

Richard E. Miller, Wisconsin Division of Health
 Michael P. Massagli, The Pennsylvania State University
 Brian R. Clarridge, Wisconsin Division of Health

RESPONSE VARIABILITY

Both research and medical practice often rely on proxy reports for information about children and about adults who are absent or incapacitated. The adequacy of such proxy reports on health practices and conditions has long been of interest (e.g. Cartwright, 1957).¹ There are numerous sources of discrepancies between self- and proxy reports. Whatever its source in the measurement process, response variability reduces the reliability of the resulting data. Response variability can result in: (1) biased estimates of population characteristics; (2) unreliable estimates of characteristics; or (3) misspecification of the existence, form, strength, and direction of relationships between characteristics.

By obtaining repeated measurements of a characteristic for the same unit or individual, it is possible to assess the reliability of the measurement process. This paper emphasizes the importance of modeling remeasurement data for improving the reliability of survey measurements of health status. Reporting agreement and bias are examined through statistical tests of agreement by chance and of marginal equality, or symmetry, in cross-classifications of the self- and proxy reports.

This study also examines how discrepancies in reporting recent health complaints or conditions are structured by characteristics of the self- and proxy reporters, their households, and the health complaints themselves. In general, agreement between the self- and proxy reporters depend upon (1) both having been cognizant of a subject's health complaint or its absence, (2) both recalling a complaint, (3) both being willing to report a complaint, and (4) both labeling a complaint the same way (Miller, 1986). Communication and recall are structured by the relationship between self and proxy, the salience to subject and proxy of a particular complaint, and the salience of the subject's complaints relative to those other household members may have.

The results show generally fair to poor agreement on the occurrence of most health complaints examined and significant bias in reporting, with relative under-reporting by proxies the source of bias. Neither the degrees of agreement nor of bias are dramatically affected by the proxy's relationship to the self-reporter, the proxy's education, the presence of children, or whether the proxy was interviewed the same day as the self-reporter or the next.

THE WISCONSIN HEALTH STATUS SURVEY

The Wisconsin Health Status Survey obtained CATI interviews from 2382 households (Soref and Miller, 1986), using a geographically stratified disproportionate random sampling design (Palit and Sharp, 1983). Two conceptually distinct respondents were interviewed by telephone in each household: a randomly selected adult (RA) and the adult most knowledgeable about the health of the

household (MK). The adult most knowledgeable was identified by the random adult. This design represents a significant improvement over many health surveys. The usual practice has been to obtain self-reports from whomever is available and proxy reports from whomever is available and willing to claim some knowledge of the health of household members (see Mathiowetz and Groves, 1985, for a review and critique of such designs).

In the Wisconsin Health Status Survey, data for the random sample of adults are matched to information on these same individuals obtained from the most knowledgeable person. This paper analyzes the responses of both respondents to questions about which of twenty common health complaints had been experienced in the two weeks preceding the interview. The RA provided a self-report; the MK reported on all household members. In about three-fourths of the households the RA claimed to be the most knowledgeable respondent or was the only adult. It is from the other 600 households that repeated measures of the RA's experience of the twenty health conditions can be obtained.

We restrict this analysis to the 408 pairs of self- and proxy reports obtained not more than one day apart.² We treat these as repeated measurements using two reporters (the RA and MK) on the same individual (the RA). This design allows us to directly examine the sources of disagreement between the two reports.

The households in which RA designated another member as MK are not a random subset of the sample. Overwhelmingly it was male RAs who designated someone else as MK: 81 percent of all RAs who did so were male. Indeed, over half (56 percent) of male RAs said they were not the MK, while only 18 percent of female RAs did so. As a result, about three-fourths of all MKs in the full sample were female. When another person was designated by the RA, that person was most commonly RA's wife (68%); a distant second was RA's mother (16%). The modal situation for the self/proxy pairs is thus a self-report by a male and a proxy report by his spouse. This is very like the typical self/proxy pair in health surveys which use at-home respondents as proxy reporters for absent members (Verbrugge, 1976).

MODELS FOR REPEATED MEASUREMENTS

Multiplicative models of cross-classified data (Goodman 1972; Hauser 1979) can be used to assay classifications of repeated measurements to locate sources of inconsistency in marginal classifications, sources of discrepancies in classification, and differences between categories in levels of agreement and disagreement (Hauser and Massagli 1983, also Taylor 1976, Clogg 1984).

In general, these models can be used to test whether the marginal distributions for the condition are discrepant, to test hypotheses concerning the sources of discrepancies, and to assay differences between categories in levels of agreement and disagreement. In the case of 2

x 2 tables, such as we construct for the presence or absence of a health complaint, the model for the comparison of the underlying sets of marginal probabilities is the model of symmetry, since in this special case marginal homogeneity implies symmetry (Bishop, Fienberg and Holland 1975:Chapter 8).

For the general case, the expected cell value, m_{ij} , where $i=1,2,\dots,I$, $j=1,2,\dots,J$, and $I=J$, the model of marginal homogeneity is satisfied if

$$m_{i+} = m_{+i} \quad \text{for } i = 1, \dots, I.$$

In the case of a 2 x 2 table, this implies that $m_{12} = m_{21}$, i.e. the off-diagonal counts are equal, or the table is symmetric about the diagonal. For a 2 x 2 table, a direct test of marginal homogeneity is therefore available. The estimated expected value for the off-diagonal cells of the 2 x 2 table is $(x_{12} + x_{21})/2$. To test the goodness-of-fit of this model, the statistic

$$L^2 = 2 \sum x_{ij} \log (2x_{ij}/x_{i+} + x_{+j})$$

is referred to a chi-square distribution with 1 degree of freedom. If the test statistic does not attain significance then there are no net classification differences between the two sources, suggesting that the sources are relatively unbiased.

Especially when the model of symmetry is rejected, it may be useful to extend this strategy from two dimensions to three or more, where the additional dimensions represent specific conditions under which relative bias may exhibit different levels or patterns than observed in the simple self-by-proxy case. As we will demonstrate later in this report, the model of symmetry can be used directly to analyze any of $I \times I \times K$ tables (Bishop, Fienberg, and Holland 1975, p.299-300).

AGREEMENT IN REPORTS OF HEALTH COMPLAINTS

One might begin to examine the degree of agreement by simply comparing marginal rates from self-and proxy reports. Table 1 shows, first, the rates at which RAs' health complaints were reported by self- and proxy respondents. We find, for example, that the self-reported rate of colds was 20.3 percent, while the proxy reported rate for the same people was two-thirds of that at 13.4 percent; the self-reported headache rate of 37.6 percent compares with the proxy reported rate of 15.4 percent. Over all conditions, the proxy reports show consistently lower rates than the self-reports.

Table 1 also shows the percent of respondent pairs who agreed on the self-reporter's condition. Since the time frame for complaints was only two weeks, most are relatively rare events. Therefore it is not surprising that, for 11 of 20 conditions, ninety percent or more of the pairs agreed on RA's status and over eighty percent agreed for all but two conditions. Nonetheless, the percent agreeing is as low as 67.4 percent (for headaches).

Because the underlying rates of complaints are low, the probability of agreement by chance is high and rates could appear deceptively similar. Further, observed differences in the estimated rates actually understate the reporters' discrepancies, since proxies not only failed to report complaints which selves reported but also reported complaints selves did not. The

appropriate measure of agreement is Cohen's kappa, which tests whether the observed agreement is significantly different from that expected by chance, given the marginal rates (Fleiss, 1981). The values of kappa for each condition are shown in Table 1.

The overall level of agreement between self-and proxy reporters is generally unimpressive, but at least better than expected by chance. No condition has a level of agreement which may be termed "excellent" (kappa greater than .75; see Landis and Koch, 1977) and only eight may be rated as showing "fair to good" agreement (kappa between .40 and .75).

The eight health complaints with higher levels of agreement are conditions which proxies will easily notice. Some are readily observed or require mutual adjustments in daily living (rashes, allergies, coughs and hearing and vision problems). Others often painfully limit activity (backaches and knee problems). Chest pains have possibly life-threatening implications, and so are likely to be communicated, highly salient, and recalled. However, other salient, painful, and/or limiting conditions are less agreed upon. Complaints which are stigmatizing, ambiguously and subjectively defined, or often privately suffered do indeed have the lowest levels of agreement (depression, restlessness, anxiety, headaches, joint pain, and sore throats).

RELATIVE BIAS IN REPORTS OF HEALTH COMPLAINTS

Lacking perfect agreement between reporters, it is revealing to examine whether discrepant reports are relatively biased. In the present context, the issue is whether self-or proxy reporters are relatively more likely to under-report health complaints. We test for marginal homogeneity in this case of 2 x 2 tables with the model of symmetry described above. The likelihood ratio test statistic (L^2) for the goodness-of-fit of this model is in the final column of Table 1.

Deviations from symmetry are significant for all but three complaints: ear or hearing problems, chest pain, and injuries. Inspection of the individual tables shows that the significant bias in reporting the other 17 conditions was consistently such that proxies failed to report conditions that selves reported.

The lack of bias in reporting hearing problems and chest pains may be accounted for by the same arguments of observability and salience invoked to explain their reporters' relatively good agreement levels. And the injuries reported frequently led to medical attention (41.8 percent) and so were likely to be noted and remembered.

However, it is not clear why other complaints with good levels of agreement were nonetheless consistently under-reported by proxies. Certainly some under-reporting is due to proxies having to report simultaneously on all family members and themselves. If there were a social desirability bias because some conditions are stigmatizing, we would expect selves to be more reticent than proxies, but we do not find this pattern at all. The simplest explanation for proxy under-reporting is that people know and recall less about others than they do about themselves.

FACTORS AFFECTING AGREEMENT

Four attributes of the reporting context were analyzed for their effects on the amount of self/proxy agreement. (1) The relationship of the proxy to the self-reporter affects the nature and degree of communication and observation between them. We examine the agreement between pairs who have husband/wife or adult child/mother relationships. (2) The educational level of the proxy may be related to communication patterns and interview performance; it is also strongly related to the proxy's age and the self-reporter's own education. (3) The presence of children under 18 is likely to distract the proxy from the health of, typically, her husband. Children also significantly increase the proxy's respondent burden. (4) Proxy MKs interviewed on the same day as RA self-reporter interviews may be inhibited by the presence of the self-reporter and less willing to report possibly stigmatizing or just "bad" health (Cannell, 1981). Interviewed the following day, proxy reporters may be more knowledgeable if family communication is stimulated by the earlier RA interview.

Table 2 presents the kappa statistics measuring agreement for each level of these four contexts. The health complaints are roughly ordered from consistently low levels of agreement across the variables to consistently high levels. Generally, those health conditions showing low overall agreement also have low agreement in all subtables. Some even fail to agree better than would be expected by chance.

Very few complaints exhibit any significant differences in agreement levels between subtables ($P(z) < .05$). Wives tend to agree with their husbands' self-reports more than mothers agree with their adult children (significant differences for three complaints and trend for ten others). Proxy reports obtained the day following the self-report tend to show less agreement than those obtained the same day (significant differences for two complaints and trend in ten others), perhaps reflecting intervening health events and the greater proportion of mothers, as opposed to wives, in that group.

FACTORS AFFECTING RELATIVE BIAS

Table 3 shows the maximum likelihood statistic assessing the fit of the model of symmetry in each subtable created by the four dichotomous attributes. The health complaints are again roughly ordered from consistently biased disagreements to consistently symmetric reports. Over all self/proxy pairs, there were only three of twenty conditions for which the model of symmetry was not rejected. Here we find more unbiased disagreement (53 of 180 subtables), but the dominant pattern in most subsets remains that of proxy under-reporting. No subtable had significant bias in the other direction.

Table 4 shows estimates of the degree of bias (where the symmetry model is rejected) by showing the proportion by which the self-yes/proxy-no cell exceeds that expected under symmetry. Over all pairs, the proportion always exceeds 40 percent and it averages 59 percent.

Mothers were unbiased proxy reporters on more health complaints than were wives, but when they did significantly under-report, they did so to a

consistently greater degree than wives did. Mothers also tended to agree less with their adult children self-reporters than did wives with their husbands. These patterns are consistent with the expectation that spouses communicate more and so are better proxy reporters, but may also reflect the effects of more next-day interviews by mothers (discussed below).

Those with some education beyond high school were unbiased reporters for somewhat more conditions than were those who had none, but each group was more biased than the other on an equal number of complaints. We noted above the absence of much effect by educational levels on degrees of agreement and so we conclude that education has little effect on the quality of proxy reports on health conditions.

We expected that proxy reporters in households with children under 18 would have somewhat worse agreement with another adult and more under-reporting of health complaints. The former expectation is not demonstrated, but the latter one is supported. All-adult households reported without bias on more types of complaints but had equally mediocre rates of agreement.

The fewest departures from symmetry were observed in the interviews done one day apart; significant proxy under-reporting was found for only seven of the twenty health conditions. This supports the hypothesis that proxies could be inhibited by the proximity of self-reporters during same-day interviews. However, the opportunity to report on complaints arising in the intervening day would tend also to create symmetrical disagreements. The tendency of next-day interviews to agree less than same-day interviews is consistent with this possibility. Note that, had the first interview stimulated significant communication and recall, we should have found more, rather than less, agreement.

SUMMARY AND DISCUSSION

We have examined the degree of agreement and the nature of disagreement in 408 pairs of self- and proxy reports on recent occurrences of twenty common health complaints. We assessed departures from marginal homogeneity and explored the impact on agreement and disagreement patterns of the proxy reporter's relationship to the self-reporter, the education of the proxy, the presence of children in the household, and whether the proxy was interviewed the same day or the next. Table 5 summarizes the rankings on degrees of agreement and symmetry among health complaints across these attributes.

The level of agreement between self- and proxy reporters was generally fair to poor, rarely good, and in no case excellent. Agreement was not dramatically affected by any of the dimensions we tested, although there was some tendency for spouses to agree more than mother/adult child pairs and for pairs interviewed the same day to agree more than ones interviewed a day apart.

The model of symmetrical disagreement generally could be rejected; disagreements were consistently biased in the direction of proxy under-reporting. Proxy characteristics which seem to reduce the incidence of bias (mothers and next-day interviews) were also associated with lower levels of agreement.

Our findings argue that proxy reports underestimate, sometimes seriously so, rates of health complaints relative to self-reports by randomly selected adults, even when the proxy is the "most knowledgeable" family member. It is perhaps more accurate to say that self-respondents report more complaints than do their surrogates, but we believe that "self over-reporting" is a much less likely scenario. In any case, given the preponderance of males among those for whom proxy reports are typically used, the debate over the degree of methodological artifact in observed sex-based morbidity rate differences (Briscoe, 1984) is here given another contribution.

The common reliance upon proxy reports in both health survey research and in medical practice should continue to be warily examined. The general picture of low agreement about and proxy under-reporting of health complaints carries implications for health surveys which must be weighed with the evidence of other studies. Briscoe (1984) judged spouses to be good surrogate reporters about health complaints, at least in a sample of frequent users of physicians. Mathiowetz and Groves (1985) found that health care utilization, acute conditions, and serious chronic conditions were reported at higher rates for others than for selves. Other work suggests that wives provide fairly reliable information about husbands' drinking, smoking and dietary habits (Kolonel et al., 1977; Lerchin and Samet, 1986; Marshall et al., 1980), traits which are habitual or in which wives play a large role. Coates et al. (1978) finds that mothers even report their children's weight better than their own. It is clear that respondent selection rules in health surveys should take into account the type of information to be collected.

FOOTNOTES

1. Overviews of previous studies of respondent roles are provided in Mathiowetz and Groves (1985) and Andersen et al. (1977: Ch. 5).
2. Comparisons of distributions of demographic characteristics show very little difference between the 600 pairs of self- and proxy reporters and the subset of 408 pairs interviewed the same day or one day apart.

REFERENCES

- Andersen R, Kasper J, Frankel MR and others. 1979. Total Survey Error. San Francisco: Jossey-Bass.
- Bishop YM, Fienberg SE, Holland PW. 1975. Discrete Multivariate Analysis: Theory and Practice. Cambridge: MIT Press.
- Briscoe, M.E. 1984. "Proxy response in health surveys: a methodological issue." Sociology of Health and Illness 6:359-65.
- Cannell CF, Miller PV, Oksenberg L. 1981. "Research on Interviewing Techniques." Pp. 389-437 in S. Leinhardt, ed. Sociological Methodology 1981. San Francisco: Jossey-Bass.
- Cartwright A. 1957. "The Effect of Obtaining Information from Different Informants on a Family Morbidity Inquiry." Applied Statistics 6,1: 18-25.
- Clogg CC. 1984. "Some Statistical Models for Analyzing Why Surveys Disagree." Pp. 319-66 in CF Turner and E Martin, eds., Surveying Subjective Phenomena, vol.II. NY: Russell Sage.
- Coates TJ, Jeffery RW, Wing RR. 1978. "The Relationship Between Person's Relative Body Weights and the Quality and Quantity of Food Stored in Their Homes." Addictive Behavior 3:179-84.
- Fleiss, J.L. 1981. Statistical Methods for Rates and Proportions. NY: John Wiley.
- Goodman LA. 1972. "Some Multiplicative Models for the Analysis of Cross-classified Data." Proceedings of the Sixth Berkeley Symposium on Mathematical Statistics and Probability. Berkeley: University of California Press.
- Hauser RM. 1979. "Some Exploratory Methods for Modeling Mobility Tables and Other Cross-Classified Data." Pp. 413-58 in K.F. Schuessler (ed.), Sociological Methodology 1980. San Francisco: Jossey-Bass.
- Hauser RM, Massagli MP. 1983. "Some Models of Agreement and Disagreement in Repeated Measurements of Occupation." Demography 20:449-60.
- Kolonel LN, Hirohata T, Nomura AMY. 1977. "Adequacy of Survey Data Collected from Substitute Respondents." Am J of Epidemiology 106:476-84.
- Landis JR, Koch GG. 1977. "A One-Way Components of Variance Model for Categorical Data." Biometrics 33:671-679.
- Lerchen ML and Samet JM. 1986. "An Assessment of the Validity of Questionnaire Responses Provided by a Surviving Spouse." Am J of Epidemiology 123:481-489.
- Marshall J, Priore R, Haughey B, Rzepka T, Graham S. 1980. "Spouse-Subject Interviews and the Reliability of Diet Studies." Am J of Epidemiology 112:675-683.
- Mathiowetz NS and Groves RM. 1985. "The Effects of Respondent Rules on Health Survey Reports." Am J of Public Health 76:639-44.
- McLemore T. 1981. "1979 Summary: National Ambulatory Medical Care Survey." NCHS Advancedata No. 66.
- Miller RE. 1986. "Self- vs. Proxy Reports on Health Conditions of Adults: The Case of the 1984 Wisconsin Health Status Survey." WI Center for Health Statistics Working Paper.
- Palit C and Sharp H. 1983. "Strategies in RDD Sampling". Unpublished Paper, Wisconsin Survey Research Laboratory.
- Soref M and Miller RE. 1986. "Sample Design, 1984 Wisconsin Health Status Survey." WI Center for Health Statistics Working Paper.
- Taylor DG. 1976. "The Accuracy of Respondent-Coded Occupation." Public Opinion Quarterly 40:245-55.
- Verbrugge LM. 1976. "Females and Illness: Recent Trends in Sex Differences in the United States." J of Health and Social Behavior 17:387-403.

TABLE 1

RATES OF HEALTH COMPLAINTS AND MEASURES OF AGREEMENT AND SYMMETRY FROM SELF AND PROXY REPORTS (N=408)

HEALTH COMPLAINT	COMPLAINT RATES ¹		PERCENT AGREEMENT ²	LEVEL OF AGREEMENT (Kappa) ³	DEPARTURE FROM SYMMETRY (L ²) ⁴
	SELF-REPORT	PROXY REPORT			
COLD	20.3%	13.4%	82.7%	.39****	11.5****
COUGH	15.7	9.5	88.3	.47****	14.0****
THROAT PROBLEM	12.9	7.2	85.8	.22****	9.6**
FEVER	4.2	2.0	95.8	.30****	5.0*
SINUS TROUBLE	24.1	10.2	81.1	.36****	46.2***
ALLERGY	9.2	6.7	94.0	.59****	4.3*
RASH	5.0	2.0	97.0	.56****	16.6****
EYE/VISION PROBLEM	5.4	2.5	95.5	.42****	8.7**
EAR/HEARING PROBLEM	5.2	4.0	95.8	.52****	1.5
HEADACHE	37.6	15.4	67.4	.21****	66.3****
JOINT PAIN	32.3	13.4	71.7	.24****	55.3****
BACKACHE	22.1	12.4	83.8	.44****	25.1****
KNEE PROBLEM	10.4	6.0	91.6	.44****	10.0**
ABDOMINAL PAIN	8.6	4.0	92.4	.36****	12.5****
CHEST PAIN	2.7	1.5	96.8	.46****	2.9
SHORTNESS OF BREATH	6.7	3.2	92.5	.22****	6.8**
INJURY	4.2	2.7	95.6	.34****	2.0
RESTLESSNESS	13.3	6.4	86.2	.23****	14.6****
ANXIETY, NERVOUSNESS	12.1	4.7	86.6	.15****	17.6****
DEPRESSION	9.8	2.5	90.2	.17****	25.3****

NOTES: * P<.05; ** P<.01; *** P<.001

1 Percents reporting complaint or condition experienced in previous two weeks. 2 Percent of pairs agreeing that self-reporter did or did not have complaint. 3 Cohen's Kappa, tested for significant difference from zero, (no more agreement than expected by chance (Fleiss, 1981)).

4 The maximum likelihood ratio with 1 d.f.

TABLE 2

LEVEL OF AGREEMENT BETWEEN SELF- AND PROXY REPORTERS BY PROXY AND HOUSEHOLD CHARACTERISTICS

HEALTH COMPLAINT	LEVEL OF AGREEMENT INDICATED BY KAPPA									
	OVERALL	RELATION ¹		EDUCATION ⁵		CHILDREN		PROXY INTERVIEW DAY		
		WIFE	MOTHER	LOW	HIGH	NONE	SOME	SAME	NEXT	
THROAT PROBLEM	.22*	.31*	.02	.19*	.29*	.22*	.23*	.24*	.12	
HEADACHE	.21*	.21*	.14	.22*	.19*	.32*	.13*	.21*	.21*	
JOINT PAIN	.24*	.22*	.06	.23*	.26*	.23*	.21*	.25*	.13	
SHORTNESS OF BREATH	.22*	.20*	.00	.25*	-.03	.28*	.11	.24*	-.03	
RESTLESSNESS	.23*	.28*	-.03	.24*	.19*	.25*	.21*	.27*	.06	
ANXIETY, NERVOUSNESS	.15*	.17*	.08	.19*	.12*	.08	.22*	.21*	-.04	
DEPRESSION	.17*	.06	.28*	.17*	.17*	.24*	.11*	.11*	.41*	
SINUS TROUBLE ²	.36*	.46*	.03	.31*	.41*	.32*	.39*	.36*	.32*	
ABDOMINAL PAIN	.36*	.30*	.31*	.25*	.46*	.47*	.26*	.39*	-.03	
INJURY	.34*	.31*	.54*	.45*	.23*	.34*	.33*	.18*	.73*	
COLD	.39*	.43*	.18	.43*	.31*	.46*	.32*	.39*	.36*	
FEVER	.30*	.32*	.66*	.16*	.41*	.16*	.41*	.34*	.00	
EYE/VISION PROBLEM	.42*	.33*	.65*	.32*	.66*	.50*	.29*	.43*	.00	
CHEST PAIN	.46*	.49*	.00	.33*	.59*	.53*	.33*	.52*	.00	
BACKACHE ⁴	.44*	.48*	.33*	.43*	.46*	.35*	.50*	.47*	.11	
KNEE PROBLEM ^{3,4}	.44*	.48*	.31*	.57*	.15*	.42*	.47*	.50*	-.06	
ALLERGY ²	.59*	.67*	.21	.66*	.48*	.69*	.51*	.59*	.62*	
RASH ²	.56*	.60*	.00	.61*	.49*	.60*	.52*	.57*	.48*	
EAR/HEARING PROBLEM	.52*	.56*	.66*	.43*	.65*	.52*	.52*	.48*	.79*	
COUGH	.47*	.43*	.63*	.45*	.53*	.49*	.45*	.47*	.50*	
(N of Pairs) ⁶	(408)	(299)	(57)	(232)	(166)	(194)	(214)	(355)	(53)	

NOTES: * P (Kappa=0) <.05. 1 The values of kappa in the combined wife/mother subset are similar to the values for all 408 pairs shown in the "overall" column. 2 Wives show more agreement than mothers (P(z) <.05). 3 Low education proxies show more agreement than high education proxies (P(z) <.05). 4 Proxies interviewed on the same day show more agreement than ones interviewed the day after (P(z) <.05). 5 "Low" education is a high school degree or less. "High" education is any post-high school training. 6 Note that we have a total of only 356 wife or mother proxies, since other relationships accounted for 52 pairs. The number of pairs reporting on a given condition varies slightly due to missing data.

TABLE 3

DEPARTURE FROM SYMMETRY BETWEEN SELF- AND PROXY REPORTERS BY PROXY AND HOUSEHOLD CHARACTERISTICS

HEALTH COMPLAINT	MAXIMUM LIKELIHOOD RATIO UNDER MARGINAL HOMOGENEITY									
	OVERALL	RELATION ¹		EDUCATION ²		CHILDREN		PROXY INTERVIEW DAY		
		WIFE	MOTHER	LOW	HIGH	NONE	SOME	SAME	NEXT	
SINUS TROUBLE	46.2*	21.3*	19.8*	26.7*	18.6*	24.8*	21.6*	37.8*	8.6*	
HEADACHE	66.3*	36.6*	16.3*	50.4*	17.1*	21.2*	45.4*	56.5*	9.8*	
JOINT PAIN	55.3*	35.6*	13.4*	24.3*	34.2*	20.6*	38.0*	43.4*	13.4*	
RESTLESSNESS	14.6*	5.6*	7.4*	6.3*	8.7*	4.6*	11.6*	9.4*	5.8*	
ANXIETY, NERVOUSNESS	17.6*	13.5*	4.8*	5.0*	11.6*	5.6*	14.1*	8.4*	12.2*	
DEPRESSION	25.3*	15.2*	8.6*	26.4*	3.4*	6.7*	19.5*	19.8*	6.9*	
BACKACHE	25.1*	10.2*	8.5*	13.7*	11.6*	7.6*	18.8*	22.2*	2.9	
COUGH	14.0*	12.7*	5.5*	4.3*	14.7*	6.1*	7.9*	12.1*	1.9	
KNEE PROBLEM	10.0*	5.0*	4.0*	11.3*	1.0	5.2*	4.9*	8.8*	1.3	
ABDOMINAL PAIN	12.5*	5.2*	4.0*	10.1*	4.9*	3.1	9.8*	11.5*	1.0	
RASH	16.6*	13.9*	1.4	8.3*	8.3*	6.9*	9.7*	13.9*	2.8	
COLD	11.5*	8.3*	4.2*	8.4*	2.8	0.9	13.7*	8.6*	3.1	
THROAT PROBLEM	9.6*	5.6*	4.9*	10.9*	0.4	2.3	8.2*	8.3*	1.4	
FEVER	5.0*	5.8*	1.4	0.1	11.1*	1.0	5.0*	2.7	4.2*	
SHORTNESS OF BREATH	6.8*	5.0*	1.4	10.8*	0.0	5.0*	2.0	5.8*	1.0	
EYE/VISION PROBLEM	8.7*	5.8*	2.8	9.0*	0.3	2.9	6.2*	7.8*	1.4	
ALLERGY	4.3*	3.4	2.9	1.6	4.0*	5.1*	1.0	7.7*	1.0	
CHEST PAIN	2.9	8.3*	1.4	1.0	1.0	0.2	5.5*	1.3	2.8	
EAR/HEARING PROBLEM	1.5	2.0	1.4	0.3	1.9	0.0	4.0*	1.0	1.4	
INJURY	2.0	0.3	0.3	1.3	0.8	0.1	2.4	2.3	0.0	
(N of Pairs) ³	(408)	(299)	(57)	(232)	(166)	(194)	(214)	(355)	(53)	

NOTES: * P(L²=0) <.05; chi-square with 1 d.f.

1 The values of the maximum likelihood ratio in the combined wife/mother subset are very similar to the values for all 408 pairs shown in the "overall" column. 2 "Low" education of proxy is a high school degree or less; "high" education is any post-high school. 3 Note that we have a total of only 356 wife or mother proxies, since other relationships accounted for 52 pairs. The number of pairs reporting on a given condition varies slightly due to missing data.

TABLE 4

DEGREE OF BIAS IN PROXY UNDER-REPORTING BY PROXY AND HOUSEHOLD CHARACTERISTICS

HEALTH COMPLAINT ²	PROPORTION IN EXCESS OF THAT EXPECTED UNDER SYMMETRY ¹									
	OVERALL	RELATION			EDUCATION		CHILDREN		PROXY INTERVIEW DAY	
		WIFE	MOTHER	LOW	HIGH	NONE	SOME	SAME	NEXT	
SINUS TROUBLE	73.7	65.2	90.0	70.8	77.8	77.8	70.0	72.3	81.8	
HEADACHE	67.9	62.8	76.0	79.7	52.5	63.4	70.7	67.8	68.4	
JOINT PAIN	66.7	61.4	86.7	57.1	85.0	55.6	80.4	63.6	86.7	
RESTLESSNESS	50.0	36.6	80.0	43.8	58.3	37.5	66.7	45.4	66.7	
ANXIETY	55.6	60.0	63.6	44.0	63.0	41.9	73.9	45.0	85.7	
DEPRESSION	75.0	75.0	81.8	92.0	-----	62.5	83.3	71.4	100.0	
BACKACHE	60.0	46.7	81.8	56.1	66.7	48.4	70.6	60.7	-----	
COUGH	53.2	56.8	100.0	37.9	87.5	52.4	53.8	52.4	-----	
KNEE PROBLEM	52.9	44.0	71.4	76.5	-----	50.0	57.1	55.6	-----	
ABDOMINAL PAIN	61.3	50.0	71.4	75.0	57.1	-----	68.4	63.0	-----	
RASH	100.0	100.0	-----	100.0	100.0	100.0	100.0	100.0	-----	
COLD	40.0	42.2	50.0	45.0	-----	-----	56.1	37.9	-----	
THROAT PROBLEM	40.4	41.9	57.1	54.3	-----	-----	51.7	42.2	-----	
FEVER	52.9	66.7	-----	-----	100.0	-----	75.0	-----	100.0	
SHORTNESS OF BREATH	46.7	44.0	-----	70.0	-----	52.9	-----	46.2	-----	
EYE/VISION PROBLEM	66.7	60.0	-----	73.3	-----	-----	77.8	64.7	-----	
ALLERGY	41.7	-----	-----	-----	53.8	75.0	-----	60.0	-----	
CHEST PAIN	-----	100.0	-----	-----	-----	-----	100.0	-----	-----	
EAR/HEARING PROBLEM	-----	-----	-----	-----	-----	-----	71.4	-----	-----	
INJURY	-----	-----	-----	-----	-----	-----	-----	-----	-----	
(N) ³	(408)	(299)	(57)	(232)	(166)	(194)	(214)	(355)	(53)	

NOTES: 1 The proportion in excess of that expected under symmetry in the cell describing proxy underreporting is $100((\text{proportion observed}/\text{proportion expected})-1)$. This proportion is not reported when departures from symmetry were insignificant. 2 Complaints are ordered as in Table 3. 3 Note that we have a total of only 356 wife or mother proxies, since other relationships accounted for 52 pairs. The number of pairs reporting on a given condition varies slightly due to missing data.

TABLE 5

SUMMARY RANKINGS OF HEALTH COMPLAINTS
BY EXTENT OF AGREEMENT AND SYMMETRY OF REPORTS
ACROSS PROXY AND HOUSEHOLD CHARACTERISTICS

HEALTH COMPLAINT	RANK FROM LOW (1) to HIGH (20)	
	DEGREE OF AGREEMENT	DEGREE OF SYMMETRY
COLD	11	12
COUGH	20	8
THROAT PROBLEM	1	13
FEVER	12	14
SINUS TROUBLE	8	1
ALLERGY	17	17
RASH	18	11
EYE/VISION PROBLEM	13	16
EAR/HEARING PROBLEM	19	19
HEADACHE	2	2
JOINT PAIN	3	3
BACKACHE	15	7
KNEE PROBLEM	16	9
ABDOMINAL PAIN	9	10
CHEST PAIN	14	18
SHORTNESS OF BREATH	4	15
INJURY	10	20
RESTLESSNESS	5	4
ANXIETY, NERVOUSNESS	6	5
DEPRESSION	7	6

NOTES: The complaints are ordered as in Table 1. The degree of agreement is ranked as in Table 2 and the degree of symmetry is ranked as in Tables 3 and 4.