Gendered exposures: Exploring the role of paid and unpaid work through life in U.S. women's cardiovascular health

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The paper explores how paid and unpaid labor history over the life course influence women's cardiovascular disease. U.S. women comprise about 50% of the paid workforce and perform the majority of unpaid labor. However, the influence of women's work on their health is under-researched. Our sample was drawn from the Women's Health Initiative Observational Study, a cohort of post-menopausal women in the U.S. aged 50-79 at recruitment. Women were categorized into five groups according to paid labor history: worked in paid jobs consistently throughout adult life; left the workforce early; entered the workforce later; discontinuous work history; never worked outside the home. Live birth history (none, at least one, missing) served as a proxy for unpaid labor in prime age. Cox proportional hazard models were used to estimate the hazard ratio of CVD associated with different paid work histories. We then assessed the effect of unpaid labor on the relation between paid labor and CVD. Paid labor participation was not associated with CVD risk among women without unpaid labor after adjusting for age, education, and birth cohort. Among those with unpaid demands, leaving the workforce early or having discontinuous work history was protective. In this U.S. sample, the association between paid work participation history and CVD risk depends on the presence of unpaid labor. Our results demonstrate the necessity of including work – paid and unpaid – in consideration of women's health.

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Introduction

Existing research on occupational health has generally assumed that women share men's experiences at work. It concludes, for example, that paid labor influences health directly (e.g., through occupational injury) and indirectly (e.g. through sleep disturbance), and that unemployment is consistently associated with poorer health. Worklessness, or the lack of work which is built into the structure and function of labor markets, also patterns population health (Bambra 2011). The relative quality of both employment and working conditions also influence health in ways that may be deleterious or beneficial to health. However, evidence suggests women's experiences of work differ from men's (Armstrong and Messing 2014). Long-accepted ideas in occupational health research, such as the healthy worker bias, appear to function differently in women than they do in men. A recent study found that while both men and women who were not in the workforce had poorer health than those who were employed (i.e., the healthy worker effect), that association was weaker in women, and it was greatly attenuated when the number of children in the household was considered (Johnson et al. 2017). That is, some women are likely out of the workforce because of family care demands, not because of poor health. Study of occupational exposure specific to women has been limited (Messing 1997; Messing and Mager Stellman 2006). Much occupational health research is built on either an abstract, non-embodied worker (Ferree and Hall 1996) or the "ideal worker" who is a male and has the "backstage support of a stay-at-home wife" (Williams, Blair-Loy, and Berdahl 2013, 210), making women anomalies, and therefore complicators of study design.

Despite significant increases in women's participation in the paid workforce over the last few decades (Toossi, Morisi, and U.S. Bureau of Labor Statistics 2017), their burden of unpaid labor (e.g., household tasks, caregiving, and the socializing of others outside of a paid marketplace) has not significantly lessened (Artazcoz, Borrell, and Benach 2001; C. E. Bird 1999; MacDonald, Phipps, and Lethbridge 2005; Rosenfield 1989; Jung and O'Brien 2019). Women in the United States perform more unpaid labor than men (Krantz-Kent, 2009). To date, limited research has evaluated the role of unpaid labor while considering the relation between paid labor and health.

We propose that public discourse in the U.S. about women and paid labor has put aside the realities and value of unpaid labor. To the degree that this discourse has occurred, it has been insufficient in relevant institutions to prompt changes in policy that accommodate and recognize the societal need for both paid and unpaid labor (Schmidt 2010). Most U.S. women have limited structural support for multiple responsibilities, such as affordable childcare, eldercare, or paid family leave, thus increasing the difficulty of managing multiple demands. We furthermore suggest that U.S.-wide and regional labor markets, workplaces, and families as institutions have not shifted in parallel with women's participation in paid labor because of structural sexism.

Structural sexism creates health inequity as institutions function to distribute power and resources based on gender at the macro (policy – e.g. persistent wage gaps), meso (family and workplace dynamics and procedures), and micro (socialization, internalization) levels (Homan 2019). Work—both paid and unpaid—distributes power and resources throughout life stages and consequently creates accumulations of advantages and disadvantages over time (Cockerham, Hamby, and Oates 2017; Mortimer and Shanahan 2007). Structural sexism might leave women with insufficient power, autonomy, or resources to use in support of their health as they move

through life. Researchers have long understood sexism as a form of stratification enacted primarily at the interpersonal and intrapersonal levels, and therefore conducted limited analyses of stratification at the meso and macro levels of institutions (Ferree and Hall 1996). However, these levels play a significant role in determining the health impacts of sexism (Homan 2019). We examine work using the perspective of structural sexism because work is both part of, and shaped by, meso- and macro-level institutions. Paid and unpaid labor are lenses on the bargaining power of women in the employer-employee relationship and within their family units. Here we propose two major connections linking labor and the health of women: time and roles.

Lack of time might limit other healthful activities women could undertake, such as exercise (Winkler et al. 2020), healthful food preparation (Dixon et al. 2014), and sleep (Winkler et al. 2020). Longer hours in paid labor have been associated with increased CVD risk (Kivimäki et al. 2015). Working long hours was recently tied to significantly increased risk for several chronic diseases in a large study, and was problematic for women compared to men (Dembe and Yao 2016). This study did not consider time spent on unpaid labor as exposure. The combined load of paid and unpaid responsibilities may also be stressful, leading to poorer health behaviors (Rosenfield 1989; Dembe and Yao 2016; Virtanen et al. 2011; Sabbath et al. 2015; Bird and Rieker 2008). Furthermore, women and those who experience work-family conflict are more likely than men to report the need to rush (Strazdins et al. 2016). Stress also causes fatigue, which limits options for using down time (Strazdins et al. 2016). Thus, women may spend more time working than men and experience greater stress.

Role theory focuses on socially-defined categories into which people fit and the behaviors specific to the context (expectations, norms, etc.) of each category. Roles such as "wife," "mother," "daughter" and "employee" may carry conflicting expectations. Studies using

role theory have generally found that work-family conflict affects women in ways distinct from men (Artazcoz, Borrell, and Benach 2001; MacDonald, Phipps, and Lethbridge 2005; Griep et al. 2016). People might manage competing demands in the meso domains of work and family by using increasingly available flexible paid work arrangements, although, for women this challenges roles in both domains. Working for pay undermines role expectations related to family nurturance, and using flexible arrangements makes it impossible to fulfil the role of the ideal worker who is completely dedicated to her paid job (Williams, Blair-Loy, and Berdahl 2013). The flexibility stigma (Williams, Blair-Loy, and Berdahl 2013) often leads workers to compensate by working more intensely or longer, perpetuating the scarcity and intensity of time.

We hypothesize that paid work as well as work which is not paid influences peoples' health. By conceptualizing work to encompass paid and unpaid labor, we are able to interrogate paid employment and family as institutions that are social determinants of health and health disparities in themselves, and which tie to other social determinants of health (Ahonen et al. 2018). We engage discursive institutionalism (Schmidt 2010), institutions at multiple levels of experience (Homan 2019; Ferree and Hall 1996), and role and time theories about how labor's influence on health may persist into late life in a structurally sexist milieu (Homan 2019). We hope to contribute to a discourse which is fuller in its examination of work, and therefore one that can more accurately assess the health effects of labor within the working reality of American women.

In this study we focus on cardiovascular disease (CVD) as an important health consequence of paid and unpaid labor. CVD causes significant disease burden and is the most common cause of death in women in the U.S. (Coulter 2011; Mensah and Brown 2007; Mosca et al. 2000). An association between paid labor and CVD is robust in men (Schnall et al. 2000), but

questions remain about it in women (Klumb and Lampert 2004). This paper addresses a significant research gap by exploring the impact of unpaid labor on the relation between paid labor during working age and CVD later in life.

Materials and methods

Data sources and sample: We used data from the Women's Health Initiative Observational Study (WHI OS), a prospective cohort study of post-menopausal women aged 50-79 at recruitment, which took place between 1993 and 1998 at 40 clinical centers in the U.S. The eligibility criteria, in addition to sex and age, included postmenopausal status, the willingness to stay in the geographic area of enrollment for at least three years, and an ability and willingness to consent to participation (Hays et al. 2003). Langer and colleagues provide further details (Langer et al. 2003). In this study, we used information collected at a baseline enrollment session, including a physical examination, in-person interview, and self-administered questionnaire (Controlled Clinical Trials 1998). We focused on the history of paid labor participation and childbearing (see below for details of measures). Of the 93,676 women who completed a baseline interview, we excluded those with a history of CVD (N=17, 528), those for whom we could not construct a paid work history (N=3,127), those who did not have a recorded follow-up time (N=302), and those who had missing information on variables related to our study questions. This resulted in an analytic sample of 68,615 women. CVD incidence data were available up to February 2017; the median follow-up duration was 17.9 years in our analytic sample.

Measures

Paid work history: At baseline, WHI OS participants were asked if they "ever had a paid job."

Women responding yes provided information on up to three longest-held paid jobs, starting with the most recent, including their current job if they were in the workforce. Based on the beginning and ending years of each job, participants' paid labor history was constructed and categorized according to the following patterns: worked in paid jobs consistently throughout adult life; left the workforce early; entered the workforce later; discontinuous work history; never worked outside the home (Palumbo et al. 2019).

Unpaid work in prime age: The number of reported live births served as a proxy for unpaid labor in prime working age under the assumption that raising a child followed each birth. The reported number of live births was categorized into none, at least one, and information missing.

CVD event: The WHI OS made follow-up contact with participants annually through phone calls, in-person interviews, or self-completed forms. Participants self-reported CVD in the form of diagnosis of coronary heart disease, ischemic or hemorrhagic stroke. If the participant died, hospital records, autopsy reports, and/or death certificates were reviewed to determine cause of death. A local physician adjudicator verified all self-reported events through a review of medical records and death certificates. Central cardiovascular adjudicators then reviewed the locally verified events. Periodically during the OS, staff also reviewed the National Death Index to ascertain the cause of death and to investigate loss to follow up (Curb et al. 2003).

Demographic information: Education was reported at the baseline. Age was self-reported. We constructed birth cohorts (1910-19, 20-29, 30-39, and 40-49) in order to capture the cohort effect on paid labor participation, education, and any associated unmeasured influence on heart health (e.g., public health campaign against smoking).

Statistical analyses: We first tabulated the demographic characteristics of the final sample. To investigate the differences in CVD risk among women with different paid

employment and live-birth histories, we calculated age-adjusted rates of CVD incidence per 1000 person-years by paid work history and by live-birth history. Next, to assess the influence of unpaid labor on the relationship between paid labor and CVD, we stratified the sample by live-birth history and used the Cox proportional hazard model to estimate the hazard ratio (HR) of CVD associated with paid work history. Models were adjusted for age and birth cohort only, then education was added. All analyses were completed using SAS™ ***(*SAS Institute Inc.** ***(version SAS® 9.4 Statements: Reference.) 2013)***.

Results

Table 1 displays demographic and social characteristics of our study sample. The most common type of paid work participation pattern was consistently throughout adult life (40.0%), followed by entering the workforce late (27.8%), and having discontinuous work history (23.9%). Few left the workforce early in life (7.5%). Discontinuous and early leaving correlated with being slightly older. Majorities in all categories except consistent work had some college or vocational studies. Most women who worked consistently attained more than a college degree. Most women reported one or more live births. Ten percent did not report their birth history, and this group disproportionately consisted of women who worked consistently. Because they were a significant portion of the sample, we kept them in the analysis by assigning a code for missing.

===== INSERT TABLE 1 ABOUT HERE ====

Table 2 shows age-adjusted CVD rates per 1000 person-years by paid and unpaid labor history. Those who worked consistently and entered the workforce later in life were at

lower risk of CVD than those in other categories; however, the 95% confidence interval (CIs) for all groups overlapped. As for unpaid labor, the rate of CVD was higher for those with our proxy of at least one birth than for those who reported no births, but again the 95% CIs overlapped.

===== INSERT TABLE 2 ABOUT HERE ====

Table 3 shows the HRs associated with paid labor history stratified by birth history, adjusted for age, education, and birth cohort. Among those with no live birth, paid labor participation history was not associated with CVD risk. However, among those with one or more live births, women who left the workforce early or had discontinuous work history had lower risk for CVD than those who worked consistently throughout life. These associations were not affected by controlling for birth cohort or education. Among those who did not report birth information, discontinuous work history was associated with *higher* risks of CVD compared with working consistently throughout life. By contrast discontinuous work history was protective for women with unpaid labor history.

===== INSERT TABLE 3 ABOUT HERE ====

Sensitivity analyses: Because women in the WHI cohort were asked about only up to three jobs they had held, starting with the most recent, those who had more than three jobs may have been misclassified. Specifically, those women who were classified as "entered the workforce late" might have had more jobs than they reported, and thus may be closer to the worked consistently or discontinuously group. But results were in unchanged if we combined entered later in life with discontinuous work history or entered later in life with worked continuously (see supplementary online materials).

Additional post hoc analyses: We used women who had worked consistently throughout their adult lives as our reference category, but that choice could obscure important differences by birth history among the women in that category. Therefore, we re-assessed our analyses in just that group, and found no significant difference in CVD risk (Appendix Table A1).

To better understand the women who did not report birth history, we compared them to those who did report (Appendix Table A2). We noticed that over a third of the women with missing birth information were never married. Given the substantial differences in marital history in the sample, we re-analyzed data with the assumption that missing birth information from women who never married meant no birth. The results were not changed from our main analysis (supplementary online materials).

Discussion

We envisioned work as the combination of paid and unpaid labor. We also proposed that gendered role expectations for women within institutions and time might link work to women's health over the life course. Our data showed that the association between paid work participation history and CVD risk depends on unpaid labor history. That is, among the women who reported live births (a proxy for unpaid labor), leaving the paid workforce early or having discontinuous paid work history was protective. In descriptive analyses, neither paid work participation history nor unpaid work history (approximated by live birth history) on its own appeared to have an association with CVD risk. Overall, these results suggest that managing paid labor demands was protective when unpaid demands existed. Additionally, discontinuous paid work history in women who reported no live birth was a marker of poor health.

Role theory suggests that women with fewer conflicts among multiple roles or demands

for time will be healthier, and women in our sample who had unpaid labor and also had less consistent paid labor histories were protected from CVD. This finding is also consistent with a recent research finding that the threshold of weekly work hours that are detrimental to health is lower for women than for men. The authors concluded that setting women's paid work hours lower than men's would avoid gender-based health inequities resulting from the added burden of women shouldering more unpaid labor than men (Dinh, Strazdins, and Welsh 2017). In this data set we were unable to directly explore the number of hours worked either in paid or unpaid labor, having only the cumulative number of years worked in paid labor and women's report of live births as a proxy indicator for time spent in unpaid labor. Future studies should directly assess time spent on both paid and unpaid labor in nuanced ways (Strazdins et al. 2016) along with health to understand the experience of long work hours directly (Dembe and Yao 2016; Kivimäki et al. 2015).

Health impact could result from long hours creating limited time for health supportive activities (Winkler et al. 2020), the stress created by rushing (Strazdins et al. 2016), or poorer health behaviors (Virtanen et al. 2011; Dembe and Yao 2016; Sabbath, Mejía-Guevara, et al. 2015; Rosenfield 1989; C. Bird and Rieker 2008). As well, labor might lead to CVD later in life because of damage done in younger ages or through health-damaging habits which are formed early and persist. This begs the question of who is able to leave the paid workforce, or to come and go – that is, who might be able to obtain protection from the burden of too many roles or time demands. On one hand, women who are poor enough to qualify for support (e.g., low-income health insurance schemes, welfare, food assistance) could potentially leave the paid workforce. The structure of many such programs in the U.S. make that unlikely, but this may be relevant elsewhere. At the other end of the spectrum, women who are financially well-off or

who have support from others (e.g., a high-earning spouse or wealthy extended family), may be able to leave paid employment. Sabbath and colleagues (Sabbath, Guevara, et al. 2015) found that adjustment for late-life household wealth attenuated mortality risk for women with multiple role configurations. Williams and colleagues (2013) have also delineated the ways in which class shapes the stigma of workers who manage multiple life demands through paid work flexibility. The demands of paid and unpaid labor may exacerbate income- and class-based health inequities in women if some women do not have alternatives to manage those demands. We were not able to incorporate income throughout the women's life-course in this analysis, but future studies should do so. This will require more detailed data on family structure and support systems, both within the family unit and from employers and broader society.

Our findings, if replicated, have important implications for occupational health research and practice, particularly because no policy mechanism addresses health problems related to work which is not "work" as defined by a market-based location. The discourse surrounding policies related to labor markets, workplaces, and families depends on framing paid labor using a model that assumes an unencumbered male breadwinner (Dinh, Strazdins, and Welsh 2017; Strazdins et al. 2016). This results in superficial social and institutional support for women's participation in paid labor combined with economic realities that often require it for individual women and for families. For instance, access to paid sick leave is limited in the U.S., and those who have sick time often must use it to care for others – like an ill child. The lack of structural social policies to support unpaid labor in the U.S., continued greater performance of unpaid labor by women, and phenomena like the flexibility stigma reflect limited shifts in institutional practices (Williams, Blair-Loy, and Berdahl 2013). Ongoing separation of "real" work and unpaid work has implications for population health. Researchers infrequently interrogate

gender-based patterns of labor for the ways in which they create differential access to resources, autonomy, self-determination, and power (Ferree and Hall 1996) in broader society, in workplaces, and in families. Unless the prevailing discourse challenges institutional practices related to work (Schmidt 2010), women's – and men's (Homan 2019) – health will likely continue to suffer.

Challenges to the current discourse require an evolved conception of work. For instance, micro-economics researchers consider the value of household labor to a society, and feminist thinking has critiqued the distribution of this labor and how that relates to its social value (Jung and O'Brien 2019). Our results suggest that a similar move toward more complex thinking about work and health could enrich occupational health research. Doing so, however, would require better measurement of labor, both paid and unpaid. Society derives enormous benefit from both types of labor, and yet even the occupational health research about women's recognized (paid) work has not been conducted with adequate scientific or conceptual rigor. For example, our study, like that of Johnson and colleagues (2017), suggests accepted occupational health wisdom about the healthy worker bias may not apply to women. In our study, when we examined paid and unpaid labor together, working for pay was less consistently health protective for women with a history of unpaid labor. That is, just because labor does not take place in the market (is not "productive" labor) doesn't mean it doesn't affect the lives of people doing it – including their health.

Public health researchers must more fully consider work in their analyses (Ahonen et al. 2018), and occupational health researchers should incorporate more nuanced thinking about labor and its effects on health in populations. Opportunities for population health improvement arise when we adequately measure the influence of an issue on the well-being of people. With

adequate evidence, society can make changes to labor, social, and economic practice that would better support the health of people who perform both paid and unpaid labor (Jung and O'Brien 2019; Robertson 1999).

Limitations

The work history patterns of the women in our sample may not represent the broader population of U.S. women. However, previous analyses using the same employment history categorization (Palumbo et al. 2019) found that the patterns in women in the WHI sample were very similar to the occupational patterns of women in other U.S. and international samples. While it covers a large segment of adult life, our measure of paid labor history does not identify specific types of jobs or time arrangements. Additionally, this study did not directly assess unpaid labor. Instead, we used live birth history, a crude indicator of unpaid labor, and do not have information about child-raising or levels of partner/family support. Furthermore, we were not able to account for other forms of unpaid labor, such as housework and elder care (Jung and O'Brien 2019) or the contributions of others in the household towards the household work. While child-rearing is a major portion of time spent in unpaid labor for U.S. women (Krantz-Kent 2009), unpaid labor takes many forms beyond care for one's own children that merit future exploration.

Moreover, the relationship between paid and unpaid labor and health can be mutually determining. For instance, having had no live births could be a marker of poor health in those women who reported it. Likewise, never having worked for pay outside the home could be a marker of poor health, or, conversely, of financial privilege and stability which would be protective of health in this group of women. We cannot fully account for all possibilities because our data preclude more detailed explorations. Finally, in our *post-hoc* analyses, we

assumed that women who did not report birth history and who were never married had no children. This is likely a more nuanced issue, and merits further exploration of how not reporting birth history may or may not relate to employment history or health in future studies.

The sample was predominantly white, which prevented us from addressing any differences which might exist by race/ethnicity. However, these results in women, among whom a majority possess racial privilege, suggest that investigations that include unpaid labor will be important for racial/ethnic groups who may also be at racial or ethnically-based social disadvantage (Williams, Blair-Loy, and Berdahl 2013).

Conclusions

This study suggests that women's unpaid work influences their health through its interrelationship with paid work, making it vital that population health research consider both forms of labor. Multiple perspectives, from public health and beyond, should be used to further explore these combined influences. The volume of paid and unpaid labor performed by women has broad implications for their health; future research should match its potential import with rigor and nuance.

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Declaration of Interest

The authors have no conflicts of interest to declare.

The findings and conclusions in this report are those of the authors and do not necessarily reflect

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Appendices

Table A1. CVD cases, person-years, and age-adjusted CVD rates by unpaid labor characteristic among women who worked consistently throughout life.

Unpaid Labor Characteristic	CVD cases	Person-years	CVD rate[1]	(95% CI)
Reproductive history				
No birth	104	867.39	76.4	(0, 170.5)
At least one birth	1802	14319.43	84.6	(60.9,108.2)
Birth Information Missing	367	2894.29	77.3	(27.0, 127.7)

[1]Adjusted for age, <55, 55-59, 60-64, 65-69, 50-74, >75

Table A2. Demographic characteristics of women by reported birth history.

Characteristic	Birth history		
	No births	At least one birth	Missing
Total Number	2210	59210	7195
Age, mean (SD)	61.7 (8.1)	63.2 (7.2)	62.8 (7.8)
Birth Cohort, n (%)			
1910-19	151 (6.8)	3744 (6.3)	574 (8.0)
1920-29	679 (30.7)	22374 (37.8)	2490 (34.6)
1930-39	826 (37.4)	25156 (42.5)	2825 (39.3)
1940-49	554 (25.1)	7936 (13.4)	1306 (18.1)
Education, n (%)			
Less than High School	85 (3.9)	2717 (4.6)	165 (2.3)
High School or GED	213 (9.6)	9951 (16.8)	760 (10.6)
Associates/Some College	700 (31.7)	22100 (37.3)	1964 (27.3)
College Degree	252 (11.4)	7075 (12.0)	867 (12.0)
More than College Degree	960 (43.4)	17367 (29.3)	3439 (47.8)
Marital Status, n (%)			
Never Married	377 (17.1)	300 (0.5)	2588 (36.0)
Divorced/Separated/widowed	838 (37.9)	19322 (32.6)	1659 (23.0)
Married/in marriage-like relationship	987 (44.6)	39458 (66.7)	2934 (40.8)
Missing	8 (0.4)	130 (0.2)	14 (0.2)

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Tables

Table 1. Demographic, social, and unpaid work history characteristics by paid work history of this study sample, drawn from the Women's Health Initiative Observational Study (WHI OS).

Characteristic	Paid Work History					Total (n=68615)
	Worked consistently (n=27414)	Left the workforce early (n=5169)	Entered the workforce later (n=19094)	Discontinuous work history (n=16378)	Never worked outside home (n=560)	
Age, mean (SD)	61.9 (7.3)	65.3 (7.5)	63.3 (7.1)	64.2 (7.1)	65.9 (7.4)	63.1 (7.3)
Birth Cohort, n (%)						
1910-19	1359 (5.0)	595 (11.5)	1232 (6.5)	1205 (7.3)	78 (13.9)	4469 (6.5)
1920-29	8704 (31.7)	2364 (45.7)	7187 (37.6)	7041 (43.0)	247 (44.1)	25543 (37.2)
1930-39	12278 (44.8)	1687 (32.7)	8250 (43.2)	6400 (39.1)	192 (34.3)	28807 (42.0)
1940-49	5073 (18.5)	523 (10.1)	2425 (12.7)	1732 (10.6)	43 (7.7)	9796 (14.3)
Education, n (%)						
Less than High School	957 (3.5)	359 (7.0)	1005 (5.3)	465 (2.8)	181 (32.3)	2967 (4.3)
High School or GED	3876 (14.1)	1052 (20.4)	3139 (16.4)	2713 (16.6)	144 (25.7)	10924 (15.9)
Associates/Some College	9148 (33.4)	1806 (34.9)	7654 (40.1)	6000 (36.6)	156 (27.9)	24764 (36.1)
College Degree	2858 (10.4)	913 (17.6)	2019 (10.6)	2352 (14.4)	52 (9.3)	8194 (12.0)
More than College Degree	10575 (38.6)	1039 (20.1)	5277 (27.6)	4848(29.6)	27 (4.8)	21766 (31.7)
Birth history, n (%)						
None	1361 (5.0)	123 (2.4)	425 (2.2)	293 (1.8)	8 (1.4)	2210 (3.2)

At Least One Birth	21307 (77.7)	4666 (90.3)	17411 (91.2)	15293 (93.4)	533 (95.2)	59210 (86.3)
Missing	4746 (17.3)	380 (7.3)	1258 (6.6)	792 (4.8)	19 (3.4)	7195 (10.5)

Table 2. CVD cases, person-years, and age-adjusted CVD rates per 1000 person-years by paid and unpaid labor characteristics.

Paid and unpaid labor characteristics	CVD cases	Person-years	CVD rate[1]	(95% CI)
Paid labor history				
Worked consistently through adult life	2273	18081.11	82.9	(62.1, 103.8)
Left the workforce early	508	3836.23	98.3	(51.1, 145.5)
Entered the workforce late	1731	13119.35	90.7	(65.9, 115.4)
Discontinuous work history	1592	12185.25	97.2	(70.6, 123.8)
Never worked outside home	54	345.14	96.4	(0, 213.8)
Reproductive history				
No birth	171	1400.29	77.4	(35.8, 151.2)
At least one birth	5368	41361.22	90.7	(76.6, 104.7)
Missing birth information	619	4805.57	86.0	(45.5, 126.6)

[1]Adjusted for age, <55, 55-59, 60-64, 65-69, 50-74, >75

Table 3. Associations of paid labor participation history with CVD risk by reproductive history.

Reproductive history (n)	**Paid labor participation history**	**N**	**HR[1]**	**(95%CI)**	**HR[2]**	**(95%CI)**
No Birth	Worked consistently through adult life	1361	1.00		1.00	
(2210)	Left the workforce early	123	0.90	(0.47, 1.72)	0.92	(0.48, 1.77)
	Entered the workforce late	425	0.96	(0.65, 1.43)	0.96	(0.65, 1.43)
	Discontinuous work history	293	0.84	(0.53, 1.32)	0.83	(0.53, 1.31)
	Never worked outside home	8	1.40	(0.20, 10.04)	1.33	(0.18, 9.60)
At Least One Birth	Worked consistently through adult life	21307	1.00		1.00	
(59210)	Left the workforce early	**4666**	**0.89**	**(0.80, 0.98)**	**0.87**	**(0.78, 0.96)**
	Entered the workforce late	17411	0.97	(0.91, 1.04)	0.95	(0.88, 1.01)
	Discontinuous work history	**15293**	**0.91**	**(0.85, 0.97)**	**0.91**	**(0.85, 0.97)**
	Never worked outside home	533	0.95	(0.72, 1.25)	0.84	(0.63, 1.11)
Birth Information Missing	Worked consistently through adult life	4746	1.00		1.00	
(7195)	Left the workforce early	380	1.12	(0.80, 1.56)	1.09	(0.78, 1.52)
	Entered the workforce late	1258	1.14	(0.93, 1.40)	1.13	(0.92, 1.39)
	Discontinuous work history	**792**	**1.36**	**(1.08, 1.70)**	**1.34**	**(1.06, 1.68)**
	Never worked outside home	19	1.03	(0.26, 4.14)	0.97	(0.24, 3.89)

[1]Adjusted for age and 10-year birth cohort (1910-19, 20-29, 30-39, and 40-49); [2]Adjusted for age, birth cohort, and educational attainment

Table S1. Sensitivity Analysis – 4 groups of paid labor participation (combined entered workforce late and discontinuous).

Associations of paid labor participation history with CVD risk by reproductive history.

Reproductive history (n)	**Paid labor participation history**	**N**	**HR[1]**	**(95%CI)**	**HR[2]**	**(95%CI)**
No birth	Worked consistently through adult life	1361	1.00		1.00	
(2210)	Left the workforce early	123	0.90	(0.47, 1.72)	0.92	(0.48, 1.77)
	Entered the workforce late/discontinuous	718	0.90	(0.65, 1.26)	0.90	(0.65, 1.26)
	Never worked outside home	8	1.40	(0.20, 10.04)	1.33	(0.18, 9.60)
At least one birth	Worked consistently through adult life	21307	1.00	1.00	1.00	
(59210)	Left the workforce early	**4666**	**0.89**	**(0.80, 0.98)**	**0.87**	**(0.78, 0.97)**
	Entered the workforce late/discontinuous	**32704**	**0.94**	**(0.89, 0.99)**	**0.93**	**(0.88, 0.98)**
	Never worked outside home	533	0.95	(0.71, 1.25)	0.84	(0.63, 1.11)
Birth information missing	Worked consistently through adult life	4746	1.00		1.00	
(7195)	Left the workforce early	380	1.12	(0.80, 1.56)	1.09	(0.78, 1.52)
	Entered the workforce late/discontinuous	**2050**	**1.23**	**(1.04, 1.45)**	**1.21**	**(1.02, 1.44)**
	Never worked outside home	19	1.03	(0.26, 4.14)	0.97	(0.24, 3.89)

[1]Adjusted for age and 10-year birth cohort (1910-19, 20-29, 30-39, and 40-49 [=ref]); [2]Adjusted for age, birth cohort, and educational attainment (college or more is reference group)

Table S2. Sensitivity analysis – 4 groups of paid labor participation (combined entered workforce late and worked consistently through adult life). Associations of paid labor participation history with CVD risk by reproductive history.

Reproductive history (n)	**Paid labor participation history**	**N**	**HR[1]**	**(95%CI)**	**HR[2]**	**(95%CI)**
No birth	Worked consistently / entered workforce late	1786	1.00		1.00	
(2210)	Left the workforce early	123	0.91	(0.48, 1.73)	0.93	(0.49, 1.78)
	Discontinuous	293	0.84	(0.54, 1.31)	0.84	(0.54, 1.31)
	Never worked outside home	8	1.41	(0.20, 10.12)	1.34	(0.19, 9.68)
At Least One Birth	Worked consistently /entered workforce late	38718	1.00	1.00	1.00	
(59210)	Left the workforce early	**4666**	**0.90**	**(0.82, 0.99)**	**0.89**	**(0.81, 0.99)**
	Discontinuous	**15293**	**0.92**	**(0.87, 0.98)**	**0.93**	**(0.88, 0.99)**
	Never worked outside home	533	0.96	(0.73, 1.27)	0.86	(0.65, 1.14)
Birth Information Missing	Worked consistently /entered workforce late	6004	1.00		1.00	
(7195)	Left the workforce early	380	1.08	(0.78, 1.51)	1.06	(0.76, 1.47)
	Discontinuous	**792**	**1.32**	**(1.06, 1.64)**	**1.30**	**(1.04, 1.62)**
	Never worked outside home	19	1.0	(0.25, 4.01)	0.93	(0.23, 3.76)

[1]Adjusted for age and 10-year birth cohort (1910-19, 20-29, 30-39, and 40-49 [=ref]); [2]Adjusted for age, birth cohort, and educational attainment (college or more is reference group).

Table S3. CVD cases, person-years, and age-adjusted CVD rates by unpaid labor characteristic (assuming missing live birth information of never married women meant no live births).

Unpaid Labor Characteristic	CVD cases	Person-years	CVD rate[1]	(95% CI)
Reproductive history				
No birth	393	3100.93	81.9	(32.0, 131.7)
At Least One Birth	5368	41361.22	90.7	(76.6, 104.7)
Birth Information Missing	397	3104.94	86.2	(35.5, 136.8)

[1]Adjusted for age, <55, 55-59, 60-64, 65-69, 50-74, >75, per 1000 person-years

Table S4. Associations of paid labor participation history with CVD risk by reproductive history (assuming missing live birth info of never married women meant no live births).

Reproductive history (n)	**Paid labor participation history**	**N**	**HR[1]**	**(95%CI)**	**HR[2]**	**(95%CI)**
No birth (4798)	Worked consistently through adult life	3356	1.00		1.00	
	Left the workforce early	166	1.08	(0.64, 1.82)	1.10	(0.65, 1.85)
	Entered the workforce late	850	0.95	(0.73, 1.24)	0.96	(0.73, 1.24)
	Discontinuous work history	413	0.84	(0.58, 1.22)	0.84	(0.58, 1.22)
	Never worked outside home	13	0.76	(0.10, 5.41)	0.73	(0.10, 5.19)
At Least One Birth (59210)	Worked consistently through adult life	21307	1.00		1.00	
	Left the workforce early	4666	**0.89**	**(0.80, 0.98)**	**0.87**	**(0.79, 0.97)**
	Entered the workforce late	17411	0.97	(0.91, 1.04)	0.95	(0.88, 1.01)
	Discontinuous work history	15293	**0.91**	**(0.85, 0.97)**	**0.91**	**(0.85, 0.97)**
	Never worked outside home	533	0.95	(0.72, 1.25)	0.84	(0.63, 1.11)
Birth Information Missing (4607)	Worked consistently through adult life	2751	1.00		1.00	
	Left the workforce early	337	1.12	(0.77, 1.62)	1.09	(0.75, 1.58)
	Entered the workforce later	833	1.28	(0.99, 1.66)	1.25	(0.97, 1.62)

	Discontinuous work history	**672**	**1.51**	**(1.17, 1.95)**	**1.50**	**(1.16, 1.93)**
	Never worked outside home	14	1.53	(0.38, 6.20)	0.97	(0.24, 3.89)

[1]Adjusted for age and 10-year birth cohort (1910-19, 20-29, 30-39, and 40-49 [=ref]); [2]Adjusted for age, birth cohort, and educational attainment