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RESEARCH BRIEF

# The Opportunity Costs of Informal Elder-Care in the United States: New Estimates from the American Time Use Survey

*Amalavoyal V. Chari, John Engberg, Kristin N. Ray, and Ateev Mehrotra*

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**Objectives.** To provide nationally representative estimates of the opportunity costs of informal elder-care in the United States.

**Data Sources.** Data from the 2011 and 2012 American Time Use Survey.

**Study Design.** Wage is used as the measure of an individual's value of time (opportunity cost), with wages being imputed for nonworking individuals using a selection-corrected regression methodology.

**Principal Findings.** The total opportunity costs of informal elder-care amount to \$522 billion annually, while the costs of replacing this care by unskilled and skilled paid care are \$221 billion and \$642 billion, respectively.

**Conclusions.** Informal caregiving remains a significant phenomenon in the United States with a high opportunity cost, although it remains more economical (in the aggregate) than skilled paid care.

**Key Words.** Informal caregiving, elder-care, opportunity cost

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There is an extensive literature studying the phenomenon of informal caregiving for the elderly. In the United States, informal (unpaid) caregiving by family members and friends remains the primary source of long-term care for the elderly population. Arno, Levine, and Memmott (1999) drew attention to the sheer size of this informal care "sector," estimating that 22–26 billion hours of informal care time were provided in 1997. Recent estimates (National Alliance for Caregiving and AARP 2009) indicate that nearly one in five adults in the United States provides care to an elderly relative or friend older than 50.

While these figures reveal the prevalence and intensity of informal elder-care in the United States, estimates of the costs of this care have been limited by the lack of nationally representative data with detailed information to allow an assessment of the value that caregivers attach to time and time spent providing

care. This paper takes advantage of new and unique data from the American Time Use Survey (ATUS) to remedy this deficit, and to provide careful, up-to-date estimates of the costs of informal elder-care in the United States.

In doing so, we update the estimates of Arno, Levine, and Memmott (1999) and Feinberg et al. (2011), while improving on these previous studies by valuing informal elder-care at opportunity cost. Opportunity cost of time, the economic value of activities forgone as a result of providing care, may be thought of as the price of supplying informal care and, as such, is one of the key determinants of how much informal care is provided.

Estimating the opportunity costs of informal care is important from a policy perspective. For many individuals, the opportunity costs of providing care may include lost income due to having reduced work hours to accommodate caregiving (Evandrou, Glaser, and Henz 2002; Henz 2006; Lilly, Laporte, and Coyte 2007; Lee and Tang 2013; Van Houtven, Coe, and Skira 2013). High opportunity costs provide a rationale for workplace flexibility policies, such as those mandated by the Family and Medical Leave Act, as well as newer programs under consideration in a number of states that would allow caregivers to take paid time off (Houser and Vartanian 2012). Relatedly, opportunity costs are an important consideration in the context of programs that allow informal caregivers to be directly compensated, such as Medicare's Cash and Counseling program that provides each eligible long-term care beneficiary with a budget that may be used to pay any caregiver of the beneficiary's choice, including family caregivers (Doty, Mahoney, and Sciegaj 2010). If the opportunity costs of informal caregivers are lower than the cost of formal replacements, this may also result in significant cost savings for Medicaid.

## METHOD

### *Data and Sample*

The ATUS, conducted by the Bureau of Labor Statistics, records the time allocated to various activities by noninstitutionalized civilians 15 years and older

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Address correspondence to Amalavoyal V. Chari, Ph.D., Department of Economics, University of Sussex, Jubilee 221, Brighton BN1 9RH, UK; e-mail: ac596@sussex.ac.uk. John Engberg, Ph.D., is with the RAND Corporation, Pittsburgh, PA. Kristin N. Ray, M.D., is Assistant Professor of Paediatrics at the University of Pittsburgh School of Medicine and practices at the Children's Hospital of Pittsburgh, Pittsburgh, PA. Ateev Mehrotra, M.D., M.P.H., is with the Department of Health Care Policy, Harvard Medical School and RAND Corporation, Boston, MA.

in the United States. Interviewees are randomly selected from households participating in the Current Population Survey (CPS). The CPS elicits detailed labor market information, including information on labor force participation, hours of work, and earnings, which is then updated at the time of the ATUS interview.

We utilize data from the 2011 and 2012 ATUS. Starting in 2011, the ATUS asked respondents if they have assisted any elderly relatives/friends with activities of daily living (ADLs) in the last 3 months. If respondents provided care in the last 3 months, they were then asked how much time they spent doing so during the last 24 hours. The responses were cross-checked with the time diary to verify their accuracy.

We restrict the analysis sample to adults older than 18 years. We define the caregivers to be those who provided care in the 24-hour recall period, because care time was only elicited for these individuals. Survey respondents self-reported their labor market status as one of the following: (1) Employed (at work), (2) Employed (absent), (3) Unemployed (on layoff), (4) Unemployed (looking for work), and (5) Not in labor force. We reclassify these responses into four categories: (1) Employed, (2) Unemployed, (3) Not in the labor force and under age 65, and (4) Not in the labor force and over age 65. We calculated hourly wages for working caregivers by dividing weekly wages by weekly hours worked. We also make use of the following demographic variables pertaining to the respondent: (1) Age in years; (2) Gender; (3) Race; which is coded into four categories, namely, non-Hispanic white, non-Hispanic black, Hispanic, and an "Other race" category; and (4) Education, which we code into five categories, namely Less than High School, High School, Some College, Completed College, and Postgraduate.

### *The Opportunity Costs of Informal Care*

We measure time costs by multiplying an individual's care time by the opportunity cost of her time. The standard model of labor supply in economics (Becker 1965) implies that an individual's hourly wage is the appropriate opportunity cost of time. In this regard, we propose to follow and extend the methodology for estimating time costs suggested by the Panel on Cost-Effectiveness in Health and Medicine (Weinstein et al. 1996).

A key limitation of this approach is that wages can only be directly calculated for individuals who are currently working. We therefore measure time values for nonworking respondents by imputing wages for them. To do so, we use a regression methodology to estimate how wages are related to the

observable characteristics for the working sample. We allow age to have a non-linear effect on wage by including the square of age as a predictor, and we estimate the wage regression separately for men and women. The coefficients from these regressions are then used to predict the wages that nonworking individuals would have earned had they chosen to work. The total opportunity costs of caregiving are then calculated by multiplying the time each individual spent providing care by his/her wage, and then summing over all individuals, using survey weights to obtain nationally representative estimates.

One problem is that such wage regressions suffer from sample selection bias and will not generate accurate predictions of the wages that nonworking individuals would have been offered (Gronau 1974; Heckman 1979). This sample selection bias may be treated as an omitted-variables problem using a two-step procedure (Heckman 1979), in which one, first, estimates a regression that predicts work-participation and then uses the estimated coefficients to construct the correct omitted variable (the inverse Mills ratio), which can then be included in the wage regression. A number of more robust approaches have been proposed that require weaker distributional assumptions (Das, Newey, and Vella 2003). However, estimates from the two-step selection model are more sensitive to the choice of covariates than to the distributional assumptions (Newey, Powell and Walker, 1990) and these newer methods of estimation are less accessible and not as widely used. We have therefore chosen to work with Heckman's methodology.

In the two-step approach, the identification is substantially strengthened if there exist variables that affect the reservation wage, but not the offered wage (i.e., they appear in the participation equation, but not in the wage equation). Following the empirical literature on labor supply (Mroz 1987), we treat the number of children under the age of 6 in the household as such a potentially "excluded" variable.

### *The Replacement Costs of Informal Care*

We supplement our analysis with cost estimates based on the cost of replacing unpaid care with paid care. We consider two alternatives: skilled paid care and unskilled paid care. We use the federal minimum wage in 2011/2012, \$7.25 per hour, as a measure of the cost of unskilled paid care. We use the hourly wage rate of a home health aide in 2011/2012, \$21 (obtained from the MetLife Market Survey of Long Term Care Costs) as a measure of the cost of skilled paid care.

## RESULTS

Of the 25,701 individuals in the sample, 5,987 (approximately 23.29 percent) identified themselves as caregivers within the past 3 months, and 1,383 (5.38 percent) reported providing care during the previous 24 hours. The remainder of our analysis will focus on the group that provided care in the 24-hour recall period.

Table 1 describes these caregivers, by comparing them to the general population. Age and labor market status are clearly two important dimen-

Table 1: Comparing Caregivers and Noncaregivers

	<i>Men</i>			<i>Women</i>		
	<i>Caregivers</i>	<i>Noncaregivers</i>	<i>p-Value</i>	<i>Caregivers</i>	<i>Noncaregivers</i>	<i>p-Value</i>
Age (years)	53.36	47.99	.000	53.65	49.47	.000
Under 65 years (fraction)	0.77	0.83	.001	0.77	0.78	.486
Race (fraction)						
White	0.67	0.68	.651	0.70	0.65	.006
Black	0.16	0.13	.065	0.17	0.16	.734
Hispanic	0.11	0.11	.079	0.10	0.14	.001
Other	0.06	0.06	.407	0.04	0.05	.166
Education (fraction)						
Less than high school	0.08	0.12	.030	0.08	0.11	.003
High school	0.29	0.27	.405	0.27	0.27	.920
Some college	0.33	0.27	.004	0.31	0.29	.269
Completed college	0.20	0.21	.508	0.21	0.21	.876
Started graduate school	0.10	0.14	.041	0.14	0.13	.213
Labor market status (fraction)						
In the labor force						
Employed	0.59	0.71	.000	0.53	0.55	.250
Unemployed*	0.07	0.05	.077	0.08	0.05	.003
Not in the labor force						
Under 65 years	0.16	0.11	.000	0.21	0.20	.566
Over 65 years	0.18	0.13	.001	0.18	0.19	.390
Observations	519	10,680		864	13,638	

*Note.* *p*-values correspond to the two-sided test of the hypothesis that caregiver and noncaregiver populations have the same mean. Caregivers are defined to be those individuals who provided care in the 24-hour recall period and are a subset of those who self-identified as having provided care in the last 3 months.

\*Unemployed individuals are those who are not currently working but consider themselves to be in the labor force.

sions along which caregivers differ from noncaregivers. Although caregivers are on average older than noncaregivers, more than three-quarters of caregivers are under the age of 65, and about three in five caregivers are in the labor force.

In the case of men, caregivers are more likely than noncaregivers to be out of the labor force and less likely to be employed. Even among working-age men (i.e., under the age of 65), caregivers are more likely to report being out of the labor force. In the case of women, there is a smaller difference in labor market status between caregivers and noncaregivers.

Table 2 describes care recipients in terms of their relationship with the caregiver and the amount of care they receive, distinguishing between older (over 65) and younger (under 65) care recipients. The majority of care recipients are older than 65. Older recipients are more likely than younger recipients to receive care from their spouses and, unsurprisingly, also receive more care than younger recipients.

We now turn to estimating the opportunity costs of caregiving. In the case of women, the probability of labor force participation falls with the number of children under the age of 6 in the household (the excluded variable in the wage regression), whereas in the case of men, this variable has a positive effect on participation (Table 3). In the case of both men and women, the coefficient on the constructed omitted variable (denoted by  $\lambda$  in the table) is significantly different from zero, confirming that sample selection bias was indeed a nonignorable issue.

Table 4 summarizes the estimated average and total care time for the population, along with estimated average opportunity cost. We estimate that informal caregiving amounts to 30.06 billion hours annually. Because most caregivers are in the under-65 group, this group accounts for the majority of

Table 2: Comparing Care Recipients by Age Group

	<i>Under 65 years</i>	<i>Over 65 years</i>	<i>p-Value</i>
Relationship of caregiver to care recipient			
Child/grandchild	0.47	0.32	.000
Spouse/unmarried partner	0.32	0.58	.000
Other	0.21	0.10	.000
Average care time received per day (in minutes)	172.08	181.86	.586
Observations	187	1,196	

*Note.* *p*-values correspond to the two-sided test of the hypothesis that younger (i.e., under 65 years) and older (i.e., over 65 years) care recipient populations have the same mean. Care recipients are defined to be those who received care in the 24-hour recall period.

Table 3: Wage Estimation Using Heckman’s Selection Correction

	Men		Women	
	Wage Regression (1)	Participation Regression (2)	Wage Regression (3)	Participation Regression (4)
Age	0.071*** (0.004)	0.104*** (0.005)	0.061*** (0.004)	0.078*** (0.004)
Age-squared	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
Black	-0.204*** (0.022)	-0.212*** (0.041)	-0.096*** (0.019)	0.045 (0.033)
Hispanic	-0.027 (0.030)	-0.011 (0.058)	-0.060* (0.037)	-0.174*** (0.054)
Other	-0.160*** (0.024)	0.062 (0.045)	-0.121*** (0.021)	-0.034 (0.039)
High school	0.222*** (0.028)	0.307*** (0.048)	0.260*** (0.027)	0.381*** (0.047)
Some college	0.335*** (0.028)	0.332*** (0.048)	0.441*** (0.028)	0.522*** (0.046)
Completed college	0.650*** (0.031)	0.538*** (0.052)	0.754*** (0.031)	0.613*** (0.049)
Started graduate	0.852*** (0.033)	0.639*** (0.057)	0.971*** (0.033)	0.818*** (0.053)
Number of children under age 6		0.052** (0.024)		-0.287*** (0.020)
$\lambda$ (Selection correction variable) <sup>†</sup>	0.027*** (0.009)		0.091*** (0.027)	
Constant	0.907*** (0.096)	-1.530*** (0.158)	0.792*** (0.104)	-1.230*** (0.137)
Observations	11,199	11,199	14,502	14,502

Note. Robust standard errors are reported in parentheses. The dependent variable in columns 1 and 3 is the log of the hourly wage. The dependent variable in columns 2 and 4 is an indicator for whether the individual had any reported earnings.

<sup>†</sup>The selection correction variable is the inverse Mills ratio computed from the estimated coefficients from the first-stage participation regression.

\*\*\* $p < .01$ , \*\* $p < .05$ , \* $p < .1$ .

informal care (22.3 billion hours annually). This group also has higher average wages and accounts for the largest fraction of the opportunity costs of caregiving.

Excluding care given by persons above 65, the opportunity costs of informal care amount to \$412 billion annually—the estimate rises to \$522 billion annually when we include older caregivers (Table 5). We estimate the replacement costs of informal caregiving at the wage rate of an unskilled paid worker (“unskilled replacement”) and at the wage rate of a home health aide (“skilled replacement”). The average wage of informal caregivers lies in between the unskilled and skilled paid care wage rates. Accordingly, we find that the opportunity cost estimates lie in between the two replacement cost estimates (\$221 billion and \$642 billion, respectively).

Table 4: Average Care Time Provided and Wages, Estimated for Different Caregiver Groups

	<i>Average Wage</i> (\$ per hour) (1)	<i>Average Care Time</i> (hours per person per year) (2)	<i>Total Care Time</i> (billions of hours per year) (3)
Under 65 years			
Men	23.12	37.19	7.93
Women	18.73	66.47	14.40
Total	20.72	53.16	22.33
Over 65 years			
Men	17.54	77.11	2.92
Women	11.49	98.05	4.81
Total	13.74	90.16	7.73
All	19.30	58.15	30.06

*Note.* The figures in this table are computed using the entire sample, including earning as well as nonearning individuals. For nonearning individuals, wages are imputed using the predictions from the Heckman selection-corrected regressions presented in Table 3. All estimates are obtained using survey weights to obtain representative estimates for the entire population.

## DISCUSSION

Informal caregiving remains an economically significant phenomenon in the United States, accounting for approximately 30 billion hours of care annually

Table 5: Costs of Informal Caregiving (in Billions of Dollars per Year)

	<i>Opportunity Cost</i> (1)	<i>Replacement Cost</i>	
		<i>Unskilled Care</i> (2)	<i>Skilled Care</i> (3)
Under 65 years			
Men	155.95	58.31	168.91
Women	256.09	107.37	311.01
Total	412.04	165.68	479.92
Over 65 years			
Men	45.57	21.19	61.38
Women	64.40	34.89	101.05
Total	109.97	56.08	162.43
All	522.01	221.76	642.35

*Note.* Cost of care is expressed in billions of annual dollars. Cost of care is calculated for each individual as care time multiplied by the value of an hour's time, and then summed over all individuals in the sample, using survey weights to obtain representative estimates for the population. In the opportunity cost calculation in Column 1, wage is imputed for those who are not working using the predictions obtained from Heckman selection correction wage estimations. In Column 2, the value of time is set at the federal minimum wage for 2011 and 2012, \$7.25. In Column 3, the value of time is set at the hourly wage rate of a home health aide in 2011 and 2012, \$21.



and \$522 billion a year in opportunity cost. This is in contrast to total spending on formal long-term care services in the United States, which was estimated at \$211 billion in 2011 (O'Shaughnessy 2013).

It is useful to compare our cost estimates with those reported in the existing literature. Arno, Levine, and Memmott (1999) and Feinberg et al. (2011) have estimated the replacement costs of informal care, using similar methodologies. The more recent estimate from Feinberg et al. (2011) used data from the *Caregiving in the U.S.* survey and the Behavioral Risk Factor Surveillance Survey (BRFSS), and estimated the total annual replacement value of informal care at \$450 billion in 2009. Their estimates lies in between our two replacement costs estimates, the difference arising due to differences in both the assumed economic value of time as well as in measured hours of caregiving. First, whereas we have separately considered unskilled and skilled paid care, Feinberg et al. (2011) measured replacement cost as a weighted average of state minimum wage, the median hourly wage of a home health aide, and the private pay hourly rate to hire a home health aide. Second, their estimate of caregiving time is higher, at approximately 40 billion hours per year. Part of this discrepancy may be due to the fact that definitions of informal caregiving vary across different surveys. In addition, surveys also vary in the manner in which caregiving time is elicited: The ATUS is unique in that it measures care time in a fairly precise way (in the context of a time diary), whereas in surveys such as the BRFSS and the *Caregiving in the U.S.*, respondents are asked how many care hours they provide in an average week.

We find that informal care is mainly provided by working-age adults, who consequently bear most of the economic burden in terms of opportunity costs. Our findings underscore the importance of workplace flexibility policies being considered by a number of states that provide paid time off from work for caregivers, as well as programs such as Medicaid's Cash and Counseling program that allows family caregivers to be paid for their assistance. Our estimates indicate that, in the aggregate, although the economic value of informal caregiving is substantially greater than what it would cost to replace this care with paid unskilled care, informal caregiving remains more economical than paid skilled care, suggesting that if the beneficiaries enrolled in Cash and Counseling programs prefer to receive care from family members, this may result in cost savings to Medicaid relative to a situation in which the care is provided by skilled replacements.

Our study has some limitations. First, we acknowledge that treating the wage as a measure of the opportunity cost of time, although it has a long tradition in economics, is not entirely accurate. More refined models of time alloca-

tion than the Beckerian model suggest that the true shadow value of time may be different from the wage (Johnson 1966; Oort 1969; De Serpa 1971; Evans 1972). Even in the Beckerian framework, the relevant shadow value of time for a working individual is the after-tax wage, including benefits. This actual wage is difficult to observe. Further, the wage forgone by a nonworking individual may be an underestimate of the value of his/her time. Notwithstanding these critiques, we believe that the measured wage remains a useful, practical approximation to the true shadow value. A second limitation of the study is that we have treated care as a broad category, encompassing many different activities. A more narrow definition that focuses on assistance with physical activities (ADLs, for example) would be useful, but it cannot be estimated using the data available. A third broad limitation of our study is that by focusing on the opportunity costs of care, we have excluded from consideration other well-documented costs associated with providing informal care, such as impacts on the emotional and physical health of the caregivers (Schulz et al. 1995; Pinquart and Sörensen 2003; Vitaliano, Zhang, and Scanlan 2003; Coe and Van Houtven 2009). Including these costs should substantially increase the total costs associated with informal care.

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## SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

Appendix SA1: Author Matrix.