Gender matters in household surveys

When a study of child health in Afghanistan produced an inconsistent result, **Sandra Alba** realised that men and women can give very different answers to the same questions. She consulted gender experts **Franz Wong** and **Yngve Bråten** to understand why

"On average, humans have one testicle" – or one ovary, if you prefer. With this absurd yet true statistic, the psychologist and author Daniel Levitin cautions us not to clump data from disparate groups.[1]

If you are a statistician reading Levitin's words, you are probably thinking that you know this already, that you would never come up with such nonsensical statements. But do we always give sex or gender differences due consideration in our investigations?

Our experience suggests that such issues are easily overlooked, and that doing so can lead to mistakes.

A cautionary tale

In 2018, one of us (SA) was part of a team analysing data from a large, nationally representative household survey in Afghanistan. More than 20,000 households took part. The survey's focus was on mother and child health – for example, how many children receive all their vaccines by the age of 5? Do pregnant women attend all recommended check-ups? In low- and middle-income countries with weak routine health data systems, such as Afghanistan, these types of population health surveys are a vital source of information for public health planning.

The survey asked several hundred questions, which were summarised in approximately 50 statistical tables. All tables were programmed twice by independent statistical programmers. They were then checked for consistency and coherence by epidemiologists writing the report. Through this process, many anomalies in data management and analysis were identified and corrected. But there was one issue the team struggled to resolve.

Two modules investigating child health gave different results. The first module investigated expenditure on illnesses; the second module investigated treatment practices for common childhood illnesses. Both modules asked questions about episodes of illness in the recent past, such as: "Has your child had fever in the past two weeks?" The answers to these questions should have been approximately the same across the modules – after all, the same questions were posed to the same households about the same children. But the answers differed. For example, the percentage of children with a reported recent bout of fever was twice as high in the second module as in the first.

The team could not have such unexplained inconsistencies in its report as this would cast doubts on the credibility of the entire survey. So what could have gone wrong?

After combing through the data, a number of potential causes were revealed. A major one, which could in itself have caused the discrepancy, was that the questions in each module were put to different people within the same household: men were asked about expenditure, while women were asked about treatment of illness.

In Afghanistan (and elsewhere) women are the primary carers of children. Men play a lesser role in care-giving but are in charge of household budgets and are therefore more likely to recall episodes of illness that involve expenditure. These episodes may only be a subset of those recalled by women, perhaps the more serious cases. More generally, men and women have different knowledge bases and will answer questions accordingly. They may also understand questions differently and disclose information differently to interviewers. Therefore, upon reflection, the survey team should have expected different answers when asking men and women about their children's fever episodes, especially as this was done within two different contexts: treatment-seeking and expenditure on care.

The final report explained all of this when presenting the results, helping to put the discrepancy in the necessary context. But still we wondered: why did this "gender bias" catch the team unawares?

A "hidden" bias

Epidemiological studies – surveys of population characteristics such as health – are almost invariably subject to bias. Bias may be defined as "any systematic error that results in an incorrect estimate of the parameter of interest (a disease rate, the prevalence of an exposure, or more often some measure of the association between an exposure and disease)".[2] Common biases in household surveys (like the Afghanistan survey) include the following:

Sandra Alba, PhD, CStat, is an epidemiologist at KIT Royal Tropical Institute with a background in medical statistics. She has 12 years' experience in the application of statistical and epidemiological methods to evaluate public health programmes, primarily in low- and middle-income countries.

Franz Wong, PhD, is a senior advisor at KIT Royal Tropical Institute. He has been a gender specialist for over 10 years, with work experience in East and South Asia, East and Southern Africa and the Middle East.

Yngve Bråten is a gender specialist with experience working with KIT Royal Tropical Institute and the United Nations Population Fund (UNFPA).

- *selection bias* – when households included in the survey are not representative of the population for which conclusions are to be drawn.
- *non-response bias* – when people who refuse to take part in a survey are different from those who do participate.
- *response bias* – people's tendency to respond inaccurately or falsely to questions. This can happen inadvertently, but may also be motivated by fear of repercussions or in hope of expected returns (e.g., government subsidies).
- *researcher bias* – when researchers have incorporated unconscious bias into the study design, data collection and analysis.

Epidemiology and survey statistics textbooks amply cover the topic of biases. Yet gender biases are hardly ever mentioned, despite often being the root cause of many other biases. For example, non-response bias may be the result of gender effects at household level: depending on their role within the household, women or men may or may not be at home when interviewers show up at their doorstep. Similarly, social desirability bias – a form of response bias where people will give certain answers to appear to conform to social norms – may disproportionately affect women in some settings. In certain contexts, response bias could occur if men interview women, or vice versa.

The unique difficulty of gender bias is that gender effects are very context-specific and may not be overtly at play. It can be easy to miss them, especially when an investigation appears to have nothing to do with gender. Yet gender effects are unlikely to be totally absent in household surveys, since these surveys mostly investigate mixed-gender households. It follows, then, that household surveys will only produce valid data if sampling, tools and field procedures take context-specific gender dimensions into account. Similarly, data analysis and interpretation should be "gender aware" to meaningfully describe a phenomenon of interest.

Gender awareness may not have yet become part of the "mainstream" conversation in either epidemiology or statistics. However, related concepts have been circulating in the epidemiological literature now for nearly two decades.

Growing awareness

Sex and gender are essential to our

ABOVE The Afghanistan health survey team makes their way to a cluster of households selected for inclusion in the survey.

Beyond sex and gender dichotomies

There is a growing recognition in scientific, social and political spheres that gender and sex vary across a continuum. According to definitions provided by the US Federal Interagency Working Group on Improving Measurement of Sexual Orientation and Gender Identity in Federal Surveys (bit.ly/2VNNzKm):

- Sex "refers to the biological characteristics that are used to categorize individuals as male, female, or intersex".
- "Gender is a multidimensional construct that has psychological, social, and behavioral dimensions that include gender identity and gender expression. ... Gender identity refers to a person's internal sense of gender (e.g., being a man, a woman, or genderqueer) and potential affiliation with a gender community (e.g., women, trans women, genderqueer). ... A person whose gender identity and sex assigned at birth are consistent can be referred to as a cis-gender person (that is, a person who[se] gender is 'consistent in sex.'). The term transgender describes anyone whose gender identity differs from their sex assigned at birth."

In recent years, governments and research organisations have increasingly sought to incorporate variations in sex and gender beyond that of male–female or man–woman dichotomies. The US Federal Interagency document provides a case in point. According to Greta Bauer and colleagues, this change is motivated by both equity and human rights as well as data quality concerns.[10] Indeed, we cannot understand and respond to the diverse health needs of gender minority populations without representative data.

Furthermore, misclassification degrades data quality and dilutes associations. Conversely, more precise gender/sex data can be seen as a gateway to better epidemiology, and thus better science. As Bauer *et al.* argue, "more sophisticated measurement of sex and gender dimensions offers the opportunity to develop more detailed causal models of the impacts of multiple dimensions of biological sex and social gender on health outcomes for both trans and cisgender persons".

ABOVE A male enumerator interviews a head of household as part of the Afghanistan health survey.

understanding of health and illness. While sex is premised on biological characteristics, gender refers to social constructs regarding roles, expectations, behaviours and relations between and among women and men.[3] "Male" and "female" refer to sex, whereas words like "masculine", "feminine", "man", and "woman" all refer to gender. But one should be very careful with these categorisations. First, neither sex nor gender can be reduced to dichotomies (see "Beyond sex and gender dichotomies", page 39). Second, since gender is a social construct, it needs to be considered within existing webs of social relations (see "Intersectionality").

The recognition of sex and gender effects in epidemiology has led to the development of concepts such as

"engendering epidemiology"[4] or "gendered epidemiology",[5] along with methodological requirements for sex- and gender-sensitive epidemiological research and reporting.[6] As Nancy Krieger explains in her analysis of genders, sexes and health, gender relations and sex-linked biology can be singly,

neither, or both relevant as determinants of health. She writes: "Expressions of gender relations include: gender segregation of the workforce and gender discrimination in wages, gender norms about hygiene, gender expectations about sexual conduct and pregnancy, gendered presentation of

Intersectionality

Intersectionality is the acknowledgement that a person's existence is "the outcome of intersections of different social locations, power relations and experiences".[11] For example, a more privileged woman (e.g., with higher education and from a politically privileged ethnicity) may have more in common with her male counterparts than with less privileged women. Intersectionality can also be understood in statistical terms: gender is an important effect modifier and confounder to consider alongside other relevant socio-demographic characteristics; and the variation within a group of men or women may be greater than the variation between the groups.

and responses to symptoms of illness, and gender-based violence. Examples of sex-linked biology include: chromosomal sex, menstruation, genital secretions, secondary sex characteristics, sex-steroid-sensitive physiology of non-reproductive tissues, pregnancy, and menopause."[7]

Part of this gendered understanding of health and illness is a realisation that epidemiological investigations should also be gender aware. In this regard, Ingeborg Jahn and her colleagues describe four types of gender bias in epidemiology: "gender insensitivity (ignoring gender aspects), over-generalisation (generalisation of research results to a group that has not been studied), double standard (e.g. drawing on gender stereotypes to explain gender differences), and androcentrism (male as the norm)".[8] Maria Teresa Ruiz-Cantero further provides a useful framework, which relates gender insensitivity in epidemiology to selection and measurement bias as well as confounding.[9]

This body of research exposes the flaw in the Afghanistan survey: the assumption that the same questions about the same subject should give the same results, despite being asked of different people in the same household. This reasoning is gender unaware. As Ruiz-Cantero puts it: "one of the main effects of gender bias in research is partial or incorrect knowledge in the results, which are systematically different from the real values".

Which group of respondents would have provided the "real", unbiased view of childhood illness? Men or women? Probably both and neither. And even if the survey team had asked men and women the same questions in the same context, they perhaps still would have answered the questions differently, referring back to their own experience, knowledge and world-view.

A lack of awareness of these issues may not be that surprising. After all, how many bachelor's or master's degrees in statistics or epidemiology cover methodological requirements for sex- and gender-sensitive analyses? Other related disciplines have been much quicker to respond to the need for gender-aware investigations. For an example from the field of agricultural livelihood surveys, see "Tips for gender-aware data collection in surveys": this is exactly the type of thinking that we need to bring to health surveys.

On average, humans have one testicle and one ovary – but these crude averages fail to tell the whole story. Gender-aware methodologies for study design, data collection and analyses are key to ensuring high quality surveys. ∎

References

1. Levitin, D. J. (2016) *A Field Guide to Lies: Critical Thinking in the Information Age*. New York: Dutton.

2. Coggon, D., Rose, G. and Barker, D. J. P. (1997) *Epidemiology for the Uninitiated*, 4th edn. London: British Medical Journal.

3. Krieger, N. (2001) A glossary for social epidemiology. *Journal of Epidemiology & Community Health*, **55**, 693–700.

4. García, A. M., Bartley, M. and Alvarez-Dardet, C. (2007) Engendering epidemiology. *Journal of Epidemiology & Community Health*, **61** (suppl. 2), 1–2.

5. White, A. and Richardson, N. (2010) Gendered epidemiology: Making men's health visible in epidemiological research. *Public Health*, **125**, 407–410.

6. Heidari, S., Babor, T. F., De Castro, P., Tort, S. and Curno, M. (2016) Sex and gender equity in research: Rationale for the SAGER guidelines and recommended use. *Research Integrity and Peer Review*, **1**, 2.

7. Krieger, N. (2003) Genders, sexes, and health: What are the connections – and why does it matter? *International Journal of Epidemiology*, **32**, 652–657.

8. Jahn, I., Börnhorst, C., Günther, F. and Brand T. (2017) Examples of sex/gender sensitivity in epidemiological research: Results of an evaluation of original articles published in JECH 2006–2014. *Health Research Policy and Systems* (2017) **15**(1), 11.

9. Ruiz-Cantero, M. T. (2007) A framework to analyse gender bias in epidemiological research. *Journal of Epidemiology & Community Health*, **61** (suppl. 2), 46–53.

10. Bauer, G. R., Braimoh, J., Scheim, A. I. and Dharma, C. (2017) Transgender-inclusive measures of sex/gender for population surveys: Mixed-methods evaluation and recommendations. *PLoS ONE*, **12**(5), e0178043.

11. Hankivsky, O. (2014) *Intersectionality 101*. Vancouver: Institute for Intersectionality Research and Policy, Simon Fraser University.

12. Elias, M. (2013) *Practical Tips for Conducting Gender-responsive Data Collection*. Rome: Bioversity International. bit.ly/2MACOId