can be inferred from knowledge of the reasons for participant attrition.

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<sup>bb</sup> The null Cox model does not contain any risk factor/s and can be obtained by specifying the *estimate* option with the *stcox* command.<sup>462</sup>

### 3.2.4 Absence of Tied Failure Times

Lastly, calculation of the partial likelihood function requires that failure times are unique for each individual.<sup>465,466</sup> Frequently, however, two or more individuals share the same failure time either because follow-up time is measured in discrete intervals, or alternatively, because the event of interest tends to occur at a particular point during the follow-up period.<sup>466</sup> Where failure times are tied, the partial likelihood function must instead be modified to accommodate tied failure times.<sup>465,467</sup>

Two approaches are typically used to incorporate tied failure times: *exact* and *approximation* methods.<sup>465,468</sup> The *exact-marginal* method<sup>469</sup> assumes that tied failure times can be ordered.<sup>468</sup> This method, therefore, incorporates all possible orderings into the calculation of the likelihood function.<sup>466,468,470</sup> As Cleves (2010) observes, however, this method is computationally intensive:

“Consider the...case where you have 10 tied failure times. The calculation of the exact [likelihood] would then require  $10! = 3,628,800$  terms...”<sup>468, p.149.</sup>

Additionally, previous work suggests that exact methods produce HR estimates that are no more accurate than those produced by the computationally efficient approximation methods.<sup>466</sup>

Efron’s (1977)<sup>471</sup> approximation weights the exact-marginal by the number of tied failure times observed at any one point in time.<sup>468</sup> Breslow’s (1974)<sup>472</sup> approximation, in contrast, does not adjust the exact-marginal for all prior tied failure times.<sup>468</sup> Simulation work suggests there is little difference between approximation methods under conditions of light tying.<sup>470</sup> Using the method outlined in Cleves (2010),<sup>468</sup> the proportion of tied failure times

per interval was estimated. For both the Swedish and CATIE datasets, there were less than 2.5 tied failure times per interval, satisfying conditions of light tying.<sup>470</sup> The Breslow approximation was therefore used to adjust for tied failure times in all subsequent analyses.

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# ***Chapter 4:***

## ***Longitudinal Association between Criminal History Risk Factors and Violence***

### ***4.0 Abstract***

A number of risk assessment instruments are currently used to assist clinicians in the assessment of violence risk. Although many of these instruments include criminal history risk factors, there is considerable variability in the factors assessed. Results of study one, furthermore, demonstrated that although the criminal history domain is most strongly associated with violence, certain criminal history factors may not be individually predictive of risk in those with schizophrenia. A longitudinal analysis was therefore conducted to investigate the relative magnitude of association for a number of criminal history risk factors commonly assessed by existing violence risk assessment instruments. Data were collected from a population-wide cohort of 13,806 individuals diagnosed with schizophrenia. Univariate Cox regression analyses found that similar criminal history risk factors were strongly associated with violence in both males and females, including: conviction/s for assault (males: HR=3.1, 95% CI 2.7–3.6; females HR=8.5, 95% CI 5.6–12.9), violence (males: HR=3.1, 95% CI 2.8–3.4; females: HR=8.0, 95% CI 5.9–10.8), and a history of imprisonment (males: HR=2.9, 95% CI 2.6–3.3; females: HR=7.3, 95% CI 3.6–14.9). Following adjustment for age and comorbid SUD, only a conviction for a violent offence was incrementally predictive of subsequent violence in both males (adjusted hazard ratio [aHR]=2.3, 95% CI 2.1–2.6) and females (aHR=5.1, 95% CI 3.7–7.2). A simple risk model

comprising these three risk factors was associated with a similar magnitude of predictive validity in both genders as many existing violence risk assessment instruments (males: c-index=69.4, 95% CI 68.1–70.8; females: c-index=69.6, 95% CI 68.3–70.9). Results of the present study therefore suggest that many of the criminal history risk factors currently assessed by these instruments do not contribute meaningfully to the prediction of violence risk in this population.

#### ***4.1 Introduction: Association between Criminal History Risk Factors and Violence***

Given the association between schizophrenia and violence, clinical practice guidelines in several countries advocate for the routine assessment of violence risk in all patients diagnosed with schizophrenia. To assist in the assessment of risk, a number of violence risk assessment instruments have been developed in which the presence or absence of various risk factors are assessed, and a determination as to an individuals' subsequent violence risk is made on the basis of this information. Although more than 100 such instruments are currently used both in psychiatric and correctional facilities,<sup>28</sup> recent work suggests that no one instrument consistently demonstrates superior predictive validity.<sup>473</sup>

Many existing violence risk assessment instruments assess similar risk domains. Using factor analysis, for example, Kroner and colleagues (2005) investigated the item content of four widely used violence risk assessment instruments and found that despite variability in the actual items assessed by these instruments, all four assessed similar risk factors; principally those relating to a previous criminal history.<sup>474</sup> Although work suggests that criminal history risk factors, such as age at first conviction for any offence and the total

number of prior convictions for violent offences, are more strongly associated with criminal, including violent, offending than various demographic, psychopathological, substance misuse, and treatment-related factors,<sup>51,104,105,108,384,475-480</sup> a number of these criminal history items may not be individually predictive of violence risk.<sup>481</sup> Grann and Wedin (2002), for example, found that of the 11 criminal history risk factors assessed by the Spousal Risk Assessment Guide (SARA;<sup>482</sup>) as many as ten were not individually predictive of subsequent violence in this sample.<sup>483</sup> Results of the meta-analysis reported in chapter two likewise found considerable variability in the strength of association for individual criminal history risk factors in those with psychosis. The inclusion of items in these instruments that do not adequately distinguish between violent and non-violent offenders may therefore contribute to the modest level of predictive validity associated with many of these instruments,<sup>484</sup> particularly when they are used to assess risk in those with schizophrenia.<sup>13</sup>

Variability in the predictive validity of individual items between studies may reflect the effects of shrinkage. Tengström (2001) therefore investigated the predictive validity of items on the VRAG in a sample which closely resembled the demographic and clinical characteristics of the original calibration sample (Table 4.1). Although some departures from the characteristics of the original VRAG calibration sample are evident, nonetheless Tengström's (2001) study provides an ideal opportunity to assess the individual predictive validity of the VRAG items under conditions in which the influence of shrinkage should be minimal. Nevertheless, of the criminal history items assessed by the VRAG, three were not predictive of violence in this study: age at index offence, severity of victim injury, and having victimised a female.<sup>485</sup>

**Table 4.1.**

Criteria used to determine whether a replication study sufficiently matches the demographic and other characteristics of the original calibration sample to protect against the effects of shrinkage.

Domain	Criterion	Explanation
<b>SAMPLE CHARACTERISTICS</b>		
	Participants of same age?	✘ Sample included adolescents as well as adults.
	Participants of same gender?	✓ Sample exclusively male.
	Same offence type used to determine study inclusion?	✓ Conviction for a violent offence.
<b>LENGTH OF FOLLOW-UP PERIOD</b>		
	Used similar length of follow-up period?	✓ Mean follow-up period of 7.0 years.
<b>DEGREE OF PARTICIPANT ATTRITION</b>		
	Similar proportion of participants died?	? No data on sample attrition provided.
	Similar proportion of participants left jurisdiction?	? No data on sample attrition provided.
	Similar proportion of participants institutionalised?	? No data on sample attrition provided.
<b>OUTCOME DEFINITION</b>		
	Recidivism given same operationalisation?	✓ Any violent offence.
	Recidivism assigned same legal status?	✓ Conviction.
<b>INTEGRITY OF ASSESSMENT</b>		
	No systematic omissions of items.	✓ No items omitted from calculation of risk score.
	Manual item scoring followed.	✘ Items 2, 7, & 10 were prorated.
	Only information from reliable sources used.	✓ Coded from medical files or official registries.
	Assessors trained in administration of instrument?	? No details on assessor training provided
	Satisfactory level of inter-rater reliability?	? Not stated.
	Assessors have access to official criminal records?	✓ Yes.

**Note:** Reproduced with permission from <sup>486</sup>

✓ Item satisfied.

✘ Item not satisfied.

? Unclear whether item satisfied.

Emerging work also suggests that some criminal history risk factors may be more predictive of violence risk in one gender as compared to the other. Within the general population, for example, a recent meta-analysis of 127 predictors of violent recidivism found that although a history of violent offending was significantly associated with an increased risk of violent recidivism, the association was not significant for males.<sup>480</sup>

The onset of psychiatric illness has also been found to affect the strength of association for violence risk factors, including criminal history factors. Kooyman and colleagues (2012), for example, compared offenders with a history of criminal offending which pre-dated diagnosis with psychosis (pre-morbid offenders) to those who only commenced offending following diagnosis (post-morbid offenders). Pre-morbid offenders were significantly younger at first conviction, were more likely to have been sentenced to a term of imprisonment, to be convicted of five or more offences, and to have been convicted of a greater range of offence types than post-morbid offenders. Additionally, whilst pre-morbid offenders were more likely to have a first conviction for theft, post-morbid offenders were significantly more likely to have a first conviction for a violent offence. These differences remained significant even following adjustment for time at risk.<sup>487</sup>

#### ***4.1.1 Aims and Hypotheses***

The aim of this study is to investigate the relative strength of association between a number of criminal history risk factors that are most frequently associated with increased violence risk in individuals with schizophrenia. Criminal history factors were derived from those included in the meta-analysis reported in chapter two, alongside those items most commonly included in violence risk assessment instruments according to a recent systematic review.<sup>13</sup> Analyses will be also be conducted to investigate whether the strength of

association for any of these criminal history factors differs for males as opposed to females and in those with a history of offending prior to diagnosis as compared to those without a criminal history prior to their diagnosis with schizophrenia. Based upon the results reported in chapter two, a previous conviction for assault is hypothesised to have the strongest association with violence in both males and females.

## ***4.2 Method***

### ***4.2.1 Inclusion and Exclusion Criteria***

All individuals, aged 15 years (the age of criminal responsibility in Sweden) or older, and who had been discharged from hospital with a diagnosis of schizophrenia on at least two separate occasions between January 1, 1973 and December 31, 2004 were included in the present study. These individuals were identified using the Swedish epidemiological sources described in the next section. A decision was made to use Swedish sources as they possess nationwide coverage and have a high degree of both accuracy and completeness.<sup>488</sup>

### ***4.2.2 Epidemiological Sources***

Data for the present study was extracted from five Swedish epidemiological sources: the Hospital Discharge Register (HDR), the Cause of Death Register (CDR), the Migration Register (MR), the Multi-Generation Register (MGR), and the National Crime Register (NCR). As each individual, including migrants and temporary residents, are assigned a personal identification number,<sup>489</sup> it is also possible to link these five epidemiological sources. Statistics Sweden, an independent Government agency, merged the registries and assigned each participant an identification number specific to this study. The coding sheet

which links the ten digit identification number to the study identification number was then destroyed to ensure anonymity. The Karolinska Institutet Ethics Committee gave approval for this study (number: 2005/174-31/4).

The HDR was used to identify individuals diagnosed with schizophrenia according to either the eighth (1973–1986; code 295), ninth (1987–1996; code 295) or tenth (1997 onwards; code F20) revisions of the ICD. The HDR has excellent completeness; since its commencement in 1964, 97% of all psychiatric hospitalisations have had discharge diagnoses recorded on this register;<sup>490</sup> only one percent of these records are missing corresponding personal identification numbers.<sup>491</sup> HDR diagnoses also have good concordance with those made using either DSM-III-R criteria,<sup>492</sup> DSM-IV criteria,<sup>493-495</sup> or the Operational Checklist for Psychotic Disorders (OPCRIT; <sup>496</sup>) algorithm,<sup>493</sup> suggesting that individuals identified on the basis of their HDR diagnosis are likely to be both symptomatically and clinically representative of this population.

HDR diagnoses are associated with modest specificity. Dalman and colleagues (2002), for example, estimated that around ten percent of schizophrenia diagnoses recorded on the HDR are false positives.<sup>cc,493</sup> Since the use of a minimum of two diagnoses has been found to increase the sensitivity of both schizophrenia<sup>497</sup> and bipolar disorder<sup>498</sup> diagnoses as individuals with more transient forms of psychosis, such as substance induced psychosis, are less likely to meet this condition, a decision was made to include only those individuals diagnosed with schizophrenia on at least two separate occasions in the present study.<sup>dd</sup>

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<sup>cc</sup> The current sample includes 13,806 individuals. A false positive rate of 10.2% would indicate that 1,408 individuals in this sample may have been misdiagnosed with schizophrenia.

<sup>dd</sup> Although data was not available to calculate the exact number of patients with only one HDR diagnosis of schizophrenia between January 1, 1973 and December 31, 2004, previous work on an overlapping sample diagnosed between January 1, 1973 and December 31, 2006 found that 56% of those with schizophrenia received only one HDR diagnosis.<sup>94</sup> Assuming a similar proportion of patients in the present cohort received only one HDR diagnosis, 7,731 individuals with schizophrenia may have been excluded from this study.

Censorship due to either death or emigration was identified from the CDR and MR respectively. The CDR records information on an individual's cause of death according to either the eighth (1981–1986), ninth (1987–1996), or tenth (1997 onwards) revisions of the ICD. Although work suggests that agreement between HDR diagnoses at the last hospitalisation before death and the cause of death as recorded on the CDR is present in just under half of all cases,<sup>ee,499</sup> the CDR does have excellent completeness; of the 93,910 deaths occurring in 1995, for example, death certificates were received for 99%.<sup>499</sup> Given that the present study is concerned with identifying numbers rather than causes of death, the completeness of the CDR is of greater concern than its specificity.

The MR records the date an individual emigrates from Sweden.<sup>500</sup> The MR is also complete; where accurate records of immigration are maintained by the receiving country, the number of people who report arriving from Sweden is consistent with those recorded as having emigrated from Sweden.<sup>501</sup>

### ***4.2.3 Criminal History Risk Factors***

Criminal history risk factors were coded from both the MGR and the NCR. A full description of the coding for each of the criminal history risk factors reported in this study is provided in Appendix E.

To generate age- and family history-related risk factors, information on each individual's date of birth and family relations was coded from the MGR which records both the name and personal identification number of each individual's parents and siblings.<sup>502</sup> The

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<sup>ee</sup> In this study, sensitivity was determined by comparing diagnoses made at the last hospitalisation before death with the cause of death as recorded on the CDR. Whilst only deaths occurring within a 12 month period were investigated, it is possible that an individual may have died of a cause unrelated to their hospital admission. In this case, however, the discrepancy would be regarded as a lack of sensitivity when the CDR record may, in contrast, be an accurate record of that individual's cause of death.

MGR has excellent completeness; for those born after 1960, maternal information is available for all individuals whilst paternal information is available in 98% of cases.<sup>503</sup> To my knowledge, however, there has been no attempt to investigate the completeness of the MGR for sibling relationships.

The NCR was used to derive all other criminal history risk factors. The NCR records the date of conviction, type of conviction, and the type and length of any sentence received. Whilst there have been no independent validations of the NCR, it is complete; less than one percent of the violent convictions recorded in the NCR between 1988 and 2000 are missing personal identification numbers.<sup>491</sup> Criminal history risk factors were categorised into one of 11 types following the approach outlined by Kyvsgaard (2003)<sup>504</sup>: arson and endangerment offences, breach of trust offences, burglary, criminal damage, military offences, other penal code violations, sexual offences, theft, treason, violations of the special codes, and violent offences. Violent offences were then further disaggregated into assault, illegal threats and/or intimidation, and weapon use.

Only risk factors identified in chapter two, and a recent systematic review of the items included in ten widely used violence risk assessment instruments,<sup>13</sup> are reported in this chapter. Additional risk factors which do not meet this criterion are reported in Appendices F, G, and H.

#### ***4.2.4 Outcome Measure***

The primary outcome measure for the present study, any conviction for a violent offence following diagnosis with schizophrenia, was coded dichotomously and included any conviction for homicide, aggravated assault, common assault, any sexual assault (e.g., rape, sexual coercion, child molestation, sexual harassment and indecent exposure), aggravated

robbery, robbery, kidnapping, arson, and illegal threats or intimidation. Attempted offences were also included, where relevant. All other offences, including: drug, property, military, and traffic offences, were considered to be non-violent. The decision to include non-contact offences, such as illegal threats and intimidation, is consistent with previous epidemiological work in this population.<sup>28,94,283,491,505,506</sup>

Violence was ascertained from conviction data for two reasons. First, in Sweden criminal cases cannot be resolved without conviction either through plea bargaining or by pleading not guilty by reason of insanity. Second, a conviction is recorded even if the individual is sentenced to a non-custodial sentence.<sup>283</sup> For these reasons, conviction data is thought to reflect the true extent of resolved criminality in Sweden.<sup>283</sup> Data on conviction for violence was obtained from the NCR.

#### ***4.2.5 Statistical Analyses***

A total of 13,806 individuals were diagnosed with schizophrenia on at least two separate occasions between January 1, 1973 and December 31, 2004. These individuals were followed from the date of their second diagnosis with schizophrenia until conviction for a violent offence, death, emigration, or end of the follow-up period (December 31, 2004), whichever came first. Time served either in prison or a forensic psychiatric facility was subtracted from time at risk. As two-thirds of a sentence is served for sentences over one month's duration in Sweden, time spent in custody was adjusted accordingly.

As previous work suggests that the strength of association for certain criminal history risk factors is affected by the onset of schizophrenia,<sup>487</sup> the overall cohort was further subdivided into those with and without a history of conviction for any offence prior to diagnosis with schizophrenia. Only family history-related risk factors could be investigated

for their association with violence in those without a history of conviction for any offence prior to diagnosis with schizophrenia, however.

Univariate Cox regression was used to investigate the longitudinal association between criminal history risk factors and violence following the procedure outlined in chapter three. For each risk factor, influential observations were assessed graphically following Cleves (2010).<sup>462</sup>

Multivariate adjusted HRs were also calculated for each criminal history risk factor. Within both the general and psychiatric populations, violence risk is strongly associated with both age and gender.<sup>507</sup> Recent epidemiological work, moreover, suggests that comorbid substance use may also be an important risk factor for violence in those with schizophrenia specifically.<sup>94</sup> HRs were therefore adjusted for the following factors: young age, gender,<sup>ff</sup> and a lifetime diagnosis of comorbid SUD. As previous work in this dataset identified 32 years as the cut-point for age that maximally distinguishes between violent and non-violent individuals,<sup>28</sup> those younger than 32 years at diagnosis were coded as “young” for the purposes of these multivariate analyses.

Following guidelines for evaluating the clinical utility of novel risk factors in other areas of medicine,<sup>508</sup> measures of *discrimination*, *calibration*, and *reclassification* were also reported to assess the incremental validity of each criminal history risk factor. Discrimination, which refers to the ability of a model to distinguish between those who do and do not experience the event of interest,<sup>509</sup> was assessed using Harrell’s c-index as recommended for data with censored observations<sup>510,511</sup> according the procedure outlined in Newson (2010).<sup>512</sup> Calibration, or goodness-of-fit, was assessed using the Likelihood Ratio.<sup>513</sup> Lastly, change in reclassification between the baseline and alternate models was

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<sup>ff</sup> The effect of gender was statistically adjusted by conducting analyses separately for males and females.

assessed using Royston's adjusted  $R^2$ <sup>gg,516</sup> as simulation work suggests that this measure is least affected by censoring.<sup>517</sup> All analyses were conducted in Stata for Windows, version 11.<sup>156</sup>

### **4.3 Results**

A total of 13,806 individuals, diagnosed with schizophrenia on at least two separate occasions between January 1, 1973 and December 31, 2004, were included in the present study. Over half of the cohort was male ( $n=8,891$ , 64.4%; females:  $n=4,915$ , 35.6%). The median length of follow-up, excluding years spent in prison and/or forensic psychiatric facilities, was 10.3 years (IQR 4.5–17.2 years).

A total of 1,816 (13.1%) members of this cohort were convicted of a violent offence following diagnosis with schizophrenia. Most of these individuals were male ( $n=1,535$ ; 84.5%; females:  $n=281$ ; 15.5%). For males, the most common violent conviction was for illegal threats ( $n=701$ ; 45.6%), followed by common assault ( $n=517$ ; 33.7%), sexual offences ( $n=6.3\%$ ), aggravated assault ( $n=55$ , 3.6%), arson ( $n=56$ , 3.6%), robbery ( $n=50$ , 3.3%), homicide ( $n=41$ , 2.3%), and finally kidnapping ( $n=18$ , 1.2%). Most of the women were also convicted for illegal threats ( $n=123$ ; 43.8%), followed by common assault ( $n=88$ ; 31.3%), arson ( $n=39$ ; 13.9%), aggravated assault ( $n=17$ ; 6.0%), homicide ( $n=7$ , 2.5%), robbery ( $n=3$ , 1.1%), and finally sexual offences ( $n=2$ , 0.7%), and kidnapping ( $n=2$ , 0.7%).

Around half of the males in the overall cohort had been convicted of an offence prior to diagnosis with schizophrenia ( $n=4,502$ , 50.6%). Of these, 1,051 (23.3%) were

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<sup>gg</sup> As change in  $R^2$  is mathematically equivalent to the *integrated reclassification index*,<sup>514</sup> this measure can be interpreted as indicating the change in predicted risk for an individual following the addition of a novel risk factor.<sup>515</sup>

subsequently convicted of a violent offence after diagnosis. The remaining 4,389 (49.3%) males had not been convicted of any offence prior to their diagnosis with schizophrenia. Of these individuals, 484 (11.0%) were subsequently convicted of a violent offence.

For females, 957 (13.3%) had a history of conviction for any offence prior to diagnosis. A total of 128 (13.4%) of these women were subsequently convicted of a violent offence following diagnosis with schizophrenia. The remaining 3,958 (80.5%) had not been convicted of any offence before their diagnosis with schizophrenia. Of these women, few ( $n=153$ ; 3.9%) received a conviction for a violent offence following diagnosis with schizophrenia.

### ***4.3.1 Univariate Analyses***

Univariate Cox regression analyses revealed that all criminal history risk factors were significantly associated with the risk of violence in both males and females with schizophrenia (Tables 4.2 and 4.3). Although the relative magnitude of these risk factors varied between males and females, similar risk factors were most strongly associated with violence in both genders, including: conviction for assault, any violent offence, and a history of imprisonment as a juvenile and/or adult.

Convictions for assault and violent offences were also strongly associated with an increased risk of conviction for a violent offence in both males and females with a history of conviction for any offence prior to diagnosis with schizophrenia (Tables 4.4 and 4.5). For those without a history of offending prior to diagnosis with schizophrenia, there was no association with risk of conviction for a violent offence in either gender (Table 4.6).

A number of additional criminal history risk factors not currently assessed by existing violence risk assessment instruments were also significantly associated with conviction for a

violent offence in males, females, and in those with a history of conviction for any offence prior to diagnosis with schizophrenia, including: persistency and versatility in offending (Appendix F).

**Table 4.2.**

Univariate associations between criminal history risk factors and conviction for a violent offence in males with schizophrenia.

Risk Factor	<i>n</i>		<i>n</i>		Unadjusted Hazard Ratio (95% CI)	<i>z</i>	<i>p</i>
	Violent	Without	With	Without			
Conviction for assault	280	1,255	522	6,834	3.1 (2.7 – 3.6)	17.1	***
Conviction for a violent offence	509	1,026	1,102	6,254	3.1 (2.8 – 3.4)	20.5	***
History of imprisonment (juvenile and/or adult)	267	1,268	543	6,813	2.9 (2.6 – 3.3)	15.8	***
Conviction for illegal threats	220	1,315	479	6,877	2.7 (2.4 – 3.1)	13.6	***
Conviction for weapon use	119	1,416	267	7,089	2.5 (2.1 – 3.1)	9.7	***
Mother convicted of a violent offence	23	1,512	41	7,313	2.5 (1.7 – 3.8)	4.4	***
Conviction for a non-violent offence	803	732	2,303	5,053	2.4 (2.2 – 2.7)	17.4	***
Most recent conviction for a violent offence	240	1,295	631	6,725	2.2 (1.9 – 2.5)	11.1	***
One or more conviction/s under 18 years of age	329	1,206	926	6,430	2.0 (1.8 – 2.3)	11.5	***
Parent convicted of a violent offence	115	1,420	312	7,042	1.9 (1.6 – 2.3)	6.5	***
Most recent conviction for a non-violent offence	506	1,029	1,545	5,811	1.8 (1.6 – 2.0)	10.7	***
Father convicted of a violent offence	96	1,439	279	7,075	1.8 (1.4 – 2.2)	5.4	***
Conviction for a sexual offence	24	1,511	82	7,274	1.7 (1.1 – 2.6)	2.7	**
Age at first conviction for any offence <sup>§</sup>					1.0 (1.0 – 1.0)	2.5	*
Age at first conviction for a violent offence <sup>†</sup>					1.0 (1.0 – 1.0)	-2.8	**

**Note:** Risk factors ranked in descending order according to HR magnitude. For risk factors measured on a continuous scale, numbers with and without the risk factor could not be calculated.

<sup>§</sup> Rounding to two decimal places, HR=1.01, 95% CI 1.00 – 1.02.

<sup>†</sup> Rounding to two decimal places, HR=0.98, 95% CI 0.96 – 0.99.

\*\*\* = significant to the 0.001 level.

\*\* = significant to the 0.01 level.

\* = significant to the 0.05 level.

**Table 4.3.**

Univariate associations between criminal history risk factors and conviction for a violent offence in females with schizophrenia.

Risk Factor	<i>n</i> Violent		<i>n</i> Non-Violent		Unadjusted Hazard Ratio (95% CI)	<i>z</i>	<i>p</i>
	<i>With</i>	<i>Without</i>	<i>With</i>	<i>Without</i>			
Conviction for weapon use	9	272	21	4,613	8.7 (4.1 – 18.6)	5.7	***
Conviction for assault	25	256	67	4,567	8.5 (5.6 – 12.9)	10.0	***
Conviction for a violent offence	54	227	160	4,474	8.0 (5.9 – 10.8)	13.4	***
History of imprisonment (juvenile and/or adult)	9	272	26	4,608	7.3 (3.6 – 14.9)	5.5	***
Most recent conviction for a violent offence	39	242	116	4,518	7.1 (5.1 – 10.1)	11.2	***
Conviction for illegal threats	18	263	56	4,578	6.5 (3.9 – 10.8)	7.2	***
One or more conviction/s under 18 years of age	29	252	127	4,507	4.5 (3.0 – 6.7)	7.4	***
Conviction for a non-violent offence	94	187	566	4,068	4.1 (3.2 – 5.3)	11.2	***
Mother convicted of a violent offence	4	277	23	4,611	3.0 (0.9 – 9.6)	1.8	0.06
Most recent conviction for a non-violent offence	66	215	486	4,148	2.9 (2.2 – 3.9)	7.7	***
Parent convicted of a violent offence	21	260	187	4,447	2.0 (1.3 – 3.2)	3.1	**
Father convicted of a violent offence	18	263	169	4,465	1.9 (1.2 – 3.2)	2.6	**
Age at first conviction for a violent offence <sup>§</sup>					1.0 (1.0 – 1.1)	1.1	0.26
Age at first conviction for any offence <sup>†</sup>					1.0 (1.0 – 1.0)	3.8	***

**Note:** As no females were convicted of a sexual offence prior to diagnosis with schizophrenia, this risk factor could not be investigated for its association with violence. Risk factors ranked in descending order according to HR magnitude. For risk factors measured on a continuous scale, numbers with and without the risk factor could not be calculated.

\*\*\* = significant to the 0.001 level.

\*\* = significant to the 0.01 level.

\* = significant to the 0.05 level.

<sup>§</sup> Rounding to two decimal places, HR=1.02, 95% CI 0.98–1.07.

<sup>†</sup> Rounding to two decimal places, HR=1.03, 95% CI 1.01–1.04.

**Table 4.4.**

Univariate associations between criminal history risk factors and conviction for a violent offence in males with a history of conviction for any offence prior to diagnosis with schizophrenia.

Risk Factor	<i>n</i> Violent		<i>n</i> Non-Violent		Unadjusted Hazard Ratio (95% CI)	<i>z</i>	<i>p</i>
	<i>With</i>	<i>Without</i>	<i>With</i>	<i>Without</i>			
Conviction for a violent offence	509	542	1,102	2,349	2.1 (1.9 – 2.4)	12.1	***
Conviction for assault	280	771	522	2,929	2.1 (1.8 – 2.4)	10.7	***
Mother convicted of a violent offence	20	1,031	29	3,421	2.1 (1.3 – 3.2)	3.2	**
History of imprisonment (juvenile and/or adult)	267	784	543	2,908	2.0 (1.7 – 2.3)	9.5	***
Conviction for illegal threats	220	831	479	2,972	1.8 (1.6 – 2.1)	7.8	***
Parent convicted of a violent offence	96	955	192	3,258	1.8 (1.4 – 2.2)	5.2	***
Conviction for weapon use	119	932	267	3,184	1.7 (1.4 – 2.1)	5.4	***
Father convicted of a violent offence	80	971	168	3,282	1.7 (1.3 – 2.1)	4.4	***
Conviction for a non-violent offence	803	248	2,303	1,148	1.5 (1.3 – 1.7)	5.7	***
Most recent conviction a violent offence	240	811	631	2,820	1.4 (1.2 – 1.6)	4.9	***
One or more conviction/s under 18 years of age	329	722	926	2,525	1.3 (1.1 – 1.5)	4.1	***
Conviction for a sexual offence	24	1,027	82	3,369	1.1 (0.8 – 1.7)	0.7	0.49
Most recent conviction a non-violent offence	506	545	1,545	1,906	1.0 (0.9 – 1.2)	0.6	0.53
Age at first conviction for any offence <sup>§</sup>					1.0 (0.9 – 1.0)	-4.3	***
Age at first conviction for a violent offence <sup>†</sup>					1.0 (1.0 – 1.0)	-2.8	**

**Note:** Risk factors ranked in descending order according to HR magnitude. For risk factors measured on a continuous scale, numbers with and without the risk factor could not be calculated.

<sup>§</sup> Rounded to two decimal places, HR=0.97, 95% CI 0.95–0.98.

<sup>†</sup> Rounded to two decimal places, HR=0.98, 95% CI 0.96–0.99.

\*\*\* = significant to the 0.001 level.

\*\* = significant to the 0.01 level.

\* = significant to the 0.05 level.

**Table 4.5.**

Univariate associations between criminal history risk factors and conviction for a violent offence in females with a history of conviction for any offence prior to diagnosis with schizophrenia.

Risk Factor	<i>n</i> Violent		<i>n</i> Non-Violent		Unadjusted Hazard Ratio (95% CI)	<i>z</i>	<i>p</i>
	<i>With</i>	<i>Without</i>	<i>With</i>	<i>Without</i>			
Mother convicted of a violent offence	4	124	5	824	4.3 (1.3 – 14.0)	2.5	*
Conviction for a violent offence	54	74	160	669	3.2 (2.3 – 4.6)	6.5	***
Conviction for assault	25	103	67	762	3.1 (2.0 – 4.8)	5.0	***
Conviction for weapon use	9	119	21	808	3.1 (1.5 – 6.6)	3.0	**
Most recent conviction for a violent offence	39	89	116	713	2.7 (1.8 – 4.0)	5.1	***
History of imprisonment (juvenile and/or adult)	9	119	26	803	2.5 (1.2 – 5.2)	2.5	*
Conviction for illegal threats	18	110	56	773	2.3 (1.4 – 3.9)	3.2	**
Parent convicted of a violent offence	13	115	44	785	2.1 (1.1 – 3.9)	2.4	*
Father convicted of a violent offence	10	118	39	790	1.8 (0.9 – 3.6)	1.7	0.08
One or more conviction/s under 18 years of age	29	99	127	702	1.6 (1.0 – 2.4)	2.2	*
Conviction for a non-violent offence	94	34	566	263	1.3 (0.9 – 2.0)	1.5	0.14
Age at first conviction for a violent offence <sup>§</sup>					1.0 (1.0 – 1.1)	1.1	0.26
Age at first conviction for any offence <sup>†</sup>					1.0 (0.9 – 1.0)	-1.2	0.21
Most recent conviction for a non-violent offence	66	62	486	343	0.8 (0.5 – 1.1)	-1.4	0.17

**Note:** As no females were convicted of a sexual offence, this risk factor could not be investigated for its association with violence. Risk factors ranked in descending order according to HR magnitude. For risk factors measured on a continuous scale, numbers with and without the risk factor could not be calculated.

<sup>§</sup> Rounding to two decimal places, HR=1.02, 95% CI 0.98–1.07.

<sup>†</sup> Rounding to two decimal places, HR=0.97, 95% CI 0.93–1.01.

\*\*\* = significant to the 0.001 level.

\*\* = significant to the 0.01 level.

\* = significant to the 0.05 level.

**Table 4.6.**

Univariate associations between criminal history risk factors and conviction for a violent offence in males and females without a history of conviction for any offence prior to diagnosis with schizophrenia.

Gender	Risk Factor	<i>n</i> Violent		<i>n</i> Non-Violent		Unadjusted Hazard Ratio (95% CI)	<i>z</i>	<i>p</i>
		<i>With</i>	<i>Without</i>	<i>With</i>	<i>Without</i>			
<b>MALES</b>								
	Mother convicted of a violent offence	3	481	12	3,892	2.0 (0.5 – 7.1)	1.1	0.29
	Parent convicted of a violent offence	19	465	120	3,784	1.3 (0.8 – 2.1)	1.2	0.23
	Father convicted of a violent offence	16	468	111	3,793	1.2 (0.7 – 2.0)	0.7	0.45
	Sibling convicted of a violent offence	26	458	179	3,725	1.0 (0.7 – 1.5)	0.03	0.98
<b>FEMALES</b>								
	Parent convicted of a violent offence	8	145	143	3,662	1.5 (0.7 – 3.3)	1.1	0.27
	Father convicted of a violent offence	8	145	130	3,675	1.7 (0.8 – 3.6)	1.3	0.18
	Sibling convicted of a violent offence	13	140	238	3,567	1.3 (0.7 – 2.3)	0.8	0.41

**Note:** As no violent female had a mother who was herself convicted of a violent offence, this risk factor could not be investigated for its association with violence. Risk factors ranked in descending order according to HR magnitude.

\*\*\* = significant to the 0.001 level.

\*\* = significant to the 0.01 level.

\* = significant to the 0.05 level.

### ***4.3.2 Incremental Predictive Validity Analyses***

For both males and females, the addition of a previous conviction for a violent offence was associated with the largest increase in both discrimination, as measured by the c-index, and reclassification, as measured by the magnitude of change in Royston's  $R^2$  (Baseline Model in Tables 4.7 and 4.8). Other criminal history risk factors did not achieve the same strength of association or increase in discrimination (Figures 4.1 and 4.2), including those not currently assessed by the majority of existing violence risk assessment instruments (Appendix G).

The further addition of other criminal history risk factors provided little additional predictive value over that provided by a previous conviction for a violent offence alone for either males (Alternate Model in Table 4.7) or females (Alternate Model in Table 4.8), including for those risk factors not currently assessed by the majority of existing violence risk assessment instruments (Appendix H).

**Table 4.7.**

Incremental validity of criminal risk factors in predicting conviction for a violent offence in males with schizophrenia.

Risk Factor	Adjusted Hazard Ratio (95% CI)	z	p	Harrell's c-index			Likelihood Ratio		Adjusted Royston's R <sup>2</sup>	
				% (95% CI)	$\Delta$ %	P	$\Delta \chi^2$	P	% (95% CI)	$\Delta$ (%)
<b>BASELINE: Young Age + Comorbid SUD</b>				<b>65.2 (63.9 – 66.6)</b>					<b>18.7 (15.3 – 22.7)</b>	
+ Conviction for a violent offence	2.3 (2.1 – 2.6)	14.3	***		+4.2	***	193.1	***		+6.8
+ Conviction for assault	2.2 (1.9 – 2.6)	11.3	***		+2.2	***	114.9	***		+4.1
+ History of imprisonment (juvenile and/or adult)	1.9 (1.6 – 2.2)	8.7	***		+1.7	***	71.9	***		+2.6
+ Conviction for illegal threats	1.9 (1.7 – 2.3)	8.6	***		+1.7	***	67.3	***		+2.4
+ Mother convicted of a violent offence	1.9 (1.3 – 3.0)	3.0	**		+0.2	**	8.2	**		+1.9
+ Most recent conviction for a violent offence	1.8 (1.6 – 2.1)	8.4	***		+2.4	***	65.0	***		+2.4
+ Conviction for weapon use	1.8 (1.5 – 2.2)	5.9	***		+1.0	***	31.0	***		+1.1
+ Conviction for a non-violent offence	1.7 (1.5 – 1.9)	9.2	***		+3.9	***	87.9	***		+3.2
+ Parent convicted of a violent offence	1.7 (1.4 – 2.0)	5.3	***		+0.5	**	24.0	***		+0.9
+ Father convicted of a violent offence	1.6 (1.3 – 2.0)	4.4	***		+0.3	*	17.2	***		+0.6
+ One or more conviction/s for any offence under 18 years of age	1.5 (1.3 – 1.7)	5.9	***		+1.3	***	32.7	***		+1.2
+ Conviction for a sexual offence	1.4 (0.9 – 2.2)	1.5	0.13		+0.2	*	2.4	0.12		+0.1
+ Most recent conviction for a non-violent offence	1.3 (1.2 – 1.5)	4.7	***		+2.2	***	22.5	***		+0.8
<b>ALTERNATE: Young Age + Comorbid SUD + Conviction for a Violent Offence</b>				<b>69.5 (68.1 – 70.8)</b>					<b>25.4 (22.0 – 31.0)</b>	
+ Mother convicted of a violent offence	1.6 (1.0 – 2.5)	2.1	*		+0.1	*	4.5	*		+0.3
+ Conviction for a non-violent offence	1.4 (1.3 – 1.6)	6.1	***		+2.1	***	38.9	***		+1.5
+ History of imprisonment (juvenile and/or adult)	1.4 (1.2 – 1.6)	4.3	***		+0.5	***	18.7	***		+0.8
+ Parent convicted of a violent offence	1.4 (1.2 – 1.8)	3.7	***		+0.2	*	13.1	**		+0.6
+ Father convicted of a violent offence	1.4 (1.1 – 1.7)	3.2	**		+0.1	0.16	9.4	**		+0.5
+ Most recent conviction for a non-violent offence	1.3 (1.2 – 1.4)	4.6	***		+0.9	***	21.3	***		+0.9
+ One or more conviction/s for any offence under 18 years of age	1.1 (1.0 – 1.3)	2.1	*		+0.4	***	4.7	*		+0.3

**Note:** As the Likelihood Ratio test compares nested models, estimates for the baseline risk model alone cannot be calculated. Risk factors ranked in descending order according to aHR magnitude. Age at first conviction for any offence and age at first conviction for a violent offence dropped from the baseline model due to collinearity with young age. Conviction for assault, illegal threats, weapon use, most recent conviction for a violent offence, and age at first conviction for a violent offence dropped from the alternate model due to collinearity with conviction for a violent offence.

\*\*\* = significant to the 0.001 level;

\*\* = significant to the 0.01 level;

\* = significant to the 0.05 level.

**Table 4.8.**

Incremental validity of criminal risk factors in predicting conviction for a violent offence in females with schizophrenia.

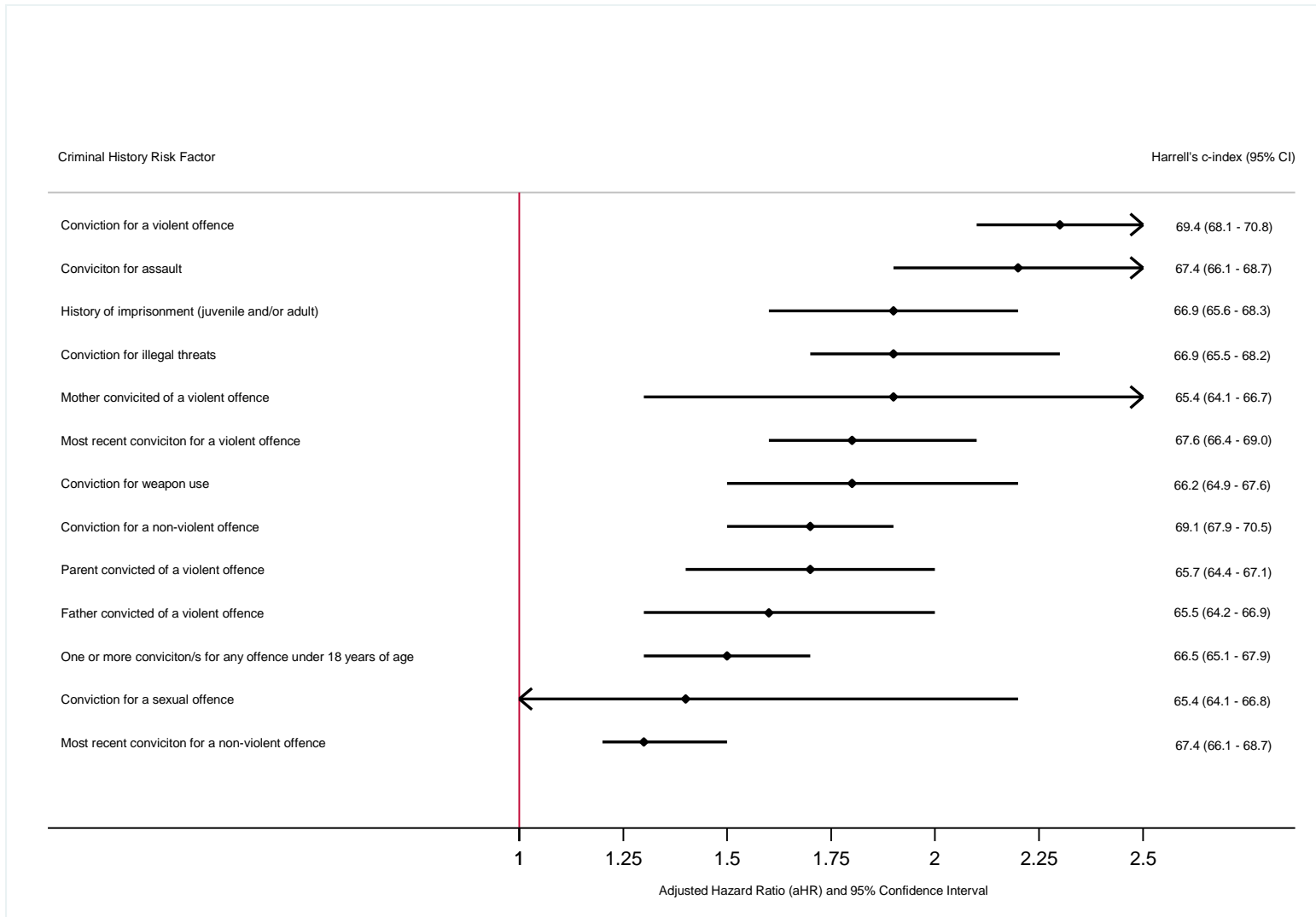
Risk Factor	Adjusted Hazard Ratio (95% CI)	z	p	Harrell's c-index			Likelihood Ratio		Adjusted Royston's R <sup>2</sup>	
				% (95% CI)	$\Delta$ %	p	$\Delta \chi^2$	p	(%)	$\Delta$ (%)
<b>BASELINE: Young Age + Comorbid SUD</b>				<b>64.3 (62.9 – 65.6)</b>					<b>26.8 (17.6 – 37.1)</b>	
+ Conviction for weapon use	6.7 (3.0 – 14.9)	4.6	***		+0.6	**	18.6	***		+3.2
+ Conviction for a violent offence	5.1 (3.7 – 7.2)	9.6	***		+5.3	***	78.0	***		+13.4
+ Most recent conviction for a violent offence	5.0 (3.4 – 7.2)	8.3	***		+3.2	***	57.4	***		+10.0
+ Conviction for assault	4.9 (3.1 – 7.8)	6.8	***		+3.2	***	37.2	***		+6.5
+ Conviction for illegal threats	3.6 (2.1 – 6.3)	4.7	***		+2.6	***	19.4	***		+3.3
+ History of imprisonment (juvenile and/or adult)	3.0 (1.4 – 6.2)	2.9	**		+2.7	***	7.3	**		+1.2
+ Conviction for a non-violent offence	2.7 (2.1 – 3.6)	7.6	***		+4.9	***	49.2	***		+8.6
+ One or more conviction/s for any offence under 18 years of age	2.7 (1.7 – 4.1)	4.5	***		+0.1	0.44	18.7	***		+3.2
+ Most recent conviction for a non-violent offence	2.0 (1.5 – 2.7)	4.8	***		+3.1	***	20.2	***		+3.5
+ Parent convicted of a violent offence	1.7 (1.1 – 2.7)	2.3	*		+0.9	***	4.7	*		+0.7
+ Father convicted of a violent offence	1.6 (1.0 – 2.6)	1.8	0.07		+0.6	**	3.1	0.08		+0.4
<b>ALTERNATE: Young Age + Comorbid SUD + Conviction for a Violent Offence</b>				<b>69.6 (68.3 – 70.9)</b>					<b>40.2 (33.6 – 48.7)</b>	
+ Conviction for a non-violent offence	2.1 (1.5 – 2.8)	4.7	***		+2.1	***	22.5	***		+3.4
+ Most recent conviction for a non-violent offence	1.9 (1.4 – 2.6)	4.2	***		+1.6	***	17.3	***		+2.6
+ Parent convicted of a violent offence	1.6 (1.0 – 2.6)	2.1	*		+0.2	*	4.1	*		+0.5
+ One or more conviction/s for any offence under 18 years of age	1.6 (1.0 – 2.6)	2.0	0.05		+0.05	0.42	4.7	*		+0.6
+ History of imprisonment (juvenile and/or adult)	1.3 (0.6 – 2.8)	0.6	0.55		+0.4	**	0.4	0.51		-0.1

**Note:** As the Likelihood Ratio test compares nested models, estimates for the baseline risk model alone cannot be calculated. Risk factors ranked in descending order according to aHR magnitude. Age at first conviction for any offence dropped from the alternate model due to collinearity with young age. Conviction for assault, illegal threats, weapon use, most recent conviction for a violent offence, and age at first violent conviction dropped from the alternate model due to collinearity with conviction for a violent offence.

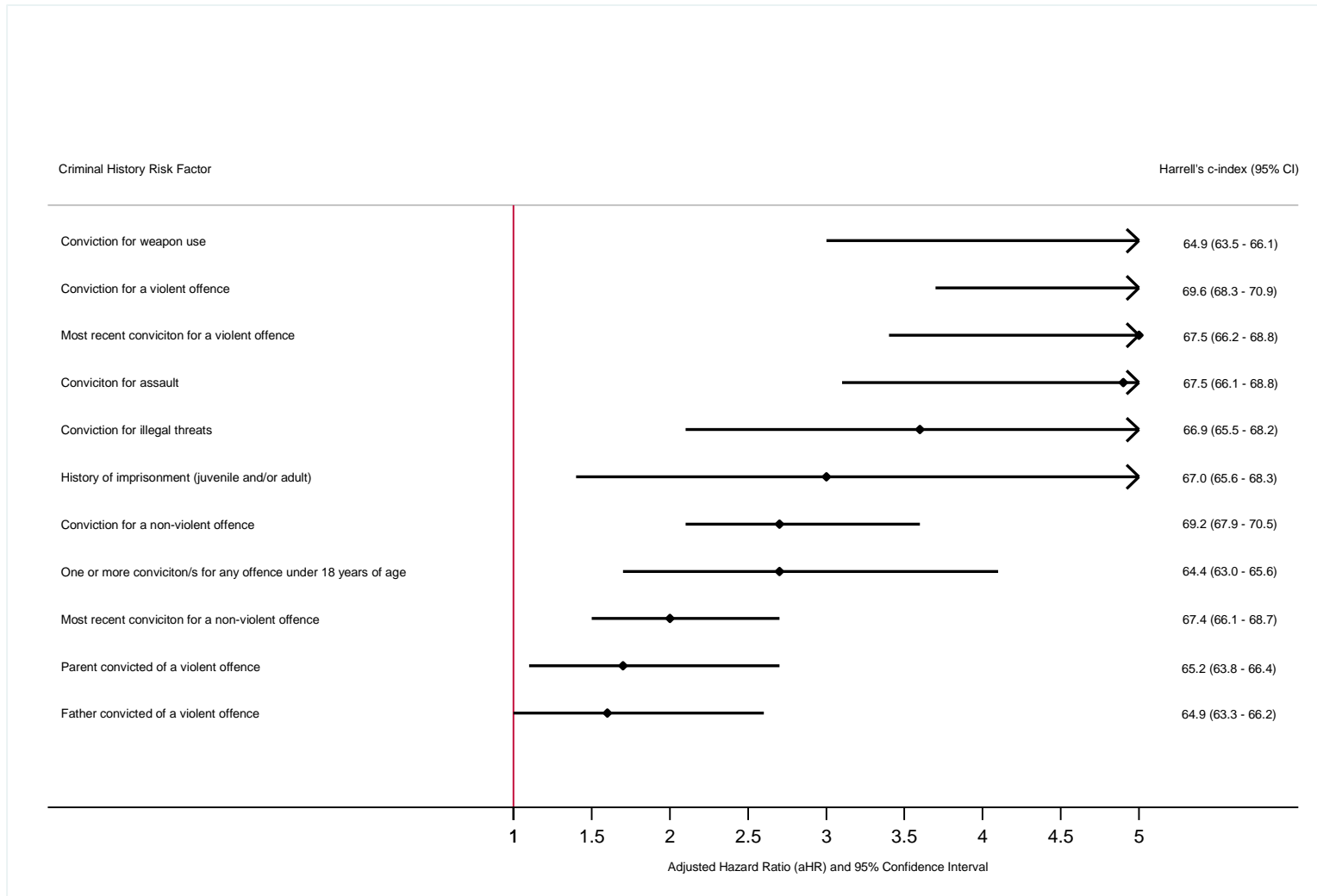
\*\*\* = significant to the 0.001 level;

\*\* = significant to the 0.01 level;

\* = significant to the 0.05 level.



**Figure 4.1.** Adjusted hazard ratios, Harrell's c-index, and accompanying 95% confidence intervals for criminal history risk factors following adjustment for young age and comorbid SUD in males with schizophrenia.



**Figure 4.2.** Adjusted hazard ratios, Harrell's c-index, and accompanying 95% confidence intervals for criminal history risk factors following adjustment for young age and comorbid SUD in females with schizophrenia.

A previous conviction for a violent offence was also associated with the greatest increase in both discrimination and reclassification in those with a history of conviction for any offence prior to diagnosis with schizophrenia (Baseline Model in Tables 4.9 and 4.10; Figures 4.3 and 4.4). As with males and females in the overall cohort, the further addition of other criminal history risk factors provided little additional predictive value over that provided by a previous conviction for a violent offence alone (Alternate Model in Tables 4.9 and 4.10), including for those factors not currently assessed by the majority of existing violence risk assessment instruments (Appendix H).

**Table 4.9.**

Incremental validity of criminal risk factors in predicting conviction for a violent offence in males with a history of conviction for any offence prior to diagnosis with schizophrenia.

Risk Factor	Adjusted Hazard Ratio (95% CI)	z	p	Harrell's c-index				Likelihood Ratio		Adjusted Royston's R <sup>2</sup>	
				% (95% CI)	p	$\Delta$ %	p	$\Delta$ $\chi^2$	p	% (95% CI)	$\Delta$ (%)
<b>BASELINE: Young Age + Comorbid SUD</b>				<b>65.2 (63.9 – 66.6)</b>				<b>***</b>		<b>10.8 (7.4 – 14.6)</b>	
+ Conviction for a violent offence	2.0 (1.7 – 2.2)	10.7	***			+4.2	***	112.7	***		+6.0
+ Conviction for assault	1.9 (1.6 – 2.2)	8.9	***			+2.2	***	72.4	***		+3.9
+ Mother convicted of a violent offence	1.7 (1.1 – 2.7)	2.2	*			+0.2	**	4.7	*		+0.2
+ History of imprisonment (juvenile and/or adult)	1.6 (1.4 – 1.9)	6.6	***			+1.7	***	41.8	***		+2.2
+ Conviction for illegal threats	1.6 (1.4 – 1.9)	6.4	***			+1.7	***	37.6	***		+2.0
+ Parent convicted of a violent offence	1.6 (1.3 – 2.0)	4.4	***			+0.5	**	17.7	***		+0.9
+ Father convicted of a violent offence	1.6 (1.2 – 2.0)	3.9	***			+0.3	*	13.8	**		+0.7
+ Most recent conviction for a violent offence	1.5 (1.3 – 1.7)	5.5	***			+2.4	***	28.0	***		+1.5
+ Conviction for weapon use	1.5 (1.2 – 1.8)	4.2	***			+1.0	***	16.5	***		+0.8
+ Conviction for a non-violent offence	1.2 (1.1 – 1.4)	3.0	**			+4.0	***	9.3	**		+0.4
+ One or more conviction/s for any offence under 18 years of age	1.2 (1.0 – 1.3)	2.4	*			+1.0	***	5.5	*		+0.2
<b>ALTERNATE: Young Age + Comorbid SUD + Conviction for a Violent Offence</b>				<b>69.5 (68.1 – 70.8)</b>				<b>***</b>		<b>16.8 (13.7 – 20.4)</b>	
+ Parent convicted of a violent offence	1.5 (1.2 – 1.8)	3.4	**			+0.3	*	11.2	**		+0.8
+ Mother convicted of a violent offence	1.5 (0.9 – 2.4)	1.8	0.08			+0.1	*	3.1	0.08		+0.4
+ History of imprisonment (juvenile and/or adult)	1.4 (1.2 – 1.6)	4.1	***			+0.3	***	16.4	**		+1.1
+ Father convicted of a violent offence	1.4 (1.1 – 1.8)	3.1	**			+0.1	0.16	8.8	**		+0.7
+ Conviction for a non-violent offence	1.3 (1.1 – 1.5)	3.4	**			+1.3	***	12.2	**		+0.8
+ One or more conviction/s for any offence under 18 years of age	1.1 (0.9 – 1.2)	0.9	0.39			+0.4	***	0.7	0.39		0.0

**Note:** As the Likelihood Ratio test compares nested models, estimates for the baseline risk model alone cannot be calculated. Risk factors are ranked in descending order according to aHR magnitude. Age at first conviction for any offence and for a violent offence were dropped from the baseline model due to collinearity with young age. Conviction for assault, illegal threats, weapon use, and most recent conviction for a violent offence were dropped from the alternate model due to collinearity with conviction for a violent offence.

\*\*\* = significant to the 0.001 level;

\*\* = significant to the 0.01 level;

\* = significant to the 0.05 level.

**Table 4.10.**

Incremental validity of criminal risk factors in predicting conviction for a violent offence in females with a history of conviction for any offence prior to diagnosis with schizophrenia.

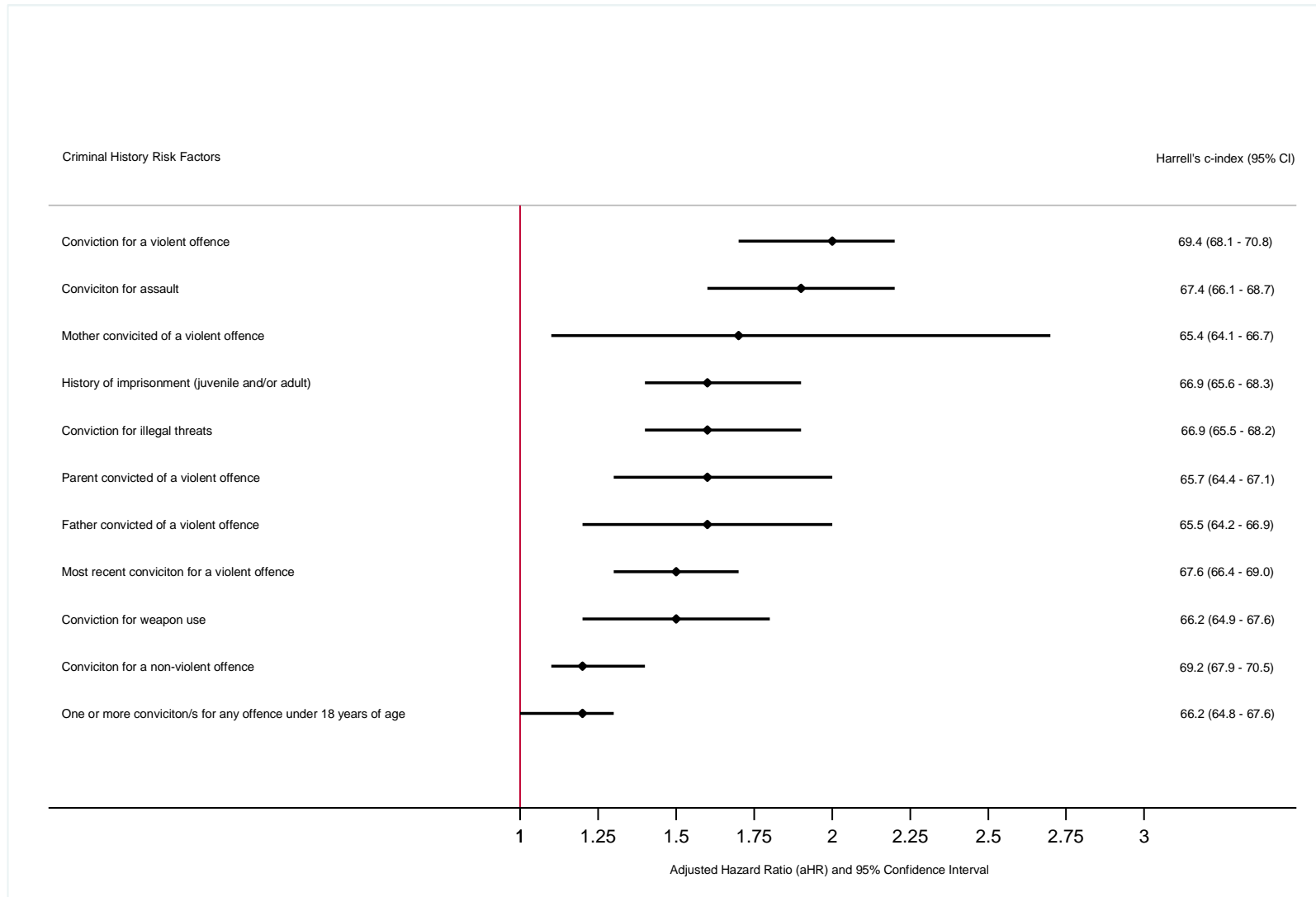
Risk Factor	Adjusted Hazard Ratio (95% CI)	z	p	Harrell's c-index				Likelihood Ratio		Adjusted Royston's R <sup>2</sup>	
				% (95% CI)	P	$\Delta$ %	P	$\Delta$ $\chi^2$	P	% 95% CI	$\Delta$ (%)
<b>BASELINE: Young Age + Comorbid SUD</b>				<b>64.3 (62.9 – 65.6)</b>						<b>13.1 (6.5 – 65.6)</b>	
+ Mother convicted of a violent offence	5.6 (1.8 – 17.2)	3.0	**			+0.2	0.10	7.1	**		+2.7
+ Conviction for weapon use	3.4 (1.6 – 7.3)	3.2	**			+0.6	**	9.1	**		+3.6
+ Conviction for a violent offence	3.0 (2.1 – 4.3)	6.0	***			+5.3	***	33.8	***		+14.1
+ Conviction for assault	2.7 (1.7 – 4.3)	4.4	***			+3.2	***	16.3	**		+6.7
+ Conviction for illegal threats	2.0 (1.2 – 3.5)	2.6	**			+1.2	***	6.6	*		+2.5
+ Parent convicted of a violent offence	1.8 (1.0 – 3.4)	1.9	0.06			+0.9	***	3.6	0.06		+1.2
+ History of imprisonment (juvenile and/or adult)	1.7 (0.8 – 3.6)	1.5	0.14			+2.7	***	2.1	0.14		+0.5
+ One or more conviction/s for any offence under 18 years of age	1.5 (0.9 – 2.3)	1.7	0.09			+0.06	0.44	2.9	0.09		+0.9
<b>ALTERNATE: Young Age + Comorbid SUD + Conviction for a Violent Offence</b>				<b>69.6 (68.3 – 70.9)</b>						<b>27.2 (16.0 – 45.8)</b>	
+ Mother convicted of a violent offence	6.7 (2.5 – 18.3)	3.7	***			-0.1	**	8.2	**		+4.4

**Note:** As the Likelihood Ratio test compares nested models, estimates for the baseline risk model alone cannot be calculated. Risk factors ranked in descending order according to aHR magnitude. Conviction for assault, illegal threats, weapon use, most recent conviction for a violent offence, and age at first violent conviction had to be dropped from the alternate model due to collinearity with conviction for a violent offence.

\*\*\* = significant to the 0.001 level;

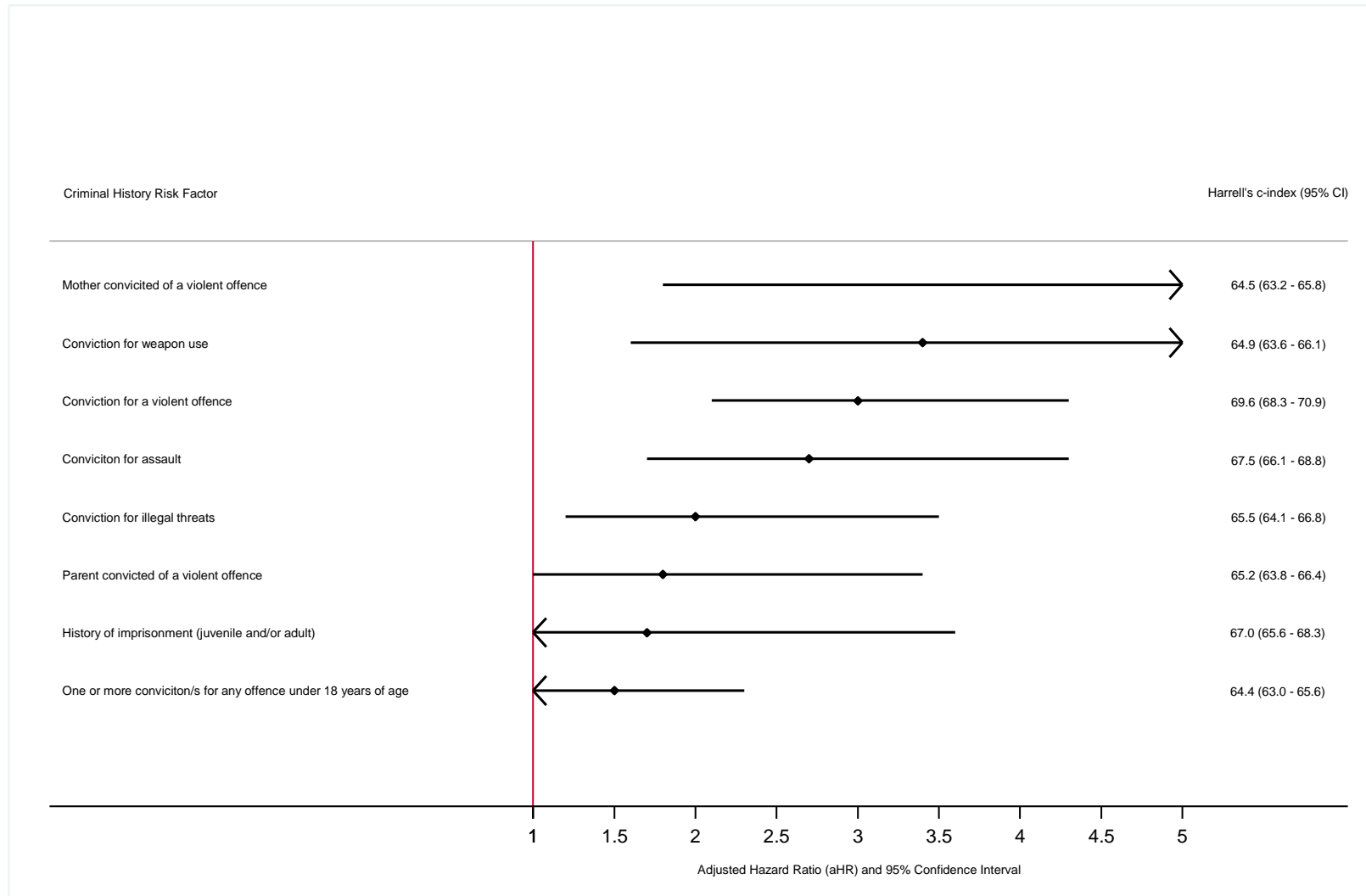
\*\* = significant to the 0.01 level;

\* = significant to the 0.05 level.



**Figure 4.3.**

Adjusted hazard ratios (aHR), Harrell's c-index, and accompanying 95% confidence intervals for criminal history risk factors following adjustment for young age and comorbid SUD in males with a history of conviction for any offence prior to diagnosis with schizophrenia.



**Figure 4.4.** Adjusted hazard ratios (aHR), Harrell's c-index, and accompanying 95% confidence intervals for criminal history risk factors following adjustment for young age and comorbid SUD in females with a history of conviction for any offence prior to diagnosis with schizophrenia.

## ***4.4 Discussion***

Results of study one suggested that although the criminal history risk domain was mostly strongly associated with violence risk in those with schizophrenia, there is considerable variation in the strength of association for individual factors. The present study, therefore, aimed to investigate the incremental predictive validity of a number of criminal history risk factors for the prediction of violence risk in a longitudinal cohort of 13,806 individuals diagnosed with schizophrenia. Although a number of criminal history risk factors were strongly associated with violence risk in this cohort according to univariate analyses, only a previous conviction for a violent offence was associated with the largest increase in both discrimination and reclassification following adjustment for young age and comorbid SUD, suggesting that previous violence may be incrementally predictive of violence risk in this population. Moreover, this simple risk model was associated with a c-index of around 70% for both males and females. The item content of a number of existing violence risk assessment instruments may therefore require revision in light of these findings.

Although a number of meta-analyses suggest that criminal history risk factors are most strongly associated with violence in both the general<sup>480</sup> and psychiatric populations,<sup>51,334</sup> few studies have investigated the relative predictive validity of these criminal history risk factors. Within the general population, recent work suggests that a previous conviction for violence is associated with a similar degree of predictive accuracy, as measured by the area under the receiver operating characteristic curve (AUC), as common violence risk assessment instruments, including the HCR-20 and PCL-R.<sup>112</sup>

Two theories have been advanced to explain the link between previous and subsequent offending. Although originally intended to describe continuity in general criminal behaviour, these theories can be easily extended to account for the association between previous and subsequent violence. The first of these, termed the *population heterogeneity* theory, posits that individuals differ in their propensity to engage in criminal behaviours, due to the presence of relatively stable, trait-like risk factors such as impulsivity or psychopathy.<sup>518</sup> The *state-dependence* theory, in contrast, suggests that previous criminal offending increases the risk of future offending either by increasing an individual's association with antisocial peers, reducing the individual's inhibition against criminal behaviour, or by disrupting the individual's opportunity to become involved in conventional activities such as education or work.<sup>518</sup>

Within the general population, for example, recent work suggests that a past year conviction for a violent offence are more strongly associated with subsequent violence than convictions occurring a number of years previously, consistent with the state-dependent theory.<sup>519,520</sup> Nevertheless, population heterogeneity risk factors remained significantly associated with violence risk in these two studies. Given the heterogeneous origin of violence in schizophrenia,<sup>117</sup> it is likely that a combination of both the population heterogeneity and state-dependent theories may also explain the strong association between previous and subsequent violence in this population.

#### ***4.4.1 Predictive Validity of Criminal History Risk Factors by Gender***

Although work suggests that some risk factors are more prevalent in female as compared to male offenders,<sup>521</sup> few studies have investigated whether there is any difference between genders in the predictive validity of these factors. In the general population, recent

work suggests that both the strength and direction of association for a number of criminal history risk factors may differ by gender.<sup>480</sup> A history of arrest and/or conviction for a violent offence, for example, was found to be non-significantly associated with subsequent violence in males. Findings of the present study, in contrast, suggest that similar criminal history risk factors are predictive of subsequent violence in both males and females with schizophrenia.

There were some differences in the relative strength of these criminal history risk factors between the genders, however. A conviction for weapon use, for example, was more strongly associated with subsequent violence in females than males. Previous work with mentally disordered offenders suggests that twice as many males use a weapon in a fight compared to females.<sup>522</sup> The association between weapon use and gender may therefore have been confounded in the present study. Perhaps males in this sample were more likely to have used a weapon in the commission of their offence, and are thus convicted of assault or robbery, whilst women are more likely to have been convicted simply for carrying a weapon. Alternatively, this finding may reflect the low base rate of this risk factor in women as, in the present study, only 0.6% of females were convicted of weapon use compared to 4.3% of the men.

#### ***4.4.2 Predictive Validity of Criminal History Risk Factors by Onset of Schizophrenia***

The onset of psychosis has been found to affect the strength of association for a number of criminal history risk factors.<sup>487</sup> Although, in the present study, findings for males and females with a history of offending prior to diagnosis with schizophrenia reflect those for males and females in the overall cohort, none of the criminal history risk factors investigated were significantly associated with an increased risk of violence for those without a criminal

history prior to diagnosis, suggesting that other risk factors may be stronger predictors of violence risk in this sub-group.

Emerging work, for example, has found that criminal history risk factors predating illness onset appear to be most strongly associated with violence risk in those with a history of offending prior to diagnosis. For those without this history, impulsivity and positive symptoms appear to be more strongly associated with risk,<sup>523-525</sup> suggesting there may be at least two distinct pathways towards violence in this population.<sup>117,125,375,526</sup> Given that non-adherence with medication only attenuates the antiaggressive effectiveness of antipsychotic medication in those without a history of antisocial behaviour prior to diagnosis,<sup>527</sup> efforts to differentiate between these two pathways may have important implications for both the assessment and management of violence risk in this population.<sup>487</sup> If positive symptoms are not significantly associated with violence risk in pre-morbid offenders, for example, even successful treatment of psychosis may be unable to significantly reduce violence risk as the underlying genetic and/or environmental causes of violence will remain unaddressed.<sup>117</sup>

#### ***4.4.3 Implications***

Although several criminal history items are assessed by existing violence risk assessment instruments,<sup>13</sup> results of the present study suggest that a number of these items may not independently contribute to the prediction of violence risk in those with schizophrenia. The inclusion of risk factors that do not adequately distinguish between violent and non-violent individuals has been cited as a major cause of the modest level of predictive validity associated with many violence risk assessment instruments.<sup>484</sup> For example, although certain criminal history risk factors, including a history of imprisonment, conviction/s for sexual offences, and for non-violent offences, are often included within existing violence risk

assessment instruments,<sup>13</sup> results of the present study suggest that these factors may not be incrementally predictive of risk following adjustment for young age, comorbid SUD, and previous violence.

Secondly, findings of the present study suggest that a simple risk model composed of young age, comorbid SUD, and a previous conviction for violence predicts subsequent violence in this cohort with a similar degree of accuracy as more complex violence risk assessment instruments. This finding validates the approach of the Risk-Matrix 2000-Violence (RM2000[V];<sup>528</sup>) which was developed from the premise that violence can be predicted from a simple model comprising age and previous violence.<sup>529</sup> Given the costs currently incurred by mental health services in purchasing violence risk assessment manuals and coding sheets, training staff to complete these assessments, as well as the time required to complete the assessment, approaches which can simplify the risk assessment process have the potential to reduce these costs by encouraging clinicians to focus on the risk factors that are incrementally associated with increased violence risk in this population.

#### ***4.4.4 Strengths***

Previous work on the gender-neutrality of risk factors for criminal offending has been criticised by feminist researchers on the grounds that results have either not been disaggregated by gender, or where risk factors for females have been specifically investigated, a non-representative sample of female offenders was studied.<sup>530</sup> The present study, in contrast, investigated criminal history risk factors separately for males and females using a nationally-representative cohort and found little difference in the relative importance of these criminal history risk factors between the genders.

Additionally, as the prevalence of both schizophrenia and of violent crime is similar in Sweden as compared to other European countries,<sup>531,532</sup> results of the present study should also help to inform the clinical prediction of violence risk in the UK.

#### **4.4.5 Limitations**

The present study relied on HDR diagnoses for the purposes of case ascertainment. As the HDR only records diagnoses made during inpatient admissions, results of the present study may not be generalizable to those treated on an outpatient basis; although work suggests that few individuals with schizophrenia in Sweden would not have been hospitalized at least once over the time frame of this study.<sup>533</sup>

Secondly, due to the modest sensitivity of HDR diagnoses, only those individuals diagnosed on at least two separate occasions with schizophrenia were eligible for inclusion. Previous work in an overlapping sample suggests that around half individuals receive only one lifetime HDR diagnosis of schizophrenia.<sup>94</sup> Similar base rates of violence in those individuals with only one discharge diagnosis for schizophrenia as compared to those with two or more diagnoses were, however, found suggesting that the magnitude of the hazard ratios found in the present study are unlikely to have been adversely affected by the decision to include only those individuals diagnosed with schizophrenia on two or more occasions.

Additionally, work in the UK suggests that violent incidents occurring in inpatient psychiatric facilities are rarely pursued through the criminal justice system.<sup>534,535</sup> Consequently, it remains possible that the association may have been attenuated.

Lastly, information on offending history was coded from conviction data which may have led to a concomitant reduction in the base rate of violence. Although work suggests that supplementing conviction data with self- or collateral reports of violence may improve

sensitivity,<sup>88</sup> a conviction is recorded in the NCR, even if the individual is sentenced to a non-custodial sentence, is transferred to a forensic psychiatric institution, is fined or cautioned. Conviction data therefore accurately reflects the true extent of resolved criminality in Sweden.<sup>283</sup>

#### ***4.4.6 Conclusions***

The majority of risk assessment instruments used within forensic psychiatry include criminal history items.<sup>13</sup> Previous work has shown that a number of the items assessed by these instruments may not be individually predictive of violence, however.<sup>481</sup> Additionally, as these items are often accorded greatest weight in existing violence risk assessment schemes, clarification as to which criminal history factors are most strongly associated with violence may help to improve the predictive accuracy of these instruments. The present study therefore aimed to identify the criminal history risk factor associated with the greatest incremental predictive validity in a longitudinal cohort of 13,806 individuals diagnosed with schizophrenia. Although univariate analyses found that a number of criminal history risk factors were significantly associated with violence risk, when added to a baseline risk model composed of young age and comorbid SUD, only a previous conviction for a violent offence was associated with the greatest increase in predictive validity. Existing violence assessment instruments may therefore require revision when used to predict violence risk in this population.

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# ***Chapter 5:***

## ***Longitudinal Association between Suicidal Behaviour and Violence***

### ***5.0 Abstract***

Results of study one suggest that suicidal behaviours may be significantly associated with violence risk; and particularly with severe violence rather than with aggression and/or hostility. Few existing violence risk assessment instruments assess for suicidality as it is unclear at present whether these behaviours remain significantly associated with violence risk following adjustment for certain demographic, substance misuse, and criminal history risk factors. Using data from the CATIE project, this study investigated whether various suicidal behaviours are incrementally predictive of violence risk in 1,460 individuals diagnosed with schizophrenia. Univariate Cox regression analyses found that suicidal threats and attempts were significantly associated with violence in both males (suicide threats: HR=3.8, 95% CI 2.4–6.0; suicide attempts: HR=2.8, 95% CI 1.5–5.4) and females (suicide threats: HR=9.4, 95% CI 4.0–21.6; suicide attempts: HR=4.4, 95% CI 1.5–12.7). Following adjustment for young age, comorbid SUD, and previous violence, only suicidal threats were incrementally predictive of violence in both genders (males: aHR=3.4, 95% CI 2.1–5.6; females: aHR=10.4, 95% CI 4.2–25.7). A simple risk model comprising young age, comorbid SUD, previous violence, and suicidal threats was associated with a similar magnitude of predictive validity for both males (c-index=75.5, 95% CI 71.1–80.0) and females (c-index=70.6, 95% CI 65.5–75.8) as more complex and time-consuming violence risk assessment instruments, suggesting

that suicidal threats may constitute an important predictor of violence risk in this population. Existing risk assessment procedures may therefore need revision in light of these findings.

## ***5.1 Introduction: The Association between Suicidal Behaviour and Violence***

Suicide and violence have typically been viewed as mutually exclusive outcomes.<sup>536,537</sup> The two fields of violence and suicide risk assessment have therefore grown independently of one another,<sup>536</sup> with the consequence that suicidal behaviours are rarely included as risk factors for violence within existing risk assessment schemes.<sup>13</sup> Epidemiological work in the general population increasingly suggests there may be an association between suicidal behaviour and violence and, furthermore, that this association may be independent of certain demographic and substance misuse factors. If this relationship also holds in mentally ill populations, the omission of suicidal behaviours from existing violence risk assessment instruments may help to explain the poor predictive validity of these instruments.

The study therefore aimed to determine whether suicidal behaviours are incrementally predictive of violence in those with schizophrenia. This chapter commences with a discussion of the nature of the relationship between suicidal behaviours and violence both in mentally healthy members of the general population as well as in those diagnosed with schizophrenia specifically.

### ***5.1.1 Violence as a Risk Factor for Suicidal Behaviour***

The epidemiological work summarised in Table 5.1 suggests that violence may be a stronger risk factor for suicidal behaviour, and particularly with attempted and completed suicide, than many demographic and substance misuse factors. In addition, recent work using latent class analysis found that one class of suicide decedents was characterised by high levels of previous violence perpetration coupled with alcohol and/or drug misuse problems and a history of prior suicide attempts. Additionally, individuals in this class were not known to have suffered from any major mental illness in their lifetime suggesting that, for some, violence may represent an independent risk factor for completed suicide.<sup>538</sup>

Although schizophrenia is associated with significantly elevated rates of both suicide<sup>539,540</sup> and violence,<sup>45,48</sup> the association between suicide and violence in this population is less clear (Table 5.2). Even two comprehensive reviews have arrived at different conclusions as to the nature of the association between violence and suicide in those with schizophrenia with one reporting no significant association between previous violence and completed suicide in this population,<sup>541</sup> whilst the second argued that violence may represent an important risk factor for the prediction of suicide, but that further research is necessary to determine whether violence is independently associated with suicidal behaviour in this population.<sup>542</sup>

**Table 5.1.**

Summary of the epidemiological work to date on the status of violence as a risk factor for suicidal behaviour in mentally healthy adults in the general population.

Study	Definition of Violence	Definition of Suicidal Behaviour	Major Finding/s	Reference
Björkenstam (2011)	A conviction for homicide, assault, robbery, arson, any sexual offence, and/or illegal threats and intimidation between 15 and 20 years of age.	Completed suicide.	Both male and female violent offenders were four times more likely to die by suicide than non-violent offenders.	<sup>543</sup>
Conner (2001)	Violent threats or behaviours during the last year of life as reported by a collateral informant.	Completed suicide.	Violent individuals were five times more likely to have died from suicide than in an accident. The association between violence and suicide was stronger for those without comorbid alcohol misuse, females, and in younger individuals.	<sup>544</sup>
Conner (2004)	<b>Irritability:</b> Score on the irritability subscale of the BDHI.  <b>Psychopathy:</b> Score on the psychopathy subscale of the Psychopathic States Inventory (PSI; <sup>545</sup> ).	Self-reported history of suicidal ideation in the past year.	Higher irritability scores were associated with suicidal ideation, but psychopathy scores were not.	<sup>546</sup>
Cook (2012)	Self-reported history of arrest for aggravated assault, common assault, robbery, rape, or any other sexual assault in the previous year.	Self-reported history of attempted suicide in the past year.	Arrest for a violent offence was not significantly associated with an increased risk of attempted suicide.	<sup>547</sup>
Cook (2012)	<b>Indicted for a violent offence:</b> Court record of an indictment for homicide, rape, or assault during the last year of life.  <b>Charged with a violent offence:</b> Charged with a violent felony offence during the last year of life.	Completed suicide.	An indictment for a violent offence was not significantly associated with an increased risk of suicide. However, those charged with a violent felony offence were five times more likely to die by suicide than from natural causes, and three times more likely to die by suicide than from accidental causes.	<sup>548</sup>
Encrenaz (2014)	Self-reported history of violence perpetration against a fellow inmate in the past year. Violence included both physical and/or sexual abuse.	<b>Current:</b> Self-reported suicidal ideation and/or suicide attempts during current term of imprisonment as a remand prisoner. Most prisoners had been imprisoned for less than 6 months.  <b>Lifetime History:</b> Self-reported lifetime history of suicidal ideation and/or suicide attempts.	Violent individuals were not significantly more likely to engage in suicidal ideation and/or attempt suicide in prison compared to non-violent individuals.	<sup>549</sup>
Hawton (2013)	Any conviction for an offence against the person.	Official records of deliberate self-harm, including intentional self-poisoning and/or self-injury regardless of intent, or completed suicide during the current term of imprisonment.	Violent males were not significantly more likely to engage in deliberate self-harm or to die by suicide. In females, a previous conviction for violence was associated with an approximate doubling in the risk of deliberate self-harm. Data on the increased risk of suicide in violent females was not presented, however.	<sup>550</sup>

*Table continued over ...*

Study	Definition of Violence	Definition of Suicidal Behaviour	Major Finding/s	Reference
Lamis (2013)	Scores on the intimate partner violence perpetration subscale of the Revised Conflict Tactics Scale (CTS-2; <sup>551</sup> ) over the course of the current or most recent relationship.	Total score on the Modified Scale for Suicide Ideation (MSSI; <sup>552</sup> ) rated over the previous two weeks.	Scores on the perpetration subscale of the CTS-2 were not incrementally predictive of suicide ideation scores beyond a baseline risk model containing factors such as depression and alcohol misuse scores.	<sup>553</sup>
Modestin (1986)	Lifetime history of any offence against the person.	Official record of completed suicide.	Violent offenders were not significantly more likely to have died from suicide than non-violent offenders.	<sup>557</sup>
Romanov (1994)	Scores on an idiosyncratic self-administered scale of hostility. The cohort was divided into three groups on the basis of these scores:  1). Low: scores between 3 and 5; 2). Moderate: scores between 6 and 10; 3). High: scores between 11 and 15.	A lifetime history of attempted or completed suicide.	Males in the high hostility group were 4 times more likely to either attempt suicide or die by suicide as compared to those in the low hostility group. For those in the moderate hostility group, the risk of attempted or completed suicide was doubled as compared to those in the low hostility group. Hostility remained significantly associated with suicidal behaviour in both the high and moderate hostility groups even following adjustment for factors, including: age and alcohol misuse.	<sup>554</sup>
Stenbacka (2012)	<b>Violence:</b> A lifetime history of at least one conviction for homicide, manslaughter, or assault.  <b>Repeated violence:</b> A lifetime history of two or more convictions for homicide, manslaughter, or assault.	Completed suicide.	The risk of dying by suicide was approximately doubled in violent offenders as compared to non-violent offenders and non-offenders. For recidivist violent offenders, the risk was increased fourfold.	<sup>555</sup>
Swogger (2011)	Scores on the aggression subscale of the Life History of Aggression Questionnaire (LHAQ; <sup>556</sup> ).	Self-reported lifetime history of attempted suicide.	Aggression scores were significantly associated with a lifetime history of attempted suicide even following adjustment for self-reported experiences of physical abuse as a child.	<sup>557</sup>
Webb (2012)	Lifetime history of charges for homicide, attempted homicide, armed robbery, aggravated assault, rape, other sexual offences against adults or children, and indecent exposure.	Completed suicide.	Both violent and sexual offenders were significantly more likely to have died by suicide. Following adjustment for factors such as SES and a lifetime history of psychiatric treatment, a history of violent or sexual offending was associated with an approximate doubling in the risk of dying by suicide in males and females. The magnitude of association did vary by offence category, however, with ORs being strongest for other sexual offences against adults in males, and for homicide in females.	<sup>558</sup>
Webb (2011)	Lifetime history of charges for homicide, attempted homicide, assault, robbery, and /or violent threats.	Completed suicide.	Violent males and females were significantly more likely to have died by suicide compared to controls. Following adjustment for factors such as SES and a lifetime history of psychiatric treatment, a history of violence was associated with an approximate doubling in the risk of dying by suicide for both genders.	<sup>559</sup>
Zimmerman (2013)	<b>Individual-level violence:</b> Self-reported weapon use, carrying a concealed weapon, arson, robbery, hitting non-family members, and/or gang-related fighting over the past year.  <b>Neighbourhood-level violence:</b> Self-reported frequency of weapon use, sexual assaults, robberies, muggings, and/or gang fights in the respondent's neighbourhood over a six week period.	Self-reported lifetime history of attempted suicide.	Neighbourhood-level violence was not significantly associated with attempted suicide. Individual-level violence, however, was associated with an approximate doubling in the risk of attempted suicide, even following adjustment for other factors, including: age, gender, substance misuse, impulsivity, and depressive symptoms.	<sup>560</sup>

**Table 5.2.**

Summary of the epidemiological work to date on the status of violence as a risk factor for suicidal behaviour in those diagnosed with schizophrenia or another psychotic disorder.

Study	Definition of Violence	Definition of Suicidal Behaviour	Major Finding/s	Reference
Allebeck (1987)	The lifetime number of involuntary inpatient admissions was used as a proxy of violent behaviour in this study.	Completed suicide.	Those with a greater number of compulsory admissions were not significantly more likely to die by suicide.	<sup>561</sup>
Cheng (1990)	Violent behaviour immediately preceding hospital admission. It is unclear what behaviour/s constituted violence in this study, however.	Completed suicide.	Individuals admitted to a psychiatric hospital due to violence were 11 times more likely to die from suicide. The association remained significant even following adjustment for age and gender.	<sup>562</sup>
Drake (1984)	A history of violent behaviour during the most recent inpatient hospitalisation. It is unclear what behaviour/s constituted violence in this study, however.	Completed suicide.	Violent behaviour was not significantly associated with the risk of dying by suicide.	<sup>563</sup>
Fialko (2006)	A self-reported history of violent behaviour. It is unclear over what time period this behaviour was reported. It is also unclear what behaviour/s constituted violence in this study.	Scores on the self-reported suicidal ideation item from the Beck Depression Inventory (BDI; <sup>564</sup> ) over the past two weeks. The cohort was divided into three groups on the basis of these scores: 1). No ideation: scores of 1; 2). Mild ideation: scores of 2; 3). Severe ideation: scores of between 3 and 4.	A history of violent behaviour was not significantly associated with having no, mild, or severe suicidal ideation.	<sup>565</sup>
Havaki-Kontaxaki (1994)	Lifetime history of homicide perpetration.	Completed suicide.	Those with a history of homicide perpetration were significantly more likely to die by suicide than those without such a history.	<sup>566</sup>
Hunt (2006)	Self-reported lifetime history of violence. It is unclear what behaviour/s constituted violence in this study, however.	Completed suicide or open verdict deaths.	Those with a history of violence were significantly more likely to die by suicide than those without such a history.	<sup>567</sup>
Kelly (2004)	A lifetime history of explosive anger and/or violent behaviour as reported by a collateral informant. It is unclear what behaviour/s constituted violence in this study.	Completed suicide.	Violent individuals were not significantly more likely to die by suicide than their non-violent counterparts.	<sup>568</sup>
Krakowski (2004)	<b>Violence as an outpatient:</b> A history of physical assault committed in the community whilst an outpatient. It is unclear over what time period this behaviour was reported.  <b>Violence as an inpatient:</b> A history of physical assault, defined as striking, hitting, or punching, committed during a four-week inpatient admission period.	Lifetime history of attempted suicide.	Individuals who were violent as an outpatient and/or an inpatient were not significantly more likely to have attempted suicide than those who were non-violent. In addition, neither the number of incidents of violence as an inpatient, nor the severity of these incidents (as measured by scores on the OAS), was significantly associated with an increased risk of attempted suicide.	<sup>230</sup>

*Table continued over ...*

Study	Definition of Violence	Definition of Suicidal Behaviour	Major Finding/s	Reference
Lee (2012)	Self- or collateral-reported number of violent behaviours over the past year. It is unclear what behaviour/s constituted violence in this study, however.	Self- or collateral-reported number of suicide attempts over the past year.	A greater number of violent behaviours over the previous year was significantly associated with suicidal attempts even following adjustment for factors such as: a greater number of incidents of deliberate self-harm, follow-up outpatient appointments, and involuntary hospitalisations over the previous year.	<sup>569</sup>
McGirr (2006)	<b>Aggression:</b> Total scores on the BGLHA as reported by a collateral informant.  <b>Hostility:</b> Total scores on the BDHI as reported by a collateral informant.	Completed suicide.	Neither aggression nor hostility scores were significantly associated with an increased risk of dying by suicide.	<sup>570</sup>
Modestin (1992)	A history of violent behaviour occurring in the year preceding death. It is unclear what behaviour/s constituted violence in this study, however.	Completed suicide.	Those with a history of violence were not significantly more likely to die by suicide.	<sup>571</sup>
Pompili (2009)	Lifetime history of violence against other people and/or objects. It is unclear what behaviour/s constituted violence in this study, however.	Completed suicide.	Those with a lifetime history of violence against others and/or objects were not significantly more likely to die by suicide.	<sup>572</sup>
Sinclair (2004)	Lifetime history of violence. It is unclear what behaviour/s constituted violence in this study, however.	Completed suicide.	A history of violence was not significantly associated with an increased risk of dying by suicide.	<sup>573</sup>
Suokas (2010)	Self-reported lifetime history of violence against others. It is unclear what behaviour/s constituted violence in this study, however.	Self-reported lifetime history of attempted suicide.	Individuals with a lifetime history of violent behaviour were four times more likely to attempt suicide than those without such a history, even following adjustment for age, symptoms of depression, and comorbid SUD.	<sup>574</sup>
Taiminen (2001)	Scores on the aggressivity item of the Schizophrenia Suicide Risk Scale (SSRS; <sup>575</sup> ) as rated by a collateral informant. It is unclear over what time period this behaviour was reported, however. It is also unclear what behaviour/s constituted aggression.	Completed suicide.	Scores on the SSRS aggressivity item were not significantly higher in those who died by suicide as compared to living controls.	<sup>575</sup>
Taiminen (1994)	Aggressive behaviour over the two-week period preceding death recorded in hospital records. It is unclear what behaviour/s constituted aggression in this study, however.	Completed suicide.	Aggressive individuals were not significantly more likely to die by suicide than their non-aggressive counterparts.	<sup>576</sup>
Walsh (2001)	Self- or collateral-reported history of assault over the previous two years.	Attempted or completed suicide during a two year follow-up period.	Violent individuals were not significantly more likely to attempt or complete suicide in the two year follow-up period than non-violent individuals.	<sup>577</sup>
Webb (2011)	A lifetime history of conviction for homicide, attempted homicide, aggravated assault, common assault, robbery, arson, any sexual offence, and/or threats and intimidation.	Completed suicide.	Males, but not females, with a lifetime history of violence were significantly more likely to die by suicide as compared to their non-violent peers even following adjustment for factors such as age. The association did, however, appear to be moderated by intelligence scores.	<sup>578</sup>
Yarden (1974)	A lifetime history of assault and/or homicide as reported by a collateral informant.	Completed suicide.	Thirty-five per cent of decedents had a lifetime history of suicide, and 20% had committed homicide. It is unclear whether assault and/or homicide were significantly associated with an increased risk of suicide in this study.	<sup>579</sup>

### ***5.1.2 Suicidal Behaviours as Risk Factors for Violence***

Until recently the absence of suicidal behaviour was thought to confer a greater risk of violence than its presence.<sup>580</sup> Emerging epidemiological work suggests that certain suicidal behaviours may represent an important risk factor for violence, and particularly for sexual violence.<sup>102</sup> Within mentally healthy members of the general population, for example, a lifetime history of attempted suicide has been associated with a six fold increased risk of conviction for a violent offence, and a seven fold increased risk of conviction for rape specifically.<sup>101</sup>

Within psychiatric populations, the strength of the association between suicidal behaviour and violence also appears to depend on the nature of the outcome. For example, previous work demonstrates that suicidal behaviour may be a stronger risk factor for physical violence than for hostility.<sup>177</sup> In line with this, results of the sub-group analysis reported in chapter two found that the suicidality domain was more strongly associated with violence in those studies that assessed the risk of severe interpersonal violence perpetration rather than aggression and/or hostility.

Previous work on the association between suicidal behaviour and violence has suffered from certain methodological limitations, however. First, work suggests that suicidal behaviour and violence share many of the same risk factors.<sup>581</sup> For example, within the general population, recent work suggests that the association between attempted suicide and rape perpetration may be mediated by certain psychopathological and criminal history risk factors, suggesting that these factors may, in fact, be stronger predictors of violence risk than a history of suicidal behaviour itself.<sup>101</sup> Alcohol and cannabis misuse may also be stronger predictors of aggression than a history of attempted suicide in those diagnosed with

schizophrenia specifically.<sup>582</sup> Few studies systematically adjust for these potentially confounding factors using incremental predictive validity analyses.

Second, many studies on the association between suicidal behaviours and violence have tended to employ cross-sectional research designs.<sup>583</sup> Consequently, it is unclear whether suicidal behaviours represent a cause or a consequence of violence at present. Even two recent longitudinal studies arrived at different conclusions as to the temporal association between suicidal behaviour and violence. In the first, a history of suicide attempts prior to age 18 was significantly associated with an increased risk of intimate partner violence perpetration in adulthood, suggesting that certain suicidal behaviours may be causally associated with an increased risk of violence.<sup>584</sup> The second, however, found that attempted suicide and violence were bi-directionally associated with one another throughout adolescence and into early adulthood.<sup>583</sup>

### ***5.1.3 Aims and Hypotheses***

This study therefore had three primary aims: firstly, to investigate whether suicidal ideation, threats, and/or attempts are significantly associated with violence in a longitudinal dataset of 1,460 individuals diagnosed with schizophrenia. Secondly, to determine whether these suicidal behaviours are incrementally predictive of violence risk in both males and females with schizophrenia beyond a baseline risk model comprising young age, comorbid SUD, and previous violence. Lastly, the association between violence perpetration and these three suicidal behaviours will be investigated to determine whether any of the risk factors common to both outcomes, as identified from a review of the literature, mediates the relationship. Based upon the results of the meta-analysis reported in chapter two, a history of

attempted suicide is hypothesised to have the strongest association with violence in both males and females.

## ***5.2 Method***

Data from the CATIE project was used to investigate the association between suicidal behaviours and violence in those diagnosed with schizophrenia. The CATIE project was a longitudinal randomised controlled trial that compared the effectiveness and tolerability of one typical and five atypical antipsychotic medications. Between January, 2001 and December, 2004,<sup>585</sup> a total of 1,493 males and females with a DSM diagnosis of schizophrenia were recruited into the project.<sup>586</sup> Due to concerns over quality, data from one site ( $n=33$ ) were excluded. The analyses presented in this chapter are therefore based on the remaining 1,460 participants.

### ***5.2.1 Inclusion and Exclusion Criteria***

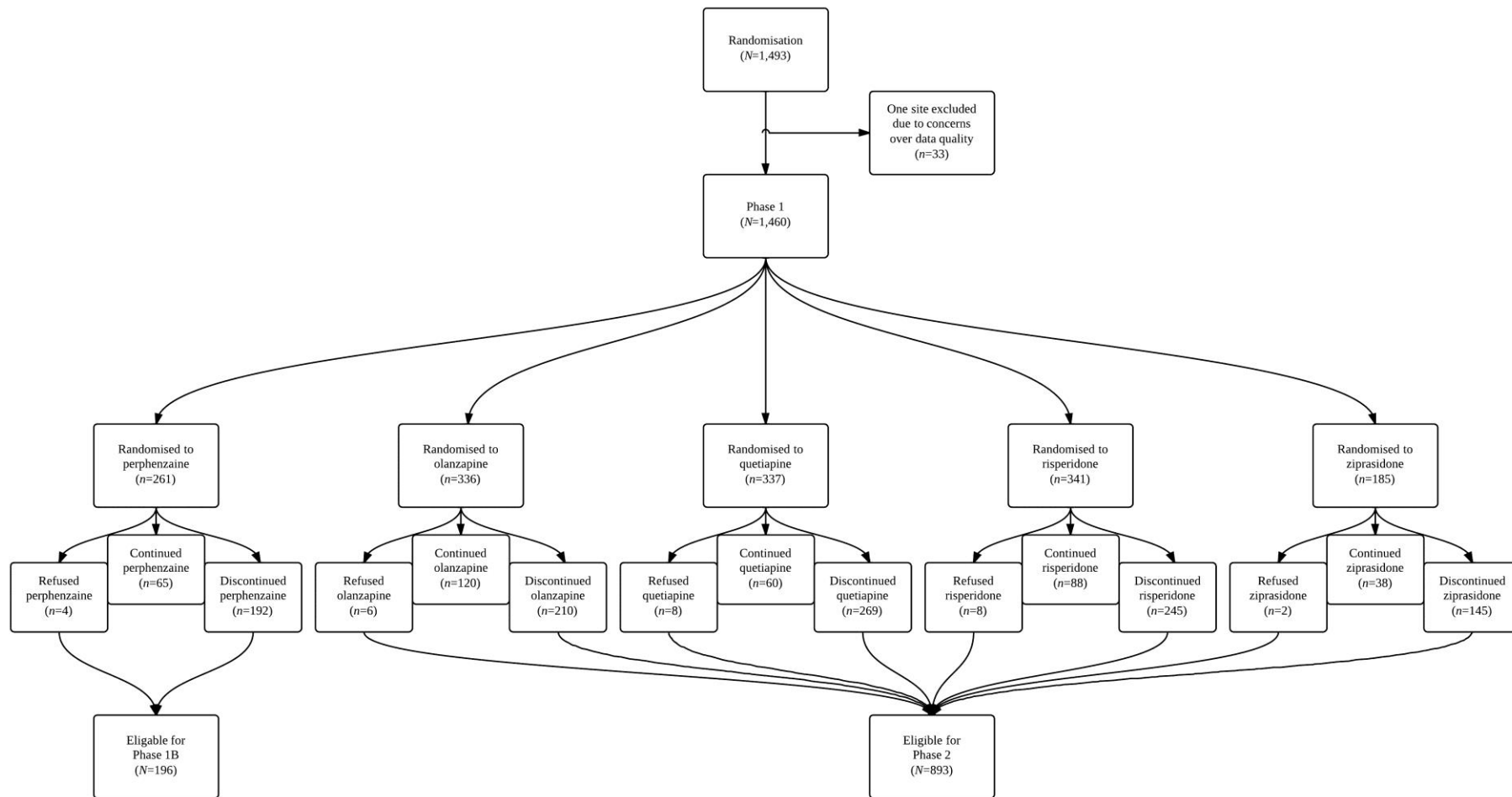
To be eligible to participate in the CATIE project, individuals had to be between 18 and 65 years of age and diagnosed with schizophrenia according to DSM-IV criteria.<sup>587,588</sup> Individuals diagnosed with any other psychotic disorder, or a first-episode of psychosis, were ineligible to participate in the project as were those with a documented history of adverse reactions to any of the trial medications, those with persistent positive symptoms despite a history of adequate treatment with any of the trial medications, those previously treated with clozapine, and those diagnosed with any general medical condition which would contraindicate treatment with any of the trial medications.<sup>587,588</sup>

Individuals with tardive dyskinesia or other extrapyramidal side effects were ineligible for randomisation to treatment with perphenazine.<sup>587,588</sup> A total of 231 (15.0%) were therefore randomised to treatment with an antipsychotic other than perphenazine on these grounds.<sup>589</sup>

### ***5.2.2 Overview of the CATIE Project***

The CATIE project was a multi-phase RCT.<sup>587,588</sup> In the first phase, a total of 1,460 individuals were randomly allocated to treatment with the typical antipsychotic perphenazine or one of three atypical antipsychotics: olanzapine, quetiapine, risperidone.<sup>587,588</sup> Subsequent to Food and Drug Administration (FDA) approval in February 2001, participants could also be randomised to treatment with the atypical antipsychotic ziprasidone.<sup>587,588</sup> Approximately 40% of the sample had been randomised before ziprasidone became available for prescription.<sup>588</sup>

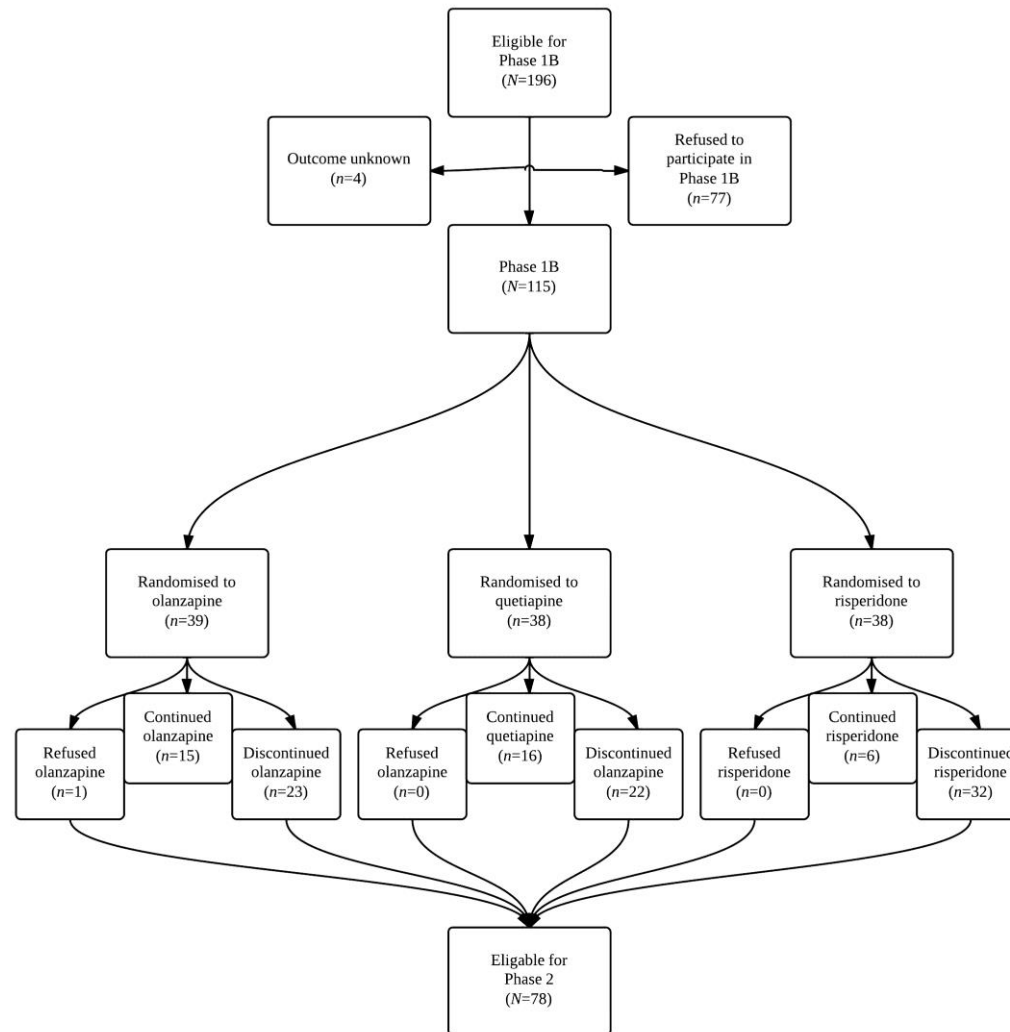
A total of 1,089 (74.5%) participants discontinued treatment in phase 1 of the project;<sup>590</sup> 28 (1.9%) refused to take the medication they had been randomised to following the development of intolerable side effects, whilst the remaining 1,061 (72.6%) discontinued due to a lack of efficacy.<sup>527</sup> The remaining 371 (25.4%) participants continued to take the antipsychotic medication they had been randomised to in this phase for the full 18 month follow up period (Figure 5.1).



**Figure 5.1**  
Participant flow during phase 1 of the *Clinical Antipsychotic Trials of Intervention Effectiveness (CATIE)* project.

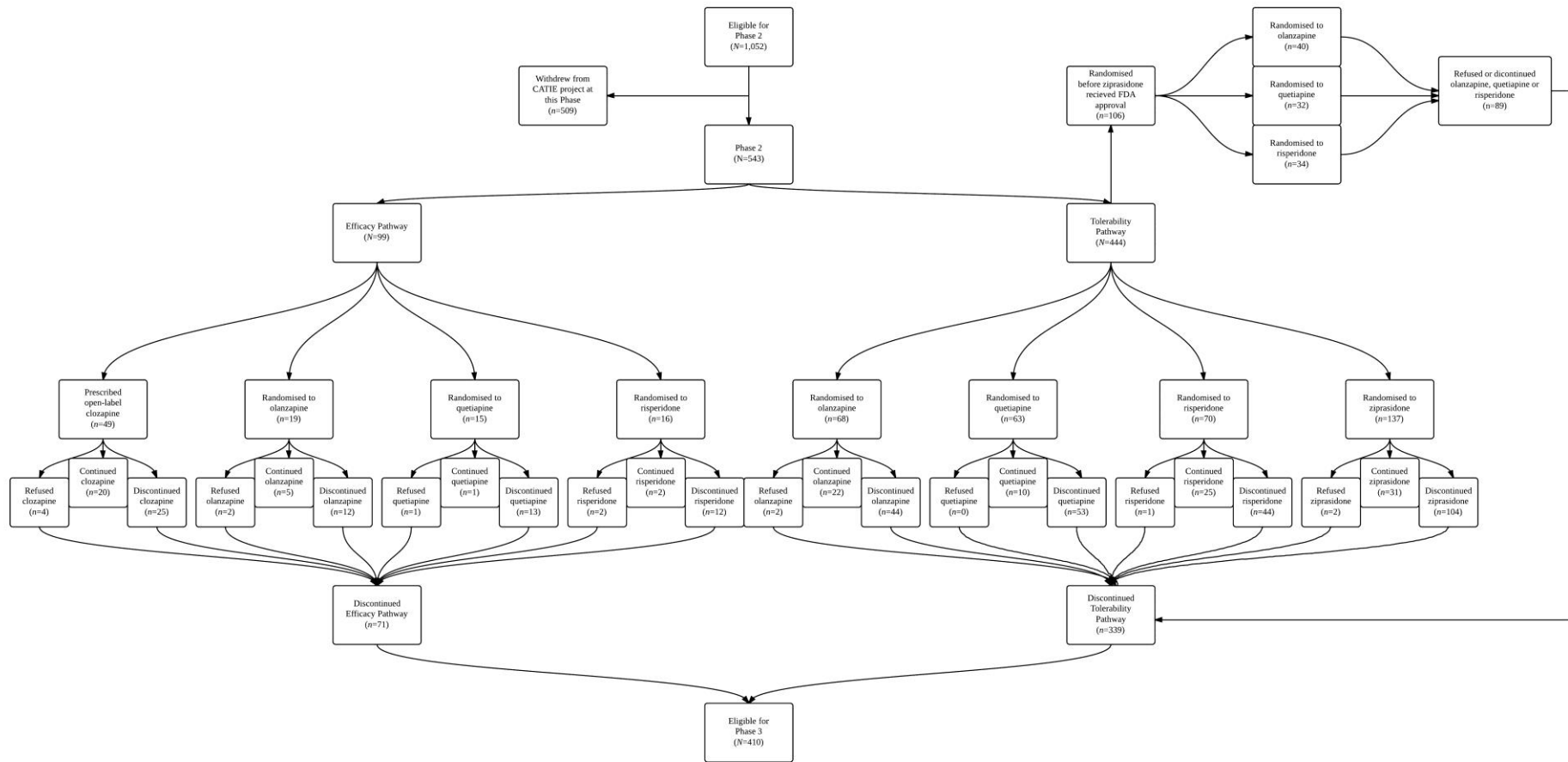
The 196 individuals who either refused or discontinued treatment with perphenazine in phase 1 were eligible to participate in phase 1B. In this phase of the project, participants were randomly reassigned to treatment with olanzapine, quetiapine or risperidone.<sup>587,588</sup> A total of 115 (58.6%) individuals chose to participate in phase 1B of the project, whereas 77 (39.2%) chose not to participate despite being eligible.<sup>591</sup> The 893 (82.0%) participants who either refused or discontinued one of the four atypical antipsychotic medications in phase 1, however, were unable to participate in this phase of the project.

Thirty-seven (32.1%) of the 115 individuals who participated in phase 1B continued to take the medication they had been prescribed in this phase for the remainder of the 18 month follow up period. A total of 78 (67.8%) refused or discontinued the atypical antipsychotic they were prescribed during this phase.<sup>591</sup> These participants, along with the 893 who had refused or discontinued any of the atypical antipsychotic medications prescribed in phase 1,<sup>587</sup> and the 77 individuals who chose not participate in phase 1B despite being eligible to do so, were then eligible for inclusion in phase 2 (Figure 5.2).<sup>588</sup>



**Figure 5.2.** Participant flow during phase 1B of the *Clinical Antipsychotic Trials of Intervention Effectiveness (CATIE)* project.

Phase 2 consisted of two separate pathways: the *efficacy* and the *tolerability* pathway.<sup>588</sup> A total of 99 (9.4%) individuals entered phase 2 through the efficacy pathway because they had previously discontinued the medication they were prescribed at phases 1 or 1B due to a lack of improvement in symptoms.<sup>588</sup> These individuals were either prescribed to open-label treatment with clozapine, or, were randomised to treatment with olanzapine, quetiapine, or risperidone.<sup>587,588</sup> Conversely, 444 (42.2%) individuals entered phase 2 through the tolerability pathway because they had previously discontinued in phase 1 or 1B due to the development of adverse side effects.<sup>588</sup> These participants were randomised to olanzapine, risperidone, quetiapine, or ziprasidone.<sup>587,588</sup> The remaining 509 (48.3%) participants chose to withdraw from the CATIE project at this phase<sup>592</sup> (Figure 5.3).

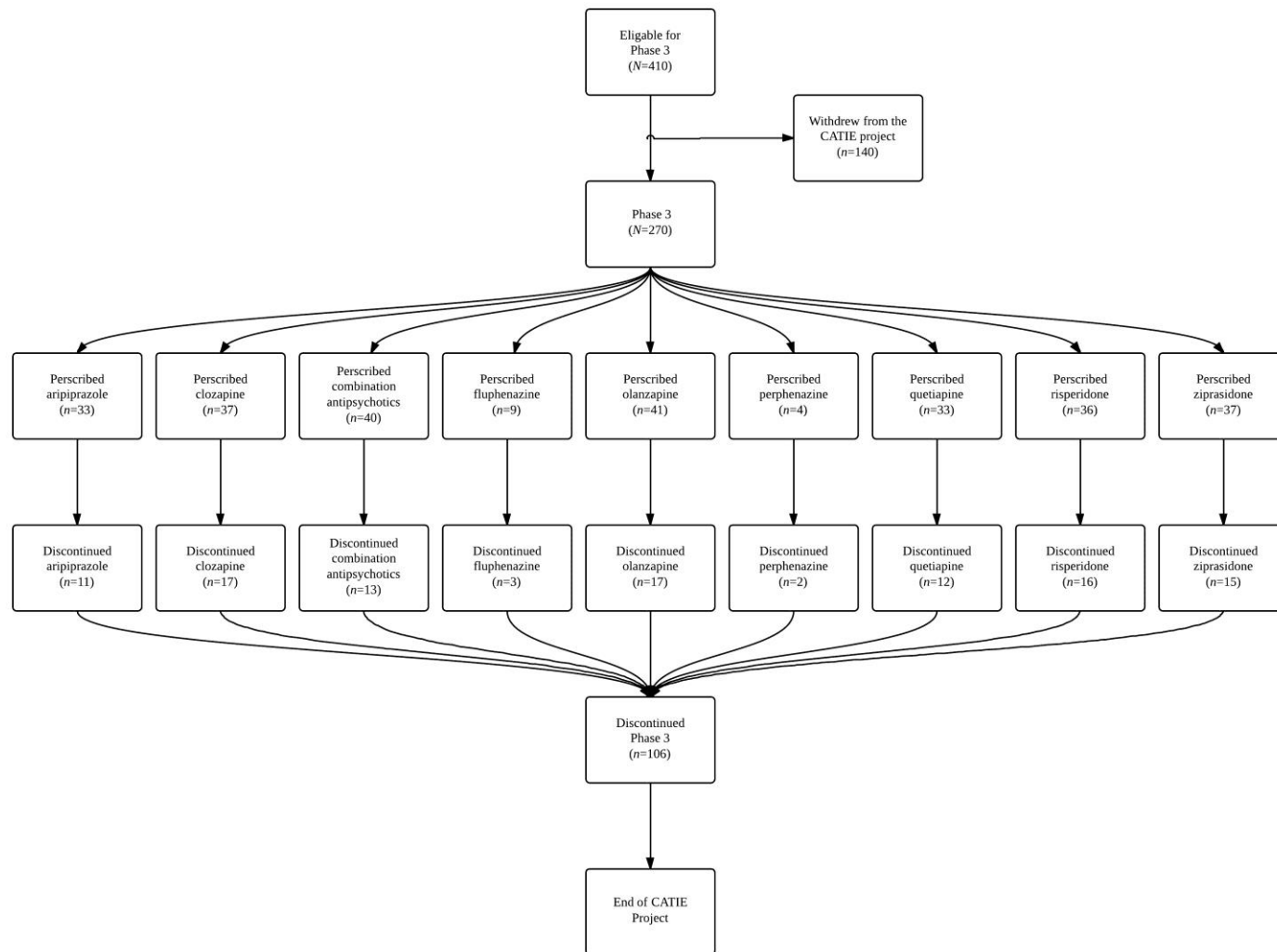


**Figure 5.3.**

Participant flow during through the efficacy and tolerability pathways during phase 2 of the *Clinical Antipsychotic Trials of Intervention Effectiveness (CATIE)* project.

Twenty-eight (28.2%) participants following the efficacy pathway remained on the medication they received at this phase for the remainder of the 18 month follow up period. A total of 71 (71.8%) participants following the efficacy pathway, however, either refused or discontinued their medication in this phase.<sup>593</sup> With regards to those participants following the tolerability pathway, 105 (23.6%) continued to take the medication they had been prescribed during phase 2, whilst 339 (76.3%) either refused or discontinued the medications they were randomised to during this phase.<sup>592</sup>

The 410 participants who refused or otherwise discontinued their assigned treatment during phase 2 were eligible to participate in phase 3<sup>588</sup> in which the participant, along with their psychiatrist, could choose to be treated with one of nine open label antipsychotic medications,<sup>587,588</sup> including aripiprazole, which was given FDA approval in November, 2002.<sup>587,588</sup> Approximately 65% of the eligible phase 3 sample had been prescribed another antipsychotic medication before aripiprazole received FDA approval.<sup>594</sup> A total of 140 participants chose to withdraw from the CATIE project at this stage, leaving a total sample of 270 individuals in phase 3 (Figure 5.4).



**Figure 5.4.** Participant flow during phase 3 of the *Clinical Antipsychotic Trials of Intervention Effectiveness (CATIE)* project.

The majority of the participants in phase 3 remained on the medication they had been prescribed at this phase until the conclusion of the 18 month follow up period ( $n=164$ ; 60.7%). The remaining 106 (39.2%), however, discontinued the medication they had chosen to be treated with in this phase. As there were no additional phases to this project, these individuals were subsequently withdrawn from the CATIE project. Altogether, almost half ( $n=681$ ; 46.6%) of the original CATIE sample completed all 18 months of follow up.

### ***5.2.3 Outcome Measures of the CATIE Project***

The CATIE project investigated the effectiveness, tolerability and safety of a first generation antipsychotic, perphenazine, compared to a number second generation medications.<sup>587</sup> Consequently, the primary outcome measures reported concern time to discontinuation of the assigned medication for any reason, as a proxy of tolerability,<sup>587,588</sup> and scores on the PANSS and CGI as a proxy of effectiveness.<sup>594</sup> To investigate the safety of these medications, however, the CATIE project also collected information on the occurrence of a wide range of outcomes,<sup>587,588</sup> including suicidal behaviours and violence.<sup>595</sup>

### ***5.2.4 Suicidal Behaviour Risk Factors***

Three suicidality risk factors were examined: ideation, threats, and attempts. In line with the Centers for Disease Control (CDC) uniform definitions,<sup>596</sup> suicidal ideation was defined as thoughts of suicide with or without a definitive plan, but with no evidence of current suicidal behaviour. Information on suicidal ideation was coded from a rating of “mild” or “moderate” on the suicidal behaviour item of the Calgary Depression Rating Scale (CDRS; <sup>597</sup>; Appendix I), or from the Severe Adverse Events record form (SAE; Appendix J).

Suicidal threats were defined as suicidal wishes communicated to another person and were coded from reports on either the baseline or follow-up family interview. Although not recognised by the CDC,<sup>596</sup> use of the term “suicidal threats” was preserved in this study to reflect the terminology used by the original authors of the CATIE project.

Suicide attempts are defined by the CDC definitions as any non-fatal behaviour with the potential for injury or death, regardless of intent.<sup>596</sup> In the present study, then, suicide attempts were coded to include both deliberate self-harm and overdose. Specifically, suicide attempts were coded from a rating of “severe” on the suicidal behaviour item of the CDRS, a positive report of attempted suicide or deliberate self-harm on the baseline or follow-up family interview, or from a report of deliberate self-harm or overdose on the SAE form.

### ***5.2.5 Outcome Measure***

The primary outcome measure of the present study, a collateral report of violent behaviour at either the six or twelve month follow-up interview, was coded dichotomously. Violence was coded from collateral reports, rather than from the self-reported MacArthur Community Violence Interview (MACVI;<sup>598</sup>) as previous work in this population suggests that reliance on self-reported incidents may underestimate the full extent of violence in this population.<sup>215</sup>

Additionally, given the multiphase nature of the CATIE project, participants were permitted to change medications up to four times during the 18 month follow-up period. Adherence with medication may therefore have been problematic for a greater proportion of participants during the earlier phases of the project. As treatment non-adherence is a significant risk factor for both suicidal behaviour<sup>541</sup> and violence,<sup>117,334</sup> where an individual had more than one positive report for violence, the incident occurring closest to the end of the

follow-up period was coded. As a greater proportion of participants were adherent with one of the study medications by phase three of the project, this approach enabled the influence of treatment non-adherence to be adjusted.

### ***5.2.6 Statistical Analyses***

The 1,460 individuals who participated in the CATIE project were followed from baseline until death, a positive rating for violence at either the six or 12 month family interviews, withdrawal from the project or, successful completion of the 18 month follow-up period. Univariate Cox regression analyses were used to investigate the longitudinal association between suicidality and violence following the procedure outlined in chapter three. As before, influential observations were identified using the procedure described by Cleves (2010).<sup>462</sup>

As previous work in both the general and psychiatric population suggests that the association between suicidal behaviour and violence may be confounded by a number of factors, including: alcohol misuse,<sup>548,599,600</sup> antisocial behaviour<sup>601</sup> and/or antisocial personality disorder,<sup>602</sup> depression symptoms,<sup>603</sup> drug misuse,<sup>599,600</sup> hostility,<sup>603</sup> impulsivity,<sup>603</sup> physical and/or sexual abuse as a child,<sup>604</sup> and the positive symptoms of schizophrenia,<sup>603</sup> multivariate Cox regression analyses were conducted to investigate whether any of these factors mediates the association between suicidal behaviour and violence risk.

Alcohol and drug misuse were coded from the CGIS, collateral informant report on either the baseline or follow-up interview (Appendix K), the Structured Clinical Interview for DSM-IV (SCID; <sup>605</sup>), or from the CATIE screening interview (Appendix L). Drug misuse was also coded from a positive test for cocaine, opiates, phencyclidine, methamphetamines or cannabis according to hair strand analysis. Depression symptoms were coded both

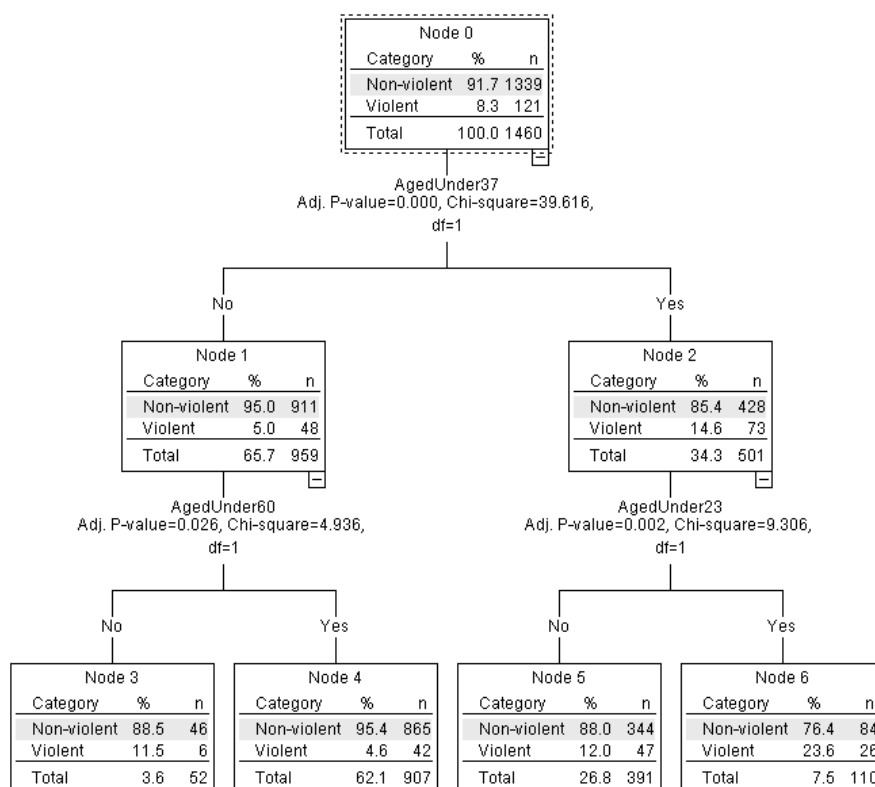
continuously, as total scores on the CDRS, and dichotomously as a lifetime diagnosis of a major depressive disorder (MDD) according to either the SCID or the CATIE screening interview. A lifetime diagnosis of ASPD was also coded from the SCID or the CATIE screening interview. Impulsivity, hostility, and positive symptoms were all coded from their respective items on the PANSS.

To investigate whether suicidal ideation, threats, and/or attempts were incrementally associated with violence risk, multivariate Cox regression analyses adjusting for young age, gender,<sup>hh</sup> and a lifetime diagnosis of comorbid SUD were also conducted. In addition, as results of chapter four suggested that a previous history of violence was incrementally associated with increased violence risk, adjustment was also made for this risk factor.

Following an approach previously used to identify the optimal cut-point for age for the purposes of violence risk prediction,<sup>28</sup> the *Chi-squared Automatic Interaction Detector* (CHAID; <sup>606</sup>) method was used to identify the cut-point for age that maximally discriminated between violent and non-violent individuals. As participants ranged in age from 18 to 67, at the first stage, a block of 50 dichotomous variables was created to indicate those younger than the specified age at randomisation. These 50 variables were then entered into the CHAID model in which violence was coded as the target outcome. By convention, the first node in the CHAID dendrogram constitutes the cut-point that best classifies individuals at risk of violence.<sup>607</sup> Using this method, 37 years emerged as the cut-point for age that best identified participants at risk of violence (Figure 5.5). Individuals aged less than 37 at randomisation were therefore coded as “young” for the purposes of these multivariate analyses.

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<sup>hh</sup> The effect of gender was statistically adjusted by stratifying analyses by gender.



**Figure 5.5.** Chi-squared Automatic Interaction Detector (CHAID) dendrogram used to identify the cut-point for age that maximally discriminates between the violent and non-violent individuals in the CATIE project.

Gender and a lifetime diagnosis of comorbid SUD were coded dichotomously from the CATIE screening interview (Appendix L). A previous history of violence was coded from the MACVI<sup>598</sup> (Appendix M). Following the definition of violence advanced by the MACVI’s authors, violence was coded dichotomously and indicated any incident of battery resulting in injury to the victim, any sexual assault, and any use of a weapon.<sup>88</sup> To ensure that this measure did not double-count an episode of violence that constituted the outcome measure of the present study, only violence in the six month period prior to randomisation was coded as indicative of a previous history of violence.

With the exception of the CHAID analyses, which were conducted in SPSS for Windows version 20,<sup>608</sup> all other analyses were conducted in Stata for Windows version 11<sup>156</sup> using the procedure as outlined in chapter three.

## ***5.3 Results***

Of the 1,460 individuals who participated in the CATIE project, 1,080 (73.9%) were males and 380 (26.1%) were females. Mean age at baseline was 40.6 years ( $sd=11.1$ , range 18.0–67.0 years).

### ***5.3.1 Univariate Analyses***

The median length of follow-up in for this analysis was 15.7 months (IQR 4.6–16.8 months). Around half ( $n=698$ ; 47.8%) of the participants withdrew from the CATIE study before all 18 months of follow-up had been completed, whilst a further five participants (0.3%) were censored because they died during the analysis period. Two died from suicide, and one each from cardiac arrest, convulsions, and hypertensive heart disease.

A total of 121 (8.3%) individuals were violent during the CATIE project. The majority of these violent individuals were male ( $n=97$ ; 80.1%; females:  $n=24$ ; 19.9%). With regards to the suicidal behaviour risk factors investigated, 493 (33.7%) reported suicidal ideation, 162 (11.1%) made suicidal threats, and 85 (5.8%) attempted suicide. Suicidal threats were most strongly associated with violence for both males and females, followed by suicide attempts. Suicidal ideation, however, was not significantly associated with violence for males or females. (Table 5.3)

**Table 5.3.**

Univariate hazard ratios and accompanying 95% confidence intervals for the association between suicidal behaviour risk factors and violence in both males and females with schizophrenia.

Gender	Risk Factor	<i>n</i> Violent		<i>n</i> Non-Violent		Unadjusted Hazard Ratio (95% CI)	<i>z</i>	<i>p</i>
		<i>With</i>	<i>Without</i>	<i>With</i>	<i>Without</i>			
<b>MALES</b>								
	Suicidal threat	31	66	79	904	3.8 (2.4 – 6.0)	5.9	***
	Suicidal attempt	13	84	47	936	2.8 (1.5 – 5.4)	3.2	**
	Suicidal ideation	34	63	321	662	1.0 (0.7 – 1.5)	0.1	0.97
<b>FEMALES</b>								
	Suicidal threat	14	10	38	318	9.4 (4.0 – 21.6)	5.2	***
	Suicidal attempt	5	19	20	336	4.4 (1.5 – 12.7)	2.8	**
	Suicidal ideation	4	20	134	222	0.3 (0.1 – 1.2)	-1.7	0.09

**Note:** Risk factors ranked according to HR magnitude.

\*\*\* = significant to the 0.001 level.

\*\* = significant to the 0.01 level.

\* = significant to the 0.05 level.

To investigate whether the association between suicidal behaviour and violence is bi-directional, a second univariate Cox regression model was constructed in which suicidal behaviour (i.e., ideation, threats, and/or attempts) was coded as the primary outcome measure. As before, for individuals experiencing more than one suicidal behaviour during the 18 month follow-up period, the behaviour occurring closest to the end of the follow-up period was preferentially coded to minimise the role of treatment non-adherence as a confounder in any association observed.

The median length of follow-up for this analysis was 10.8 months (IQR 2.8–6.6 months). Again, around half of the sample withdrew prior to successful completion of the full 18 month follow-up period ( $n=698$ ; 47.8%). Three participants died during this analysis period: one each from hypertensive heart disease, convulsions, and suicide.

Suicidal behaviour was observed in around one-third of participants ( $n=470$ ; 32.2%). A total of 196 (28.8%) participants were rated by a family member as having a previous history of violent behaviour. Univariate analyses found no significant association between a history of violence and subsequent suicidal behaviour in either males (HR=1.3, 95% CI 0.9–1.8,  $p=0.10$ ) or females (HR=1.0, 95% CI 0.6–1.6,  $p=0.93$ ).

### ***5.3.2 Multivariate Analyses***

A total of 485 (33.2%) participants had a history of alcohol misuse (males:  $n=407$ , 37.6%; females:  $n=78$ , 20.5%), 709 (48.5%) had a history of misusing drugs (males:  $n=564$ , 52.2%; females:  $n=145$ , 38.1%), 420 (28.7%) had a lifetime diagnosis of major depression (males:  $n=291$ , 26.9%; females: 129, 33.9%), and 17 (1.1%) were diagnosed with ASPD (males:  $n=15$ , 1.3%; females:  $n=2$ , 0.5%). Adjusting for these factors did not materially

change the association between suicidal ideation, threats, and/or attempts and violence for either males or females, however (Table 5.4).

**Table 5.4.**

Multivariate adjusted hazard ratios and accompanying 95% confidence intervals for the association between suicidal behaviour risk factors and violence in both males and females with schizophrenia adjusted for categorical confounders.

Categorical Confounders	MALES						FEMALES					
	Suicidal threat		Suicide attempt		Suicidal ideation		Suicidal threat		Suicide attempt		Suicidal ideation	
	<i>aHR (95% CI)</i>	<i>p</i>	<i>aHR (95% CI)</i>	<i>p</i>	<i>aHR (95% CI)</i>	<i>p</i>	<i>aHR (95% CI)</i>	<i>p</i>	<i>aHR (95% CI)</i>	<i>p</i>	<i>aHR (95% CI)</i>	<i>p</i>
Health insurance (Public vs. Private) <sup>§</sup>	3.6 (2.3 – 5.7)	***	2.6 (1.4 – 5.0)	**	1.0 (0.7 – 1.6)	0.89	8.6 (3.5 – 21.1)	***	4.5 (1.6 – 13.0)	**	0.4 (0.1 – 1.2)	0.11
Non-White ethnicity	3.7 (2.3 – 5.8)	***	2.6 (1.3 – 5.1)	**	1.0 (0.6 – 1.5)	0.95	9.0 (4.0 – 20.5)	***	4.0 (1.4 – 11.6)	*	0.3 (0.1 – 1.1)	0.07
Not completed high school education	3.8 (2.4 – 6.0)	***	2.9 (1.5 – 5.5)	**	1.0 (0.7 – 1.5)	0.96	9.4 (4.1 – 21.7)	***	4.3 (1.5 – 12.9)	**	0.3 (0.1 – 1.2)	0.09
Physical abuse prior to age 15	3.8 (2.4 – 6.0)	***	2.8 (1.5 – 5.4)	**	1.0 (0.6 – 1.5)	0.99	9.3 (4.0 – 21.5)	***	4.5 (1.5 – 13.0)	**	0.3 (0.1 – 1.2)	0.09
Sexual abuse prior to age 15	3.9 (2.5 – 6.1)	***	2.9 (1.5 – 5.4)	**	1.0 (0.6 – 1.5)	0.92	9.7 (4.1 – 22.9)	***	4.6 (1.5 – 13.8)	**	0.3 (0.1 – 1.2)	0.09
Physical and/or sexual abuse prior to age 15	3.8 (2.4 – 6.0)	***	2.8 (1.5 – 5.4)	**	1.0 (0.6 – 1.5)	0.99	9.2 (4.0 – 21.3)	***	4.6 (1.6 – 13.4)	**	0.4 (0.1 – 1.2)	0.10
Lifetime history of alcohol misuse	3.4 (2.2 – 5.3)	***	2.8 (1.5 – 5.4)	**	0.9 (0.6 – 1.4)	0.72	8.6 (3.7 – 19.8)	***	4.0 (1.4 – 11.3)	**	0.3 (0.1 – 1.1)	0.06
Lifetime history of drug misuse	3.9 (2.5 – 6.1)	***	2.8 (1.5 – 5.4)	**	0.9 (0.6 – 1.4)	0.83	9.4 (4.0 – 21.8)	***	4.3 (1.4 – 12.7)	**	0.3 (0.1 – 1.1)	0.08
Lifetime history of major depression	3.8 (2.4 – 6.0)	***	2.8 (1.4 – 5.4)	**	1.0 (0.6 – 1.5)	0.89	9.3 (3.9 – 21.9)	***	4.5 (1.5 – 13.2)	**	0.3 (0.1 – 1.2)	0.10
Lifetime history of ASPD	3.8 (2.4 – 6.0)	***	2.8 (1.5 – 5.3)	**	1.0 (0.7 – 1.5)	0.96	9.3 (4.0 – 21.5)	***	4.4 (1.5 – 12.6)	**	0.3 (0.1 – 1.2)	0.09
Lifetime history of any psychiatric comorbidity	3.8 (2.5 – 5.9)	***	2.8 (1.5 – 5.4)	**	0.9 (0.6 – 1.4)	0.61	9.4 (4.0 – 21.9)	***	4.4 (1.5 – 12.9)	**	0.3 (0.1 – 1.1)	0.07

**Note:**

\*\*\* = significant to the 0.001 level.

\*\* = significant to the 0.01 level.

\* = significant to the 0.05 level.

<sup>§</sup> Public health insurance status includes both Medicaid and Medicare recipients.

There were also no material changes to the association between suicidal ideation, threats, and/or attempts for females following adjustment for depression, hostility, impulse control, and positive symptoms scores at baseline or following six months of follow-up (Table 5.5). For males, however, depression, hostility, positive symptom, and impulsivity scores at the six month follow-up interview caused the association between attempted suicide and violence to become non-significant (Table 5.5).

**Table 5.5.**

Multivariate adjusted hazard ratios and accompanying 95% confidence intervals for the association between suicidal behaviour risk factors and violence in both males and females with schizophrenia adjusted for continuous confounders.

Continuous Confounders	MALES						FEMALES					
	Suicidal threat		Suicide attempt		Suicidal ideation		Suicidal threat		Suicide attempt		Suicidal ideation	
	<i>aHR (95% CI)</i>	<i>p</i>	<i>aHR (95% CI)</i>	<i>p</i>	<i>aHR (95% CI)</i>	<i>p</i>	<i>aHR (95% CI)</i>	<i>p</i>	<i>aHR (95% CI)</i>	<i>p</i>	<i>aHR (95% CI)</i>	<i>p</i>
Duration of illness (years) <sup>§</sup>	3.4 (2.1 – 5.5)	***	2.2 (1.1 – 4.4)	*	0.9 (0.6 – 1.5)	0.84	10.5 (4.3 – 25.2)	***	4.5 (1.5 – 13.3)	**	0.4 (0.1 – 1.3)	0.12
Number previous psychiatric hospitalisations	3.7 (2.4 – 5.8)	***	2.7 (1.4 – 5.2)	**	1.0 (0.6 – 1.5)	0.99	9.4 (4.1 – 21.8)	***	4.7 (1.6 – 13.6)	**	0.3 (0.1 – 1.1)	0.08
Depression scores (baseline)	3.8 (2.4 – 6.1)	***	2.8 (1.4 – 5.5)	**	0.9 (0.5 – 1.4)	0.62	10.7 (4.5 – 25.5)	***	5.3 (1.8 – 15.9)	**	0.4 (0.1 – 1.7)	0.24
Hostility scores (baseline)	3.9 (2.5 – 6.1)	***	3.0 (1.6 – 5.6)	**	0.9 (0.6 – 1.4)	0.81	10.0 (4.1 – 24.0)	***	4.3 (1.4 – 13.1)	**	0.3 (0.1 – 1.2)	0.09
Positive symptom scores (baseline)	3.8 (2.4 – 6.0)	***	2.9 (1.5 – 5.5)	**	0.9 (0.6 – 1.5)	0.84	9.1 (3.7 – 22.4)	***	4.2 (1.4 – 12.7)	*	0.3 (0.1 – 1.1)	0.08
Poor impulse control scores (baseline)	3.9 (2.5 – 6.2)	***	2.9 (1.5 – 5.6)	**	0.9 (0.6 – 1.4)	0.79	9.6 (4.0 – 22.9)	***	4.5 (1.5 – 13.3)	**	0.3 (0.1 – 1.1)	0.07
Depression scores (6 months)	3.0 (1.7 – 5.4)	***	2.1 (0.9 – 5.2)	0.09	0.8 (0.4 – 1.5)	0.55	15.6 (5.2 – 46.9)	***	5.7 (1.8 – 18.3)	**	0.2 (0.1 – 1.2)	0.08
Hostility scores (6 months)	3.6 (2.0 – 6.4)	***	2.3 (0.9 – 5.6)	0.06	1.1 (0.6 – 1.8)	0.79	13.6 (4.7 – 39.1)	***	5.2 (1.4 – 19.2)	*	0.3 (0.1 – 1.4)	0.12
Positive symptom scores (6 months)	3.2 (1.8 – 5.8)	***	2.3 (0.9 – 5.4)	0.07	1.1 (0.7 – 1.9)	0.58	12.3 (4.2 – 35.9)	***	5.0 (1.6 – 15.8)	**	0.3 (0.1 – 1.2)	0.09
Poor impulse control scores (6 months)	3.5 (1.9 – 6.2)	***	2.4 (0.9 – 5.7)	0.05	1.1 (0.7 – 1.9)	0.60	12.4 (3.9 – 39.9)	***	5.4 (1.6 – 17.6)	**	0.3 (0.1 – 1.2)	0.09

**Note:**

\*\*\* = significant to the 0.001 level.

\*\* = significant to the 0.01 level.

\* = significant to the 0.05 level.

<sup>§</sup> Duration of illness measured from date of first antipsychotic medication prescription until date of randomisation into the CATIE project.

### ***5.3.3 Incremental Predictive Validity Analyses***

For both males and females, the addition of suicidal threats to a baseline risk model comprised of young age, comorbid SUD, and recent violent behaviour, was associated with the largest increase in both discrimination, as measured by the c-index, and reclassification, measured by the magnitude of change in Royston's  $R^2$ , suggesting that this risk factor may be incrementally predictive of violence risk (Table 5.6; Figure 5.6). A simple model containing just four risk factors: young age, comorbid SUD, a history of violent behaviour, and recent suicidal threats, explained 70.8% of the variance in violence risk for females, and just over one-third (35.6%) for males.

**Table 5.6.**  
Incremental validity of suicidal behaviour risk factors in predicting violence in males and females with schizophrenia.

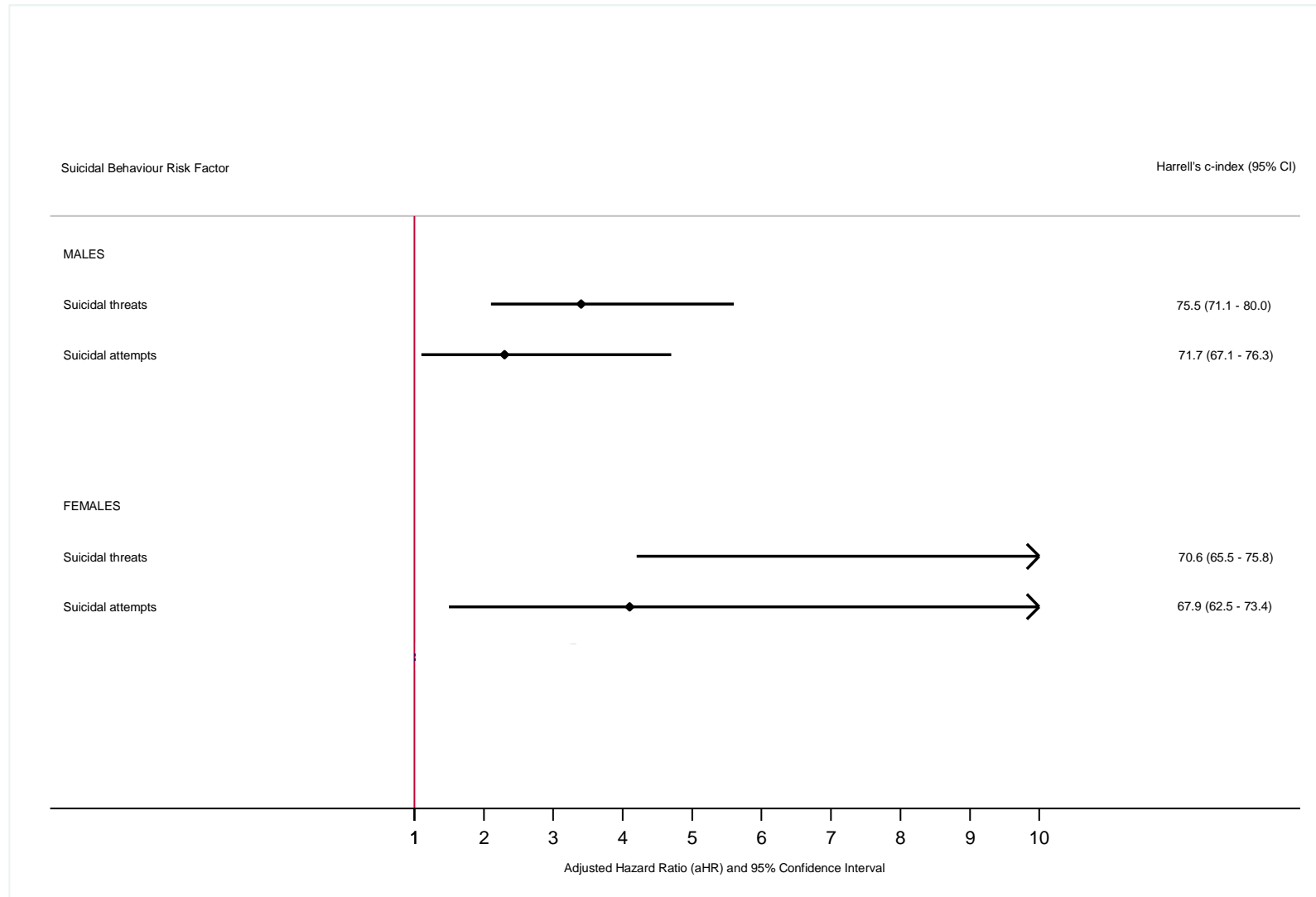
Gender	Risk Factor	Adjusted Hazard Ratio (95% CI)	z	p	Harrell's c-index			Likelihood Ratio		Adjusted Royston's R <sup>2</sup>	
					% (95% CI)	$\Delta$ %	p	$\Delta$ $\chi^2$	p	% (95% CI)	$\Delta$ (%)
<b>MALES</b>											
	<b>BASELINE: Young Age + Comorbid SUD + Previous Violence</b>				<b>70.2 (65.7 – 74.7)</b>					<b>22.2 (12.6 – 34.9)</b>	
	+ Suicidal threats	3.4 (2.1 – 5.6)	5.0	***	+5.3	**	26.1	***			+13.4
	+ Suicidal attempts	2.3 (1.1 – 4.7)	2.7	**	+1.5	0.05	6.3	*			+2.9
<b>FEMALES</b>											
	<b>BASELINE: Young Age + Comorbid SUD + Previous Violence</b>				<b>67.3 (62.0 – 72.7)</b>					<b>26.7 (3.7 – 82.4)</b>	
	+ Suicidal threats	10.4 (4.2 – 25.7)	5.1	***	+3.3	0.16	27.1	***			+44.1
	+ Suicidal attempts	4.1 (1.5 – 11.4)	2.8	**	+0.6	0.50	5.7	*			+10.3

**Note:** As the Likelihood Ratio test compares nested models, estimates for the baseline model alone cannot be calculated. Risk factors ranked in descending order according to aHR magnitude.

\*\*\* = significant to the 0.001 level.

\*\* = significant to the 0.01 level.

\* = significant to the 0.05 level.



**Figure 5.6.** Adjusted hazard ratios (aHR), Harrell's c-index, and accompanying 95% confidence intervals following adjustment for young age, comorbid SUD, and previous violence for males and females with schizophrenia.

## ***5.4 Discussion***

Results of study one suggested that suicidal behaviour may be a significant risk factor for violence, and particularly severe violence rather than aggression and/or hostility. At present, however, it is unclear whether these behaviours remain significantly associated with violence risk following adjustment for certain demographic, substance misuse, and criminal history risk factors. The primary aim of the present study was therefore to investigate whether suicidal behaviour adds incremental validity to the prediction of violence risk in 1,460 individuals with schizophrenia. Univariate analyses demonstrated that suicidal threats and attempts, but not ideation, were significantly associated with an increased risk of violence in this population.

When added to a baseline risk model, only suicidal threats significantly improved predictive validity. Results of the present study therefore suggest that the omission of items assessing a history of suicidal threats may explain why existing violence risk assessment instruments are associated with poorer predictive validity in this population as compared to that achieved for both the general and psychiatric populations.<sup>13</sup> The item content of many widely used violence risk assessment instruments may therefore require revision in light of these findings.

### ***5.4.1 Suicidal Behaviours as Risk Factors for Violence***

The association between suicidality and violence may reflect a generalised tendency to engaged in physically risk-taking behaviours,<sup>609</sup> suggesting that the relationship between suicidality and violence may be specific to the behavioural forms of these outcomes. In line with this, previous work has found that the association between suicidality and violence is stronger for attempted suicide rather than for suicidal ideation in mentally healthy members

of the general population.<sup>610-612</sup> Results of the present study likewise found that, in those with schizophrenia, suicidal threats and/or attempts appear to confer a greater risk of violence than suicidal ideation alone.

Whereas suicidal ideation represents a passive form of suicidal thinking, suicidal threats may reflect aggressive rather than dysphoric traits. Papolous and colleagues (2005), for example, found that aggression was more strongly associated with parent-reported use of suicidal threats than depression in adolescents diagnosed with bipolar disorder.<sup>613</sup> Rather than representing risk factors for two distinct outcomes, aggression and suicidal threats may instead co-occur in a sub-group of patients characterised by a high risk of both suicidal behaviour and violence.

#### ***5.4.2 Violence as a Risk Factor for Suicidal Behaviour***

Contrary to previous work in the general population, which suggests that suicidal behaviour and violence are bi-directionally associated with one another,<sup>583</sup> the present study found that violence does not appear to be predictive of suicidal behaviour in those with schizophrenia.

The *interpersonal theory of suicide* has recently been invoked to explain the association between suicidal behaviour and violence.<sup>614</sup> According to this theory, progression from suicidal ideation to suicidal action requires individuals overcome inhibitions against engaging in painful and potentially life-threatening behaviours.<sup>615</sup> The perpetration of interpersonal violence is hypothesised to represent one such mechanism by which individuals may acquire the capacity to translate suicidal thoughts into suicidal behaviour.<sup>616</sup> To achieve adequate statistical power, however, suicidal ideation was combined with attempted suicide in the present analysis. If violence represents a specific risk factor for more behavioural

forms of suicidality, such as attempted suicide, it remains possible that the association between violence and suicidal behaviour was attenuated in the present study by the inclusion of suicidal ideation.

### ***5.4.3 Incremental Predictive Validity Analyses***

Within the general population, epidemiological work suggests that although the association between suicidal behaviour and violence is independent of certain demographic, substance misuse, and psychopathological risk factors,<sup>560</sup> it does appear to be moderated by a previous history of violence.<sup>101</sup> The incremental predictive validity of suicidal threats and/or attempts was therefore investigated using nested multivariate Cox regression analyses.

The addition of suicidal threats to a baseline risk model comprised of young age, comorbid SUD, and recent violent behaviour, was associated with the largest increase in discrimination, suggesting that this risk factor may be incrementally predictive of violence in those with schizophrenia. Moreover, this simple risk model achieved a similar degree of predictive accuracy, as measured by the c-index, as more complex risk assessment instruments, including the Level of Service Inventory Revised (LSI-R;<sup>617</sup>) and PCL-R.<sup>507</sup>

### ***5.4.4 Implications***

Most existing violence risk assessment instruments have been developed from epidemiological work in diagnostically heterogeneous psychiatric populations.<sup>13</sup> However, recent work using cluster analytic methods to identify subgroups of psychiatric patients at high risk for violence has found that suicidal threats may be stronger predictors of violence risk in certain diagnostic groups; particularly those with psychotic symptoms.<sup>618</sup> The omission of items assessing suicidal behaviour may therefore explain why these risk

assessment instruments are associated with poorer predictive validity when used to predict violence risk in samples with schizophrenia.<sup>13</sup>

Additionally, Harrell's c-index for the baseline risk model for males and females in this study was similar to that obtained for the alternate model in chapter four (males: 69.5% vs. 70.2%; females: 69.6% vs. 67.3%) thereby validating the incremental predictive validity analyses for young age, comorbid SUD, and previous violence in an independent sample.

#### **5.4.5 Strengths**

This study combined information from self-report, family report, and clinician report when coding suicidal ideation, threats, and attempts. Given that previous work in this population suggests violence is likely to be under-reported when relying on self-reported data alone,<sup>215</sup> the use of family reported violence will have led to a more accurate indication as to the extent of violence in this study compared to previous investigations which relied only on self-reported violence.

Second, the CATIE project sought to recruit a diverse group of individuals with schizophrenia. Consequently, few exclusion criteria were used to prevent participation of subgroups of schizophrenia patients who are often excluded from other RCTs, including those with a history of medication non-adherence,<sup>619</sup> and those with comorbid conditions, or substance misuse.<sup>620</sup> Nevertheless, RCTs of antipsychotic effectiveness in schizophrenia are less likely to include individuals with a history of suicidal behaviour.<sup>620</sup> It remains possible, then, that the association between suicidality and violence reported in this study may be attenuated.

### 5.4.6 Limitations

As the data for this study had not been specifically collected for this study, many risk factors investigated in the present study were coded from proxy measures.<sup>621</sup> These measures may not adequately capture the intended meaning of the original risk factor, however. For example, although previous work identifies impulsivity as a possible confounding factor for the association between suicide and violence,<sup>603</sup> the only variable available to code impulsivity from in the CATIE project was the PANSS poor impulse control item. Impulsivity, however, is not a unitary construct.<sup>622</sup> Instead, impulsivity can be decomposed into two facets: *impulsive choice* and *impulsive action*.

Impulsive choice refers to rapid decision-making characterised by an inability to delay gratification and a preference for immediate reward. Impulsive action, on the other hand, refers to an inability to inhibit the expression of inappropriate behavioural responses.<sup>622,623</sup> The measurement of impulsivity should therefore incorporate both the behavioural and cognitive aspects of impulsivity.<sup>624</sup> The wording of the PANSS impulse control item (see Appendix N), implies that responses are made on the basis of behaviour observed by either the clinician or a family informant. This item may therefore reflect only impulsive action, and not impulsive choice. It therefore remains to be determined whether measures which reflect impulsive choice may account for the association between suicidality and violence.

Additionally, some potentially relevant confounding factors could not be investigated in the present study. Previous work in individuals diagnosed with schizophrenia, for example, suggests that intelligence may also moderate the association between suicidality and violence.<sup>578</sup> Full-scale intelligence, however, was not assessed during the CATIE project. Instead, participants underwent a neuropsychological battery which assessed verbal intelligence, working memory, reasoning abilities, social cognition, vigilance, and processing speed.<sup>625,626</sup> Whilst composite neuropsychological scores, derived from the scores of these

individual neuropsychological tests,<sup>627</sup> can be used to analogue full-scale intelligence scores, a recent meta-review found that scores on composite neuropsychological scores are not sufficiently similar to full-scale intelligence scores in individuals with schizophrenia. Instead, the use of neuropsychological composite scores underestimates the extent of deficit in this population.<sup>627</sup> For this reason, intelligence could not be investigated as a potentially confounding factor.

Secondly, Kennedy and colleagues (1999) postulated that, given that previous epidemiological work suggests an unequal distribution of both homicide<sup>628</sup> and suicide<sup>629</sup> between countries, risk factors which confound the association between violence and suicide are more likely to reflect population rather than individual-level factors. Comparing homicide and suicide rates between the 32 London boroughs, the authors found that although the association between violence and suicide remained statistically significant following adjustment for the proportion of the borough aged between 25 and 34, population density, and mental health needs as assessed by total scores on the Mental Illness Needs Index (MINI;<sup>630</sup>), scores on the deprivation scale accounted for most of the regional variation in homicide and suicide rates, with rates of both homicide and suicide being highest in those London boroughs characterised by higher socioeconomic deprivation. This suggests that neighbourhood deprivation may be an important confounder of the association between suicidal behaviour and violence.<sup>631</sup> No marker of neighbourhood deprivation, however, was assessed by the CATIE project.

Thirdly, around half of the CATIE participants withdrew from the study before all 18 months of follow-up had been completed. Adjusting for completion status, however, did not materially affect the association between suicidal attempts (males: HR=2.8, 95% CI 1.4–5.2; females: HR=4.3, 95% CI 1.4–13.1), ideation (males: HR=1.0, 95% CI 0.7–1.5; females:

HR=0.4, 95% CI 0.1–1.2), or threats (males: HR=3.6, 95% CI 2.3–5.7; females: HR=9.1, 95% CI 4.0–21.1).

Lastly, although CHAID methodology has been previously used to determine the optimal cut-point for age,<sup>28</sup> simulation studies suggest that predictive models developed using this methodology may not generalise well to fresh datasets.<sup>632</sup> Future work is therefore required to identify the most stable method of determining optimal cut-points for continuous data for the purposes of risk prediction in this population.

#### ***5.4.7 Conclusions***

The present study found that suicidal threats and attempts were significantly associated with an increased risk of violent behaviour in a sample of 1,460 males and females with schizophrenia. When added to a baseline risk model comprised of young age, comorbid SUD, and previous violence, only suicidal threats emerged as significantly associated with incremental predictive validity. Results of this study therefore suggest that suicidal threats may represent an independent risk factor for violence in those with schizophrenia.

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# *Chapter 6:*

## *General Conclusions*

Recent epidemiological work suggests that those with schizophrenia are significantly more likely to behave violently compared to mentally healthy members of the general population.<sup>48</sup> As a consequence, the assessment of violence risk has become a central focus of the mental health system in recent years.<sup>633,634</sup> Treatment practice guidelines in several countries now mandate that all patients with schizophrenia should be assessed for violence risk upon diagnosis.<sup>4-6</sup>

The accuracy of these assessments is predicated on the identification of risk factors that are both strongly and positively associated with violence in the population under assessment.<sup>634</sup> Although more than 100 different instruments have been developed to assess violence risk in mentally ill populations,<sup>28</sup> few have been validated in samples diagnosed with schizophrenia.<sup>13</sup> Instead, there has been a tendency to assume that factors associated with violence in diagnostically heterogeneous populations will be similarly predictive of risk in those with schizophrenia. Recent work suggests that certain risk factors may not be equally predictive of violence risk across all diagnostic groups. Yang and colleagues (2012), for example, found that although alcohol misuse, depression symptoms, and recent violent behaviour were significantly associated with violence risk in patients diagnosed with major depression, neither factor was predictive of violence in those with psychosis.<sup>14</sup>

Given that the predictive accuracy of existing violence risk assessment instruments is highest when used in populations that closely match the demographic and diagnostic features of the original calibration sample,<sup>635</sup> diagnosis-specific risk assessment instruments may be associated with greater predictive validity than those developed from epidemiological work

with diagnostically heterogeneous populations.<sup>113</sup> Previous work on the risk factors for violence in those with psychosis, however, has either neglected to systematically review the literature or has not investigated the relative magnitude of these factors.<sup>334</sup> This thesis therefore had three overall aims:

- 1) To identify those factors that have been associated with an increased risk of violent offending in those with schizophrenia and other psychoses using systematic review and meta-analysis methodologies;
- 2) Given previous work suggesting that criminal history factors constitute the most important risk factors for violence in both the general and psychiatric populations, novel incremental predictive validity analyses were used to determine which individual criminal history risk factor most strongly predicted violence risk in those with schizophrenia;
- 3) Last, incremental predictive validity analyses were also used to investigate whether suicidal ideation, threats, and/or attempts, which have previously been associated with an increased risk of violence in a small number of population-based epidemiological studies, are significantly associated with violence risk in this population.

Before turning to a discussion of the overall implications of this research, however, the major findings and implications of each study will be briefly summarised.

## ***6.0 Major Findings***

### ***6.0.1 Meta-Analysis of Risk Factors for Violence in Psychosis***

To identify risk factors for violence in those with psychosis, a systematic search of the extant literature was undertaken. A total of 110 studies met inclusion criteria and, from these studies, 146 risk factors were identified. Using meta-analytic techniques, the relative strength of these risk factors was investigated. An innovative meta-epidemiological method was also used to combine similar risk factors into one of ten psychosocial domains. Although previous reviews have also used psychosocial domains to organise their findings,<sup>51,102</sup> this is the first study to quantify the magnitude of association for these ten risk domains. Given that many risk factors assess similar constructs, for example a propensity towards violence,<sup>51</sup> this approach should prove useful in enabling researchers and clinicians alike to conceptualise risk more broadly.

Criminal history risk factors were found to be most strongly associated with violence risk, followed by demographic, and substance misuse factors. This result is consistent with several population-wide epidemiological studies. For the prediction of general recidivism, for example, criminal history risk factors have been found to explain twice the variance of demographic factors and four times that of psychopathological factors.<sup>636</sup> Criminal history risk factors are also assessed by all violence risk assessment instruments<sup>13</sup> and, in the case of actuarial assessment schemes, these factors are generally heavily weighted. There was considerable variation in the magnitude of association between individual criminal history factors, however.

### ***6.0.2 Longitudinal Association between Criminal History Risk Factors and Violence***

The second study therefore investigated this variability in a nationwide cohort of 13,806 individuals with schizophrenia. Criminal history risk factors were identified from the first study as well as from a recent systematic review.<sup>13</sup> Following standard guidelines for assessing the clinical utility of novel risk factors,<sup>508</sup> the association between these criminal history risk factors was firstly investigated using univariate Cox regression analyses. Significant factors were then entered into a multivariate model which adjusted for covariates known to be strongly associated with violence risk from prior epidemiological work, namely young age and comorbid SUD.

Of the criminal history risk factors examined, only a previous conviction for a violent offence was associated with incremental validity beyond this baseline risk model. For males, moreover, this simple model was associated with an area under the receiver operating characteristic curve of 69.4% (95% CI 68.1–70.8); similar to that obtained for more complex instruments, including the LSI–R and PCL–R.<sup>507</sup> Given that these instruments are both costly and time-consuming to administer,<sup>637,638</sup> results of the present study suggest that the process of assessing violence risk in those with schizophrenia could be streamlined by attending to those risk factors which are incrementally associated with increased violence risk.

### ***6.0.3 Longitudinal Association between Suicidal Behaviour Risk Factors and Violence***

Results of study one suggest that suicidal behaviours may be significantly associated with violence risk; and particularly with severe violence rather than aggression and/or hostility. Although previous work found that the association between suicidal behaviours and violence is independent of certain demographic, substance misuse, and psychopathological

factors,<sup>560</sup> it is unclear whether suicidal behaviours are incrementally associated with violence risk following adjustment for criminal history factors. Within the general population, for example, epidemiological work demonstrates that although attempted suicide is associated with a seven fold increase in the risk of being convicted for rape, following adjustment for a previous history of violence, the association became non-significant.<sup>101</sup> The aim of study three, therefore, was to explore the clinical utility of various suicidal behaviours as predictors of violence risk in 1,460 individuals with schizophrenia.

Study three found that suicidal threats and attempts, but not ideation, were significantly associated with violence risk. Following adjustment for age, comorbid SUD, and previous violence, however, only suicidal threats was significantly predictive of violence in this population. Together, these four risk factors explained 70.8% of the variance in violence risk for females, and just over one-third in males, suggesting that suicidal threats add incremental predictive validity to the assessment of violence risk in this population. However, few existing violence risk assessment instruments treat suicidal behaviour as a specific risk factor for violence. Results of this thesis, therefore, suggest that the item content of these existing instruments may need to be revised in light of these findings.<sup>334</sup>

## ***6.1 Major Implications***

Results of the work presented in this thesis suggest a number of important implications for researchers, clinicians, legal professionals, and policy makers.

### ***6.1.1 Implications for Researchers***

Work suggests that many items currently included in violence risk assessment instruments may not, in fact, be individually predictive of violence risk.<sup>481</sup> Comparing the predictive validity of four existing instruments to four derived by randomly selecting risk factors from these existing instruments, Kroner and colleagues (2005) found that the randomly derived instruments predicted subsequent violence risk as accurately as the existing instruments.<sup>474</sup> Factor analysis of the item content of these four existing risk assessment instruments, moreover, suggested that all tapped similar risk domains, including criminal history and substance misuse.<sup>474</sup>

To improve the predictive accuracy of these instruments there is a need to identify factors with incremental validity relative to known predictors of violence risk.<sup>639</sup> Guidelines in other areas of medicine suggest that the ability of a novel risk factor to add incremental predictive validity to an existing risk assessment scheme should be investigated before a novel risk factor should be considered for inclusion within that scheme.<sup>508</sup> In psychiatry, although a number of studies have evaluated the incremental predictive validity of one violence risk assessment instrument over another,<sup>640-644</sup> few have investigated the incremental predictive validity of individual risk factors. There is some suggestion that a number of risk factors found to be significantly associated with violence risk in this population, including diagnosis with a comorbid personality disorder<sup>50</sup> and recent drug use,<sup>219</sup> may not contribute incremental predictive validity relative to demographic and criminal history factors.

Efforts to identify those factors that are incrementally predictive of violence risk may help to decrease the length, complexity, and cost currently associated with the assessment of violence risk. Recent work suggests that the average violence risk assessment takes 15 hours to complete and costs around \$100 USD per hour in direct wage costs.<sup>645</sup> In addition, there

are costs associated with training and with the purchase of manuals and coding sheets.<sup>646</sup> By removing factors without incremental predictive validity from existing violence risk assessment instruments, many could be limited to as few as four items.<sup>647</sup> Results of this thesis suggest that these items should include young age, comorbid substance misuse, previous violence, and suicidal threats.

### ***6.1.2 Implications for Clinicians***

As previous work has found that violence risk assessment instruments produce higher rates of predictive validity when used to assess risk in individuals that closely match the instrument's original calibration sample,<sup>635</sup> clinicians have been encouraged to assess risk using an instrument that closely matches the characteristics of their population and outcome of interest.<sup>607</sup> Results of the present thesis suggest that, in addition, clinicians should consider the risk factors assessed by these instruments. Given that, in this thesis, suicidal threats were incrementally associated with violence, it is possible that violence and other forms of potentially lethal behaviours, including suicidality, may tap a generalised tendency to engage in physical risk-taking behaviours.<sup>609</sup> The assessment of violence risk without consideration of previous suicidal behaviour may therefore underestimate risk. Clinicians are therefore encouraged to make use of violence risk assessment instruments, such as the COVR or the START, which assess for the simultaneous presence of suicidal and violent behaviours.

In addition to this main implication, results of study one found that non-adherence with both psychological and pharmacological treatment was associated with a significantly increased risk of violence. Few RCTs have investigated whether efforts to improve adherence in this population results in a concomitant decrease in violence risk, however. Instead, individuals with a history of violence are typically excluded from RCTs of treatment

efficacy.<sup>648</sup> One recent RCT, however, found that although the offer of financial inducements significantly improved medication adherence, improved adherence was not associated with a significant reduction in the number of incidents of violence over a 12 month follow-up period.<sup>418</sup> Treatment adherence may therefore represent a necessary, but not sufficient, condition for the management of violence risk in this population. Other factors which have been linked to both treatment non-adherence and violence, such as a lack of insight,<sup>649</sup> may therefore also be important for the successful management of violence in this population.

### ***6.1.3 Implications for Legal Professionals***

Results of study one suggested that criminal history risk factors represent stronger risk factors for subsequent violence in this population than psychopathological and symptomatic risk factors. Emerging work also suggests that although positive symptoms are associated with violence risk in those without a premorbid history of offending, these symptoms do not appear to explain the association with violence in those with a premorbid history of offending.<sup>117,242,650</sup>

## ***6.2 Future Directions***

A number of avenues for future research are suggested by the results of the present thesis. In particular, there is a need to further investigate: (1) possible confounding between the risk factors identified by this thesis; (2) factors that contribute to the inaccuracy of violence risk assessments in females; (3) whether treatment can effectively reduce violence risk; and (4) methods of improving the accuracy of violence risk assessment through the use of individualised violence risk assessments.

### ***6.2.1 Investigating Confounding between Risk Factors***

Meta-analyses of aggregate-level data, in which the sample represents the unit of analysis, are unsuited to the identification of confounding between risk factors unless all included studies provide effect sizes adjusted by the same confounder.<sup>651</sup> Failing this, interactions between risk factors can only be investigated by crudely sub-grouping studies. As an example, although recent work suggests that positive symptoms may only be significantly associated with violence risk in those patients without a premorbid history of violence,<sup>117</sup> no included study provided tabular data on positive symptoms for previously violent and previously non-violent participants separately. Instead, in meta-regression analyses, the proportion of previously violent participants within a given study had to be investigated as a proxy. Simulation studies, however, suggest this approach is associated with a loss of statistical power and a concomitant reduction in size and significance of the meta-regression parameters.<sup>652</sup> In addition, any conclusion drawn on the basis of these analyses may be subject to the *ecological fallacy*;<sup>653</sup> in which an association between two variables observed at the ecological level is (mis)interpreted as though the association applies with equal fidelity at the individual level.<sup>654</sup> Meta-analyses of aggregate data are also unable to investigate confounding within risk factors. Recent work, for example, suggests that the maximum score on the hostility item of the PANSS is confounded by violence as scores of above approximately four are defined by the presence of violent behaviour.<sup>117</sup>

The synthesis of raw participant data, in contrast, would enable researchers to calculate adjusted odds ratios to investigate whether the association with violence varies as a function of different individual-level characteristics.<sup>652,655</sup> It may not always be possible to obtain individual-level data, however. Primary investigators may no longer be traceable, may refuse permission to release the raw data, or the data may have been destroyed or lost in the intervening years.<sup>656</sup>

Pigott (2012) discusses two methods of synthesising individual participant data where available, supplemented by aggregate-level data for those studies in which individual-level data is unavailable. The first, referred to as the *two-stage model*, aggregates available individual participant data to calculate study-level effect sizes, combining these with aggregate-level effect sizes using standard meta-analytic techniques.<sup>657,658</sup> As this method is limited to analysing relationships between variables at the aggregate level, results of two-stage individual participant data meta-analyses remain vulnerable to the ecological fallacy.<sup>657</sup>

The *one-stage model*, in contrast, uses multilevel modelling techniques to simultaneously combine individual and aggregate-level data.<sup>657</sup> This approach would enable researchers not only to investigate confounding between and within risk factors, but also to identify whether there may be factors specific to the prediction of violence risk for certain sub-groups of patients, for example, those with a history of premonitory violence.

### ***6.2.2 Factors that Contribute to the Inaccuracy of Violence Risk Assessments in Females***

Within the literature, distinction is made between two main approaches to the assessment of violence risk in females. According to the *gender-neutral* approach, similar risk factors are associated with violence in both genders. The *gender-specific* approach, in contrast, argues that female offenders are more likely than their male counterparts to experience certain risk factors; particularly those relating to experiences of childhood abuse and adult sexual victimisation.<sup>659</sup> According to this approach, the assessment of violence risk in females should therefore be sensitive to these differences.<sup>112,660,661</sup>

As the majority of violence risk assessment instruments were developed in predominately male samples,<sup>662</sup> proponents of the gender-specific approach argue that the

accuracy of these instruments for female offenders is likely to be adversely affected by the omission of female-specific risk factors.<sup>530</sup> To address these concerns, de Vogel and colleagues (2012) recently developed the FAM–HCR–20 to supplement assessments made using the HCR-20 risk assessment scheme.<sup>414</sup> The FAM–HCR–20 contains nine items thought to be specific to the prediction of violence risk in females, including items assessing a history of suicidal behaviour. Results of study three, however, suggest that suicidal attempts or threats are significantly associated with violence risk in both males and females with schizophrenia. Meta-regression analyses presented in study one, moreover, found that gender composition did not materially affect the strength of association for a number of other risk factors assessed by the FAM–HCR–20, including: the experience of physical or sexual abuse as a child, and deliberate self-harm.

Although similar risk factors would appear to be associated with violence risk in both genders, violence risk is nevertheless frequently underestimated in females.<sup>663,664</sup> Previous work suggests that clinicians are less likely to initiate discussions of violent ideation in female as compared to male psychiatric patients.<sup>665</sup> As treatment guidelines now mandate the assessment of violence risk in this population, however, it is likely that factors other than clinician decision may also be affecting the accuracy of violence risk assessments in females.

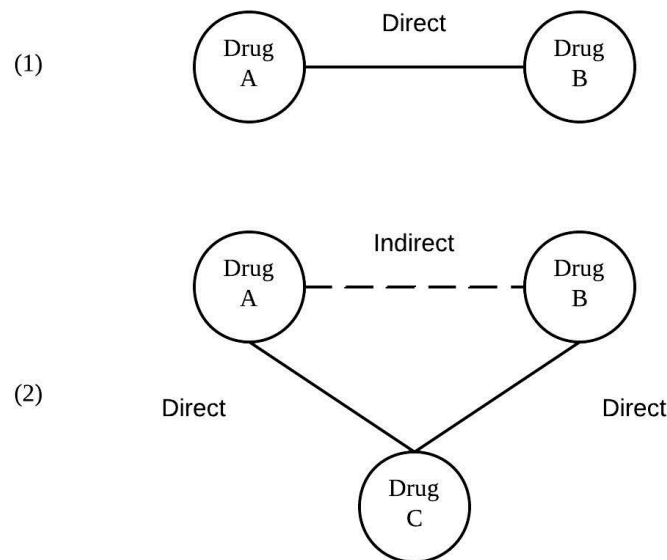
More recently, work has found that clinicians also appear to be significantly more likely to associate women’s violence risk with disorder-related risk factors such as positive symptoms and treatment non-adherence which, in turn, may explain the poorer accuracy of these assessments.<sup>666</sup> Given the consequences of inaccurate violence risk assessments as discussed previously, further research into the causes of inaccuracy of violence risk assessments in females is necessary to ensure not only that women are placed in forensic facilities commensurate to their actual level of risk, but also to ensure that treatment is appropriately targeted to their needs.

### ***6.2.3 The Effectiveness of Pharmacological and Psychological Treatments for Violence***

Although two RCTs suggested that second generation antipsychotic medications, such as clozapine, olanzapine, and risperidone, are more effective than haloperidol in reducing violence in this population,<sup>231,667</sup> another investigating the effectiveness of a number of first versus second generation antipsychotic medications found that no one medication demonstrated a superior antiaggressive effect.<sup>668</sup> Similarly, a recent meta-analysis of published and unpublished RCT data found that intramuscular injections of aripiprazole, haloperidol, lorazepam, olanzapine, and ziprasidone are equally effective in reducing aggression over a two-hour observation period.<sup>669</sup>

Recent work, however, suggests that clozapine may have a specific antiaggressive effect,<sup>670</sup> independent of its effect on the positive symptoms of psychosis and its general sedative effect.<sup>671</sup> Despite this, few RCTs specifically investigate the antiaggressive effectiveness of clozapine as compared to other antipsychotic medications. Given the serious side-effects associated with the long-term use of clozapine,<sup>672</sup> as well as the large number of comorbid conditions for which clozapine use is contraindicated,<sup>673</sup> it would be desirable to investigate whether other antipsychotic medications are equally effective in reducing violence risk in this population.

Network meta-analysis can rank each medication by their relative effectiveness,<sup>674</sup> even if no RCT has directly compared each medication on a pairwise basis.<sup>675</sup> Network meta-analysis combines direct evidence, obtained when two or more medications are compared within a single RCT ( (1) in Figure 6.1), with indirect evidence from multiple RCTs that evaluate the effectiveness of a given antipsychotic medication against a common comparator ( (2) in Figure 6.1).<sup>675-677</sup>



**Figure 6.1**

Schematic illustration demonstrating, at (1), a direct comparison between drug A and drug B and, at (2), an indirect comparison between drug A and drug B via their common association with drug C. Reproduced with permission from <sup>678</sup>

Several scholars warn against the use of network meta-analysis with observational data, however, as the *principle of transitivity* may not hold.<sup>677</sup> Valid indirect comparisons require not only that all included studies are similar with respect to important clinical and methodological characteristics, but also that studies providing direct evidence have a similar distribution of these characteristics.<sup>675</sup> Even slight differences between studies with respect to illness severity, dosage, and route of administration (oral vs. depot) can violate the principle of transitivity.<sup>675</sup>

Given the heterogeneous origin of violence in this population, as highlighted by the findings of the meta-analysis reported in chapter two, pharmacological treatments alone are unlikely to significantly reduce violence risk.<sup>668</sup> Combining pharmacological with psychological treatments may therefore be necessary.<sup>679</sup> Cognitive behavioural therapy (CBT) was found to significantly reduce inpatient violent behaviour in one recent RCT;

principally through a reduction in anger.<sup>680</sup> Group-based psychoeducation and problem-solving therapy have also shown some promise in improving insight<sup>681</sup> and problem-solving abilities<sup>682</sup> in violent offenders with psychosis. As violence was not investigated as a primary outcome measure in these studies, however, it is unclear at this point whether improved insight and problem-solving abilities will lead to a concomitant reduction of violence in this population.

#### ***6.2.4 Development of Individualised Violence Risk Assessments***

At present, the assessment of violence risk relies on instruments derived from epidemiological work. Risk factors included in these instruments therefore reflect those found to accurately post-dict violence in the original calibration sample.<sup>683</sup> Judgements of violence risk in any one individual are then made with reference to this original sample, as Monahan (1995) illustrates:

“[When] inferring statements about an *individual case from the fact that a person* belongs to a certain *class of cases* that have *X* probability of violence... all one can say...is that the person whose behaviour is being predicted has characteristics X, Y, Z, and that *other* persons who have been studied in the *past* who have had characteristics X, Y, and Z, have committed violent acts at a certain rate.” (Emphasis in original).<sup>684, pp. 65-66</sup>

Some scholars argue that this approach results in risk predictions that, for any one individual, possess little, if any, accuracy.<sup>685,686</sup> Recent efforts to incorporate individualised risk factors have therefore focussed on the development of a professional override option in existing instruments which clinicians can use to down- or upgrade an individual’s risk on the basis of rare protective or risk factors. Use of the professional override option has been

associated with a reduction in the predictive validity of these instruments, however, as clinicians tend to incorporate non risk-related factors, such as mental health diagnoses.<sup>687</sup>

Another method of achieving individualised risk assessments is to devise a separate risk assessment instrument for each individual. Using mobile phone messaging technology, Fazel is currently piloting a novel violence risk assessment instrument at Littlemore Hospital. Patients, or their clinicians, respond to daily questionnaires regarding a number of risk factors found to be strongly associated with violence risk on the basis of the meta-analysis reported in chapter two, including young age, comorbid SUD, previous violence, and previous suicidal behaviour. On the basis of these responses, a risk profile which is unique to the individual is built up over time. This profile can then be used to determine each individual's future risk of violence.

Machine learning techniques may also facilitate the development of individualised risk assessment approaches. Machine learning uses an iterative process to incorporate information on prediction accuracy for any one individual.<sup>688</sup> This information is then used to modify the items assessed by the instrument. Using this approach, risk factors found to be weakly associated with violence risk in this thesis, such as positive symptoms, would be automatically dropped from existing violence risk assessment instruments whilst those identified as incrementally predictive of risk would be given greater emphasis in the risk assessment process.

### ***6.3 Major Conclusions***

Although treatment practice guidelines now mandate the assessment of violence risk in all individuals diagnosed with schizophrenia, few violence risk assessment instruments have been specifically validated in this population. Recent work instead suggests that these instruments are typically associated with lower predictive validity in samples with schizophrenia, leading to concerns that these instruments omit risk factors specific to the prediction of violence risk in this population. This thesis therefore aimed to investigate the risk factors for violence in this population, with a view to identifying those factors with incremental validity over age, gender, and substance misuse; factors which have been regularly identified as critical to the prediction of violence risk in both the general and mentally ill populations. Findings suggest that a simple risk model, composed of young age, comorbid substance use disorder, previous violent behaviour, and suicidal threats, is associated with a similar degree of predictive validity for both males and females as many lengthier instruments, including the HCR-20, LSI-R, PCL-R, and VRAG. Results of the present thesis therefore suggest that a number of the risk factors assessed by these existing instruments contribute little incremental predictive validity beyond these four factors.

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# *Appendix A:*

## *Khan Study Criteria*

Score each criterion as +1 if present, 0 if absent.

<b>Study Design: Cohort/RCT</b>		<b>Score</b>
1	Is there sufficient description of the groups and the distribution of prognostic factors?	_____
2	Are the groups assembled at a similar point in their disease progression?	_____
3	Is the intervention/treatment reliably ascertained?	_____
4	Were the groups comparable on all important confounding factors?	_____
5	Was there adequate adjustment for the effects of these confounding factors?	_____
6	Was a dose-response relationship between the intervention and outcome demonstrated?	_____
7	Was outcome assessment blind to exposure status?	_____
8	Was follow-up long enough for the outcomes to occur?	_____
9	What proportion was followed-up?	_____
10	Were rates and reasons for drop-out similar across the intervention and unexposed group?	_____

<b>Study Design: Case-Control/Cross-Sectional</b>		<b>Score</b>
1	Is the case definition explicit?	_____
2	Has the state of the case been reliably assessed and validated?	_____
3	Were the controls randomly selected from the source of the population of the cases?	_____
4	How comparable are the cases and controls with respect to potential confounding factors?	_____
5	Were interventions and other exposures assessed in the same way for cases and controls?	_____
6	How was the response rate defined?	_____
7	Were the non-response rates and reasons for non-response the same for both cases and controls?	_____
8	Is it possible that over-matching has occurred in that cases and controls were matched on factors relating to exposure?	_____
9	Was an appropriate statistical analysis used (matched or unmatched)?	_____

**Note:** Reproduced with permission from <sup>138</sup>

# Appendix B: Duplicated Risk Factors

Risk Domain	Risk Factor	<i>k</i>	<i>n</i>	<i>N</i>	Random Effects Odds Ratio (95% CI)	<i>z</i>	<i>I</i> <sup>2</sup>	<i>p</i>
<b>DEMOGRAPHIC</b>								
	Historical non-violent victimisation during adulthood	2	337	1,812	2.8 (1.9 – 4.0)	5.6	0	***
	Migrant	2	1,825	13,867	2.7 (0.5 – 14.5)	1.1	85	0.25
	Less than 40 years of age at study enrolment	2	258	970	2.6 (1.5 – 4.3)	3.7	0	***
	Unemployed and not currently enrolled a student/in vocational training	2	53	83	2.6 (0.7 – 10.0)	1.4	0	0.14
	Older maternal age at birth (years)	2	135	271	1.7 (0.4 – 7.4)	0.8	30	0.42
	Failed to complete compulsory military service	2	63	121	1.5 (0.6 – 3.6)	0.9	0	0.35
	Living in supported/sheltered accommodation	2	53	83	1.0 (0.1 – 7.1)	0.1	33	0.97
	Unemployed but currently enrolled as a student/in vocational training	2	53	83	0.7 (0.2 – 2.4)	0.5	0	0.57
<b>PREMORBID</b>								
	Higher premorbid adjustment in adulthood scores	2	55	126	1.5 (0.6 – 3.9)	0.9	0	0.34
	Parental history of drug misuse during childhood	2	26	320	1.2 (0.6 – 2.2)	0.6	0	0.52
	Did not live with both parents up to 15 years of age	2	26	320	1.1 (0.6 – 2.0)	0.5	0	0.58
	Parental history of any psychiatric disorder	2	26	320	1.0 (0.6 – 1.4)	0.0	0	0.99
	Higher total scores on the Premorbid Adjustment Scale	2	55	126	1.0 (0.5 – 1.7)	0.0	0	0.99
<b>CRIMINAL HISTORY</b>								
	Higher trait anger scores	2	11	149	12.0 (2.3–106.5)	2.2	0	*
	Historical arrest and/or conviction for any offence	2	170	732	9.8 (0.3–261.3)	1.3	71	0.17
	Higher physical aggression scores	2	104	206	6.3 (0.8 – 47.8)	1.7	11	0.07
	Historical contact with police not resulting in arrest	2	126	325	4.5 (1.1 – 18.7)	2.1	0	*
	Higher antisocial behaviour scores	2	113	226	2.1 (0.6 – 7.2)	1.2	0	0.21
	Higher criticisms of others scores	2	98	196	1.8 (0.6 – 5.4)	1.1	0	0.27
	Recent violent ideations	2	60	312	1.7 (0.2 – 12.9)	0.5	34	0.60
	Historical violence against psychiatric staff	2	77	212	1.3 (0.4 – 4.4)	0.5	59	0.61
	Greater number of convictions for violent offences	2	169	820	1.0 (0.4 – 2.3)	0.0	2	0.98
<b>PSYCHOPATHOLOGICAL</b>								
	Received poor family care during illness episodes	2	63	212	12.7 (3.8 – 42.2)	4.1	0	***
	Higher lack of insight into consequence of illness subscale scores	2	131	289	4.8 (0.8 – 28.0)	1.7	0	0.07
	Higher irritability scores	2	44	230	4.1 (0.8 – 21.2)	1.6	0	0.09
	Higher lack of insight into the need for treatment subscale scores	2	131	289	3.8 (0.7 – 19.1)	1.6	0	0.10
	Diagnosed with a comorbid personality disorder of any type	2	258	970	2.1 (1.5 – 2.9)	4.3	0	***
	Diagnosed with comorbid mania	2	207	655	2.0 (0.8 – 5.0)	1.4	73	0.14
	Higher tension scores	2	39	158	1.9 (0.6 – 6.0)	1.1	0	0.24
	Diagnosed with a comorbid psychiatric illness of any type	2	53	83	1.8 (0.2 – 12.5)	0.6	0	0.51
	Psychosis onset prior to 19 years of age	2	143	587	1.8 (1.2 – 2.6)	2.9	0	**
	Higher projection of hostility scores	2	98	196	1.6 (0.6 – 4.1)	0.9	0	0.33

Table continued over ...

Risk Domain	Risk Factor	k	n	N	Random Effects				
					Odds Ratio (95% CI)	z	I <sup>2</sup>	p	
<b>PSYCHOPATHOLOGICAL</b>									
	Lower psychoticism scores	2	755	876	1.3 (0.1 – 15.8)	0.2	61	0.83	
	Higher direction of hostility scores	2	98	196	1.2 (0.6 – 2.6)	0.7	0	0.47	
	Higher psychopathy deceitful interpersonal style scores	2	44	194	1.2 (0.4 – 3.1)	0.3	27	0.70	
	Acute illness onset	2	403	1,512	1.1 (0.8 – 1.6)	0.8	0	0.38	
	Insidious illness onset	2	229	661	0.8 (0.6 – 1.2)	0.8	0	0.39	
	Higher psychopathy impulsive/irresponsible behaviour scores	2	44	194	1.0 (0.7 – 1.6)	0.4	0	0.66	
	Behaves anxiously	2	60	312	1.0 (0.8 – 1.2)	0.1	0	0.86	
	Currently experiencing psychosocial stress	2	60	312	1.0 (0.5 – 1.9)	0.1	0	0.93	
	Diagnosed with hebephrenic schizophrenia subtype	2	40	82	0.9 (0.2 – 3.5)	0.1	10	0.96	
	Higher psychopathy deficient emotional experiences scores	2	44	194	1.0 (0.5 – 1.9)	0.0	0	0.99	
	Higher mannerisms/posturing scores	2	39	158	1.0 (0.5 – 2.0)	0.0	0	0.99	
<b>POSITIVE SYMPTOMS</b>									
	Experienced concurrent hallucinations and delusions	2	64	233	6.2 (2.1 – 18.4)	3.3	0	**	
	Behaves bizarrely	2	30	241	2.7 (0.3 – 26.0)	0.8	90	0.37	
	Higher bizarre behaviour scores	2	80	160	2.0 (0.6 – 6.7)	1.2	0	0.22	
	Experienced manic symptoms	2	207	655	1.6 (0.8 – 3.2)	1.3	70	0.17	
	Higher threat, control/override (TCO) symptom scores	2	35	290	1.3 (0.2 – 9.1)	0.3	57	0.75	
	Experienced hallucinations of any type	2	60	312	1.3 (0.7 – 2.4)	0.9	0	0.37	
	Experienced delusions of passivity	2	66	228	1.2 (0.1 – 9.8)	0.2	64	0.84	
	Experienced delusions of jealousy	2	44	222	0.9 (0.5 – 1.6)	0.1	0	0.86	
	Experienced somatic delusions	2	44	222	0.9 (0.3 – 2.1)	0.2	13	0.79	
<b>NEGATIVE SYMPTOMS</b>									
	Evidence of poor self care	2	60	312	1.9 (0.3 – 11.7)	0.7	82	0.48	
	Higher poor rapport scores	2	36	163	1.9 (0.6 – 5.9)	1.1	0	0.25	
	Higher avolition scores	2	80	160	1.8 (0.6 – 5.6)	1.1	0	0.26	
	Higher alogia scores	2	80	160	1.4 (0.6 – 3.4)	0.8	0	0.38	
	Lower anergia scores	2	57	285	0.9 (0.6 – 1.3)	0.4	0	0.69	
<b>NEUROPSYCHOLOGICAL</b>									
	Smaller total brain volume (cm <sup>3</sup> )	2	35	69	2.5 (0.6 – 9.6)	1.3	0	0.17	
	Higher executive functioning scores	2	35	155	1.8 (0.6 – 5.4)	1.1	0	0.26	
	Higher block design scores	2	39	82	1.3 (0.04 – 43.4)	0.1	72	0.87	
	Higher digit symbol scores	2	39	82	1.2 (0.05 – 26.9)	0.1	68	0.90	
	Diagnosed with a comorbid neurological illness of any type	2	53	83	1.1 (0.3 – 3.9)	0.2	0	0.80	
	Higher object assembly scores	2	39	82	1.1 (0.1 – 13.2)	0.1	59	0.89	
	Higher picture arrangement scores	2	39	82	1.1 (0.05 – 21.2)	0.1	67	0.95	
	Lower total Stroop test scores	2	47	85	1.0 (0.3 – 2.6)	0.1	8	0.96	

Table continued over ...

Risk Domain	Risk Factor	<i>k</i>	<i>n</i>	<i>N</i>	Random Effects Odds Ratio (95% CI)	<i>z</i>	<i>I</i> <sup>2</sup>	<i>p</i>
<b>SUBSTANCE MISUSE</b>								
	Diagnosed with comorbid alcohol use disorder	2	24	272	1.5 (0.5 – 4.0)	0.8	0	0.39
	Diagnosed with comorbid drug use disorder	2	24	272	1.5 (0.5 – 4.0)	0.8	0	0.40
	Recent tobacco use	2	91	995	1.3 (0.4 – 3.7)	0.5	55	0.62
	Historical cocaine misuse	2	43	220	1.1 (0.5 – 2.4)	0.2	0	0.77
<b>SUICIDAL BEHAVIOUR</b>								
	Higher self-criticism scores	2	98	196	1.8 (0.6 – 5.6)	1.1	0	0.26
	Recent deliberate self-harm	2	241	647	1.6 (0.1 – 15.8)	0.4	84	0.67
	Higher suicidal behaviour scores	2	19	126	1.0 (0.5 – 1.8)	0.0	0	0.99
	Recent suicidal ideation	2	60	312	0.9 (0.5 – 1.7)	0.1	0	0.88
<b>TREATMENT-RELATED</b>								
	Prescribed antiparkinsonism medication	2	82	222	1.7 (0.9 – 3.2)	1.7	0	0.08
	Prescribed clozapine rather than another antipsychotic medication	2	20	150	1.4 (0.5 – 3.9)	0.7	0	0.44
	Longer duration of previous inpatient admission (months)	2	220	2,263	1.1 (0.6 – 2.1)	0.6	0	0.55
	Longer cumulative duration of inpatient admissions (months)	2	33	144	1.0 (0.3 – 3.2)	0.1	18	0.93

**Notes:** *k* = number of studies analysed, *n* = number of violent participants, *N* = number of total participants, *I*<sup>2</sup> = percentage of variability in effect size estimates attributable to between-study variation. Factors ranked according to pooled OR magnitude. No study-level characteristic was significantly associated with heterogeneity for any risk factor with an *I*<sup>2</sup> ≥ 75%.

\*\*\* = significant to the 0.001 level;

\*\* = significant to the 0.01 level;

\* = significant to the 0.05 level.

***Appendix C:***  
***Methodological Characteristics of***  
***Included Studies***

First Author & Year of Publication	Inclusion Criteria	Exclusion Criteria	Definition of Violence	Diagnostic Information			Reference
				Criteria	Screen	Diagnosis	
Abu-Akel (2004)	Males, between 20 and 54 years of age, diagnosed with paranoid schizophrenia, treated as inpatients within a general or maximum-security psychiatric ward.	Females, those diagnosed with a schizophrenia subtype other than paranoid.	History of a minimum of three assaults against others.	ICD-10.	None stated.	Schizophrenia (paranoid).	<sup>258</sup>
Abushua'leh (2006)	Males, between 20 and 54 years of age, diagnosed with schizophrenia, treated as inpatients within a general or maximum-security psychiatric ward.	Females.	History of a minimum of three assaults against others.	ICD-10.	None stated.	Schizophrenia.	<sup>259</sup>
Aragno (1999)	Males and females, 18 years of age or older, diagnosed with schizophrenia or schizo-affective disorder, consecutively treated as inpatients in a short-term general psychiatric unit for a minimum of three days.	Those who were transferred to another hospital within three days of admission, or were discharged within 72 hours of admission.	At least one incident of physical aggression against others which scored three or more on the Overt Aggression Scale (OAS; <sup>324</sup> ) during the admission period.	DSM-IV.	None stated.	Schizophrenia, schizo-affective disorder.	<sup>179</sup>
Arango (2006)	Males and females, 18 years of age or older, diagnosed with schizophrenia, treated as inpatients in one of three general or psychiatric hospitals, responsible for an incident of violence which scored three or more on the physical aggression subscale of the Modified Overt Aggression Scale (MOAS; <sup>689</sup> ) in the one year preceding study enrolment.	Those diagnosed with comorbid axis I disorders, alcohol and/or drug abuse and/or dependence, and those diagnosed with mental retardation.	At least one incident of violence which scored three or more on the physical aggression subscale of the MOAS during the one year follow-up period.	DSM-IV.	None stated.	Schizophrenia.	<sup>277</sup>
Barkataki (2005)	Males, between 18 and 45 years of age, diagnosed with schizophrenia, treated as inpatients in a general psychiatric facility or incarcerated in a high-security or a medium-security forensic psychiatric ward.	Females, left-handers, those whose first language is not English, those currently abusing illicit drugs, and those with a history of neurological conditions (e.g., epilepsy), head injury, or diagnosed with comorbid ASPD.	At least one incident of violence which scored four or more on the Gunn and Robertson Scale of Violence (GRSV; <sup>690</sup> ); indicative of a fatal or near-fatal assault.	DSM-IV.	SCID.	Schizophrenia.	<sup>245</sup>
Barkataki (2006)	Males, between 18 and 45 years of age, diagnosed with schizophrenia, treated as inpatients in an open psychiatric facility or incarcerated in a high-security or a medium-security forensic psychiatric ward.	Females, left-handers, those whose first language is not English, those currently abusing illicit drugs, those who abused illicit drugs within the past two years, and those with a history of neurological conditions (e.g., epilepsy), head injury, or diagnosed with comorbid ASPD.	At least one incident of violence which scored four or more on the GRSV; indicative of a fatal or near-fatal assault.	DSM-IV.	SCID.	Schizophrenia.	<sup>246</sup>

Table continued over...

First Author & Year of Publication	Inclusion Criteria	Exclusion Criteria	Definition of Violence	Diagnostic Information			Reference
				Criteria	Screen	Diagnosis	
Bartels (1991)	Males and females, 18 years of age or older, diagnosed with schizophrenia or schizoaffective disorder, treated as outpatients by an ambulatory community service team.	None stated.	At least one incident of severe or extremely severe violence over the one year follow-up period scored according to an idiosyncratic 5-point hostility measure developed by the study's authors from the 7-point hostility item of the BPRS; indicative of destruction to property, assault not occasioning bodily harm to the victim, assault occasioning actual bodily harm to the victim or assault with the potential to have caused bodily harm to the victim.	DSM-III.	None stated.	Schizophrenia, schizoaffective disorder	<sup>221</sup>
Belfrage (1998)	Males and females, between 17 and 70 years of age, diagnosed with schizophrenia, an affective psychosis or paranoia, discharged from inpatient care within one of three mental hospitals, and followed in the community ten years later.	Those who died during the ten year follow-up period.	Sentenced for a violent criminal offence during the ten year follow-up period.	ICD-9.	None stated.	Schizophrenia, an affective psychosis, or paranoia	<sup>281</sup>
Bitter (2005)	Males and females, 18 years of age or older, diagnosed with schizophrenia, treated as outpatients in any psychiatric centre within the 27 participating countries, and prescribed monotherapy with either clozapine, olanzapine, risperidone, quetiapine, or haloperidol.	Those with no baseline information available, not prescribed anti-psychotic therapy, prescribed to polyanti-psychotic therapy, prescribed an anti-psychotic other than clozapine, olanzapine, risperidone, quetiapine, or haloperidol, prescribed a different antipsychotic halfway through the follow-up period, with incomplete information regarding antipsychotic dosage, with incomplete information regarding hostility, or with no six month follow-up information available.	An affirmative response to the following question: "Has the patient exhibited verbal or physical hostility or aggression over the follow-up period?"	ICD-10 or DSM-IV.	None stated.	Schizophrenia.	<sup>318</sup>
Bobes (2009)	Males and females, 18 years of age or older, diagnosed with schizophrenia, consecutively treated as outpatients.	Those recently diagnosed with schizophrenia, with a mental illness other than schizophrenia, prescribed antipsychotic medication for less than three months prior to study enrolment, and those who refused to participate.	At least one incident of aggressiveness in the week preceding study enrolment which scored three or more on any subscale of the MOAS.	DSM-IV.	None stated.	Schizophrenia.	<sup>278</sup>

Table continued over...

First Author & Year of Publication	Inclusion Criteria	Exclusion Criteria	Definition of Violence	Diagnostic Information			Reference
				Criteria	Screen	Diagnosis	
Buckley (2004)	Males and females, 18 years of age or older, diagnosed with schizophrenia or schizoaffective disorder, treated as outpatients at one of two community mental health centres, or incarcerated in a county jail.	None stated.	At least one incident of physical aggression against property or another person for which criminal charges have been laid.	DSM-IV	None stated.	Schizophrenia, schizoaffective disorder.	<sup>222</sup>
Calcedo-Barba (1994)	Males and females, 18 years of age or older, diagnosed with paranoid schizophrenia, admitted to the psychiatry department of a university hospital due to a relapse or following a violent incident.	Those diagnosed with a schizophrenia subtype other than paranoid, and those without a collateral informant who could provide information on the participant's behaviour whilst living in the community.	At least one incident of violence in the week preceding study enrolment scoring two or more on the physical violence subscale of the OAS.	DSM-III-R.	None stated.	Schizophrenia (paranoid).	<sup>279</sup>
Cannon (2002)	Males and females born between 1951 and 1960 in Helsinki, Finland, and diagnosed with schizophrenia, schizoaffective disorder or schizophreniform disorder.	None stated.	Convicted of a violent offence, including: homicide, assault, robbery, arson, illegal possession of a weapon, sexual offences, and domestic violence.	ICD-8 or ICD-9.	None stated.	Schizophrenia, schizoaffective disorder, or schizophreniform disorder.	<sup>301</sup>
Chang (2011)	Males and females, between 15 and 25 years of age, diagnosed with first-episode schizophrenia, consecutively treated as outpatients.	Those diagnosed with mental retardation, psychosis due to a physical medical condition, substance induced psychosis, with more than one month of treatment prior to study enrolment, and those with incomplete or missing medical files.	History of violence as revealed by clinical or forensic records.	ICD-10.	None stated.	Schizophrenia.	<sup>286</sup>
Cheung (1996)	Males and females, 18 years of age and older, diagnosed with schizophrenia, and treated as inpatients within a rehabilitation ward.	Those not currently stabilised on medication, not currently experiencing at least one positive symptom, diagnosed with comorbid SUD, a history of head injury, intellectual impairment, and those unable to communicate effectively in English.	Two or more incidents of physical aggression towards objects or others during a ward survey conducted prior to study enrolment, and with at least one incident of physical aggression towards objects or others each month between the conclusion of this ward survey and the commencement of the study.	DSM-III-R.	SCID.	Schizophrenia	<sup>267</sup>
Cheung (1997)	Males and females, 18 years of age or older, diagnosed with schizophrenia, and treated as inpatients within a rehabilitation ward.	Those not currently stabilised on medication, not currently experiencing at least one positive symptom, diagnosed with comorbid SUD, a history of head injury, intellectual impairment, and those unable to communicate effectively in English.	Two or more incidents of physical aggression towards objects or others during a ward survey conducted prior to study enrolment, and at least one incident of physical aggression towards objects or others each month between the conclusion of this ward survey and the commencement of the study.	DSM-III-R.	SCID.	Schizophrenia.	<sup>268</sup>

Table continued over ...

First Author & Year of Publication	Inclusion Criteria	Exclusion Criteria	Definition of Violence	Diagnostic Information			Reference
				Criteria	Screen	Diagnosis	
Cheung (1997)	Males and females, 18 years of age or older, diagnosed with schizophrenia, treated as in-patients within a rehabilitation ward.	Those not currently stabilised on medication, not currently experiencing at least one positive symptom, diagnosed with comorbid SUD, a history of head injury, intellectual impairment, those unable to communicate effectively in English, and those whose urine test was positive for illicit drugs.	Two or more incidents of physical aggression towards objects or others during a ward survey conducted prior to study enrolment, and at least one incident of physical aggression towards objects or others each month between the conclusion of this ward survey and the commencement of the study.	DSM-III-R.	SCID.	Schizophrenia.	<sup>269</sup>
Cheung (1997)	Males and females, 18 years of age or older, diagnosed with schizophrenia, treated as inpatients within a rehabilitation ward.	Those not currently stabilised on medication, not currently experiencing at least one positive symptom, diagnosed with comorbid SUD, a history of head injury, intellectual impairment, those unable to communicate effectively in English, .and those whose urine test was positive for illicit drugs.	Two or more incidents of physical aggression rated from the Staff Observation Aggression Scale (SOAS; <sup>691</sup> ) during an eight week screening survey, and at least one incident of physical aggression towards objects or others each month between the conclusion of this survey and the commencement of the study.	DSM-III-R.	SCID.	Schizophrenia.	<sup>270</sup>
Chung (2006)	Males, between 18 and 65 years of age, diagnosed with schizophrenia or schizoaffective disorder, treated as inpatients in a general or forensic psychiatric hospital.	Females, those diagnosed with any physical or neurological abnormality, with a history of organic brain damage, and those unable to communicate effectively in Korean.	Conviction for homicide.	DSM-IV.	None stated.	Schizophrenia, schizoaffective disorder.	<sup>272</sup>
Chung (2010)	Males, between 18 and 65 years of age, diagnosed with schizophrenia, treated as inpatients in a general or forensic psychiatric hospital.	Females, left-handers, those diagnosed with any physical or neurological abnormality, mental retardation, organic brain damage, those unable to communicate effectively in Korean, and those who have not been stabilized by antipsychotic medication for a minimum of two months prior to study enrolment.	Conviction for homicide.	DSM-IV.	SCID.	Schizophrenia.	<sup>273</sup>
Cuffel (1994)	Males and females, between 18 and 55 years of age, diagnosed with schizophrenia or schizoaffective disorder, treated as out-patients within a general hospital research clinic, and participating in a randomised controlled trial of fluphenazine decanoate.	Those diagnosed with drug or alcohol dependence, and those with an extensive legal history.	At least one incident of any of the following: verbal threats to others, non-verbal threats to others, throwing objects at others, physical assault, use of a weapon, arson, or property damage.	DSM-III-R.	SCID.	Schizophrenia, schizoaffective disorder.	<sup>223</sup>

Table continued over ...

First Author & Year of Publication	Inclusion Criteria	Exclusion Criteria	Definition of Violence	Diagnostic Information			Reference
				Criteria	Screen	Diagnosis	
Dean (2006)	Females, between 18 and 65 years of age, diagnosed with schizophrenia, schizoaffective disorder, psychosis NOS, or bipolar disorder, hospitalised on at least two separate occasions for psychotic symptoms, currently being treated as outpatients at one of four urban outpatient mental health services, and participating in a randomised controlled trial of intensive community case management.	Males, those diagnosed with an organic brain disorder, and those with a history of substance misuse.	At least one incident of physical assault over the two year follow-up period.	ICD-10.	OPCRIT.	Schizophrenia, schizoaffective disorder, psychosis NOS, bipolar disorder.	<sup>247</sup>
Dean (2007)	Males and females, between 16 and 64 years of age, diagnosed with any psychotic disorder, and being treated as in- or outpatients at a specialist first-episode psychosis service.	Those diagnosed with a mental illness other than psychosis.	Precipitating reason for treatment was due to an incident of violent behaviour perceived as threatening to others, or, a documented history of violence or aggression, including: physical assault, use of a weapon, arson, extensive property damage, verbal threats, delusional content related to thoughts of wanting to harm others, or, behaving in an aggressive or hostile manner towards others.	ICD-10.	RDC.	Psychosis.	<sup>248</sup>
Ellouze (2009)	Males and females, 18 years of age or older, diagnosed with schizophrenia, treated as inpatients within a general hospital.	Those who had committed any of the following offences: homicide, attempted homicide, armed robbery, sexual offences, and those who had a history of deliberate self-harm.	At least one incident of physical aggression against others during the one year prior to study enrolment.	DSM-IV.	None stated.	Schizophrenia.	<sup>317</sup>
Eriksson (2010)	Males, born between 1949 and 1951 and conscripted into the Swedish Army between 1969 and 1970, discharged from hospital with a diagnosis of schizophrenia or schizoaffective disorder.	Females, those who could not be conscripted into the Swedish Army due to intellectual handicap, a pre-existing psych-iatric illness, or due to imprisonment.	Convicted of any of the following offences: homicide, attempted homicide, manslaughter, assault, robbery, assaulting or threatening a police officer or other public official, forcible confinement, or a sexual assault.	ICD-7, ICD-8 ICD-9, or ICD-10	None stated.	Schizophrenia, schizoaffective disorder	<sup>282</sup>
Erkiran (2006)	Males and females, between 18 and 59 years of age, diagnosed with schizophrenia, schizoaffective disorder, schizophreniform disorder, or delusional disorder either with or without a comorbid SUD, and treated as inpatients in a general psychiatric hospital.	None stated.	At least one incident of violence in the three days preceding study enrolment scoring two or more on the physical violence subscale of the OAS.	DSM-IV.	None stated.	Schizophrenia, schizoaffective disorder, schizophreniform disorder, delusional disorder.	<sup>302</sup>
Fazel (2009)	Males and females, 15 years of age or older, discharged from hospital on at least two separate occasions with a diagnosis of schizophrenia, followed in the community.	Those discharged from hospital with a diagnosis of schizophrenia on only one occasion.	Conviction for any of the following violent offences: homicide, attempted homicide, aggravated assault, common assault, robbery, arson, any sexual offence, or illegal threats and/or intimidation.	ICD-8, ICD-9 ICD-10	None stated.	Schizophrenia.	<sup>283</sup>

Table continued over ...

First Author & Year of Publication	Inclusion Criteria	Exclusion Criteria	Definition of Violence	Diagnostic Information			Reference
				Criteria	Screen	Diagnosis	
Fazel (2010)	Males and females, 15 years of age or older, discharged from hospital on at least two separate occasions with a diagnosis of schizophrenia, followed in the community.	Those convicted of infanticide or of a violent offence other than homicide, and those discharged from hospital with a diagnosis of schizophrenia on only one occasion.	Convicted of homicide, including: actual and attempted murder, and manslaughter.	ICD-9, ICD-10.	None stated.	Schizophrenia.	<sup>284</sup>
Flannery (1998)	Males and females, 18 years of age or older, diagnosed with any schizophrenia spectrum disorder, treated as inpatients, involuntarily admitted to a government mental health facility.	Those with private medical insurance.	One or more positive ratings on a checklist adapted from the New York State Level of Care Rating Scale (NYS-LOC; <sup>692</sup> ), comprised of the following items: a history of attempted murder, assault, sexually assault, molestation of a child, arson, use of a weapon, dangerous behaviour, property destruction, and/or threats to kill.	DSM-III-R.	None stated.	Schizophrenia-spectrum disorder	<sup>224</sup>
Foley (2005)	Males and females, between 16 and 65 years of age, diagnosed with schizophrenia, delusional disorder, substance induced psychosis, psychotic depression, organic psychosis, psychosis NOS, or bipolar disorder, treated as inpatients or outpatients.	None stated.	A score of greater than one on any of the following MOAS subscales: aggression against property, autoaggression, or, aggression against others. Additionally, participants must have engaged in at least one incident of physical violence, including: throwing an object, harming themselves and/or physically attacking others.	DSM-III-R.	None stated.	Schizophrenia, delusional disorder, substance induced psychosis, psychotic depression, organic psychosis, psychosis NOS, or bipolar disorder.	<sup>310</sup>
Fresán (2004)	Males and females, between 17 and 45 years of age, diagnosed with schizophrenia, and treated as outpatients.	Those diagnosed with comorbid alcohol and/or substance abuse in the six months preceding study enrolment.	At least one incident in the week preceding study enrolment which scored seven or more on the total aggression subscale of the OAS.	DSM-IV.	SCID.	Schizophrenia.	<sup>294</sup>
Fresán (2005)	Males and females, between 18 and 50 years of age, diagnosed with schizophrenia, currently experiencing an acute episode of psychosis, and treated as inpatients or outpatients.	Those diagnosed with comorbid alcohol and/or substance abuse in the six months prior to study enrolment.	At least one incident in the week preceding study enrolment which scored seven or more on the total aggression subscale of the OAS.	DSM-IV.	SCID.	Schizophrenia.	<sup>295</sup>
Fresán (2007)	Males and females, between 17 and 45 years of age, diagnosed with schizophrenia, and treated as outpatients.	Those diagnosed with comorbid alcohol and/or substance abuse in the six months prior to study enrolment.	At least one incident in the week preceding study enrolment which scored seven or more on the total aggression subscale of the OAS.	DSM-IV.	SCID.	Schizophrenia.	<sup>296</sup>

Table continued over ...

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				Criteria	Screen	Diagnosis	
Fresán (2007)	Males and females, between 17 and 50 years of age, diagnosed with schizophrenia, currently experiencing an acute episode of psychosis, not in receipt of any oral antipsychotic for at least four weeks prior to study enrolment, and/or not in receipt of any depot antipsychotic for at least six months prior to study enrolment, and treated as inpatients or outpatients.	Those with any axis I comorbidity, a history of bipolar disorder, any comorbid medical or neurological illness, hearing loss, current substance abuse, or a history of substance dependence within the six months preceding study enrolment.	Participants' usual pattern of behaviour in the month preceding study enrolment rated as seven or more on the total aggression subscale of the OAS.	DSM-IV.	SCID.	Schizophrenia.	<sup>297</sup>
Fullam (2008)	Males, 18 years of age or older, diagnosed with schizophrenia, treated as inpatients in a medium or high security forensic psychiatric hospital.	Females, those with a history of organic brain disorder, head injury, a recent history of electroconvulsive shock therapy, those not currently symptomatically stable on medication, and those unable to provide informed consent.	At least one incident of physical aggression since admission in which the participant was the clear instigator or co-instigator.	DSM-IV.	None stated.	Schizophrenia.	<sup>249</sup>
Guy (2003)	Males, between 18 and 35 years of age, diagnosed with schizophrenia, treated as inpatients in the psychiatric department of a general hospital or in a maximum security forensic psychiatric institution.	Females, those too unwell to comprehend the study procedure, and those who refused consent to participate.	Charged with actual bodily harm against another, regardless of severity of injury to the victim.	ICD-10.	None stated.	Schizophrenia.	<sup>250</sup>
Hatta (1999)	Males, between 18 and 64 years of age, diagnosed with schizophrenia, delusional disorder, or schizotypal disorder, treated as inpatients in a psychiatric intensive care unit, and prescribed parenteral benzodiazepines due to prolonged non-compliance with oral antipsychotic medications.	Females, those who received medication in the year prior to admission, and those diagnosed with comorbid alcohol and/or substance misuse.	A score of three or more on the verbal aggression subscale of the OAS; indicative of using threatening language towards others.	ICD-10.	None stated.	Schizophrenia, delusional disorder, or schizotypal disorder.	<sup>311</sup>
Herrera (1988)	Males, between 25 and 44 years of age, diagnosed with schizophrenia, treated as inpatients, with a history of non-remission despite treatment with at least three different antipsychotics medications over a two and a half year period prior to study enrolment, and currently prescribed a high-potency antipsychotic medication.	Females, those not experiencing an acute episode of psychosis, those with a history of organic brain disorder, mental retardation, comorbid alcohol and/or substance abuse in the two weeks prior to study enrolment, and those with any comorbid physical illness.	A score of three or greater on Lion's Scale of Inpatient Violence (LSIV; <sup>693</sup> ).	DSM-III.	None stated.	Schizophrenia.	<sup>225</sup>
Hodgins (2003)	Males, 18 years of age or older, diagnosed with schizophrenia or schizoaffective disorder, recently discharged from one of four general psychiatric hospitals, or one of four forensic psychiatric hospitals, and followed in the community.	Females.	At least one incident of the following during the six month follow-up period: throwing objects at others, pushing, shoving, grabbing, slapping, kicking, biting, choking or hitting another person, rape, or use of a weapon in a threatening manner.	DSM.	SCID.	Schizophrenia, schizoaffective disorder	<sup>319</sup>

Table continued over ...

First Author & Year of Publication	Inclusion Criteria	Exclusion Criteria	Definition of Violence	Diagnostic Information			Reference
				Criteria	Screen	Diagnosis	
Hodgins (2011)	Males and females, 18 years of age or older, diagnosed with schizophrenia or schizoaffective disorder, recently discharged from one of four general psychiatric hospitals or one of four forensic psychiatric hospitals, and currently living in the community.	None stated.	At least one incident of the following during the six month follow-up period: throwing objects at others, pushing, shoving, grabbing, slapping, kicking, biting, choking or hitting another person, rape, or use of a weapon in a threatening manner.	DSM-IV.	SCID.	Schizophrenia, schizoaffective disorder, or schizophreniform disorder	<sup>65</sup>
Hong (2008)	Males, between 18 and 65 years of age, diagnosed with schizophrenia, treated as inpatients in one of two general psychiatric hospitals or in a forensic psychiatric hospital, currently symptomatically stabilised, and on stable doses of antipsychotic medication.	Females, those not symptomatically stabilised or who have not been prescribed stable doses of antipsychotic medications for at least two months prior to study enrolment, those with a history of head trauma, and those diagnosed with a neurological problem, or with other serious medical problems.	Conviction for homicide.	DSM-IV.	SCID.	Schizophrenia.	<sup>274</sup>
Hoptman (1999)	Males, 18 years of age or older, diagnosed with a major mental illness (97% were diagnosed with schizophrenia), treated as inpatients in a maximum security forensic psychiatric hospital.	Females.	At least one incident of assault during the 12 week follow-up period.	DSM-III-R.	SCID.	97% of the sample were diagnosed with schizophrenia.	<sup>226</sup>
Iancu (2010)	Males, 18 years of age or older, diagnosed with schizophrenia, treated as inpatients in a mental health clinic.	Females.	Total scores on the OAS.	DSM-IV.	SCID.	Schizophrenia.	<sup>260</sup>
Jones (2001)	Males and females, 18 years of age or older, diagnosed with schizophrenia, treated as inpatients or outpatients.	Females, those of non-white ethnicity, immigrants, and those whose parents were born outside of the United Kingdom and/or Republic of Ireland.	At least one incident of violence which scored 13 or more on the OAS; indicative of threatening behaviour, including: striking, kicking, pushing, and pulling the hair of others, attacking another causing mild injury, and attacking another causing severe physical injury.	DSM-IV.	SCAN.	Schizophrenia.	<sup>251</sup>
Kim (2009)	Males and females, 18 years of age or older, diagnosed with schizophrenia, treated as inpatients at one of two psychiatric hospitals.	Those with any comorbid axis I psychiatric disorder.	At least two incidents of physical violence requiring seclusion in the two weeks preceding study enrolment in addition to a lifetime history of at least two serious assaults.	DSM-IV.	None stated.	Schizophrenia.	<sup>275</sup>

Table continued over ...

First Author & Year of Publication	Inclusion Criteria	Exclusion Criteria	Definition of Violence	Diagnostic Information			Reference
				Criteria	Screen	Diagnosis	
Koen (2004)	Males, 18 years of age or older, diagnosed with schizophrenia, at least one prior hospitalisation for treatment for schizophrenia, currently being treated as inpatients on the acute psychiatric ward of a psychiatric hospital.	Females.	At least one incident of physical violence against others, objects or the self, or, use of verbal threats preceding admission or during first presentation.	DSM-IV.	None stated.	Schizophrenia.	<sup>314</sup>
Kotler (1999)	Males and females, 18 years of age or older, diagnosed with schizophrenia, treated as inpatients in a general psychiatric hospital or in a maximum-security forensic psychiatric hospital.	None stated.	Committed homicide.	ICD-10.	None stated.	Schizophrenia.	<sup>261</sup>
Iancu (2010)	Males, 18 years of age or older, diagnosed with schizophrenia, treated as inpatients in a mental health clinic.	Females.	Total scores on the OAS.	DSM-IV.	SCID.	Schizophrenia.	<sup>260</sup>
Krakowski (1989)	Males and females, 18 years of age or older, diagnosed with schizophrenia, treated as inpatients on a regular ward of a psychiatric hospital or on a ward specially designed for the management of violent patients.	Those who were too ill or too violent to comply with the study procedure, or those who refused consent.	Two or more incidents of assault against objects or others or verbal threats to kill others during the month prior to study enrolment which were judged to be so serious they necessitated transfer to a special ward designed for the management of violent patients.	DSM-III.	None stated.	Schizophrenia.	<sup>227</sup>
Krakowski (1999)	Males and females, between 18 and 55 years of age, diagnosed with schizophrenia or schizoaffective disorder, treated as inpatients in one of two psychiatric hospitals.	Those diagnosed with any systemic disease (e.g. pulmonary or cardiovascular diseases).	At least one incident of physical assault in the first two months of admission followed by another physical assault during a four week survey period. Assault included: striking, kicking, pushing or scratching another person.	DSM-III-R.	SCID.	Schizophrenia, schizoaffective disorder	<sup>228</sup>
Krakowski (2004)	Males and females, between 18 and 55 years of age, diagnosed with schizophrenia, schizoaffective, or bipolar disorder, treated as inpatients in one of two psychiatric hospitals.	Those diagnosed with a neurological illness or mental retardation.	At least one incident of physical assault in the first two months of admission. Assault included: striking, kicking, pushing, or scratching another person.	DSM-III-R.	SCID.	Schizophrenia, schizoaffective disorder, or bipolar disorder	<sup>229</sup>
Krakowski (2004)	Males and females, between 18 and 55 years of age, diagnosed with schizophrenia, schizoaffective or bipolar disorder, treated as inpatients in one of two psychiatric hospitals.	Those who refused consent to participate.	At least one incident of physical assault in the first two months of admission. Assault included: striking, kicking, pushing or scratching another person.	DSM-III-R.	SCID.	Schizophrenia, schizoaffective disorder, or bipolar disorder	<sup>230</sup>

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First Author & Year of Publication	Inclusion Criteria	Exclusion Criteria	Definition of Violence	Diagnostic Information			Reference
				Criteria	Screen	Diagnosis	
Krakowski (2006)	Males and females, between 18 and 60 years of age, diagnosed with schizophrenia or schizoaffective disorder, treated as inpatients within a psychiatric hospital, committed at least one physical assault against another person during the current inpatient admission, a lifetime history of physical assault prior to study enrolment, participating in a randomised controlled trial of clozapine, olanzapine or haloperidol.	Those hospitalised for more than one year, a history of non-response to clozapine, olanzapine or haloperidol, a history of clozapine, olanzapine, or haloperidol intolerance, those currently receiving contra-indicated medications, and those who received any depot antipsychotic in 30 days prior to study enrolment.	Scores on the physical aggression sub-scale of the MOAS.	DSM-IV.	None stated.	Schizophrenia, schizoaffective disorder	<sup>231</sup>
Kumari (2006)	Males, between 18 and 55 years of age, diagnosed with schizophrenia, treated as inpatients or outpatients, or incarcerated in a forensic psychiatric hospital or unit.	Females, left handers, those who abused substances prior to study enrolment, diagnosed with comorbid ASPD, have a history of neurological conditions or head injury, and those whose first language is not English.	A recent incident of violence which scored four or more on the GRSV; indicative of a fatal or near-fatal assault.	DSM-IV.	SCID.	Schizophrenia.	<sup>252</sup>
Kumari (2009)	Males, between 18 and 55 years of age, diagnosed with schizophrenia, treated as inpatients or outpatients, or incarcerated in a forensic psychiatric hospital or unit.	Females, left handers, those who abused substances prior to study enrolment, diagnosed with comorbid ASPD, a history of neurological conditions or head injury, and those whose first language is not English.	A recent incident of violence which scored four or more on the GRSV; indicative of a fatal or near-fatal assault	DSM.	SCID.	Schizophrenia.	<sup>254</sup>
Kumari (2009)	Males, between 18 and 55 years of age, diagnosed with schizophrenia, treated inpatients or outpatients, or incarcerated in a forensic psychiatric hospital or unit.	Females, left handers, those who abused substances prior to study enrolment, diagnosed with comorbid ASPD, a history of neurological conditions or head injury, and those whose first language is not English.	A recent incident of violence which scored four or more on the GRSV; indicative of a fatal or near-fatal assault.	DSM.	SCID.	Schizophrenia.	<sup>253</sup>
Lachman (1998)	Males and females, 18 years of age or older, diagnosed with schizophrenia or schizoaffective disorder, treated as inpatients within one of two psychiatric centres.	Those with a lifetime history of only one prior assault, those who use aggressive gestures only, or those who use verbally threatening behaviour only.	A lifetime history of multiple physical assaults against others. Physical assaults included: hitting, kicking, slapping, biting, choking, using a weapon, or threatening behaviour.	DSM-IV.	None stated.	Schizophrenia, schizoaffective disorder.	<sup>232</sup>
Lafayette (2003)	Males and females, 18 years of age or older, diagnosed with schizophrenia or schizoaffective disorder, treated as outpatients within a mental health clinic.	None stated.	A history of at least one arrest for any of the following offences: murder, rape, robbery, or aggravated assault.	DSM-IV.	SCID.	Schizophrenia, schizoaffective disorder.	<sup>233</sup>

Table continued over ...

First Author & Year of Publication	Inclusion Criteria	Exclusion Criteria	Definition of Violence	Diagnostic Information			Reference
				Criteria	Screen	Diagnosis	
Lincoln (2008)	Males and females, 18 years of age or older, diagnosed with schizophrenia, recently discharged from one of four general or forensic psychiatric hospitals, and followed in the community.	None stated.	At least one incident of the following behaviours during the two year follow-up period: throwing objects at others, pushing, shoving, grabbing, slapping, kicking, biting, choking or hitting another, rape, or using a weapon in a threatening manner.	DSM-IV.	SCID.	Schizophrenia.	<sup>321</sup>
Lysaker (2002)	Males, 18 years of age or older, diagnosed with schizophrenia or schizoaffective disorder, treated as outpatients, and in a stable phase of illness.	Females, those diagnosed with an organic brain syndrome, or with a history of mental retardation.	High scores on either the assault or verbal subscale of the Buss-Durkee Hostility Inventory (BDHI, <sup>325</sup> ); indicative of high levels of hostile behaviour expressed directly through violent actions or indirectly through violent verbal threats.	DSM-IV.	SCID.	Schizophrenia, schizoaffective disorder	<sup>234</sup>
Maguire (1997)	Males and females, 18 years of age or older, diagnosed with schizophrenia, treated as inpatients within a rehabilitation ward.	Those not currently stabilised on medication, not currently experiencing at least one positive symptom, with a current diagnosis of substance abuse, a history of head injury or intellectual impairment, and those unable to communicate effectively in English.	Two or more incidents of physical aggression towards objects or others during a ward survey conducted prior to study enrolment, and at least one incident of physical aggression towards objects or others each month between the conclusion of this ward survey and the commencement of the study.	DSM-III-R.	SCID.	Schizophrenia.	<sup>271</sup>
Majorek (2009)	Males and females, 18 years of age or older, diagnosed with schizophrenia, treated as inpatients in regular psychiatric hospitals, or incarcerated in a high-security forensic psychiatric hospital.	None stated.	Convicted or awaiting trial for any violent offence, including: robbery, arson, unlawful coercion, assault, sexual offences, assault occasioning severe bodily harm, and/or manslaughter.	DSM-IV.	None stated.	Schizophrenia.	<sup>290</sup>
Martínez-Martín (2011)	Males and females, 18 years of age or older, diagnosed with schizophrenia, treated as outpatients in any publically funded mental health centre, in a stable phase of illness, and prescribed at least one second-generation antipsychotic medication for a minimum of three months prior to study enrolment.	Those without a medical history at the clinic, and those who either refused or withdrew consent to participate.	At least one incident of aggression in the week prior to study enrolment which scored at least three on all four subscales of the MOAS.	DSM-IV.	None stated.	Schizophrenia.	<sup>280</sup>
Milton (2001)	Males and females, between 16 and 64 years of age, diagnosed with a first-episode of any psychotic illness, making first contact with a community-based psychiatric clinic, and followed-up for in the community.	Those diagnosed with an organic psychosis, or those who withdrew consent for participation.	At least one incident of aggression during the follow-up period, including: use of a weapon, threatening another with a weapon in hand, sexual assault, and any assault which caused harm to the victim at any point post-presentation.	ICD-10.	RDC.	First-episode psychosis.	<sup>255</sup>

Table continued over ...

First Author & Year of Publication	Inclusion Criteria	Exclusion Criteria	Definition of Violence	Diagnostic Information			Reference
				Criteria	Screen	Diagnosis	
Mitchell (2011)	Males and females, between 18 and 64 years of age, diagnosed with schizophrenia, schizoaffective disorder, psychosis NOS, or delusional disorder, treated as outpatients by a community mental health team, a forensic community mental health team, or, incarcerated in a medium- or low-security forensic psychiatric hospital.	Those acutely psychotic, diagnosed with an autistic-spectrum disorder or another learning disability, those with a history of organic or acquired brain injury, those whose first language is not English.	A history of violence against others which would present a significant risk of injury to the victim.	None stated.	None stated.	Schizophrenia, schizoaffective disorder, psychosis NOS, delusional disorder	<sup>256</sup>
Modai (2000)	Males and females, 18 years of age and older, diagnosed with schizophrenia, treated as inpatients.	Those prescribed antidepressants, atypical antipsychotics, lithium, or aspirin within three months prior to study enrolment, and those diagnosed with a major physical illness, drug dependency, epilepsy, or an organic brain disorder.	At least one incident of aggressive behaviour in the six months preceding study enrolment.	DSM-IV.	None stated.	Schizophrenia.	<sup>262</sup>
Monahan (2000)	Males and females, between 18 and 40 years of age, of white ethnicity, diagnosed with schizophrenia, recently discharged from in one of three acute inpatient psychiatric hospitals, and followed in the community.	Those unable to communicate effectively in English, and those of non-white ethnicity.	At least one incident of battery, sexual assault, use of a weapon, and threats made with a weapon in the 20 week follow-up period.	DSM-III-R.	None Stated.	Schizophrenia.	<sup>235</sup>
Munkner (2005)	Males and females, 15 years of age or older, born on or after 1 November, 1963, diagnosed with schizophrenia, treated as inpatients or outpatients, and followed in the community.	Those who died during the follow-up period, and those admitted to a psychiatric hospital before the age of 15.	Convicted for a violent offence, including: homicide, attempted homicide, aggravated assault, common assault, illegal threats, arson, rape, attempted rape, other sexual offences, robbery, and any other violent interpersonal offence. This conviction must have post-dated diagnosis for schizophrenia.	ICD-8, ICD-10	None stated.	Schizophrenia.	<sup>307</sup>
Nederlof (2011)	Males and females, between 19 and 51 years of age, diagnosed with schizophrenia, schizoaffective disorder, delusional disorder, or psychosis NOS, treated as inpatients within one of three psychiatric hospitals.	Those diagnosed with a comorbid axis I or II disorder, currently suffering from cognitive distortions, or receiving tranquilising medications capable of distorting alertness and attention.	Total scores on the Aggression Questionnaire (AQ; <sup>694</sup> ).	DSM-IV.	SCID-I/P.	Schizophrenia, schizoaffective disorder, delusional disorder, or psychosis NOS	<sup>316</sup>
Nolan (1999)	Males and females, 18 years of age or older, of white ethnicity, diagnosed with schizophrenia or schizoaffective disorder, treated as inpatients at one of two psychiatric centres.	Those of non-white ethnicity, who were violent only whilst acutely psychotic, or who had not been violent during the one year preceding study enrolment.	At least two assaults against others as documented in medical records, admission or discharge summaries, or in RAP sheets.	DSM-IV.	None stated.	Schizophrenia, schizoaffective disorder	<sup>236</sup>

Table continued over ...

First Author & Year of Publication	Inclusion Criteria	Exclusion Criteria	Definition of Violence	Diagnostic Information			Reference
				Criteria	Screen	Diagnosis	
Nolan (2000)	Males and females, 18 years of age or older, of white ethnicity, diagnosed with schizophrenia or schizoaffective disorder, treated as inpatients at one of four psychiatric centres.	Those of non-white ethnicity, who were violent only whilst acutely psychotic, or who had not been violent during the one year preceding study enrolment, and those without at least one psychiatric inpatient admission preceding study enrolment.	At least two assaults against others as documented in medical records, admission or discharge summaries, or in RAP sheets.	DSM-IV.	None stated.	Schizophrenia, schizoaffective disorder	<sup>237</sup>
Nolan (2005)	Males and females, between 18 and 60 years of age, diagnosed with schizophrenia or schizoaffective disorder, treated as inpatients at one of four state psychiatric facilities, scoring at least 60 on the PANSS, with persistent positive symptoms of psychosis despite six consecutive weeks of treatment with at least one conventional antipsychotic medication at 600mg chlorpromazine equivalent dosage levels evidenced by a lack of functional recovery (indicated by a lack of employment, education, or significant relationships outside the family) in the two years prior to study enrolment.	None stated.	At least one incident of aggression during the 14 week follow-up period as recorded on the OAS.	DSM-IV.	None stated.	Schizophrenia, schizoaffective disorder	<sup>220</sup>
Oldemeyer (2009)	Males, 18 years of age and older, diagnosed with schizophrenia, schizoaffective disorder, psychosis NOS, or bipolar disorder, incarcerated for a non-violent or violent offence	Females.	Convicted of arson, assault, kidnapping, rape, other sexual assaults, or murder.	DSM-IV.	None stated.	Schizophrenia, schizoaffective disorder, psychosis NOS, or bipolar disorder	<sup>238</sup>
Ran (2010)	Males and females, 15 years of age and older, diagnosed with schizophrenia, followed in the community.	None stated.	At least one incident of violent property damage, arson, sexual assaults, physical assaults or murder during the 10 year follow-up period.	ICD-10.	PSE-9.	Schizophrenia.	<sup>287</sup>
Räsänen (1998)	Males, born in 1966, living in Finland until at least 16 years of age, diagnosed with schizophrenia, schizophreniform disorder, schizoaffective disorder, delusional disorder, schizoid or schizotypal personality disorder.	Females, or those who emigrated from Finland before 16 years of age.	Convicted of homicide, assault, robbery, arson or violation of the peace before 27 years of age.	DSM-III-R.	OPCRIT.	Schizophrenia, schizophreniform disorder, schizoaffective disorder, delusional disorder, schizoid, or schizotypal personality disorder.	<sup>85</sup>

Table continued over ...

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				Criteria	Screen	Diagnosis	
Rasmussen (1995)	Males, between 20 and 45 years of age, diagnosed with schizophrenia, treated as inpatients or outpatients within a general psychiatric hospital, or as inpatients within a special psychiatric unit for violent and aggressive patients.	Females, those who were too ill to comply with the assessment procedure.	At least one incident of violence or aggression which necessitated admission to a special unit for the management of violent or aggressive patients.	DSM-III.	None stated.	Schizophrenia.	<sup>312</sup>
Ritsner (2003)	Males and females, between 20 and 57 years of age, diagnosed with schizophrenia, treated as inpatients within a general psychiatric institution.	Those prescribed antidepressants, mood stabilisers, or benzodiazepines within three months prior to study enrolment, those suffering from any major physical illness, with a lifetime history of drug or alcohol abuse, a lifetime history of epilepsy, or a lifetime history of an organic brain syndrome.	At least four incidents of physical aggression over the two months prior to study enrolment.	DSM-IV.	SCID.	Schizophrenia.	<sup>263</sup>
Roy (1987)	Males, between 25 and 44 years of age, diagnosed with schizophrenia, treated as inpatients, resistant to antipsychotic treatment with at least three different antipsychotic medications (at least one being a typical antipsychotic and one being an atypical antipsychotic); defined as a failure to demonstrate improvement in symptoms for a minimum period of six weeks over a two-and-a-half years prior to study enrolment, currently prescribed a fixed dose of haloperidol three times daily.	Females.	Score of three or greater on LSIV.	DSM-III.	None stated.	Schizophrenia.	<sup>239</sup>
Sarne (1995)	Males and females, 18 years of age or older, diagnosed with schizophrenia, treated as inpatients.	Those prescribed antidepressants, lithium or benzodiazepines.	At least one incident of hostile behaviour both during the current admission period and during previous inpatient admissions as recorded in the participants' medical records.	DSM-III.	None stated.	Schizophrenia.	<sup>264</sup>
Schanda (1992)	Males, 18 years of age or older, diagnosed with schizophrenia, treated as inpatients within an urban or rural general psychiatric hospital, or incarcerated in a secure hospital for mentally ill offenders.	Females.	Convicted of murder, attempted murder, severe bodily injury, compulsion, illegal threats, robbery, sexual delinquency, or arson.	ICD-9.	None stated.	Schizophrenia.	<sup>298</sup>

Table continued over ...

First Author & Year of Publication	Inclusion Criteria	Exclusion Criteria	Definition of Violence	Diagnostic Information			Reference
				Criteria	Screen	Diagnosis	
Schug (2010)	Males and females, 18 years of age and older, diagnosed with schizophrenia, acute transient psychosis with paranoid features, acute transient psychosis with a schizophrenia-like psychosis, or another schizophrenia-like psychosis, treated as inpatients within a general hospital, or detained in a forensic psychiatric unit.	None stated.	Accused of homicide.	DSM-IV.	None Stated.	Schizophrenia-spectrum psychoses.	<sup>288</sup>
Serper (2008)	Males and females, between 18 and 65 years of age, diagnosed with schizophrenia, schizoaffective disorder, or bipolar disorder, treated as inpatients within one of six acute inpatient psychiatric units within 72 hours of admission, admission preceded by an acute exacerbation of illness.	Those diagnosed with mental retardation, dementia, HIV, any disorder of the central nervous system, a developmental disorder, or any other disorder which may affect cognitive functioning, those with a lifetime history of head trauma, and whose reading ability is below the sixth-grade level.	Scores on the Retrospective Overt Aggression Scale (ROAS; <sup>695</sup> ).	DSM-IV.	SCID.	Schizophrenia, schizoaffective disorder, or bipolar disorder	<sup>240</sup>
Silver (2005)	Males, 18 years of age or older, diagnosed with schizophrenia or schizoaffective disorder, treated as inpatients within a regular ward of a general psychiatric hospital or in a maximum security ward of the same hospital for at least six months prior to study enrolment.	Females, those with a duration of illness of less than two years, diagnosed with comorbid major depression, a lifetime history of brain damage, and those who abused drugs or alcohol during the six months prior to study enrolment.	Convicted of murder, rape, or recurrent acts of violence against others (e.g. robbery, assault) and whose behaviour during admission was so violent it necessitated transfer to a maximum security ward specialising in the management of violent patients.	DSM-IV.	None stated.	Schizophrenia, schizoaffective disorder.	<sup>265</sup>
Song (2009)	Males and females, between 18 and 60 years of age, diagnosed with schizophrenia, schizoaffective disorder, or schizophreniform disorder, treated as inpatients or outpatients within a general medical centre.	Those younger than 18 or older than 60 years of age, diagnosed with an axis I psychiatric disorder other than schizophrenia, with an IQ score of less than 70, and those unable to complete the test battery for other reasons.	Scores on the MOAS.	DSM-IV.	SCID.	Schizophrenia, schizoaffective disorder, or schizophreniform disorder.	<sup>276</sup>
Soyka (2007)	Males and females, 18 years of age or older, diagnosed with schizophrenia, previously treated as inpatients within a university psychiatric hospital, currently living in the community.	None stated.	Convicted for any violent offence, including: assault, aggravated assault, aggravated battery, illegal threats, invasion, sexual abuse of a minor, robbery, attempted manslaughter, illegal restraint, involuntary manslaughter, manslaughter, murder, sexual assault, rape, and use of a weapon during the 12 year follow-up period.	ICD-9.	None stated.	Schizophrenia.	<sup>291</sup>

Table continued over ...

First Author & Year of Publication	Participant Inclusion Criteria	Participant Exclusion Criteria	Definition of Violence	Diagnostic Information			Reference
				Criteria	Screen	Diagnosis	
Spidel (2010)	Males and females, 18 years of age or older, diagnosed with a schizophrenia-spectrum psychosis or bipolar disorder, treated as outpatients by one of two specialist first-episode psychosis services, with a psychosis onset less of than two years prior to study enrolment, and currently living in the community.	Those with an intellectual disability, diagnosed with an organic disorder, or with drug induced psychosis.	A lifetime history of physically aggressive behaviour as recorded on the physical aggression subscale of the MOAS.	DSM-IV.	None stated.	Schizophrenia, Schizoaffective disorder, psychosis NOS, or bipolar disorder	<sup>305</sup>
Steinert (1996)	Males and females, 18 years of age or older, diagnosed with schizophrenia, treated as inpatients within a state psychiatric hospital.	Those with a history of aggressive behaviour during previous psychiatric inpatient admissions (non-violent group only).	At least one incident of aggression during current admission to the acute psychiatric reception ward as recorded on the OAS.	ICD-10.	None stated.	Schizophrenia.	<sup>292</sup>
Stompe (2004)	Males, 18 years of age or older, diagnosed with schizophrenia, treated as inpatients within a university psychiatric clinic, or incarcerated in a high-security forensic psychiatric facility.	Females, those with a lifetime history of conviction for a violent offence (non-violent group only), or whose medical records indicated incidents of aggression or violence prior to study enrolment (non-violent group only).	Found not guilty by reason of insanity for any violent offence, including: sexual offences, robbery, compulsion using a weapon, severe property damage, causing severe bodily harm, arson, murder and attempted murder.	DSM-IV.	None stated.	Schizophrenia.	<sup>299</sup>
Stompe (2006)	Males, between 18 and 62 years of age, diagnosed with schizophrenia, treated as inpatients in a University psychiatric clinic or rehabilitation clinic, or incarcerated in a high-security forensic psychiatric facility.	Females, those with a lifetime history of conviction for a violent offence (non-violent group only), or whose medical records indicated incidents of aggression or violence prior to study enrolment (non-violent group only).	Found not guilty by reason of insanity for any violent offence, including: sexual offences, robbery, compulsion using a weapon, severe property damage, causing severe bodily harm, arson, murder and attempted murder.	DSM-III.	SCID-I.	Schizophrenia.	<sup>300</sup>
Swanson (2000)	Males and females, 18 years of age and older, diagnosed with a major mental illness (96% met criteria for schizophrenia, schizoaffective disorder, another psychotic disorder, or bipolar disorder), duration of illness of at least one year preceding study enrolment, experiencing significant functional impairment in daily living, received intensive case management at any point during the two years preceding study enrolment, and court-ordered to undergo a period of involuntary outpatient commitment upon discharge.	None stated.	At least one incident of being cautioned by police or arrested for a violent offence, including: assault, physical fights, or making threats with a weapon in hand as reported by either the self or a collateral informant during the one year follow-up period.	DSM.	None stated.	96% diagnosed with a psychotic spectrum disorder.	<sup>241</sup>
Swanson (2002)	Males and females, 18 years of age or older, diagnosed with schizophrenia or schizoaffective disorder, treated as inpatients or outpatients within publicly funded mental health facilities in one of four states of the USA.	None stated.	At least one incident of fighting, assault occasioning bodily injury, use of a weapon to threaten or harm others, and any sexual assault during the one year preceding study enrolment.	DSM-IV.	None stated.	Schizophrenia, schizoaffective disorder	<sup>218</sup>

Table continued over ...

First Author & Year of Publication	Participant Inclusion Criteria	Participant Exclusion Criteria	Definition of Violence	Diagnostic Information			Reference
				Criteria	Screen	Diagnosis	
Swanson (2004)	Males and females, 18 years of age or older, diagnosed with schizophrenia, schizoaffective disorder, or schizophreniform disorder, treated as outpatients within the community.	Those unable to provide informed consent, or who had participated in another clinical trial within 30 days prior to study enrolment.	At least one incident of assault or battery (e.g. hitting, shoving, kicking or biting) against another person as reported by either the self, or, as recorded in medical records or arrest records.	DSM-IV.	None stated.	Schizophrenia, schizoaffective disorder, or schizophreniform disorder	<sup>216</sup>
Swanson (2006)	Males and females, between 18 and 65 years of age, diagnosed with any major psychosis-spectrum disorder, treated as outpatients within any publically funded mental health facility, onset of psychosis at least six months prior to enrolment.	Those treated for an SUD only, and those unable to speak English or Spanish.	At least one incident of violence, including: assault (regardless of whether the assault caused injury to the victim), use of a weapon, use of a weapon which caused injury to the victim, threats with a weapon in hand, or sexual assault.	DSM-IV	None stated	Psychosis-spectrum disorders	<sup>217</sup>
Swanson (2006)	Males and females, between 18 and 65 years of age, diagnosed with schizophrenia, treated as inpatients or outpatients at one of 57 clinical sites located throughout the USA.	Those diagnosed with first-episode psychosis, with mental retardation, developmental or neurodegenerative disorders, another general medical condition; particularly cardiac conditions, those with a lifetime history of serious adverse reactions to any antipsychotic medication, a failure to respond to any antipsychotic medication, with treatment resistant psychosis, stabilised on depot antipsychotic medications, with a contraindication to any antipsychotic medication, and women who are pregnant or breast-feeding.	At least one incident of violence, including: assault (regardless of the level of injury caused to the victim), use of a weapon, use of a weapon which caused injury to the victim, threats made with a weapon in hand, or sexual assault.	DSM-IV.	SCID.	Schizophrenia.	<sup>215</sup>
Swanson (2008)	Males and females, between 18 and 65 years of age, diagnosed with schizophrenia, treated as inpatients or outpatients at one of 57 clinical sites located throughout the USA.	Those diagnosed with first-episode psychosis, with mental retardation, developmental or neurodegenerative disorders, another general medical condition; particularly cardiac conditions, those with a lifetime history of serious adverse reactions to any antipsychotic medication, a failure to respond to any antipsychotic medication, with treatment resistant psychosis, stabilised on depot antipsychotic medications, with a contraindication to any antipsychotic medication, and women who are pregnant or breast-feeding.	At least one incident of violence, including: assault (regardless of the level of injury caused to the victim), use of a weapon, use of a weapon which caused injury to the victim, threats made with a weapon in hand, or sexual assault.	DSM-IV.	SCID-I/P.	Schizophrenia.	<sup>242</sup>

Table continued over ...

First Author & Year of Publication	Inclusion Criteria	Exclusion Criteria	Definition of Violence	Diagnostic Information			Reference
				Criteria	Screen	Diagnosis	
Teixeria (2009)	Males, 18 years of age or older, diagnosed with a schizophrenia-spectrum disorder with prominent delusional ideas for a minimum of 5 but less than 20 years, treated as inpatients within one of two general psychiatric wards in a university psychiatric hospital, a general psychiatric hospital, or incarcerated in a high security forensic psychiatric hospital.	Females, those whose delusional ideas resolve following treatment with any antipsychotic medication, diagnosed with substance-induced psychosis or a brief psychotic episode, those diagnosed with a schizophrenia-spectrum disorder for less than 5 or greater than 20 years, with a lifetime history of head injury, brain damage or mental retardation, whose violent crime was not directly motivated by their delusional ideas (violent group only), and those who had previously committed violent offences (non-violent group only).	Found not guilty by reason of insanity of any violent offence including: offences which resulted in death (e.g. murder, manslaughter), offences which caused severe bodily harm (e.g. rape, assault), or, offences of repeated threat of harm (e.g. robbery).	DSM-IV, ICD-10.	None stated.	Schizophrenia-spectrum disorders with prominent delusional ideas.	<sup>304</sup>
Thomas (2005)	Males and females, between 18 and 65 years of age, hospitalised on at least two separate occasions for psychotic symptoms, diagnosed with schizophrenia, schizoaffective disorder, affective psychosis, psychosis NOS, or bipolar disorder.	Those diagnosed with an organic brain disorder, or with a lifetime history of substance misuse.	At least one incident of physical assault during the two year follow-up period.	ICD-10.	OPCRIT.	Schizophrenia, schizoaffective disorder, affective psychosis, psychosis NOS, bipolar disorder.	<sup>257</sup>
Tripathi (2010)	Males, between 18 and 50 years of age, diagnosed with schizophrenia, treated as inpatients within a general psychiatric facility, or incarcerated in jail.	Females, those with a diagnosis other than schizophrenia, with organic pathology, a lifetime history of head injury, seizures, mental retardation, substance abuse, or formal thought disorder, those unable to communicate effectively due to, for example, a tendency towards incoherent speech, and those with less than a seventh grade education.	Convicted of murder, attempted murder, assault, rape, or theft.	ICD-10.	RDC.	Schizophrenia.	<sup>309</sup>
Tuninger (2001)	Males and females, between 18 and 75 years of age, diagnosed with a major mental illness (98% were diagnosed with a psychosis-spectrum disorder), treated as inpatients within a psychiatric ward.	None stated.	At least one violent offence as recorded in a Government register of criminality.	ICD-9.	SCID.	98% were diagnosed with a psychosis-spectrum disorder.	<sup>285</sup>
Turkoglu (2009)	Males, between 19 and 59 years of age, diagnosed with schizophrenia, treated as inpatients within a general psychiatric hospital.	Females.	Convicted of any violent offence, including: homicide, wounding, property damage, assault, battery and robbery.	DSM-IV.	None stated.	Schizophrenia.	<sup>303</sup>

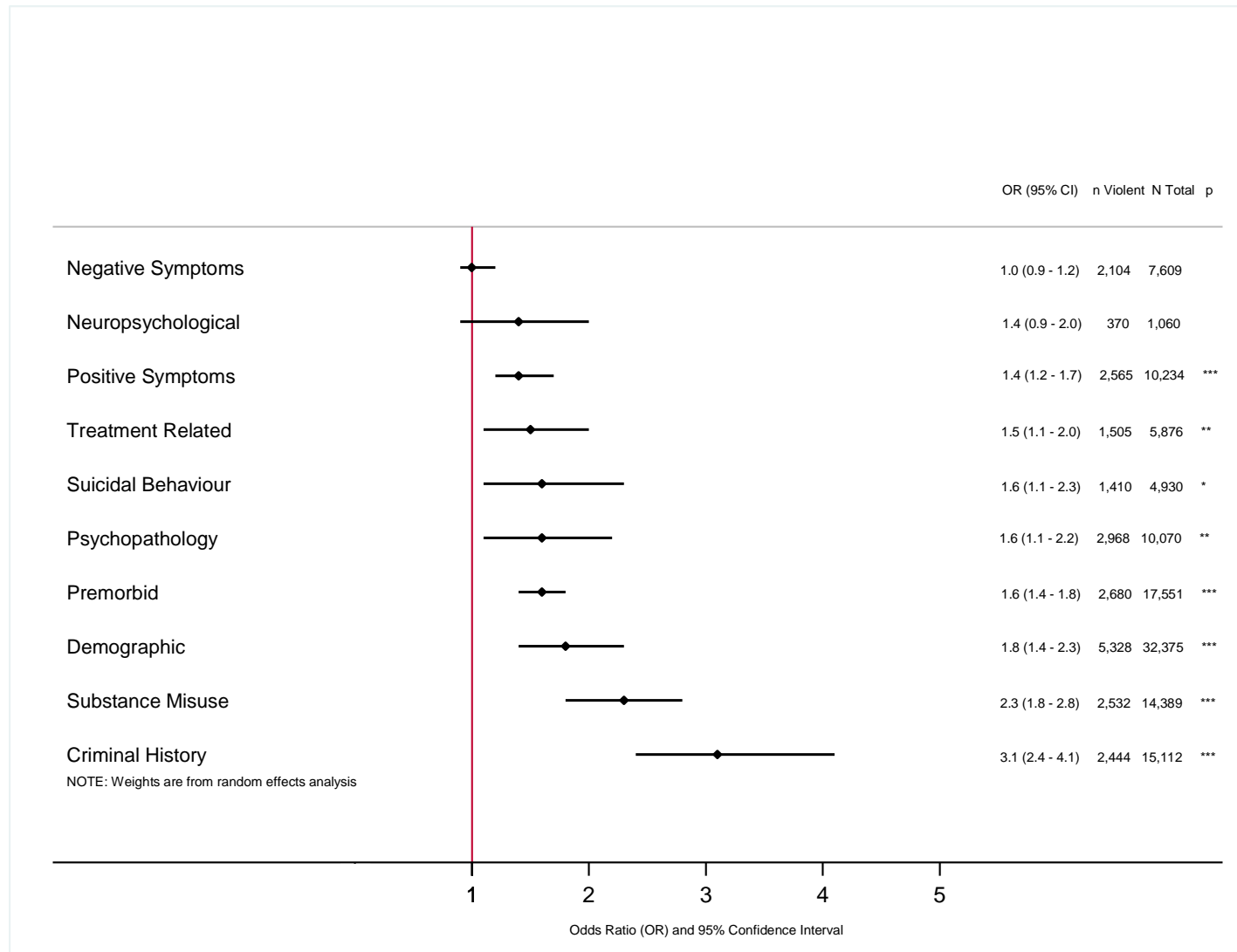
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First Author & Year of Publication	Inclusion Criteria	Exclusion Criteria	Definition of Violence	Diagnostic Information			Reference
				Criteria	Screen	Diagnosis	
Valevski (1999)	Males and females, 18 years of age or older, diagnosed with schizophrenia, treated as inpatients within a general psychiatric facility, or incarcerated in a high-security forensic psychiatric facility for severely violent psychiatric patients.	None stated.	Found not guilty by reason of insanity for homicide.	DSM-IV.	None stated.	Schizophrenia.	<sup>266</sup>
Verma (2005)	Males and females, between 15 and 40 years of age, diagnosed with a first-episode psychosis, currently experiencing acute psychotic symptoms, treated as inpatients or outpatients within a specialist first-episode psychosis service.	Those diagnosed with major medical or neurological illnesses, currently misusing substances, and those who have received treatment with antipsychotic medications prior to study enrolment.	At least one incident of aggression prior to study enrolment scoring two or more on the MACVI; indicative of weapon use, threats made with a weapon in hand, sexual assault or any other act occasioning bodily injury.	DSM-IV.	SCID-I.	95% were diagnosed with schizophrenia, brief psychotic disorder, delusional disorder or psychosis NOS.	<sup>313</sup>
Veveva (2005)	Males and females, 18 years of age or older, diagnosed with schizophrenia, treated as inpatients within an inpatient unit in a university psychiatric hospital.	Those diagnosed with a psychiatric illness other than schizophrenia, and those of a non-white ethnicity.	At least one incident of physical or verbal aggression scoring three or more on the MOAS; indicative of physical aggression against another person, or verbal aggression accompanied by threats made with a weapon in hand.	DSM-IV.	None stated.	Schizophrenia.	<sup>306</sup>
Volavka (1997)	Males and females, between 15 and 54 years of age, diagnosed with schizophrenia, experienced acute psychotic symptoms for at least 12 months prior to enrolment, making first contact to psychiatric services.	Those who have resided in the catchment area of their local psychiatric service for less than six months prior to enrolment, who have not suffered from psychotic symptoms, or have a diagnosis other than for schizophrenia.	An affirmative answer to the Psychiatric and Personal History Schedule (PPHS; <sup>696</sup> ) item: "Did you at any point in the past assault another person physically?"	ICD-10.	None stated.	Schizophrenia.	<sup>322</sup>
Wootton (2008)	Males and females, between 18 and 65 years of age, hospitalised on at least two separate occasions for psychotic symptoms, diagnosed with schizophrenia, schizoaffective disorder, affective psychosis, psychosis NOS, or bipolar disorder.	Those diagnosed with an organic brain disorder, or with a lifetime history of substance misuse.	At least one incident of actual physical assault over the two year follow-up period as revealed by self-report, case-note review, from case managers' reports, or from criminal records.	ICD-10.	RDC.	Schizophrenia, schizoaffective disorder, affective psychosis, psychosis NOS, bipolar disorder.	<sup>219</sup>
Yang (2010)	Males and females, 18 years of age or older, diagnosed with schizophrenia, treated as inpatients within a general hospital, or incarcerated in a forensic psychiatric unit.	None stated.	Accused of homicide.	DSM-IV.	None stated.	Schizophrenia.	<sup>289</sup>
Yen (2002)	Males and females, 18 years of age or older, diagnosed with schizophrenia, treated as outpatients within a medical centre, or general psychiatric hospital, and currently in remission or with minimal residual psychosis symptoms as indicated by a score of 60 or less on the PANSS.	Those with comorbid mental retardation, SUD, or an organic mental disorder.	Total scores on the violence subscale of the Violence and Suicide Assessment Scale (VSAS; <sup>697</sup> ) over the one year follow-up period.	DSM-IV.	None stated.	Schizophrenia.	<sup>315</sup>

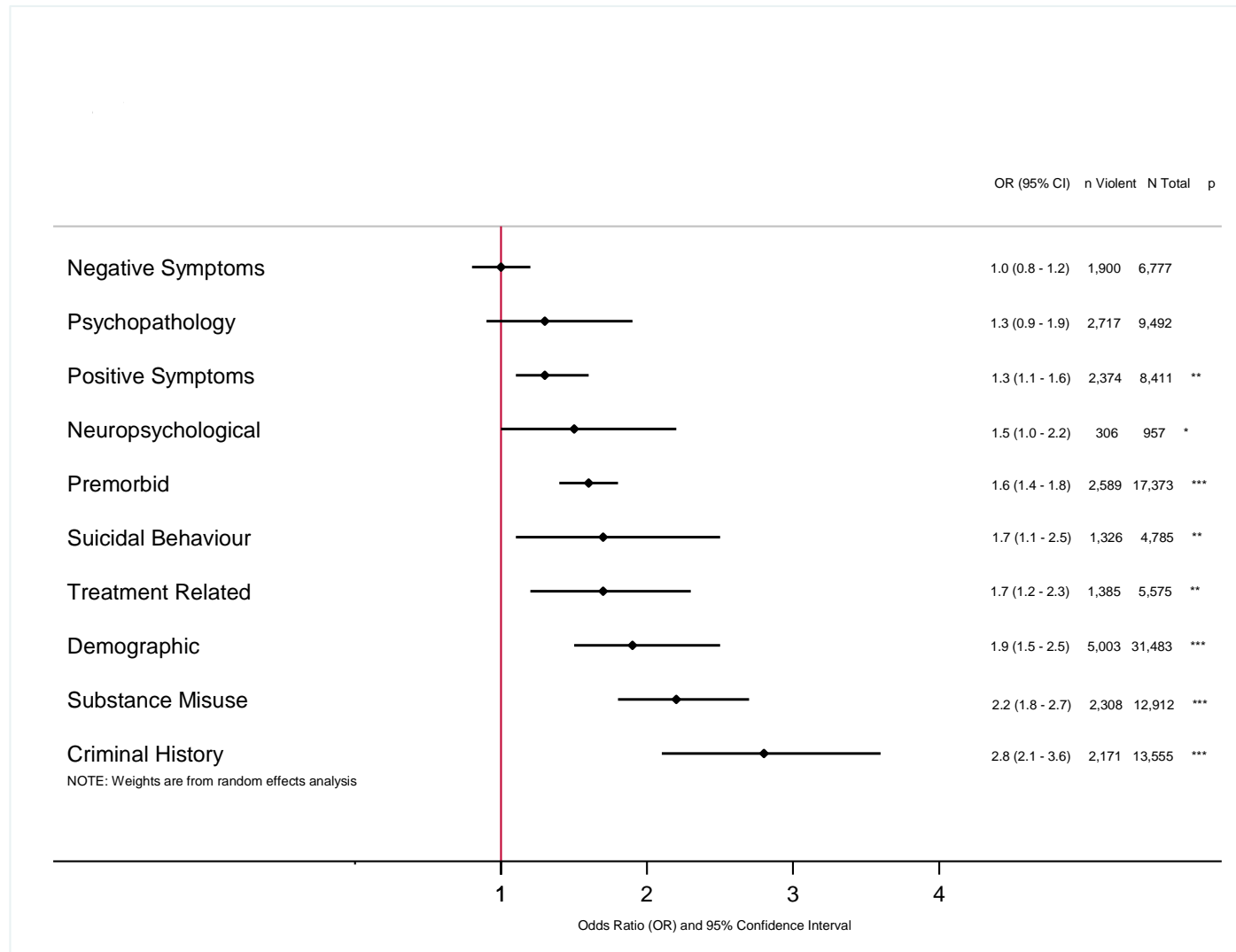
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First Author & Year of Publication	Inclusion Criteria	Exclusion Criteria	Definition of Violence	Diagnostic Information			Reference
				Criteria	Screen	Diagnosis	
Yesavage (1983)	Males, between 19 and 68 years of age, diagnosed with schizophrenia or schizo-affective disorder, involuntarily admitted for inpatient treatment, and treated within in a psychiatric intensive care unit.	Females.	At least one incident of assault-related behaviour observed for up to seven days post-admission, scored according to a modified version of LSIV.	DSM-III.	None stated.	Schizophrenia, schizo-affective disorder	<sup>244</sup>
Yesavage (1984)	Males, between 19 and 68 years of age, diagnosed with schizophrenia or schizo-affective disorder, involuntarily admitted for inpatient treatment, and treated within in a psychiatric intensive care unit.	Females.	At least one incident of assaultive behaviour in the seven days post-admission which necessitated either seclusion or use of four-point restraints. Severity was scored according to a modified version of LSIV.	DSM-III.	None stated.	Schizophrenia.	<sup>243</sup>
Zoghes (1988)	Males, between 18 and 65 years of age, diagnosed with schizophrenia, treated as inpatients within one of two psychiatric clinics in a publicly funded psychiatric hospital, or incarcerated in a "prisoner's unit" within a publicly funded psychiatric hospital.	Females, those who are illiterate, foreign born, or who were diagnosed with a central nervous system disease.	Committed murder or attempted murder.	DSM-III.	None stated.	Schizophrenia.	<sup>308</sup>

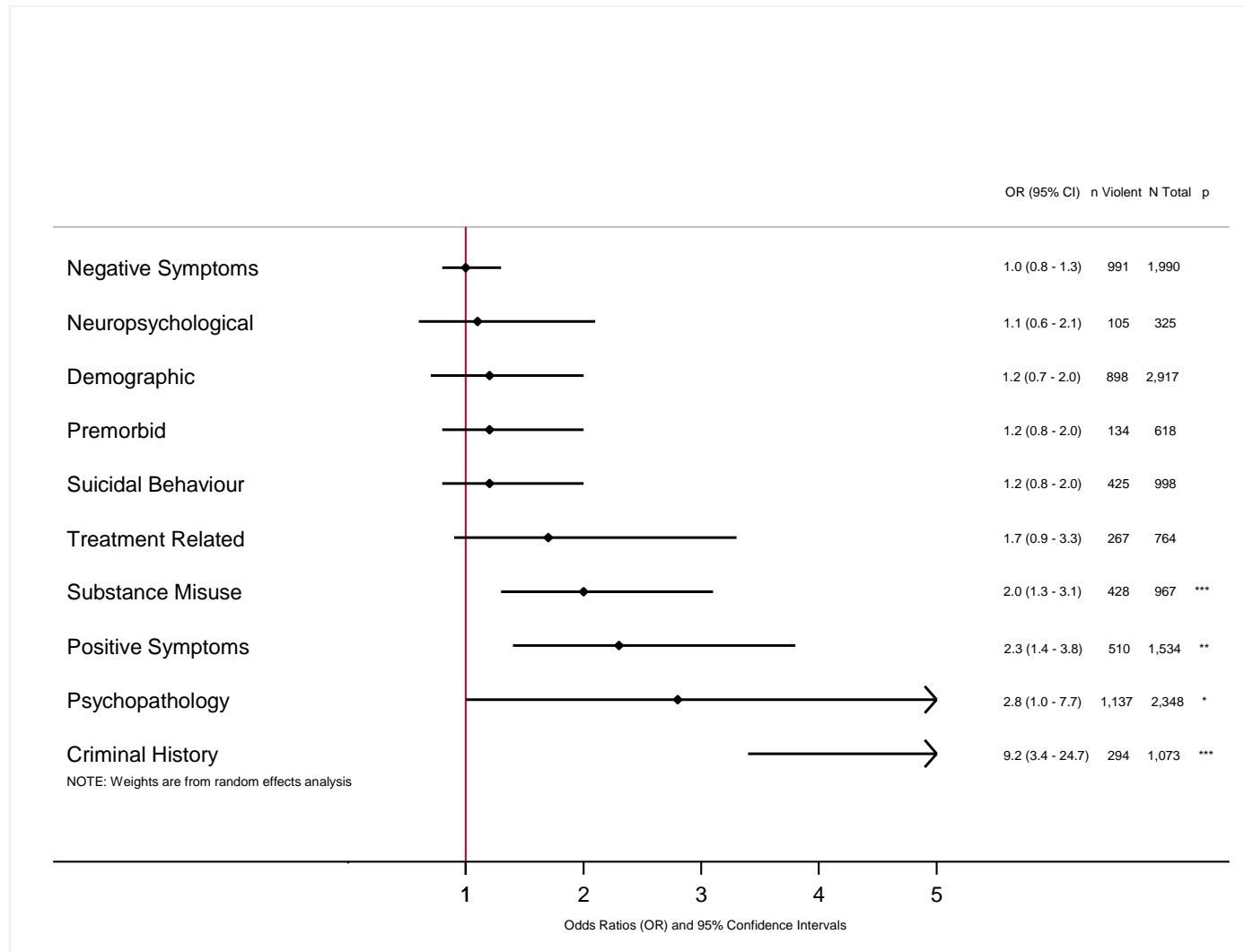
***Appendix D:***  
***Psychosocial Domain-Based***  
***Analyses***



**Figure D.1**  
Pooled odds ratio and accompanying 95% confidence interval for each of the ten psychosocial domains.



**Figure D.2**  
Pooled odds ratio and accompanying 95% confidence interval for each of the ten psychosocial domains for those studies which measured severe violence rather than aggression and/or hostility.



**Figure D.3**  
Pooled odds ratio and accompanying 95% confidence interval for each of the ten psychosocial domains for those studies based in predominately inpatient samples.

# ***Appendix E:***

## ***Coding Summary for Criminal History Risk Factors***

Risk Factor	Coding Description
<b>CONTINUOUS</b>	
<b>Age at first conviction for any offence</b>	Age at first conviction for any offence.
<b>Age at first conviction for a violent offence</b>	Age at first conviction for any violent offence as defined in the methods section. Includes assault against a superior officer, the King, a member of the Royal family, or a foreign Head of State. Excludes criminal damage, negligent homicide, and all sexual offences.
<b>Number of convictions for any offence</b>	Total number of convictions received for any offence.
<b>Number terms of imprisonment (juvenile and/or adult)</b>	Total number of prison terms received as an adult and/or as a juvenile.
<b>Number of convictions for non-violent offences</b>	Total number of convictions received for a conviction for any offence other than those defined as violent in the methods section, as well as assault against a superior officer, the King, a member of the Royal family, or a foreign Head of State.
<b>Number of convictions for sexual offences</b>	Total number of convictions received for sexual offences.
<b>Number of convictions for violent offences</b>	Total number of convictions received for any violent offence as defined in the methods section. Includes assault against a superior officer, the King, a member of the Royal family, or a foreign Head of State. Excludes criminal damage, negligent homicide, and all sexual offences.
<b>CATEGORICAL</b>	
<b>Conviction for arson/endangerment</b>	Coded as +1 if convicted of arson or other offences which endanger victims, 0 if otherwise. Includes trafficking, creating a situation of danger, and negligent homicide.
<b>Conviction for assault</b>	Coded as +1 if convicted of common assault or aggravated assault, 0 if otherwise. Includes assault against a superior officer, the King, a member of the Royal family, or a foreign Head of State.
<b>Conviction for breach of trust</b>	Coded as +1 if convicted of forgery, embezzlement, and other fraud offences, 0 if otherwise.
<b>Conviction for burglary</b>	Coded as +1 if convicted of any type of burglary, 0 if otherwise.
<b>Conviction for criminal damage</b>	Coded as +1 if convicted of vandalism and other property damage offences, 0 if otherwise.
<b>Conviction for illegal threats</b>	Coded as +1 if convicted of illegal threats or intimidation, 0 if otherwise.
<b>Conviction for a military offence</b>	Coded as +1 if convicted of failure to prepare for military duty, failure to follow orders, desertion, and insubordination, 0 if otherwise. Excludes assault against a superior officer.
<b>Convictions for more than one type of sexual offence</b>	Coded as +1 if convicted of more than one type of sexual offence, 0 if otherwise.
<b>Conviction for non-contact sexual offences</b>	Coded as +1 if convicted of any non-contact sexual offence, 0 if otherwise. Excludes rape, attempted rape, sexual coercion, sexual exploitation, sexual exploitation of a minor, or sexual molestation
<b>Conviction for a non-violent offence</b>	Coded as +1 if convicted of any offence other than those defined as violent in the methods section, as well as assault against a superior officer, the King, a member of the Royal family, or a foreign Head of State. Coded as 0 if otherwise.

*Table continued over ...*

Risk Factor	Coding Description
<b>CATEGORICAL (continued)</b>	
<b>Conviction for another penal code violation</b>	Coded as +1 if convicted of perjury, defamation, and violation of privacy, 0 if otherwise.
<b>Conviction for a sexual offence</b>	Coded as +1 if convicted of any sexual offence, 0 if otherwise.
<b>Conviction for theft</b>	Coded as +1 if convicted of theft from vehicles, vehicle theft, shoplifting, and other forms of theft, 0 if otherwise.
<b>Conviction for treason</b>	Coded as +1 if convicted of treason, treachery, or espionage offences, 0 if otherwise. Excludes assault against the King, a member of the Royal family, or a foreign Head of State.
<b>Conviction for a violation of the special codes</b>	Coded as +1 if convicted of any violation of a Swedish code other than the Swedish Criminal Code, including violations of the Environmental Code and the Bookkeeping Act. Coded as 0 if otherwise.
<b>Conviction for a violent offence</b>	Coded as +1 if convicted of any violent offence defined in the methods section, 0 if otherwise. Includes assault against a superior officer, the King, a member of the Royal family, or a foreign Head of State. Excludes criminal damage, negligent homicide, and all sexual offences.
<b>Conviction for weapon use</b>	Coded as +1 if convicted of weapon use, 0 if otherwise.
<b>Escalation in offence seriousness</b>	Coded as +1 if offence seriousness increased over the 3 convictions immediately prior to diagnosis, 0 if otherwise. Offence seriousness coded from the maximum imposable sentence for each conviction following the approach outlined in Kyvsgaard (2003). <sup>698</sup>
<b>Family member convicted of a violent offence</b>	Coded as +1 if mother/father/sibling were convicted on at least one occasion for any violent offence defined in the methods section, 0 if otherwise. Includes assault against a superior officer, the King, a member of the Royal family, or a foreign Head of State. Excludes criminal damage and negligent homicide.
<b>Father convicted of a violent offence</b>	Coded as +1 if father was convicted on at least one occasion for any violent offence defined in the methods section, 0 if otherwise. Includes assault against a superior officer, the King, a member of the Royal family, or a foreign Head of State. Excludes criminal damage, negligent homicide, and all sexual offences.
<b>History of imprisonment (juvenile and/or adult)</b>	Coded as +1 if sentenced to a term of imprisonment as an adult and/or as a juvenile, 0 if otherwise.
<b>Mother convicted of a violent offence</b>	Coded as +1 if mother was convicted on at least one occasion for any violent offence defined in the methods section, 0 if otherwise. Includes assault against a superior officer, the King, a member of the Royal family, or a foreign Head of State. Excludes criminal damage, negligent homicide, and all sexual offences.
<b>Most recent conviction for arson/endorment</b>	Coded as +1 if conviction immediately prior to diagnosis was for arson and other offences which endanger victims, 0 if otherwise. Includes trafficking, creating a situation of danger, and negligent homicide.
<b>Most recent conviction for assault</b>	Coded as +1 if conviction immediately prior to diagnosis was for common assault or aggravated assault, 0 if otherwise. Includes assault against a superior officer, the King, a member of the Royal family, or a foreign Head of State.
<b>Most recent conviction for breach of trust</b>	Coded as +1 if conviction immediately prior to diagnosis was for forgery, embezzlement, and other fraud offences, 0 if otherwise.
<b>Most recent conviction for burglary</b>	Coded as +1 if conviction immediately prior to diagnosis was for any type of burglary, 0 if otherwise.

*Table continued over ...*

Risk Factor	Coding Description
<b>CATEGORICAL (continued)</b>	
<b>Most recent conviction for criminal damage</b>	Coded as +1 if conviction immediately prior to diagnosis was for vandalism and other property damage offences, 0 if otherwise.
<b>Most recent conviction for illegal threats</b>	Coded as +1 if conviction immediately prior to diagnosis was for illegal threats or intimidation, 0 if otherwise.
<b>Most recent conviction for a military offence</b>	Coded as +1 if conviction immediately prior to diagnosis was for failure to prepare for military duty, failure to follow orders, desertion, and insubordination, 0 if otherwise. Excludes assault against a superior officer.
<b>Most recent conviction for a non-violent offence</b>	Coded as +1 if conviction immediately prior to diagnosis was for any offence other than those defined as violent in the methods section, , 0 if otherwise. Includes assault against a superior officer, the King, a member of the Royal family, or a foreign Head of State.
<b>Most recent conviction for another penal code violation</b>	Coded as +1 if conviction immediately prior to diagnosis was for perjury, defamation, and violation of privacy, 0 if otherwise.
<b>Most recent conviction for a sexual offence</b>	Coded as +1 if conviction immediately prior to diagnosis was for any sexual offence, 0 if otherwise.
<b>Most recent conviction for theft</b>	Coded as +1 if conviction immediately prior to diagnosis was for theft from vehicles, vehicle theft, shoplifting, and other forms of theft, 0 if otherwise.
<b>Most recent conviction for treason</b>	Coded as +1 if conviction immediately prior to diagnosis was for treason, treachery, or espionage offences, 0 if otherwise. Excludes assault against the King, a member of the Royal family, or a foreign Head of State.
<b>Most recent conviction for a violation of special codes</b>	Coded as +1 if conviction immediately prior to diagnosis was for any violation of a Swedish code other than the Swedish Criminal Code, including violations of the Environmental Code and the Bookkeeping Act. Coded as 0 if otherwise.
<b>Most recent conviction for a violent offence</b>	Coded as +1 if conviction immediately prior to diagnosis was for any violent offence defined in the methods section, 0 if otherwise. Includes assault against a superior officer, the King, a member of the Royal family, or a foreign Head of State. Excludes criminal damage, negligent homicide, and all sexual offences.
<b>Most recent conviction for weapon use</b>	Coded as +1 if conviction immediately prior to diagnosis was for weapon use, 0 if otherwise.
<b>One or more convictions under 18</b>	Coded as +1 if total number of convictions under 18 years of age is one or more, 0 if otherwise.
<b>Parent convicted of a violent offence</b>	Coded as +1 if either parent received at least one conviction for any violent offence defined in the methods section, 0 if otherwise. Includes assault against a superior officer, the King, a member of the Royal family, or a foreign Head of State. Excludes criminal damage, negligent homicide, and all sexual offences.
<b>Persistent offender</b>	Coded as +1 if convicted of 5 or more offences, 0 if otherwise.
<b>Sibling convicted of a violent offence</b>	Coded as +1 if sibling was convicted on at least one occasion for any violent offence defined in the methods section, 0 if otherwise. Includes assault against a superior officer, the King, a member of the Royal family, or a foreign Head of State. Excludes criminal damage, negligent homicide, and all sexual offences.
<b>Three or more convictions for any offence</b>	Coded as +1 if convicted of 3 or more offences, 0 if otherwise.

*Table continued over ...*

Risk Factor	Coding Description
<b>CATEGORICAL (continued)</b>	
<b>Two or more convictions for any offence</b>	Coded as +1 if convicted of 2 or more offences, 0 if otherwise.
<b>Versatile offender</b>	Coded as +1 if convicted of two or more offences from the following categories: arson/endorment, breach of trust, burglary, criminal damage, military, another penal code violation, sexual, theft, treason, violation of the special codes, or violent following the approach outlined by Kyvsgaard(2003). <sup>504,699</sup> Coded as 0 if otherwise.
<b>&lt;16 years at first conviction for any offence</b>	Coded as +1 if convicted of at least 1 offence whilst under 16 years of age, 0 if otherwise.

# Appendix F:

## Criminal History Risk Factors Univariate Analyses

Gender	Risk Factor	<i>n</i> Violent		<i>n</i> Non-Violent		Univariate Unadjusted		
		With	Without	With	Without	Hazard Ratio (95% CI)	<i>z</i>	<i>p</i>
<b>MALES</b>								
	Conviction for more than one type of sexual offence	4	1,531	3	7,353	5.5 (1.8 – 16.5)	3.0	**
	Persistent offender	427	1,108	859	6,497	3.1 (2.7 – 3.4)	19.5	***
	Versatile offender	547	988	1,217	6,139	2.9 (2.6 – 3.2)	19.7	***
	Escalation in offence seriousness	10	1,525	15	7,341	2.9 (1.6 – 5.2)	3.6	***
	Three or more convictions for any offence	608	927	1,452	5,904	2.8 (2.5 – 3.1)	19.6	***
	Two or more convictions for any offence	777	758	2,085	5,271	2.7 (2.5 – 3.0)	19.7	**
	Conviction for burglary	137	1,398	237	7,119	2.5 (2.1 – 3.0)	10.3	***
	Most recent conviction for assault	103	1,432	229	7,127	2.4 (1.9 – 2.9)	8.4	***
	Conviction for theft	597	938	1,587	5,769	2.3 (2.1 – 2.6)	16.1	***
	Conviction for criminal damage	290	1,245	678	6,678	2.3 (2.0 – 2.6)	12.9	***
	Most recent conviction for breach of trust	53	1,482	145	7,211	2.3 (1.9 – 2.6)	10.7	***
	Conviction for breach of trust	193	1,342	451	6,905	2.3 (1.9 – 2.6)	10.7	***
	Conviction for another penal code violation	184	1,351	455	6,901	2.2 (1.8 – 2.5)	9.8	***
	<16 years at first conviction for any offence	59	1,476	151	7,205	2.1 (1.6 – 2.7)	5.6	***
	Most recent conviction for illegal threats	69	1,466	212	7,144	1.8 (1.4 – 2.4)	4.9	***
	Most recent conviction for weapon use	36	1,499	117	7,239	1.8 (1.2 – 2.5)	3.2	**
	Most recent conviction for burglary	19	1,516	40	7,316	1.8 (1.1 – 2.8)	2.5	*
	Conviction for arson/endangerment offence	27	1,508	81	7,275	1.7 (1.2 – 2.6)	2.7	**
	Most recent conviction for theft	260	1,275	797	6,559	1.6 (1.4 – 1.8)	7.0	***
	Most recent conviction for criminal damage	96	1,439	292	7,064	1.6 (1.3 – 2.0)	4.4	***
	Most recent conviction arson/endangerment offence	11	1,524	37	7,319	1.6 (0.8 – 3.0)	1.4	0.17
	Sibling convicted of a violent offence	178	1,357	558	6,796	1.5 (1.3 – 1.8)	5.2	***
	Number of convictions for sexual offences					1.5 (1.1 – 1.9)	2.8	**
	Most recent conviction for another penal code violation	38	1,497	125	7,231	1.5 (1.1 – 2.0)	2.4	*
	Conviction for a military offence	52	1,483	160	7,196	1.4 (1.1 – 1.9)	2.6	**
	Number of convictions for violent offences <sup>§</sup>					1.3 (1.3 – 1.4)	11.1	***
	Number of terms imprisonment (juvenile and/or adult) <sup>†</sup>					1.1 (1.1 – 1.2)	8.3	***
	Number of convictions for non-violent offences <sup>‡</sup>					1.0 (1.0 – 1.1)	13.9	***
	Number of convictions for any offence <sup>‡</sup>					1.0 (1.0 – 1.1)	13.7	***
	Most recent conviction for a military offence	15	1,520	58	7,298	1.0 (0.6 – 1.8)	0.2	0.86
<b>FEMALES</b>								
	Persistent offender	34	247	80	4,554	10.2 (7.0 – 15.0)	11.9	***
	Most recent conviction for weapon use	7	274	15	4,619	9.4 (3.9 – 22.4)	5.0	***
	Most recent conviction for illegal threats	12	269	27	4,607	8.5 (4.5 – 15.8)	6.7	***
	Versatile offender	55	226	167	4,467	7.5 (5.6 – 10.2)	13.0	***
	Three or more convictions for any offence	55	226	182	4,452	7.4 (5.4 – 10.0)	12.8	***

Table continued over ...

Gender	Risk Factor	<i>n</i> Violent		<i>n</i> Non-Violent		Univariate Unadjusted		
		With	Without	With	Without	Hazard Ratio (95% CI)	z	p
<b>FEMALES (continued)</b>								
	Conviction for burglary	6	275	14	4,620	7.2 (2.8 – 18.5)	4.1	***
	Most recent conviction for assault	16	265	48	4,586	6.6 (3.9 – 11.0)	7.2	***
	Conviction for another penal code violation	15	266	43	4,591	6.3 (3.6 – 11.0)	6.5	***
	Two or more convictions for any offence	78	203	327	4,307	5.9 (4.5 – 7.7)	13.0	***
	<16 years at first conviction for any offence	3	278	11	4,623	5.7 (1.3 – 24.4)	2.4	*
	Conviction for arson/endangerment offence	6	275	25	4,609	5.4 (2.2 – 13.2)	3.7	***
	Most recent conviction for another penal code violation	6	275	22	4,612	5.2 (2.1 – 12.9)	3.5	***
	Conviction for criminal damage	26	255	98	4,536	5.0 (3.3 – 7.7)	7.5	***
	Conviction for breach of trust	35	246	148	4,486	4.7 (3.2 – 6.7)	8.2	***
	Conviction for theft	70	211	398	4,236	4.1 (3.1 – 5.4)	10.2	***
	Most recent conviction arson/endangerment offence	3	278	20	4,614	3.5 (0.9 – 13.4)	1.8	0.07
	Most recent conviction for criminal damage	10	271	56	4,578	2.8 (1.5 – 5.6)	3.1	**
	Most recent conviction for theft	36	245	296	4,338	2.5 (1.8 – 3.6)	5.1	***
	Most recent conviction for breach of trust	11	270	88	4,546	2.2 (1.2 – 4.3)	2.5	*
	Sibling convicted of a violent offence	40	241	321	4,313	2.1 (1.5 – 2.9)	4.2	***
	Number of convictions for violent offences					2.0 (1.2 – 3.3)	2.7	**
	Number of convictions for non-violent offences					2.0 (1.2 – 3.3)	2.7	**
	Number of terms imprisonment (juvenile and/or adult)					1.9 (1.2 – 2.8)	3.0	**
	Number of convictions for any offence <sup>1</sup>					1.1 (1.1 – 1.2)	5.1	***
<b>MALES WITH A CRIMINAL HISTORY PRIOR TO DIAGNOSIS</b>								
	Conviction of more than one type of sexual offence	4	1,047	3	3,448	3.6 (1.2 – 11.0)	2.3	*
	Persistent offender	427	624	859	2,529	2.1 (1.8 – 2.4)	11.7	***
	Versatile offender	547	504	1,217	2,234	2.0 (1.7 – 2.2)	11.0	***
	Three or more convictions for any offence	608	443	1,452	1,999	1.9 (1.7 – 2.2)	10.4	***
	Two or more convictions for any offence	777	274	2,085	1,366	1.9 (1.7 – 2.2)	9.2	***
	Escalation in offence seriousness	10	1,041	15	3,436	1.9 (1.1 – 3.5)	2.2	*
	Conviction for burglary	137	914	237	3,214	1.7 (1.4 – 2.0)	5.7	***
	Most recent conviction for assault	103	948	229	3,222	1.6 (1.3 – 1.9)	4.4	***
	Conviction for theft	597	454	1,587	1,864	1.5 (1.3 – 1.7)	6.3	***
	Conviction for criminal damage	290	761	678	2,773	1.5 (1.3 – 1.7)	6.2	***
	Conviction for breach of trust	193	858	451	3,000	1.5 (1.3 – 1.7)	5.1	***
	Conviction for another penal code violation	184	867	455	2,996	1.4 (1.2 – 1.7)	4.3	***
	Sibling convicted of a violent offence	152	899	379	3,071	1.4 (1.1 – 1.6)	3.4	**
	<16 years at first conviction for any offence	59	992	151	3,300	1.4 (1.1 – 1.8)	2.4	*
	Number of convictions for violent offences <sup>1</sup>					1.3 (1.2 – 1.3)	11.3	***
	Number of convictions for sexual offences					1.2 (1.0 – 1.5)	2.4	*
	Most recent conviction for illegal threats	69	982	212	3,239	1.2 (0.9 – 1.6)	1.6	0.11
	Most recent conviction for weapon use	36	1,015	117	3,334	1.2 (0.8 – 1.6)	0.9	0.36
	Most recent conviction for burglary	19	1,032	40	3,411	1.2 (0.7 – 1.9)	0.8	0.44
	Number terms of imprisonment (juvenile and/or adult) <sup>1</sup>					1.1 (1.1 – 1.1)	6.7	***
	Most recent conviction for breach of trust	53	998	145	3,306	1.1 (0.9 – 1.5)	0.9	0.35

Table continued over ...

Gender	Risk Factor	<i>n</i> Violent		<i>n</i> Non-Violent		Univariate Unadjusted		
		With	Without	With	Without	Hazard Ratio (95% CI)	z	p
<b>MALES WITH A CRIMINAL HISTORY PRIOR TO DIAGNOSIS (continued)</b>								
	Conviction for arson/endangerment offence	27	1,024	81	3,370	1.1 (0.8 – 1.7)	0.7	0.49
	Most recent conviction for a sexual offence	12	1,039	45	3,406	1.1 (0.6 – 2.0)	0.3	0.75
	Number of convictions for any offence <sup>b</sup>					1.0 (1.0 – 1.0)	10.8	***
	Number of convictions for non-violent offences <sup>b</sup>					1.0 (1.0 – 1.0)	10.0	***
	Most recent conviction for criminal damage	96	955	292	3,159	1.0 (0.8 – 1.3)	0.4	0.67
	Most recent conviction for theft	260	791	797	2,654	1.0 (0.9 – 1.2)	0.1	0.88
	Most recent conviction for arson/endangerment offence	11	1,040	37	3,414	1.0 (0.5 – 2.0)	0.1	0.89
	Most recent conviction for another penal code violation	38	1,013	125	3,326	0.9 (0.7 – 1.3)	-0.1	0.89
	Conviction for a military offence	52	999	160	3,291	0.9 (0.7 – 1.3)	-0.3	0.76
	Most recent conviction for a military offence	15	1,036	58	3,393	0.7 (0.4 – 1.2)	-1.3	0.18
<b>FEMALES WITH A CRIMINAL HISTORY PRIOR TO DIAGNOSIS</b>								
	Persistent offender	34	94	80	749	3.9 (2.6 – 5.9)	6.5	***
	Most recent conviction for weapon use	7	121	15	814	3.3 (1.4 – 7.8)	2.7	**
	Versatile offender	55	73	167	662	3.1 (2.1 – 4.4)	6.2	***
	Three or more convictions for any offence	55	73	182	647	3.0 (2.1 – 4.2)	6.0	***
	Most recent conviction for illegal threats	12	116	27	802	3.0 (1.6 – 5.6)	3.5	**
	Conviction for burglary	6	122	14	815	2.6 (1.0 – 6.5)	2.0	0.05
	Two or more convictions for any offence	78	50	327	502	2.5 (1.7 – 3.5)	5.0	***
	Most recent conviction for assault	16	112	48	781	2.3 (1.4 – 4.0)	3.2	**
	Conviction for another penal code violation	15	113	43	786	2.3 (1.3 – 4.0)	2.9	**
	Sibling convicted of a violent offence	27	101	83	746	2.1 (1.3 – 3.2)	3.3	**
	<16 years at first conviction for any offence	3	125	11	818	2.0 (0.5 – 8.5)	1.0	0.33
	Conviction for arson/endangerment offence	6	122	25	804	1.9 (0.8 – 4.7)	1.4	0.16
	Conviction for criminal damage	26	102	98	731	1.8 (1.2 – 2.8)	2.6	**
	Most recent conviction for another penal code violation	6	122	22	807	1.8 (0.7 – 4.5)	1.3	0.19
	Conviction for breach of trust	35	93	148	681	1.7 (1.1 – 2.5)	2.5	*
	Number of convictions for violent offences					1.6 (1.1 – 2.3)	2.7	**
	Number of terms of imprisonment (juvenile and/or adult)					1.5 (1.1 – 2.0)	2.6	**
	Conviction for theft	70	58	398	431	1.4 (1.0 – 2.0)	1.9	0.06
	Most recent conviction arson/endangerment offence	3	125	20	809	1.2 (0.3 – 4.7)	0.3	0.76
	Number of convictions for non-violent offences <sup>q</sup>					1.1 (1.0 – 1.1)	4.4	***
	Number of convictions for any offence					1.1 (1.0 – 1.1)	4.9	***
	Most recent conviction for criminal damage	10	118	56	773	1.0 (0.5 – 2.0)	0.04	0.97
	Most recent conviction for theft	36	92	296	533	0.7 (0.5 – 1.1)	-1.4	0.16
	Most recent conviction for breach of trust	11	117	88	741	0.8 (0.4 – 1.5)	-0.8	0.44

**Note:** As only one violent male was convicted of treason or a violation of the special codes, and/or was most recently convicted of treason or a violation of the special codes, jack-knifed HRs could not be estimated. Additionally, as no violent males were convicted of non-contact sexual offences, this risk factor could not be investigated for its association with violence. As no violent female was convicted of a military offence, a violation of the special codes, and/or was most recently convicted of burglary, these risk factors could not be investigated. Lastly, as no females were convicted of a sexual offence or treason, these risk factors could also not be investigated.

<sup>§</sup> Rounded to two decimal places, HR=1.34, 95% CI 1.27–1.41.

<sup>†</sup> Rounded to two decimal places, HR=1.15, 95% CI 1.11–1.18.

<sup>\*</sup> Rounded to two decimal places, HR=1.05, 95% CI 1.04–1.06.

<sup>†</sup> Rounded to two decimal places, HR=1.15, 95% CI 1.09–1.21.

<sup>‡</sup> Rounded to two decimal places, HR=1.26, 95% CI 1.21–1.31.

<sup>‡</sup> Rounded to two decimal places, HR=1.10, 95% CI 1.07–1.14.

<sup>b</sup> Rounded to two decimal places, HR=1.04, 95% CI 1.03–1.05.

<sup>q</sup> Rounded to two decimal places, HR=1.09, 95% CI 1.05–1.13.

***Appendix G:***  
***Criminal History Risk Factors***  
***Incremental Validity Analyses***  
***(Baseline Risk Model)***

Gender	Risk Factor	Multivariate Adjusted			Harrel's c-index			Likelihood Ratio		Royston's R <sup>2</sup>	
		Hazard Ratio (95% CI)	z	p	% (95% CI)	Δ%	p	Δχ <sup>2</sup>	p	% (95% CI)	Δ%
<b>MALES</b>					<b>65.2 (63.9 – 66.6)</b>					<b>18.7 (15.3 – 22.7)</b>	
	<b>BASELINE: Young age + Comorbid SUD</b>										
	+Conviction for more than one type of sexual offence	6.2 (2.7 – 14.6)	4.2	***		+0.04	0.18	7.9	**		+0.3
	+Two or more convictions for any offence	1.9 (1.8 – 2.1)	10.8	***		+4.4	***	119.9	***		+4.3
	+Versatile offender	1.9 (1.7 – 2.2)	10.5	***		+3.3	***	113.5	***		+4.1
	+Three or more convictions for any offence	1.9 (1.6 – 2.1)	10.1	***		+3.3	***	104.3	***		+3.7
	+Persistent offender	1.9 (1.7 – 2.2)	9.9	***		+2.2	***	95.1	***		+3.3
	+Most recent conviction for assault	1.9 (1.6 – 2.4)	6.4	***		+1.0	***	35.6	***		+1.3
	+Escalation in offence seriousness	1.7 (0.9 – 3.2)	1.8	0.07		+0.03	0.25	2.5	0.11		+0.1
	+Conviction for theft	1.6 (1.4 – 1.7)	7.7	***		+2.4	***	58.3	***		+2.1
	+Conviction for criminal damage	1.6 (1.4 – 1.8)	6.6	***		+1.8	***	42.9	***		+1.6
	+Conviction for breach of trust	1.6 (1.3 – 1.8)	5.5	***		+1.2	***	28.1	***		+1.0
	+Most recent conviction for illegal threats	1.6 (1.3 – 2.1)	3.8	***		+0.8	***	13.6	**		+0.5
	+Conviction for another penal code violation	1.5 (1.3 – 1.7)	4.9	***		+0.8	***	22.6	***		+0.8
	+Conviction for burglary	1.5 (1.2 – 1.8)	4.1	***		+0.5	***	16.1	**		+0.6
	+<16 years at first conviction for any offence	1.5 (1.1 – 1.9)	2.9	**		+0.3	**	7.6	**		+0.3
	+Most recent conviction for breach of trust	1.5 (1.1 – 1.9)	2.8	**		+0.5	**	6.7	**		+0.2
	+Most recent conviction for weapon use	1.5 (1.1 – 2.2)	2.5	*		+0.5	**	6.1	*		+0.2
	+Number of convictions for sexual offences	1.3 (1.1 – 1.6)	2.5	*		+0.2	*	5.3	*		+0.2
	+Conviction for arson/endangerment offence	1.3 (0.9 – 2.0)	1.4	0.17		+0.3	*	2.0	0.16		+0.1
	+Number of convictions for violent offences	1.2 (1.1 – 1.3)	10.6	***		+2.9	***	135.7	***		+4.8
	+Sibling convicted of a violent offence	1.2 (1.0 – 1.4)	2.6	*		+0.2	0.22	6.1	*		+0.2
	+Most recent conviction for theft	1.2 (1.0 – 1.3)	2.4	*		+0.7	**	5.7	*		+0.2
	+Most recent conviction for criminal damage	1.2 (1.0 – 1.5)	1.8	0.07		+0.5	**	3.4	0.06		+0.2
	+Most recent conviction for penal code violation	1.2 (0.8 – 1.6)	1.0	0.31		+0.1	*	0.9	0.33		0.0
	+Conviction for a military offence	1.2 (0.9 – 1.5)	1.0	0.29		+0.1	*	1.0	0.30		0.0
	+Number terms imprisonment (juvenile and/or adult) <sup>§</sup>	1.1 (1.1 – 1.1)	6.0	***		+1.1	***	33.8	***		+1.2
	+Most recent conviction for burglary	1.1 (0.7 – 1.8)	0.6	0.53		+0.01	0.62	0.4	0.53		0.0
	+Number of convictions for any offence <sup>†</sup>	1.0 (1.0 – 1.0)	9.9	***		+4.3	***	91.5	***		+3.3
	+Number of convictions for non-violent offences <sup>‡</sup>	1.0 (1.0 – 1.0)	8.9	***		+3.4	***	66.9	***		+2.4
<b>FEMALES</b>					<b>64.3 (62.9 – 65.6)</b>					<b>26.8 (17.6 – 37.1)</b>	
	<b>BASELINE: Young age + Comorbid SUD</b>										
	+Persistent offender	4.6 (3.0 – 7.0)	7.1	***		+3.2	***	43.9	***		+8.2
	+Most recent conviction for weapon use	9.4 (3.7 – 23.5)	4.8	***		+1.3	*	18.6	***		+3.8
	+Most recent conviction for illegal threats	5.7 (2.9 – 11.1)	5.1	***		+1.6	*	21.5	***		+4.3
	+Most recent conviction for assault	4.2 (2.4 – 7.4)	5.0	***		+2.0	**	20.6	***		+4.1
	+Versatile offender	4.1 (2.9 – 5.7)	8.2	***		+4.4	***	58.3	***		+10.6
	+Most recent conviction for penal code violation	3.9 (1.6 – 9.5)	3.0	**		+1.1	0.09	7.3	**		+1.7
	+Three or more convictions for any offence	3.8 (2.7 – 5.4)	7.5	***		+4.4	***	51.6	***		+9.5
	+Two or more convictions for any offence	3.5 (2.6 – 4.7)	8.3	***		+5.4	***	62.5	***		+11.3

Table continued over ...

Gender	Risk Factor	Multivariate Adjusted			Harrel's c-index			Likelihood Ratio		Royston's R <sup>2</sup>	
		Hazard Ratio (95% CI)	z	p	% (95% CI)	Δ%	p	Δχ <sup>2</sup>	p	% (95% CI)	Δ%
<b>FEMALES (continued)</b>											
	+Conviction for a penal code violation	3.4 (1.9 – 6.0)	4.2	***		+1.7	**	14.7	**		+3.0
	+<16 years at first conviction for any offence	3.3 (0.8 – 14.6)	1.6	0.11		+0.5	***	3.0	0.08		+0.9
	+Conviction for arson/endangerment offence	3.2 (1.3 – 7.8)	2.6	*		+1.2	0.05	5.6	*		+1.4
	+Conviction for burglary	3.2 (1.2 – 8.2)	2.4	*		+1.5	*	5.6	*		+1.4
	+Conviction for criminal damage	2.9 (1.9 – 4.5)	4.8	***		+2.8	***	19.9	***		+4.0
	+Conviction for breach of trust	2.7 (1.9 – 4.0)	5.1	***		+2.1	**	23.1	***		+4.6
	+Conviction for theft	2.6 (1.9 – 3.4)	6.5	***		+3.4	***	35.7	***		+6.8
	+Most recent conviction for criminal damage	1.9 (1.0 – 3.6)	1.9	0.06		+0.7	***	3.1	0.08		+0.9
	+Most recent conviction for theft	1.7 (1.2 – 2.4)	2.9	**		+1.7	**	7.3	**		+1.7
	+Number of convictions for violent offences	1.7 (1.1 – 2.6)	2.6	*		+5.2	***	45.9	***		+8.6
	+Sibling convicted of a violent offence	1.6 (1.1 – 2.3)	2.8	**		+1.2	0.05	7.2	**		-7.9
	+Number terms imprisonment (juvenile and/or adult)	1.5 (1.1 – 2.1)	2.7	**		+2.8	***	6.9	**		+1.6
	+Most recent conviction for breach of trust	1.5 (0.8 – 3.0)	1.3	0.20		+1.4	*	1.7	0.19		+0.7
	+Number of convictions for any offence <sup>l</sup>	1.1 (1.1 – 1.1)	5.3	***		+6.6	***	40.9	***		+7.7
	+Number of convictions for non-violent offences <sup>l</sup>	1.1 (1.1 – 1.1)	4.8	***		+5.5	***	31.7	***		+6.1
<b>MALES WITH A CRIMINAL HISTORY PRIOR TO DIAGNOSIS</b>											
	<b>BASELINE: Young age + Comorbid SUD</b>					<b>65.2 (63.9 – 66.6)</b>					<b>10.8 (7.4 – 14.6)</b>
	+Conviction for more than one type of sexual offence	4.8 (2.0 – 11.5)	3.5	***		+0.06	0.18	6.2	*		+0.4
	+Persistent offender	1.6 (1.4 – 1.9)	7.3	***		+2.3	***	51.8	***		+2.9
	+Versatile offender	1.6 (1.4 – 1.8)	7.2	***		+3.4	***	52.1	***		+2.9
	+Most recent conviction for assault	1.6 (1.3 – 2.0)	4.6	***		+1.0	***	18.4	***		+1.1
	+Three or more convictions for any offence	1.5 (1.3 – 1.7)	6.3	***		+3.3	***	40.1	***		+2.3
	+Two or more convictions for any offence	1.5 (1.3 – 1.7)	5.6	***		+4.3	***	33.0	***		+1.9
	+Escalation in offence seriousness	1.5 (0.8 – 2.7)	1.4	0.17		+0.03	0.25	1.5	0.22		+0.1
	+Conviction for criminal damage	1.3 (1.1 – 1.5)	4.0	***		+1.8	***	15.5	**		+0.9
	+Conviction for breach of trust	1.3 (1.1 – 1.5)	3.4	**		+1.2	***	10.8	**		+0.7
	+Conviction for burglary	1.3 (1.1 – 1.5)	2.8	**		+0.5	***	7.2	**		+0.5
	+Conviction for theft	1.2 (1.1 – 1.4)	3.0	**		+2.4	***	8.8	**		+0.6
	+Conviction for another penal code violation	1.2 (1.1 – 1.5)	2.8	**		+0.8	***	7.3	**		+0.5
	+Sibling convicted of a violent offence	1.2 (1.0 – 1.4)	2.0	*		+0.2	0.07	3.8	0.05		+0.3
	+<16 years at first conviction for any offence	1.2 (0.9 – 1.6)	1.5	0.12		+0.3	**	2.3	0.13		+0.2
	+Number of convictions for violent offences <sup>l</sup>	1.2 (1.2 – 1.3)	10.2	***		+2.9	***	96.1	***		+5.3
	+Number of convictions for sexual offences	1.2 (1.0 – 1.4)	2.6	*		+0.2	*	2.8	0.09		+0.2
	+Number of terms of imprisonment (juvenile or adult) <sup>db</sup>	1.1 (1.0 – 1.1)	5.1	***		+1.0	***	23.4	***		+1.4
	+Number of convictions for any offence <sup>ap</sup>	1.0 (1.0 – 1.0)	7.7	***		+4.1	***	50.7	***		+2.9
	+Number of convictions for non-violent offences <sup>ap</sup>	1.0 (1.0 – 1.0)	6.3	***		+3.4	***	33.2	***		+1.9
<b>FEMALES WITH A CRIMINAL HISTORY PRIOR TO DIAGNOSIS</b>											
	<b>BASELINE: Young age + Comorbid SUD</b>					<b>64.3 (62.9 – 65.6)</b>					<b>13.1 (6.3 – 65.6)</b>
	+Most recent conviction for weapon use	4.3 (1.8 – 10.4)	3.3	**		+0.2	0.22	9.5	**		+5.1

Table continued over ...

Gender	Risk Factor	Multivariate Adjusted			Harrel's c-index			Likelihood Ratio		Royston's $R^2$	
		Hazard Ratio (95% CI)	z	p	% (95% CI)	$\Delta\%$	p	$\Delta\chi^2$	p	% (95% CI)	$\Delta\%$
<b>FEMALES WITH A CRIMINAL HISTORY PRIOR TO DIAGNOSIS (continued)</b>											
	+Most recent conviction for illegal threats	3.0 (1.6 – 5.7)	3.4	**		+0.3	0.13	10.1	**		+5.3
	+Persistent offender	2.9 (1.9 – 4.5)	4.8	***		+3.2	***	20.7	***		+9.9
	+Versatile offender	2.4 (1.7 – 3.5)	4.8	***		+4.4	***	21.2	***		+10.1
	+Conviction for a penal code violation	3.4 (1.9 – 6.0)	4.2	***		+1.7	**	14.7	**		+3.0
	+Most recent conviction for assault	2.3 (1.3 – 3.9)	3.0	**		+1.0	***	7.6	**		+4.3
	+Three or more convictions for any offence	2.2 (1.5 – 3.3)	4.2	***		+4.4	***	17.1	***		+8.4
	+Two or more convictions for any offence	2.0 (1.4 – 2.9)	3.9	***		+5.3	***	14.4	**		+7.2
	+Conviction for another penal code violation	1.9 (1.1 – 3.2)	2.3	*		+1.7	**	4.7	*		+3.0
	+Sibling convicted of a violent offence	1.8 (1.1 – 2.7)	2.6	*		+0.4	*	6.1	*		+3.6
	+Conviction for criminal damage	1.6 (1.0 – 2.5)	2.1	*		+1.8	***	4.2	*		+2.7
	+Number of convictions for violent offences	1.5 (1.1 – 2.1)	2.5	*		+5.2	***	25.0	***		+11.6
	+Conviction for breach of trust	1.5 (1.0 – 2.2)	1.9	0.05		+2.1	**	3.5	0.06		+2.5
	+Number terms of imprisonment (juvenile and/or adult)	1.3 (1.0 – 1.7)	2.1	*		+2.8	***	3.2	0.07		+2.3
	+Number convictions for any offence <sup>§</sup>	1.1 (1.0 – 1.1)	4.1	***		+6.6	***	13.7	**		+6.9
	+Number of convictions for non-violent offences <sup>†</sup>	1.1 (1.0 – 1.1)	3.4	**		+5.5	***	8.5	**		+4.7

**Note:** Risk factors ranked in descending order according to aHR magnitude. For risk factors measured on a continuous scale, numbers with and without the risk factor could not be calculated.

<sup>§</sup> Rounding to two decimal places, HR=1.09, 95% CI 1.06–1.12.

<sup>†</sup> Rounding to two decimal places, HR=1.04, 95% CI 1.03–1.05.

<sup>‡</sup> Rounding to two decimal places, HR=1.03, 95% CI 1.02–1.04.

<sup>§</sup> Rounding to two decimal places, HR=1.11, 95% CI 1.07–1.15.

<sup>¶</sup> Rounding to two decimal places, HR=1.10, 95% CI 1.06–1.15.

<sup>||</sup> Rounding to two decimal places, HR=1.23, 95% CI 1.18–1.27.

<sup>Ⓓ</sup> Rounding to two decimal places, HR=1.08, 95% CI 1.05–1.11.

<sup>Ⓚ</sup> Rounding to two decimal places, HR=1.03, 95% CI 1.02–1.04.

<sup>Ⓛ</sup> Rounding to two decimal places, HR=1.07, 95% CI 1.04–1.11.

<sup>Ⓛ</sup> Rounding to two decimal places, HR=1.06, 95% CI 1.03–1.10.

***Appendix H:***  
***Criminal History Risk Factors***  
***Incremental Validity Analyses***  
***(Alternate Risk Model)***

Gender	Risk Factor	Multivariate Adjusted			Harrel's c-index			Likelihood Ratio		Royston's R <sup>2</sup>	
		Hazard Ratio (95% CI)	z	p	% (95% CI)	Δ %	p	Δ χ <sup>2</sup>	p	% (95% CI)	Δ %
<b>MALES</b>											
<b>ALTERNATE: Young age + Comorbid SUD + Conviction for a Violent Offence</b>		<b>69.5 (68.1 – 70.8)</b>					<b>25.4 (22.0 – 31.0)</b>				
	+Persistent offender	1.4 (1.2 – 1.6)	4.4	***		+0.7	***	20.0	***		+0.8
	+Two or more convictions for any offence	1.4 (1.3 – 1.6)	5.4	***		+1.7	***	30.8	***		+1.2
	+Three or more convictions for any offence	1.4 (1.2 – 1.6)	4.4	***		+1.2	***	20.5	***		+0.8
	+Most recent conviction for breach of trust	1.4 (1.1 – 1.9)	2.7	**		+0.3	*	6.5	*		+0.4
	+Conviction for theft	1.3 (1.1 – 1.4)	4.1	***		+0.7	***	17.1	***		+0.7
	+Conviction for criminal damage	1.3 (1.1 – 1.5)	4.0	***		+0.5	***	16.1	**		+0.7
	+Versatile offender	1.3 (1.1 – 1.5)	3.9	***		+0.6	***	16.3	**		+0.7
	+Conviction for breach of trust	1.3 (1.1 – 1.5)	3.5	***		+0.2	**	11.7	**		+0.5
	+Conviction for another penal code violation	1.2 (1.0 – 1.4)	2.2	*		+0.2	**	4.9	*		+0.3
	+Conviction for burglary	1.2 (1.0 – 1.4)	1.9	0.06		+0.2	**	3.5	0.06		+0.3
	+<16 years at first conviction for any offence	1.1 (0.8 – 1.4)	0.7	0.47		+0.1	**	0.5	0.46		+0.1
	+Most recent conviction for theft	1.1 (1.0 – 1.3)	1.8	0.07		+0.3	**	3.4	0.06		+0.2
	+Sibling convicted of a violent offence	1.1 (0.9 – 1.3)	1.4	0.17		+0.06	0.52	1.8	0.17		+0.2
	+Number terms imprisonment (juvenile and/or adult) <sup>§</sup>	1.0 (1.0 – 1.1)	3.0	**		+0.2	***	8.4	**		+0.4
	+Number of convictions for any offence <sup>†</sup>	1.0 (1.0 – 1.0)	5.0	***		+1.8	***	23.3	***		+0.9
	+Number of convictions for non-violent offences <sup>†</sup>	1.0 (1.0 – 1.0)	4.7	***		+1.7	***	20.0	***		+0.8
<b>FEMALES</b>											
<b>ALTERNATE: Young age + Comorbid SUD + Conviction for a Violent Offence</b>		<b>69.6 (68.3 – 70.9)</b>					<b>40.2 (33.6 – 48.7)</b>				
	+Most recent conviction for penal code violation	4.3 (1.7 – 11.1)	3.0	**		+0.006	0.96	8.2	**		+2.0
	+Persistent offender	2.3 (1.3 – 3.8)	3.1	**		+0.7	***	11.8	**		+2.4
	+Conviction for arson/endangerment offence	2.3 (0.8 – 6.9)	1.5	0.12		+0.2	*	3.2	0.07		+1.0
	+Two or more convictions for any offence	2.2 (1.5 – 3.3)	4.0	***		+1.6	***	18.8	***		+3.5
	+Three or more convictions for any offence	2.1 (1.3 – 3.4)	3.1	**		+1.1	***	13.0	**		+2.6
	+Versatile offender	2.1 (1.2 – 3.5)	2.7	**		+0.9	***	10.6	**		+2.2
	+Conviction for another penal code violation	2.0 (1.0 – 4.1)	2.0	*		+0.2	*	5.6	*		+1.4
	+Conviction for breach of trust	1.9 (1.2 – 2.9)	2.7	**		+0.6	**	8.7	**		+1.9
	+Conviction for criminal damage	1.9 (1.2 – 3.2)	2.6	**		+0.8	***	7.8	**		+1.7
	+Conviction for theft	1.8 (1.3 – 2.5)	3.4	**		+1.1	***	12.3	**		+2.5
	+Conviction for burglary	1.7 (0.7 – 4.3)	1.1	0.26		+0.2	0.05	1.4	0.24		+0.7
	+Most recent conviction for theft	1.6 (1.1 – 2.4)	2.7	**		+0.5	**	6.6	**		+1.6
	+Sibling convicted of a violent offence <sup>‡</sup>	1.4 (1.0 – 2.0)	1.7	0.08		+0.001	0.99	3.1	0.07		+1.0
	+Number terms imprisonment (juvenile and/or adult)	1.2 (0.8 – 1.8)	1.0	0.32		+0.4	**	1.7	0.20		+0.7
	+Number of convictions for any offence <sup>‡</sup>	1.0 (1.0 – 1.1)	2.9	**		+2.2	***	8.5	**		+1.9
	+Number of convictions for non-violent offences <sup>‡</sup>	1.0 (1.0 – 1.1)	2.8	**		+2.2	***	7.9	**		+1.8
<b>MALES WITH A CRIMINAL HISTORY PRIOR TO DIAGNOSIS</b>											
<b>ALTERNATE: Young age + Comorbid SUD + Conviction for a Violent Offence</b>		<b>69.5 (68.1 – 70.8)</b>					<b>16.8 (13.7 – 20.4)</b>				
	+Conviction for more than one type of sexual offence	5.7 (2.7 – 11.9)	4.5	***		+0.04	0.27	7.2	**		+0.6

Table continued over ...

Gender	Risk Factor	Multivariate Adjusted			Harrel's c-index			Likelihood Ratio		Royston's R <sup>2</sup>	
		Hazard Ratio (95% CI)	z	P	% (95% CI)	Δ %	p	Δχ <sup>2</sup>	p	% (95% CI)	Δ %
<b>MALES WITH A CRIMINAL HISTORY PRIOR TO DIAGNOSIS (continued)</b>											
	+Persistent offender	1.3 (1.2 – 1.5)	4.1	***		+0.04	***	7.2	**		+1.2
	+Two or more convictions for any offence	1.3 (1.1 – 1.5)	3.1	**		+1.1	***	10.1	**		+0.7
	+Three or more convictions for any offence	1.2 (1.1 – 1.4)	3.2	**		+0.7	***	10.3	**		+0.7
	+Versatile offender	1.2 (1.1 – 1.4)	3.1	**		+0.6	***	9.6	**		+0.7
	+Conviction for criminal damage	1.2 (1.1 – 1.4)	3.1	**		+0.6	***	9.4	**		+0.7
	+Conviction for breach of trust	1.2 (1.1 – 1.5)	2.8	**		+0.3	***	7.5	**		+0.6
	+Conviction for burglary	1.2 (1.0 – 1.4)	1.7	0.08		+0.1	**	2.9	0.09		+0.4
	+Conviction for theft	1.1 (1.0 – 1.3)	2.2	*		+0.7	***	4.9	*		+0.5
	+Conviction for another penal code violation	1.1 (1.0 – 1.3)	1.6	0.10		+0.2	**	2.6	0.11		+0.3
	+Sibling convicted of a violent offence	1.1 (0.9 – 1.3)	1.4	0.17		+0.06	0.52	1.8	0.17		+0.3
	+Number term imprisonment (juvenile and/or adult) <sup>§</sup>	1.0 (1.0 – 1.1)	3.1	**		+0.3	***	8.8	**		+0.7
	+Number convictions for any offence <sup>†</sup>	1.0 (1.0 – 1.0)	4.5	***		+1.8	***	18.8	***		+1.2
	+Number convictions for non-violent offences <sup>‡</sup>	1.0 (1.0 – 1.0)	4.1	***		+1.7	***	15.2	**		+1.0
<b>FEMALES WITH A CRIMINAL HISTORY PRIOR TO DIAGNOSIS</b>											
	<b>ALTERNATE: Young age + Comorbid SUD + Conviction for a Violent Offence</b>					<b>69.6 (68.3 – 70.9)</b>					<b>27.2 (16.0 – 45.8)</b>
	+Persistent offender	2.1 (1.3 – 3.4)	3.1	**		+0.7	***	9.8	**		+5.1
	+Conviction for another penal code violation	1.8 (0.9 – 3.3)	1.8	0.07		+0.2	*	3.6	0.06		+2.6
	+Three or more convictions for any offence	1.7 (1.1 – 2.6)	2.6	*		+1.1	***	7.2	**		+4.0
	+Versatile offender	1.7 (1.1 – 2.6)	2.4	*		+0.9	***	6.1	*		+3.6
	+Two or more convictions for any offence	1.6 (1.1 – 2.4)	2.5	*		+1.6	***	6.3	*		+3.7
	+Sibling convicted of a violent offence	1.5 (1.0 – 2.3)	1.8	0.06		+0.005	0.97	3.5	0.06		+2.8
	+Conviction for criminal damage	1.5 (1.0 – 2.4)	1.8	0.07		+0.8	***	3.4	0.06		+2.5
	+Number term imprisonment (juvenile and/or adult)	1.2 (0.8 – 1.7)	1.0	0.31		+0.4	**	1.4	0.24		+1.7
	+Number convictions for any offence <sup>‡</sup>	1.0 (1.0 – 1.1)	2.3	*		+2.2	***	4.5	*		+3.0
	+Number convictions for non-violent offences <sup>‡</sup>	1.0 (1.0 – 1.1)	2.2	*		+2.2	***	3.9	*		+2.8

**Note:** Conviction for multiple sexual offences, most recent conviction for a sexual offence, assault, illegal threats, and/or weapon use, and number of convictions for sexual offences and/or violent offences had to be dropped from the alternate model due to collinearity with conviction for a violent offence. Risk factors ranked in descending order according to aHR magnitude. For risk factors measured on a continuous scale, numbers with and without the risk factor could not be estimated.

<sup>§</sup> Rounding to two decimal places, HR=1.05, 95% CI 1.02–1.08.

<sup>†</sup> Rounding to two decimal places, HR=1.02, 95% CI 1.01–1.03.

<sup>‡</sup> Rounding to two decimal places, HR=1.38, 95% CI 0.96–1.98.

<sup>‡</sup> Rounding to two decimal places, HR=1.05, 95% CI 1.02–1.09.

<sup>‡</sup> Rounding to two decimal places, HR=1.04, 95% CI 1.01–1.08.

<sup>‡</sup> Rounding to two decimal places, HR=1.05, 95% CI 1.00–1.08.

# Appendix I:

## Calgary Depression Rating Scale

NIMH CATIE SCHIZOPHRENIA

Patient initials:	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>	Visit date (mmm, dd, yy):	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>
Patient number:	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>	Visit:	<input style="width: 20px; height: 20px;" type="text"/>

### CALGARY DERESSION RATING SCALE

Examiner Initials: \_\_\_\_\_

Indicate degree of severity for each of the CDRS items for the past week.

1	<p><b>Depression</b> (<i>How would you describe your mood over the last week: Do you keep reasonably cheerful or have you been very depressed or low spirited recently? In the last week, how often have you (own words) every day? All day?.</i>)</p> <p>Mild. Expresses some sadness or discouragement on questioning.</p> <p>Moderate. Distinct depressed mood persisting up to half of the time over the last two weeks.</p> <p>Severe. Markedly depressed mood persisting daily over half the time interfering with normal motor and social functioning.</p>	Absent	=1	
		Mild	=2	
		Moderate	=3	
		Severe	=4	
2	<p><b>Hopelessness</b> (<i>How do you see the future for yourself? Can you see any future? – or has life seemed quite hopeless? Have you given up or does there still seem to be some reason for trying?.</i>)</p> <p>Mild. Has at times felt hopeless over the last week but still has some degree of hope for the future.</p> <p>Moderate. Persistent, moderate sense of hopelessness over last week. Can be persuaded to acknowledge the possibility of things being better.</p> <p>Severe. Persisting and distressing sense of hopelessness.</p>	Absent	=1	
		Mild	=2	
		Moderate	=3	
		Severe	=4	
3	<p><b>Self Depreciation</b> (<i>What is your opinion of yourself compared to other people? Do you feel better or not as good or about the same as most? Do you feel inferior or even worthless?.</i>)</p> <p>Mild. Some inferiority; not amounting to feelings of worthlessness.</p> <p>Moderate. Subject feels worthless, but less than 50% of the time.</p> <p>Severe. Subject feels worthless more than 50% of the time. May be challenged to acknowledge otherwise.</p>	Absent	=1	
		Mild	=2	
		Moderate	=3	
		Severe	=4	
4	<p><b>Guilty Ideas of Reference</b> (<i>Do you have the feeling that you are being blamed for something, or even wrongly accused? What about? [Do not include justifiable blame or accusations. Exclude delusions of guilt].</i>)</p> <p>Mild. Subject feels blamed but not accused less than 50% of the time</p> <p>Moderate. Persisting sense of being blamed and/or occasional sense of being accused.</p> <p>Severe. Persisting sense of being accused. When challenged, acknowledges that it is <u>not</u> so.</p>	Absent	=1	
		Mild	=2	
		Moderate	=3	
		Severe	=4	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

CALGARY DERESSION RATING SCALE (continued)

<p>5 <b>Pathological Guilt</b> (<i>Do you tend to blame yourself for little things you may have done in the past? Do you think you deserve to be so concerned about this?</i>)</p> <p>Mild. Subject sometimes feels over guilty about some minor peccadillo, but less than 50% of the time.</p> <p>Moderate. Subject usually (over 50% of the time) feels guilty about past actions the significance of which s/he exaggerates.</p> <p>Severe. Subject usually feels s/he is to blame for everything that has gone wrong, even when it is not his/her fault.</p>	Absent	=1	
	Mild	=2	
	Moderate	=3	
	Severe	=4	
<p>6 <b>Morning Depression</b> (<i>When you have felt depressed over the last week, have you noticed the depression being worse at any particular time of the day?</i>)</p> <p>Mild. Depression present but no diurnal variation.</p> <p>Moderate. Depression spontaneously mentioned to be worse in a.m.</p> <p>Severe. Depression markedly worse in a.m., with impaired functioning which improves in p.m.</p>	Absent	=1	
	Mild	=2	
	Moderate	=3	
	Severe	=4	
<p>7 <b>Early Wakening</b> (<i>Do you wake earlier in the morning than is normal for you? How many times a week does this happen?</i>)</p> <p>Mild. Occasionally wakes (up to twice weekly) 1 hour or more before normal time to wake or before alarm clock.</p> <p>Moderate. Often wakes early (up to 5 times weekly) 1 hour or more before normal time to wake or before alarm clock.</p> <p>Severe. Daily wakes 1 hour or more before normal time.</p>	Absent	=1	
	Mild	=2	
	Moderate	=3	
	Severe	=4	
<p>8 <b>Suicide</b> (<i>Have you ever felt that life wasn't worth living? Did you ever feel like ending it all? What did you think you might do? Did you actually try?</i>)</p> <p>Mild. Frequent thoughts of being better off dead, or occasional thoughts of suicide.</p> <p>Moderate. Deliberately considered suicide with a plan, but made no attempt.</p> <p>Severe. Suicide attempt apparently designed to end in death (i.e., accidently discovery or inefficient means).</p>	Absent	=1	
	Mild	=2	
	Moderate	=3	
	Severe	=4	
<p>9 <b>Observed Depression</b> (<i>Based on interviewer's observations during the entire interview. The question "Do you feel like crying?" used at appropriate points in the interview may elicit information useful to this observation</i>)</p> <p>Mild. Subject appears sad and mournful even during parts of the interview involving affectively neutral discussion.</p> <p>Moderate. Subject appears sad and mournful throughout the interview, with gloomy monotonous voice and is tearful or close to tears at times.</p> <p>Severe. Subject chokes on distressing topics, frequently sighs deeply, cries openly, or is persistently in a state of frozen misery if examiner is sure that this is present.</p>	Absent	=1	
	Mild	=2	
	Moderate	=3	
	Severe	=4	

Comments:

# *Appendix J:*

## *CATIE Adverse Events Form*

NIMH CATIE SCHIZOPHRENIA

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Patient initials:         Visit date (mmm, dd, yy):

Patient number:            Visit:

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### ADVERSE EVENT / SIDE EFFECTS FORM

Examiner Initials: \_\_\_\_\_

Record adverse events reported by the patient over the past 3 months (or since the last time that the Adverse Event/Side Effect Form was completed). Do not include symptoms related to schizophrenia that are recorded on the PANSS or Calgary Depression Rating Scale. Severity of the adverse event or side effect may have varied over the rating period; please record the highest severity rating possible.

Serious adverse events (i.e., fatal or life threatening, permanently disabling, requiring in-patient hospitalization, or a congenital anomaly, cancer, or overdose) must also be reported, immediately, on the SAE form.

This form is divided into two sections:

- i). A systematic inquiry addressing specific adverse events commonly reported by patients taking the drugs included in this trial; and,
- ii). A general inquiry offering the patient the opportunity to bring up other complaints.

If an adverse event/side effect is *ABSENT*, skip the adherence impact and go on to the next adverse event/side effect.

NIMH CATIE SCHIZOPHRENIA

Patient initials:	<table border="1" style="width: 100%; height: 20px;"> <tr> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> </tr> </table>					Visit date (mmm, dd, yy):	<table border="1" style="width: 100%; height: 20px;"> <tr> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> </tr> </table>					
Patient number:	<table border="1" style="width: 100%; height: 20px;"> <tr> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> </tr> </table>									Visit:	<table border="1" style="width: 100%; height: 20px;"> <tr> <td style="width: 100%;"></td> </tr> </table>	

ADVERSE EVENT / SIDE EFFECTS FORM (continued)

i). SYSTEMATIC INQUIRY:

I would like to ask you some specific questions about your health since your last study visit.

1	<b>Orthostatic Faintness:</b> Have you had any problems with light-headedness or fainting when you get up from sitting down or lying in bed? ( <i>Severe = blacking out</i> ).				
Clinician rating of severity:		Absent	=0		
		Mild	=1		
		Moderate	=2		
		Severe	=3		
Patient rating of severity:		Absent	=0		
		Mild	=1		
		Moderate	=2		
		Severe	=3		
Adherence impact: Do you think it is due to the medication? (if YES, does it affect your willingness to take the medication?)					
<i>UNRELATED TO ANTIPSYCHOTIC MEDS</i>			=0		
<i>SE CAUSED BY MEDS BUT NO IMPACT ON ADHERENCE</i>			=1		
<i>SE CAUSED BY MEDS BUT PT STILL TAKES MEDS</i>			=2		
<i>SE CAUSED BY MEDS &amp; PT NOT WILLING TO TAKE MEDS</i>			=3		
2	<b>Dry Mouth:</b> Have you had any problems with dry mouth? ( <i>Severe = feels like cotton inside your mouth</i> ).				
Clinician rating of severity:		Absent	=0		
		Mild	=1		
		Moderate	=2		
		Severe	=3		
Patient rating of severity:		Absent	=0		
		Mild	=1		
		Moderate	=2		
		Severe	=3		
Adherence impact: Do you think it is due to the medication? (if YES, does it affect your willingness to take the medication?)					
<i>UNRELATED TO ANTIPSYCHOTIC MEDS</i>			=0		
<i>SE CAUSED BY MEDS BUT NO IMPACT ON ADHERENCE</i>			=1		
<i>SE CAUSED BY MEDS BUT PT STILL TAKES MEDS</i>			=2		
<i>SE CAUSED BY MEDS &amp; PT NOT WILLING TO TAKE MEDS</i>			=3		

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

ADVERSE EVENT / SIDE EFFECTS FORM (continued)

<p>3 <b>Constipation:</b> Have you had any problems with constipation? Moving your bowels? (Severe = obstipation).</p>			
<p>Clinician rating of severity:</p>	Absent	=0	
	Mild	=1	
	Moderate	=2	
	Severe	=3	
<p>Patient rating of severity:</p>	Absent	=0	
	Mild	=1	
	Moderate	=2	
	Severe	=3	
<p>Adherence impact: Do you think it is due to the medication? (if YES, does it affect your willingness to take the medication?)</p>			
<p><i>UNRELATED TO ANTIPSYCHOTIC MEDS</i></p>			=0
<p><i>SE CAUSED BY MEDS BUT NO IMPACT ON ADHERENCE</i></p>			=1
<p><i>SE CAUSED BY MEDS BUT PT STILL TAKES MEDS</i></p>			=2
<p><i>SE CAUSED BY MEDS &amp; PT NOT WILLING TO TAKE MEDS</i></p>			=3
<p>4 <b>Sialorrhea:</b> Have you had any problems with excessive saliva or drooling? (Severe = carries a towel).</p>			
<p>Clinician rating of severity:</p>	Absent	=0	
	Mild	=1	
	Moderate	=2	
	Severe	=3	
<p>Patient rating of severity:</p>	Absent	=0	
	Mild	=1	
	Moderate	=2	
	Severe	=3	
<p>Adherence impact: Do you think it is due to the medication? (if YES, does it affect your willingness to take the medication?)</p>			
<p><i>UNRELATED TO ANTIPSYCHOTIC MEDS</i></p>			=0
<p><i>SE CAUSED BY MEDS BUT NO IMPACT ON ADHERENCE</i></p>			=1
<p><i>SE CAUSED BY MEDS BUT PT STILL TAKES MEDS</i></p>			=2
<p><i>SE CAUSED BY MEDS &amp; PT NOT WILLING TO TAKE MEDS</i></p>			=3

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

ADVERSE EVENT / SIDE EFFECTS FORM (continued)

5 <u>Menstrual Irregularities</u> : Premenopausal women only. Have you had any problems with changes in your menstrual periods? ( <i>Severe = menses have ceased</i> ).		
Clinician rating of severity:	Absent	=0
	Mild	=1
	Moderate	=2
	Severe	=3
Patient rating of severity:	Absent	=0
	Mild	=1
	Moderate	=2
	Severe	=3
Adherence impact: Do you think it is due to the medication? (if YES, does it affect your willingness to take the medication?)		
UNRELATED TO ANTIPSYCHOTIC MEDS		=0
SE CAUSED BY MEDS BUT NO IMPACT ON ADHERENCE		=1
SE CAUSED BY MEDS BUT PT STILL TAKES MEDS		=2
SE CAUSED BY MEDS & PT NOT WILLING TO TAKE MEDS		=3
6 <u>Gynecomastia/galactorrhea</u> : Have you had any problems with swelling or tenderness in your breasts, or discharge from your nipples? ( <i>Severe = discharge soils clothes</i> ).		
Clinician rating of severity:	Absent	=0
	Mild	=1
	Moderate	=2
	Severe	=3
Patient rating of severity:	Absent	=0
	Mild	=1
	Moderate	=2
	Severe	=3
Adherence impact: Do you think it is due to the medication? (if YES, does it affect your willingness to take the medication?)		
UNRELATED TO ANTIPSYCHOTIC MEDS		=0
SE CAUSED BY MEDS BUT NO IMPACT ON ADHERENCE		=1
SE CAUSED BY MEDS BUT PT STILL TAKES MEDS		=2
SE CAUSED BY MEDS & PT NOT WILLING TO TAKE MEDS		=3

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

ADVERSE EVENT / SIDE EFFECTS FORM (continued)

7 <b>Sex Drive:</b> Have you had any problems with your sex drive? (Severe = no interest in sex).			
Clinician rating of severity:	Absent	=0	
	Mild	=1	
	Moderate	=2	
	Severe	=3	
Patient rating of severity:	Absent	=0	
	Mild	=1	
	Moderate	=2	
	Severe	=3	
Adherence impact: Do you think it is due to the medication? (if YES, does it affect your willingness to take the medication?)			
UNRELATED TO ANTIPSYCHOTIC MEDS		=0	
SE CAUSED BY MEDS BUT NO IMPACT ON ADHERENCE		=1	
SE CAUSED BY MEDS BUT PT STILL TAKES MEDS		=2	
SE CAUSED BY MEDS & PT NOT WILLING TO TAKE MEDS		=3	
8 <b>Sexual Arousal:</b> Have you had any problems becoming sexually aroused? (Severe for men = unable to achieve erection; Severe for females = vaginal dryness).			
Clinician rating of severity:	Absent	=0	
	Mild	=1	
	Moderate	=2	
	Severe	=3	
Patient rating of severity:	Absent	=0	
	Mild	=1	
	Moderate	=2	
	Severe	=3	
Adherence impact: Do you think it is due to the medication? (if YES, does it affect your willingness to take the medication?)			
UNRELATED TO ANTIPSYCHOTIC MEDS		=0	
SE CAUSED BY MEDS BUT NO IMPACT ON ADHERENCE		=1	
SE CAUSED BY MEDS BUT PT STILL TAKES MEDS		=2	
SE CAUSED BY MEDS & PT NOT WILLING TO TAKE MEDS		=3	

NIMH CATIE SCHIZOPHRENIA

Patient initials:	<input type="text"/>	Visit date (mmm, dd, yy):	<input type="text"/>
Patient number:	<input type="text"/>	Visit:	<input type="text"/>

ADVERSE EVENT / SIDE EFFECTS FORM (continued)

<p>9 <u>Sexual Orgasm</u>: Have you had problems having an orgasm? (Severe = anorgasmia).</p>			
Clinician rating of severity:	Absent	=0	<input type="text"/>
	Mild	=1	<input type="text"/>
	Moderate	=2	<input type="text"/>
	Severe	=3	<input type="text"/>
Patient rating of severity:	Absent	=0	<input type="text"/>
	Mild	=1	<input type="text"/>
	Moderate	=2	<input type="text"/>
	Severe	=3	<input type="text"/>
Adherence impact: Do you think it is due to the medication? (if YES, does it affect your willingness to take the medication?)			
UNRELATED TO ANTIPSYCHOTIC MEDS		=0	<input type="text"/>
SE CAUSED BY MEDS BUT NO IMPACT ON ADHERENCE		=1	<input type="text"/>
SE CAUSED BY MEDS BUT PT STILL TAKES MEDS		=2	<input type="text"/>
SE CAUSED BY MEDS & PT NOT WILLING TO TAKE MEDS		=3	<input type="text"/>
<p>10 <u>Incontinence/Nocturia</u>: Have you had any problems urinating when you do not plan to during the day, or wetting the bed at night? (Severe = frequently changes clothes or bed linen).</p>			
Clinician rating of severity:	Absent	=0	<input type="text"/>
	Mild	=1	<input type="text"/>
	Moderate	=2	<input type="text"/>
	Severe	=3	<input type="text"/>
Patient rating of severity:	Absent	=0	<input type="text"/>
	Mild	=1	<input type="text"/>
	Moderate	=2	<input type="text"/>
	Severe	=3	<input type="text"/>
Adherence impact: Do you think it is due to the medication? (if YES, does it affect your willingness to take the medication?)			
UNRELATED TO ANTIPSYCHOTIC MEDS		=0	<input type="text"/>
SE CAUSED BY MEDS BUT NO IMPACT ON ADHERENCE		=1	<input type="text"/>
SE CAUSED BY MEDS BUT PT STILL TAKES MEDS		=2	<input type="text"/>
SE CAUSED BY MEDS & PT NOT WILLING TO TAKE MEDS		=3	<input type="text"/>

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

ADVERSE EVENT / SIDE EFFECTS FORM (continued)

11 <u>Urinary Hesitancy</u> : Have you had any problems starting to urinate? (Severe = catheterization required).			
Clinician rating of severity:	Absent	=0	
	Mild	=1	
	Moderate	=2	
	Severe	=3	
Patient rating of severity:	Absent	=0	
	Mild	=1	
	Moderate	=2	
	Severe	=3	
Adherence impact: Do you think it is due to the medication? (if YES, does it affect your willingness to take the medication?)			
UNRELATED TO ANTIPSYCHOTIC MEDS		=0	
SE CAUSED BY MEDS BUT NO IMPACT ON ADHERENCE		=1	
SE CAUSED BY MEDS BUT PT STILL TAKES MEDS		=2	
SE CAUSED BY MEDS & PT NOT WILLING TO TAKE MEDS		=3	
12 <u>Skin Rash</u> : Have you had any problems with skin rash or your skin being more sensitive to the sun? (Severe = dermatologic consultation required).			
Clinician rating of severity:	Absent	=0	
	Mild	=1	
	Moderate	=2	
	Severe	=3	
Patient rating of severity:	Absent	=0	
	Mild	=1	
	Moderate	=2	
	Severe	=3	
Adherence impact: Do you think it is due to the medication?			
UNRELATED TO ANTIPSYCHOTIC MEDS		=0	
SE CAUSED BY MEDS BUT NO IMPACT ON ADHERENCE		=1	
SE CAUSED BY MEDS BUT PT STILL TAKES MEDS		=2	
SE CAUSED BY MEDS & PT NOT WILLING TO TAKE MEDS		=3	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

ADVERSE EVENT / SIDE EFFECTS FORM (continued)

<p>13 <b>Sleepiness:</b> Have you had any problems with drowsiness or sleepiness during the day?  <i>(Severe = spontaneously falls asleep during the day).</i></p>			
<p>Clinician rating of severity:</p>	Absent	=0	
	Mild	=1	
	Moderate	=2	
	Severe	=3	
<p>Patient rating of severity:</p>	Absent	=0	
	Mild	=1	
	Moderate	=2	
	Severe	=3	
<p>Adherence impact:                  Do you think it is due to the medication?  <i>(if YES, does it affect your willingness to take the medication?)</i></p>			
<p><i>UNRELATED TO ANTIPSYCHOTIC MEDS</i></p>		=0	
<p><i>SE CAUSED BY MEDS BUT NO IMPACT ON ADHERENCE</i></p>		=1	
<p><i>SE CAUSED BY MEDS BUT PT STILL TAKES MEDS</i></p>		=2	
<p><i>SE CAUSED BY MEDS &amp; PT NOT WILLING TO TAKE MEDS</i></p>		=3	
<p>14 <b>Hypersomnia:</b> How many hours do you sleep a night? Is this a change from usual for you? Have you had any problems with sleeping too much?  <i>(Severe = sleep time increased more than 3 hours most nights).</i></p>			
<p>Clinician rating of severity:</p>	Absent	=0	
	Mild	=1	
	Moderate	=2	
	Severe	=3	
<p>Patient rating of severity:</p>	Absent	=0	
	Mild	=1	
	Moderate	=2	
	Severe	=3	
<p>Adherence impact:                  Do you think it is due to the medication?  <i>(if YES, does it affect your willingness to take the medication?)</i></p>			
<p><i>UNRELATED TO ANTIPSYCHOTIC MEDS</i></p>		=0	
<p><i>SE CAUSED BY MEDS BUT NO IMPACT ON ADHERENCE</i></p>		=1	
<p><i>SE CAUSED BY MEDS BUT PT STILL TAKES MEDS</i></p>		=2	
<p><i>SE CAUSED BY MEDS &amp; PT NOT WILLING TO TAKE MEDS</i></p>		=3	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

ADVERSE EVENT / SIDE EFFECTS FORM (continued)

15 <b>Insomnia:</b> Have you had any problems with falling asleep, staying asleep, or waking up too early? (Severe = sleep time disrupted more than 3 hours most nights).			
Clinician rating of severity:	Absent	=0	
	Mild	=1	
	Moderate	=2	
	Severe	=3	
Patient rating of severity:	Absent	=0	
	Mild	=1	
	Moderate	=2	
	Severe	=3	
Adherence impact: Do you think it is due to the medication? (if YES, does it affect your willingness to take the medication?)			
UNRELATED TO ANTIPSYCHOTIC MEDS		=0	
SE CAUSED BY MEDS BUT NO IMPACT ON ADHERENCE		=1	
SE CAUSED BY MEDS BUT PT STILL TAKES MEDS		=2	
SE CAUSED BY MEDS & PT NOT WILLING TO TAKE MEDS		=3	
16 <b>Weight Gain:</b> Have you had any problems with increased appetite or weight gain? (Severe = new clothes required).			
Clinician rating of severity:	Absent	=0	
	Mild	=1	
	Moderate	=2	
	Severe	=3	
Patient rating of severity:	Absent	=0	
	Mild	=1	
	Moderate	=2	
	Severe	=3	
Adherence impact: Do you think it is due to the medication? (if YES, does it affect your willingness to take the medication?)			
UNRELATED TO ANTIPSYCHOTIC MEDS		=0	
SE CAUSED BY MEDS BUT NO IMPACT ON ADHERENCE		=1	
SE CAUSED BY MEDS BUT PT STILL TAKES MEDS		=2	
SE CAUSED BY MEDS & PT NOT WILLING TO TAKE MEDS		=3	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

ADVERSE EVENT / SIDE EFFECTS FORM (continued)

17 **Akathisia:** Have you had any problems with a sense of inner restlessness, or a feeling that you need to move? Have you had difficulty sitting or standing still due to this restless feeling?  
(Severe = individual is unable to maintain any position for more than a few seconds).

Clinician rating of severity:	Absent	=0	
	Mild	=1	
	Moderate	=2	
	Severe	=3	
Patient rating of severity:	Absent	=0	
	Mild	=1	
	Moderate	=2	
	Severe	=3	
Adherence impact: Do you think it is due to the medication? (if YES, does it affect your willingness to take the medication?)			
UNRELATED TO ANTIPSYCHOTIC MEDS		=0	
SE CAUSED BY MEDS BUT NO IMPACT ON ADHERENCE		=1	
SE CAUSED BY MEDS BUT PT STILL TAKES MEDS		=2	
SE CAUSED BY MEDS & PT NOT WILLING TO TAKE MEDS		=3	

18 **Akinesia:** (A decrease in spontaneous motor activity). Have you noticed that you are more slowed down? Does it take you longer to start an activity? To complete an activity? Do you have fewer facial expressions? Fewer gestures? Fewer bodily movements? Do you feel listless? Are you less spontaneous?  
(Severe = decrease in spontaneous motor activity that is clearly noticeable to others and significantly interferes with ability to perform activities of daily living ).

Clinician rating of severity:	Absent	=0	
	Mild	=1	
	Moderate	=2	
	Severe	=3	
Patient rating of severity:	Absent	=0	
	Mild	=1	
	Moderate	=2	
	Severe	=3	
Adherence impact: Do you think it is due to the medication? (if YES, does it affect your willingness to take the medication?)			
UNRELATED TO ANTIPSYCHOTIC MEDS		=0	
SE CAUSED BY MEDS BUT NO IMPACT ON ADHERENCE		=1	
SE CAUSED BY MEDS BUT PT STILL TAKES MEDS		=2	
SE CAUSED BY MEDS & PT NOT WILLING TO TAKE MEDS		=3	

NIMH CATIE SCHIZOPHRENIA

Patient initials:	<input type="text"/>	Visit date (mmm, dd, yy):	<input type="text"/>
Patient number:	<input type="text"/>	Visit:	<input type="text"/>

ADVERSE EVENT / SIDE EFFECTS FORM (continued)

ii). GENERAL INQUIRY

Have you had any other physical or health problems since your last visit? Have you cut down on the things you usually do because of not feeling physically able since your last visit?

1 <u>Adverse Event:</u>			
Clinician rating of severity:	Absent	=0	<input type="text"/>
	Mild	=1	<input type="text"/>
	Moderate	=2	<input type="text"/>
	Severe	=3	<input type="text"/>
Patient rating of severity:	Absent	=0	<input type="text"/>
	Mild	=1	<input type="text"/>
	Moderate	=2	<input type="text"/>
	Severe	=3	<input type="text"/>
Adherence impact: Do you think it is due to the medication? (if YES, does it affect your willingness to take the medication?) <i>UNRELATED TO ANTIPSYCHOTIC MEDS</i> <i>SE CAUSED BY MEDS BUT NO IMPACT ON ADHERENCE</i> <i>SE CAUSED BY MEDS BUT PT STILL TAKES MEDS</i> <i>SE CAUSED BY MEDS &amp; PT NOT WILLING TO TAKE MEDS</i>		<input type="text"/>	<input type="text"/>
		=0	<input type="text"/>
		=1	<input type="text"/>
		=2	<input type="text"/>
		=3	<input type="text"/>
2 <u>Adverse Event:</u>			
Clinician rating of severity:	Absent	=0	<input type="text"/>
	Mild	=1	<input type="text"/>
	Moderate	=2	<input type="text"/>
	Severe	=3	<input type="text"/>
Patient rating of severity:	Absent	=0	<input type="text"/>
	Mild	=1	<input type="text"/>
	Moderate	=2	<input type="text"/>
	Severe	=3	<input type="text"/>
Adherence impact: Do you think it is due to the medication? (if YES, does it affect your willingness to take the medication?) <i>UNRELATED TO ANTIPSYCHOTIC MEDS</i> <i>SE CAUSED BY MEDS BUT NO IMPACT ON ADHERENCE</i> <i>SE CAUSED BY MEDS BUT PT STILL TAKES MEDS</i> <i>SE CAUSED BY MEDS &amp; PT NOT WILLING TO TAKE MEDS</i>		<input type="text"/>	<input type="text"/>
		=0	<input type="text"/>
		=1	<input type="text"/>
		=2	<input type="text"/>
		=3	<input type="text"/>

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

ADVERSE EVENT / SIDE EFFECTS FORM (continued)

3 <u>Adverse Event:</u>			
Clinician rating of severity:	Absent	=0	
	Mild	=1	
	Moderate	=2	
	Severe	=3	
Patient rating of severity:	Absent	=0	
	Mild	=1	
	Moderate	=2	
	Severe	=3	
Adherence impact: Do you think it is due to the medication? (if YES, does it affect your willingness to take the medication?)			
<i>UNRELATED TO ANTIPSYCHOTIC MEDS</i>		=0	
<i>SE CAUSED BY MEDS BUT NO IMPACT ON ADHERENCE</i>		=1	
<i>SE CAUSED BY MEDS BUT PT STILL TAKES MEDS</i>		=2	
<i>SE CAUSED BY MEDS &amp; PT NOT WILLING TO TAKE MEDS</i>		=3	
4 <u>Adverse Event:</u>			
Clinician rating of severity:	Absent	=0	
	Mild	=1	
	Moderate	=2	
	Severe	=3	
Patient rating of severity:	Absent	=0	
	Mild	=1	
	Moderate	=2	
	Severe	=3	
Adherence impact: Do you think it is due to the medication? (if YES, does it affect your willingness to take the medication?)			
<i>UNRELATED TO ANTIPSYCHOTIC MEDS</i>		=0	
<i>SE CAUSED BY MEDS BUT NO IMPACT ON ADHERENCE</i>		=1	
<i>SE CAUSED BY MEDS BUT PT STILL TAKES MEDS</i>		=2	
<i>SE CAUSED BY MEDS &amp; PT NOT WILLING TO TAKE MEDS</i>		=3	

Comments:

# Appendix K:

## CATIE Baseline/Follow-up Interview Form

NIMH CATIE SCHIZOPHRENIA

Patient initials:				Visit date (mmm, dd, yy):			
Patient number:							
				Visit:			

### FAMILY / CAREGIVER INTERVIEW

<b>Caregiver initials:</b>		
1 Relationship to the patient: <i>PARENT/STEP-PARENT</i> <i>GRANDPARENT</i> <i>AUNT/UNCLE</i> <i>BROTHER/SISTER</i> <i>ADULT CHILD OF THE PATIENT</i> <i>OTHER, SPECIFY:</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=1	
	=2	
	=3	
	=4	
	=5	
	=6	
	=7	
	=97	
	=98	
	=99	
2 In the past month, did the patient live with you? (if YES, skip to question 4) <i>NO</i> <i>YES</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=98	
	=99	
3 Did [patient's name] live with you at any time during the last month? <i>NO</i> <i>YES</i> <i>SKIP</i> <i>RFUSED</i> <i>DON'T KNOW</i>	=1	
	=2	
	=96	
	=97	
	=98	
4 What is your age? <i>RFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	yrs	
	=97	
	=98	
	=99	
<b>Race or Ethnic group:</b> 5a White: <i>NO</i> <i>YES</i> <i>RFUSED</i> <i>DON'T KNOW</i>	=0	
	=1	
	=97	
	=98	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

FAMILY / CAREGIVER INTERVIEW (continued)

b Black or African American: <i>NO</i> <i>YES</i> <i>REFUSED</i> <i>DON'T KNOW</i>	=0	
	=1	
	=97	
	=98	
c American Indian or Alaska Native: <i>NO</i> <i>YES</i> <i>REFUSED</i> <i>DON'T KNOW</i>	=0	
	=1	
	=97	
	=98	
d Asian: <i>NO</i> <i>YES</i> <i>REFUSED</i> <i>DON'T KNOW</i>	=0	
	=1	
	=97	
	=98	
e Native Hawaiian or other Pacific Islander: <i>NO</i> <i>YES</i> <i>REFUSED</i> <i>DON'T KNOW</i>	=0	
	=1	
	=97	
	=98	
6 Are you Spanish/Hispanic/Latino? <i>NO</i> <i>YES</i> <i>REFUSED</i> <i>DON'T KNOW</i>	=0	
	=1	
	=97	
	=98	
7 Are you currently employed? [if retired due to disability, check <i>NOT EMPLOYED (DISABLED)</i> ]. (if not employed, skip to question 9). <i>YES. EMPLOYED FULL-TIME</i> <i>YES. EMPLOYED PART-TIME (OR IRREGULAR SHIFTS)</i> <i>NOT EMPLOYED. (CANNOT FIND WORK)</i> <i>NOT EMPLOYED. (HOMEMAKER/CARER)</i> <i>NOT EMPLOYED (DISABLED)</i> <i>NOT EMPLOYED. (RETIRED)</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=1	
	=2	
	=3	
	=4	
	=5	
	=6	
	=97	
	=98	
	=99	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

FAMILY / CAREGIVER INTERVIEW (continued)

8 What kind of work do you do? <i>SHELTERED EMPLOYMENT</i> <i>TRANSITIONAL EMPLOYMENT</i> <i>UNSKILLED LABOR</i> <i>SKILLED LABOR</i> <i>SALES CLERK</i> <i>ADMINISTRATIVE/SUPERVISORY/TECHNICIAN</i> <i>MANAGER</i> <i>EXECUTIVE/PROFESSIONAL</i> <i>OTHER, SPECIFY:</i> <i>SKIP</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=1	
	=2	
	=3	
	=4	
	=5	
	=6	
	=7	
	=8	
	=9	
	=96	
	=97	
9 Are you married, or living as though married to someone? <i>MARRIED/COHABITING</i> <i>WIDOWED</i> <i>SEPERATED</i> <i>DIVORCED</i> <i>NEVER MARRIED</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=1	
	=2	
	=3	
	=4	
	=5	
	=97	
	=98	
10 In the past month, how many times did a member of your household have contact with [patient's name]? <i>NOT AT ALL</i> <i>ONCE</i> <i>ONCE (OR MORE) PER WEEK</i> <i>ONCE (OR MORE) PER DAY</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=2	
	=3	
	=97	
	=98	
	=99	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

FAMILY / CAREGIVER INTERVIEW (continued)

<b>Patient Problem Behaviors:</b>			
11 Sleeps to little? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>		=0	
		=1	
		=2	
		=3	
		=97	
		=98	
		=99	
12 Sleeps to much? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>		=0	
		=1	
		=2	
		=3	
		=97	
		=98	
		=99	
13 Sleeps at odd hours? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>		=0	
		=1	
		=2	
		=3	
		=97	
		=98	
		=99	
14 Overeats? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>		=0	
		=1	
		=2	
		=3	
		=97	
		=98	
		=99	
15 Eats too little? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>		=0	
		=1	
		=2	
		=3	
		=97	
		=98	
		=99	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

FAMILY / CAREGIVER INTERVIEW (continued)

16 Has hallucinations/delusions? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=2	
	=3	
	=97	
	=98	
	=99	
	17 Socially withdrawn? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=0
=1		
=2		
=3		
=97		
=98		
=99		
18 Verbally abusive? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>		=0
	=1	
	=2	
	=3	
	=97	
	=98	
	=99	
	19 Destroys property? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=0
=1		
=2		
=3		
=97		
=98		
=99		
20 Paces aimlessly? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>		=0
	=1	
	=2	
	=3	
	=97	
	=98	
	=99	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

FAMILY / CAREGIVER INTERVIEW (continued)

21 Has temper tantrums? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=2	
	=3	
	=97	
	=98	
	=99	
22 Physically abuses others? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=2	
	=3	
	=97	
	=98	
	=99	
23 Runs away? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=2	
	=3	
	=97	
	=98	
	=99	
24 Engages in inappropriate sexual behaviors? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=2	
	=3	
	=97	
	=98	
	=99	
25 Careless with his/her own safety? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=2	
	=3	
	=97	
	=98	
	=99	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

FAMILY / CAREGIVER INTERVIEW (continued)

26	Thinks people talk behind his/her back? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>		
		=0	
		=1	
		=2	
		=3	
		=97	
		=98	
		=99	
27a	Maintains his/her personal hygiene? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>		
		=0	
		=1	
		=2	
		=3	
		=97	
		=98	
		=99	
b	How often did you try to help with this problem? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>SKIP</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>		
		=0	
		=1	
		=2	
		=3	
		=96	
		=97	
		=98	
=99			
28a	Taking medication as prescribed? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>		
		=0	
		=1	
		=2	
		=3	
		=97	
		=98	
		=99	
b	How often did you try to help with this problem? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>SKIP</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>		
		=0	
		=1	
		=2	
		=3	
		=96	
		=97	
		=98	
=99			

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

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FAMILY / CAREGIVER INTERVIEW (continued)

29a Prepares his/her own meals? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=0 =1 =2 =3 =97 =98 =99	
b How often did you try to help with this problem? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>SKIP</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=0 =1 =2 =3 =96 =97 =98 =99	
30a Getting him/her self up and dressed? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=0 =1 =2 =3 =97 =98 =99	
b How often did you try to help with this problem? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>SKIP</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=0 =1 =2 =3 =96 =97 =98 =99	
31a Doing household chores? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=0 =1 =2 =3 =97 =98 =99	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

FAMILY / CAREGIVER INTERVIEW (continued)

<p>b How often did you try to help with this problem?</p> <p><i>NEVER</i></p> <p><i>RARELY</i></p> <p><i>OCCASIONALLY</i></p> <p><i>OFTEN</i></p> <p><i>SKIP</i></p> <p><i>REFUSED</i></p> <p><i>DON'T KNOW</i></p> <p><i>N/A</i></p>	<table border="1"> <tr><td>=0</td><td></td></tr> <tr><td>=1</td><td></td></tr> <tr><td>=2</td><td></td></tr> <tr><td>=3</td><td></td></tr> <tr><td>=96</td><td></td></tr> <tr><td>=97</td><td></td></tr> <tr><td>=98</td><td></td></tr> <tr><td>=99</td><td></td></tr> </table>	=0		=1		=2		=3		=96		=97		=98		=99	
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=2																	
=3																	
=96																	
=97																	
=98																	
=99																	
<p>32a Making use of leisure time?</p> <p><i>NEVER</i></p> <p><i>RARELY</i></p> <p><i>OCCASIONALLY</i></p> <p><i>OFTEN</i></p> <p><i>REFUSED</i></p> <p><i>DON'T KNOW</i></p> <p><i>N/A</i></p>	<table border="1"> <tr><td>=0</td><td></td></tr> <tr><td>=1</td><td></td></tr> <tr><td>=2</td><td></td></tr> <tr><td>=3</td><td></td></tr> <tr><td>=97</td><td></td></tr> <tr><td>=98</td><td></td></tr> <tr><td>=99</td><td></td></tr> </table>	=0		=1		=2		=3		=97		=98		=99			
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=98																	
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<p>b How often did you try to help with this problem?</p> <p><i>NEVER</i></p> <p><i>RARELY</i></p> <p><i>OCCASIONALLY</i></p> <p><i>OFTEN</i></p> <p><i>SKIP</i></p> <p><i>REFUSED</i></p> <p><i>DON'T KNOW</i></p> <p><i>N/A</i></p>	<table border="1"> <tr><td>=0</td><td></td></tr> <tr><td>=1</td><td></td></tr> <tr><td>=2</td><td></td></tr> <tr><td>=3</td><td></td></tr> <tr><td>=96</td><td></td></tr> <tr><td>=97</td><td></td></tr> <tr><td>=98</td><td></td></tr> <tr><td>=99</td><td></td></tr> </table>	=0		=1		=2		=3		=96		=97		=98		=99	
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=97																	
=98																	
=99																	
<p>33a Socially unacceptable behaviour? (such as throwing a temper tantrum in a store, or acting in other ways to embarrass you)</p> <p><i>NEVER</i></p> <p><i>RARELY</i></p> <p><i>OCCASIONALLY</i></p> <p><i>OFTEN</i></p> <p><i>REFUSED</i></p> <p><i>DON'T KNOW</i></p> <p><i>N/A</i></p>	<table border="1"> <tr><td>=0</td><td></td></tr> <tr><td>=1</td><td></td></tr> <tr><td>=2</td><td></td></tr> <tr><td>=3</td><td></td></tr> <tr><td>=97</td><td></td></tr> <tr><td>=98</td><td></td></tr> <tr><td>=99</td><td></td></tr> </table>	=0		=1		=2		=3		=97		=98		=99			
=0																	
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<p>b How often did you try to help with this problem?</p> <p><i>NEVER</i></p> <p><i>RARELY</i></p> <p><i>OCCASIONALLY</i></p> <p><i>OFTEN</i></p> <p><i>SKIP</i></p> <p><i>REFUSED</i></p> <p><i>DON'T KNOW</i></p> <p><i>N/A</i></p>	<table border="1"> <tr><td>=0</td><td></td></tr> <tr><td>=1</td><td></td></tr> <tr><td>=2</td><td></td></tr> <tr><td>=3</td><td></td></tr> <tr><td>=96</td><td></td></tr> <tr><td>=97</td><td></td></tr> <tr><td>=98</td><td></td></tr> <tr><td>=99</td><td></td></tr> </table>	=0		=1		=2		=3		=96		=97		=98		=99	
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NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

FAMILY / CAREGIVER INTERVIEW (continued)

34a Inappropriate sexual behaviour? <i>(such as disrobing in public, explicit language, or inappropriate touching)</i> NEVER RARELY OCCASIONALLY OFTEN REFUSED DON'T KNOW N/A		
	=0	
	=1	
	=2	
	=3	
	=97	
	=98	
	=99	
b How often did you try to help with this problem? NEVER RARELY OCCASIONALLY OFTEN SKIP REFUSED DON'T KNOW N/A		
	=0	
	=1	
	=2	
	=3	
	=96	
	=97	
	=98	
35a Stealing? NEVER RARELY OCCASIONALLY OFTEN REFUSED DON'T KNOW N/A		
	=0	
	=1	
	=2	
	=3	
	=97	
	=98	
	=99	
b How often did you try to help with this problem? NEVER RARELY OCCASIONALLY OFTEN SKIP REFUSED DON'T KNOW N/A		
	=0	
	=1	
	=2	
	=3	
	=96	
	=97	
	=98	
36a Violent or threatening behavior? NEVER RARELY OCCASIONALLY OFTEN REFUSED DON'T KNOW N/A		
	=0	
	=1	
	=2	
	=3	
	=97	
	=98	
	=99	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

FAMILY / CAREGIVER INTERVIEW (continued)

<p>b How often did you try to help with this problem?</p> <p><i>NEVER</i></p> <p><i>RARELY</i></p> <p><i>OCCASIONALLY</i></p> <p><i>OFTEN</i></p> <p><i>SKIP</i></p> <p><i>REFUSED</i></p> <p><i>DON'T KNOW</i></p> <p><i>N/A</i></p>	<p>=0</p> <p>=1</p> <p>=2</p> <p>=3</p> <p>=96</p> <p>=97</p> <p>=98</p> <p>=99</p>	
<p>37a Talk or threaten suicide?</p> <p><i>NEVER</i></p> <p><i>RARELY</i></p> <p><i>OCCASIONALLY</i></p> <p><i>OFTEN</i></p> <p><i>REFUSED</i></p> <p><i>DON'T KNOW</i></p> <p><i>N/A</i></p>	<p>=0</p> <p>=1</p> <p>=2</p> <p>=3</p> <p>=97</p> <p>=98</p> <p>=99</p>	
<p>b How often did you try to help with this problem?</p> <p><i>NEVER</i></p> <p><i>RARELY</i></p> <p><i>OCCASIONALLY</i></p> <p><i>OFTEN</i></p> <p><i>SKIP</i></p> <p><i>REFUSED</i></p> <p><i>DON'T KNOW</i></p> <p><i>N/A</i></p>	<p>=0</p> <p>=1</p> <p>=2</p> <p>=3</p> <p>=96</p> <p>=97</p> <p>=98</p> <p>=99</p>	
<p>38a Disturbing behaviors at night? (such as pacing the hall, wandering, listening to very loud music, or watching TV late)</p> <p><i>NEVER</i></p> <p><i>RARELY</i></p> <p><i>OCCASIONALLY</i></p> <p><i>OFTEN</i></p> <p><i>REFUSED</i></p> <p><i>DON'T KNOW</i></p> <p><i>N/A</i></p>	<p>=0</p> <p>=1</p> <p>=2</p> <p>=3</p> <p>=97</p> <p>=98</p> <p>=99</p>	
<p>b How often did you try to help with this problem?</p> <p><i>NEVER</i></p> <p><i>RARELY</i></p> <p><i>OCCASIONALLY</i></p> <p><i>OFTEN</i></p> <p><i>SKIP</i></p> <p><i>REFUSED</i></p> <p><i>DON'T KNOW</i></p> <p><i>N/A</i></p>	<p>=0</p> <p>=1</p> <p>=2</p> <p>=3</p> <p>=96</p> <p>=97</p> <p>=98</p> <p>=99</p>	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

FAMILY / CAREGIVER INTERVIEW (continued)

<p>39a Excessive use of drugs?  <i>NEVER</i>  <i>RARELY</i>  <i>OCCASIONALLY</i>  <i>OFTEN</i>  <i>REFUSED</i>  <i>DON'T KNOW</i>  <i>N/A</i></p>	<p>=0 =1 =2 =3 =97 =98 =99</p>	
<p>b How often did you try to help with this problem?  <i>NEVER</i>  <i>RARELY</i>  <i>OCCASIONALLY</i>  <i>OFTEN</i>  <i>SKIP</i>  <i>REFUSED</i>  <i>DON'T KNOW</i>  <i>N/A</i></p>	<p>=0 =1 =2 =3 =96 =97 =98 =99</p>	
<p>40a Excessive use of alcohol?  <i>NEVER</i>  <i>RARELY</i>  <i>OCCASIONALLY</i>  <i>OFTEN</i>  <i>REFUSED</i>  <i>DON'T KNOW</i>  <i>N/A</i></p>	<p>=0 =1 =2 =3 =97 =98 =99</p>	
<p>b How often did you try to help with this problem?  <i>NEVER</i>  <i>RARELY</i>  <i>OCCASIONALLY</i>  <i>OFTEN</i>  <i>SKIP</i>  <i>REFUSED</i>  <i>DON'T KNOW</i>  <i>N/A</i></p>	<p>=0 =1 =2 =3 =96 =97 =98 =99</p>	
<p><b>In the past month, how often did the following problems occur?:</b></p>		
<p>41 Disruption of household routine due to problems associated with your mentally ill family member?  <i>NEVER</i>  <i>RARELY</i>  <i>OCCASIONALLY</i>  <i>OFTEN</i>  <i>REFUSED</i>  <i>DON'T KNOW</i>  <i>N/A</i></p>	<p>=0 =1 =2 =3 =97 =98 =99</p>	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

FAMILY / CAREGIVER INTERVIEW (continued)

42 Limitations on social/leisure activities of members of the household? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=2	
	=3	
	=97	
	=98	
	=99	
43 Other household members felt neglected due to the enormous amount of attention required by [patient's name]? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=2	
	=3	
	=97	
	=98	
	=99	
44 Household relationships were strained? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=2	
	=3	
	=97	
	=98	
	=99	
45 Lost job opportunities for adults in the household? <i>NEVER</i> <i>RARELY</i> <i>OCCASIONALLY</i> <i>OFTEN</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=2	
	=3	
	=97	
	=98	
	=99	
46 On the whole, do you feel that, during the past month your relative was? <i>NO WORRY TO YOU</i> <i>A MINOR WORRY TO YOU</i> <i>SOME WORRY TO YOU</i> <i>A GREAT WORRY TO YOU</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=2	
	=3	
	=97	
	=98	
	=99	
47 Dealing with the police, sheriff, or court system concerning your relative: <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	hrs/wk	
	=97	
	=98	
	=99	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

FAMILY / CAREGIVER INTERVIEW (continued)

48 Talking with a preacher or clergy about [patient's name]: <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	hrs/wk	
	=97	<input type="text"/>
	=98	<input type="text"/>
	=99	<input type="text"/>
49 Providing recreation or social activity for [patient's name]: <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	hrs/wk	
	=97	<input type="text"/>
	=98	<input type="text"/>
	=99	<input type="text"/>
50 Caregiving for him/her: <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	hrs/wk	
	=97	<input type="text"/>
	=98	<input type="text"/>
	=99	<input type="text"/>
51 Talking with mental health professionals: <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	hrs/wk	
	=97	<input type="text"/>
	=98	<input type="text"/>
	=99	<input type="text"/>
52 If you are working, how many days in the past month did you miss work because you were providing assistance to [patient's name]: <i>(use fractions of days if appropriate)</i>	days	
53 How many days in the past month were you unable to perform your household responsibilities because you were carding for or providing assistance to [patient's name]: <i>(use fractions of days if appropriate)</i>	days	
54 Has anyone else missed work in the past month to provide assistance? For how many days? <i>(use fractions of days if appropriate)</i>	days	
<b>The next set of questions asks about financial contributions that your household has made on behalf of [patient's name]. All questions refer to the past month.</b>		
55 Transportation? <i>NO</i> <i>YES</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	<input type="text"/>
	=1	<input type="text"/>
	=97	<input type="text"/>
	=98	<input type="text"/>
	=99	<input type="text"/>
56 Pocket money for activities and recreation, clothing, and/or cigarettes? <i>NO</i> <i>YES</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	<input type="text"/>
	=1	<input type="text"/>
	=97	<input type="text"/>
	=98	<input type="text"/>
	=99	<input type="text"/>
57 Food? <i>NO</i> <i>YES</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	<input type="text"/>
	=1	<input type="text"/>
	=97	<input type="text"/>
	=98	<input type="text"/>
	=99	<input type="text"/>

NIMH CATIE SCHIZOPHRENIA

Patient initials:         Visit date (mmm, dd, yy):

Patient number:            Visit:

FAMILY / CAREGIVER INTERVIEW (continued)

58 Rent? <i>NO</i> <i>YES</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>		
	=0	
	=1	
	=97	
	=98	
	=99	
59 Household property damaged by client? <i>NO</i> <i>YES</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>		
	=0	
	=1	
	=97	
	=98	
	=99	
60 Fines or damages for other's property? <i>NO</i> <i>YES</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>		
	=0	
	=1	
	=97	
	=98	
	=99	
61 Legal expenses? <i>NO</i> <i>YES</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>		
	=0	
	=1	
	=97	
	=98	
	=99	
62 Any kind of medication? <i>NO</i> <i>YES</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>		
	=0	
	=1	
	=97	
	=98	
	=99	
63 Any mental health treatments? (office or clinic) <i>NO</i> <i>YES</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>		
	=0	
	=1	
	=97	
	=98	
	=99	
64 Medical or dental expenses? (office or clinic) <i>NO</i> <i>YES</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>		
	=0	
	=1	
	=97	
	=98	
	=99	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

FAMILY / CAREGIVER INTERVIEW (continued)

65 Any health insurance payments? <i>NO</i> <i>YES</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>		
	=0	
	=1	
	=97	
	=98	
	=99	
66 Did you lose work time? <i>NO</i> <i>YES</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>		
	=0	
	=1	
	=97	
	=98	
	=99	
67 Any other expenses in the past month? <i>NO</i> <i>YES</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>		
	=0	
	=1	
	=97	
	=98	
	=99	
68 Considering all of these areas, how much have you personally spent in the past month on [patient's name]? <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>		\$
	=97	
	=98	
	=99	
69 In the past month, did you feel burdened by any financial support you provided to [patient's name]. That is, for all the living costs for him/her? <i>NOT AT ALL</i> <i>NOT MUCH</i> <i>SOMETIMES</i> <i>A LOT</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>		
	=1	
	=2	
	=3	
	=4	
	=97	
	=98	
	=99	
70 In the past month, how much of the time did [patient's name] take oral medications as prescribed? <i>NEVER/ALMOST NEVER</i> <i>SOMETIMES</i> <i>USUALLY</i> <i>ALWAYS/ALMOST ALWAYS</i> <i>SKIP</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>		
	=1	
	=2	
	=3	
	=4	
	=96	
	=97	
	=98	
	=99	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

FAMILY / CAREGIVER INTERVIEW (continued)

<p>71 In the past month, did someone regularly remind [patient's name] to take his/her oral medications? Did someone observe him/her taking his/her medication?  <i>Regularly = once per week or more</i>  <i>(if no, skip to question 73)</i>                  NO                  YES. REMINDED                  YES. OBSERVED                  SKIP                  REFUSED                  DON'T KNOW                  N/A</p>	<table border="1"> <tr><td>=0</td><td></td></tr> <tr><td>=1</td><td></td></tr> <tr><td>=2</td><td></td></tr> <tr><td>=96</td><td></td></tr> <tr><td>=97</td><td></td></tr> <tr><td>=98</td><td></td></tr> <tr><td>=99</td><td></td></tr> </table>	=0		=1		=2		=96		=97		=98		=99	
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<p><b>Who reminded him/her to take his/her oral medications?</b></p>															
<p>72a You?                  NO                  YES                  SKIP                  REFUSED                  DON'T KNOW                  N/A</p>	<table border="1"> <tr><td>=0</td><td></td></tr> <tr><td>=1</td><td></td></tr> <tr><td>=96</td><td></td></tr> <tr><td>=97</td><td></td></tr> <tr><td>=98</td><td></td></tr> <tr><td>=99</td><td></td></tr> </table>	=0		=1		=96		=97		=98		=99			
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<p>b Parent?                  NO                  YES                  SKIP                  REFUSED                  DON'T KNOW                  N/A</p>	<table border="1"> <tr><td>=0</td><td></td></tr> <tr><td>=1</td><td></td></tr> <tr><td>=96</td><td></td></tr> <tr><td>=97</td><td></td></tr> <tr><td>=98</td><td></td></tr> <tr><td>=99</td><td></td></tr> </table>	=0		=1		=96		=97		=98		=99			
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<p>c Spouse?                  NO                  YES                  SKIP                  REFUSED                  DON'T KNOW                  N/A</p>	<table border="1"> <tr><td>=0</td><td></td></tr> <tr><td>=1</td><td></td></tr> <tr><td>=96</td><td></td></tr> <tr><td>=97</td><td></td></tr> <tr><td>=98</td><td></td></tr> <tr><td>=99</td><td></td></tr> </table>	=0		=1		=96		=97		=98		=99			
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<p>d Other relative?                  NO                  YES                  SKIP                  REFUSED                  DON'T KNOW                  N/A</p>	<table border="1"> <tr><td>=0</td><td></td></tr> <tr><td>=1</td><td></td></tr> <tr><td>=96</td><td></td></tr> <tr><td>=97</td><td></td></tr> <tr><td>=98</td><td></td></tr> <tr><td>=99</td><td></td></tr> </table>	=0		=1		=96		=97		=98		=99			
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=1															
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<p>e Legal guardian (non-relative)?                  NO                  YES                  SKIP                  REFUSED                  DON'T KNOW                  N/A</p>	<table border="1"> <tr><td>=0</td><td></td></tr> <tr><td>=1</td><td></td></tr> <tr><td>=96</td><td></td></tr> <tr><td>=97</td><td></td></tr> <tr><td>=98</td><td></td></tr> <tr><td>=99</td><td></td></tr> </table>	=0		=1		=96		=97		=98		=99			
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NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

FAMILY / CAREGIVER INTERVIEW (continued)

<p>f MH/Social Service worker?  <i>NO</i>  <i>YES</i>  <i>SKIP</i>  <i>REFUSED</i>  <i>DON'T KNOW</i>  <i>N/A</i></p>	<table border="1"> <tr><td>=0</td><td></td></tr> <tr><td>=1</td><td></td></tr> <tr><td>=96</td><td></td></tr> <tr><td>=97</td><td></td></tr> <tr><td>=98</td><td></td></tr> <tr><td>=99</td><td></td></tr> </table>	=0		=1		=96		=97		=98		=99					
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=99																	
<p>g Other? Specify:  <i>NO</i>  <i>YES</i>  <i>SKIP</i>  <i>REFUSED</i>  <i>DON'T KNOW</i>  <i>N/A</i></p>	<table border="1"> <tr><td>=0</td><td></td></tr> <tr><td>=1</td><td></td></tr> <tr><td>=96</td><td></td></tr> <tr><td>=97</td><td></td></tr> <tr><td>=98</td><td></td></tr> <tr><td>=99</td><td></td></tr> </table>	=0		=1		=96		=97		=98		=99					
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<p>73 We have just discussed medications and you told me that [patient's name] (was / was not) supposed to be taking medication. Was s/he (also) supposed to keep appointments with the mental health center, local clinic, or other mental health professional?  <i>NO</i>  <i>YES</i>  <i>REFUSED</i>  <i>DON'T KNOW</i>  <i>N/A</i></p>	<table border="1"> <tr><td>=0</td><td></td></tr> <tr><td>=1</td><td></td></tr> <tr><td>=97</td><td></td></tr> <tr><td>=98</td><td></td></tr> <tr><td>=99</td><td></td></tr> </table>	=0		=1		=97		=98		=99							
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=97																	
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=99																	
<p>74 How much of the time did [patient's name] make the appointment as scheduled?  <i>NEVER/ALMOST NEVER</i>  <i>SOMETIMES</i>  <i>USUSALLY</i>  <i>ALWAYS/ALMOST ALWAYS</i>  <i>SKIP</i>  <i>REFUSED</i>  <i>DON'T KNOW</i>  <i>N/A</i></p>	<table border="1"> <tr><td>=1</td><td></td></tr> <tr><td>=2</td><td></td></tr> <tr><td>=3</td><td></td></tr> <tr><td>=4</td><td></td></tr> <tr><td>=96</td><td></td></tr> <tr><td>=97</td><td></td></tr> <tr><td>=98</td><td></td></tr> <tr><td>=99</td><td></td></tr> </table>	=1		=2		=3		=4		=96		=97		=98		=99	
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<p>75 During the past 6 months, was [patient's name] involved in any physical fights – even if s/he was not the one who started it?  <i>NO</i>  <i>YES</i>  <i>REFUESD</i>  <i>DON'T KNOW</i>  <i>N/A</i></p>	<table border="1"> <tr><td>=0</td><td></td></tr> <tr><td>=1</td><td></td></tr> <tr><td>=97</td><td></td></tr> <tr><td>=98</td><td></td></tr> <tr><td>=99</td><td></td></tr> </table>	=0		=1		=97		=98		=99							
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<p>76 During the past 6 months, did [patient's name] threaten to hurt someone?  <i>NO</i>  <i>YES</i>  <i>REFUESD</i>  <i>DON'T KNOW</i>  <i>N/A</i></p>	<table border="1"> <tr><td>=0</td><td></td></tr> <tr><td>=1</td><td></td></tr> <tr><td>=97</td><td></td></tr> <tr><td>=98</td><td></td></tr> <tr><td>=99</td><td></td></tr> </table>	=0		=1		=97		=98		=99							
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NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

FAMILY / CAREGIVER INTERVIEW (continued)

77 During the past 6 months, did [patient's name] ever damage property? <i>NO</i> <i>YES</i> <i>REFUESD</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=97	
	=98	
	=99	
78 During the past 6 months, did [patient's name] attempt suicide? <i>NO</i> <i>YES</i> <i>REFUESD</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=97	
	=98	
	=99	
79 During the past 6 months, did [patient's name] deliberately try to hurt him/her self, for example, by cutting or punching him/her self? <i>NO</i> <i>YES</i> <i>REFUESD</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=97	
	=98	
	=99	
80 In general, would you say that your health is poor, fair, good, or excellent? <i>POOR</i> <i>FAIR</i> <i>GOOD</i> <i>EXCELLENT</i> <i>REFUESD</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=2	
	=3	
	=97	
	=98	
81 In general, how would you rate your mental health? <i>POOR</i> <i>FAIR</i> <i>GOOD</i> <i>EXCELLENT</i> <i>REFUESD</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=2	
	=3	
	=97	
	=98	
82 In the past month, was there a doctor, therapist, or case manager you saw for problems with your emotions, nerves, or mental health? <i>NO</i> <i>YES</i> <i>REFUESD</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=97	
	=98	
	=99	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

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FAMILY / CAREGIVER INTERVIEW (continued)

83 Do you wake up fresh and rested most mornings? <i>NO</i> <i>YES</i> <i>REFUESD</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=97	
	=98	
	=99	
84 Is your daily life full of things that keep you interested? <i>NO</i> <i>YES</i> <i>REFUESD</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=97	
	=98	
	=99	
85 Does it seem to you that no one understands you? <i>NO</i> <i>YES</i> <i>REFUESD</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=97	
	=98	
	=99	
86 Have you had periods of days/weeks/months when you couldn't take care of things because you couldn't "get going"? <i>NO</i> <i>YES</i> <i>REFUESD</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=97	
	=98	
	=99	
87 Is your sleep fitful and disturbed? <i>NO</i> <i>YES</i> <i>REFUESD</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=97	
	=98	
	=99	
88 Do you feel weak all over much of the time? <i>NO</i> <i>YES</i> <i>REFUESD</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=97	
	=98	
	=99	
89 Are you troubled by headaches? <i>NO</i> <i>YES</i> <i>REFUESD</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=97	
	=98	
	=99	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

FAMILY / CAREGIVER INTERVIEW (continued)

90 Do you sometimes have difficulty in keeping your balance while walking? <i>NO</i> <i>YES</i> <i>REFUESD</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=97	
	=98	
	=99	
91 Are you sometimes troubled by your heart pounding or shortness of breath? <i>NO</i> <i>YES</i> <i>REFUESD</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=97	
	=98	
	=99	
92 Do you sometimes suddenly feel hot all over? <i>NO</i> <i>YES</i> <i>REFUESD</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=97	
	=98	
	=99	
93 Do you sometimes have periods of great restlessness where you cannot sit still very long? <i>NO</i> <i>YES</i> <i>REFUESD</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=97	
	=98	
	=99	
94 Would you say your appetite is good? <i>NO</i> <i>YES</i> <i>REFUESD</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=97	
	=98	
	=99	
95 Are you the worrying type? <i>NO</i> <i>YES</i> <i>REFUESD</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=97	
	=98	
	=99	
96 Are you sometimes bothered by nervousness or tenseness? <i>NO</i> <i>YES</i> <i>REFUESD</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=97	
	=98	
	=99	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

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FAMILY / CAREGIVER INTERVIEW (continued)

97 Do you ever have trouble getting to sleep or staying asleep? <i>NO</i> <i>YES</i> <i>REFUESD</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=97	
	=98	
	=99	
98 Are you bothered by acid stomach? <i>NO</i> <i>YES</i> <i>REFUESD</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=97	
	=98	
	=99	
99 Are you occasionally bothered by "cold sweats"? <i>NO</i> <i>YES</i> <i>REFUESD</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=97	
	=98	
	=99	
100 Are you occasionally bothered by feelings of guilt? <i>NO</i> <i>YES</i> <i>REFUESD</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=97	
	=98	
	=99	
101 Do you sometimes feel overwhelmed by responsibility? <i>NO</i> <i>YES</i> <i>REFUESD</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=97	
	=98	
	=99	
102 Do you have personal worries that are getting you down physically? <i>NO</i> <i>YES</i> <i>REFUESD</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=97	
	=98	
	=99	
103 Do you feel somewhat alone, even among friends? <i>NO</i> <i>YES</i> <i>REFUESD</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=97	
	=98	
	=99	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

FAMILY / CAREGIVER INTERVIEW (continued)

104 Do you sometimes find yourself wondering if anything is worthwhile anymore? <i>NO</i> <i>YES</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=0	
	=1	
	=97	
	=98	
	=99	
105 Do you feel useful to your family and friends most of the time, some of the time, or hardly ever? <i>HARDLY EVER</i> <i>SOME</i> <i>MOST</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=1	
	=2	
	=3	
	=97	
	=98	
106 Do you know what is going on with your family and friends most of the time, some of the time, or hardly ever? <i>HARDLY EVER</i> <i>SOME</i> <i>MOST</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=1	
	=2	
	=3	
	=97	
	=98	
107 When you are talking with your family and friends, do you feel you are being listened to most of the time, some of the time, or hardly ever? <i>HARDLY EVER</i> <i>SOME</i> <i>MOST</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=1	
	=2	
	=3	
	=97	
	=98	
108 Do you feel you have a definite role (place) in your family and among your friends most of the time, some of the time, or hardly ever? <i>HARDLY EVER</i> <i>SOME</i> <i>MOST</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=1	
	=2	
	=3	
	=97	
	=98	
109 Can you talk about your deepest problems with at least some of your family and friends most of the time, some of the time, or hardly ever? <i>HARDLY EVER</i> <i>SOME</i> <i>MOST</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>	=1	
	=2	
	=3	
	=97	
	=98	
	=99	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

FAMILY / CAREGIVER INTERVIEW (continued)

<p>110 How satisfied are you with the kind of relationships you have with your family and friends – very dissatisfied, somewhat dissatisfied, or satisfied? (if no family or friends, would you say that you are very dissatisfied, somewhat dissatisfied, or satisfied with not having any of these relationships?)</p> <p><i>VERY DISSATISFIED</i> <i>SOMEWHAT DISSATISFIED</i> <i>SATISFIED</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i></p>		
	=1	
	=2	
	=3	
	=97	
	=98	
	=99	
<p>111 During the past 6 months, how much information did you receive from mental health service providers about [patient's name]?</p> <p><i>NONE AT ALL</i> <i>VERY LITTLE</i> <i>SOME</i> <i>A LOT</i> <i>REFUSED</i> <i>DON'T KNOW</i></p>		
	=1	
	=2	
	=3	
	=4	
	=97	
	=98	
<p>112 During the past 6 months, how satisfied were you with the amount and quality of your contact with mental health providers pertaining to [patient's name] care?</p> <p><i>NONE AT ALL</i> <i>VERY LITTLE</i> <i>SOME</i> <i>A LOT</i> <i>REFUSED</i> <i>DON'T KNOW</i></p>		
	=1	
	=2	
	=3	
	=4	
	=97	
	=98	
<p>113 During the past 6 months, how satisfied were you with the mental health systems' overall responses to your concerns about [patient's name]?</p> <p><i>NONE AT ALL</i> <i>VERY LITTLE</i> <i>DON'T KNOW/AMBIVALENT</i> <i>SOME</i> <i>A LOT</i> <i>REFUSED</i></p>		
	=1	
	=2	
	=3	
	=4	
	=5	
	=97	
<p>114 During the past 6 months, how much help did [patient's name] receive from mental health professionals in finding other services, such as housing, legal aid, vocational programs, or transportation?</p> <p><i>NONE AT ALL</i> <i>VERY LITTLE</i> <i>SOME</i> <i>A LOT</i> <i>REFUSED</i> <i>DON'T KNOW</i></p>		
	=1	
	=2	
	=3	
	=4	
	=97	
	=98	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

FAMILY / CAREGIVER INTERVIEW (continued)

115 During the past 6 months, how available to [patient's name] were general health services, such as treatment for a cold or the 'flu, injuries, or chronic physical conditions such as diabetes? <i>NONE AT ALL</i> <i>VERY LITTLE</i> <i>SOME</i> <i>A LOT</i> <i>REFUSED</i> <i>DON'T KNOW</i>		
	=1	
	=2	
	=3	
	=4	
	=97	
	=98	
116 During the past 6 months, how satisfied were you with the services [patient's name] received? <i>NONE AT ALL</i> <i>VERY LITTLE</i> <i>SOME</i> <i>A LOT</i> <i>REFUSED</i> <i>DON'T KNOW</i>		
	=1	
	=2	
	=3	
	=4	
	=97	
	=98	
117 During the past 6 months, how much help has [patient's name] been with household chores, preparing meals, shopping, or providing you with transportation? <i>NONE AT ALL</i> <i>A LITTLE</i> <i>SOME</i> <i>A LOT</i>		
	=1	
	=2	
	=4	
b Providing financial assistance? <i>NONE AT ALL</i> <i>A LITTLE</i> <i>SOME</i> <i>A LOT</i>		
	=1	
	=2	
	=4	
c Providing companionship and emotional support? <i>NONE AT ALL</i> <i>A LITTLE</i> <i>SOME</i> <i>A LOT</i>		
	=1	
	=2	
	=4	
d In any other way? Specify: <i>NONE AT ALL</i> <i>A LITTLE</i> <i>SOME</i> <i>A LOT</i>		
	=1	
	=2	
	=4	
118 Are you planning to move or change residence in the next several months (if NO, skip to question 120) <i>NO</i> <i>YES</i> <i>REFUSED</i> <i>DON'T KNOW</i> <i>N/A</i>		
	=0	
	=1	
	=97	
	=99	

NIMH CATIE SCHIZOPHRENIA

Patient initials:	<input type="text"/>	Visit date (mmm, dd, yy):	<input type="text"/>
Patient number:	<input type="text"/>	Visit:	<input type="text"/>

FAMILY / CAREGIVER INTERVIEW (continued)

<b>This item is not to be entered into the web collect database...</b>	
119 If so, what will be your new address and phone number?	
120 What is the highest educational level you have obtained?	
<i>NEVER ATTENDED SCHOOL</i>	=0
<i>ATTENDED ONLY SPECIAL EDUCATION</i>	=1
<i>COMPLETED GRADE 6 OR LESS</i>	=2
<i>COMPLETED GRADE 7-12</i>	=3
<i>GRADUATED FROM HIGH SCHOOL WITH GED</i>	=4
<i>SOME COLLEGE/TECHNICAL SCHOOL</i>	=5
<i>GRADUATED FROM COLLEGE</i>	=6
<i>COMPLETED GRADUATE SCHOOL</i>	=7
<i>REFUSED</i>	=97
<i>DON'T KNOW</i>	=98
<i>N/A</i>	=99
121 You might find this next question a little personal, but I need to know your before taxes income (exclude mentally ill family member's income if s/he is living with you). I'd like to read off some income ranges, and you can tell me which level you fall into: <i>(since our study is concerned with the costs of caring for the mentally ill, we need a basis of comparison for the financial data we receive).</i>	
<i>UNDER \$5,000</i>	=1
<i>\$5,000-\$9,999</i>	=2
<i>\$10,000-\$19,999</i>	=3
<i>\$20,000-\$29,999</i>	=4
<i>\$30,000-\$39,999</i>	=5
<i>\$40,000-\$49,999</i>	=6
<i>\$50,000-\$59,999</i>	=7
<i>\$60,000-\$69,999</i>	=8
<i>\$70,000 OR MORE</i>	=9
<i>REFUSED</i>	=97
<i>DON'T KNOW</i>	=98
<i>N/A</i>	=99
122 Judging from the telephone voice, indicate the respondent's gender:	
<i>FEMALE</i>	=0
<i>MALE</i>	=1

# Appendix L: CATIE Screening Interview

\*\*\*\*\* Complete this CRF page at least 24 hours prior to randomization \*\*\*\*\*

**NIMH CATIE SCHIZOPHRENIA**

---

Patient initials:	<input style="width: 100%;" type="text"/>	Visit date (mmm, dd, yy):	<input style="width: 100%;" type="text"/>
Patient number:	<input style="width: 100%;" type="text"/>	Visit:	<input style="width: 100%;" type="text"/>

---

**NIMH CATIE SCHIZOPHRENIA SCREENING INTERVIEW**

Examiner Initials: \_\_\_\_\_

<b>1a</b> Has the patient been previously screened for the NIMH CATIE Schizophrenia Project, and assigned a subject number? <i>NO</i> <i>YES</i>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 20px; text-align: center;">=0</td><td style="width: 20px;"></td></tr> <tr><td style="text-align: center;">=1</td><td></td></tr> </table>	=0		=1							
=0											
=1											
<b>b</b> If yes, please indicate the patient's previous subject ID number:	<input style="width: 100%;" type="text"/>										
<b>2</b> Date of birth:	<input style="width: 100%;" type="text"/>										
<b>3</b> Date screened for eligibility:	<input style="width: 100%;" type="text"/>										
<b>4</b> Sex: <i>MALE</i> <i>FEMALE</i>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 20px; text-align: center;">=1</td><td style="width: 20px;"></td></tr> <tr><td style="text-align: center;">=2</td><td></td></tr> </table>	=1		=2							
=1											
=2											
<b>5</b> Race (check all that apply): <i>WHITE</i> <i>BLACK/AFRICAN AMERICAN</i> <i>AMERICAN INDIAN/ALASKA NATIVE</i> <i>ASIAN</i> <i>NATIVE HAWAIIAN/OTHER PACIFIC ISLANDER</i>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 20px; text-align: center;">=1</td><td style="width: 20px;"></td></tr> <tr><td style="text-align: center;">=2</td><td></td></tr> <tr><td style="text-align: center;">=3</td><td></td></tr> <tr><td style="text-align: center;">=4</td><td></td></tr> <tr><td style="text-align: center;">=5</td><td></td></tr> </table>	=1		=2		=3		=4		=5	
=1											
=2											
=3											
=4											
=5											
<b>6</b> Is the patient Spanish/Hispanic/Latino <i>NO</i> <i>YES</i>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 20px; text-align: center;">=0</td><td style="width: 20px;"></td></tr> <tr><td style="text-align: center;">=1</td><td></td></tr> </table>	=0		=1							
=0											
=1											
<b>7</b> Has the patient been hospitalized or required crisis-stabilization services in the past 3 months for any mental health problem? <i>NO</i> <i>YES</i>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 20px; text-align: center;">=0</td><td style="width: 20px;"></td></tr> <tr><td style="text-align: center;">=1</td><td></td></tr> </table>	=0		=1							
=0											
=1											

NIMH CATIE SCHIZOPHRENIA

Patient initials:	<input type="text"/>	Visit date (mmm, dd, yy):	<input type="text"/>
Patient number:	<input type="text"/>	Visit:	<input type="text"/>

NIMH CATIE SCHIZOPHRENIA SCREENING INTERVIEW (continued)

8 Indicate primary clinical diagnosis: <i>SCHIZOPHRENIA</i> <i>SCHIZOPHRENIFORM DISORDER</i> <i>SCHIZOAFFECTIVE DISORDER</i> <i>BIPOLAR DISORDER</i> <i>MAJOR DEPRESSION</i> <i>PSYCHOSIS NOS</i> <i>OTHER, PLEASE SPECIFY:</i>	=1	
	=2	
	=3	
	=4	
	=5	
	=6	
	=7	
9 Indicate additional comorbid diagnoses (check all that apply): <i>ALCOHOL DEPENDENCE</i> <i>ALCOHOL ABUSE</i> <i>DRUG DEPENDENCE</i> <i>DRUG ABUSE</i> <i>OBSESSIVE COMPULSIVE DISORDER</i> <i>OTHER ANXIETY DISORDER, SPECIFY:</i> <i>MAJOR DEPRESSION</i> <i>ANTISOCIAL PERSONALITY DISORDER</i> <i>OTHER PERSONALITY DISORDER, SPECIFY:</i> <i>OTHER, SPECIFY:</i> <i>NO COMORBID CONDITIONS</i>	=1	
	=2	
	=3	
	=4	
	=5	
	=6	
	=7	
	=8	
	=9	
	=10	
	=11	
10 Does this patient have tardive dyskinesia? <i>NO</i> <i>YES</i>	=0	
	=1	
11 Is this a monolingual Spanish speaking patient? <i>NO</i> <i>YES</i>	=0	
	=1	

NIMH CATIE SCHIZOPHRENIA

Patient initials:	<input type="text"/> <input type="text"/> <input type="text"/>	Visit date (mmm, dd, yy):	<input type="text"/> <input type="text"/> <input type="text"/>
Patient number:	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	Visit:	<input type="text"/>

NIMH CATIE SCHIZOPHRENIA SCREENING INTERVIEW (continued)

MEDICAL OUTCOMES SURVEY: 12-ITEM SHORT FORM HEALTH SURVEY

1 In general, would you say your health is: <i>EXCELLENT</i> <i>VERY GOOD</i> <i>GOOD</i> <i>FAIR</i> <i>POOR</i>	=1	
	=2	
	=3	
	=4	
	=5	
2 Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf: <i>YES. LIMITED A LOT</i> <i>YES. LIMITED A LITTLE</i> <i>NO. NOT LIMITED AT ALL</i>	=1	
	=2	
	=3	
3 Climbing several flights of stairs: <i>YES. LIMITED A LOT</i> <i>YES. LIMITED A LITTLE</i> <i>NO. NOT LIMITED AT ALL</i>	=1	
	=2	
	=3	

<b>Physical Health</b>		
4 Accomplished less than you would like: <i>NO</i> <i>YES</i>	=0	
	=1	
5 Were limited in the kind of work or other activities you could do: <i>NO</i> <i>YES</i>	=0	
	=1	

<b>Emotional Health</b>		
6 Accomplished less than you would like: <i>NO</i> <i>YES</i>	=0	
	=1	
7 Didn't do work or other activities as carefully as usual: <i>NO</i> <i>YES</i>	=0	
	=1	
8 During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?: <i>NOT AT ALL</i> <i>SLIGHTLY</i> <i>MODERATELY</i> <i>QUITE A BIT</i> <i>EXTREMELY</i>	=1	
	=2	
	=3	
	=4	
	=5	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

NIMH CATIE SCHIZOPHRENIA SCREENING INTERVIEW (continued)

9 Over the past 4 weeks, how much of the time have you felt calm and peaceful? <i>ALL OF THE TIME</i> <i>MOST OF THE TIME</i> <i>A GOOD BIT OF THE TIME</i> <i>SOME OF THE TIME</i> <i>A LITTLE OF THE TIME</i> <i>NONE OF THE TIME</i>	=1	
	=2	
	=3	
	=4	
	=5	
	=6	
10 Over the past 4 weeks, how much of the time did you have a lot of energy? <i>ALL OF THE TIME</i> <i>MOST OF THE TIME</i> <i>A GOOD BIT OF THE TIME</i> <i>SOME OF THE TIME</i> <i>A LITTLE OF THE TIME</i> <i>NONE OF THE TIME</i>	=1	
	=2	
	=3	
	=4	
	=5	
	=6	
11 Over the past 4 weeks, how much of the time have you felt downhearted and blue? <i>ALL OF THE TIME</i> <i>MOST OF THE TIME</i> <i>A GOOD BIT OF THE TIME</i> <i>SOME OF THE TIME</i> <i>A LITTLE OF THE TIME</i> <i>NONE OF THE TIME</i>	=1	
	=2	
	=3	
	=4	
	=5	
	=6	
12 During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc.)? <i>ALL OF THE TIME</i> <i>MOST OF THE TIME</i> <i>A GOOD BIT OF THE TIME</i> <i>SOME OF THE TIME</i> <i>A LITTLE OF THE TIME</i> <i>NONE OF THE TIME</i>	=1	
	=2	
	=3	
	=4	
	=5	
	=6	

# *Appendix M:*

## *MacArthur Community Violence Risk Assessment Instrument*

NIMH CATIE SCHIZOPHRENIA

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Patient initials:  Visit date (mmm, dd, yy):   
Patient number:  Visit:

---

### MACARTHUR ABBREVIATED COMMUNITY VIOLENCE INSTRUMENT

Examiner Initials: \_\_\_\_\_

I would like you to think back over the past several months, since (insert reference date: baseline reference date is past 6 months; follow-up reference date is date of last administration of the MacArthur Community Violence Instrument).

Reference Date: \_\_\_\_\_

That would have been around (anchor calendar event, e.g., “not long after Christmas...”). I would like to ask you about whether people may have hurt you physically, or whether you have been in fights with people. By “fights” I mean physical fights in which someone gets hit, slapped, kicked, grabbed, shoved, bitten, hurt with a knife or gun, or has something thrown at them.

I’m going to read you some types of problems, and I would like you to tell me how many times each of these has happened since [reference date].

(Administration Instruction: “Was anyone hurt?” “Hurt” or “harm” is defined as a visible bruise, cut, loss of consciousness, internal bodily injury, broken bones or teeth, stab or gunshot wound, or death, caused by another person’s direct action. If violence is answered “None” then skip the question “Was anyone hurt?”)

Since [reference date], how many times, if any...

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

MACARTHUR ABBREVIATED COMMUNITY VIOLENCE INSTRUMENT (continued)

1	Has anyone thrown something at you?			None	=0	
	Was anyone hurt?	No	=0	Once	=1	
		Yes	=1	More than once	=2	
		Refused	=97	Refused	=97	
		Don't know	=98	Don't know	=98	
2	Have you thrown something at anyone?			None	=0	
	Was anyone hurt?	No	=0	Once	=1	
		Yes	=1	More than once	=2	
		Refused	=97	Refused	=97	
		Don't know	=98	Don't know	=98	
3	Has anyone pushed, grabbed, or shoved you?			None	=0	
	Was anyone hurt?	No	=0	Once	=1	
		Yes	=1	More than once	=2	
		Refused	=97	Refused	=97	
		Don't know	=98	Don't know	=98	
4	Have you pushed, grabbed, or shoved anyone?			None	=0	
	Was anyone hurt?	No	=0	Once	=1	
		Yes	=1	More than once	=2	
		Refused	=97	Refused	=97	
		Don't know	=98	Don't know	=98	
5	Has anyone slapped you?			None	=0	
	Was anyone hurt?	No	=0	Once	=1	
		Yes	=1	More than once	=2	
		Refused	=97	Refused	=97	
		Don't know	=98	Don't know	=98	
6	Have you slapped anyone?			None	=0	
	Was anyone hurt?	No	=0	Once	=1	
		Yes	=1	More than once	=2	
		Refused	=97	Refused	=97	
		Don't know	=98	Don't know	=98	
7	Has anyone kicked, bitten, or choked you?			None	=0	
	Was anyone hurt?	No	=0	Once	=1	
		Yes	=1	More than once	=2	
		Refused	=97	Refused	=97	
		Don't know	=98	Don't know	=98	
8	Have you kicked, bitten, or choked anyone?			None	=0	
	Was anyone hurt?	No	=0	Once	=1	
		Yes	=1	More than once	=2	
		Refused	=97	Refused	=97	
		Don't know	=98	Don't know	=98	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

MACARTHUR ABBREVIATED COMMUNITY VIOLENCE INSTRUMENT (continued)

9	Has anyone hit you with a fist /object, or beaten you up?			None	=0	
				Once	=1	
	Was anyone hurt?	No	=0	More than once	=2	
		Yes	=1	Refused	=97	
		Refused	=97	Don't know	=98	
Don't know		=98				
10	Have you hit anyone with a fist/object, or beaten anyone up?			None	=0	
				Once	=1	
	Was anyone hurt?	No	=0	More than once	=2	
		Yes	=1	Refused	=97	
		Refused	=97	Don't know	=98	
Don't know		=98				
11	Has anyone tried to force you to have sex against your will?			None	=0	
				Once	=1	
	Was anyone hurt?	No	=0	More than once	=2	
		Yes	=1	Refused	=97	
		Refused	=97	Don't know	=98	
Don't know		=98				
12	Have you forced anyone to have sex against their will?			None	=0	
				Once	=1	
	Was anyone hurt?	No	=0	More than once	=2	
		Yes	=1	Refused	=97	
		Refused	=97	Don't know	=98	
Don't know		=98				
13	Has anyone threatened you with a gun/knife/other lethal weapon?			None	=0	
				Once	=1	
	Was anyone hurt?	No	=0	More than once	=2	
		Yes	=1	Refused	=97	
		Refused	=97	Don't know	=98	
Don't know		=98				
14	Have you threatened anyone with a gun/knife/other lethal weapon?			None	=0	
				Once	=1	
	Was anyone hurt?	No	=0	More than once	=2	
		Yes	=1	Refused	=97	
		Refused	=97	Don't know	=98	
Don't know		=98				
15	Has anyone used a knife or fired a gun at you?			None	=0	
				Once	=1	
	Was anyone hurt?	No	=0	More than once	=2	
		Yes	=1	Refused	=97	
		Refused	=97	Don't know	=98	
Don't know		=98				
16	Have you used a knife or fired a gun at anyone?			None	=0	
				Once	=1	
	Was anyone hurt?	No	=0	More than once	=2	
		Yes	=1	Refused	=97	
		Refused	=97	Don't know	=98	
Don't know		=98				

NIMH CATIE SCHIZOPHRENIA

---

Patient initials:         Visit date (mmm, dd, yy):

Patient number:            Visit:

---

MACARTHUR ABBREVIATED COMMUNITY VIOLENCE INSTRUMENT (continued)

17	Have you done anything else that might be considered violent?			None	=0		
				Once	=1		
		Was anyone hurt?	No	=0	More than once	=2	
			Yes	=1	Refused	=97	
			Refused	=97	Don't know	=98	
Don't know	=98						
18	Since [reference date], did you physically hurt or injure anyone – like give them a bruise, cut, broken bone, knock them out, or something like that?			No	=0		
				Yes	=1		
				Refused	=97		
				Don't know	=98		

# Appendix N: Positive and Negative Symptom Scale (PANSS)

NIMH CATIE SCHIZOPHRENIA

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Patient initials:				Visit date (mmm, dd, yy):			
Patient number:							
				Visit:			

---

## POSITIVE AND NEGATIVE SYNDROME SCALE (PANSS)

Examiner Initials: \_\_\_\_\_

**Instructions:** Check the box for the appropriate rating for each dimension following the clinical interview. Information to score most items will have been collected during the clinical interview.

*Rate each item for the previous week.*

<b>Positive Scale</b>			
P1	<b>Delusions:</b> Beliefs with are unfounded, and idiosyncratic. <i>(Basis for Rating: Thought content expressed in the interview and its influence on social relations and behaviour)</i>		
	Definition does not apply.	Absent	=1
	Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2
	Presence of one or two delusions which are vague, uncrystallized, and not tenaciously held. Delusions do not interfere with thinking, social relations, or behavior.	Mild	=3
	Presence of either a kaleidoscopic array of poorly formed, unstable delusions, or of a few well-formed delusions that occasionally interfere with thinking, social relations, or behavior	Moderate	=4
	Presence of numerous well-formed delusions that are tenaciously held and occasionally interfere with thinking, social relations, or behavior.	Mod Sev	=5
	Presence of a stable set of delusions which are crystallized, possibly systematized, tenaciously held, and clearly interfere with thinking, social relations, and behavior	Severe	=6
	Presence of a stable set of delusions which are either highly systematized or very numerous, and which dominate major facets of the patient's life. This frequently results in inappropriate and irresponsible action, which may even jeopardize the safety of the patient or others.	Extreme	=7

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

POSITIVE AND NEGATIVE SYNDROME SCALE (PANSS)

**P2** Conceptual Disorganization: Disorganized process of thinking characterized by disruption of goal-directed sequencing, e.g., circumstantiality, tangentiality, loose abstractions, non sequiturs, gross illogicality, or thought block.  
*(Basis for Rating: Cognitive-verbal processes observed during the course of the interview)*

Definition does not apply.	Absent	=1	
Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2	
Thinking is circumstantial, tangential, or paralogical. There is some difficulty in directing thoughts toward a goal, and some loosening of associations may be evidenced under pressure.	Mild	=3	
Able to focus on thoughts when communications are brief and structured, but becomes loose or irrelevant when dealing with more complex communications or when under minimal pressure.	Moderate	=4	
Generally has difficulty in organising thoughts, as evidenced by frequent irrelevancies, disconnectedness, or loosening of associations when not under pressure.	Mod Sev	=5	
Thinking is seriously derailed and internally consistent, resulting in gross irrelevancies and disruption of thought processes, which occur almost constantly.	Severe	=6	
Thoughts are disrupted to the point where the patient is incoherent. Marked loosening of associations, which results in total failure of communication, e.g., "word salad" or mutism.	Extreme	=7	

**P3** Hallucinatory Behavior: Verbal report or behavior indicating perceptions which are not generated by external stimuli. These may be auditory, visual, olfactory, or somatic.  
*(Basis for Rating: Verbal reports and physical manifestations during the course of the interview as well as reports of behavior by primary care workers or family)*

Definition does not apply.	Absent	=1	
Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2	
One or two clearly formed but infrequent hallucinations, or else a number of vague abnormal perceptions which do not result in distortions of thinking or behavior.	Mild	=3	
Hallucinations occur frequently but not continuously, and the patient's thinking and behavior are affected only to a minor extent.	Moderate	=4	
Hallucinations are frequent, may involve more than one sensory modality and tend to distort thinking and/or behavior. Patient may have delusional interpretation of these experiences and respond to them emotionally and, on occasion, verbally as well.	Mod Sev	=5	
Hallucinations are present almost continuously, causing major disruption of thinking and behavior. Patient treats these as real perceptions, and functioning is impeded by frequent emotional and verbal responses to them.	Severe	=6	
Patient is almost totally preoccupied with hallucinations, which virtually dominate thinking and behavior. Hallucinations are provided a rigid delusional interpretation and provoke verbal and behavioral responses, including obedience to command hallucinations.	Extreme	=7	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

POSITIVE AND NEGATIVE SYNDROME SCALE (PANSS) (continued)

**P4** Excitement: Hyperactivity as reflected in accelerated motor behavior, heightened responsivity to stimuli, hypervigilance, or excessive mood lability.  
*(Basis for Rating: Behavioral manifestations during the course of the interview as well as reports of behavior by primary care workers or family)*

Definition does not apply.	Absent	=1	
Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2	
Tends to be slightly agitated, hypervigilant, or mildly over-aroused throughout the interview, but without distinct episodes of excitement or marked mood lability. Speech may be slightly pressured.	Mild	=3	
Agitation or over-arousal is clearly evident throughout the interview, affecting speech and general mobility, or episodic outbursts occur sporadically.	Moderate	=4	
Significant hyperactivity or frequent outbursts of motor activity are observed, making it difficult for the patient to sit still for longer than several minutes at any given moment.	Mod Sev	=5	
Marked excitement dominates the interview, delimits attention, and to some extent affects personal functions such as eating and sleeping.	Severe	=6	
Marked excitement seriously interferes in eating and sleeping and makes interpersonal interactions virtually impossible. Acceleration of speech and motor activity may result in incoherence and exhaustion.	Extreme	=7	

**P5** Grandiosity: Exaggerated self-opinion and unrealistic conviction of superiority, including delusion of extraordinary abilities, wealth, knowledge, fame, power, and moral righteousness.  
*(Basis for Rating: Thought content expressed in the interview and its influence on behavior)*

Definition does not apply.	Absent	=1	
Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2	
Some expansiveness or boastfulness is evident, but without clear-cut grandiose delusions.	Mild	=3	
Feels distinctly and unrealistically superior to others. Some poorly formed delusions about special status or abilities may be present but they are not acted upon.	Moderate	=4	
Clear-cut delusions or remarkable abilities, status, or power are expressed and influence attitude but not behavior.	Mod Sev	=5	
Clear-cut delusions or remarkable superiority involving more than one parameter (wealth, knowledge, fame, etc.) are expressed, notably influence interactions, and may be acted upon.	Severe	=6	
Thinking, interactions, and behavior are dominated by multiple delusions of amazing ability, wealthy, knowledge, fame, power, and/or moral stature, which may take on a bizarre quality.	Extreme	=7	

**P6** Suspiciousness/Persecution: Unrealistic or exaggerated ideas of persecution, as reflected in guardedness, a distrustful attitude, suspicious hypervigilance, or the presence of frank delusions that others are intending to harm the patient.  
*(Basis for Rating: Thought content expressed in the interview and its influence on behavior)*

Definition does not apply.	Absent	=1	
Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2	
Presents a guarded or even openly distrustful attitude, but thoughts, interactions, and behavior are minimally affected.	Mild	=3	
Distrustfulness is clearly evident and intrudes on the interview and/or behavior, but there is no evidence of persecutory delusions. Alternatively, there may be indications of loosely formed persecutory delusions, but these do not seem to affect the patient's attitude or interpersonal relations.	Moderate	=4	
Patient shows marked distrustfulness, leading to major disruption of interpersonal relations, or else these are clear-cut persecutory delusions that have limited impact on interpersonal relations/behavior.	Mod Sev	=5	
Clear-cut pervasive delusions of persecution which may be systematized and significantly interfere in interpersonal relations.	Severe	=6	
A network of systematized persecutory delusions dominates the patient's thinking, social relations, and behavior.	Extreme	=7	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

POSITIVE AND NEGATIVE SYNDROME SCALE (PANSS) (continued)

P7. **Hostility:** Verbal and nonverbal expressions of anger and resentment, including sarcasm, passive-aggressive behavior, verbal abuse, and assaultiveness.  
*(Basis for Rating: Interpersonal behavior observed during the interview and reports by primary care workers or family)*

Definition does not apply.	Absent	=1	
Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2	
Indirect or restrained communication of anger, such as sarcasm, disrespect, hostile expressions, and occasional irritability.	Mild	=3	
Presents an overtly hostile attitude, showing frequent irritability and direct expression of anger or resentment.	Moderate	=4	
Patient is highly irritable and occasionally verbally abusive or threatening.	Mod Sev	=5	
Uncooperativeness and verbal abuse or threats notable influence the interview and seriously impact on social relations. Patient may be violent and destructive but is not physically assaultive toward others.	Severe	=6	
Marked anger results in extreme uncooperativeness, precluding other interactions, or in episode/s of physical assault towards others.	Extreme	=7	

**Negative Scale**

N1 **Blunted Affect:** Diminished emotional responsiveness as characterized by a reduction in facial expression, modulation of feelings, and communicative gestures.  
*(Basis for Rating: Observation of physical manifestations of affective tone and emotional responsiveness during the course of the interview)*

Definition does not apply.	Absent	=1	
Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2	
Changes in facial expression and communicative gestures seem to be stilted, forced, artificial, or lacking in modulation.	Mild	=3	
Reduced range of facial expression and few expressive gestures result in a dull appearance.	Moderate	=4	
Affect is generally "flat" with only occasional changes in facial expression and a paucity of communicative gestures.	Mod Sev	=5	
Marked flatness and deficiency of emotions exhibited most of the time. There may be unmodulated extreme affective discharges, such as excitement, rage, or inappropriate laughter.	Severe	=6	
Changes in facial expression and evidence of communicative gestures are virtually absent. Patient seems constantly to show a barren or "wooden" expression.	Extreme	=7	

N2 **Emotional Withdrawal:** Lack of interest in, involvement with, and affective commitment to life.  
*(Basis for Rating: Reports of functioning from primary care workers or family and observations of interpersonal behavior during the course of the interview)*

Definition does not apply.	Absent	=1	
Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2	
Usually lacks initiative and occasionally may show deficient interest in surrounding events.	Mild	=3	
Patient is generally distanced emotionally from the milieu and its challenges but, with encouragement, can be engaged.	Moderate	=4	
Patient is clearly detached emotionally from persons and events in the milieu, resisting all effort at encouragement. Patient appears distant, docile, and purposeless but can be involved in communication at least briefly and tends to personal needs, sometimes with assistance.	Mod Sev	=5	
Marked deficiency of interest and emotional commitment results in limited conversation with others and frequent neglect of personal functions, for which the patient requires supervision.	Severe	=6	
Patient is almost totally withdrawn, uncommunicative, and neglectful of personal needs as a result of profound lack of interest and emotional commitment.	Extreme	=7	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

POSITIVE AND NEGATIVE SYNDROME SCALE (PANSS) (continued)

<p>N3 <b>Poor Rapport:</b> Lack of interpersonal empathy, openness in conversation, and sense of closeness, interest, or involvement with the interview. This is evidenced by interpersonal distancing and reduced verbal and non-verbal communication.  <i>(Basis for Rating: Interpersonal behavior during the course of the interview).</i></p>	Definition does not apply.	Absent	=1	
	Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2	
	Conversation is characterized by a stilted, strained, or artificial tone. It may lack emotional depth or tend to remain on an impersonal, intellectual plane.	Mild	=3	
	Patient is typically aloof, with interpersonal distance quite evident. Patient may answer questions mechanically, act bored, or express disinterest.	Moderate	=4	
	Dis-involvement is obvious and clearly impedes the productivity of the interview. Patient may tend to avoid eye or face contact.	Mod Sev	=5	
	Patient is highly indifferent, with marked interpersonal distance. Answers are perfunctory, and there is little nonverbal evidence of involvement. Eye and face contact are frequently avoided.	Severe	=6	
	Patient is totally uninvolved with interviewer. Patient appears to be completely indifferent and consistently avoids verbal and nonverbal interactions during the interview.	Extreme	=7	

<p>N4 <b>Passive/Apathetic Social Withdrawal:</b> Diminished interest and initiative in social interactions due to passivity, apathy, anergy, or avolition. This leads to reduced interpersonal involvements and neglect of activities of daily living.  <i>(Basis for Rating: Reports on social behavior from primary care workers or family).</i></p>	Definition does not apply.	Absent	=1	
	Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2	
	Shows occasional interest in social activities but poor initiative. Usually engages with others only when approached by them first.	Mild	=3	
	Passively goes along with most social activities but in a disinterested or mechanical way. Tends to receded into the background.	Moderate	=4	
	Passively participates in only a minority of activities and shows virtually no interest or initiative. Generally spends little time with others.	Mod Sev	=5	
	Tends to be apathetic and isolated, participating very rarely in social activities and occasionally neglecting personal needs. Has very few spontaneous social contacts.	Severe	=6	
	Profoundly apathetic, socially isolated, and personally neglectful.	Extreme	=7	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

POSITIVE AND NEGATIVE SYNDROME SCALE (PANSS) (continued)

<p><b>N5</b> <u>Difficulty in Abstract Thinking:</u> Impairment in the use of the abstract symbolic mode of thinking, as evidenced by difficulty in classification, forming generalizations, and proceeding beyond concrete or egocentric thinking in problem-solving tasks.  <i>(Basis for Rating: Responses to questions on similarities and proverb interpretation, a use of concrete vs. abstract mode during the course of the interview).</i></p>			
Definition does not apply.	Absent	=1	
Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2	
Tends to give a literal or personalized interpretations to the more difficult proverbs and some categories. Tends to be distracted by functional aspects and salient features.	Mild	=3	
Often uses a concrete mode. Has difficulty with most proverbs and some categories. Tends to be distracted by functional aspects and salient features.	Moderate	=4	
Deals primarily in the concrete mode, exhibiting difficulty with most proverbs and many categories.	Mod Sev	=5	
Unable to grasp the abstract meaning of any proverb or figurative expressions and formulate classifications for only the most simple similarities. Thinking is either vacuous or locked into functional aspects, salient features, and idiosyncratic interpretations.	Severe	=6	
Can only use concrete modes of thinking. Shows no comprehension of proverbs, common metaphors, or similes, and simple categories. Even salient and functional attributes do not serve as a basis for classification.	Extreme	=7	

<p><b>N6</b> <u>Lack of Spontaneity/Flow of Conversation:</u> Reduction in the normal flow of conversation associated with apathy, avolition, defensiveness, or cognitive deficit. This is manifested by diminished fluidity and productivity of the verbal-interactive process.  <i>(Basis for Rating: Cognitive-verbal processes observed during the course of the interview).</i></p>			
Definition does not apply.	Absent	=1	
Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2	
Conversation shows little initiative. Patient's answers to questions tend to be brief and unembellished, requiring direct and leading questions by the interviewer.	Mild	=3	
Conversation lacks free flow and appears uneven or halting. Leading questions are frequently needed to elicit adequate responses and proceed with the conversation.	Moderate	=4	
Patient shows a marked lack of spontaneity and openness, replying to the interviewer's questions with only one or two brief sentences.	Mod Sev	=5	
Patient's responses are limited mainly to a few words or short phrases intended to curtail conversation (e.g., "I don't know", "I'm not at liberty to say".) Conversation is seriously impaired as a result and the interview is highly unproductive.	Severe	=6	
Verbal output is restricted to, at most, an occasional utterance, making conversation not possible.	Extreme	=7	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

POSITIVE AND NEGATIVE SYNDROME SCALE (PANSS) (continued)

**N7 Stereotyped Thinking:** Decreased fluidity, spontaneity, and flexibility of thinking, as evidenced by rigid, repetitious, or barren thought content.  
*(Basis for Rating: Cognitive-verbal processes observed during the course of the interview).*

Definition does not apply.	Absent	=1	
Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2	
Some rigidity shown in attitudes or beliefs. Patient may refuse to consider alternative positions or have difficulty in shifting from one idea to another.	Mild	=3	
Conversation revolves around a recurrent theme, resulting in difficulty in shifting to a new topic.	Moderate	=4	
Thinking is rigid and repetitious to the point that, despite the interviewer's efforts, conversation is limited to only two or three dominating topics.	Mod Sev	=5	
Uncontrolled repetition of demands, statements, ideas, or questions which severely impairs conversation.	Severe	=6	
Thinking, behavior, and conversation are dominated by constant repetition of fixed ideas or limited phrases, leading to gross rigidity, inappropriateness, and restrictiveness of patient's communication.	Extreme	=7	

**General Psychopathology Scale**

**G1 Somatic Concerns:** Physical complaints or beliefs about bodily illness or malfunctions. This may range from a vague sense of being ill to clear-cut decisions of catastrophic physical disease  
*(Basis for Rating: Thought content expressed in the interview).*

Definition does not apply.	Absent	=1	
Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2	
Distinctly concerned about health or somatic issues, as evidenced by occasional questions and a desire from reassurance.	Mild	=3	
Complaints about poor health or bodily malfunction, but there is no delusional conviction, and over-concern can be allayed by reassurance.	Moderate	=4	
Patient expressed numerous or frequent complaints about physical illness or bodily malfunction, or else patient reveals one or two clear-cut delusions involving these themes, but is not preoccupied by them.	Mod Sev	=5	
Patient is preoccupied by one or a few clear-cut delusions about physical disease or organic malfunction, but affect is not fully immersed in these themes, and thoughts can be diverted by the interviewer with some effort.	Severe	=6	
Numerous and frequently reported somatic delusions, or only a few somatic delusions of a catastrophic nature, which dominate the patient's affect and thinking.	Extreme	=7	

**G2 Anxiety:** Subjective experience of nervousness, worry, apprehension, or restlessness, ranging from excessive concern about the present or future to feelings of panic.  
*(Basis for Rating: Verbal report during the course of interview and corresponding physical manifestations).*

Definition does not apply.	Absent	=1	
Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2	
Expresses some worry, over-concern, or subjective restlessness, but no somatic and behavioral consequences are reported or evidenced.	Mild	=3	
Patient reports distinct symptoms of nervousness, which are reflected in mild manifestations such as a fine hand tremor or excessive perspiration.	Moderate	=4	
Patient reports serious problems of anxiety which have significant physical and behavioral consequences, such as marked tension, poor concentration, palpitations, or impaired sleep.	Mod Sev	=5	
Subjective state of almost constant fear associated with phobias, marked restlessness, or numerous somatic manifestations.	Severe	=6	
Patient's life is seriously disrupted by anxiety, which is present almost constantly and, at times, reaches panic proportion or is manifested in actual panic attacks.	Extreme	=7	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

POSITIVE AND NEGATIVE SYNDROME SCALE (PANSS) (continued)

<p><b>G3 <u>Guilt Feelings:</u> Sense of remorse or self-blame for real or imagined misdeeds in the past.</b>  <i>(Basis for Rating: Verbal report during the course of interview and the influence on attitudes and thoughts).</i></p>			
Definition does not apply.	Absent	=1	
Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2	
Questioning elicits a vague sense of guilt or self-blame for a minor incident, but the patient clearly is not overtly concerned.	Mild	=3	
Patient expressed distinct concern over his/her responsibility for a real incident in his/her life, but is not preoccupied with it, and attitude and behavior are essentially unaffected.	Moderate	=4	
Patient expresses a strong sense of guilt associated with self-depreciation or the belief that s/he deserved punishment. The guilt feelings may have a delusional basis, may be volunteered spontaneously, may be a source of preoccupation and/or depressed mood, and cannot be allayed readily by the interviewer.	Mod Sev	=5	
Strong ideas of guilt take on a delusional quality and lead to an attitude of hopelessness or worthlessness. The patient believes s/he should receive harsh sanctions for the misdeeds and may even regard his current life situation as such punishment.	Severe	=6	
Patient's life is dominated by unshakable delusions of guilt, for which s/he feels deserving of drastic punishment, such as life imprisonment, torture, or death. There may be associated suicidal thoughts or attribution of others' problems to one's own past misdeeds.	Extreme	=7	

<p><b>G4 <u>Tension:</u> Overt physical manifestations of fear, anxiety, and agitation, such as stiffness, tremor, profuse sweating, and restlessness.</b>  <i>(Basis for Rating: Verbal report attesting to anxiety and, thereupon, the severity of physical manifestations of tension observed during the interview).</i></p>			
Definition does not apply.	Absent	=1	
Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2	
Posture and movements indicate slight apprehensiveness, such as minor rigidity, occasional restlessness, shifting of positive, or fine rapid hand tremor.	Mild	=3	
A clearly nervous appearance emerges from various manifestations, such as fidgety behavior, obvious hand tremor, excessive perspiration, or nervous mannerisms.	Moderate	=4	
Pronounced tension is evidenced by numerous manifestations, such as nervous shaking, profuse sweating, and restlessness, but conduct in the interview is not significantly affected.	Mod Sev	=5	
Pronounced tension to the point that interpersonal interactions are disrupted. The patient, for example, may be constantly fidgeting, unable to sit still for long, or show hyperventilation.	Severe	=6	
Marked tension is manifested by signs of panic or gross motor acceleration, such as rapid restlessness, pacing, an inability to remain seated for longer than a minute, which makes sustained conversation not possible.	Extreme	=7	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

POSITIVE AND NEGATIVE SYNDROME SCALE (PANSS) (continued)

G5 Mannerisms and Posturing: Unnatural movements or posture as characterized by an awkward, stilted, disorganised, or bizarre appearance.  
*(Basis for Rating: Observation of physical manifestations during the course of interview as well as reports from primary care workers or family).*

Definition does not apply.	Absent	=1	
Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2	
Slight awkwardness in movements of minor rigidity of posture.	Mild	=3	
Movements are notably awkward or disjointed, or an unnatural posture is maintained for brief periods.	Moderate	=4	
Occasional bizarre rituals or contorted posture are observed, or an abnormal position is sustained for extended periods.	Mod Sev	=5	
Frequent repetition of bizarre rituals, mannerisms, or stereotyped movements, or a contorted posture is sustained for extended periods.	Severe	=6	
Functioning is seriously impaired by virtually constant involvement in ritualistic, manneristic, or stereotyped movements, or by an unnatural fixed posture which is sustained most of the time.	Extreme	=7	

G6 Depression: Feelings of sadness, discouragement, helplessness, and pessimism.  
*(Basis for Rating: Verbal report of depressed mood during the course of the interview and its observed influence on attitude and behavior).*

Definition does not apply.	Absent	=1	
Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2	
Expresses some sadness or discouragement only on questioning, but there is no evidence of depression in general attitude or demeanor.	Mild	=3	
Distinct feelings of sadness or hopelessness, which may be spontaneously divulged but depressed mood has no major impact on behavior or on social functioning, and the patient usually can be cheered up.	Moderate	=4	
Distinctly depressed mood is associated with obvious sadness, pessimism, loss of social interest, psychomotor retardation, and some interference in appetite and sleep. The patient cannot be easily cheered up.	Mod Sev	=5	
Markedly depressed mood is associated with sustained feelings of misery, occasional crying, hopelessness, and worthlessness. In addition, there is major interference in appetite and/or sleep as well as in normal motor and social functions, with possible signs of self-neglect.	Severe	=6	
Depressive feelings seriously interfere in most major functions. The manifestations include frequent crying, pronounced somatic symptoms, impaired concentration, psychomotor retardation, social disinterest, self-neglect, possible depressive or nihilistic delusions, and/or possible suicidal thoughts or actions.	Extreme	=7	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

POSITIVE AND NEGATIVE SYNDROME SCALE (PANSS) (continued)

G7 **Motor Retardation:** Reduction in motor activity as reflected in slowing or lessening of movements and speech, diminished responsiveness to stimuli, and reduced body tone.  
*(Basis for Rating: Manifestations during the course of interview as well as reports by primary care workers or family).*

Definition does not apply.	Absent	=1	
Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2	
Slight but noticeable diminution in the rate of movement and speech. Patient may be somewhat under-productive in conversation and gestures.	Mild	=3	
Patient is clearly slow in movements, and speech may be characterized by poor productivity, including long response latency, extended pauses, or slow pace.	Moderate	=4	
A marked reduction in motor activity renders communication highly unproductive or delimits functioning in social and occupational situations. Patient can usually be found sitting or lying down.	Mod Sev	=5	
Movements are extremely slow, resulting in a minimum of activity and speech. Essentially the day is spent sitting idly or lying down.	Severe	=6	
Patient is almost completely immobile and virtually unresponsive to external stimuli.	Extreme	=7	

G8 **Uncooperativeness:** Active refusal to comply with the will of significant others, including the interviewer, hospital staff, or family, which may be associated with distrust, defensiveness, stubbornness, negativism, rejection of authority, hostility, or belligerence.  
*(Basis for Rating: Interpersonal behavior observed during the course of interview as well as reports by primary care workers or family).*

Definition does not apply.	Absent	=1	
Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2	
Complies with an attitude of resentment, impatience, or sarcasm. May inoffensively object to sensitive probing during the interview.	Mild	=3	
Occasional outright refusal to comply with normal social demands, such as making own bed, attending scheduled programs, etc. The patient may project a hostile defensive or negative attitude but usually can be worked on.	Moderate	=4	
Patient is frequently noncompliant with the demands of his/her milieu and may be characterized by others as an "outcast" or having "a serious attitude problem". Uncooperativeness is reflected in obvious defensiveness or irritability with the interviewer and possible unwillingness to address many questions.	Mod Sev	=5	
Patient is highly uncooperative, negativistic, and possibly also belligerent. Refuses to comply with most social demands and may be unwilling to initiate or conclude with full interview.	Severe	=6	
Active resistance seriously impacts on virtually all major areas of functioning. Patient may refuse to join in any social activities, tend to personal hygiene, converse with family or staff, and participate even briefly in an interview.	Extreme	=7	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

POSITIVE AND NEGATIVE SYNDROME SCALE (PANSS) (continued)

G9 **Unusual Thought Content:** Thinking characterized by strange, fantastic, or bizarre ideas, ranging from those which are remote or atypical to those which are distorted, illogical, and/or thoughts that are patently absurd.  
*(Basis for Rating: Thought content expressed during the course of the interview).*

Definition does not apply.	Absent	=1	
Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2	
Thought content is somewhat peculiar or idiosyncratic, or familiar ideas are framed in an odd context.	Mild	=3	
Ideas are frequently distorted and occasionally seem quite bizarre.	Moderate	=4	
Patient expresses many strange and fantastic thoughts (e.g., being the adopted son of a king, being an escapee from death row) or some which are patently absurd (e.g., having hundreds of children, receiving radio messages from outer space through a tooth filling).	Mod Sev	=5	
Patient expressed many illogical or absurd ideas or some which have a distinct bizarre quality (e.g., having three heads, being a visitor from another planet).	Severe	=6	
Thinking is replete with absurd, bizarre, and grotesque ideas.	Extreme	=7	

G10 **Disorientation:** Lack of awareness of one's relationship to the milieu, including persons, place, and time which may be due to confusion or withdrawal.  
*(Basis for Rating: Responses to interview questions or orientation).*

Definition does not apply.	Absent	=1	
Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2	
General orientation is adequate but there is some difficulty with specifics. For example, patient knows his location but not the street address; knows hospital staff names but not their functions; knows the month but confuses the day of the week with an adjacent day; or errs in the date by more than two days. There may be a narrowing of interest evidenced by familiarity with the immediate but not extended milieu, such as an ability to identify staff but not the mayor, Governor, or President.	Mild	=3	
Only partial success in recognizing persons, places, and time. For example, knows s/he is in a hospital but not its name; know the name of his/her city but not the borough or district; knows the name of his/her primary therapist but not many other direct care workers; knows the year and season but is not sure of the month.	Moderate	=4	
Considerable failure in recognizing persons, place, and time. Patient has only a vague notion of where s/he is and seems unfamiliar with most people in his milieu. S/he may identify the year correctly, or nearly, so, but does not know the current month, day of week, or even the season.	Mod Sev	=5	
Marked failure in recognizing persons, place, and time. For example, patient has no knowledge of his/her whereabouts; confuses the date by more than one year; can name only one or two individuals in his/her current life.	Severe	=6	
Patient appears completely disoriented with regard to persons, place, and time. There is gross confusion or total ignorance about one's location, the current year, and even the most familiar people such as parents, spouse, friends, and primary therapist.	Extreme	=7	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

POSITIVE AND NEGATIVE SYNDROME SCALE (PANSS) (continued)

<p>G11 <u>Poor Attention</u>: Failure in focussed alertness manifested by poor concentration, distractibility from internal and external stimuli, and difficulty in harnessing, sustaining, or shifting focus.  <i>(Basis for Rating: Manifestations during the course of the interview).</i></p>	Definition does not apply.	Absent	=1	
	Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2	
	Limited concentration evidenced by occasional vulnerability to distraction or faltering attention toward the end of the interview.	Mild	=3	
	Conversation is affected by the tendency to be easily distracted, difficulty in long sustaining concentration on a given topic, or problems in shifting attention to new topics.	Moderate	=4	
	Conversation is seriously hampered by poor concentration, distractibility, and difficulty in shifting focus appropriately.	Mod Sev	=5	
	Patient's attention can be harnessed for only brief moments or with great effort, due to marked distraction by internal or external stimuli.	Severe	=6	
	Attention is so disrupted that even brief conversation is not possible.	Extreme	=7	

<p>G12 <u>Lack of Judgment and Insight</u>: Impaired awareness of understanding of one's own psychiatric condition and life situation. This is evidenced by failure to recognize past or present psychiatric illness or symptoms, denial of need for psychiatric hospitalization or treatment, decisions characterized by poor anticipation of consequences, and unrealistic planning.  <i>(Basis for Rating: Thought content expressed during the interview).</i></p>	Definition does not apply.	Absent	=1	
	Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2	
	Recognizes having a psychiatric disorder but clearly underestimates its seriousness, the implications for treatment, or the importance of taking measures to avoid relapse. Future planning may be poorly conceived.	Mild	=3	
	Patient shows only a vague or shallow recognition of illness. There may be fluctuations in acknowledgement of being ill or little awareness of major symptoms which are present, such as delusions, disorganized thinking, suspiciousness, and social withdrawal. The patient may rationalize the need for treatment in terms of its relieving lesser symptoms, such as anxiety, tension, and sleep difficulty.	Moderate	=4	
	Acknowledges past but not present psychiatric disorder. If challenged, the patient may concede the presence of some unrelated or insignificant symptoms, which tend to be explained away by gross misinterpretation or delusional thinking. The need for psychiatric treatment similarly goes unrecognized.	Mod Sev	=5	
	Patient denies ever having had a psychiatric disorder. He/she disavows the presence of any psychiatric symptoms in the past or present, and though compliant, denies the need for treatment and hospitalization.	Severe	=6	
	Emphatic denial of past and present psychiatric illness. Current hospitalization and treatment are given a delusional interpretation (e.g., as punishment for misdeeds, as persecution by tormenters, etc.), and the patient may thus refuse to cooperate with therapists, medication, or other aspects of treatment.	Extreme	=7	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

POSITIVE AND NEGATIVE SYNDROME SCALE (PANSS) (continued)

G13	<b>Disturbance of Volition:</b> Disturbance in the wilful initiation, sustenance, and control of one's thoughts, behaviour, movements, and speech. <i>(Basis for Rating: Thought content and behavior manifested in the course of the interview).</i>		
	Definition does not apply.	Absent	=1
	Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2
	There is some evidence of some indecisiveness in conversation and thinking, which may impede verbal and cognitive processes to a minor extent.	Mild	=3
	Patient is often ambivalent and shows clear difficulty in reaching decisions. Conversation may be marred by alternation in thinking, and in consequence verbal and cognitive functioning are clearly impaired.	Moderate	=4
	Disturbance of volition interferes in thinking as well as behaviour. Patient shows pronounced indecision that impedes the initiation and continuation of social and motor activities, and which also may evidenced in halting speech.	Mod Sev	=5
	Disturbance of volition interferes in the execution of simple, automatic motor functions, such as dressing and grooming, and markedly affects speech.	Severe	=6
Almost complete failure of volition is manifested by gross inhibition of movement and speech, resulting in immobility and/or mutism.	Extreme	=7	

G14	<b>Poor Impulse Control:</b> Disordered regulation and control of action on inner urges, resulting in sudden, unmodulated, arbitrary, or misdirected discharge of tension and emotions without concern about the consequences of their actions. <i>(Basis for Rating: Behavior during the course of interview and reported by primary care workers or family).</i>		
	Definition does not apply.	Absent	=1
	Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2
	Patient tends to be easily angered and frustrated when facing stress or denied gratification but rarely acts on impulse.	Mild	=3
	Patient gets angered and verbally abusive with minimal provocation. May be occasionally threatening, destructive, or have one or two episodes involving physical confrontation or a minor brawl.	Moderate	=4
	Patient exhibits repeated impulsive episodes involving verbal abuse, destruction of property, or physical threats. There may be one or two episodes involving serious assault, for which the patient requires isolation, physical restraint, or p.r.n. sedation.	Mod Sev	=5
	Patient frequently is impulsively aggressive, threatening, demanding, and destructive, without any apparent consideration of consequences. Shows assaultive behaviour and may also be sexually offensive and possibly respond behaviorally to hallucinatory commands.	Severe	=6
Patient exhibits homicidal attacks, sexual assaults, repeated brutality, or self-destructive behavior. Requires constant direct supervision or external constraints because of inability to control dangerous impulses.	Extreme	=7	

NIMH CATIE SCHIZOPHRENIA

Patient initials:    Visit date (mmm, dd, yy):

Patient number:       Visit:

POSITIVE AND NEGATIVE SYNDROME SCALE (PANSS) (continued)

<p>G15 <b>Preoccupation:</b> Absorption with internally generated thoughts and feelings and with autistic experiences to the detriment of reality orientation and adaptive behavior.  <i>(Basis for Rating: Interpersonal behavior observed during the course of interview).</i></p>			
Definition does not apply.	Absent	=1	
Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2	
Excessive involvement with personal needs or problems, such that conversation veers back to egocentric themes and there is diminished concern exhibited toward others.	Mild	=3	
Patient occasionally appears self-absorbed, as if daydreaming or involved with internal experiences, which interferes with communication to a minor extent.	Moderate	=4	
Patient often appears to be engaged in autistic experiences, as evidenced by behaviors that significantly intrude on social and communicational functions, such as the presence of a vacant stare, muttering or talking to oneself, or involvement with stereotyped motor patterns.	Mod Sev	=5	
Marked preoccupation with autistic experiences, which seriously delimits concentration, ability to converse, and orientation to the milieu. The patient frequently may be observed smiling, laughing, muttering, talking or shouting to himself.	Severe	=6	
Gross absorption with autistic experiences, which profoundly affects all major realms of behavior. The patient constantly may be responding verbally and behaviourally to hallucinations and show little awareness of other people or the external milieu.	Extreme	=7	

<p>G16 <b>Active Social Avoidance:</b> Diminished social involvement associated with unwarranted fear, hostility, or distrust of others.  <i>(Basis for Rating: Reports of social functioning by primary care workers or family).</i></p>			
Definition does not apply.	Absent	=1	
Questionable pathology; may be at the upper extremes of normal limits.	Minimal	=2	
Patient seems ill at ease in the presence of others and prefers to spend time alone, although he/she participates in social functions when required.	Mild	=3	
Patient begrudgingly attends all or most social activities but may need to be persuaded or may terminate prematurely on account of anxiety, suspiciousness, or hostility.	Moderate	=4	
Patient fearfully or angrily keeps away from many social interactions despite others' efforts to engage him. Tends to spend unstructured time alone.	Mod Sev	=5	
Patient participates in very few social activities because of fear, hostility, or distrust. When approached, the patient shows a strong tendency to break off interactions, and generally he/she appears to isolate himself from others.	Severe	=6	
Patient cannot be engaged in social activities because of pronounced fears, hostility, or persecutory delusions. To the extent possible, s/he avoids all interactions and remains isolated from others.	Extreme	=7	

Comments:

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