Consequences of Child Health on Women's Health Experiences in Mid-Life and Menopause

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1 Introduction

The lifecourse approach to the study of health considers how exposures during childhood through adult life coalesce to contribute to adult health. Models have suggested three mechanisms through which early experiences influence adult outcomes. The latent effects model posits that early environments create lasting characteristics unmitigated by later events (Elstad 2005). Pathway affects argues that early life sets individuals onto different health trajectories (Hertzman et al. 2001). Lastly, the accumulation model argues that exposure to disadvantage has an influence on the dose-response relationship (Graham 2002). This paper extends the lifecourse framework to the study of menopause symptoms and similar health domains in mid-life to understand how these mid-life experiences relate to ether and to health over the lifecourse. In the United States, menopause is a key health event both as an experience in an of itself and because of the potential influence on later health. In looking from childhood to later adult health, menopause may act as a mitigating event or exert influence an accumulation effect. This paper focuses on establishing whether a relationship exists between childhood health and outcomes in mid-life and discusses, but does not test, implications for the study of later health and the theoretical lifecourse models.

While previous research has established a link between childhood health and health status later in life,a review of the literature produced only one paper on menopause in relation to the lifecourse framework. Kuh et al. (2002)

found that menopause symptoms did not mediate the relationship between adverse childhood social events and later poor psychological health, supporting the latent effect model. However, in relation to differing propensities for menopause symptoms, previous research has demonstrated the relation between life history and menopause symptoms. Amore et al. (2004) have shown that previous depression is a key predictor for depression during menopause.

This analysis relates to the broader study of women's health. As populations age and women's longevity in particular increases, identifying preventative measures for health later in life becomes of focus of health promotion. Turning to childhood and midlife can illuminate this process. Childhood health should bear influence on health experiences in mid-life, both those relating to menopause and those relating to health in general. I test the following specific hypothesis: Women who report problems with health during childhood are more likely to have problems with menopause symptoms of bone pain, depression, and sleep problems, as these symptoms represent lasting health conditions. Childhood health will also predict general measures relating to these domains of health. On the other hand, childhood health will not predict the menopause symptoms of night sweats and hot flashes, which represent temporary health adjustments. Therefore, childhood health is an indicator of underlying health, and should independently predict this lasting menopause measures and health conditions independently and jointly.

2 Methods and Data

2.1 Data

The sample comes from the Wisconsin Longitudinal Study (Wisconsin Longitudinal Study 2004) and consists of female respondents who participated in both the 1992 and 2004 waves of the survey. The sample size is 1255. All questions except for childhood health come from the 1992 wave, and childhood health measures come from the 2004 wave. Although I select only female respondents, the Wisconsin Longitudinal Study (WLS) is a sample of male and female high school graduates of the class of 1957 in the state of Wisconsin. As a survey of the general population, as opposed to a clinical one, the results provide a more complete cross-section of the experiences of women (Groeneveld et al., 1995). On the other hand, there are several reasons that the results from this survey are not directly generalizable to

women globally or to the United States population. First, all survey respondents have complete high school or higher education, based on the sampling technique at baseline. Since education is known to lead to more pro-active health behaviors and positive health outcomes (Preston and Taubman 1994), the women in the sample are more likely to have fewer health problems and to lead healthier lifestyles compared to the greater U.S. population of women. Second, the ethnic and racial composition of Wisconsin in 1957 is not reflective of the current population. It is highly likely that Wisconsin women do not reflect the menopause experiences of American women, as cultural norms and genetic differences may influence the menopause experience. (Lock 1993) Although race and ethnicity are not available in the public data file that I use, based on the codebook frequencies, nearly all survey respondents are white.

2.2 Adult Health and Menopause Symptom Measures

Table 1 lists the variables from the 1992 wave used in the analysis. In this wave there were separate interview modules on menopause and general health, allowing for comparison of the same health issues asked both as menopause symptoms and as general measures. The survey asked how much trouble the respondent has had with the following menopause symptoms: bone pain, depression, sleep problems, hot flashes, and night sweats. Response options were "a lot," "some," "a little," and "none." Because of individual variation in experience, I attempted to capture the meaningful difference between those whom the symptom affected and those not affected. I created binary indicators for "a lot" and "some" versus "a little" and "none."

I have also selected outcome measures that either capture similar or identical concepts as menopause symptoms. As the corresponding measures capture similar domains of health, the goal is to assess whether the attribution of health to menopause creates different results. These outcomes consist of depression as measured with the Center for Epidemiologic Studies Depression Scale (CES-D), sleep problems, and muscle aches. The CES-D asks a series of 20 questions about how the respondent felt during the past week. The range in score is from 0 to 60, and a score of 16 or greater is considered a marker for depression. The questions about sleep problems and muscle aches ask about the amount of discomfort over the past six months with the same response rubric as for menopause symptoms. I create binary indicators in the similar fashion as for menopause symptoms. Although there is no general

health measure of bone pain, the use of muscle aches is a good proxy. It is possible that women experience musculoskeletal pain.

2.3 Childhood Health

I use the following measures of childhood health: index of conditions had as a child (asthma, frequent ear infections, tonsils removed, chronic bronchitis, whooping cough, polio, diphtheria, hepatitis, meningitis, and mononucleosis), self-reported health in childhood (excellent, very good, good, fair, or poor), and whether the respondent was sick for one month or more that resulted in missing school or having to stay in bed. The distributions of these measures are displayed in Table 2. I created the following three indicator variables: reported fair or poor health, was in top quartile of health index (reported two or more conditions), and either missed at least one month of school or was in bed for at least one month. Because only 211 respondents reported any of the three indicators of childhood health, I created another indicator variable for whether the respondent experienced any of the three measures of childhood health. It is however possible that there is a gradient and that women who report two or three of these variables have a more severe impact than women who report only one. In this analysis I do not account for such a gradient because of small sub-sample sizes.

2.4 Menopause-Related Measures

Menopause status relates to intensity of symptoms for many women. Blumel et al. (2004) find that vasomotor symptoms are the most severe during postmenopause and that there is no change in psychological symptoms over the menopause transition. Because women were at different stages of the menopause transition during the 1992 interview, the differences in experiences of symptoms may related to this variation. To control for these differences in timing, I include the menopause statuses of premenopause, perimenopause, and menopause. I create these groupings based on one question of self-report and one question of time of last menstrual period. Women who respond that they have not gone through and are not going through menopause are considered premenopausal. Women who respond that they have either gone through or are going through menopause and have not had a menstrual period in the previous 12 months are considered menopausal. Women who responded they have either gone through or are going through

menopause and have had a menstrual period in the past 12 months are considered perimenopausal. The menopause symptom questions may likely reflect current or recent history, although the question refers to the overall experience. To account for this recency dimension in timing, I also include an indicator variable for the extent to which the respondent is currently experiencing symptoms in the same fashion as for menopause symptoms.

In addition to menopause status, I account for other menopause-related markers that may influence symptoms. The use of hormone replacement therapy (HRT) and reproductive surgery may be related to symptoms. For both of these measures I use an indicator variable for ever-use. While these two variables are important, they are also extremely complex. The indicator variables may not be the most precise, but they do attempt to capture the concepts. However, as recall may also be an issue for these two variables, previous research has shown that ever-use is the most reliable marker (Crawford 2000). Reproductive organ surgery is also likely related to symptoms, as a method of relieving the symptoms. While only surgery that involves the removal of both ovaries will result definitely in menopause, it is unclear whether the differences associated with surgery are related to the actual sudden onset of menopause or related to other aspects of the experience. I have used both any surgery and only surgery involving removal of both ovaries as indicators of reproductive surgery, and the results were similar.

2.5 Other Measures

Current health is a key determinant of health conditions and likely relates to menopause symptoms. I consider body mass index (BMI), whether the respondent has ever been a regular smoker, frequency of light exercise, and frequency of vigorous exercise. I represent BMI in approximate quartiles. Ever-smoked is an indicator variable. With the inclusion of BMI, the frequency of vigorous and light exercise variables become measurably and statistically insignificant, and I do not include them in the analysis.

I also consider the controls of educational attainment and age that are known to influence health. I have created a binary indicator for whether the respondent completed a graduate degree. It is possible that there are other important turning points in education. Given the relative homogeneity of educational experiences, namely that all women have at least graduated from high school, the sample may not detect such points. Age is also known to influence health, but because essentially all women are within 2 years of the

same age, there is not enough variation for age to be a meaningful variable. However, because the sample inherently controls for age, there is also control over the period experience of menopause and expectations.

2.6 Issues in Menopause Measures and Retrospective Error

Debate about how to establish menopause status continues over the meaning of self report versus a hormonal assessment versus use of last menstrual period. The only stage clearly defined is menopause as occurring 12 months after the final menstrual period. The classification I propose has shortcomings. First, if a woman did not self-identify as menopausal, even if she had not had a period in over 12 months, she is still considered premenopausal. Second, it is possible that a woman could be menopausal at the time of the 1992 survey, but since 12 months had not yet passed, she would not be considered as such. This aspect of menopause status reporting results from the retrospective nature of determining menopause only after 12 months of amenorrhea. The more probable error is the later. Therefore, since there is likely an undercount of menopausal women, there is likely an underestimating of the effect of being postmenopausal. At the same time, because women may not recognize the signs of going through menopause (most notably changes to the frequency and/or duration of menstrual cycles), there may also be an undercount of perimenopausal women, which may bias the effect of being perimenopausal down.

2.7 Methods

The main analytic method is linear regression. Although I have binary outcomes, I choose to use linear regression for ease in interpretation of results. I have also confirmed results using logistic regression, which produces conceptually equivalent results. To test the relationship of childhood health on health trajectories in mid-life, I consider three outcome variables. First, I consider the menopause symptoms. Second, I consider the corresponding general health measures. Third, I consider the reporting of both menopause symptom and corresponding health measure. The three pairs are depression and depression, sleep problems and sleep problems, and bone pain and muscle aches. I refer to the last pair as musculoskeletal pain.While these first two outcomes treat menopause and general health measures as independent

health events, the third measures whether childhood health increases the probability of reporting both types of measures. Together, these results will suggest whether childhood health acts on symptoms and health measures independently as well as jointly and will demonstrate whether these mid-life measures are related. By "statistical significance," I refer to whether the p value is less than 0.05. By "measurable significance," I refer to the size of the coefficient relative to the other coefficients.

3 Results

I present the relationships between childhood health and the independent and joint measures of symptoms and health through odds ratios. Then I present multivariate regression results for independent menopause symptoms and health indicators, and then for joint outcomes.

3.1 Odds Ratios

Considering independent outcomes, as demonstrated in Table 3 reporting any childhood health indicator results in an increased odds ratio for all menopause symptoms except for hot flashes and for all general health indicators. All such odds ratios are statistically significant except for the menopause symptoms of night sweats and sleep problems and the general health measure of sleep problems. For the joint outcomes, all odds ratios are above 1, but the odds ratio for the joint outcome of sleep is not statistically significant. These results suggest that childhood health's influence is most notable among the independent and join measures of musculoskeletal pain and depression.

3.2 Multivariate Results

As Table 4 shows, the occurrence of childhood conditions does not have a measurably or statistically significant impact on vasomotor menopause symptoms. Menopause-related variables are more important in both respects. Current experience of menopause is the strongest predictor, suggesting that these measures of symptoms refer to current (or perhaps recent) and not overall experience. On the other hand, these symptoms seem to decrease during menopause (although this is cross-sectional data). Women who have ever taken HRT are more likely to have had problems. Women who have had

any type of reproductive surgery are less likely to have problems. However, since these and other symptoms not measured in this survey (bleeding) are likely to lead to surgery, it is possible that this measure is picking up recent as opposed to overall experience with symptoms. It is possible for HRT results that women who are taking HRT have done so for menopause and are more apt to respond as such as opposed to a general health indicator question.

There is stronger evidence that childhood conditions have more impact on the menopause symptoms of depression, sleep problems, and muscle aches. In Table 5 the coefficients for childhood conditions for the symptoms of depression and bone pain are statistically significant. However, in comparison to the current experience of symptoms, the size of these coefficients is small. However, in relation to other menopause-related symptoms and BMI in the case of bone pain, the size is comparable.

In Table 6 the size of the coefficients for the outcomes of depression, muscle aches, and sleep problems is nearly identical as that of the corresponding menopause measures. Number of childhood conditions is statistically significant for all three outcomes. As in the case of menopause symptoms, the current experience of menopause symptoms has the largest coefficient, suggesting that the experience of general health and menopause symptoms are related. No other menopause related variables are statistically or measurably significant. For depression and muscle aches, BMI is a predictive variable. As with bone pain, this is the case, but depression as a menopause symptom it is not. These results for general health and menopause symptoms suggest that childhood conditions are related to menopause symptoms and general health, although the current experience of menopause symptoms is the strongest indicator. Nonetheless, the effect is persistent menopause symptoms that may indicate more lasting health situations, as confirmed by the analysis of similar measures of general health. For all measures, menopause status matters for the outcomes of symptoms, but not for general measures.

Turning to the joint outcomes in Table 7, the coefficient on childhood conditions is statistically significant for depression and musculoskeletal outcomes. Again, the current experience of menopause has a much larger coefficient than the childhood markers. Aside from this current variable, the coefficient on childhood markers is comparable to that of other current measures of BMI.

4 Conclusions

Among Wisconsin women who graduated from high school in 1957, childhood health has a lasting negative impact on the experience of menopause symptoms and corresponding general health measures at approximately age 53. While the effect is smaller than the current experience of menopause across outcomes, the effect remains statistically and measurably significant for musculoskeletal health and depression. Vasomotor symptoms of hot flashes and night sweats do not show such a pattern and appear to be associated more with current menopause related measures. Depression and musculoskeletal pain as measured through symptom and general health questions do indicate a relationship to childhood health. On the other hand, sleep problems have this relationship only as general health indicators.

There are several limitations to this study. Retrospective questioning complicates the accuracy and clarity of responses relating to menopause. While including a variable for current experience of menopause symptoms attempts to alleviate this issues, information bias is still a likely possibility. It would be more desirable to have shorter intervals between follow-up periods as to decrease the recall problems with symptoms and other menopause measures. Also, following women as they transition as opposed to capturing all women at a certain chronological time that corresponds to differing menopause statuses. Compared to other surveys, the list of menopause symptoms is also limited. This limitation affects the depth of the analysis of symptoms. For example, other survey include several dimensions of psychological health. The study does not yet address other current factors relating to stress known to influence the experience of menopause and health including family life and work.

As many women seek medical attention for menopause-related symptoms, it is important to understand the root of the symptom, and whether it is related to menopause or the underlying health. The WLS includes a survey wave in 2004. Further research involving later health outcomes from this wave will inform which of the three theories of lifecourse health menopause and mid-life health support. Such results are important to understand how to improve the quality of life for women during mid-life.

Table 1: Percentage Distribution of Indicators

Measure	Percent
Symptoms	
Depression	16.49
Hot Flashes	49.72
Bone Pain	16.49
Sleep Problems	30.52
Night Sweats	38.01
Current Experience	19.92
Other Menopause Measures	
Ever-Use of HRT	62.79
Reproductive Surgery	7.09
Menopause Status	
Premenopause	14.82
Perimenopause	32.43
Menopause	52.75
Health	
Depression (CES-D)	20.96
Sleep Problems	18.17
Muscle Aches	20.80
Body Mass Index	
1st Quartile (¡ 23)	34.98
2nd Quartile (23-25)	19.84
3rd Quartile (25-28)	20.23
4th Quartile (¿ 28)	24.86
Ever-Smoked	46.45
Age in 1992	
55	0.56
54	10.84
53	83.11
52	5.50
Education	
Graduate Degree	9.08

Table 2: Percentage Distribution of Childhood Health Indicators

Measure	**Percent**
Fair or Poor Health	3.27
Number of Conditions	
1st Quartile (0)	28.05
2nd Quartile (1)	41.04
3rd Quartile (2)	22.71
4th Quartile (3+)	8.21
Missed at Least One Month	9.56
Report of Any Childhood Indicator	16.81

Table 3: Odds Ratios for Childhood Health Counts with Outcomes for Menopause Symptoms and General Health Indicators*

Independent Outcomes	**Reporting Any Health Measure**
Menopause Symptoms	
Hot Flashes	1.00
Night Sweats	1.18
Sleep Problems	1.35
Bone Pain	**1.75**
Depression	**2.06**
General Health	
Sleep Problems	1.37
Muscle Aches	**1.82**
Depression	**1.70**
Joint Outcomes	**Reporting Any Health Measure**
Musculoskeletal	**2.33**
Depression	**1.87**
Sleep	1.41

*Zero counts is the reference group.

P-value < 0.05.

Table 4: Effect of Number of Childhood Conditions, Menopause Symptoms, and Current Health on Vasomotor Menopause Symptoms, Controlling for Education

Variable	Hot Flashes (SE)	Night Sweats (SE)
Menopause Measures		
Currently Experiencing Symptoms	**0.4668 (0.0319)**	**0.4565 (0.0316)**
Menopause Status		
Premenopause	**0.0916 (0.0281)**	0.0372 (0.0278)
Perimenopause	ref.	ref.
Menopause	**-0.2221 (0.0415)**	**-0.1098 (0.0411)**
Ever-Use of HRT	**0.1508 (0.0262)**	**0.1917 (0.0260)**
Reproductive Surgery	**-0.1422 (0.0517)**	**-0.1376 (0.0511)**
Current Health Measures		
Body Mass Index		
1st Quartile	ref.	ref.
2nd Quartile	0.0144 (0.0350)	0.0300 (0.0346)
3rd Quartile	0.0184 (0.0346)	0.0599 (0.0343)
4th Quartile	-0.0126 (0.0331)	0.0125 (0.0327)
Ever-Smoked	0.0301 (0.0251)	0.0441 (0.0248)
Number of Childhood Conditions	-0.0211 (0.0243)	0.0172 (0.0241)

Source: Wisconsin Longitudinal Study, 1992 and 2004

Bold face denotes $p < 0.05$.

Table 5: Effect of Number of Childhood Conditions, Menopause Symptoms, and Current Health on Psychological and Somatic Menopause Symptoms, Controlling for Education

Variable	Depression (SE)	Bone Pain (SE)	Sleep Problems (SE)
Menopause Measures			
Currently Experiencing Symptoms	**0.2160 (0.0271)**	**0.3226 (0.0248)**	**0.4000 (0.0305)**
Menopause Status			
Premenopause	-0.0201 (0.0271)	**-0.0560(0.0218)**	-0.0449 (0.0269)
Perimenopause	ref.	ref.	ref.
Menopause	**-0.0766 (0.0353)**	**-0.0866 (0.0322)**	**-0.1239 (0.0400)**
Ever-Use of HRT	**0.0734 (0.0223)**	**0.0455 (0.0204)**	**0.1732 (0.0251)**
Reproductive Surgery	-0.0021 (0.0440)	0.0785 (0.0401)	**-0.1393 (0.0494)**
Health Behaviors			
Body Mass Index			
1st Quartile	ref.	ref.	ref.
2nd Quartile	0.0531 (0.0298)	**0.0790 (0.0272)**	0.0110 (0.0335)
3rd Quartile	0.0282 (0.0295)	**0.0761 (0.0269)**	0.0565 (0.0331)
4th Quartile	0.0315 (0.0281)	**0.1033 (0.0257)**	0.0251 (0.0316)
Ever-Smoked	0.0374 (0.0214)	0.0354 (0.0195)	-0.0036 (0.0240)
Number of Childhood Conditions	**0.0885 (0.0207)**	**0.0581 (0.0189)**	0.0392 (0.0233)

Source: Wisconsin Longitudinal Study, 1992 and 2004

Bold face denotes $p < 0.05$.

Table 6: Effect of Number of Childhood Conditions, Menopause Symptoms, and Current Health on General Health Indicators, Controlling for Education

Variable	Depression (SE)	Muscle Aches (SE)	Sleep Problems (SE)
Menopause Measures			
Currently Experiencing Symptoms	**0.1912 (0.0288)**	**0.2033 (0.0284)**	**0.2023 (0.0274)**
Menopause Status			
Premenopause	0.0174 (0.0254)	-0.0300 (0.0250)	0.0283 (0.0241)
Perimenopause	ref.	ref.	ref.
Menopause	0.01752 (0.0375)	-0.0405 (0.0369)	-0.0197 (0.0256)
Ever-Use of HRT	-0.0067 (0.0237)	0.0118 (0.0233)	0.0209 (0.0225)
Reproductive Surgery	-0.0277 (0.0467)	**0.1037 (0.0459)**	-0.0557 (0.0443)
Health Behaviors			
Body Mass Index			
1st Quartile	ref.	ref.	ref.
2nd Quartile	**0.0728 (0.0316)**	0.0588 (0.0311)	0.0090 (0.0300)
3rd Quartile	**0.0759 (0.0313)**	**0.0786 (0.0308))**	0.0433 (0.0297)
4th Quartile	**0.0894 (0.0299)**	**0.1442 (0.0294)**	0.0111 (0.0284)
Ever-Smoked	-0.0088 (0.0299)	-0.0360 (0.0223)	-0.0386 (0.0284)
Number of Childhood Conditions	**0.0809 (0.0220)**	**0.0751 (0.0216)**	**0.0468 (0.0209)**

Source: Wisconsin Longitudinal Study, 1992 and 2004

Bold face denotes $p < 0.05$.

Table 7: Effect of Number of Childhood Conditions, Menopause Syptoms, and Current Health on Joint Menopause Symptoms and General Health Conditions, Controlling for Education

Variable	Depression (SE)	Musculoskeletal (SE)	Sleep Problems (SE)
Menopause Measures			
Currently Experiencing Symptoms	**0.1725 (0.0206)**	**0.1944 (0.0195)**	**0.2264 (0.0235)**
Menopause Status			
Premenopause	0.0051 (0.0182)	-0.0286 (0.0172)	-0.0053 (0.0207)
Perimenopause	ref.	ref.	ref.
Menopause	-0.0330 (0.0268)	-0.0286 (0.0253)	-0.0590 (0.0206)
Ever-Use of HRT	0.0102 (0.0169)	0.0287 (0.0160)	**0.0422 (0.0192)**
Reproductive Surgery	-0.0193 (0.0334)	**0.0870 (0.0315)**	-0.0278 (0.0381)
Health Behaviors			
Body Mass Index			
1st Quartile	ref.	ref.	ref.
2nd Quartile	**0.0515 (0.0226)**	**0.0534 (0.0214)**	0.0023 (0.0258)
3rd Quartile	0.0306 (0.0224)	**0.0489 (0.0212)**	0.0445 (0.0255)
4th Quartile	0.0372 (0.0213)	**0.0863 (0.0202)**	0.0073 (0.0244)
Ever-Smoked	0.0055 (0.0162)	-0.0031 (0.0153)	-0.0334 (0.0185)
Childhood Conditions	**0.0513 (0.0215)**	**0.0617 (0.0204)**	0.0261 (0.0246)

Source: Wisconsin Longitudinal Study, 1992 and 2004

Bold face denotes $p < 0.05$.

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