The Relationship Between Household Size and the Demand for Medical Care

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Abstract

This article documents a robust negative relationship between household size and medical expenditures. Residing in a larger family is associated with less consumption of medical care ceteris paribus. An additional household member is associated with between $255.60 and $277.36 fewer expenditures on health care on average. Using quantile regression, we found that the magnitude of cost saving associated with living in a larger family increases with the demand for medical care. Based on these findings, we conclude that larger family size may be beneficial to a person's health. Future research is needed to verify the mechanisms underlying this correlation.

Keywords: household size, medical expenditure, family, care-giving

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1. INTRODUCTION

In the economic literature, considerable research has been conducted on the effects of household size and demographic structure on consumer behavior. For example, previous research has examined the economies of scale within households (Deaton and Paxson 1998), the measurement of child costs (Deaton and Muellbauer 1986), and the effect of household size on poverty measurement (Lanjouw and Ravallion 1995). However, scant attention has been paid to the relationship between household structure and the consumption of medical care. In this article, we fill this void by estimating the relationship between household size and medical expenditures and discussing possible mechanisms why the two should be related.

2. BACKGROUND

In the United States, 10% of patients account for 70% of total health expenditures (Bodenheimer and Berry-Millett, 2009). Moreover, many patients who require expensive medical care have multiple chronic conditions, many medications, frequent hospital admissions, and limitations on their ability to perform basic daily functions due to physical, mental, or psychosocial challenges. Consequently, a pressing policy concern in the United States has been cost containment, particularly for the sickest constituents of society.

A body of literature provides evidence that family support can be protective and beneficial to people with a chronic illness (Aldwin and Greenberger, 1987, Schofield et al., 2001, Beebe, 2002, Doornbos, 2001, Sorensen et al., 2002). Studies consistently have shown that individuals with supportive family environment are less likely to be institutionalized and that the absence of family care-giving is a leading predictor of

institutionalization (National Alliance for Care-giving/AARP, 2004). Several mechanisms may explain these results. First, family caregivers may detect abnormalities in a patient's health before a condition progresses to an acute stage. Because early detection may prevent emergency department visits and hospital admissions, it may decrease a household's medical expenditures. Second, family support can create a positive emotional state for a patient and may reduce endocrine and immunologic responses that are known to be harmful to health. Third, family support for a healthy lifestyle and behaviors may positively influence a patient's adherence to treatment regimens (Wallace, 1996). However, much of the existing evidence has a limitation: The results are typically from small-scale studies that are not nationally representative and that offer limited information on medical care expenditures. We proposed to fill this void by investigating the relationship between household size and medical consumption in the Medical Expenditure Panel Survey (MEPS) - a dataset that is representative of the U.S. population and contains excellent information on medical expenditures.

We claim that household size can be a reliable proxy measure of both the quantity and quality of family support for several reasons. First, a decision to reside with a family member who needs care-giving may indicate a level of emotional attachment that may increase the likelihood of providing care for that person. Second, a larger family may suggests that more people can monitor and detect changes in an ill member's health and can initiate immediate treatment. Third, the burden of care-giving may be shared among several family members, allowing for uninterrupted care. Finally, larger family size implies that several relational qualities are available to the care-receiver. Thus, should a

conflict or stressful relational issue arise, other relationships that can mediate the conflict's negative effects may be readily available to the patient.

In this study, we tested two hypotheses.

Hypothesis 1. Conditional on socioeconomic status and morbidity, larger households will consume less medical care.

Hypothesis 2. The benefits of family support are greater for sicker people.

3. METHODS

3.1 Sample

Our sample for this study was a 4-year panel, 2003-2006, from the Medical Expenditures Panel Survey, which is a set of surveys of that contains comprehensive information on the medical consumption and expenditures of American families and individuals. Each year of the panel contains raw data for about 34,000 individuals. In our analysis, we restricted the sample to the working-aged population, which we defined to be older than 30 years. This restricted the sample sizes in a given year to about 10,000 women and 8,000 men. Because some information is missing on some variables for certain individuals, the sample sizes for the regression analysis are smaller.

3.2 Variables

Our measure of medical expenditures, defined as total and out-of-pocket (OOP) expenditures including total emergency department visits in the past year, comprised payments from all sources to hospitals, physicians, and other health care providers, including dentists and pharmacies. Finally, we used information on household size, marital status, self-reported health status, body mass index, age, gender, morbidities (arthritis, diabetes, high blood pressure, myocardial infarction, and stroke), personal

income, and family income as a percentage of the poverty line. Table I reports the descriptive statistics for our sample.

3.3 Analytical strategies

Our empirical strategy was to estimate the relationship between household size and medical demand while controlling for confounding factors by regressing medical demand (denoted by med) on household size (denoted by hh) and a rich set of control variables (denoted by x). Our measures of medical demand were total and OOP medical expenditures and emergency department visits. The control variables included age; dummies for being married, widowed or divorced; a dummy for being uninsured during the previous year; individual income; family income as a percentage of the poverty line; dummies for self-rated heath status; body mass index; and dummies for having asthma, diabetes, high blood pressure, and ever having had a myocardial infarction or stroke. We used two techniques: ordinary least squares (OLS) regression as a benchmark and quantile regression for our main results. We used STATA 10 for all estimations.

The OLS regressions modeled the conditional mean of medical demand. Because we included individuals with zero and non-zero demands, we modeled the effects of the covariates at both the intensive and extensive margins. We did not use selection models because they have been shown to have highly undesirable finite sample properties in the presence of heteroskedasticity. For a discussion of the pitfalls of selection models in the presence of heteroskedastic errors and a lucid defense of the use of linear regression to estimate a model with a censored dependent variable, we refer the reader to Deaton (1997 pp. 91-92). To address heteroskedastic errors, we used the Huber-White robust standard

errors. To address correlations in observations of individuals and across time, we clustered on individuals.

The quantile regression modeled the αth quantile of medical demand conditional on household size and control variables. We write

$$q_\alpha(med|hh, x) = hh\gamma_\alpha + x\beta_\alpha.$$

We chose quantile regression for two reasons. First, quantiles are not affected by monotonic transformations and, consequently, our estimates were not affected by outliers that are prevalent in medical expenditure data. This addressed the potential pitfall of the OLS regressions. Second, as we hypothesized, the relationship between household size and medical expenditures may vary at different parts of the distribution of medical expenditures so that $\gamma_\alpha$may depend on α. Finally, we used a bootstrap procedure to compute standard errors with 50 repetitions and in which individual (as opposed to individual-time) observations were re-sampled to account for observing the same individual at multiple times in our data. This is analogous to adjusting for clustering on individuals in the OLS regressions.

4. RESULTS

Table II reports the results of the OLS regressions. The regressions are estimated separately by gender for three dependent variables (total expenditures, OOP expenditures, and total emergency department visits) and with a linear age trend or with age dummies. The table reports the results of 12 estimations.

The results in Table II are broadly consistent with the notion that, all things being equal, people residing in larger families have fewer medical care expenditures. In the first two columns, where the dependent variable is total expenditures, we see a negative

relationship ($p < .001$) between household size in all four specifications. The results suggest that an additional household member is associated with between $255.60 and $277.36 fewer expenditures on health care. This result is not affected by the inclusion of a set of age dummies and is robust to the inclusion of a comprehensive set of controls for morbidities and socioeconomic status. Also, a significant and negative relationship between household size and OOP expenditures ($p < .001$) and emergency department visits was found ($p < .05$). Estimates for OOP expenditures range between -$48.33 and -$61.89. Estimates for emergency department visits range from -0.0010 and -0.0088. To put these estimates in perspective, we can compare them with the average number of emergency department visits from Table I, which is 0.21; the estimates constitute between 0.47% and 4.1% of the mean.

In Table III, we also used OLS regressions, but we disaggregated household size into men and women within particular age brackets. The most interesting feature of this table is the coefficients on children between zero and one year of age in the regressions that were run on the sample of women in columns two, four, and six. These coefficients are positive, reflecting the increased medical demand of postpartum medical care. For the most part, coefficients on the remaining age brackets for women and most of the age brackets for men are negative, and many of these are significant. However, we did not see any salient patterns beyond this.

Table IV reports the results of the quantile regressions. Each cell of this table corresponds to a coefficient from a separate regression. We estimate the regressions using $\alpha = 0.5, 0.6, 0.7, 0.8, 0.9, 0.95,$ and 0.99 for men and women, with total and OOP expenditures as the dependent variables. In total, 28 coefficient estimates are reported

together with their bootstrapped standard errors. We did not estimate quantile regressions using total emergency department visits as a dependent variable; over 75% of these observations were zeros and using quantiles less than 75, the nonlinear optimization routine used by STATA often did not converge. The results in this table show that the relationship between household size and medical consumption is larger in magnitude for people with higher demands for medical care. For example, consider the first column which reports the relationship between household size and total expenditures for men. At the 50th percentile, the coefficient estimate is -51.77 and highly significant ($p < .01$), suggesting that an additional household member reduces the conditional median of total expenditures by $51.77. However, when one looks at the 99th percentile, the coefficient estimate increases in magnitude to -618.82 ($p < .05$), which constitutes a 12-fold increase. The coefficient magnitudes increase monotonically with the quantile size. A similar pattern can be seen with OOP expenditures in the second column and with women in the third and fourth columns.

5. DISCUSSION

The results of this study support our two hypotheses. First, people residing in a larger household spend less money on medical care and visit the emergency department less often. Second, people who require a larger amount of medical care benefit more from residing in a larger household. With both hypotheses strongly supported, we conclude that larger family size appears to be beneficial to a person's health. The study findings concur with recent literature that family support has a positive effect on the management of a person's chronic illness. In a recent report issued by the Robert Wood Johnson Foundation's Synthesis Project, *the* key feature to lowering health care costs is keeping

patients with complex and chronic disease out of institutions (Bodenheimer and Berry-Millett, 2009).

These findings have multiple policy implications. First, families who care for a chronically ill member should be rewarded. Supporting family caregivers may result in greater direct and indirect cost savings. In terms of direct cost saving, the results suggest that an additional household member is associated with between $255.60 and $277.36 fewer expenditures on health care. In addition to fostering positive health, family support also provides significant indirect cost savings, such as housing and meals. Often, when a person becomes severely ill, he or she may suffer temporary or permanent loss of income, which may jeopardize their housing. Having family members reside with a patient stabilizes housing and provides him or her with regular meals. Thus, a family is absorbing costs, such as for public housing, that otherwise would have been borne by the community (Park and Chesla, In Print). Chronically ill persons without family support are more likely to rely on public support, increasing the cost of care. Because this was beyond the scope of our study, we did not investigate indirect-cost savings due to family support but will consider them in future work.

Second, family caregivers should be given the necessary skill sets to care for an ill family member. Although strong evidence shows that family care-giving may be beneficial to a care-receiver, equally strong evidence shows that chronic illness is burdensome and can impair a family caregiver's health. Providing support to an ill family member is stressful for family caregivers, ultimately increasing their rates of morbidity and mortality (Lee and Farran, 2004, U.S. Census Bureau, 2007, Talley and Crews, 2007, Ohaeri, 2003). By providing families with a skill set to manage an illness and to navigate

the health care system, the burden of illness on a family can be lowered and valuable family support for the patients can be fostered. By improving family support, negative health outcomes in both patients and their family caregivers may be prevented. This two-pronged approach (providing assistance to patient and family caregiver may have a greater effect than the traditional health care model that focuses on the individual.

Third, clinicians must be offered creative incentives to include family caregivers in patient education. Including family members may be a key to an effective and sustainable intervention for a chronically ill person. A paradigm shift that fundamentally revises the conceptualization of family in chronic illness management may be necessary. Instead of considering family members to be ancillary to a patient's health behavior modification, they should be considered to be active and essential participants in the disease self-management process. Innovative ways may be needed to better monitor a patient's condition.

Fourth, for those patients without family caregivers, interventions modeled on family care-giving should be developed, for example, support groups of patients with similar conditions or clinicians who can consistently provide patients with family-like emotional stability. In addition, the use of telemedicine may provide a cost-effective means of closely monitoring chronically ill patients in the absence of a family care-giver.

6. CONCLUSION

This is one of the first studies to investigate the relationship between household size and medical expenditure, although further research is needed to explain the mechanisms underlying this correlation. We found that people who reside in larger

households have fewer medical expenditures, all things being equal. In addition, the protective effects of household size are greater for sicker people.

Despite the relevance of its findings to many health-related fields, this study offers limited information on why and how larger household size is beneficial to a person's health. Thus, further studies, including randomized controlled trials, are needed to elucidate these mechanisms to create interventions for individuals without family support and to build a realistic health policy. At the theoretical level, health economists and health care researchers should collaborate to develop a more sophisticated, explanatory model to determine how family factors, such as household size, protect people with chronic illness.

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Table 1: Summary Statistics

	Mean (Standard Deviation)
Total Expenditures[1]	4583.84
	(12434.20)
Total OOP Expenditures[1]	813.02
	(1890.53)
Total ER Visits	0.21
	(0.64)
HH Size	2.95
	(1.64)
Age	51.98
	(14.50)
Married [2]	0.62
	(0.49)
Widowed[2]	0.10
	(0.29)
Divorced[2]	0.14
	(0.35)
Uninsured[2]	0.16
	(0.37)
Individual's Income[1]	29714.86
	(30210.26)
Poverty Line [3]	3.60
	(1.41)
Self Reported Health Status (SRHS)	2.55

	(1.15)
Body Mess Index (BMI)	28.03
	(6.24)
Diagnosed with Diabetes [2]	0.11
	(0.31)
Diagnosed with Asthma[2]	0.09
	(0.29)
Diagnosed with High Blood Pressure[2]	0.34
	(0.47)
History of Heart Attack[2]	0.04
	(0.20)
History of Stroke[2]	0.04
	(0.18)
Diagnosed Arthritis[2]	0.26
	(0.44)

[1]In 2005 dollars.

[2]Dummy variable. 1 = Yes and 0 = No.

[3]Family income as a % of the poverty line

Table 2: OLS Regressions

Men

Dep. Var.	Total Exp		OOP Exp		Total ER Visits	
	(1)	(2)	(3)	(4)	(5)	(6)
HH Size	-277.36***	-269.47***	-48.73***	-48.33***	-0.0088***	-0.0010***
	(40.64)	(42.61)	(7.88)	(8.06)	(0.0023)	(0.0024)
Age Control	Linear Trend	Dummies	Linear Trend	Dummies	Linear Trend	Dummies
R2	0.0974	0.0993	0.1009	0.1028	0.0523	0.0542
NT	30305	30305	30305	30305	30305	30305

Women

HH Size	-255.60***	-268.64***	-59.61***	-61.89***	-0.0065**	-0.0084***
	(37.30)	(37.84)	(7.87)	(7.95)	(0.0031)	(0.0031)
Age Control	Linear Trend	Dummies	Linear Trend	Dummies	Linear Trend	Dummies
R2	0.1304	0.1328	0.1025	0.1047	0.0729	0.0758
NT	36497	36497	36497	36497	36497	36497

Notes: All regressions are estimated for a sub-sample of people over 30 years of age. All standard errors adjust for clustering by individuals and heteroskedasticty. All specifications include additional controls for marital status (dummies for being married, widowed or divorced), srhs (dummies for shrs=1, srhs=2, srhs=3, srhs=4), individual income, family income as a percentage of the poverty line, BMI, and morbidity dummies (diabetes, high blood pressure, stroke, heart attack, arthritis). Standard errors are reported in parentheses.

* significant at the 90% level

* * significant at the 95% level

* ** significant at the 99% level

Table 3: OLS Regressions, Decomposing HH Size

Dep. Var.	Total Exp		OOP Exp		Total ER Visits	
	(1)	(2)	(3)	(4)	(5)	(6)
Females btn						
0 and 1	-194.97	1625.62***	-55.65***	85.55	-0.004	0.035**
	(131.52)	(263.80)	(18.95)	(69.20)	(0.012)	(0.018)
2 and 5	-220.02*	-40.66	-45.07***	-1.45	0.0004	0.029**
	(120.52)	(151.18)	(16.27)	(47.71)	(0.008)	(0.012)
6 and 18	-315.34***	-292.58***	-20.29	-70.41***	-0.006	0.001
	(86.14)	(69.66)	(19.46)	(12.75)	(0.004)	(0.006)
19 and 65	-337.94***	-537.05***	-60.38***	-82.28***	-0.003	-0.002
	(117.96)	(104.78)	(17.82)	(17.34)	(0.006)	(0.007)
66 +	39.77	-93.53	-4.44	72.74*	0.001	-0.022*
	(229.86)	(192.47)	(35.27)	(41.82)	(0.013)	(0.012)
Males btn						
0 and 1	-297.23**	1243.17***	-32.42	15.74	-0.010	0.026
	(149.73)	(215.08)	(23.08)	(32.76)	(0.012)	(0.020)
2 and 5	-358.07***	-175.94	-62.64***	-76.69***	-0.002	0.004
	(118.60)	(151.79)	(14.81)	(21.17)	(0.008)	(0.010)
6 and 18	-137.15	-323.16***	-48.92***	-91.03***	0.006	-0.001
	(144.03)	(73.00)	(12.61)	(10.77)	(0.005)	(0.005)
19 and 65	-111.94	-420.46***	-42.27**	-116.83***	-0.015***	-0.002
	(117.08)	(118.89)	(18.06)	(15.32)	(0.005)	(0.007)
66 +	-90.75	-391.04*	-94.16***	10.79	-0.022*	-0.030**
	(274.24)	(220.23)	(36.00)	(35.24)	(0.012)	(0.012)
Sample of	Men	Women	Men	Women	Men	Women

Men/Women						
R2	0.0976	0.1329	0.1014	0.1022	0.0519	0.0542
NT	30305	36498	30306	36500	36500	30305

Notes: All regressions are estimated for a sub-sample of people over 30 years of age. All standard errors adjust for clustering by individuals and heteroskedasticty. All specifications include controls for a linear trend in age, marital status (dummies for being married, widowed or divorced), srhs (dummies for shrs=1, srhs=2, srhs=3, srhs=4), individual income, family income as a percentage of the poverty line, BMI, and morbidity dummies (diabetes, high blood pressure, stroke, heart attack, arthritis). Standard errors are reported in parentheses.

* significant at the 90% level

* * significant at the 95% level

* ** significant at the 99% level

Table 4: Quantile Regressions

	Men		Women	
Dep. Var.	Total Exp	OOP Exp	Total Exp	OOP Exp
	(1)	(2)	(3)	(4)
50th %	-51.77***	-12.28***	-109.31***	-30.82***
	(3.10)	(1.04)	(7.69)	(1.83)
60th %	-67.50***	-17.76***	-131.30***	-37.72***
	(4.83)	(1.25)	(11.62)	(2.38)
70th %	-87.17***	-24.93***	-150.03***	-47.08***
	(6.29)	(1.80)	(13.62)	(4.00)
80th %	-123.53***	-34.68***	-160.67***	-60.82***
	(9.12)	(2.94)	(24.12)	(6.04)
90th %	-208.90***	-65.94***	-142.99***	-85.89***
	(22.68)	(5.09)	(40.03)	(11.67)
95th %	-344.08***	-101.73***	-177.98***	-123.32***
	(49.88)	(10.15)	(57.36)	(17.81)
99th %	-618.82**	-214.83***	-513.65	-139.63
	(240.51)	(42.16)	(353.50)	(87.64)

Notes: Each cell reports the coefficient on HH size from a quantile regression. All regressions are estimated for a sub-sample of people over 30 years of age. All regressions include a linear age trend plus all of the control variables from Table 2. Bootstrapped standard errors are reported in parentheses.

* significant at the 90% level

* * significant at the 95% level

* ** significant at the 99% level