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In telephone surveys, it is common for a member of the sample (the principal) to designate another individual to complete some or all of the interview (or for one respondent to provide information about all household members). The individual who actually completes the interview for the sample member is called a proxy respondent. A number of research studies on survey respondent rules have been conducted, many of which have focused on proxy reporting of health conditions in household surveys.¹ In order to maximize overall response to its socioeconomic survey program, the AMA offers potential respondents a number of options for participation, including the use of a designated proxy respondent. This study examines the characteristics of physicians who designate proxy respondents for a telephone survey of the socioeconomic characteristics of medical practice. In addition, we compare proxy respondents to principals on a key measure of survey data quality, item response rates.

The decision to respond directly to a survey or to use a proxy has an economic component. Anyone contacted about participating in a telephone survey will weigh the advantages and disadvantages of participation. A part of this calculation, whether explicit or implicit, is to determine the least cost method of responding to the initial request. The real cost of responding to a telephone survey depends on the amount of time involved for the respondent and the value of that time.² Designating a proxy is one way for a physician to minimize the cost of participating by substituting lower cost personnel time for more expensive physician time. Alternatively, a physician might recognize that some of the information on the survey could be retrieved more easily by a business manager or receptionist who routinely handles some of the business aspects of practice. For that case, it is not the value of time but the differential cost of information retrieval that matters. This study analyzes the role of estimated physician average hourly earnings in the decision to use a proxy respondent. Physicians with higher wage rates are expected to be more likely to use a low cost substitute for their own time, i.e., a proxy respondent. These proxies may incur significant costs in retrieving the data necessary to answer such questions as the physician's net income from medical practice. If that is the case, item response rates could be lower from these proxy respondents. Alternatively, proxies may know information such as fees and be able to answer those questions more easily than the survey principal. By examining item response rates for a range of questions, we will evaluate the impact of proxy respondents on this indicator of survey data quality.

Description of the Socioeconomic Monitoring System

The American Medical Association's Socioeconomic Monitoring System (SMS) is a series of semi-annual telephone surveys of non-federal patient care physicians (excluding resident physicians). The annual core survey, which is conducted in the spring, collects data from approximately 4,000 physicians through an interview averaging 25 minutes in length. The autumn survey collects data from approximately 2,800 respondents through a 16-minute interview.

The sample for each survey is selected from the AMA Physician Masterfile, an enumeration of all physicians in the U.S. The sample design is a stratified random sample with the strata defined by specialty and geographic region. Each survey includes reinterviews with physicians who were initially interviewed a year earlier, as well as interviews with physicians selected for the first time.

Several special data collection efforts are used to ensure a high survey response rate. These include: provision of mail surveys to physicians who request them, making numerous calls, refusal conversion attempts, and allowing the use of proxy respondents as designated by the physician.

This study examines the 1987 core survey, which was conducted for the AMA by Mathematica Policy Research (MPR). MPR used a computer assisted telephone interviewing system to conduct interviews from mid-March through July 1987. There were 4,014 respondents for a survey response rate of 66.9%. Of these respondents, 623 used proxies for some or all of the interview.

Analytic Strategy

First, we computed a measure of the value of time for survey respondents. The measure used was predicted average hourly wage (this was used rather than hourly wage to maximize the number of cases used in the analysis--there is high item nonresponse for net income, one of the variables used in constructing hourly wage). Using ordinary least squares regression, average hourly wage (annual income divided by the product of weeks worked last year and hours worked last week) was predicted as a function of standard human capital variables such as specialty, sex, years of experience, and location.³ We examined the role of value of time in the decision to use a proxy and in specific item response decisions by including predicted hourly wage as an dependent variable in bivariate probit analyses, along with several practice characteristics.

We examined two groups respondents who used proxies, those who designated proxies for the income and expense section of the survey (n=429), and those who designated proxies for the fee section (n=353). There were 254 cases that appear in both groups. Three questions

were considered in the item response analysis: annual net income, annual practice expenses, and the fee for an established patient office visit.

The demographic and practice characteristics used in the various analyses are obtained from the AMA Physician Masterfile. These variables include: sex, specialty (13 categories), board certification status, country of medical school, census region (4 categories), AMA membership status, location (nonmetropolitan, small metropolitan, or large metropolitan area), and major professional activity (office or hospital based). Years of experience and type of practice (solo or group) are obtained from responses to the SMS survey.

Results

Table 1 presents the average hourly wage regression coefficients. Using these coefficients, we computed a predicted hourly wage for all survey respondents. Also presented are means of the dummy variables used in the analysis.

Table 2 presents characteristics of the respondents who designated proxies to answer the income and expense questions and the remaining respondents who did not use proxies for income and expenses. Also presented are the characteristics of respondents in fee-for-service practices who did and did not use proxies for the fee section of the survey. Both groups of respondents who designated proxies have a significantly higher predicted hourly wage than those who did not designate proxies. Both groups of respondents who designated proxies have significantly different distributions by specialty and census region than those who did not designate proxies. Among the respondents using proxies, there are more surgical subspecialists and obstetrician/gynecologists, while among the respondents not using proxies, there are more psychiatrists, pathologists, and physicians in emergency medicine. Physicians in the Northeast region are less likely to use proxies. More AMA members than nonmembers use proxies for income and expenses, and more office-based physicians use proxies for income and expenses.

Table 3 presents results of binomial probit analyses of the probability of use of a proxy. The dependent variable has a value of 1 if a proxy was used and 0 otherwise. Separate analyses are done on the probability of using a proxy for fees and of using a proxy for income and expenses. Individuals who used a proxy for both sections of the survey are given the value 1 for the dependent variable in both probit analyses.

Analyses are done with and without predicted hourly wage as an explanatory variable. Predicted hourly wage is a significant predictor of use of a proxy for income and expenses and for fees. As expected, the higher the predicted wage the more likely the physician is to designate a proxy.

The probabilities of using a proxy for income and expenses and for fees are predicted by the set of demographic and practice characteristics considered (all four model chi-

squares are significant at the 0.01 level). In column 1 of Table 3, we find that surgical subspecialists and obstetrician/gynecologists are more likely than general internists to use a proxy for income and expenses while pediatricians, radiologists, psychiatrists, anesthesiologists, pathologists, and emergency medicine specialists are less likely to use a proxy for income and expenses. Physicians in the Northeast region are less likely than those in any other region, and AMA members are more likely to use proxies for income and expenses.

In column 2, where predicted hourly wage is included as an explanatory variable, the results differ slightly. Most notably, the sign of the coefficient for surgical subspecialists is changed, and location and country of medical school are also significant predictors of the use of a proxy for income and expenses.

Column 3 presents results of the analysis of the probability of using a proxy for fees, excluding predicted wage as an explanatory variable. Females and physicians in the Northeast region are less likely to use a proxy for fees. General/family practitioners, pediatricians, radiologists, psychiatrists, anesthesiologists, pathologists, and emergency medicine specialists are less likely than general internists to use a proxy for fees and obstetrician/gynecologists are more likely to use a proxy for fees. Similar results were obtained when predicted wage was included (Column 4), except that the coefficients for sex, AMA membership status and some specialties became insignificant.

Item response rates to net income, practice expenses, and the fee for established patient office visits are presented in Table 4. Proxy respondents have a much lower response rate to net income (58.7%) than physician respondents (80.9%). Proxy respondents also have lower item response rates to expenses. However, the item response rate for the fee question is significantly higher for proxy respondents. These findings are consistent with the hypothesis that proxies know well the fee information. Thus, their costs for reporting fees are lower than those of the principal respondents.

Table 5 summarizes results of item response probit analyses. For each of the three items (net income, practice expenses, and fee for established patient office visit), the dependent variable is given the value 1 if the item is answered, and 0 if not. The independent variables include dummies for the various demographic and practice characteristics as well as a dummy for use of a proxy. Analyses are done both with and without predicted wage as an independent variable. Respondents with a high predicted hourly wage are less likely to answer net income. Predicted wage is not significantly related to the probability of answering the expense or fee question, however. Proxy respondents are significantly less likely than physician respondents to answer income and expenses.

Conclusion

The results support our hypothesis that physicians with higher wage rates are more

likely to use proxy respondents. We found that physicians who designate proxies differ from those who do not designate proxies on other practice characteristics, as well. However, item response rates of proxy respondents were lower than those of physician respondents for income and expense questions, while proxy respondents were more likely to answer fees. Physicians with higher wage rates were less likely to answer the net income item.

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Table 1

Hourly Wage^a Regression

	Mean	Regression Coefficient	T-Statistic
INTERCEPT	1.000	18.10	6.225
<u>Experience</u>			
Years in Practice	16.48	1.74**	9.953
(Years in Practice) ²	271.6	-0.04**	-8.777
<u>Sex</u>			
Female	0.105	-6.35**	-3.296
<u>Specialty</u>			
General/Family Practice	0.151	-3.05	-1.309
IM Subspecialties	0.077	12.66**	4.571
General Surgery	0.052	15.74**	5.052
Surgical Subspecialties	0.157	31.35**	13.34
Pediatrics	0.075	-3.03	-1.126
Obstetrics/Gynecology	0.071	14.19**	4.972
Radiology	0.066	31.27**	10.493
Psychiatry	0.073	4.97	1.826
Anesthesiology	0.055	25.82**	8.558
Pathology	0.037	21.19**	5.951
Emergency Medicine	0.032	2.92	0.832
Other Specialties	0.050	12.96**	4.239
<u>Census Region</u>			
North Central	0.231	2.14	1.229
South	0.336	-0.37	-0.227
West	0.206	-2.23	-1.270
<u>Location</u>			
Metropolitan 1,000,000	0.211	1.91	1.117
Metropolitan 1,000,000	0.364	2.36	1.389
<u>Board-Certification Status</u>			
Certified	0.706	7.23**	5.233
<u>Country of Medical School</u>			
Foreign	0.541	-2.94	-1.927
<u>Major Professional Activity</u>			
Hospital-based	0.472	-4.19*	-2.028
<u>Type of Practice</u>			
Solo	0.400	-4.53**	-3.557
ADJUSTED R ²		21.5%	
Number of Cases			3058

a Hourly Wage is defined as annual net income last year divided by the product of hours in medical and administrative activities last week and the number of weeks practiced last year. The mean hourly wage is \$47.34.

Reference category is male, non-board certified, office-based, non-AMA member, general internists in group practices in nonmetropolitan areas in the Northeast region who graduated from U.S. medical schools.

Table 2

Characteristics of Survey Respondents

	Income and Expenses		Fees	
	Proxy	Physician	Proxy	Physician
Number of Cases	429	3585	353	3116
Mean Years Experience	16.7	16.5	15.5	16.7
Mean Predicted Hourly Wage	\$54.1**	\$50.5	\$53.7**	\$50.3
<u>Sex</u>				
Male	92.1%	89.2%	93.5%	90.4%
Female	7.9	10.8	6.5	9.6
<u>Specialty</u>				
General/Family Practice	15.6**	14.9	13.9**	16.5
General Internal Medicine	11.4	10.4	11.9	10.8
IM Subspecialties	7.9	7.8	9.9	8.2
General Surgery	5.1	5.1	7.1	5.5
Surgical Subspecialties	24.9	14.8	25.8	16.9
Pediatrics	4.2	7.9	4.5	8.1
Obstetrics/Gynecology	13.0	6.7	14.7	7.2
Radiology	5.1	6.7	3.1	7.6
Psychiatry	3.5	7.6	2.8	7.6
Anesthesiology	3.3	5.8	0	0
Pathology	0.9	4.0	1.1	3.8
Emergency Medicine	0.5	3.4	1.1	3.0
Other Specialties	4.4	5.1	4.0	4.8
<u>Census Region</u>				
North East	17.7*	23.3	16.2**	23.6
North Central	23.8	22.9	21.5	22.8
South	38.5	33.0	42.8	33.5
West	20.0	20.9	19.6	20.1
<u>Location</u>				
Nonmetropolitan	18.2	16.3	18.7	17.1
Metropolitan 1,000,000	38.7	36.0	37.7	36.7
Metropolitan 1,000,000	43.1	47.8	43.6	46.2
<u>Board Certification Status</u>				
Not certified	26.1	29.7	25.5	27.6
Certified	73.9	70.3	74.5	72.4
<u>Country of Medical School</u>				
U.S.	80.0	79.9	83.0	80.8
Foreign	20.0	21.1	17.0	19.2
<u>AMA Membership Status</u>				
Non-member	38.0**	46.8	39.9	44.4
Member	62.0	53.2	60.1	55.6
<u>Major Professional Activity</u>				
Hospital-based	5.4**	9.5	5.1	7.7
Office-based	94.6	90.5	94.9	92.3
<u>Type of Practice</u>				
Group	60.4	56.9	54.1	56.8
Solo	39.6	43.1	45.9	43.2

*,** = Significantly different from non-proxy respondents at p = .05, and .01, respectively.

Note: The last two columns include only respondents in fee-for-service practices.

Table 3

Probit Analyses on Probability of Use of Proxy

	Use of Proxy for Income and Expenses		Use of Proxy for Fees	
	1	2 ^a	3	4 ^a
	CONSTANT	-1.354	-1.922	-1.344
Predicted Hourly Wage	--	0.014**	--	0.010**
<u>Sex</u>				
Female	-0.072	0.061	-0.135*	-0.035
<u>Specialty</u>				
General/Family Practice	-0.063	0.043	-0.186*	-0.063
IM Subspecialties	-0.073	-0.205*	0.025	-0.041
General Surgery	-0.114	-0.301**	0.046	-0.044
Surgical Subspecialties	0.173*	-0.260*	0.126	-0.147
Pediatrics	-0.362**	-0.321**	-0.342**	-0.335**
Obstetrics/Gynecology	0.272**	0.054	0.315**	0.162
Radiology	-0.243**	-0.644**	-0.516**	-0.786**
Psychiatry	-0.411**	-0.455**	-0.505**	-0.510**
Anesthesiology	-0.363**	-0.731**	--	--
Pathology	-0.746**	-1.007*	-0.620**	-0.780**
Emergency Medicine	-0.860**	-1.016*	-0.535**	-0.550**
Other Specialties	-0.146	-0.308**	-0.161	-0.216
<u>Census Region</u>				
North Central	0.135**	0.095	0.160**	0.135*
South	0.172**	0.155**	0.301**	0.281**
West	0.109*	0.083	0.166**	0.101
<u>Location</u>				
Metro. 1,000,000	0.009	0.015	-0.024	-0.006
Metro. 1,000,000	-0.063	-0.108*	-0.025	-0.030
<u>Board Certification Status</u>				
Certified	0.067	-0.047	0.021	-0.026
<u>Country of Medical School</u>				
Foreign	0.065	0.119**	-0.032	-0.020
<u>AMA Membership Status</u>				
Member	0.103**	0.099**	0.000	-0.020
<u>Major Professional Activity</u>				
Hospital-based	-0.106	-0.036	-0.016	0.035
<u>Type of Practice</u>				
Solo	-0.005	0.048	-0.016	0.026
Log-likelihood	-1309.0	-1187.0	-1093.1	-985.0
χ^2	111.07**	109.70**	95.97**	86.12**
Degrees of freedom	23	24	22	23

a Hourly Wage is included as an independent variable.

*,** Significant at p = .05, .01, respectively.

Reference category is male, non-board certified, office-based, non-AMA member, general internists in group practices in nonmetropolitan areas in the Northeast region who graduated from U.S. medical schools.

Individuals who used a proxy for both sections of the questionnaire are given the value 1 for the dependent variable in both probit analyses.

Table 4

Item Response Rates of Proxy vs. Physician Respondents

	Proxy	Physician
Net Income	58.7%**	80.9%
Practice Expenses	55.8**	66.8
Fee for Established Patient Office Visit	91.8*	87.4

Table 5

Item Response Probits

	Net Income		Practice Expenses		Fee for Estab- lished Patient Office Visit	
	1	2 ^a	3	4 ^a	5	6 ^a
	CONSTANT	1.044	1.440	0.239	0.146	1.171
Predicted Hourly Wage	--	-0.010*	--	0.003	--	-0.006
<u>Type of Respondent</u>						
Proxy ^b	-0.631**	-0.485**	-0.239**	-0.164*	0.102	0.135
<u>Sex</u>						
Female	0.009	-0.069	-0.119	-0.099	-0.282**	-0.290*
<u>Specialty</u>						
General/Family Practice	-0.012	-0.077	0.022	0.018	0.238	0.213
IM Subspecialties	-0.239*	-0.118	-0.086	-0.105	-0.067	-0.004
General Surgery	-0.099	0.063	0.122	0.060	-0.346*	-0.214
Surgical Subspecialties	-0.256**	0.053	-0.090	-0.188	-0.016	0.171
Pediatrics	0.068	0.103	0.211	0.267*	-0.144	-0.186
Obstetrics/Gynecology	-0.288*	-0.128	-0.138	-0.165	0.356*	0.503*
Radiology	-0.293*	0.013	-0.039	-0.180	--	--
Psychiatry	0.297*	0.344*	0.465**	0.431**	--	--
Anesthesiology	-0.088	0.130	0.243	0.138	--	--
Pathology	-0.291	-0.086	0.116	-0.015	--	--
Emergency Medicine	0.314	0.320	0.194	0.179	-1.930*	-1.929*
Other Specialties	0.010	0.156	-0.094	-0.181	-0.282	-0.161
<u>Census Region</u>						
North Central	0.041	0.042	-0.098	-0.046	-0.099	-0.109
South	0.102	0.082	0.107	0.088	0.020	-0.023
West	0.217**	0.233**	0.120	0.138	0.009	0.000
<u>Location</u>						
Metropolitan 1,000,000	-0.116	-0.108	-0.205**	-0.221**	-0.230*	-0.236*
Metropolitan 1,000,000	-0.230**	-0.227**	-0.244**	-0.263**	-0.209	-0.230
<u>Board Certification Status</u>						
Certified	0.149**	0.229**	0.096	0.059	0.166*	0.205
<u>Country of Medical School</u>						
Foreign	-0.128*	-0.140*	-0.106	-0.100	-0.147	-0.130
<u>AMA Membership Status</u>						
Member	0.009	0.027	0.143**	0.154**	0.228**	0.246**
<u>Major Professional Activity</u>						
Hospital-based	-0.002	-0.037	-0.025	0.009	-0.396**	-0.421**
<u>Type of Practice</u>						
Solo	-0.216**	-0.275**	0.320**	0.348**	0.472**	0.437**
Log-likelihood	-1985.4	-1897.8	-1841.2	-1781.4	-848.9	-826.5
x ²	207.77**	177.84**	128.63**	118.10**	410.12**	404.60**
Degrees of freedom	24	25	24	25	20	21

^a Hourly wage is included as an independent variable.

^b The proxy variable was given the value of 1 if a proxy respondent was used and 0 otherwise.

Reference category is male, non-board certified, office-based, non-AMA member, general internists in group practices in nonmetropolitan areas in the Northeast region who graduated from U.S. medical schools.

*,** Significant at p = .05, .01 respectively.