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Rethinking menopause measurement: untangling the complexities in the Demographic Health Survey data

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The Demographic Health Survey (DHS) data currently misclassifies women post-hysterectomy without bilateral oophorectomy, creating a bias that affects research findings, particularly when studying premature menopause. This commentary critiques this methodological flaw, which obscures crucial differences between natural and surgical menopause, ultimately skewing prevalence estimates, risk estimates, and our understanding of health consequences. I argue that including a specific question about oophorectomy status in DHS questionnaires is essential for generating accurate data that can inform effective public health policy and interventions globally.

Menopause represents a natural stage marking the end of a woman's reproductive years, brings about profound physiological and psychological shifts. To better understand this transition at the population level, researchers frequently turn to data from the Demographic and Health Surveys (DHS), which offer valuable insights into women's health worldwide. While clinical diagnosis employs detailed criteria (such as STRAW stages), large-scale surveys like the DHS often rely on simpler, operational definitions for practical feasibility. However, many studies using DHS data depend on a simplified binary definition of menopause, categorizing women as either pre-menopausal (*menstruating within the past 12 months*) or menopausal (*not menstruating for more than 12 months, currently experiencing menopause, or having undergone a hysterectomy*)^{1,2}. This commentary focuses specifically on the limitations of this common DHS classification approach for epidemiological and public health research.

While this definition generally works for women with intact uteri, it overlooks crucial distinctions in physiological experiences, particularly following hysterectomy. I can identify at least three primary scenarios relevant to survey classification:

1. **Active Menstruation:** Women experience regular menstrual bleeding.
2. **Hysterectomy Without Bilateral Oophorectomy:** Menstruation ceases due to uterus removal, but women may continue experiencing menstrual symptoms and hormonal fluctuations because at least one ovary remains functional.
3. **Menopause (Natural or Surgical):** Estrogen levels are reduced or absent, leading to eventual cessation of menstruation. Surgical menopause is specifically defined as menopause induced by the removal of

both ovaries (bilateral oophorectomy), which may or may not be accompanied by hysterectomy. It's worth noting that menopausal symptoms (such as changes in menstrual flow and hot flashes) often begin during the menopausal transition, *before* the final menstrual period³.

The current DHS approach, which often classifies all women who have undergone a hysterectomy as menopausal, fails to differentiate between these scenarios 2 and 3. This proves misleading, as a 38-year-old woman who had a hysterectomy due to fibroids but retained her ovaries would be classified identically to a 52-year-old woman experiencing natural menopause or a 45-year-old who had bilateral oophorectomy. This classification issue becomes most problematic when hysterectomy occurs before the typical age of natural menopause. This lack of distinction poses a significant problem for research using DHS data, particularly studies examining premature menopause (age < 40) or early menopause (age: 40–45), as it can skew findings related to prevalence, age of onset, risk factors, and potentially symptom experience.

This issue arises because different types of hysterectomies carry different endocrine implications^{4,5}. Hysterectomy prevalence varies significantly across countries and regions⁶. In partial and total hysterectomy without oophorectomy, only the uterus (*and cervix, in the latter*) are removed. Menstruation ceases, but because the ovaries remain, the woman will experience natural menopause later. Evidence also suggests that even hysterectomy *without* oophorectomy may be associated with an earlier onset of natural menopause compared to women who haven't had the procedure^{7,8}. In contrast, a hysterectomy accompanied by bilateral oophorectomy removes the uterus along with both ovaries. Only bilateral oophorectomy triggers immediate surgical menopause due to the sudden loss of estrogen production from both ovaries. Unilateral oophorectomy typically doesn't induce immediate menopause if the remaining ovary function normally.

This distinction between natural and surgical menopause proves critical from a public health perspective. Premature menopause (*before age 40*) is associated with an increased risk of cardiovascular disease, osteoporosis, and cognitive decline, presenting significant long-term health challenges for women^{9,10}. Sudden menopause due to surgical bilateral oophorectomy potentially amplifies these risks due to the abrupt hormonal shift compared to the more gradual decline of natural menopause. Accurately identifying women experiencing surgical menopause is essential for understanding the full scope of these public health implications. This distinction becomes especially crucial for studies on premature menopause, where the differences in long-term health outcomes could be even more pronounced.

Further, misclassifying women who underwent a hysterectomy without bilateral oophorectomy as menopausal can skew population-level data derived from surveys like DHS. This misclassification can artificially inflate

prevalence rates of premature and early menopause and obscure true risk factors by mistakenly linking hysterectomy itself (rather than the specific removal of both ovaries) to early menopause. Accurate population data on premature menopause remains vital for directing public health resources, developing effective prevention strategies, and providing appropriate population level support frameworks¹¹.

Limitations in current data and measurement

A significant limitation in accurately classifying menopause status post-hysterectomy in surveys is that many women may not know the specifics of their surgery, particularly whether one or both ovaries were removed. Studies comparing patient reports to medical records have found notable discordance regarding oophorectomy status^{12,13}. This accuracy can vary based on factors such as time since surgery, patient education, and potentially the quality of patient-provider communication^{12,13}.

Recommendations for improving DHS menopause measurement

To address these limitations and enhance the quality of data for population research, it is crucial to refine data collection methods related to menopause in large-scale surveys like DHS. Here are some key recommendations:

- 1. Direct Question on Oophorectomy Status:** The most crucial recommendation is to include a clear and specific question about oophorectomy status for all women who report having had a hysterectomy such as, 'When you had your hysterectomy, were one or both of your ovaries removed?' Response options should include 'No ovaries removed,' 'One ovary removed,' 'Both ovaries removed,' and crucially, 'Don't know,' given that recall or knowledge of the exact procedure can be limited. This seemingly small addition would significantly improve the accuracy of menopause classification.
- 2. Incorporate Standardized Symptom Questionnaires:** Given the limitations of hormonal testing in large surveys and the fact that hysterectomy removes the primary indicator (menstruation), collecting standardized data on menopausal symptoms offers a valuable alternative. This would provide valuable insights into the experiences of women, especially those with hysterectomy but intact ovaries who might still experience hormonal fluctuations and symptoms. Relevant symptoms to capture could include vasomotor (hot flashes, night sweats), psychosocial (mood changes, sleep disturbances), and urogenital symptoms. While full clinical scales may be too lengthy, adapted modules based on validated questionnaires (such as the Menopause Rating Scale¹⁴ or the Greene Climacteric Scale¹⁵) could be considered for inclusion in DHS modules, focusing on key indicative symptoms experienced over a defined period (for example, the past month or year). Capturing symptom data across different age groups and hysterectomy statuses would significantly enrich our understanding of the menopausal transition in diverse populations.
- 3. Maximize Use of Existing Data:** While awaiting improved data collection, researchers using existing DHS data can employ interim strategies, recognizing their inherent limitations. Leveraging information on the reason for hysterectomy and age at the procedure might offer clues. For example, hysterectomies performed at younger ages or for reasons like cancer are potentially more likely to involve bilateral oophorectomy than those performed later in life for benign conditions like fibroids or prolapse. Analyzing long-term health outcomes stratified by reason for hysterectomy might also reveal patterns suggestive of underlying oophorectomy status. However, these approaches are proxies and limited by the quality and detail of the available data, potential recall bias regarding

reasons for surgery, and the heterogeneity of surgical practices across settings. Researchers should explicitly state these limitations and consider sensitivity analyses based on different assumptions about oophorectomy status.

While the DHS provides invaluable data for understanding women's health globally, refining its approach to measuring menopause is essential for improving data accuracy in population research¹⁶. Consistently distinguishing between women with natural menopause, hysterectomy with ovarian conservation, and surgical menopause induced by bilateral oophorectomy remains critical. Implementing the recommendations above, particularly asking about oophorectomy status, will allow researchers and policymakers to gain a more accurate and nuanced understanding of menopause, especially premature menopause, and its public health implications. This improved understanding, while acknowledging the limitations of survey data including recall issues, will ultimately contribute to better-informed public health strategies and support for women.

Data availability

No datasets were generated or analyzed during the current study.

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K.B. wrote and edited the main manuscript text.

Competing interests

The author declares no competing interests.

Additional information

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