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## CHRONIC MEDICAL CONDITIONS AND REPRODUCIBILITY OF SELF-REPORTED AGE AT MENOPAUSE AMONG COMMUNITY DWELLING WOMEN

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### Abstract

**OBJECTIVE**—To examine the association between chronic medical conditions and reproducibility of self-reported age at menopause among community-dwelling women.

**METHOD**—Age at menopause was assessed in a population-based longitudinal survey of 240 women twice, in 1993 and 2004. Women who recalled age at menopause in 2004 within one year or less of the age at menopause recalled in 1993 (concordant) were compared with women who did not recall of age at menopause in 2004 within 1 year of age at menopause recalled in 1993 (discordant). Type of menopause (surgical or natural) and chronic medical conditions were assessed by self-report.

**RESULTS**—One hundred and forty three women (59.6%) reported surgical menopause and 97 (40.4%) reported natural menopause. In all, 130 (54.2%) of women recalled age at menopause in 2004 within one year or less of recalled age at menopause in 1994 while 110 (45.8%) women did not recall age at menopause in 2004 within one year or less of recalled age at menopause in 1994. Among women with surgical menopause, women with three or more medical conditions were less likely to have concordant recall of age at menopause than women with less than three chronic medical conditions (adjusted odds ratio (OR) = 0.36, 95% confidence interval (CI) [0.15, 0.91]) in multivariate models controlling for potentially influential characteristics including cognition and years from menopause.

**CONCLUSIONS**—Among women who underwent surgical menopause, the presence of three or more medical conditions is associated with decreased reproducibility of self-reported age at menopause.

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CONFLICTS OF INTEREST: None

## Keywords

reproducibility; menopause; recall; medical comorbidity; cohort study

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## INTRODUCTION

Age at menopause is an important epidemiologic determinant of health outcomes because the hormone changes during menopause are related to medical conditions such as cardiovascular diseases, neurological diseases, psychiatric diseases, and osteoporosis.<sup>1</sup> Ascertainment of age at menopause is commonly determined through retrospective self-reports. Inaccuracies in self-reported age at menopause may influence the strength of an effect of age at menopause on health outcomes.<sup>2</sup> Epidemiologic investigations employing interviews or self-reports have examined whether women recall their age at menopause consistently. Findings from several studies report that recall of age at menopause within one year ranges from 44%–95%,<sup>3–10</sup> and declines with increasing intervals of time since menopause.<sup>3–6</sup> Inconsistency in reporting age at menopause has been associated with advancing age with older age being predictive of misremembering.<sup>3, 4, 7</sup> Surgical menopause (hysterectomy and bilateral oophorectomy) is associated with greater reproducibility of recall of age at menopause than natural menopause.<sup>3–6</sup> Chronic medical conditions are associated with poor recall of medical information,<sup>11</sup> but no known studies have examined the relationship between chronic medical conditions and reproducibility of self-reported age at menopause in surgical and natural menopause.

Our investigation is based on an ongoing prospective observational study, the Baltimore Epidemiologic Catchment Area (ECA) cohort, involving a diverse sample of community-dwelling older adults. Our investigation differs in several ways from prior work on reproducibility of self-reported age at menopause. First, our sample allows for the examination of recent age and cohort effects with over approximately a decade of follow-up. Dynamic changes in healthcare systems and demographic characteristics in the United States (U.S.) indicate a need for the examination of recent U.S. cohorts.<sup>12–15</sup> A U.S. sample differs in important ways from samples drawn from other countries.<sup>16, 17</sup> Second, our sample composition differs from samples drawn in previous studies by sociodemographic indicators of recall and health. Prior works include samples that are primarily early post-menopausal,<sup>5, 10</sup> white,<sup>3, 7, 8</sup> affluent,<sup>4</sup> or highly educated.<sup>5, 9</sup> Sample heterogeneity may allow for the generalization of findings to other samples. Third, our examination differs methodologically than prior studies.<sup>5, 10</sup> We employ consistent application of coding criteria and interview questions for both interviews increasing the reliability of our findings. Lastly, our data includes variables for the assessment of medical comorbidity allowing for the investigation of the role of chronic medical conditions in recall of age at menopause.

The aim of our study was to examine whether chronic medical conditions influenced reproducibility of self-reported age at menopause in natural and surgical menopause. Among women with natural and surgical menopause, we hypothesized that women with high medical burden would be less likely to recall age at menopause within one year or less compared to women without high medical burden.

## METHODS

### The Baltimore Epidemiologic Catchment Area Program

The Epidemiologic Catchment Area (ECA) Program was a survey of the general population conducted by the National Institute of Mental Health (NIMH). Baseline surveys were conducted between 1980 and 1984 at five sites in the United States. One of the five sites was

the Baltimore site of the ECA Program<sup>18</sup> which probabilistically sampled from adult household residents in Eastern Baltimore. Between 1993 and June of 1996, 1,920 participants were interviewed.<sup>19</sup> Between 2004 and 2005, 1,071 participants interviewed in the prior wave (1993–1996) were interviewed again (55.8%). At the baseline interview participants gave permission for future follow-up. The Johns Hopkins University Institutional Review Board Committee on Human Research approved the protocol. The ECA study design and methods have been described in detail elsewhere.<sup>20</sup>

### Age at menopause

If women answered “yes” to the question: “Have your menstrual cycles stopped permanently?” they were asked “How old were you when they completely stopped?” Reproducibility of recall of age at menopause was assessed based on their answer to this question at baseline in 1993 and 2004. Women who recalled age at menopause in 2004 within one year or less of the age at menopause recalled in 1993 were categorized as “concordant” while women who did not recall age at menopause in 2004 within 1 year of age at menopause recalled in 1993 were categorized as “discordant.”

### Chronic medical conditions

The participants were asked if they had ever had the following conditions: asthma, diabetes, heart trouble, high blood pressure, arthritis, stroke and cancer in 1993. Based on follow-up interviews, a positive response to any of these conditions was considered a chronic medical condition. Consistent with prior publications,<sup>21</sup> persons with 3 or more conditions were considered to have high medical burden.

### Covariates

Gender, age, educational attainment, self-identified ethnicity were assessed using standard questions in 1993. Cognition was assessed using the Mini-Mental State Examination (MMSE) in 1993, a short standardized mental status examination widely employed for clinical and research purposes to assess global cognitive functioning.<sup>22</sup> Functional status was assessed in 1993 using standard survey items on activities of daily living (ADLs) and instrumental activities of daily living (IADLs). Items assessing ADLs included using a knife or fork to cut up food, getting to bed by oneself, dressing and undressing, taking a bath or shower, and using the toilet. IADLs were assessed by items including getting together with friends, keeping track of money and bills, using the telephone, cleaning the house, and preparing meals. As in prior ECA studies,<sup>23, 24</sup> if an individual was unable to perform one or more of the activities without help they were classified as having ADL or IADL impairment respectively. Years from menopause was calculated by subtracting age of menopause reported in 1993 from the reported age at the same wave (1993).

### Study sample

In all, 282 women responded “yes” to the question “Have your menstrual cycles stopped permanently?” in 1993. Seventeen women were excluded because their answer to the question “Have your menstrual cycles stopped permanently?” was inconsistent in 1993 and 2004. Nine women were excluded because their answer to the question “Did your menstrual cycles stop due to surgery?” was inconsistent in 1993 and 2004. In addition, 16 women were excluded due to missing data on additional covariates of interest leaving 240 women for our analysis. These exclusionary criteria allowed us to begin the observational interval with a cohort of individuals who had concordant recall of whether menstrual cycles had stopped and type of menopause in order to focus our examination specifically on reproducibility of self-reported age at menopause.

## Analytic Strategy

The first step of our analysis involved calculating appropriate means and frequencies for each variable for participants with surgical and natural menopause. Comparisons were made between participants with concordant and discordant recall of age at menopause using  $\chi^2$  or t-tests as appropriate for categorical data or continuous data. Bivariate associations within type of menopause (surgical versus natural) were assessed examining concordant and discordant recall and potentially influential covariates. Next, multivariable analyses using the 1993 and 2004 interview data were conducted to assess the relationship among women with surgical and natural menopause between concordance of recall and the presence of three or more medical conditions. We tested for effect modification of the presence of three or more medical conditions on concordance of recall by baseline type of menopause by adding an interaction between type of menopause and the presence of three or more medical conditions in the model. Multivariable models adjusted for age, years from menopause, ethnicity, education level, activities of daily living impairment, instrumental activities of daily living impairment, and cognition by including them in the final models. All multivariate models were assessed for goodness-of-fit using the Hosmer-Lemeshow test.<sup>25</sup> Data analysis was performed using SPSS version 12 (SPSS, Chicago, IL).

## RESULTS

### Sample characteristics

Among 240 women reporting age at menopause in both 1993 and 2004, 143 (59.6%) reported surgical menopause and 97 (40.4%) reported natural menopause. The mean age of women with surgical menopause was 62.2 years with a standard deviation of 10.5 years. The age range was 42 to 88 years. Seventy-nine (55.3%) of women with surgical menopause were white and 51 (35.7%) had less than a high school education. In all, 38 (26.6%) of women with surgical menopause reported 3 or more chronic medical conditions. The mean age of women with natural menopause was 71.9 years with a standard deviation of 11.0 years. The age range was 47 to 97 years. Sixty-six (68%) of women with natural menopause were white and 33 (34.0%) had less than a high school education. Eighteen (18.6%) of women with natural menopause reported 3 or more chronic medical conditions.

### Characteristics of the sample by surgical or natural menopause and concordance of recall of age at menopause

Overall, 130 (54.2%) of women recalled age at menopause in 2004 within one year or less of the age at menopause recalled in 1993 (concordant recall) after 11 years of follow-up. Among women with surgical menopause, 85 (59.4%) had concordant recall of age at menopause. Among women with natural menopause, 45 (46.4%) had concordant recall of age at menopause. There was a statistically significant difference in the proportion of women with concordant recall of age at menopause by type of menopause ( $p=0.046$ ). Women with surgical menopause and concordant recall were more likely to be white and have three or more chronic medical conditions than women with surgical menopause and discordant recall. Characteristics by surgical or natural menopause and concordance of recall of age at menopause are presented in Table 1. Because of the statistically significant interaction ( $p=0.009$ ) between type of menopause and the presence of three or more medical conditions we report unadjusted and adjusted odds ratios stratified by type of menopause. Women with surgical menopause reporting three or more chronic medical conditions were less likely to have concordant recall than those with less than three chronic medical conditions (unadjusted odds ratio (OR) = 0.38, 95% CI [0.18, 0.81]). These findings remained significant in the final model even after adjusting for age, years from menopause, ethnicity, education level, activities of daily living impairment, instrumental activities of daily living impairment, and cognition (adjusted odds ratio (OR) = 0.36, 95% confidence

interval (CI) [0.15, 0.91]). No association was found between high medical burden and concordance of recall of age at menopause among women who underwent natural menopause (Table 2).

## DISCUSSION

The principal finding of our study is that women who underwent surgical menopause and had three or more medical conditions were less likely to have concordant recall of age at menopause than women with less than three medical conditions. In the past two decades studies have examined concordant recall in relation to demographic characteristics and time since menopause. Our investigation is the most recent examination of factors associated with reproducibility of self-reported age at menopause in a community based sample drawn in the United States and is the first to examine chronic medical conditions in relation to reproducibility of self-reported age at menopause.

Our results were not wholly consistent with our initial hypothesis. Women who underwent surgical menopause and had three or more medical conditions were less likely to have concordant recall of age at menopause than women with less than three medical conditions even when controlling for potentially influential factors including cognition and age. Our findings are aligned with reports that increasing complexity of clinical events and a procedure greatly diminishes recall of medical information.<sup>10</sup> However, among women who underwent natural menopause, there was a nonsignificant trend towards increased concordant recall with greater than or equal to 3 medical conditions compared to women with fewer medical conditions. The reason for this difference in direction of association compared to women who underwent surgical menopause is unclear. Women who have had surgically induced menopause may have also had a concurrent oophorectomy which could place them at risk for multiple comorbidities that may influence the consistency of recall of age at menopause. Between 1994 and 1999, out of the approximately 1 in 9 women aged 35–45 years that had undergone a hysterectomy, 40% also had a bilateral oophorectomy at the same time.<sup>26</sup> Several reports link early induced menopause from bilateral oophorectomy to significant health problems including premature death, cardiovascular, neurologic disease, poor health related quality of life, and osteoporosis.<sup>27</sup> In addition, prevalent medical comorbidities prior to surgery may predispose women to medical comorbidities perioperatively and later in life.<sup>28, 29</sup> Although the proportion of women with greater than or equal to 3 medical conditions was not statistically significant between women that underwent surgical versus natural menopause, it is possible that the medical conditions experienced by women that may have had an oophorectomy were more severe adding to their apparent medical burden. Conversely, women that underwent natural menopause may have less complex medical conditions that do not interfere with consistency of recall of age at menopause. Future prospective studies are required to determine the precise mechanism by which high medical burden in women that underwent surgical menopause leads to discordant recall of age at menopause over time.

Several potential study limitations deserve comment. Our study could not address validity, the reported versus true age at menopause. With discrepancies in reported ages both may be erroneous but both cannot be true. Reporting is likely most accurate sooner to the event (as opposed to later) and because recall declines with age. As a result ages reported more proximal to the event (reports from 1993) are more valid and are likely the best source for comparison. In addition, while the initial study was drawn from a community sample, follow-up data consisted of people that could be found and re-interviewed. However, studies based on the ECA follow-up data have shown little influence of baseline factors on loss to follow-up.<sup>30</sup> Study data on chronic medical conditions are based on self-reports. Identification of chronic medical conditions is complex and each method used to ascertain

the presence of medical illnesses has limitations.<sup>31</sup> Patients may not know or be able to recall their diagnoses and may misuse terms; however, medical records are often incomplete. For example, relying on medical records may miss persons who received health care in more than one health system. Finally, the lack of statistical significance for predictors of concordant recall of age at menopause such as age and years from menopause may be due to small sample sizes.

## CONCLUSION

Despite these limitations our results deserve attention because we took advantage of a population-based follow-up to examine prospectively recall of age at menopause in relation to type of menopause (surgical or natural) and chronic medical conditions. Findings from this study are generalizable to community-dwelling women in the United States as our sample was drawn from a large ethnically diverse community-based population. Our findings build on prior work elucidating mechanisms through which the characteristics of women influence reproducibility of self-reported age at menopause, namely type of menopause and chronic medical conditions. Our findings are important for the examination of self-reported menopause and occurrence of chronic medical conditions. For women with high medical burden and surgical menopause, a prospective examination of risk of disease (such as breast cancer or osteoporosis) may be more reliable.

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Table 1

Reproducibility of self-reported age at menopause by surgical or natural menopause (n=240). Concordant means age at menopause reported in 2004 was within one year or less of the age at menopause reported in 1994; Discordant means age at menopause reported in 2004 was not within 1 year of the age at menopause reported in 2004.

	Surgical menopause (n=143)			Natural menopause (n=97)		
	Concordant (n=85)	Discordant (n=58)	p-value	Concordant (n=45)	Discordant (n=52)	p-value
<b>Sociodemographic characteristics</b>						
Age, mean (s.d.)	62.5 (10.3)	61.8 (10.7)	.69	72.4 (10.8)	71.7 (11.2)	.80
Years from menopause (as reported in 1993), mean (s.d.)	15.8 (9.3)	15.4 (9.5)	.83	14.4 (11.6)	13.0 (11.6)	.55
White, n (%)	54 (63.5%)	25 (43.1%)	.02*	28 (62.2%)	38 (73.1%)	.25
Education less than high school, n (%)	28 (32.9%)	23 (39.7%)	.41	14 (31.1%)	19 (36.5%)	.57
<b>Medical comorbidity and functional status</b>						
3 or more chronic medical conditions, n (%)	16 (18.8%)	22 (37.9%)	.01*	11 (24.4%)	7 (13.5%)	.17
ADLs impaired, n (%)	8 (9.4%)	4 (6.9%)	.59	7 (15.6%)	3 (5.8%)	.11
IADLs impaired, n (%)	14 (16.5%)	16 (27.6%)	.11	9 (20.0%)	9 (17.3%)	.69
<b>Cognitive status</b>						
MMSE score, mean (s.d.)	28.3 (1.9)	27.9 (2.7)	.28	26.8 (5.5)	27.4 (2.6)	.51

Note: Data gathered from the Baltimore, Maryland Epidemiologic Catchment Area Program Follow-up, 1993 and 2004.

\* P-values given for comparison groups with chi-square or t-test as appropriate. s.d.= standard deviation; ADL= activities of daily living; IADL=instrumental activities of daily living; MMSE=Mini-Mental State Examination. \*p<.05

**Table 2**

Association between number of chronic medical conditions with surgical and natural menopause and recall of age at menopause within 1 or less years.

Menopause	Crude OR	Adjusted* OR
Surgical		
3 or more medical conditions Reference: less than 3 medical conditions	0.38 [.18, .81]	0.36 [.15, .91]
Natural		
3 or more medical conditions Reference: less than 3 medical conditions	2.08 [.73, 5.93]	2.25 [.63, 8.03]

Note: Data gathered from Baltimore, Maryland Epidemiologic Catchment Area Follow-up, 1993 and 2004.

\* Adjusted for age, years from menopause, ethnicity, education level, activities of daily living impairment, instrumental activities of daily living impairment, and cognition. OR=Odds ratio; CI=confidence interval.

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