

# Linking public issues with private troubles: Panel studies in developing countries

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# Linking public issues with private troubles: Panel studies in developing countries

# Abstract

Accompanying the call for increased evidence-based policy the developed world is implementing more longitudinal panel studies which periodically gather information about the same people over a number of years. Panel studies distinguish between transitory and persistent states (e.g. poverty, unemployment) and facilitate causal explanations of relationships between variables. However, they are complex and costly. A growing number of developing countries are now implementing or considering starting panel studies. The objectives of this paper are to identify challenges that arise in panel studies, and to give examples of how these have been addressed in resource-constrained environments. The main issues considered are: the development of a conceptual framework which links macro and micro contexts; sampling the cohort in a cost-effective way; tracking individuals; ethics and data management and analysis. Panel studies require long term funding, a stable institution and an acceptance that there will be limited value for money in terms of results from early stages, with greater benefits accumulating in the study's mature years.

# I. Introduction: the attraction of panel studies

*‘...a new spectre is now haunting social scientists- the spectre of household panel surveys. Not content with cross-sectional surveys,... academic groups and national statistical offices have launched household panel surveys in most European countries as well as in North America. [They]... appear to have voracious appetites for severely constrained resources from national science foundation budgets and may suffer from a number of technical problems as well’ (Duncan 2000 p. 54).*

The above quote identifies the burgeoning number of panel studies in ‘developed’ countries. Reviews and lists of panel studies in developed countries are regularly produced by the UK Longitudinal Studies Centre of the Institute of Social and Economic Research at Essex University ([www.iser.essex.ac.uk/ulsc](http://www.iser.essex.ac.uk/ulsc)). However, there is now an increasing call for panel studies in some developing countries that are moving towards evidence-based policy (see Garner et al 1998 for examples from the health sector). This paper outlines the strengths and weaknesses of panel studies and considers their implementation in developing countries.

The essence of the longitudinal survey is that it offers repeated observations of individuals over time. Such time-series design is often encountered under the generic term **panel study**. The unit of analysis is normally the individual and not (as in some cross-sectional surveys) the family or household. This is because the nature of families or households can change across time. ‘Panel studies should use the individual rather than the household as the unit of analysis and map the relationship existing between the two at different points in time. One can use the household as the unit of *measurement* but ought to use the individual as unit of *analysis*, attributing to each individual the characteristics of the household in which he or she lives’ (Laurie and Sullivan 1991: 122). In economic studies, the unit is often the household because many economic variables are not readily measurable at the individual level. This raises problems about defining what constitutes the ‘same household’. Using Living Standards Measurements Survey (LSMS) data from Cote D’Ivoire, Grootaert and Kanbur (1995) called it the same

household if there was just one member from the previous round. This raises potentially serious issues of interpretation.

A **cohort study** is a form of panel study and is designed so that the cohort or sample members share the same initial condition such as being born in the same year (note that in epidemiology the terms cohort, longitudinal and follow-up are used interchangeably (Last 2001)). Because the same people are followed across time, data can be used to examine flows into and out of certain states (for example, poverty), thus opening up a wider range of possibilities in terms of causal analysis and inferences compared to cross-sectional surveys (Menard 1991).

Rose (2000, p.34) sums up strengths of panel studies as follows: ‘Essentially panel data allow us to distinguish between transitory and persistent aspects of phenomena such as poverty and unemployment. They allow us to examine gross change - flows as well as the stocks. As they mature, panels provide vital information on intergenerational issues, for example social mobility ... However, these advantages only emerge if panel surveys are well designed and are maintained so that the disadvantages inherent to panels - panel conditioning [respondents becoming atypical of the population because of their panel membership], wave non-response, attrition - are minimised’. ‘Transitory aspects’ can only be captured if the frequency of observation is high relative to the duration of the ‘transitory’ phenomenon.

Rose (2000) argues that the prime purpose of household studies is to provide both social scientists and policy makers with prospective micro data in order to improve our understanding of processes, causes and effects in relation to social trends and social change. He suggests that the most imaginative social science has sought to connect public issues and private troubles (Mills 1959) and thus to explore macro and micro interconnections. While cross-sectional studies can also examine macro-micro linkages, panel studies are particularly suitable because of the added time dimension. Panel studies are often aimed at the study of individual change within theoretical frameworks, which place micro-level changes in a macro-level context. To give

a concrete, sectoral example of a call for such research, consider the fact that epidemiology in the UK has demonstrated links between material inequalities experienced in childhood and inequalities of health outcomes in adulthood. Morrow (2000) points out that these studies cannot explain why such a link exists nor trace the processes involved as they failed to measure the macro-level context. She draws attention to Popay et al's (1998) call for studies that explore the complex interactive relationship between individual experience, social action and the way in which societies are organised at the macro level. In other words, the linkage between private troubles and public issues.

Panel studies are analytically strong, provide an opportunity to link macro-micro issues and are increasingly called for in the research recommendations of numerous projects. However, the disadvantages of panel studies need to be borne in mind: they are costly and complex; it takes a long time for results to become available; and determination of aims at the outset may restrict the ability to respond to emerging policy questions. The objectives of this paper are to identify challenges that arise in panel studies, and to give examples of how these can be addressed in a resource-constrained environment such as a developing country. Examples of panel studies in developing countries are presented then problems such as linking macro and micro contexts, sampling in a cost-effective way and tracking individuals are considered.



## 2. Examples of panel studies in developing countries

**TABLE 1. EXAMPLES OF PANEL STUDIES IN DEVELOPING COUNTRIES WITH MORE THAN 1,000 SUBJECTS, FOLLOWED FOR AT LEAST TWO YEARS WITH MORE THAN ONE FOLLOW UP**

Place	Cohort	Current state	Tracked*	Notable Features	Reference
1. Johannesburg, S.Africa	4,029 children born April-June 1990	Ongoing	70%	Under-enrollment of white, middle class babies	Richter et al 1995
2. Pelotas, Brazil	1) 6,011 hospital births in 1982	Ongoing	1) 82% at age 12 months 87% at 20 & 42 months	3 follow ups at varying intervals	1) Barros et al, 1990
	2) 5,304 hospital births in 1993	Ongoing	2) 95% at 12 months		2) Barros et al, 2001
3. Yaounde, Cameroon	9,774 hospital births in 1978	?	88% after 1 month	Examining determinants of infant mortality,	Kuate-Defo B 1992
			65% after 2 years	7 follow ups at 4 month intervals	
4. Cebu, Philippines	3,080 mother-infant pairs born May '83-April '84 across 33 communities (rural and urban)	Ended 1999	By 1994, 75% were tracked (1991, 1994, 1999)	14 rounds in 1st 2 yrs, plus 3 others	www.cpc.unc.edu/cebu/
5. China	3,800 households across 8 provinces	?	?	4 rounds studying health, nutrition and family planning	www.cpc.unc.edu/china/
6. Guinea-Bissau	10,000 women across 5 northern regions	?	?	Visited 6-monthly for 6 years to measure maternal mortality causes	Hoj et al 1999
7. Rural Bangladesh	16,270 children aged 9-60 months	Ended 1985	?	Followed fortnightly from date of measles vaccination until: death/out-migration/ attainment of 60 months of age/end of study (Oct '85)	Koenig et al 2001
8. Rural Senegal	4,852 children born March '83-Dec '89 to mothers resident in 22 villages in 1983	?	?	Yearly censuses 1983-87. From Jan '87, weekly visits (demographic surveillance area). Examined causes of child mortality.	Ronsmans 1996

? = Information not known

\* It is not known whether this includes subjects who died before revisit or whether this is net of such mortality

Table 1 shows examples of large-scale (>1000 subjects) panel studies which have been conducted in developing countries. These studies have taken place in Asia, Latin America and sub-Saharan Africa and several have continued over many years. They all originated in the health and nutrition field. The table excludes ‘population laboratories’ or ‘population observatories’ which are prospective community studies that register the total population (typically 20,000) in a given area and follow up to monitor vital events such as deaths, births, and illness (Das Gupta et al 1997). Famous examples of these are the Matlab study in Bangladesh and the Narangwal study in India. Such studies have somewhat different aims and challenges compared to cohort studies and are not considered further here. The table also excludes some important panel studies from economics because the number of subjects was less than 1000 per sweep. Morduch (2001) points out that the Indian ICRISAT (International Crops Research Institute for Semi Arid Tropics) 10 village study, despite a cross section of just 120 households per year, still yields valuable new insights many years after the last wave was collected in 1983-84 (data were collected every year for ten years). The ICRISAT data have produced important work on risk-coping strategies, nutrition, crop choice, tenancy contracts, labour supply and poverty dynamics and have influenced safety net design world-wide. Few households stayed in the sample for the entire period (53 of the original 120 by 1983) but the survey was particularly rich in the variety of questions asked. This, combined with the fact that it managed 10 repeat rounds, made it particularly useful. Similarly some of the Living Standards Measurement Surveys (LSMS-[www.worldbank.org/lsms](http://www.worldbank.org/lsms)) have had panel elements, for example, Cote D’Ivoire (which had a nationally representative cross section of households). Each year 1600 households were sampled; half of these were revisited the following year, the other half was replaced with new households. The result is four cross-sectional data sets and three two-year panels (for 1985-6, 1986-7 and 1987-8). Annual attrition (% of the base year sample) ranged from 5-13% for the ‘poor’ and 11-15% for the ‘non-poor’.

### **Other examples of how results of panel studies have been used are:**

- i) Birth to Twenty (previously known as Birth to Ten) is a birth cohort study of 4029 in Table children born during a seven-week period in 1990 in Soweto-Johannesburg, South Africa (<http://www.wits.ac.za/birthto20>). The first ten years of the study focused on the determinants of growth, health and development of the cohort. In the second 10-year period, new research areas such as sexual maturation, education, and the social risks and vulnerability of young people to contract HIV/AIDS are included. The Birth to Twenty study results have had a major impact on a number of areas of policy relating to children's health, well-being and education in South Africa. For example, children's perceptions and experiences of tobacco at 5 and 7 years of age contributed to changes in the South African tobacco control legislation passed in 2000. Birth to Twenty successfully uses policy briefs and newspaper articles to highlight findings of the study. Examples include the consequences of high blood lead levels in children living in the Johannesburg metropolitan area, the impact of tobacco advertising on children and the problem of bullying in schools.
- ii) Pelotas (Brazil) birth cohort studies (1982 and 1993). Data from these studies have been used to investigate inequities in child health and the implementation of new public health interventions (Victora et al 2000). The authors confirmed the hypothesis that new interventions and programmes initially reach those of higher socio-economic status and only later affect the poor, resulting in increases in inequity ratios for health indicators at the earlier stages of programme implementation. This has led to calls to policy-makers and programme managers to adjust their targeting strategies.

The principal challenges of conducting panel studies are addressed in the next section.

### 3. Addressing problems of panel studies in developing countries

#### 3.1 Conceptual frameworks which link macro and micro contexts

‘In the search for effective policies to combat poverty, bridging the gap between macro-level policy analysis and micro-level livelihoods analysis is an essential task, but not an easy one’ (Shankland 2001: no page number). Because panel studies are well suited to linking macro policy changes with micro individual or household changes, it is imperative to have a conceptual framework that links the two. A conceptual framework requires hypothetical linkages between risk factors (or determinants, depending on what discipline one is from) and outcomes. For example, a child poverty study may have numerous outcomes such as a child’s physical and mental health, her nutritional status and developmental stage for age, numeracy, literacy, and the child’s own, subjective perception of well-being. These would be measured empirically, at each sweep, or round, of the study. In addition, there will be risk factors for such outcomes.

Continuing the example of a study of child poverty, risk factors would include aspects of childcare (including use of services), work, play, education, and household structure including parental characteristics such as caregivers’ education status and physical and mental health. In addition, particularly in development studies, careful consideration needs to be given to the measurement of wealth, socio-economic status and livelihoods. A recently launched longitudinal study covering four developing countries, the Young Lives project (see Harpham 2002 and [www.younglives.org.uk](http://www.younglives.org.uk)) for example, uses a livelihoods framework and tries to capture shocks and various assets (such as social capital) which may buffer the effect of shocks. As Dercon (2001:7) states: ‘panel data... are crucial for increasing our quantitative understanding of shocks and their impact’. But, all this is at the microlevel; what about the macro? In between the two levels are community structures and institutions. It is useful to capture contextual information by implementing a community (ecologic) questionnaire using a similar format to the community questionnaires implemented in the large-scale international household surveys such as the World Fertility Survey (WFS), the Demographic and Health Surveys (DHS) and the Living Standards Measurement Surveys (LSMS). The sampling procedure (see section 3.2) can facilitate or

hamper the collection of the most useful community-level data. We need enough communities to see variation in the effect of policy implementation (or to confirm its uniformity across the state). ‘Within’ communities we want all of a set of households to be part of the same ‘community’.

Measuring change at the macro level requires monitoring policy over time and then, in analyses, linking such change to micro level change at the household or community level. Studies may be concerned with specific sectors, such as health, or may be interested in broader issues such as poverty, in which case cross-sectoral policies have to be monitored (e.g. privatization). Evidence of policy implementation, not mere declarations or enactment, needs to be monitored. Thus, information is required on any differential implementation (between places (region, rural/urban), times or population groups).

If inter-sweep tracking visits are made to cohort members (see section 3.3 below), field workers can undertake checks of policy implementation at the local level during these visits. For example, if user fees are introduced at the national level, are local health facilities actually charging them? This confirmation of policy implementation at the local level is easiest for sectoral policies. In cross-sectoral policies it may be more difficult for the causal links to be made. For example, trade liberalization may be linked to rises in prices of agricultural inputs (e.g. fertilizers), which may result in changes in the productivity and ultimately the welfare of household members. However, changes in productivity may be associated with potential ‘confounding’ factors such as seasonal climatic change, gradual erosion of farmers’ capitals etc. Careful, step-by-step diaries of policy implementation are needed for robust analysis of macro-micro links. In addition, complementary longitudinal qualitative data may illuminate quantitative relationships observed (Laurie and Sullivan 1991).

Another point to note about macro-micro linkages in panel studies is that a single cohort study is not able to inform us about trends. For life-course processes recorded for a single cohort,

there is no scope to examine variation from cohort to cohort. Only a comparison *between* cohorts allows one to establish whether there has been change across time, for example whether children born ten years later have better nutritional status (Dale and Davies 1994). However, this substantially adds to costs and a single, additional cross-sectional survey of children at a particular age is a compromise that will at least provide some comparative data, provided it uses the same sampling basis as the original cohort. In addition, the panel data can be compared to secondary data sources (e.g. previous national surveys) if population groups are sufficiently similar.

### **3.2 Sampling the cohort in a cost-effective way**

Sample selection for a panel study needs very careful consideration. While a developed-country study might reasonably select children born in a hospital, a developing country sample would often be biased in favour of the wealthier and the urban by such a choice. In many cases, it may be impractical to take a sample that is representative of the relevant age-group, from the general population. It would need to be very large and expensive to contain enough of any given target group.

If it has the aim of illuminating macro-micro issues, a study needs to focus on geographical areas (“sites”) where it is meaningful to assess the local implementation of relevant policies and to collect a meaningful sample of micro-level information on individuals. The sampling strategy requires work at two levels: site selection and sampling of individual households within sites. Those individuals selected within sites studied will of course be personally unknown and anonymous to analysts concerned with the whole study, so the usual requirements of objectivity demand that sampling have the benefits associated with randomness, rather than being casual or opportunistic. Also, repeated follow-up makes it imperative that the selections made can be documented and traced, so the site sample can be reproduced without difficulty. In practice, this is likely to mean that a systematic form of sampling is used, carefully adapted to local conditions.

For example in a peri-urban area with moderate population density and no reliable long-term house-numbering system, one might sample households lying on transects, each beginning at an established road junction and heading directly towards a visible landmark. The target dwellings, the site description, and the instructions to later researchers who will follow the tracking rules need to be very well-described.

At the level of site selection, it can be anticipated that plausible entities that might become sampled sites will have numerous characteristics that are well known at least regionally. For example, one site may be a centre of a particular form of child labour in an ill-regulated industry, a market for some specific products, the centre of inter-communal religious violence, and so on. Sampling sites at random disregards this plethora of information, and will only work well if there are a huge number of selected sites so that most important features are adequately represented. To keep down the workload and the corresponding costs, developing country studies are likely to have a relatively small number of sites. Therefore, these must be sampled purposively, ensuring they serve to illuminate macro-micro policy linkages known to be important at the outset, e.g. individual or combined impacts of legislation on child labour, and an improved commitment to industrial regulation. A claim to have avoided subjective selection biases depends on a very clear qualitative description of the site selection, e.g. how it draws on published data, and was agreed by a consensus of named experts. The usual statistical approach to “cluster sampling” sets out to suit a one-off cross-sectional study; relatively many, relatively small clusters are chosen, often at random from a list of possibles, and the individual clusters are not regarded as individually interesting in their own right. In contrast, the panel study focuses its attention repeatedly on the same sites, has to maintain a reasonable sample at each site even though anticipating some degree of attrition as time goes by, and minimises attrition by good liaison with community members and bodies. Rather than following the precepts of cluster sampling, it is thus reasonable for a panel study to adopt the pattern of sentinel site surveillance – a relatively small number of carefully documented sites studied in a consistent way at intervals. Typical health sector sentinel

surveillance exercises entail quite frequent collection of relatively simple data in order to follow trends in public health indicators. The panel study is usually distinguished from such exercises by complex study instruments and a far greater need to retain the same sample members as time goes by.

The Young Lives study, in which the authors are involved, follows the above principles and regards it as important that the panel study sites provide excellent settings in which complementary research approaches can very effectively be implemented: given the necessary funding, this structure allows in-depth and perforce smaller-scale qualitative studies to be conducted in one or a few sites, and articulated with the broader, but shallower panel study information.

### **3.3 Tracking individuals**

Minimizing loss of individuals over time is, perhaps, one of the greatest challenges facing any panel study. A review of the literature shows that refusal to continue participation is the main reason for loss in developed country cohort studies, whereas in developing countries the principal problem is failure to trace participants (Hill, 2002). Tracing rates, naturally, vary according to factors such as the inter-sweep interval and local conditions. The selection of strategies to maximize tracing is determined by resources and local circumstances. These strategies range from the gathering of pertinent information to the use of technology. Information on key friends, neighbours and family of a participant can lead to useful sources of help when a cohort member has moved. Another possibility is to employ a local community member to conduct occasional tracing checks on cohort members. Improvements in communications technology bring new possibilities. In an urban cohort in South Africa, the cheap availability of 'pay as you go' mobile phones has assisted in minimizing attrition by the researchers providing respondents with a cheap phone and the researchers regularly phoning to maintain contact with the respondents. Geographical Information Systems (GIS) provide exciting new opportunities for



tracking in remote areas. Inevitably resources will constrain the extent of the tracking that can be undertaken in a study. Decisions must be taken on, for example, whether or not to follow individuals who move outside the study catchment areas. Large-scale studies have used a central tracking operation for cases that move beyond a local area. In the Young Lives study, information will be gathered in the first sweep of the study to establish tracking strategies for the different sentinel sites, according to factors such as within-site mobility and migration rates.

### 3.4 Ethical issues

Ethical issues are particularly important in panel studies because of the increased burden on respondents. In some developing countries, appropriate ethical committees do not yet exist, and, therefore, they may have to be established before the implementation of a panel study. An important aspect of successful tracking of cohort individuals is that on entry to the study they are aware of its longitudinal nature and that they consent to being traced over time. This is one ethical issue that differs from single cross-sectional studies. Panel studies, naturally, share many ethical concerns with other study designs and these are important to address. These include issues such as informed consent, how to deal with cases of illness or abuse that are encountered, and how to interview vulnerable groups such as children. An issue which perhaps bears greater significance in panel studies, is that of incentives for participants. The question of whether to use incentives, in the form of cash or kind, particularly where there is no immediate benefit of participating in a study, is not straightforward. In the South African Birth to Twenty Project, for example, study participants receive simple tangible reminders of the project such as stickers, key rings, annual calendars, fridge magnets, pens and rulers, all with a prominent study logo. Participants are refunded for any transport costs incurred and a limited social and health service has been incorporated into the study. A toll-free number has been installed in the project office to enable families to contact the study for advice and information. Referral notes to local services are given to families when serious health or social problems were detected. Incentives in the form of communication to make participants feel involved have also proved helpful to keep participants interested and to remind them to inform organizers about change of address.

Examples include birthday cards, regular newsletters, reports on the study in the local media, and a website (<http://www.wits.ac.za/birthto20>).

### **3.4 Data management and analytical challenges**

Improvements in both computing software and hardware have helped put panel studies within easier reach of researchers. Nevertheless, their complexities for data management and analysis should not be underestimated, and require considerable care in design and ongoing maintenance. Planning for data management and analysis at an early stage can also inform the design of data collection instruments, such as questionnaires - for example, by clarifying the coding of variables or by evaluating the utility of a question, in an analysis plan with dummy tables. These points hold for other types of study, but for panel studies they are perhaps of even greater importance, since the early planning stages need to consider the data management and analysis requirements of later sweeps. A good foundation will reap many benefits at later stages.

To capitalise on the primary strength of panel studies means looking at data longitudinally, that is linking data measured at one point in time with measurements at later points. This requires consideration of how stable or transient variables are in assessing their use as determinants or correlates of later outcomes. A key problem is that of missing data, either when an individual is lost to follow-up entirely or misses a sweep but returns later. This is a methodological field of enquiry which is currently attracting considerable attention and is likely to generate more sophisticated and accessible methods for dealing with missing data such as imputation.

Finally, a crucial issue for long-term successful use of panel data is comprehensive documentation of procedures and structures. Few researchers will be involved with a long-term study for its entire duration and as the complexity of datasets increases, the need grows for clear metadata - explanatory information associated with the actual data, e.g. as to what was measured or recorded by whom and about whom, when and where; and any changes to datasets during 'cleaning': These metadata should be securely locked on to the data themselves and all

documentation and definitions should be of sufficient standard that the provenance of early data can still be fully understood fifteen or thirty years thence. This requires rigorous attention to the archiving of metadata, in turn requiring a high degree of selectivity about the data and metadata items preserved, to avoid too large a bureaucratic burden.

## 4. Conclusions

Panel studies are important in developed countries due to their ability to inform policy (Office for National Statistics 1999, Institute for Social and Economic Research 2000). As the call for evidence-based policy increases in developing countries, the attraction of panel studies will grow. However, they are expensive (eg. the UK 1970 Birth Cohort Study and the UK National Child Development Study have each cost c. £1.5m) and complex. As experience of implementing panel studies in developing countries increases, more guidelines can be formed regarding the challenges considered in this paper: selecting a sample in the absence of a sampling frame; linking macro and micro contexts; tracking mobile populations; the need for ethics committee approval; and sophisticated data management and analysis. Panel studies should not be entered into lightly in any context, but in resource-constrained environments, their added value needs careful consideration. They certainly require quite long-term robustness of funding and a stable institutional setting, and they require their backers to have sufficient vision and patience to accept limited value for money in terms of results from the early stages, the greater benefits accumulating in the study's mature years.

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