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Opportunity Costs of Ambulatory Medical Care in the United States

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Abstract

Objectives: The typical focus in discussions of healthcare spending is on direct medical costs such as physician reimbursement. The indirect costs of healthcare—patient opportunity costs associated with seeking care, for example—have not been adequately quantified. We aimed to quantify the opportunity costs for adults seeking medical care for themselves or others.

Study Design: Secondary analysis of the 2003–2010 American Time Use Survey (ATUS).

Methods: We used the nationally representative 2003–2010 ATUS to estimate opportunity costs associated with ambulatory medical visits. We estimated opportunity costs for employed adults using self-reported hourly wages and for unemployed adults using a Heckman selection model. We used the Medical Expenditure Panel Survey to compare opportunity costs with direct costs (ie, patient out-of-pocket, provider reimbursement) in 2010.

Results: Average total time per visit was 121 minutes (95% CI, 118–124), with 37 minutes (95% CI, 36–39) of travel time and 84 minutes (95% CI, 81–86) of clinic time. The average opportunity

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cost per visit was $43, which exceeds the average patient's out-of-pocket payment. Total opportunity costs per year for all physician visits in the United States were $52 billion in 2010. For every dollar spent in visit reimbursement, an additional 15 cents were spent in opportunity costs.

Conclusions: In the United States, opportunity costs associated with ambulatory medical care are substantial. Accounting for patient opportunity costs is important for examining US healthcare system efficiency and for evaluating methods to improve the efficient delivery of patient-centered care.

Time spent seeking healthcare represents a burden to patients, lost productivity to employers and society, and a potential inefficiency within healthcare systems. The Institute of Medicine has identified improving timeliness of care, including reducing waiting time, as 1 of the 6 key quality goals in the US healthcare system.[1] Patient time burden (measured in minutes) and patient time costs (measured in dollars) are 2 methods of measuring the time spent by patients traveling to, waiting for, and receiving medical care. While guidelines recommend that patient time costs should be included in economic evaluations,[2] these time costs are rarely addressed, often due to lack of perceived importance or unavailable data.[3] Opportunity costs, which value patient time based on the value of foregone activities, are 1 method of estimating patient time costs. Opportunity costs are increasingly relevant given the increasing emphasis on patient-centered care,[1] recognition that some physician visits may not require face-to-face care,[4,5] and innovation in healthcare delivery options that may reduce time burden (eg, telemedicine).

To date, there exist no rigorous national estimates of opportunity costs associated with ambulatory medical care. One prior study provided important estimates of the time burden associated with adult ambulatory visits,[6] but these time estimates did not include time costs, which are needed to incorporate these time burdens into economic assessments. Other prior studies offered estimates of time spent during only specific portions of ambulatory encounters such as travel time[7] and face-to-face physician time.[8] Indirect costs of specific illnesses or procedures are often estimated, but these estimates only rarely include patient time costs.[9–13]

Using nationally representative surveys, we estimated opportunity costs for adults seeking medical care for themselves or loved ones. We examined both per visit opportunity costs for ambulatory medical visits and aggregate opportunity costs across all physician visits in the United States.

METHODS

We used 3 nationally representative data sources. We assessed opportunity costs associated with seeking ambulatory medical care using the 2003–2010 American Time Use Survey (ATUS). To further contextualize our results, we also determined time spent face-to-face with providers using the 2003–2010 National Ambulatory Medical Care Survey (NAMCS), and annual number of ambulatory physician visits and per visit direct medical costs using the 2010 Medical Expenditure Panel Survey (MEPS).

Description of Surveys

The ATUS, administered by the Bureau of Labor Statistics, estimates time spent by noninstitutionalized civilians within the US population by surveying individuals randomly selected from households that completed the Current Population Survey.[14] ATUS respondents are interviewed on a randomly selected day (including weekends). Via telephone interview, respondents recount time spent from 4 am the prior day until 4 am on the interview day; these time diaries are then coded by activity. The response rate has ranged from 53% to 58% from 2003 to 2010, with survey fatigue being the primary reason for nonresponse.[15] Sampling weights and successive difference replicate weights allow for nationally representative estimates. ATUS includes detailed demographic, employment, and income data. The 2003–2010 data files include 106,657 respondents aged ≥18 years.

The NAMCS, administered by the National Center for Health Statistics, characterizes visits to office-based physicians.[16] NAMCS uses multistage sampling: first sampling physicians within primary sampling units, then sampling patient visits from among sampled physicians' visits. The 2003–2010 NAMCS includes 223,516 physician visits with sampling weights for national estimates.

The MEPS, administered by the Agency for Healthcare Research and Quality, was used to estimate costs and counts of physician visits.[17] Expenditures are collected through household and medical provider interviews regarding actual payments by patients, public and private insurance, other public programs, and any other sources. We estimated the annual number of physician visits nationally, out-of-pocket costs, and total expenditures per physician visit. The 2010 MEPS Household Component sampled 32,846 respondents with sampling weights for national estimates, and includes 19,053 respondents reporting 1 or more physician visits.

Measuring Time Components of Visits

The ATUS codes distinguish between time spent seeking medical care for oneself, for another adult, or for a child. While ATUS has separate codes for time obtaining medical care and time waiting for medical care, these codes do not adequately differentiate between time actually spent receiving clinical care and other time in the clinic. For example, ATUS categorizes the act of paying for care as "obtaining care" and includes "waiting while doctor examines child" as "waiting for care." Because these delineations do not appear to adequately distinguish between times where medical care was and was not being received, we aggregated obtaining and waiting time into "clinic time," which represents time spent obtaining or waiting for care. Additionally, ATUS specifically codes time spent traveling for medical care for oneself, and also codes travel related to caring for another adult or child. We included time spent traveling for medical care for oneself or time traveling related to caring for another adult or a child as "travel time" only when the person also reported "clinic time" on that day. "Total time" was the sum of travel time and clinic time. We excluded a small number of extreme outliers (>6 hours clinic time, n = 74) to focus our analysis on ambulatory encounters. This resulted in 3927 respondents reporting clinic time for themselves, other adults, or children.

Given the limitations of ATUS categories for distinguishing between time obtaining care and time waiting for care, we used NAMCS to estimate average face-to-face provider time. For each sampled physician visit (adult [n = 185,412] and pediatric [n = 38,104]), the physician or nurse working with the physician is asked to record "time spent with physician." NAMCS data were not used to estimate total time or opportunity costs. Instead, these estimates were determined to contextualize the time estimates obtained from the ATUS.

Estimating Opportunity Costs

We estimated opportunity costs for all ambulatory medical visits and also for the subset of visits by employed individuals through methods used previously to determine opportunity costs of informal elder care.[18]

For employed ATUS respondents (n = 1925, 49% of all respondents with a visit), we estimated opportunity costs using self-reported wages. In typical labor economic theory, hourly wage is considered a valid measure of the value of one's time during both working and nonworking hours.[19] For respondents reporting employment but not reporting wages (n = 305), we imputed wages through a linear regression model using age, sex, race/ethnicity, education, year, and state. For each respondent, hourly wages were multiplied by total time reported within the ATUS to determine a total opportunity cost inclusive of both travel and clinic time. In sensitivity analysis, we determined opportunity costs only for those reporting wages; wages were adjusted to 2010 dollars using the Consumer Price Index.[20]

For unemployed ATUS respondents, we valued each individual's time by imputing wages. Because our previously estimated linear regression model only described the relationship between wages and socioeconomic characteristics for the sample of working individuals, imputing wages for nonworking individuals using this estimated relationship would result in biased estimates of opportunity cost. For this reason, we adopted the approach of Heckman[21] in order to treat this bias as an omitted-variable problem and to correct for it using a 2-step approach. Specifically, we first estimated a regression that predicted work-participation, and we then used the estimated coefficients to construct the omitted variable (the inverse Milles ratio), which was then included in the regression predicting wages. Our models of wages and workforce participation both included age, sex, race/ethnicity, education, year, and state. Additionally, the 2-step procedure is strengthened by the specification of a variable that predicts workforce participation but not wages; the presence of household children under 6 years old was included for this purpose.

Finally, we estimated the total national annual opportunity costs associated with ambulatory physician visits using our estimates of opportunity costs per visit from ATUS along with the number of ambulatory physician visits in 2010 from MEPS. We also compared opportunity costs with direct medical costs (ie, total reimbursement, patient out-of-pocket costs) in MEPS for ambulatory physician visits for children and adults. We recognize that ambulatory medical visits in the ATUS are not limited to physician visits, but also include nonphysician visits such as visiting chiropractors or pharmacists. In using our per visit opportunity cost estimates for ambulatory medical visits for physician visits, our results will be biased to the degree the time associated with physician and nonphysician visits differ. Through the

supplemental use of MEPS, however, we were able to scale our national estimates specifically to the number of physician visits.

Analysis was performed using Stata/SE version 12.1 (StataCorp, College Station, Texas). All analyses accounted for survey design and weights. Ethical approval for this study was granted by our institution's Institutional Review Board.

RESULTS

A total of 3927 respondents reported seeking care for themselves, other adults, or children on their interview day (4.6% of total weighted population). Characteristics of ATUS respondents who sought medical care on their interview day are reported in Table 1. Of respondents seeking care, 2889 reported a visit for themselves, 530 accompanied another adult, and 607 accompanied a child. Ninety-nine adults reported visits for multiple individuals during the sampled day, generally for oneself and another adult (n = 40) or oneself and a child (n = 54).

Comparing weighted visits for oneself with weighted visits for another adult, we estimated that adult patients were accompanied by another adult in 20% of their visits.

Total Time Associated With Visits and Components

Mean total time associated with medical visits was 121 minutes (95% CI, 118–124)—37 minutes of which was travel time and 84 minutes of clinic time (Table 2). In comparison, reported face-to-face physician time was only 20 minutes (95% CI, 20–20).

Compared with those seeking care for themselves, adults accompanying other adults or children reported an average of 24 minutes and 13 minutes more total time, respectively. By comparison, face-to-face provider time was 21 minutes (95% CI, 20–21) for adults and 18 minutes (95% CI, 17–18) for children.

Over the study period (2003–2010), there were no significant changes in total time, clinic time, travel time, or face-to-face time. Travel time was similar for respondents in metropolitan statistical areas (37 minutes) and nonmetropolitan statistical areas (38 minutes).

Opportunity Costs and Direct Medical Costs

Across all visits for all ATUS respondents (including the unemployed), mean total opportunity cost per visit was $43 (95% CI, $42–45). Opportunity costs for care for themselves, other adults, or children were $42 (95% CI, $40-$44), $47 (95% CI, $43-$52), and $44 (95% CI, $39-$49), respectively (Table 3).

Across all visits among employed ATUS respondents (49%), the mean total opportunity cost per visit was $41 (95% CI, $39-$44). The average opportunity costs for care for themselves, other adults, or children were $39 (95% CI, $36-$41), $46 (95% CI, $39-$53), and $47 (95% CI, $39-$54), respectively (Table 3). Sensitivity analysis, limited to self-reported

wages, resulted in no substantive change in estimated opportunity costs among employed adults (see eAppendix Table, available at www.ajmc.com).

In comparison, the per ambulatory physician visit mean patient out-of-pocket cost was $32 and total provider reimbursement was $279.

In total, there were 1.034 billion visits (870 million and 164 million adult and child visits, respectively) to physicians in 2010. Of these, we estimate that 599 million visits involved employed individuals seeking care for themselves or others. This represents 1.1 billion hours in time spent and $25 billion in opportunity costs among employed adults in total. Among the entire population (including the unemployed), we estimate 2.4 billion hours in time spent and $52 billion in opportunity costs annually.

DISCUSSION

In the first national estimate of opportunity costs associated with ambulatory medical care, we found $43 in opportunity costs per visit among the entire adult population. The time per visit underlying our opportunity cost estimates (just over 2 hours) is similar to a prior study by Russell et al,[6] which used earlier years of the ATUS. Our analysis furthers this important prior analysis by including more recent years of ATUS data, by including consideration of adults attending pediatric visits, and most notably, by translating this time burden into opportunity costs. These opportunity costs may be more readily interpreted by payers, policy makers, and employers, and also allows for comparison to direct medical spending. The opportunity costs per visit exceeded average out-of-pocket costs per visit. Opportunity costs added 15 additional cents in indirect costs to every dollar spent in physician visit reimbursement.

While the fact that individuals incur significant opportunity costs when seeking care may not be surprising, quantifying opportunity costs illuminates a hidden piece of healthcare spending, which we estimate to be $52 billion annually for the adult US population. Our estimates, specifically among the employed, demonstrate the potential financial impact on worker productivity, which may have particular importance from the employer perspective. The indirect healthcare cost just for employed adults is 1.1 billion hours of time (equivalent to the total annual hours worked by 563,000 full-time employees, which is approximately the employed adult population of Dallas, Texas[22]) and $25 billion in opportunity costs.

Much of these opportunity costs are due to time spent in activities other than actually receiving care. Comparing ATUS total time estimates with NAMCS face-to-face time suggests that more than 80% of time associated with visits was in activities other than face-to-face care with a physician. While some of this time may be spent receiving care or counseling from other members of the care team, the remainder is spent traveling, waiting at the clinic, or in ancillary tasks such as paying bills. This high time burden, primarily due to activities other than direct patient care, translates into high opportunity costs and reflects an ambulatory health system that has room to improve in terms of patient centeredness and efficiency. As discussed below, how much nondirect patient care time can be eliminated via

improved efficiency or use of alternative methods of delivering care remains unclear, but opportunity costs provide a metric to monitor and evaluate improvement efforts.

There are several possible mechanisms to decrease patient opportunity costs. One approach is reducing inefficiencies in physician clinical settings. Although some amount of patient wait time is unavoidable in a clinic setting,[23] prior work has demonstrated that it is possible to significantly decrease patient wait time through appropriate scheduling.[24] Another approach is to promote alternative means of providing care. Work-site, retail, and school-based health clinics have the potential to reduce opportunity costs associated with physician visits by reducing travel and/or wait times.[25–27] Telemedicine, including care via telephone, e-mail, Internet, and videoconference, has the potential to reduce or eliminate travel and wait times even more radically.[28–31] What fraction of physician office visits could be replaced by telemedicine remains unclear. Estimates of the potential for telemedicine to replace face-to-face care range from 7% of internist visits[5] to 47% of nursing home visits.[4] Including patient opportunity costs may be important to fairly assess the comparative effectiveness of these alternative methods of care delivery.

While reducing opportunity costs associated with visits may be valued by patients, we recognize it could also result in increased ambulatory care utilization. As co-payments aim to reduce excess healthcare utilization by addressing “moral hazard,” opportunity costs may also decrease outpatient utilization.[32] Small changes in co-payment amounts can drive significant change in care-seeking behavior; for example, elderly patients exposed to an increase in patient co-payment of less than $10 decreased outpatient utilization by 20 fewer outpatient visits per 100 people.[33] Given that the average opportunity cost ($43) substantially exceeds average co-payment ($32), opportunity costs may be a significant disincentive to ambulatory care. A decrease in opportunity costs may render healthcare more accessible, resulting in increased demand for care and increased ambulatory healthcare spending. While this may lead to improved outcomes in populations that have previously foregone or delayed needed care due to opportunity costs, decreasing opportunity costs may also generate unnecessary visits and spending.

To our knowledge, ours is the first nationally representative study of opportunity costs associated with ambulatory medical visits. It utilizes the ATUS, which is a unique data source that has the best current national estimates of how US citizens use their time, and has key socioeconomic variables such as individual wages. Supplementing the ATUS with data from the 2 additional surveys allows us to contextualize how opportunity costs relate to face-to-face physician time and direct medical spending. However, there are also several critical limitations to the ATUS data. ATUS does not include many health-related variables such as health status, health conditions, type of provider, or nature of visit. As we note above in our methods, one concern is that the ATUS coding does not adequately differentiate between visits to physicians and nonphysicians, which might bias our results. If the time associated with nonphysician visits is less than the time associated with physician visits, we may be underestimating the opportunity costs of a physician visit.

ATUS data are also unable to distinguish between face-to-face provider time and time spent on clerical matters or waiting. For this reason, we used NAMCS to estimate face-to-face

provider time to allow readers to compare this face-to-face time with the total clinic time reported in ATUS. Time reported in both ATUS and NAMCS relies on respondent reporting, raising the potential for recall and selection bias. As an example, direct observation studies have found that NAMCS may overestimate face-to-face provider time by 30% to 40%,[34,35] suggesting that face-to-face time may be still lower than the values we present. Additionally, while NAMCS and MEPS allow us to differentiate between visits for children and adults, they do not allow us to distinguish between visits where adults are alone or accompanied, requiring us to use estimates for adult visits in general as the estimates for accompanied adults as well. This may underestimate face-to-face time and direct medical costs for accompanied adults, as these visits might be more complex. Finally, we recognize that there are controversies on how to value time, particularly for the unemployed. We used accepted labor economic approaches to value the time of employed and unemployed individuals.[19,21] Additionally, we included estimates focusing specifically on employed individuals because these estimates may be of particular interest to employers and employer-based health plans.

CONCLUSIONS

In the United States, opportunity costs of seeking care are substantial for the average individual. For every dollar of direct medical expenditures for ambulatory physician visits, 15 additional cents were spent on the indirect costs of patient time. Time spent per year by employed adults seeking medical care exceeded the number of annual hours worked by more than half a million full-time employees and the societal opportunity costs are greater than $50 billion a year. Accounting for patient opportunity costs is important for examining US healthcare system efficiency and evaluating methods to improve the efficient delivery of care.

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Appendix

eAppendix Table.

Time-Cost Sensitivity Analysis Among Employed Respondents

	Among Employed, Respondents Seeking Care With Reported and Imputed Wages[a]		Among Employed, Respondents Seeking Care With Reported Wages Only	
	Hourly wages $ (95% CI)	**Time-costs $ (95% CI)**	**Hourly wages $ (95% CI)**	**Time-costs $ (95% CI)**
Visit for self	$23 ($21–$24)	$39 ($36–$41)	$23 ($21–$24)	$38 ($35–$41)
Visit for child	$23 ($20–$25)	$47 ($39–$54)	$23 ($20–$26)	$48 ($39–$56)
Visit for other adult	$19 ($17–$21)	$46 ($39–$53)	$18 ($16–$21)	$44 ($36–$52)

	Among Employed, Respondents Seeking Care With Reported and Imputed Wages[a]		Among Employed, Respondents Seeking Care With Reported Wages Only	
	Hourly wages $ (95% CI)	Time-costs $ (95% CI)	Hourly wages $ (95% CI)	Time-costs $ (95% CI)
Any visit	$22 ($21–$23)	$41 ($39–$44)	$22 ($21–$23)	$41 ($38–$44)

[a] In primary analysis, wages were imputed for respondents who reported employment but did not provide wages.

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Take-Away Points

- Total annual opportunity costs to patients for physician visits in the United States were $52 billion in 2010.
- For every dollar spent in visit reimbursement, an additional 15 cents of patient opportunity costs occurs.
- The average opportunity cost for an ambulatory medical visit was $43, which exceeds the average patient's out-of-pocket payment for ambulatory medical visits.
- Accounting for patient opportunity costs is important for examining US healthcare system efficiency and for valuing innovations that improve the efficient delivery of care.

Table 1.

American Time Use Survey Respondents Aged ≥18 Years Seeking Care for Self, Other Adults, and Children on Their Interview Day

	American Time Use Survey Respondents Aged ≥18 Years			
	Seeking Care for Self	**Seeking Care for Other Adult**	**Seeking Care for Child**	**All Adults Seeking Care for Self or Others**
	N = 2889	**N = 530**	**N = 607**	**N = 3927**
Age				
18–24 years	6%	7%	11%	7%
25–44 years	26%	21%	67%	30%
45–64 years	39%	43%	21%	37%
≥65 years	29%	29%	1%	26%
Sex				
Male	35%	36%	17%	33%
Female	65%	64%	83%	67%
Race/ethnicity				
Non-Hispanic white	75%	74%	68%	75%
Non-Hispanic black	10%	10%	8%	10%
Hispanic	10%	10%	18%	11%
Other/mixed	4%	6%	6%	4%
Education				
Less than high school	14%	13%	12%	13%
High school	30%	36%	28%	31%
Some college	27%	29%	28%	27%
Completed college	18%	12%	21%	18%
Started graduate	10%	11%	12%	11%
Rural/urban[a]				
MSA	81%	80%	85%	82%
Non-MSA	19%	20%	15%	18%
Work status				
Full-time	35%	31%	39%	35%
Part-time	13%	15%	23%	15%

American Time Use Survey Respondents Aged ≥18 Years

	Seeking Care for Self	Seeking Care for Other Adult	Seeking Care for Child	All Adults Seeking Care for Self or Others
	N = 2889	**N = 530**	**N = 607**	**N = 3927**
Unemployed	4%	5%	5%	4%
Not in labor force	48%	48%	32%	47%
Hourly income				
Not employed/in labor force	51%	54%	38%	51%
1st quartile	11%	16%	18%	12%
2nd quartile	12%	12%	13%	12%
3rd quartile	13%	10%	16%	13%
4th quartile	12%	8%	15%	12%

[a]Metropolitan statistical area (MSA) status missing for 0.58% of sample; MSA/non-MSA data presented for those with non-missing MSA status. May not sum to 100% due to rounding.

Table 2.

Time per Visit Seeking Care for Oneself, Other Adult, or a Child

	Seeking Care for Self	Seeking Care for Other Adult	Seeking Care for Child	All Adults Seeking Care for Self or Others
	Average minutes per visit (95% CI)			
All adult respondents	N = 2889	N = 530	N = 607	N = 3927[a]
Total time	115 (112–119)	139 (129–149)	128 (118–138)	121 (118–124)
Travel time	33 (32–34)	48 (43–53)	50 (45–55)	37 (36–39)
Clinic time	82 (80–85)	91 (84–99)	78 (71–85)	84 (81–86)
Employed adult respondents	N = 1339	N = 243	N = 400	N = 1925[a]
Total time	105 (101–109)	142 (127–157)	121 (108–134)	113 (109–117)
Travel time	31 (29–33)	45 (39–52)	50 (42–58)	36 (34–39)
Clinic time	73 (69–77)	97 (85–109)	71 (64–78)	77 (73–80)
All respondents				
Time face-to-face with physician[b]	21 (20–21)	21[c] (20–21)	18 (17–18)	20 (20–20)

[a]Sum of individual visits exceeds total any visits, because a small number of respondents sought care for multiple people during their reported day.

[b]"Time face-to-face physician" was obtained from a separate data source, the 2003–2010 National Ambulatory Care Medical Survey (NAMCS) for adult, pediatric, and all visits.

[c]Because NAMCS does not indicate visits accompanied by another adult, the estimate for all adults is also used for accompanied adults.

Table 3.

Opportunity Costs and Direct Costs of Visits for Self, Other Adults, or Children

	Seeking Care for Self	Seeking Care for Other Adult	Seeking Care for Child	All Adults Seeking Care for Self or Others
	Average opportunity costs per visit, $ (95% CI)			
Opportunity costs of visits				
All adult respondents	$42 ($40–$44)	$47 ($43–$52)	$44 ($39–$49)	$43 ($42–$45)
Employed adult respondents	$39 ($36–$41)	$46 ($39–$53)	$47 ($39–$54)	$41 ($39–$44)
Direct costs of visits				
Total reimbursement[a]	$294 ($281–$306)	$294[b] ($281–$306)	$201 ($181–$221)	$279 ($268–$290)
Patient out-of-pocket costs[a]	$34 ($32–$37)	$34[b] ($32–$37)	$23 ($19–$26)	$32 ($30–$34)

[a]Total reimbursement (the amount paid by patients and any third-party payer) and patient out-of-pocket costs (the amount paid by patients) were obtained from a separate data source, the 2010 Medical Expenditure Panel Survey (MEPS).

[b]Because MEPS does not indicate visits accompanied by another adult, the estimate for all adults is also used for accompanied adults.