



The Effects on Labor Supply of Living with Older Family Members Needing Assistance with Activities of Daily Living

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Abstract

Using a sample of 18,201 observations of working age respondents drawn from the Medical Expenditure Panel Survey, 1996–2018, this research examined the labor supply effects for younger family members of living with older persons needing assistance with activities of daily living. We report the effects for three labor supply outcomes of younger family members: working hours, full-time work, and occupational flexibility of working hours. Our results indicate that living with an older family member needing assistance significantly reduced younger women's working hours and the probability of working full-time among younger women, but increased both of these labor outcomes among younger men. In addition, living with an older family member needing help led younger women to work in occupations with significantly larger average variances in working hours. This suggests that these women occupied positions that allowed greater flexibility of working hours. We found little effect on flexibility of working hours for younger men. We conclude that the need for assistance among older family members has important effects on the labor market outcomes of younger family members.

Keywords Elder caregiving · Labor supply

JEL Classification J—Labor and demographic economics · J22—Time allocation and labor supply

Introduction

The number of Americans providing care to ill or needy family members is large and growing as the baby boom cohort ages. In 2020, the AARP and National Alliance for Caregiving (2020) reported survey findings describing the caregiving population: Estimates indicated that in 2020, 16.8% of Americans were caregivers for individuals who were at least 50 years old. Most caregivers of adults cared for a relative, typically an older relative. Caregivers reported averaging about 24 hours of care each week for the care recipient. The picture painted by these numbers clearly shows that many millions of family members are directly or indirectly burdened by the need to care for older family members. While empirical research has shown that employment, whether

part-time or full-time, may not have had a large impact on the hours spent by daughters in assisting parents (Dautzenberg et al., 2000; Mazotta et al., 2020), this research asks instead whether living with older family members needing assistance impacts younger family members' labor supply.

The impact on family members' labor supply is an understudied indirect family cost of elder care. Numerous studies have examined the psychological, physical, and emotional burden borne by caregivers (National Academies of Sciences, Engineering, and Medicine, 2016, Chapter 3). However, fewer studies have examined how the care burden impacts the work activities of family members. Of those studies that examined the impact on family members' labor supply, many focused solely on the burden of the primary caregiver and ignored the burden on other family members. Because these costs may be significant, in our research we consider the effects of living with older family members needing assistance on the labor market outcomes of both younger women and men rather than limiting our focus to women, who have traditionally been more likely to be caregivers.

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In this paper we report findings from analyses in which we focused on younger workers who co-resided with older family members. Using a sample of 18,201 observations of working age respondents drawn from the Medical Expenditure Panel Survey, 1996–2018, we estimated the effects of co-residence on the working hours, full-time employment, and working hours flexibility of the younger workers. While our focus on both younger women and men allowed us to observe the possible effects of caregiving by family members, which may have decreased working hours and full-time employment and increased the chosen flexibility of working hours, we also observed an opposite effect for some younger family members who increased their labor supply, possibly in order to afford medical and personal care services for the older family member. Additionally, we found instances in which no impact on the younger family members' labor supply was observed. This may indicate that the older family member's need for assistance was mild or that she or he had financial resources to pay for personal care and medical services. We conclude that the need for assistance among older family members has important effects on the labor market outcomes of younger family members.

Review of the Literature

First, we review the literature describing the costs of caregiving. Although there is a large literature addressing the physical, psychological, emotional and social aspects of the family burden of elder care, particularly that borne by primary caregivers, a smaller number of studies has examined the effects on family members' labor market activities (National Academies of Sciences, Engineering, and Medicine, 2016, Chapters 3 and 4). A common problem in the earlier literature describing the burdens of caregiving was that the data were often obtained from local surveys or projects (Kemper, 1992; Leon et al., 1998; Max et al., 1995; Rubenstein et al., 2001; Taylor & Sloan, 2000). In these studies, a primary caregiver was often asked to report the amount of time devoted to caregiving activities. Hours spent in caregiving were multiplied by an hourly wage rate to obtain a monetary estimate of caregiver burden. For example, in a cross-sectional study of dementia patient-family caregiver pairs, Leon et al. (1998) measured informal costs of dementia by asking a primary family caregiver to report the amount of time spent on both activities of daily living and on household chores. Reports of caregiving hours were multiplied by national hourly wage rates. The results indicated that cost savings for formal and informal care could be achieved if memory and physical functioning of dementia patients could be improved or if the rate of decline could be delayed. However, the usefulness of these findings was limited because the local nature of the data implies that the

findings of the study could not be generalized for the United States population (Franks, 1990).

Further, these studies often limited the analyses to labor market effects for a designated caregiver (Carmichael et al., 2010; Ciani, 2012; Leigh, 2010; Van Houtven et al., 2013; Wolf & Soldo, 1994). This is a general problem of the literature describing the labor market effects of illness. Typically, studies in this literature focused on the effects of physical and mental disorders on the labor supply of the afflicted individual and ignored the effects on family members (Max et al., 1995; Marcotte and Wilcox-Gök, 2000, 2001; Skira, 2015). Although some studies analyzed the effect of poor physical health of a specific illness on a family member's labor supply, these often considered only the effect on the family member expected to be the primary caregiver: Examples include the response in the wife's labor supply to a decline in the health of her husband, that of a daughter to the health of her disabled, elderly parent, and that of a mother's labor force participation to the chronic illness of a child (Berger & Fleischer, 1984; Boaz & Muller, 1992; Chang & White-Means, 2006; Ettner, 1995a, 1995b; Muurinen, 1986; Stommel et al., 1994; Whetton-Goldstein et al., 1997; White-Means, 1992). Unfortunately, the exclusive focus of these studies on caregivers' labor supply means that the findings were subject to selection bias. The study samples were nonrandomly selected because they included only individuals designated as caregivers and excluded other family members.

More recent studies of the financial impact of caregiving activities on families with ill members utilized larger national samples (Carmichael et al., 2010; Ciani, 2012; Fevang et al., 2012; Langa et al., 2001; Latif, 2006; Leigh, 2010; Meng, 2013; Mentzakis et al., 2009; Van Houtven et al., 2013). For example, Langa et al. (2001) used the 1993 asset and health dynamics (AHEAD) Study to compare caregiving time and cost for two older groups: elderly with dementia and elderly with normal cognition. Incremental weekly caregiving hours and the associated cost of informal caregiving were greater for elders with dementia than for those without dementia. Among those with dementia, caregiving time and cost increased substantially as cognitive impairment worsened. While this study is one of the best to be found in the literature describing the effects of dementia on family caregiving, even this study aggregated family members' time and did not allow for substitution of one family member's time in the labor market for that of another who was engaged in caregiving.

Examples of studies that examined labor market effects for multiple family members can be found for other disorders than dementia (Emanuel et al., 2000; Roberts, 1999; Weinberger et al., 1993). Weinberger et al. (1993) found the largest components of family burden associated with Parkinson's disease to be the burden of providing informal caregiving

and the loss of earnings due to substituting caregiving activities for market work. Emanuel et al. (2000), a study of terminally ill patients and their caregivers, reported that patients with substantial care needs were significantly more likely to report that they or their family members had to obtain an additional job to deal with the increased economic burden.

Finally, two recent studies departed from the usual focus on current labor market effects to estimate longer term labor market outcomes among caregiving women: Schmitz and Westphal (2017) estimated the long-term effects of female caregivers in Germany and Skira (2015) examined the long-term effects among female caregivers in the United States. These studies reported mild short-term effects but found that caregiving significantly reduced the probability of returning to work or increasing work hours after a caregiving spell.

Above we reviewed studies that addressed how the need for caregiving may have *decreased* family members' labor supply. An alternative effect of co-residing with an older family member needing assistance was for younger family members to have *increased* labor supply in order to better afford medical and personal care services for the older family member. Relatively few studies have explicitly considered this possibility and the findings were mixed (Berger & Fleischer, 1984; Coile, 2004; Gould, 2004; Roberts, 1999; Siegel, 2006). Using the National Longitudinal Survey of older males, Berger and Fleischer (1984) found that transfer income played a crucial role in a wife's labor supply response when a husband became ill: When no income transfers were available, the wife increased her market work to replace the lost earnings of the husband. However, as the level of transfer income increased, the wife reduced her labor supply, enabling her to spend more time at home caring for her husband. Roberts (1999) and Coile (2004) found that an illness in the family caused an increase in men's labor supply and no effect or a decrease in women's labor supply. Gould (2004) reported that mothers worked fewer hours if a sick child had a condition requiring time-intensive caregiving. She found no evidence of mothers working more hours. Similar to our theoretical approach, Siegel (2006) explained that when a husband's earnings decreased due to illness, the coefficient of the husband's health in models of his wife's labor force participation and hours of work reflected her decision to either decrease her labor supply to provide health care for her husband or increase it to purchase this care in the market. Using data from the Health and Retirement Study, Siegel found that when the husband had physical limitations or a heart condition, the wife's probability of employment increased, other things equal. However, when the husband's endogenous earnings are instrumented, the author found that a husband's ill health, such as a stroke, led an employed wife to decrease work hours. To reconcile these apparently contradictory findings, Siegel suggested that "the functional debilitation that results from a stroke is severe enough to

warrant more costly care, i.e., care that costs more per hour than a wife's market wage" (p. 598).

In addition to the impact on the labor supply measures of working hours and full-time employment, in the research reported here we estimated the impact of co-residing with an older family member needing help on younger family members' choice of flexibility in working hours. Our assumption was that an occupation with a larger variance in usual working hours offered greater choice in working schedules. Empirical evidence from prior studies suggests that higher family demands increased the probability that women chose self-employment, which offered greater flexibility in their working hours (Boden, 1999; Lombard, 2001). Baxter (2011) found that flexible work hours allowed parents to better allocate their time between work time and family time.

Among workers who are not self-employed, Golden (2008) noted that "not all occupations lend themselves by nature to flexible scheduling" (p. 87). Despite the lack of broad availability of flexible scheduling across occupations, Golden (2008) found that the distribution of flexible work arrangements was somewhat related to family demands (p. 104). This is echoed in Goldin (2014), who found that greater average earnings of men compared to women was partially attributable to men working in occupations with less flexible work schedules, while women were more likely to work in occupations with greater work schedule flexibility. Although both Golden (2008) and Goldin (2014) focused on family demands due to the presence of young children in the home, the presence of older family members needing assistance with activities of daily living may have similar effects.

Labor Supply Model

Our empirical research is based on a time allocation model of labor supply (Becker, 1965). Becker's model, which explicitly recognizes the importance of time costs in economic decision-making, was first applied to family labor supply by Mincer (1962). It is now a standard model in labor economics (Chiappori & Lewbel, 2015) and was applied to caregiving for elder family members as early as 1986 (Muurinen, 1986; White-Means, 1992). Stanfors et al. (2019) reported that this model was the basis for several studies examining the tradeoff among paid work, leisure, and home care for individuals with caregiving responsibilities.

The time allocation model is a utility-maximizing model of behavior, implying that family members of the ill are assumed to make decisions that give them the most satisfaction. In addition to the utility function, the model has a production function specifying the alternative activities that a family member may pursue, including but not limited to working in the labor market. The household

production functions indicate the time needed to transform goods and services purchased in the marketplace into final consumption goods. For example, a person engaged in giving care to an ill family member might use two hours of her or his time and various store-bought commodities to help the ill family member bathe. The final consumption good produced is a bath.

Each individual compares her or his productivity in the home to that in the labor market to determine the optimal allocation of time between home and market work. This is a relatively simple decision if there is only one family member of the ill person. However, in the context of a multi-person family, some individuals will have relatively higher productivity in the labor market and others will have relatively higher productivity in home production. Given institutional restrictions, such as an employer's required number of hours to be worked each week, the family must choose the optimal allocation of time for family members. Individuals whose relative wage rate is lower than other family members may find that their time is more efficiently spent performing duties in the household (including caregiving for an older family member), leading to a reduction in work hours. This might be a change in hours on the current job, a shift from a full-time to a part-time position, or if hours devoted to caregiving are sufficiently large, the person may leave the labor force altogether. The decision to reduce hours of work or leave the labor force imposes a cost on the family in the form of foregone earnings, though it is important to note that nonmarket activities in the home while caretaking can be highly valued even though they are uncompensated in the labor market.

Conversely, family members with relatively higher wage rates may increase their hours of work to earn income needed for supplying services for the ill individual or secure health insurance coverage for the ill family member. This imposes a cost on the family in the form of the value of foregone home activities and leisure.

Our hypotheses are drawn from a simple version of a time allocation model describing the younger family members' labor supply. The older family member's health (H) is a commodity that is produced in the home by combining market commodities (z) with the caregiver's time (b). The individual's utility function is expressed as

$$U = U(C, H) \quad (1)$$

where $C = c(x, a)$ and $H = h(z, b, e)$.

The arguments are defined as C = consumption goods and services, H = older family member's health, x = market goods and services used to produce home consumption goods, P_x = price per unit of x , z = market goods and services used to provide care, P_z = price per unit of z , a = time

in home production of C , b = time used in caregiving, e = exogenous health endowment of older family member (measures the need of the care receiver, with a higher e indicating a healthier person), T = total time endowment, w = individual's wage rate, V = family's unearned income, and n = labor supply hours.

Leisure does not specifically enter into the utility function. Following Heckman (1974), all leisure activities can technically be considered consumption activities. Because the separate notation of consumption and leisure is not necessary to derive the desired results, we choose to simply include leisure activities in C .

The utility-maximization problem is:

$$\text{Maximize } U(c(x, a), h(z, b, e)) \quad (2)$$

subject to the budget constraint

$$wn + V = P_x x + P_z z \quad (3)$$

and the time constraint

$$n = T - a - b \quad (4)$$

Combining the budget and time constraints into a single constraint, the Lagrangian is

$$L = U(c(x, a), h(z, b, e)) + \lambda(wT - wa - wb + V - P_x x - P_z z) \quad (5)$$

The first order conditions provide the usual results: The marginal utility of time spent doing a equals the marginal utility of time spent in b , the marginal utility per dollar spent on x equals the marginal utility per dollar spent on z , and income is fully exhausted on expenditures. From these conditions, we derive the individual's demand for hours of work (n) and determine how this will vary with the wage rate (w) and the health of the ill member of the family (e). Alternative responses are possible because care can be provided either directly with a family member's time (b) or indirectly with purchases of services from the market (z).

The prediction of the effect of illness of older family members needing assistance with activities of daily living (*ADLHELP*) on the labor market outcomes of younger family members (*LMO*) using this model is ambiguous: Illness makes time in health production more valuable, leading to more health production and reduced labor supply ($\partial LMO / \partial ADLHELP < 0$). However, if greater earnings are needed to purchase medical inputs for the older family member, there can be an income effect leading to an increase in labor supply ($\partial LMO / \partial ADLHELP > 0$). The observed impact will be the net effect of these two opposing forces. For our first hypothesis, we assume that the former effect dominates the latter leading to a decrease in labor supply, other things equal (compared to individuals co-residing with older family members who do not need ADL assistance).

H1 The presence in the household of an individual needing ADL assistance (*ADLHELP*) will cause a decrease in labor supply (*LMO*) of other family members, other things equal:

$$\partial LMO / \partial ADLHELP < 0$$

If the value of the family member's time matters in determining the impact on her or his labor supply, the effect of living with an older family member needing assistance may vary depending upon the wage rate of the younger person. For younger family members with relatively low wage rates, the effect of having an older person in the household who needs assistance may be to decrease labor supply. As a consequence, individuals who have lower wage rates are more likely to decrease work hours when a family member is ill. In contrast, for family members with relatively high wage rates, the effect of co-residing with an older family member who requires assistance may be to increase labor supply.

The need for caregiving time or higher earnings to purchase market inputs may impact not only the total time available for work in the labor market, but also the timing of work. To the extent that the caregiving effect dominates the earnings effect, younger family members may desire greater flexibility in their work schedules. Under this assumption, we expect to observe that younger family members will be more likely to choose jobs in occupations with greater work schedule flexibility. This generates our next hypothesis.

H2 The presence in the household of an individual suffering from an illness who requires care (*ADLHELP*) will lead other family members to choose employment in occupations with greater work schedule flexibility, other things equal:

$$\partial FLEX / \partial ADLHELP > 0$$

Next, we consider the effects that wage rates may have on the response to living with an older family member needing assistance with activities of daily living (ADL). The wage rate is a fundamental determinant of labor supply because it represents the value of an hour of time: Simplistically, if an individual works one hour less in order to engage in an alternative activity, the wage rate is the amount of earnings foregone. The higher the wage rate, the greater the cost of foregoing work hours (Ehrenberg et al., 2023). Following the reasoning above, we expect the impact of living with an older family member needing ADL help on labor supply to decrease with the individual's wage for both men and women. This leads to our third hypothesis.

H3 The effect on labor supply (*LMO*) due to the presence in the household of an individual requiring care (*ADLHELP*) will decrease as the wage rate rises, other things equal:

$$\partial LMO^2 / \partial ADLHELP \cdot \partial w < 0$$

Finally, we examine the effect of other factors, such as social norms regarding work and caretaking, on the labor supply of individuals living with an older family member needing ADL assistance. Prior research has established that average wage rates for women are lower than those for men (Goldin et al., 2017). The lower value of time in the labor market for women may at least partially explain why women have traditionally been more likely to be caretakers than men. In our analyses, we estimate the effect of living with an older family member needing ADL assistance while controlling for the individual's wage rate and interacting the wage rate variable with the ADL help variable. If the variable representing ADL help continues to be positive and significant for younger women (and not for younger men), this indicates that factors such as social norms may significantly influence the individual's choices. While our model cannot identify these other factors, by testing whether the inclusion of the wage rate is sufficient to explain the labor supply effects of living with an older family member needing ADL help, it can ascertain their importance. To establish a testable hypothesis, we assume that female family members will experience greater labor market effects than men of living with older family members needing assistance, *even while controlling for the wage rate*. This leads to our final hypothesis.

H4 The presence in the household of an individual suffering from an illness who requires assistance (*ADLHELP*) will lead to an average effect on labor supply (*LMO*) of female family members that is more negative than the effect on labor supply of male family members, other things equal:

$$(\partial LMO / \partial ADLHELP)^{WOMEN} < (\partial LMO / \partial ADLHELP)^{MEN}$$

Note that the condition in H4 is satisfied if the impacts on labor supply for both women and men are negative, but the effect for women is larger in absolute value, or if the impact on women's labor supply is negative and the impact on men's labor supply is zero or positive. Hypothesis H4 illustrates that it is possible to observe differing effects of illness on different members of the same family. One family member may reduce her labor supply and other members may compensate by increasing their labor supplies. In fact, we expect family members to self-sort into labor market activity versus home production according to the relative productivities (represented by wage rates) of the members. It is possible that we will reject H4 because the wage rate of the younger family member explains the labor supply effect of living with an older family member needing ADL assistance: That is, we may observe that the labor supply of female family members does not decrease more than that of male family members *when the wage rate is controlled for*.

Table 1 Definitions of variables

Variable	Definition
Hours worked	Usual hours worked per week (37.373, 10.867)
Full time	Dummy variable = 1 if younger family member works more than 35 hours per week (0.733, 0.442)
Hours variance	Variance in usual weekly hours in the younger family member's occupation (136.665, 42.499)
ADL help	Dummy variable = 1 if an older family member needs help with activities of daily living (0.158, 0.365)
Wage	Hourly wage of younger family member (\$US 2012) (17.848, 12.541)
ADL help * Wage	Interaction of ADL help and Wage
Other income	Household income other than that earned by the younger family member (\$US 2012) (55.941, 53.042)
Age	Individual's years of age (42.927, 13.458)
Age squared	Individual's years of age squared
School years	Years of schooling (11.291, 4.857)
Female	Dummy variable = 1 if individual is female
Married	Dummy variable = 1 if individual is married (0.462, 0.499)
Minor children	Number of children in the household less than 18 years of age (0.746, 1.199)
Poor physical health	Dummy variable = 1 if individual rates her/his physical health as excellent or very good (0.179, 0.384)
Poor mental health	Dummy variable = 1 if individual rates her/his mental health as excellent or very good (0.089, 0.285)
White	Dummy variable = 1 if individual is White (reference category) (0.674, 0.469)
Asian	Dummy variable = 1 if individual is Asian (reference category is "white") (0.104, 0.305)
Black	Dummy variable = 1 if individual is Black (reference category is "white") (0.191, 0.393)
Other race	Dummy variable = 1 if individual is not Asian, Black, or White (reference category is "white") (0.031, 0.172)
Hispanic	Dummy variable = 1 if individual is Hispanic (reference category is "not Hispanic") (0.270, 0.444)
Northeast	Dummy variable = 1 if individual lives in the Northeast (reference region is the South) (0.166, 0.372)
Midwest	Dummy variable = 1 if individual lives in the Midwest (reference region is the South) (0.158, 0.365)
West	Dummy variable = 1 if individual lives in the West (reference region is the South) (0.303, 0.459)
South	Dummy variable = 1 if individual lives in the South (0.374, 0.484)
Year1–Year22	Dummy variables indicating year (1996–2018)

Means and standard deviations of 18,201 observations in study sample are reported in parentheses

These hypotheses are tested in our empirical analyses. First, however, we describe the data used for the study in the following section.

Data

We used observations drawn from 23 years of the medical expenditure panel survey (MEPS) for the empirical analyses (Agency for Healthcare Research and Quality, 1996–2018). For the research reported in this paper, we focused only on individuals co-residing with older family members. Drawing observations from the 1996 through 2018 MEPS data, we obtained a pooled study sample including 30,677 unweighted observations of working age respondents (17,959 women and 12,718 men). Of this preliminary sample, which included both employed and unemployed respondents living in households with at least two family members, 10,185 working women and 8016 working men reported co-residing with older (age 65 or older) family members. Of these, 1513 working women and 1363 working men reported co-residing with older family members

needing assistance with activities of daily living (ADL). In our analyses, we compared the labor supply outcomes of the respondents co-residing with older family members who require ADL assistance with those of working age respondents co-residing with older family members not requiring ADL assistance.

Independent and Dependent Variables

Variables used in the statistical analyses are defined in Table 1. All monetary figures were converted to 2012 dollars. The dependent variables for the analyses represented labor supply decisions of the younger family members. The first measure was usual working hours per week (Hours worked). The second labor supply measure was full-time employment (Full time): This variable was dichotomous with a value = 1 if the person worked for more than 35 hours per week and a value = 0 otherwise.

Ideally, we might have examined the effect on hours of work in a sample of self-employed younger family members who can determine their own hours of work. However, the hourly wage for self-employed respondents is frequently

missing in the MEPS data. Instead, we considered an alternative measure of flexibility in hours worked: We calculated the population variance in the usual number of working hours for the occupation in which the younger family member was employed (Hours variance). As the MEPS provides nationally representative data, we calculated the variance in the usual number of working hours for each of eight broad occupational categories (management; professional; service; sales; administrative support; farming, fishing, and maintenance; and production, transportation, and material moving) using all MEPS respondents. Average hours worked per week in these occupational groups ranged from 34.13 (sales) to 42.13 (management). The variance in hours worked per week ranged from 165.4 (professional) to 520.6 (farming, fishing, and forestry). Relatively low values of the variance in usual hours were observed for positions in management (175.2), professional (165.4), and administrative support (178.5), while higher variances in usual hours worked per week were observed for jobs in service (293.0), sales (271.2), production, transportation, and material moving (264.3), and farming, fishing, and forestry (520.6). While more narrowly defined occupational groups might better represent the variance in usual hours worked per week for various jobs, we were limited to those categories reported in the MEPS data.¹

To describe the functionality of older family members, we used a dummy variable indicating whether the older person required help or supervision with activities of daily living (ADL help), such as bathing, dressing, or getting around the house.² We also used control variables representing relevant social, demographic, and economic information of the younger family member. These included age, sex, marital status, race, ethnicity, years of education, presence of minor children in the home, regional residence, and other family income. In addition, we controlled for the self-assessed physical and mental health status of the younger family member by including dummy variables indicating whether the family member of the ill person rated his or her own physical or mental health as fair or poor. Because the data is pooled from 23 years of MEPS data, we included a set of year dummy variables to capture year-specific effects in the labor market measures. Finally, for identification in

the selection model of the employment decision, we used regional unemployment rates.

To allow comparison of the study sample to a more general sample, in Table 2 we provide averages for older family members in our study sample and for the entire MEPS survey sample of older respondents. Averages are reported for each group by whether they reported needing ADL assistance. Thirteen percent of the 15,213 co-residing older family members in our study sample reported needing help with ADLs. Among the older family members in our study sample, those needing ADL assistance differed significantly from those not requiring help. For example, older family members requiring ADL help were older, more likely to be a woman, less likely to be married, had fewer years of education, and were far less likely to be working. Older family members needing ADL help also had poorer physical and mental health than their counterparts. Regarding race and ethnicity, older family members needing ADL help were more likely to be Black or Hispanic and less likely to be White or Asian.

In comparison to the above information describing older family members in our study sample, 11.3% of the entire group of older MEPS respondents reported needing help with ADLs. Except for the percentage of older persons who reported being Asian, the relative values of those needing ADL help to those not needing ADL help follow a similar pattern.

However, there were differences between the averages for the study sample and those for the MEPS survey sample. These differences permit us to understand how the older family members in our study sample differ from the general population of older persons. The percentage of older women who reported needing ADL help in our study sample was similar to the general MEPS population. The racial and ethnic composition of the two samples differed in that the older family members needing ADL help in the study sample were more likely to be Black, Asian, and Hispanic, while there was a larger percentage of individuals who reported being White in the MEPS survey. The older family members needing ADL help in the study sample reported poorer mental health than those in the MEPS survey sample, although the difference in average physical health between the two groups was not statistically significant. The older family members needing ADL help in the study sample were less likely to be married than older persons in the MEPS survey sample and they also had fewer years of education. The percentage who worked was very low in both samples.

Older persons in our study sample who did not need ADL help were slightly younger on average than the sample of older MEPS respondents. They were more likely to be male, married, and employed, and had fewer years of education. Like their counterparts needing ADL help in the study sample, the older family members who did not require ADL

¹ For occupation coding, MEPS groups the 2010 4-digit Census occupation codes into 11 categories. We excluded jobs in military occupations and unclassified occupations, as well as “not in labor force”, leaving eight broad categories.

² An alternative measure of activities of daily living, the number of activities for which the older family member required assistance, was not available. We also considered including the number of older family members requiring ADL assistance in a household, but found that there were very few households with more than one older family member needing ADL assistance.

Table 2 Average characteristics of older family members with and without need for help with activities of daily living

	Study sample ^a		Survey sample ^b	
	Needing ADL help ^c	Not needing ADL help ^d	Needing ADL help	Not needing ADL help
Age	78.023	71.912	78.487	73.681
Female	0.682	0.525	0.669	0.564
Married	0.283	0.563	0.340	0.537
Poor physical health	0.809	0.368	0.799	0.345
Poor mental health	0.628	0.173	0.580	0.172
School years	8.147	9.665	9.078	10.812
Employed	0.027	0.261	0.024	0.201
White	0.643	0.692	0.726	0.788
Black	0.244	0.186	0.209	0.146
Asian	0.085	0.101	0.045	0.048
Other race	0.028	0.020	0.020	0.018
Hispanic	0.262	0.234	0.170	0.126
N	1985	13,228	9940	78,185

Based on unweighted observations of persons ages 65 and older of the Medical Expenditures Panel Survey, 1996–2018

^aAll differences between those who need ADL help and those who do not are statistically significant for $\alpha=0.05$

^bAll differences between those who need ADL help and those who do not are statistically significant for $\alpha=0.05$ except for Asian

^cAll differences between those in the study sample and the survey sample who need ADL help are statistically significant for $\alpha=0.05$ except Female, Employed, and Poor physical health

^dAll differences between those in the study sample and the survey sample who do not need ADL help are statistically significant for $\alpha=0.05$ except Poor mental health

assistance were more likely to report being Black, Asian, and Hispanic.

Table 3 provides unweighted averages of the characteristics for the younger working women and men in the study sample. The first two columns report the averages for younger family members who co-resided with an older family member needing ADL help. The third and fourth columns report averages for younger family members who lived with an older family member not requiring ADL help. While the pattern of averages describing labor force outcomes in Table 3 is typical for men and women, our purpose was to ascertain whether there were differences in the characteristics of women or men associated with the presence of older family members needing ADL assistance. For this reason, we compared the averages for women (men) who co-resided with an older family member needing ADL help with those for women (men) who co-resided with an older family member not needing ADL help.

Younger women who lived with an older family member needing ADL help were less likely to be White and more likely to be Black or Other race than younger women who lived with older family members who did not need help. They were also less likely to be married and reported being in poorer physical and mental health than their

female counterparts who lived with older family members not needing assistance. Younger women who lived with older family members needing ADL help had lower hourly wage rates and were less likely to work full-time, but the difference in average hours worked per week was small (0.639 h). However, the variance in usual hours for jobs held by younger women who lived with older family members needing ADL help was significantly greater than that of younger women who lived with healthy older family members.

The significant differences between men in the two groups were fewer: Younger men who lived with older family members needing ADL help were less likely to be White and more likely to be Black than those who lived with older family members not needing help. They were more likely to be married, reported poorer physical health, and were on average 15 months older than men who lived with older family members not needing ADL assistance.

MEPS was a useful data source for this study: The MEPS data contained information that allowed us to identify and describe older family members co-residing with younger family members; the MEPS data allowed us to include a measure of an older family member's need for assistance with activities of daily living; and the MEPS data provided

Table 3 Average characteristics of working age family members

	Older family member needs ADL help		Older family member does not need ADL help	
	Women	Men	Women	Men
Hours worked	35.550 ^{a,b}	39.282	36.189 ^a	38.940
Full time	0.639 ^{a,b}	0.802	0.691 ^a	0.795
Hours variance	144.311 ^{a,b}	137.884	135.136	136.671
Age	44.088 ^{a,b}	41.335 ^b	45.152 ^a	40.089
School years	11.180 ^b	11.231	11.487 ^a	11.072
Wage	16.244 ^{a,b}	18.204	17.383 ^a	18.747
Other income	56.041	59.009	59.469	58.695
White	0.618 ^b	0.637 ^b	0.676 ^a	0.693
Black	0.237 ^b	0.236 ^b	0.194 ^a	0.169
Asian	0.109	0.090	0.103	0.106
Other race	0.036 ^b	0.037	0.027 ^a	0.033
Hispanic	0.269 ^a	0.289	0.252 ^a	0.289
Married	0.449 ^{a,b}	0.488 ^b	0.519 ^a	0.386
Minor children	0.798	0.720	0.739	0.748
Poor physical health	0.247 ^{a,b}	0.196 ^b	0.183 ^a	0.155
Poor mental health	0.108 ^b	0.100	0.086	0.087
Northeast	0.146	0.152	0.173	0.164
Midwest	0.161	0.150	0.159	0.157
West	0.302	0.326	0.292	0.312
N	1513	1363	8672	6653

Based on unweighted observations of persons ages 18 through 64 living in families of at least two persons, Medical Expenditures Panel Survey, 1996–2018

^aDifference between women and men (within ADL help group) is statistically significant for $\alpha=0.05$

^bDifference in average for women between “needs ADL help” and “does not need ADL help” is statistically significant for $\alpha=0.05$. Similarly defined for difference in averages for men

measures of labor supply as well as sociodemographic variables.³

³ A drawback of the MEPS survey data was that it was not possible to link older persons to younger family members if they were not co-residing. However, it may be useful for readers to note how our study sample differed from the sample of MEPS respondents who were not co-residing with an older family member: Younger respondents in our study sample (who co-resided with an older family member) were more likely to be Asian and less likely to be married or have minor children in the household than other young MEPS respondents. They were six years older on average, reported six months less schooling, and reported poorer physical health status on average. They were less likely to work in a professional occupation and were more likely to work in a service occupation or in administrative support. Notably, other family income for younger family members in our study sample was significantly greater (\$55,191) than that for young respondents not co-residing with an older family member (\$46,517).

Empirical Model

This section describes the empirical models used in the analyses. We estimated the effects of co-residing with an older family member needing assistance with activities of daily living on three types of labor market outcomes: working hours per week, full-time employment, and variance in usual working hours in the respondent’s primary job. The ordinary least squares regression analyses of hours worked for an individual i may be represented by the following equation:

$$\text{Hours worked}_i = \alpha + X_i\gamma + \beta \text{ ADL help}_i + \ell \text{ year}_i + \varepsilon_i \quad (6)$$

In Eq. (6), the vector X represents a vector of sociodemographic and economic control variables, which include the hourly wage rate, other family income, age and age squared, years of education, marital status, the presence of minor children in the household, indicators of poor physical health and poor mental health, and race, ethnicity, and region indicators. The variable ADL help is a dummy variable indicating if the older family member needed assistance with activities of daily living. The variable year represents a vector of dummy variables indicating the year from which the data was drawn.

The specifications used for the ordinary least square regressions of the variance in usual weekly working hours were identical to Eq. (6), although the dependent variable was logged to normalize the distribution. Similarly, the specifications used for the analyses of the probability of full-time employment were identical to that in Eq. (6) although the analyses conducted were probit regressions. We report the marginal effects from these analyses in our results tables. Also, for comparison purposes, we report estimates for each outcome measure from a baseline model in which the ADL help variable was omitted.

As explained in the description of the theoretical model, the effect of living with an older family member who needed ADL help was ambiguous because a younger family member may have responded by either reducing labor supply to engage in caretaking or increasing labor supply to afford purchases of market goods and services for the older family member. For the purpose of establishing a testable hypothesis, we assumed in hypotheses H1 that the caretaking effect dominates. This implies that $\beta < 0$ for our analyses of working hours and full-time employment. Finding $\beta \geq 0$ implies that the hypothesis was rejected: That is, the presence of an older family member requiring ADL assistance did not decrease hours worked per week or the probability of full-time work.

In our analyses of work schedule flexibility, hypothesis H2 implies that the presence of an older family member needing ADL assistance caused younger family members to seek jobs in which they had greater work schedule flexibility.

This flexibility was represented by the logged standard deviation of usual occupational work hours. Thus, we expected the effect of ADL help on work schedule flexibility to be positive: $\beta > 0$.

To assess whether the hypothesized effect of co-residing with an older family member who required ADL help diminished as the younger family member's wage rate increased, we estimated a specification of our model in which we interacted the hourly wage rate with the ADL help variable:

$$\text{Hours worked}_i = \alpha + X_i\gamma + \beta \text{ ADL help}_i + \gamma \text{ year}_i + \delta (\text{Wage}_i \cdot \text{ADL help}_i) + \varepsilon_i \quad (7)$$

We hypothesized in H3 that a higher wage rate would increase the use of market substitutes for own time in providing assistance, other things equal. This implied that the coefficient of the interaction variable would be negative for both women and men: $\delta > 0$.

While our multivariate analyses controlled for several sociodemographic factors, they did not control for social norms or other factors that may have influenced younger family members' responses to living with an older family member needing ADL assistance. Given social norms that may have influenced work and caregiving roles of women and men, for hypothesis H4 we assumed that $|\beta^{\text{WOMEN}}| < |\beta^{\text{MEN}}|$. That is, we expected to observe larger impacts among younger women than among younger men, even when controlling for the wage rate effects.

The issue of self-selection into the labor force may be relevant in this research because it is possible that self-selection into the labor force exists for both women and men. Following Puhani (2000), we assessed the appropriateness of using a correction method for selection bias by first checking for collinearity problems. Puhani (2000) notes that "in the absence of collinearity problems, the full-information maximum likelihood estimator is the preferable to the limited-information two-step method of Heckman (1974), although the latter also gives reasonable results. If, however, collinearity problems prevail, subsample OLS (or the Two-Part Model) is the most robust amongst the simple-to-calculate estimators" (p. 53). We report the results of these tests in the results section.

Finally, we focused on the effects of older family members who resided with the younger family members without reference to the possible endogeneity between the younger family member's co-residence and labor supply. The direction of potential bias due to endogenous co-residence is unknown: While older persons with health problems may have been more likely to reside with working age family members, it is also possible that healthy older persons who co-resided may have assisted with childcare or simply provided housing for the younger family members (Fuller-Thomson & Minkler, 2001; Kanji, 2018; Matsudaira, 2016).

In either case, it may have been that the working age family members in households with an older family member in residence differed in observable and unobservable ways from working age family members living in families without an ill older member. To avoid potential endogeneity in the research reported here, we limited our study sample to working younger family members who co-resided with older family members.

Results

The comparisons of means reported in Table 3 indicate significant differences in several characteristics between younger family members living with older persons requiring ADL assistance and those living with older family members not requiring assistance. To assess the impact of these differences on labor supply outcomes, we report our estimates of the effects of ADL help from multivariate analyses in Tables 4, 5, and 6. Because prior studies have shown that the labor supply behavior of men differed importantly from that of women, in our analyses we followed the usual practice in labor economics of separately analyzing labor outcomes for women and men (Bargain & Peichl, 2016; Killingsworth & Heckman, 1986; Pencavel, 1986). In this section we describe our estimates and discuss the implications for the hypotheses described above.

To determine whether to report estimates for regressions and probit analyses with corrections for selection into the labor force, we first conducted the tests suggested by Puhani (2000) to assess the presence of collinearity problems. The test statistics for our application indicated the presence of significant collinearity. For this reason, we report estimates for the sample of working younger family members without controlling for selection bias. However, we also estimated the models using a Heckman correction for self-selection and found that the estimates were similar in sign with only slight differences in the magnitude of some estimates. We also estimated a two-part model (Duan et al., 1983) and found that the estimates were almost identical to those reported in this paper.⁴

We report estimates from ordinary least squares regressions of working hours and the logged variance in working hours in Tables 4 and 6 and estimates from probit regressions of full-time employment in Table 5. All variables included in the regressions are defined in Table 1, with the exception that the value of the variable other income has been divided by one million to scale the estimates in Tables 4, 5, 6. In all analyses, we included dummy variables

⁴ Both the selection bias corrected estimates and the two-part model estimates are available from the authors on request.

Table 4 Effects of older family member's need for ADL help on younger family member's hours worked

	Women			Men		
	Coefficient estimates			Coefficient estimates		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Wage	0.176***	0.176***	0.178***	0.095***	0.095***	0.106***
ADL help		− 0.779*	− 0.544		0.070	1.366*
ADL help * Wage			− 0.014			− 0.071*
Other income ^a	− 4.690*	− 4.700*	− 4.680*	− 1.240	− 1.250	− 1.130
Age	0.984***	0.991***	0.992***	0.864***	0.864***	0.863***
Age squared	− 0.011***	− 0.011***	− 0.011***	− 0.010***	− 0.010***	− 0.010***
School years	0.043	0.042	0.042	− 0.044	− 0.044	− 0.043
Married	0.014	− 0.008	− 0.008	3.043***	3.037***	3.041***
Minor children	− 0.097	− 0.100	− 0.101	0.243*	0.244*	0.240*
Poor physical health	− 0.590 [†]	− 0.557 [†]	− 0.561 [†]	− 0.989**	− 0.991**	− 0.996**
Poor mental health	− 1.337**	− 1.331*	− 1.329**	− 1.709**	− 1.709**	− 1.698**
Asian	0.605 [‡]	0.632 [†]	0.633 [†]	− 1.304**	− 1.303**	− 1.331**
Black	0.329	0.359	0.363	− 1.501***	− 1.508***	− 1.521***
Other race	0.564	0.611	0.616	0.008	0.005	− 0.006
Hispanic	0.611*	0.625*	0.626*	− 0.620*	− 0.621*	− 0.613*
Midwest	− 0.893**	− 0.886*	− 0.886**	− 0.377	− 0.378	− 0.385
Northeast	− 1.231***	− 1.248***	− 1.248***	− 1.138**	− 1.137**	− 1.124**
West	− 1.006***	− 1.005***	− 1.004***	− 0.822**	− 0.823**	− 0.826*
Constant	12.227***	12.232***	12.182***	20.660***	20.650***	20.437***
N	10,185	10,185	10,185	8016	8016	8016
R ²	0.0870	0.0877	0.0877	0.1098	0.1098	0.1109
prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

OLS regressions for sample of working age family members drawn from the Medical Expenditures Panel Survey, 1996–2018. Year dummy variables included. Standard errors clustered by household

^aOTHINC is divided by 1 million to scale the coefficient estimates

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; [†] $p \leq 0.10$; [‡] $p \leq 0.15$

representing the year of the survey response. Because there were multiple observations of individual respondents as well as of respondents in the same household, standard errors of the coefficient estimates were clustered by household. To provide the reader with information describing the statistical significance of estimates that may be close to conventional levels of significance, in Tables 4 through 7 we indicate the significance of coefficient estimates that were 'weakly significant' ($0.05 < p \leq 0.10$) and 'nearly significant' ($0.10 < p \leq 0.15$).

For each of the analyses reported, the low probability of exceeding the critical value of the F statistic or the Wald X^2 indicated that our empirical models of labor supply were statistically significant. The first column of estimates in each of Tables 4 through 6 reports the estimates from the baseline analysis that excluded the ADL help variable. These are provided solely to allow comparisons with the other analyses, but we note that the estimated effects of the variables included in Model 1 were stable across all three models. That is, the inclusion of the variables representing the presence of an older family member needing ADL help

and the interaction of the ADL help variable with the wage rate had little impact on the estimated effects of the control variables. We therefore focus our discussion of findings on the estimates from Models 2 and 3 which included the ADL help variables.

We begin in Table 4 by reporting the estimated effects of living with an older family member needing ADL assistance on the usual working hours of employed younger family members. The coefficient estimate for Model 2 in the second column of Table 4 indicates that the effect of providing ADL help was negative and significant for women. This means that women decreased their working hours in response to living with an older family member needing ADL assistance, other things equal. However, the insignificant estimate for Model 2 in the fifth column suggests that there was no impact on men's working hours.

The marginal effects on full-time employment for Model 2 in the second and fifth columns of Table 5 yield a similar picture: The effect for women was negative and statistically significant. This indicates that residing with an older family member requiring ADL assistance reduced women's

Table 5 Effects of older family member's need for ADL help on younger family member's full time status

	Women			Men		
	Marginal effects			Marginal effects		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Wage	0.007***	0.007***	0.007***	0.003***	0.003***	0.004***
ADL help		− 0.050***	− 0.048 [†]		− 0.004	0.043*
ADL help * Wage			− 0.0001			− 0.003**
Other income ^a	− 0.151 [†]	− 0.141 [‡]	− 0.141 [†]	0.003	0.003	0.004
Age	0.037***	0.037***	0.037***	0.030***	0.030***	0.030***
Age squared	− 0.0004***	− 0.0004***	− 0.0004***	− 0.0003***	− 0.0003***	− 0.0003***
School years	0.002 [‡]	0.002 [‡]	0.002 [‡]	− 0.002 [†]	− 0.002 [‡]	− 0.002 [†]
Married	− 0.012	− 0.013	− 0.013	0.097***	0.097***	0.098***
Minor children	− 0.008*	− 0.008*	− 0.008*	0.006 [†]	0.006 [‡]	0.006 [‡]
Poor physical health	− 0.029*	− 0.026*	− 0.026*	− 0.025*	− 0.025*	− 0.025*
Poor mental health	− 0.036*	− 0.036*	− 0.036*	− 0.071***	− 0.071***	− 0.071***
Asian	0.037*	0.037*	0.039*	− 0.019	− 0.019	− 0.020 [‡]
Black	0.027*	0.028*	0.028*	− 0.016 [‡]	− 0.016 [‡]	− 0.016 [‡]
Other race	0.020	0.022	0.022	0.015	0.015	0.014
Hispanic	0.031**	0.032**	0.032**	0.007	0.007	0.007
Midwest	− 0.033**	− 0.032**	− 0.032**	− 0.011	− 0.011	− 0.011
Northeast	− 0.023 [†]	− 0.024 [†]	− 0.024 [†]	− 0.022 [†]	− 0.022 [†]	− 0.022 [†]
West	− 0.038***	− 0.038***	− 0.038***	− 0.014	− 0.014	− 0.014
N	10,185	10,185	10,185	8016	8016	8016
Pseudo R ²	0.0801	0.0818	0.0818	0.1171	0.1172	0.1188
prob > χ^2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Probit regressions for sample of working age family members drawn from the Medical Expenditures Panel Survey, 1996–2018. Year dummy variables included. Standard errors clustered by household

^aOTHINC is divided by 1 million to scale the coefficient estimates

*p < 0.05; **p < 0.01; ***p < 0.001; [†]p ≤ 0.10; [‡]p ≤ 0.15

full-time employment by 5.0%, other things equal. Given the average full-time employment rate of 69% for the sub-sample of co-residing younger women whose older family member did not require ADL assistance, this effect implied a 7.2% decrease in full-time employment. In contrast, for men the estimated marginal effect for Model 2 was statistically insignificant. The findings reported for Model 2 in Tables 4 and 5 support our hypothesis H1 for women: Co-residing with an older family member requiring ADL help negatively impacted labor market outcomes, even when the woman's wage rate was controlled for in the analysis. The findings also support hypothesis H4: Women's labor market outcomes were more strongly affected than men's. Not surprisingly, this means that factors such as social norms played a significant role in determining women's labor supply response to living with an older family member needing ADL assistance.⁵

The third and sixth columns of Tables 4 and 5 report the estimated effects from our analyses of Model 3. Model 3

included a variable representing the direct effect of living with an older family member needing ADL assistance as well as a variable representing the interaction of ADL help with the wage rate. The estimated direct effect on women's working hours of living with an older family member needing ADL help was insignificant, but we found a weakly significant negative effect on the probability of women working full-time. For men the estimated direct effects on working hours and the probability of working full-time were both positive and statistically significant.

⁵ As social norms have changed over time, the roles of younger women and men in the family and the workplace may have evolved over the 23 years considered in this study. While it is beyond the scope of this study to investigate these changes in depth, a cursory investigation using our study sample suggested that the negative impact on younger women's labor supply was indeed somewhat reduced over time, although women living with older family members needing ADL help continued to experience significant negative effects on labor supply. In contrast, we found no change in the effect on men's labor supply. A table of estimated effects is available from the authors.

Table 6 Effects of older family member's need for ADL help on logged variance of average hours worked for younger family member's occupation

	Women			Men		
	Coefficient estimates			Coefficient estimates		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Wage	− 0.005***	− 0.005***	− 0.004***	− 0.003***	− 0.003***	− 0.003***
ADL help		0.041***	0.055***		0.001	− 0.018
ADL help * Wage			− 0.001			0.001*
Other income ^a	− 0.171**	− 0.170**	− 0.168**	− 0.050	− 0.050	− 0.052
Age	− 0.007***	− 0.007***	− 0.007***	− 0.008***	− 0.008***	− 0.008***
Age squared	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***
School years	− 0.010***	− 0.010***	− 0.010***	− 0.003***	− 0.003***	− 0.004***
Married	0.002	0.003	0.003	− 0.025***	− 0.025***	− 0.025***
Minor children	0.014***	0.014***	0.014***	0.001	0.001	0.001
Poor physical health	0.029***	0.027***	0.027***	0.002	0.002	0.002
Poor mental health	0.036***	0.036***	0.036***	0.029*	0.029*	0.029*
Asian	0.061***	0.060***	0.060***	0.021*	0.021*	0.021*
Black	0.045***	0.043***	0.044***	0.040***	0.040***	0.040***
Other race	0.004	0.001	0.001	0.017	0.017	0.017
Hispanic	0.033***	0.032***	0.032***	0.010	0.010	0.010
Midwest	0.007	0.006	0.006	0.031***	0.031***	0.032***
Northeast	0.015*	0.016*	0.016*	0.017*	0.017*	0.017*
West	0.003	0.003	0.003	0.029***	0.029***	0.029***
Constant	4.923***	4.923***	4.920***	4.886***	4.885***	4.889***
N	10,185	10,185	10,185	8016	8016	8016
Pseudo R ²	0.2191	0.2215	0.2217	0.2092	0.2092	0.2095
prob > χ^2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

OLS regressions for sample of working age family members drawn from the Medical Expenditures Panel Survey, 1996–2018. Year dummy variables included. Standard errors clustered by household. Dependent variable is logged for regression analysis

^aOTHINC is divided by 1 million to scale the coefficient estimates

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; † $p < 0.10$; ‡ $p < 0.15$

The interaction variable was included to test the hypothesis (H3) that the direct effect of living with an older family member needing ADL assistance diminished as the individual's wage rate increased. For both working hours (Table 4) and the probability of working full-time (Table 5), the estimated effect of the interaction variable was statistically insignificant for women. Its inclusion caused the estimate of the direct effect of the ADL help variable to lose significance. However, for men the inclusion in the specification of the interaction variable caused the estimates of the direct effect to become positive and statistically significant, suggesting that men responded to living with an older family member needing ADL help by increasing both work hours and the probability of full-time employment. The coefficient estimate of the interaction variable for men was negative and statistically significant. The negative coefficient estimates for men of the interaction variable for men indicates that the results are consistent with our hypothesis H3: The impact of co-residing with an older family member needing ADL assistance decreased with higher wage rates, other things

equal. However, the interpretation differs from our expectation that a negative interaction would imply that a negative direct effect is decreased. Instead, we observed that the negative interaction effect decreased a positive direct effect among men.

The pattern of estimated effects indicates that among men the net effect of living with an older family member needing ADL help on working hours depended on the man's wage rate: The estimated effect was positive for wage rates less than \$19.24 but decreasing as the wage rate increased until the effect became negative for wage rates greater than \$19.24.⁶ Converting this value to its \$US 2022 value, the breakeven wage rate was \$24.33.

As reported in Table 5, the estimated marginal effect of the interaction variable for women in Model 3 was zero and its inclusion had no effect on the estimated marginal effect

⁶ This estimate was obtained by treating the ADL help variable as continuous.

Table 7 Effects of older family member's need for ADL help—interactions with marital status

	Women Coefficient estimate	Men Coefficient estimate
Hours worked		
ADL help	− 0.431	0.385
Married	0.115	3.155***
ADL help * Married	− 0.762	− 0.670
R ²	0.0878	0.1100
Prob > F	0.0000	0.0000
	Women Marginal effect	Men Marginal effect
ADL help	− 0.041**	0.014
Married	− 0.010	0.108***
ADL help * Married	− 0.020	− 0.052*
Pseudo R ²	0.0818	0.1180
Prob > chi ²	0.0000	0.0000
	Women Coefficient estimate	Men Coefficient estimate
Hours variance		
ADL help	0.035**	− 0.018 [†]
Married	0.001	− 0.032***
ADL help * Married	0.014	0.041**
R ²	0.2216	0.2099
Prob > F	0.0000	0.0000
N	10,185	8016

Sample of working age family members drawn from the Medical Expenditures Panel Survey, 1996–2018. Year dummy variables included. Standard errors

clustered by household. Wage interaction excluded

* $p < .05$; ** $p < .01$; *** $p < .001$; [†] $p \leq .10$; [‡] $p \leq .15$; [§] $p \leq .10$

of the ADL help variable. However, the estimated marginal effect of the interaction variable for men in Model 3 was negative and statistically significant. Although its value was very small, its inclusion caused the point estimate of the marginal effect of the ADL help variable to become positive and statistically significant, suggesting that men responded to living with an older family member needing ADL help by increasing the probability of working full-time. Similar to the net effect on hours worked by men, the net effect of living with an older family member needing ADL help on men's probability of working full-time depended upon the wage rate: The net effect of living with an older family member needing ADL help on men's probability of working full-time was positive for men working at lower wage rates but decreased as the wage rate increased until the effect became negative for wage rates greater than \$14.33. Converting this value to \$US 2022 value, the breakeven wage rate was \$18.04. Thus, we found a nonlinear impact: At lower wage rates men had a higher probability of working full-time, but this effect declined as the wage rate increased. A possible explanation for the effects on both hours worked and the probability of full-time employment is that men earning

lower wage rates worked greater hours in response to the reduced earnings of their female spouses who decreased labor supply when living with an older family member needing ADL help.

Table 6 reports the estimated effects of living with an older family member needing ADL assistance on the (logged) variance in usual hours of work per week for the occupational category of the younger family member's job. In shown in the estimates for Model 2 reported in the second column, we found that women living with an older family member needing ADL help had jobs in occupational categories with greater variance in usual working hours. Consistent with hypothesis H2, this suggests that these women were employed in occupations with more flexibility in working hours. In comparison, the Model 2 estimate for men in the fifth column was statistically insignificant, suggesting that there was no effect on flexibility of men's work hours.

The estimates in the third and sixth columns of Table 6 refer to the Model 3 specification that included an interaction term. Among women, including the interaction term increased the magnitude of the positive direct effect of living with an older family member needing ADL help on the

variance in work hours, although the interaction effect was itself not statistically significant. This implies that the net effect of co-residing with an older family member needing ADL help was positive for women. For men, inclusion of the interaction term caused the estimate of the direct effect of ADL help to become negative, although it remained statistically insignificant. The estimated effect of the interaction term was positive and statistically significant, although very small. If we ignore the lack of statistical significance and consider the values of the point estimates, the negative net effect of ADL help among men suggests that living with an older family member requiring ADL help decreased the variance in hours worked for men, but only minimally. While this is consistent with the effects reported in Tables 4 and 5, the lack of statistical significance for the estimate of the direct effect in Model 3 weakens this conjecture.

To assess the sensitivity of the reported estimates to the specification of the model, we considered several further specifications: We estimated models including additional variables representing interactions of the ADL help variable with the race (Asian, Black, Other race) and Hispanic variables and with the presence of minor children in the home. The estimated effects of these interaction variables were statistically insignificant and their inclusion had no impact on our target estimates. The only significant interaction was that between the ADL help and Married variables. The estimates from this model, which we report in Table 7, indicate that among men the direct effect of being married increased working hours and the probability of working full-time. This is consistent with long-standing empirical results (Knowles, 2013; Pencavel, 1986). The interaction effect of living with an older family member needing ADL help reduced the probability of working full-time for married men, but the net effect of being married was positive. Similarly, married men worked in occupations with less variance in usual work hours, but the effect of living with an older family member needing ADL assistance counteracted this effect of marriage. In this case, the net effect of being married was slightly positive.⁷

⁷ Separate analyses of married and unmarried men confirmed that married men living with older family members needing ADL help were significantly less likely to work full-time. They also worked in jobs with greater flexibility in usual hours worked, while unmarried men worked in jobs with less flexibility in usual hours worked. However, the effects on flexibility of usual hours worked were only weakly significant.

Discussion and Conclusion

In this paper we report the estimated effects on the labor supply of younger individuals of co-residing with an older family member. Our analyses estimated how living with an older family member needing help with activities of daily living (ADL) impacted the working hours, full-time employment, and flexibility of work hours of the younger workers. For our multivariate analyses we used a study sample of 10,185 working women and 8016 working men who reported living with older family members. The data were drawn from 23 years of the medical expenditure panel survey (MEPS).

We report several findings that contribute to the literature: First, consistent with our hypotheses, we found that living with an older family member needing ADL assistance had a significant negative impact on the labor supply of younger women: Younger women worked fewer hours per week and were less likely to work full-time, other things equal. These findings are consistent with prior findings in the literature documenting the indirect effects of family illness. Observing these effects for women in our study sample confirms this phenomenon, which is generally attributed to caregiving. For example, Gould (2004) found that mothers worked fewer hours in the labor market when a child had an illness requiring time-intensive caregiving. Similarly, Siegel (2006) reported that a husband's ill health led an employed wife to reduce hours of work.

Second, in contrast to the findings for women, we found that men living with an older family member needing ADL help increased work hours and were more likely to work full-time, other things equal. These findings reinforce prior research such as Roberts (1999) and Coile (2004), which reported that family illness increased men's labor supply. However, observing this effect among men living with older family members needing ADL assistance represents a significant contribution to this literature.

Third, in addition to the effects on work hours and full-time employment, we found that younger women living with older family members needing ADL help worked in occupations with more flexible working hours, other things equal. Thus, it appears that younger women adjusted to the time burden of living with an older family member needing assistance both by reducing labor supply and by working in occupations that permit more flexible work schedules. This effect has been observed among women with greater family demands due to the presence of children, so it is not surprising. For example, Boden (1999) and Lombard (2001) reported that greater family demands led women to choose self-employment, offering greater flexibility in work hours. However, we believe this is the first time that it has been examined using this measure of flexibility and in the context of elder care. In contrast to our finding for women, we

found little impact of living with an older family member needing ADL assistance on the flexibility of men's work hours. While there are no prior studies for direct comparison, this finding is consistent with prior studies that reported men were more likely to be employed in occupations with relatively inflexible work schedules (Golden, 2008; Goldin, 2014). Both studies concluded that women seeking greater work schedule flexibility to manage childcare responsibilities were more likely to work in occupations in which the work schedule, both total hours and specified hours, was more flexible than the occupations in which men worked. While these studies did not address the effects of family illness, the findings are consistent with our finding that women were more likely than men to work in occupations with greater flexibility in work hours in response to living with an older family member needing ADL assistance.

Fourth, we found support for another hypothesis we posited which suggested that the effect of living with an older family member needing ADL help would decrease at higher wage rates: We observed that the magnitude of the labor supply effects for men decreased at higher wages. Thus, the positive effect on work hours observed among men living with an older family member needing assistance was lessened among higher wage male workers. It may be that in families with lower earnings, financial needs dictated that income lost due to the wife reducing work hours was compensated for by the husband's increased hours. If the families of higher wage men had lesser financial constraints, there may have been less need for these men to increase their work hours. In comparison to our finding for men, while a women's wage rate was a significant determinant of her labor supply, we did not observe a reduction in the negative labor supply effects of living with an older family member needing ADL help among higher wage women. Thus, the evidence suggests that higher wage women did not use greater hours of work and higher earnings to purchase care for the older family member as a substitute for their own caregiving hours. These findings are consistent with evidence reported in several studies that men increased work hours in response to a family illness (Coile, 2004; Emanuel et al., 2000; Roberts, 1999). However, none of these studies considered the relationship between the response in hours of work and the family member's wage rate.

Finally, it is worthwhile to emphasize that our estimates demonstrate that the younger family member's sex mattered even when the wage rate was controlled for in the analyses: The wage rate had a positive and significant effect on all of our measures of labor supply, but living with an older family member needing ADL help nevertheless had an independent negative impact on women's labor supply and an independent positive effect on men's labor supply. This implies that other factors, such as social norms, play a role that extends beyond earning potential in determining a woman's response

to living with an older family member needing assistance. This is consistent with studies that examine the interaction of economic forces and social norms (Burda et al., 2013; Maxwell & Wozny, 2021). Maxwell and Wozny found that social norms about work and home production explain perhaps 40% of the gender gap in time allocation for work in the labor market and work and household production.

Social norms vary across cultures. Some cultures have much stronger expectations regarding responsibilities toward older family members than others. While we controlled for sociodemographic factors such as age, education, marital status and children, family income, health, race, Hispanicity, and region of residence, it was beyond the scope of this study to examine how cultural differences associated with race and ethnicity may have differentially influenced expectations about men's and women's roles in providing for older family members. With a larger data sample with richer information describing race and ethnicities and specific information describing caregiving activities, a more detailed picture may emerge of these subtle differences.

Social norms also change with time. The roles of younger women and men in the family and the workplace have evolved over the 23 years considered in this study. While it is beyond the scope of this study to investigate these changes in depth, a cursory investigation using our study sample suggested that the negative impact on younger women's labor supply was indeed somewhat reduced over time, although women living with older family members needing ADL help continued to experience significant negative effects on labor supply. In contrast, we found no change in the effect on men's labor supply. This confirms research suggesting that despite women's increased participation in the labor force over the past several decades, they continue to typically spend disproportionately more time on unpaid work in the home than men (Ferrant et al., 2014).

The contributions of this research are strengthened by our use of a large, multi-year, nationally representative data set to examine the effects for both women and men in the family. Observations of the effects on both men and women provide a more accurate picture of the family burden of illness among older family members. However, despite using several years of data for our analyses we were not able to conduct panel data estimation, which would have permitted individual-specific unobserved factors to be controlled for in the analyses. To the extent that there may have been selection into co-residence, controlling for unobserved heterogeneity may have provided more accurate estimates. We were unable to address this selection because MEPS, like many large-scale data sets, did not include information describing younger family members who did not co-reside with the older individual needing assistance in our study sample. Our data also precluded consideration of the severity of the ADL impairment. Because this may be important in determining

the effect on younger family members' labor supplies, it would be useful to address this in future research using an alternative data source.

Our findings have implications for how families handled elder care during the COVID-19 pandemic. In a review of studies focused on family functioning during the pandemic, Andrade et al. (2022) noted that despite some evidence of reallocation of household and childcare tasks in countries affected by the COVID-19 pandemic, gender disparities continued (p.206). With daycare in public spaces closed during the pandemic and families reluctant to bring care workers into the home, younger family members may have been more likely to care for older family members needing assistance themselves. Our findings suggest that younger women, while more likely to be in the labor force and career-oriented in recent decades, were still more likely to provide elder care during the pandemic just as they provided the bulk of child care for children whose schools closed (Igielnik, 2021).

The empirical evidence of the family labor supply costs of living with older family members needing care suggests the importance of policy initiatives to support family members providing elder care. Our findings suggest that more public provision of elder care and public financial support of families providing care would reduce the lost working hours among women and ease the financial stress that appears to push men into working more hours. In the last decade, states have started to shift their Medicaid spending toward greater home care support for older citizens, which might provide more support to families with older family members needing assistance, but the level and type of care varies by state (Abrams, 2021).

Another option for families is the use of family medical leaves to provide relief to workers needing release time to provide care to older family members, but there are restrictions on eligibility for federal FMLA leaves and state leaves. For example, Klerman et al. (2014) reported that approximately 40 percent of American workers did not qualify for FMLA because of the law's other restrictions. These limitations are exacerbated for lower income families by their inability to afford unpaid leaves. Paid leaves, which are relatively less available and generally have replacement rates less than 100 percent, are also not a viable option for these families (Bureau of Labor Statistics, 2022).

Most promising is a movement among employers toward greater flexibility in work schedules. A flexible workplace could provide employed family members providing care for older family members with the time they need to handle both unexpected events and scheduled events such as doctor's appointments. Rather than forcing the caregiver to choose a job with a more flexible schedule, possibly incurring losses in wage rates, earnings, and career growth, employers may allow more flexibility across all positions. Ironically, while the COVID-19 pandemic may have increased the immediate

family burden of elder care, it increased employers' interest in flexible work schedules and working from home. Both of these practices may benefit younger workers living with older family members needing assistance, although it remains to be seen whether it will contribute to equalizing the burden of at home work between women and men.

Overall, the findings reported in the paper provide information that is important for the design of public health and workplace policies that recognize the full impact of elder caregiving and appropriately target resources to alleviate its effects. To the extent that public and private sector policies support younger family members burdened by living with an older family member needing assistance, they benefit not only the younger individuals, but also the older family members who may delay or avoid entry into a nursing home, and employers who may retain full-time valuable employees. Although not cost-free, these policies have the potential to improve the family lives and workplaces of Americans.

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Data Availability This study uses publicly available, anonymous data.

Declarations

Conflict of interest The authors have no competing interests to declare that are relevant to the content of this article.

Research Involving in Human and Animal Participants Screening by the NIU Institutional Review Board indicated that it does not involve human subjects and further review was waived.

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