

# Caregiving to Children and Grandchildren and Risk of Coronary Heart Disease in Women

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Almost all women provide care to their own children, and a growing number of grandmothers provide care to their grandchildren. According to recent data, 14.5% of American grandmothers have raised a grandchild for 6 months or more.<sup>1</sup>

Although studies have been conducted investigating health consequences among individuals who provide care to ill children and grandchildren, few studies have examined the health consequences for caregivers of looking after non-ill children. Most studies of caregiving provided to grandchildren have been limited to grandparents whose adult children are mentally ill, incarcerated, dead, or divorced. Among such grandparents, assuming primary responsibility for rearing grandchildren has been linked to depression, insomnia, hypertension, diabetes, functional health limitations, and declines in self-rated health.<sup>2–8</sup> Researchers conducting other qualitative studies have noted the tendency among grandparents with caregiving responsibilities to delay seeking help for their own health problems.<sup>9–11</sup>

In the present prospective study, we examined the association between caregiving responsibilities (for non-ill children and non-ill grandchildren) and the incidence of coronary heart disease (CHD) in a cohort of middle-aged and older women.

## METHODS

### Study Population

Study participants were drawn from the Nurses' Health Study, an ongoing cohort investigation of US female registered nurses. The Nurses' Health Study was established in 1976, when 121 700 female registered nurses aged 30 to 55 years completed a mailed questionnaire providing information about risk factors for cardiovascular disease, cancer, and other major health conditions. Since then, follow-up questionnaires have

**Objectives.** We examined the relationship between burden of providing care to non-ill children and grandchildren and incidence of coronary heart disease (CHD) among women.

**Methods.** A prospective cohort study was conducted as part of the Nurses' Health Study among 54 412 women aged 46 to 71 years who were registered nurses. Women answered questions about their child care responsibilities.

**Results.** We documented 321 incident cases of CHD during 4 years of follow-up. Multivariate analyses showed that caring for non-ill children 21 hours or more per week and caring for non-ill grandchildren 9 hours or more per week (vs no caregiving) were associated with an increased risk of CHD (relative risks were 1.59 and 1.55, respectively).

**Conclusions.** High levels of care provision to grandchildren (and possibly children) may increase the risk of CHD among women. (*Am J Public Health.* 2003;93:1939–1944)

been mailed to the cohort every 2 years for the purpose of updating information on exposures and occurrences of major illnesses.

### Assessment of Caregiving

On the 1992 questionnaire, participants reported the number of hours per week they typically spent providing care to non-ill children or grandchildren: "Outside of your employment, do you provide regular care to any of the following? (Mark one response on each line. For people to whom you do not provide regular care, mark 'zero hours.')" We asked women about caregiving provided to their children, grandchildren, disabled or ill spouse, disabled or ill parent, and other disabled or ill relatives.

In the present study, we focused on care provided to children and grandchildren while controlling for care provided to ill or disabled spouses, ill or disabled parents, and other ill or disabled family members. The following response categories were used to assess weekly duration of caregiving: 0 hours (reference category), 1 to 8 hours, 9 to 20 hours, 21 to 35 hours, 36 to 72 hours, and 73 or more hours per week. Women reported separate weekly totals for each type of care.

We also asked caregivers to rate the degree of stress and reward associated with providing care: "How stressful would you say it is to provide care to the individuals mentioned

above?" and "How rewarding would you say it is to provide care to the individuals mentioned above?" In the case of both questions, possible responses were as follows: not applicable, not at all, just a little bit, moderately, extremely, and don't know. Participants who answered "don't know" (1740 [1.6%] for the stress question and 2967 [2.8%] for the reward question) were excluded from analyses.

### Ascertainment of CHD

The outcome investigated in this study consisted of all incident cases of nonfatal myocardial infarction and fatal CHD that occurred between the time participants returned the 1992 questionnaire and June 1, 1996. Each woman who reported having a myocardial infarction was asked for permission to review her medical records. Cases were confirmed if they met the diagnostic criteria of the World Health Organization (i.e., symptoms combined with either cardiac enzyme level elevations or diagnostic electrocardiogram changes).<sup>12</sup> Medical records were reviewed by physicians unaware of participants' exposure status. Occurrence of a myocardial infarction was defined as probable if (1) a patient's medical records were not available but he or she had been hospitalized and (2) confirmatory information was obtained via interview or letter. We included both definite and probable cases in the present analyses. Of all CHD cases ana-

lyzed, 92% were categorized as “definite” according to the criteria just described.

Most deaths were reported by next of kin or postal authorities. Systematic searches of state vital records and the National Death Index were also conducted to identify deaths among participants who did not respond during each questionnaire cycle. More than 98% of deaths in the cohort are estimated to have been identified by this method.<sup>13</sup> If death appeared to be a result of vascular causes, written permission was requested from the next of kin (subject to the regulations of vital records offices) to review the decedent’s medical records. Fatal CHD cases were confirmed via hospital records or autopsy reports; also, cases were considered confirmed if CHD was recorded on the death certificate, it was the underlying and most probable cause of death, and there was previous evidence of CHD. In no instance was the cause listed on the death certificate accepted without corroboration. Nonfatal myocardial infarctions and fatal CHD were combined in ascertaining overall frequencies of CHD.

Among the 121 700 members of the 1976 cohort, we excluded those who had died before 1992 ( $n=2888$ ) or who had a history of CHD ( $n=7728$ ), stroke ( $n=1087$ ), or cancer ( $n=13\,068$ ). Therefore, the study population was free of diagnosed CHD, stroke, and cancer (except nonmelanoma skin cancer) at the beginning of follow-up. Questions related to caregiving were asked on the last page of the 1992 questionnaire, which was mailed only once to the cohort. Although a shortened version of the 1992 questionnaire was mailed up to 4 times to nonrespondents (resulting in an eventual response rate above 90%), caregiving items were dropped from the repeat mailings to reduce respondent burden and maximize response rate. The response rate for the single mailing of the questionnaire containing the caregiving questions was 75%. We excluded 29 607 women who did not provide information on caregiving.

In addition to the exclusions just outlined, 1589 women were excluded because they were lost to follow-up or because they did not respond during the 1992 to 1996 follow-ups. Thus, our final study population comprised 54 412 women. Women who were excluded because of missing information on caregiving

( $n=40\,929$ ) differed from the women included in the present study in terms of several characteristics. Those who were excluded were more likely to smoke (21.7% vs 13.9%), slightly less likely to use postmenopausal hormones (22.3% vs 35.2%), and less likely to be in the highest quintiles in regard to physical activity (10.4% vs 20.6%), vitamin E intake (9.8% vs 18.8%), and aspirin use (8.5% vs 15.6%). Also, they were more likely to be married (91.6% vs 82.5%) and less likely to have at least a college-level education (12.7% vs 30.6%). We adjusted for all of these variables when comparing CHD risk among caregivers and noncaregivers.

### Data Analyses

The major focus of the data analyses was the prospective relationship between hours spent in caregiving and incidence of CHD. Information on potential confounders—including history of hypertension, hypercholesterolemia, and diabetes; physical activity levels; tobacco use; cholesterol intake; and postmenopausal hormone use—was ascertained in 1992 and updated in 1994 according to responses provided by the participants on the biennial questionnaire.

In all models, caregiving measures were treated as categorical variables. On the basis of the distribution of participants, we combined some of the higher categories in regard to caregiving hours. Relative risks for any single type of caregiving were adjusted for other types of caregiving. For example, to examine the effect of caring for children, we controlled for caring for grandchildren, ill or disabled spouses, ill or disabled parents, and other ill or disabled family members.

Stress and reward measures were also treated as categorical variables. These measures involved 5 possible responses: not applicable (no caregiving), not at all stressful/rewarding, just a little bit stressful/rewarding, moderately stressful/rewarding, and extremely stressful/rewarding. In the present analyses, we combined (1) “not at all” and “just a little bit” and (2) “moderately” and “extremely.” We then compared each group with women providing no care. Furthermore, for each caregiving classification (children and grandchildren), we combined the stress/reward measures and hours of caregiving into

4 categories: low stress/reward and low number of caregiving hours, low stress/reward and high number of caregiving hours, high stress/reward and low number of caregiving hours, and high stress/reward and high number of caregiving hours.

Relative risk (RR) was defined as the CHD incidence rate among those who reported providing child care divided by the corresponding rate among women who did not provide care. Relative risks were adjusted for age and categorized in 5-year groups, and 95% confidence intervals (CIs) were calculated. Proportional hazards models were used to adjust for risk factors including smoking (never; past; current, 1–14 cigarettes per day; current, 15–24 cigarettes per day; current,  $\geq 25$  cigarettes per day); alcohol intake (0 g per day, 0.1–4.9 g per day [one third to one half drink per day], 5.0–14.9 g per day [about one drink], or  $\geq 15.0$  g per day [more than one drink per day], with one drink considered as 12.8 g of beer, 11.0 g of wine, or 14.0 g of spirits); body mass index ( $\text{kg}/\text{m}^2$ ; in quintiles); history of hypertension, diabetes, and hypercholesterolemia; menopausal status (yes/no); current use of postmenopausal hormones; average aspirin intake (less than 1, 1–6, and  $\geq 7$  tablets per week); past use of oral contraceptives; saturated fat intake (in quintiles); vitamin E intake (in quintiles); and physical activity level (in quintiles).

We assessed recreational physical activity from women’s responses to questions about how often they engaged in 8 common activities. We measured activity in metabolic equivalent hours (MET hours) per week. One MET hour is equivalent to the energy expended during 1 hour of rest. Walking at an average pace for 1 hour is estimated to consume about 3 MET units, while jogging or bicycling is estimated to consume about 7 MET units. Physical activity levels were divided into quintiles based on MET units, and an equal number of women were grouped in each quintile.

We also adjusted for parental history of myocardial infarction before the age of 60 years, educational attainment (registered nursing certification, bachelor’s degree, or graduate degree), marital status (currently married, divorced, or widowed), husband’s educational attainment (high school diploma, bachelor’s

**TABLE 1—Mean Ages and Age-Standardized Distribution of Coronary Heart Disease Risk Factors and Other Characteristics According to Type of Caregiving**

Characteristic	No Care (n = 25 985)	Children (n = 13 433)	Grandchildren (n = 13 392)
Mean age, y	59.3	53.6	60.2
Hypertension, %	30.5	32.6	33.6
Diabetes, %	4.2	5.0	4.8
Hypercholesterolemia, %	43.1	43.5	44.2
Smoking status, %			
Never smoked	42.5	47.3	46.7
Past smoker	43.5	38.5	39.4
Current smoker	14.0	14.1	14.0
Current use of postmenopausal hormones, %	37.1	30.8	34.9
Past use of oral contraceptives, %	52.4	49.1	50.9
Parental history of myocardial infarction before age of 60 y, %	13.1	13.2	13.4
Mean alcohol intake, g/d	5.8	4.5	4.5
Highest exercise quintile, %	20.2	18.6	17.7
Highest quintile of vitamin E intake, %	19.2	17.2	17.7
Highest quintile of saturated fat intake, %	17.7	17.2	20.9
Mean body mass index, kg/m <sup>2</sup>	25.6	26.3	26.5
Consumption of $\geq 7$ aspirin tablets/wk, %	15.3	14.3	17.3
Marital status, %			
Currently married	80.9	85.3	82.1
Divorced or separated	8.8	8.8	6.3
Widowed	10.3	6.0	11.6
Education, %			
Registered nurse certification	68.4	67.1	76.1
Bachelor's degree	20.3	23.1	17.1
Graduate degree	11.3	9.8	6.8
Employment status, %			
Full-time nurse	53.2	53.2	48.9
Part-time nurse	27.2	30.2	33.7
Full-time other	10.5	8.3	7.7
Part-time other	9.1	8.4	9.7
Husband's education, %			
High school diploma	37.1	34.4	45.1
Bachelor's degree	25.2	25.8	23.8
Graduate degree	21.6	24.3	17.5
Missing	16.1	15.6	13.6

degree, graduate degree, or missing information on education). SAS was used in conducting all analyses (SAS Institute Inc, Cary, NC).

## RESULTS

Table 1 shows the age-standardized distribution of risk factors for CHD and other

characteristics according to type of care provided. Women who provided care to children were younger than those who provided care to grandchildren or provided no care. Percentages of women reporting current use of postmenopausal hormones and past use of oral contraceptives were slightly higher among those who provided no care. Also,

women who provided no care had slightly higher alcohol intakes, tended to exercise slightly more often, and tended to take vitamin E slightly more often.

Women who provided care to grandchildren tended to consume more saturated fat and to have less education than those who did not provide such care. They were also more likely to work part time, and their husbands' education levels were generally lower than those of the husbands of women who provided no care or provided care to children. All of these differences in risk factors were controlled in examinations of the association between caregiving and risk of CHD. In total, 321 incident cases of CHD (including 231 nonfatal myocardial infarctions and 90 CHD deaths) occurred during the 4 years of follow-up.

### Care of Children and Grandchildren

In comparison with women providing no child care, women who reported providing care to children 21 hours or more a week had an age-adjusted relative risk of (total incident) CHD of 1.77 (95% CI=1.08, 2.89; Table 2). However, providing care to children for fewer than 21 hours a week was not associated with an increase in risk of CHD. Adjustment for all of the risk factors listed in Table 1 and for other types of care resulted in a degree of attenuation of relative risk (RR=1.58; 95% CI=0.96, 2.61). When we stratified participants according to employment status, there was little difference in risk between those who were working and those who were not; relative risks were 1.56 (95% CI=0.82, 2.96) for women who were working and provided care to children 21 hours or more per week (vs women who were working and did not provide care) and 1.76 (95% CI=0.78, 3.96) for women who were not working and provided care to children 21 hours or more per week (vs women who were not working and provided no care).

In comparison with women providing no care to grandchildren, the age-adjusted relative risk of CHD among women reporting 9 or more hours of care per week (the highest level of care) was 1.86 (95% CI=1.33, 2.59; Table 3). Adjustment for all of the risk factors listed in Table 1 and other types of care resulted in a degree of attenuation of relative

**TABLE 2—Relative Risks (RRs) of Coronary Heart Disease (CHD) Among Women Caring for Children**

	No Caregiving	1–8 Hours per Week	9–20 Hours per Week	≥21 Hours per Week
<b>Total CHD</b>				
No. of cases	262	30	10	19
Age-adjusted RR (95% CI)	1.00	0.90 (0.61, 1.32)	0.91 (0.48, 1.74)	1.77 (1.08, 2.89)
Multivariate RR (95% CI)	1.00	0.83 (0.56, 1.23)	0.78 (0.41, 1.50)	1.58 (0.96, 2.61)
<b>Nonfatal CHD</b>				
No. of cases	190	19	8	14
Age-adjusted RR (95% CI)	1.00	0.79 (0.49, 1.28)	1.02 (0.50, 2.11)	1.83 (1.03, 3.25)
Multivariate RR (95% CI)	1.00	0.73 (0.44, 1.18)	0.90 (0.44, 1.86)	1.74 (0.97, 3.12)
<b>Fatal CHD<sup>a</sup></b>				
No. of cases	72	11	2	5
Age-adjusted RR (95% CI)	1.00	1.15 (0.60, 2.21)	0.63 (0.15, 2.60)	1.57 (0.61, 4.06)

Note. CI = confidence interval.

<sup>a</sup>There were too few cases of fatal CHD to carry out multivariate analyses.

**TABLE 3—Relative Risks (RRs) of Coronary Heart Disease (CHD) Among Women Caring for Grandchildren**

	No Caregiving	1–8 Hours per Week	9–20 Hours per Week
<b>Total CHD</b>			
No. of cases	217	62	42
Age-adjusted RR (95% CI)	1.00	1.07 (0.80, 1.42)	1.86 (1.33, 2.59)
Multivariate RR (95% CI)	1.00	1.07 (0.80, 1.43)	1.55 (1.10, 2.18)
<b>Nonfatal CHD</b>			
No. of cases	153	45	33
Age-adjusted RR (95% CI)	1.00	1.10 (0.79, 1.53)	2.06 (1.41, 3.01)
Multivariate RR (95% CI)	1.00	1.09 (0.78, 1.53)	1.75 (1.18, 2.58)
<b>Fatal CHD<sup>a</sup></b>			
No. of cases	64	17	9
Age-adjusted RR (95% CI)	1.00	1.00 (0.59, 1.71)	1.36 (0.68, 2.74)

Note. CI = confidence interval.

<sup>a</sup>There were too few cases of fatal CHD to carry out multivariate analyses.

risk (RR = 1.55; 95% CI = 1.10, 2.18). However, providing care to grandchildren 9 hours or more per week was associated with a significantly increased risk of CHD even after control for a number of potential confounders. When we stratified participants according to employment status, there was a small difference in risk among women who were and were not working; relative risks were 1.20 (95% CI = 0.67, 2.17) for women who were working and provided care to grandchildren 9 hours or more per week (vs women who were working and provided no care) and

1.69 (95% CI = 1.10, 2.60) for women who were not working and provided care to grandchildren 9 hours or more per week (vs women who were not working and provided no care).

### Caregiving Stress and Reward

In the case of both care provided to children and care provided to grandchildren, neither caregiving stress nor caregiving reward was associated with incidence of CHD. After adjustment for caregiving reward, the overall multivariate relative risk of CHD among

women reporting moderate or extreme care-related stress (vs women providing no care) was 1.05 (95% CI = 0.48, 2.29). On the other hand, after adjustment for stress, the multivariate relative risk of total CHD among women reporting moderate or extreme care-related reward (vs women providing no care) was 0.97 (95% CI = 0.47, 2.02).

Combined measures of stress/reward and hours of caregiving likewise demonstrated no distinct pattern in risk of CHD according to either stress or reward. Among women who provided care to children, the multivariate relative risk of CHD associated with the combination of low stress (no caregiving responsibilities combined with caregiving rated as not at all stressful or minimally stressful) and 9 or more caregiving hours per week (vs the combination of low stress and a low number of caregiving hours) was 1.53 (95% CI = 0.96 to 2.45). The combination of reward and hours of caregiving showed a similar trend. Finally, results were similar when the coronary endpoints were confined to definite cases of CHD (n = 303) in all 5 caregiving categories.

## DISCUSSION

Previous studies of the effects of child care on the health of caregivers have primarily focused on grandparents who provided care for grandchildren whose parents were ill, incarcerated, or deceased.<sup>10,14–17</sup> Other studies have focused on health consequences among caregivers of ill or disabled spouses.<sup>18–25</sup> Under such circumstances, it is not difficult to imagine that the stress of providing care might result in deleterious health consequences for the caregiver.

To our knowledge, the present prospective data are among the first to suggest that high levels of care provided to non-ill children and grandchildren may increase the risk of CHD among women. Although we did not examine the mechanisms underlying this association, it is possible that women (especially grandmothers) with high levels of child care demands have less opportunity to engage in their own self-care and in preventive health behaviors. Role conflict may also be a stressor among working mothers and grandmothers.

We found that risk of CHD did not vary by women's working status (i.e., not working



vs working full or part time). Our findings therefore failed to confirm the concept of “the second shift” introduced by Hochschild. According to this notion, working women confront the dual burden of stress associated with their working lives and stress arising from their continued responsibilities in the home environment (household chores and child rearing). Hochschild’s ethnographic studies showed that working women were more tired and reported more stress than their spouses.<sup>26</sup>

Our findings also failed to replicate results from the Framingham Heart Study, in which CHD incidence rates were 11% among working women aged 45 to 64 years with 3 or more children and 4.4% among housewives in the same age group with 3 or more children.<sup>27</sup> The discrepancies in findings between the Framingham study and the Nurses’ Health Study may be due to the differences in the socioeconomic composition of the cohorts. In the Framingham Heart Study the majority of the working women taking part (more than 80%) were employed in either blue-collar or clerical jobs, whereas in our cohort all of the women were registered nurses. Because the Framingham study did not control for coronary risk factors other than age, the higher risk of CHD observed among clerical women in that cohort may have been due to residual confounding by other coronary risk factors. By contrast, the occupational homogeneity in the Nurses’ Health Study may have resulted in lack of effect modification according to employment status.

Our findings regarding care provided to grandchildren are consistent with those of a recent cross-sectional study focusing on the health of grandparents.<sup>28</sup> That study involved a subsample of the National Survey of Families and Households cohort, which comprised 173 individuals providing care to grandchildren and 3304 individuals not providing such care. The authors found that, in comparison with grandparents not providing care, those with primary responsibility for raising grandchildren had an odds ratio (OR) of 1.5 (95% CI=1.03, 2.20) in regard to limitations in at least one activity of daily living. In the same study, individuals providing care to grandchildren were significantly more likely

to report lower satisfaction with their health status and lower ratings of their health.

The same authors extended their study with a second wave of interviews and found that caregiving grandmothers were more likely than noncaregivers (32% vs 19%) to be categorized as depressed. Grandmothers who were raising their grandchildren had 54% higher odds of having at least one limitation in activities of daily living than did noncaregiving grandmothers after demographic variables had been controlled (OR=1.54; 95% CI=1.03, 2.28).<sup>29</sup>

Providing care to grandchildren often involves physical work and time commitments. In comparison with children who go to school, younger children (infants or preschoolers) require more physical strength in terms of holding them, playing with them, bathing them, and so forth, as well as close monitoring most of the time. Our findings on women caring for grandchildren failed to replicate Hochschild’s “second shift” concept. Analyses stratified according to working status demonstrated that women who were not working and provided care to grandchildren 9 hours or more a week had a greater relative risk (RR=1.69; 95% CI=1.10, 2.60) than women who worked and provided care to grandchildren for the same amount of time (RR=1.20; 95% CI=0.67, 2.17).

Despite our suggestive findings, our results need to be interpreted with caution. Some women who reported that they provided care to children or grandchildren may have misunderstood the question as referring to providing care to ill or disabled children or grandchildren, especially since our questions appeared adjacent to items focusing on providing care to ill or disabled spouses, parents, or others. Conversely, the percentages of women who responded that they provided care to children (24.7%) and grandchildren (24.6%) were implausibly high to suggest that such an error accounted entirely for our findings.

In addition, selection bias may have occurred in regard to the respondents who reported providing care to healthy children or grandchildren; it is possible that only women who perceived child caring as very stressful answered this question. Some women may have answered that they did not provide

“care” even though they did in fact look after their children, the reason being that they took this care for granted. In our cohort, 20% of women who had at least one child 18 years or younger reported not providing care. The crude manner in which we asked about caregiving for children and grandchildren was thus likely to have introduced an element of self-selection.

The interesting fact remains that women who self-identified as caregivers exhibited an increased risk of CHD over our prospective follow-up. Further studies are therefore warranted to clarify the nature of the association between caregiving for children or grandchildren and CHD risk.

In the present study, we did not observe a relation between degree of caregiving stress/reward and risk of CHD. Weekly durations of caregiving seemed to matter more than the perceived stress or reward associated with caregiving. Supplementing self-reports with more objective measures of stress, such as salivary cortisol level, might have differentiated the women who were at risk of subsequent CHD.

An additional limitation of our study was the lack of information regarding cumulative duration of caregiving. Although we gathered information on the amount of time spent each week on child care, we could not determine whether there was a cumulative effect of caregiving burden on CHD risk. Finally, if women who provide care are healthier in the first place (the “healthy caregiver effect”), there may have been a selection bias that resulted in underestimation of the effect of caregiving on CHD.

Our data suggest that high levels of caregiving to grandchildren (and possibly children) increase the risk of CHD. In light of the growing participation of women with young children in the labor market, consideration should be given to policies that support the provision of child care. Such policies might include increasing the numbers of multigenerational clinics and other health care delivery systems providing “one-stop shopping” for parents, grandparents, and children in their care<sup>28</sup> so that parents and grandparents will not delay seeking help for their own physical and emotional health problems. Finally, policies focusing on provision of more affordable

and accessible child care facilities and on flexibility in work schedules may contribute toward keeping our child caregivers healthy. ■

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### Contributors

All of the authors participated in the conceptualization of the study, interpretation of results, and preparation of the article.

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### Human Participant Protection

Ethical clearance for this research was obtained from institutional review boards at the Brigham and Women's Hospital. All participants provided written informed consent.

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