Latin American countries lead in Google search volumes for anorexia nervosa and bulimia nervosa: Implications for global mental health research

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Abstract

Objective: Although eating disorders occur worldwide, prevalence data beyond Euro-American contexts are sparse, and eating disorders largely remain outside global mental health agendas. This study aims to address this gap in the epidemiological literature through a global *infodemiological* comparison of Google search volumes for the topics 'Anorexia nervosa' and 'Bulimia nervosa'.

Method: Data were generated through Google Trends, a tool that assesses the relative search volumes of keywords and topics. Google Trends data, collected from 1 January 2004 to 31 December 2016, were obtained for the relative search volumes of the topics 'Anorexia nervosa' and 'Bulimia nervosa' worldwide.

Results: The findings revealed that Latin American countries accounted for the top ten in search volume for both topics, with Mexico ranked first until 2016, when Bolivia rose to the top of the list.

Discussion: The results suggest that eating disorders are of considerable and consistent salience across Latin America, and that population-based, nationally representative studies to assess the prevalence of eating disorders in Latin American countries should be prioritized within global mental health research agendas.

Keywords

Anorexia nervosa; bulimia nervosa; epidemiology; global health; Latin America

Introduction

Although eating disorders are not limited to the Global North, little is known about the epidemiology of eating disorders worldwide. Data on the prevalence and incidence of eating disorders outside Euro-American contexts are sparse, and eating disorders continue to be excluded from global mental health agendas, which have tended to focus on disorders such as depression and psychosis (Baxter et al., 2013; Erskine et al., 2017).

The present study aims to address this gap in the epidemiological literature by turning to Google Trends. Google Trends is a tool that provides data on the relative search volume of search words and topics across time and geographical locales. Data are normalized to make them comparable, as described by Google: "Each data point is divided by the total searches of the geography and time range it represents to compare relative popularity…. The resulting numbers are then scaled on a range of 0 to 100 based on a topic's proportion to all searches on all topics" (Trends Help, 2018). Google Trends, therefore, can be employed to obtain the relative search volumes of the topics 'Anorexia nervosa' and 'Bulimia nervosa' worldwide, for a country-by-country comparison of the issue salience of eating disorders.

Designed as a tool for assessing public opinion trends, and used extensively by journalists and political scientists (Mellon, 2014), Google Trends has also been applied widely in health-related research (Nuti et al., 2014). In epidemiology, Google Trends is considered useful because it allows for the real-time and seasonal tracking of health-related symptoms and behaviours, as well as the long-term assessment of trends in public interest and conceptualizations of particular diseases, disorders, and health-related search terms (Nuti et al., 2014).

While Google Trends is not an epidemiological instrument, and its use as such has been problematized (Olson et al., 2013), it can be conceptualized as an *infodemiological*

instrument (Seifter et al., 2010). Infodemiology, as coined by Eysenbach (2009:1), refers to "the science of distribution and determinants of information in an electronic medium, specifically the Internet, or in a population, with the ultimate aim to inform public health and public policy". According to Eysenbach (2009:1), infodemiology carries several advantages, among which are affordances for predicting outbreaks, "tracking the effectiveness of health marketing campaigns", and "detecting and quantifying disparities in health information availability" in real time. These affordances, Eysenbach (2009) suggests, set infodemiology apart from traditional epidemiological approaches, which are not predictive and often require years of planning, data collection, and analysis.

Notable examples of the infodemiological affordances of Google Trends, as applied in health-related research, include a study that correlated the spread of influenza with the temporality of Google relative search volumes (Carneiro and Mylonakis, 2009) and a study that found positive associations between the relative search volumes of the term 'Lyme disease' across the United States and the state-by-state prevalence of Lyme disease (Seifter et al., 2010). In addition to studies focused on infectious disease, Google Trends has been used in research on monitoring population risk for mental ill-health, including self-harm (Bragazzi, 2014), suicidality (McCarthy, 2010; Gunn and Lester, 2013), and the seasonality thereof (Ayers et al., 2013). However, while Google search volumes may have predictive value where infectious disease epidemics or self-injurious behaviors are concerned, their epidemiological value is attenuated in cases of long-term mental health and chronic conditions, where the main strength of infodemiology is the patterning of health information interest and demand (Breyer and Eisenberg, 2010; Brigo et al., 2014).

In the case of eating disorders, where population-based epidemiological research is lacking on the global level, Google Trends data can provide an important lens onto the issue salience of eating disorders in understudied locales. This study, then, aims to answer the following

research question: which countries lead in online search volumes for anorexia nervosa and bulimia nervosa?

Methods

Google Trends was used to rank countries by the relative search volumes of the topics 'Anorexia nervosa' and 'Bulimia nervosa'. To create a cross-country comparison that included linguistic variations, the analysis was based on topics rather than exact search terms. As explained on the Google Trends 'Compare trends search terms' webpage, "[s]earch terms show matches for all terms in your query, in the language given", while "[t]opics are a group of terms that share the same concept, in any language" (Trends Help, 2017). Thus, while the search for topics was conducted in English, data were generated for all languages.

Google Trends data were obtained for the topics 'Anorexia nervosa' and 'Bulimia nervosa' separately. To obtain these data, the author first entered a search term in the Google Trends 'Explore' page search box (e.g., 'anorexia nervosa'), and then selected the search topic (e.g., 'Anorexia nervosa: Disorder') which appeared in the automatically generated drop-down search menu (Google Trends, 2017). In addition to the search box, the 'Explore' page included separate drop-down menus for country and for time range. The author selected 'Worldwide' in all queries. For each of the two topics, the author selected 'Customised time range' to obtain data for each full year separately, beginning with the earliest available data (2004) and ending with the last full year of data (2016), as well as for the total period of 1 January 2004 to 31 December 2016. The outputs included data for all the countries that had sufficient search volume; because Google search data are less reliable with low search volume, sufficient search volume is needed "to both generate signals and drown out noise" (Chan et al., 2011:5). Data were presented on the 'Explore' page in ranked country lists, in

descending order of search volume, including each country's assigned search volume value. The data were then downloaded as CSV files.

All data used in this study were publicly available, aggregated, and anonymous, and could not be traced back to identifiable individuals. The study therefore did not require ethical approval by an institutional review board.

Results

For the total period of 1 January 2004 to 31 December 2016, Google Trends identified 64 countries with sufficient search volume for the 'Anorexia nervosa' topic, and 67 countries with sufficient search volume for the 'Bulimia nervosa' topic. Latin American countries were the top ten in search volume for both the 'Anorexia nervosa' topic and the 'Bulimia nervosa' topic. Moreover, Latin American countries accounted for 14 of the top 20 countries in search volume for the 'Anorexia nervosa' topic, and 16 of the top 20 countries in search volume for the 'Bulimia nervosa' topic. Excepting Japan (number 12 in search volume for the 'Bulimia nervosa' topic) and Australia (number 16 in search volume for the 'Anorexia nervosa' topic), all other countries in the top 20 for both topics were European (see table 1 and table 2).

[Insert table 1]

[Insert table 2]

The annual breakdown of the search volume results revealed that Latin American countries accounted for the top ten in search volume for the 'Anorexia nervosa' topic in 2007, 2008, and 2011, nine of the top ten in 2006, 2009, 2010, and 2012, and eight of the top ten in 2004, 2005, 2013, 2014, 2015, and 2016. Latin American countries accounted for the top ten in search volume for the 'Bulimia nervosa' topic in all years until 2013, when Japan entered the

top ten and began a steady rise in search volume, reaching number four in 2016. The annual breakdown also revealed that Mexico had the top search volume for both the 'Anorexia nervosa' topic and the 'Bulimia nervosa' topic until 2016, when Bolivia had the top search volume for both topics, with Mexico ranked second (see table 1 and table 2 for the top 20 country rankings in 2004, 2010, and 2016).

Discussion

The results reveal that anorexia nervosa and bulimia nervosa are issues of considerable and consistent salience across Latin America. While the relative prevalence of eating disorders in Latin American countries compared to other countries cannot be extrapolated from Google Trends data, the findings convey the necessity of researching the epidemiology of eating disorders in Latin American countries. To date, epidemiological research on eating disorders in Latin America has been scant, with little to no population coverage in many Latin American countries (Erskine et al., 2016; Erskine et al., 2017). However, the few epidemiological studies that have been conducted suggest that eating disorders in Latin America warrant further attention. A recent meta-analysis of epidemiological research carried out in six Latin American countries found that the point-prevalence of bulimia nervosa and binge eating disorder was higher in those countries than in Euro-American countries, whereas the point-prevalence of anorexia nervosa was lower (Kolar et al., 2016). The present study appears to mirror these findings with respect to bulimia nervosa, while suggesting that anorexia nervosa might have greater salience amongst Latin American populations than epidemiological surveys have implied.

The apparent disparity between the epidemiological data on anorexia nervosa in these six Latin American countries and the Google Trends search volumes for the topic 'Anorexia

nervosa' across Latin America might reflect the gap between infodemiology and epidemiology. Because Google search volumes measure issue salience and not disease prevalence, it is possible that public interest in anorexia nervosa is high – due to consistently high volumes of media mentions of anorexia nervosa, for instance – while the prevalence of the disorder remains low. However, since epidemiological research on eating disorders in Latin America has been limited, and epidemiological data are missing for many Latin American counties, it is also possible that the extant epidemiological data underestimate the prevalence of eating disorders, particularly anorexia nervosa and its subtypes. In addition, it is possible that the diagnostic features of anorexia nervosa and its subtypes, as employed in epidemiological studies, may need to be adjusted to reflect Latin American manifestations of the disorder. Indeed, the *DSM-5* (APA, 2013) revision of the eating disorders category has acknowledged the cultural specificity of the anorexia nervosa diagnosis, stipulating that non-fat-phobic manifestations of anorexia nervosa may be more culturally appropriate to US Latino populations.

Notably, while extant epidemiological research on eating disorders in Latin America has been limited to countries classified as 'Upper Middle Income' by the OECD, the present study has shown that the topics of anorexia nervosa and bulimia nervosa are salient across Latin America, including those countries classified as 'Lower Middle Income' (OECD, 2014). To enhance the interpretation of these search terms' apparent regional salience, the author obtained Google Trends data on the 2016 worldwide rankings, by search topic, for three non-communicable conditions for which, unlike eating disorders, robust global prevalence data are available: obsessive-compulsive disorder (Remes et al., 2016), major depressive disorder (Ferrari et al., 2013), and diabetes mellitus (Guariguata et al., 2014). While these search volume rankings did not parallel the country-by-country prevalence rankings of these conditions, when interpreted on the basis of geographic region, the rankings (for countries

with sufficient search volume) demonstrated patterns largely commensurate with what is known about the regional prevalence of these conditions: for diabetes mellitus, the top ten included nine Middle Eastern countries; for major depressive disorder, the top ten included eight European countries; and for obsessive-compulsive disorder, the top ten included eight Middle Eastern countries. This suggests that regional patterns of high search volume rankings may reflect convergences between the broader regional prevalence of long-term conditions and levels of public interest.

The study has several limitations. Because the results reflect only those segments of the population that use the Internet, they do not necessarily represent the issue salience of anorexia nervosa and bulimia nervosa among the general population (Mellon, 2014). This is a particularly important limitation because Internet use rates vary considerably between Latin American countries, from 24.6% in Nicaragua to 80.3% in Puerto Rico; Mexico – which leads both the anorexia nervosa and the bulimia nervosa search volume lists – has an Internet use rate of 59.5% (World Bank, 2017). This suggests that Internet searches may vary on a country-by-country basis in the degree to which they represent issue salience at the population level. Given previous research on the demographics of Internet users in Latin American countries, it is likely that Internet searches in some countries represent younger, more affluent, urban populations (Grazzi and Vergara, 2014). Additionally, in including only countries where sufficient search volumes for the topics ‘Anorexia nervosa’ and ‘Bulimia nervosa’ were recorded, the study’s findings excluded small and sparsely populated nations, as well as nations where Internet use is not widespread. Finally, the study’s findings are limited by the choice of ‘Anorexia nervosa’ and ‘Bulimia nervosa’ as the search topics, rather than ‘Eating disorder’. The search topic ‘Eating disorder’ would have produced different results, with the top ten dominated by Euro-American countries, likely reflecting regional terminological and conceptual understandings of the broader category of eating disorders. For

example, in the period studied (1/1/2004 – 31/12/2016), comparative data showed that the term ‘Eating disorders’ was widely used among English-speaking Google users in the US (with an average search volume of 22 versus 43 for the term ‘Anorexia’), whereas the equivalent terms ‘Trastornos alimentarios’ and ‘Trastornos de la conducta alimentaria’ were rarely used among Spanish-speaking Google users in Mexico (with an average search volume of <1 versus 31 for the term ‘Anorexia’). All considered, the search topics ‘Anorexia nervosa’ and ‘Bulimia nervosa’ were selected for two main reasons: (1) these terms allow for specificity, which is important given the extant, if limited, epidemiological data available on the disparate prevalence rates of anorexia nervosa and bulimia nervosa globally, including in Latin America (Kolar et al. 2016); (2) worldwide, for the period studied, the topic ‘Anorexia nervosa’ had more than double the average search volume of ‘Eating disorder’, at 43 versus 18, and ‘Bulimia nervosa’ had an average search volume of 52 versus 40 for ‘Eating disorder’.

Taking the study’s limitations into account, the results offer two important implications for research in global mental health. From a socio-cultural perspective, the high issue salience of eating disorder topics among Internet-using segments of Latin American populations calls for ethnographic and other qualitative research that explores the intersections of economic transitions, changing media discourses, local concepts of self and body image, and public interest in eating disorders (see Becker, 2004; Lester, 2007). From an epidemiological perspective, the results – interpreted within the wider context of regional parallels between search volumes and known prevalence data for other conditions – suggest that population-based, nationally representative studies to assess the prevalence of eating disorders in Latin American countries should be prioritized within global mental health research agendas.

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Table 1. The top 20 countries in worldwide search volume values for the topic 'Anorexia nervosa: Disorder'.

	2004	*2010*	*2016*	*2004 - 2016*
1	Mexico (100)	Mexico (100)	Bolivia (100)	Mexico (100)
2	Costa Rica (85)	Bolivia (76)	Mexico (72)	Guatemala (63)
3	Guatemala (76)	Guatemala (65)	Paraguay (63)	Paraguay (60)
4	Chile (72)	Ecuador (61)	Guatemala (59)	Costa Rica (58)
5	Australia (67)	El Salvador (54)	Argentina (56)	Peru (58)
6	Colombia (63)	Colombia (53)	Nicaragua (54)	Bolivia (56)
7	Puerto Rico (61)	Costa Rica (48)	Peru (52)	Chile (55)
8	Argentina (59)	Peru (48)	Honduras (52)	Puerto Rico (54)
9	South Africa (55)	Norway (46)	Norway (52)	Ecuador (53)
10	Poland (55)	Chile (44)	Chile (49)	Argentina (51)
11	Portugal (54)	Puerto Rico (42)	Costa Rica (47)	Colombia (51)
12	Bolivia (54)	Netherlands (38)	Sweden (47)	El Salvador (50)
13	Ecuador (53)	Sweden (37)	Finland (46)	Sweden (49)
14	Sweden (50)	South Africa (37)	Uruguay (45)	Norway (48)
15	New Zealand (49)	Argentina (36)	Ecuador (45)	Finland (46)
16	Israel (48)	Australia (35)	El Salvador (43)	Australia (43)
17	Spain (47)	Finland (35)	Netherlands (43)	Uruguay (43)
18	Netherlands (42)	Poland (35)	Puerto Rico (39)	Netherlands (42)
19	Cyprus (41)	Denmark (34)	Panama (39)	Panama (42)
20	Brazil (41)	United Kingdom (31)	Denmark (38)	Denmark (41)

Table 2. The top 20 countries in worldwide search volume values for the topic 'Bulimia nervosa: Disorder'.

	2004	*2010*	*2016*	*2004 – 2016*
1	Mexico (100)	Mexico (100)	Bolivia (100)	Mexico (100)
2	Argentina (93)	Bolivia (68)	Mexico (76)	Paraguay (60)
3	Guatemala (71)	Guatemala (47)	Paraguay (66)	Peru (55)
4	Chile (63)	Ecuador (45)	Japan (56)	Argentina (53)
5	Puerto Rico (60)	Peru (44)	Argentina (53)	Guatemala (53)
6	Costa Rica (58)	Costa Rica (35)	Peru (51)	Bolivia (51)
7	Peru (56)	Argentina (34)	Guatemala (47)	Ecuador (46)
8	Uruguay (55)	El Salvador (32)	Ecuador (43)	Puerto Rico (44)
9	Bolivia (54)	Chile (32)	Honduras (43)	El Salvador (42)
10	Ecuador (47)	Colombia (31)	Costa Rica (36)	Chile (41)
11	Colombia (43)	Puerto Rico (29)	El Salvador (36)	Costa Rica (41)
12	El Salvador (34)	Norway (21)	Puerto Rico (33)	Japan (36)
13	Spain (33)	Estonia (19)	Chile (33)	Uruguay (35)
14	South Africa (33)	Portugal (19)	Panama (31)	Panama (32)
15	Poland (32)	Brazil (19)	Dominican Republic (30)	Colombia (31)
16	Portugal (28)	Poland (19)	Uruguay (30)	Dominican Republic (30)
17	Australia (27)	Latvia (18)	Colombia (26)	Venezuela (26)
18	Brazil (26)	Spain (17)	Norway (25)	Poland (25)
19	Switzerland (25)	Venezuela (17)	Austria (24)	Austria (24)
20	Austria (24)	Germany (16)	Switzerland (23)	Norway (24)