

Completeness and quality of low back pain prevalence data in the Global Burden of Disease Study 2017

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ABSTRACT

Introduction Completeness of Global Burden of Disease (GBD) Study data is acknowledged as a limitation. To date, no study has evaluated this issue for low back pain, a leading contributor to disease burden globally.

Methods We retrieved reports, in any language, based on citation details from the GBD 2017 study website. Pairs of raters independently extracted the following data: number of prevalence reports tallied across countries, age groups, gender and years from 1987 to 2017. We also considered if studies enrolled a representative sample and/or used an acceptable measure of low back pain.

Results We retrieved 488 country-level reports that provide prevalence data for 103 of 204 countries (50.5%), with most prevalence reports (61%) being for high-income countries. Only 16 countries (7.8%) have prevalence reports for each of the three decades of the GBD. Most of the reports (79%) did not use an acceptable measure of low back pain when estimating prevalence.

Conclusion We found incomplete coverage across countries and time, and limitations in the primary prevalence studies included in the GBD 2017 study. This means there is considerable uncertainty about GBD estimates of low back pain prevalence and the disease burden metrics derived from prevalence.

INTRODUCTION

The Global Burden of Disease (GBD) Study aims to provide disease metrics to understand trends in global health. GBD studies^{1 2} have become the gold standard for measuring the burden of disease. As an example, the Lancet Low Back Pain Series used GBD disease metrics to argue for the urgent need for action to address the burden and impact of low back pain (LBP)^{3 4} globally. The challenge is that understanding trends in global health requires an enormous amount of data. As an illustration, the GBD 2019² study provides estimates for disease burden expressed in years of life lost, years lived with disability (YLD) and disability-adjusted life years (DALYs) for 369 conditions in 204 countries for the period 1990–2019. That is ~6.8 million data points.

Key questions

What is already known?

- In Global Burden of Disease (GBD) Studies, low back pain (LBP) is usually ranked #1 when disease burden is measured by disability and among the top 10 when both death and disability are considered.
- A limitation of GBD Studies is the reliance on modelling when data are not available.

What are the new findings?

- The reports included in the GBD 2017 study only provide LBP prevalence data for 103 of 204 countries (50.5%) in the time period 1987–2017 and most (61%) of the prevalence reports are for high-income countries.
- For the time periods 1987–1996, 1997–2006 and 2007–2017, there were reports for 18, 93 and 55 countries, respectively, with only 16 countries (7.8%) having prevalence reports for all three time periods.
- While most reports enrolled a representative sample (91%), few (16%) used an acceptable LBP definition.

What do the new findings imply?

- There is considerable uncertainty about the LBP prevalence estimates in the GBD study because of incomplete coverage and the limitations of the primary prevalence studies.
- This uncertainty will impact two of the three disease burden metrics that are produced by the GBD study: years lived with disability and disability-adjusted life years.
- Uncertainty in GBD estimates means that the true burden of LBP is not known creating a challenge for assessing if progress is being made in reducing the global burden of LBP.

The GBD study uses a complex modelling approach to provide estimates of disease burden. For example, when estimating non-fatal health outcomes the model includes study-level covariates, location-level covariates, disability weights and comorbidity correction, in addition to prevalence data from the primary prevalence studies. The ambitious scope of GBD studies means that



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completeness of data needs to be borne in mind when considering GBD disease metrics. The GBD studies^{2 5} acknowledge a major limitation: a reliance on modelling to estimate key disease metrics such as incidence and prevalence when primary data are not available. The completeness of prevalence data is particularly important as these data are combined with disability weights to estimate the two burden measures that incorporate disability burden: YLD and DALYs.

While GBD studies acknowledge problems with data completeness, there has been little exploration of the coverage of prevalence data across years, diseases and global regions. The GBD 2017 study⁵ provides a visual portrayal of non-fatal data coverage over time and regions revealing for example that Oceania has less data than Western Europe. What is missing however is a quantitative assessment of data completeness and information on data coverage across years and for individual diseases. This information is important as successive versions of the GBD studies report the leading causes of disease burden for that report year and also trends over time.

Across the various GBD studies, LBP is usually the leading contributor to disease burden expressed as YLD and among the top 10 when disease burden is measured by DALYs. GBD estimates have been used to examine trends in the burden of LBP. For example, Wu et al⁶ reported that LBP prevalence reduced slightly in the period between 1990 and 2017, the prevalence was higher in females, increases with age, and that prevalence was higher in Southern Latin America (13.47%) than in Central Latin America (5.62%). But even this simple level of analysis requires >20 000 data points (ie, 21 regions × 28 years × 19 year age bands × 2 genders) and analysis at the level of country raises this to >200 000 disease metrics. While the authors acknowledge uncertainty in their estimates: ‘burden estimates were heavily reliant on models’; they do not quantify the extent of missing primary data. Therefore, it is unclear to what extent the trends identified are driven by primary LBP prevalence data or modelled LBP prevalence data.

The current study examined the completeness of primary LBP prevalence data that informed the estimates in the GBD 2017 study. We also aimed to determine where primary data are lacking and how future prevalence studies contributing data to the GBD studies could be improved.

METHODS

To describe completeness we tallied the number of reports included in the GBD 2017 study that provided LBP prevalence data for each of the following strata: world regions, countries, years (from 1987 to 2017), age of participants (5-year age groups from birth up to 95+) and gender of participants. We also tallied the subsets of reports that enrolled a representative sample and/or used an ‘acceptable’ measure of an LBP episode, which we describe below.

Table 1 Characteristics of included primary prevalence study reports (n=488) providing data for the period 1987–2017

Variables	N (%)*
Study type	
Peer-reviewed	194 (40)
Report or survey	294 (60)
Region (Global Burden of Disease super regions)	
Central Europe, Eastern Europe and Central Asia	75 (15)
High Income	300 (61)
Latin America and Caribbean	27 (6)
North Africa and Middle East	20 (4)
South Asia	9 (2)
Southeast Asia, East Asia and Oceania	25 (5)
Sub-Saharan Africa	32 (7)
Prevalence	
Any prevalence period	484 (99)
Unclear prevalence period	4 (1)
Point prevalence	57 (12)
Incidence	9 (2)
Age groups	
0–4	28 (6)
5–9	33 (7)
10–14	214 (44)
15–19	385 (79)
20–24	256 (52)
25–29	264 (54)
30–34	270 (55)
35–39	273 (56)
40–44	281 (58)
45–49	287 (59)
50–54	297 (61)
55–59	294 (60)
60–64	286 (59)
65–69	276 (57)
70–74	268 (55)
75–79	257 (53)
80–84	245 (50)
85–89	243 (50)
90–94	241 (49)
95+	240 (49)
Data for both genders available	472 (97)
Representative sample	446 (91)
Acceptable low back pain definition	79 (16)

*Numbers do not add up to the total number of reports (488) because some reports measured more than one prevalence period.

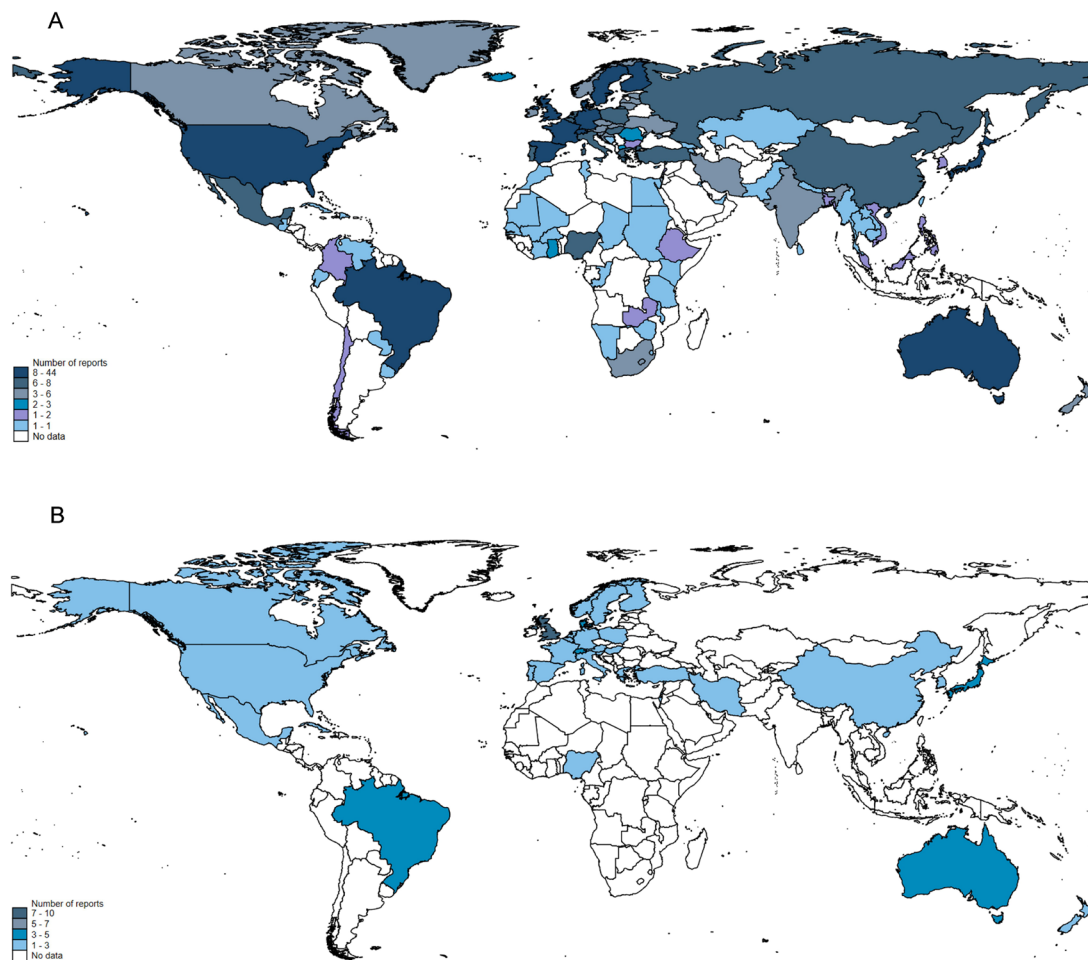


Figure 1 Number of LBP prevalence studies per country (A) and number of LBP prevalence studies per country that used an acceptable measure of LBP (B). LBP, low back pain.

Study design

This was a descriptive study.

Study procedure

Search strategy

We identified citation details for the primary prevalence study reports included in the GBD 2017 study via the Global Health Data Exchange website <http://ghdx.healthdata.org/gbd-2017>. We searched for data sources using their Data Input Sources Tool. In that tool, we selected ‘Nonfatal Health Outcomes’ under components AND ‘Low Back Pain’ under causes. This search revealed all sources used to calculate disease burden metrics used by GBD 2017. These sources included articles published in peer-reviewed journals and unpublished primary reports (eg, government reports, national health surveys, reports of claims data). We searched for the full text of primary reports published in academic journals via electronic databases (eg, PubMed, MEDLINE, EMBASE) and primary reports not published in academic journals via Google and Google Scholar.

Inclusion criteria

All reports included in the GBD 2017 study were considered eligible for this study.

Data extraction

Pairs of independent raters, from a panel of four, extracted data from the included reports using a piloted spreadsheet. We included all reports irrespective of language. For languages other than English, we sought help from native speakers in that language who performed the data extraction individually when possible. When we could not find a native speaker, we used the Google translate tool which is considered an accurate tool.⁷ Disagreements were discussed by the two original raters until consensus was reached. If consensus could not be reached a third author arbitrated.

We used a data extraction template to extract the following data from each report: age (5-year age groups from birth up to 95+) and gender of participants, global region/country where the study was conducted, prevalence study (yes/no), prevalence period (point, 1 week, 1 month, 3 months, 6 months, 12 months), incidence study (yes/no), years of prevalence/incidence data contained in each study from 1987 to 2017, whether the study enrolled a representative sample, and whether the study used an acceptable measure of an LBP episode.

As studies and reports frequently collapsed one or more age groups together (eg, ‘age 65+’), we assumed

Table 2 Countries (n=33) with at least one report using an acceptable LBP definition for measuring low back prevalence and frequency of reports providing data for the period 1987–2017

Region	N
Central Europe, Eastern Europe and Central Asia	
Hungary	1
Poland	1
Slovenia	1
High Income	
Australia	4
Austria	1
Belgium	1
Canada	1
Denmark	5
Finland	3
France	2
Germany	2
Greece	3
Israel	1
Italy	1
Japan	5
Netherlands	3
New Zealand	3
Norway	1
Portugal	1
South Korea	1
Spain	3
Sweden	2
Switzerland	5
UK	10
USA	2
Latin America and Caribbean	
Brazil	5
Cuba	1
Mexico	1
North Africa and Middle East	
Iran	2
Turkey	1
Southeast Asia, East Asia and Oceania	
China	2
Hong Kong	1
Sub-Saharan Africa	
Nigeria	3
Total	79

LBP, low back pain.

that data for all age groups had been collected. For each report, we recorded when data collection took place for example, the year 1990. The date for data collection had

to be explicitly mentioned in the report otherwise we coded it as unclear. We did not use publication date as a surrogate for this variable.

To be coded 'yes' for an acceptable measure of an LBP episode the survey instrument used in the primary study needed to: (1) include a visual or verbal depiction of the low back region (lower ribs to buttock crease); (2) collect responses directly from the person rather than a proxy and (3) measure an episode of pain OR activity-limiting pain. The operational definitions for enrolling a representative sample are in online supplemental appendix 1.

Data analyses

We analysed data by country, not report, as some reports provided data for more than one country. We collapsed data by country and tallied the number of prevalence studies across the seven GBD Super Regions. (1) Central Europe, Eastern Europe and Central Asia; (2) High Income; (3) Latin America and Caribbean; (4) North Africa and Middle East; (5) South Asia; (6) Southeast Asia, East Asia and Oceania; (7) sub-Saharan Africa, age groups (in 5-year bands) and over time in 1-year increments from 1987 to 2017. We divided the period covered by GBD 2017 into three time periods 1987–1996, 1997–2006, 2007–2017 (NB the third period is 11 years) to assess the extent to which there were sufficient prevalence reports over time. Our primary analysis was based on the full set of retrieved prevalence reports. We also considered the subset of reports that enrolled a representative sample and/or used an acceptable definition of LBP when measuring prevalence. Choropleth maps were created to summarise the frequency of reports per country. Darker shades represent a higher number of reports. To assess completeness of data per country from 1987 to 2017, we built heatplots to depict the number of studies or reports with data for each of the 30 years that were part of our analysis. White spots mean there is no data available. All analyses were done in Stata V.16.0.

RESULTS

Characteristics of identified reports

We obtained citation details for 470 reports from the data query tool on the GBD website. We located copies of 459 reports (citations for 11 missing reports are in online supplemental appendix 2) and with some reports covering more than one country we finally had 488 country-level reports.

The characteristics of the 488 retrieved country-level reports are provided in [table 1](#). Forty per cent of reports were published in peer-reviewed journals, 12% reported point prevalence data, the remainder used other or unclear prevalence periods. There were 300 (61%) reports providing data for the GBD Super

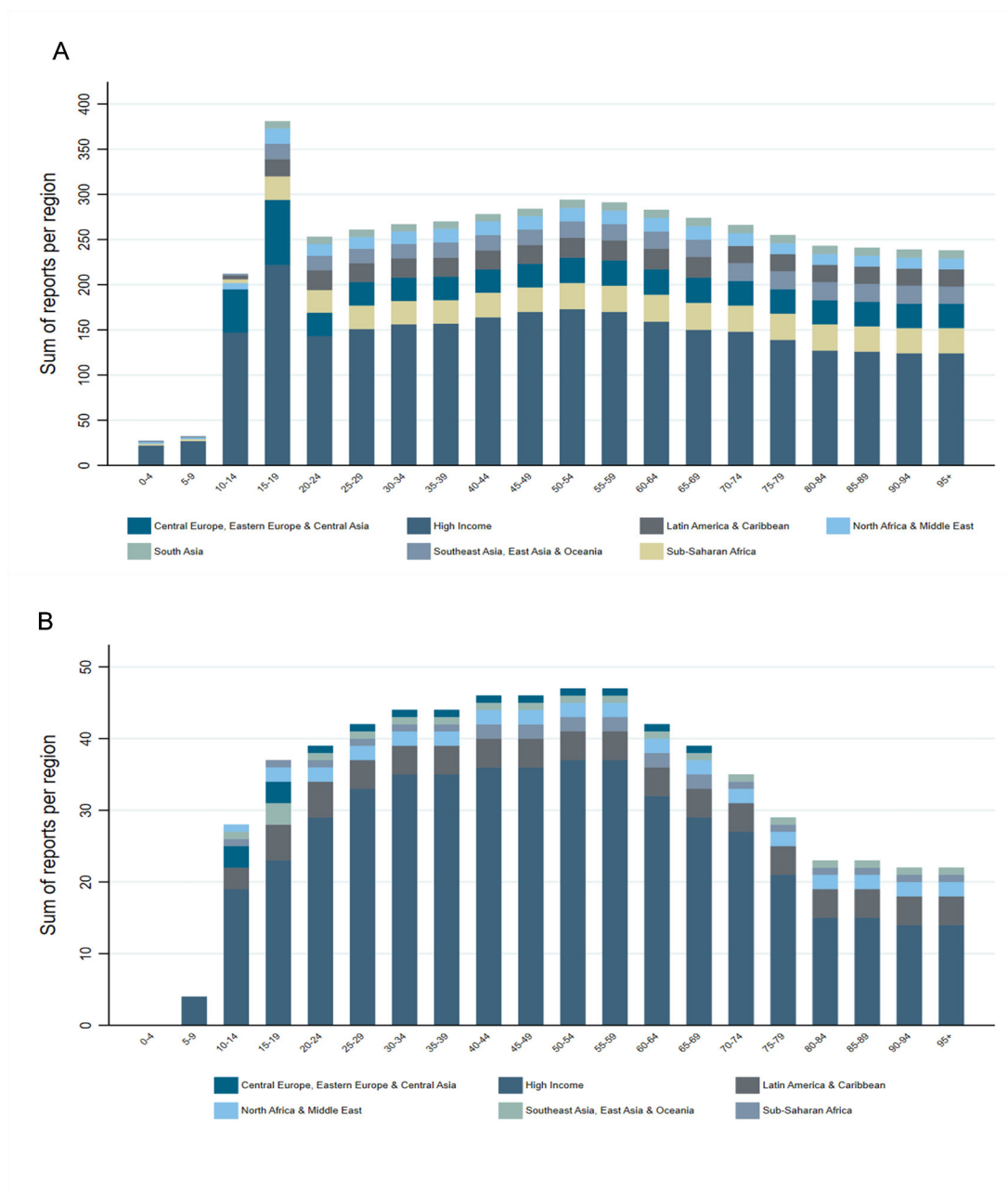


Figure 2 Number of LBP prevalence studies by age group per region (A) and number of LBP prevalence studies by age group per region that used an acceptable measure of LBP (B). LBP, low back pain.

Region ‘high-income’ countries, the other six global regions had from 9 to 75 reports providing prevalence data. While most studies (97%) provided data for males and females that was not the case across age groups with coverage ranging from 28 studies for age group 0–4 years to 385 studies for age group 15–19 years.

At the country level, 103 of 204 countries (50.5%) had at least one prevalence report (figure 1A). There was at least one prevalence report for 18 of 204 countries (8.8%) in the period 1987–1996, 93 of 204 (45.6%) countries in the second period 1997–2006 and 55 of 204 countries (26.9%) in the third period 2007–2017. Only

16 of 204 (7.8%) countries had a prevalence report in each time period.

Coverage based on prevalence reports that used an acceptable definition of LBP

At the region level, all seven had at least one primary prevalence report but only 33 of 204 countries (16.2%) had a primary prevalence report (table 2). High income was the region with the best coverage (60 reports) but within that region countries had from 1 to 10 reports. For the other six regions there was very little prevalence data. Country-level coverage is portrayed in figure 1B. For example, there are only two primary reports for China,

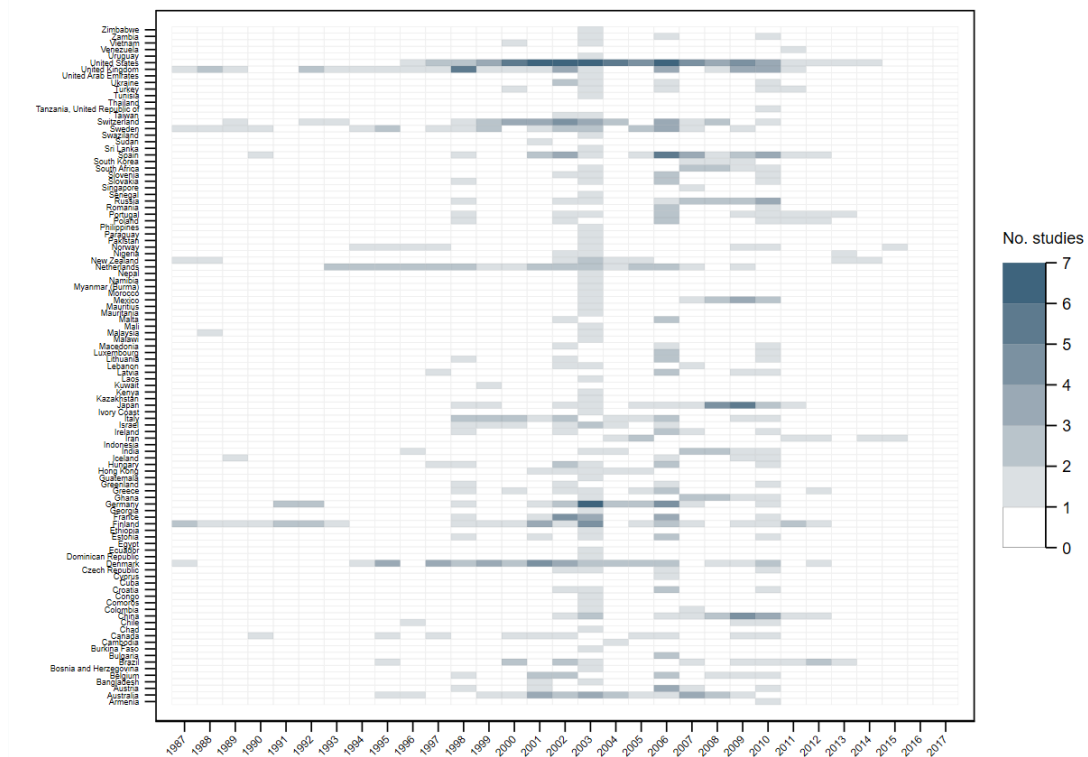


Figure 3 Number of LBP prevalence studies per year across countries from 1987 to 2017. LBP, low back pain.

and no primary reports for India and Brazil is the only South American country with data based on an acceptable LBP definition.

Coverage across age groups

The number of reports per 5-year age groups, stratified by global region is shown in figure 2A (all reports) and figure 2B (reports using an acceptable definition of LBP). The prevalence data from those studies using an acceptable definition of LBP is skewed towards younger adults and a greater proportion of the data comes from high-income countries.

Coverage over time

The completeness of data per country from 1987 to 2017 is shown in figure 3. Limited data mean it is challenging to provide comments about the prevalence of LBP over time at the level of a country. For example the USA has data for the years 1999, 2000 and 2006 in the period 1987–2017, but Canada only has data for the year 1995.

DISCUSSION

Statement of principal findings

The prevalence reports included in the GBD 2017 study only provide prevalence data for 103 of 204 countries (50.5%) in the time period 1987–2017. For the time periods 1987–1996, 1997–2006 and 2007–2017; there were reports for 18, 93 and 55 countries respectively. Only 16 countries (7.8%) have prevalence reports for all three time periods. Most of the prevalence reports are

for high-income countries. While most reports enrolled a representative sample, few used an acceptable LBP definition.

Strengths and weaknesses of the study

The strengths of the study include that we piloted the data extraction template until 100% agreement between raters was achieved. We also used double data extraction to ensure data quality. A weakness of the study is that while we performed a comprehensive search for the reports included in the GBD 2017 study and retrieved 98%; there were 11 reports that we could not locate. Another potential weakness is that the GBD 2019 study has been released; however we do not think our main result about coverage would change as the 2019 study has 455 reports compared with 470 reports in the 2017 study. This small decrease in studies would not be enough to change our main results. When study reports presented results stratified by age and used wider categories than we did for example, age 65+, we presumed data for all age bands had been collected. This approach will exaggerate coverage across age bands.

Strengths and weaknesses in relation to other studies, discussing important differences in results

The trends in LBP prevalence reported in previous analyses of GBD estimates need careful consideration. For example Wu *et al*⁶ analysed the GBD 2017 study estimates and concluded that for the year 2017 there were marked differences in point prevalence across global regions

ranging from 13.47% in Southern Latin America to 3.92% in East Asia. However, we found that these two regions had little if any acceptable primary prevalence data in the period 1987–2017, and no primary prevalence data of any sort for the year 2017. Another issue that complicates drawing conclusions about point prevalence is that only 12% of the LBP prevalence studies included in the GBD 2017 study directly measured point prevalence. A challenge for future research in this area is to communicate to readers the extent to which the presented point prevalence estimates incorporate indirect data (ie, other prevalence periods, bodily pain rather than back pain) and/or modelled data. At present there is little transparency on these two important issues.

Meaning of the study: possible explanations and implications for clinicians and policymakers

The limited prevalence data we have means that it is challenging to assess if progress is being made in reducing the global burden of LBP. Only 16 countries have prevalence data for each decade of the GBD 2017 study, and for almost half the countries there are no data at all. Given the enormous amount of money that is currently devoted to healthcare for LBP there would seem to be a strong justification for better surveillance to understand if these investments are achieving their intended effects.

While we studied completeness of LBP prevalence data, similar issues likely apply to other common health conditions. When we repeated our search strategy for the 25 most burdensome health conditions in the GBD 2019 study (judged by DALYs); we found that most conditions had less prevalence reports than were available for LBP. The number of reports ranged from 19 (Dietary iron deficiency) to 2644 (Malaria) with a median of 429 (see online supplemental appendix 3). This situation makes the GBD study tables of leading causes of disease burden challenging to interpret.

The GBD model used to estimate non-fatal health outcomes is not only reliant on the completeness and validity of prevalence data. There is one set of disability weights, representing different severity levels of LBP, with no attempt to generate disability weights per country. This approach presumes that cases of LBP are similarly disabling regardless of where the person lives, whereas the prevailing view in the LBP field is that disability can vary substantially between countries and is influenced by factors such as work, health and social systems.³ In this regard, it is important to note that the LBP disability weights used in the GBD studies are based on surveys of respondents mainly from high-income settings.⁸ A second issue is that the primary prevalence reports measure prevalence of LBP, not prevalence of the six different types of LBP represented by the set of six disability weights used in the model. The split across the severity types is estimated from US claims data; which may not generalise to people who do not seek care (approximately 42% of people with LBP)⁹ or other countries.

Unanswered questions and future research

Our results strongly suggest we need better primary studies that adopt agreed best practice methods for measuring LBP prevalence that are implemented at regular time intervals. There is also a need to focus energies on parts of the world that have little or no LBP prevalence data.¹⁰ A good example of a model is that adopted in the Solomon Islands¹¹ where the Global Alliance for Musculoskeletal Health Survey Module was included in the country's national health survey. Another option would be to include the Musculoskeletal Health Survey Module in the WHO's STEPs programme for non-communicable diseases.¹²

CONCLUSION

Our results suggest there is considerable uncertainty about the LBP prevalence estimates in the 2017 GBD study because of incomplete coverage and the limitations of the primary prevalence studies. The limited prevalence data are concerning as prevalence data drive two of the three disease burden metrics produced by the GBD study: YLD and DALYs.

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