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Evaluating the Quality of Self-Reports of Hypertension and Diabetes

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Evaluating the Quality of Self-Reports of Hypertension and Diabetes

Abstract

Researchers and health specialists are increasingly obtaining information on chronic illnesses from self-reports. This study validates self-reports of two major health conditions, hypertension and diabetes, based on a recently fielded survey in Taiwan (SEBAS, 2000). The survey includes both self-reported health information and a physical examination for a large, nationally representative sample of respondents aged 54 and older. Average blood pressure readings, laboratory measures of glycosylated hemoglobin and information on whether the respondent was taking medication for hypertension or diabetes are used to validate respondents' reports of high blood pressure and diabetes. The resulting comparisons reveal that self-reports vastly underestimate the prevalence of hypertension (by almost 50 percent), but yield a reasonably accurate estimate of the prevalence of diabetes (a sensitivity of 83 percent). Significant correlates of the accuracy of the self-reports include age, education, time of the most recent health exam, and cognitive function.

diabetes; hypertension; self-reports; validity, accuracy
Running title: Evaluating the quality of self-reports

Researchers and health specialists alike are increasingly obtaining information about chronic illnesses, conditions, and risk factors for disease from self-reports of the target population. The data, often collected via face-to-face interviews, mail-back questionnaires or telephone interviews, have an obvious advantage over clinical records, namely that they can be obtained readily for a large and representative sample of the population without great expense. Unfortunately, they have a potential drawback as well: the accuracy of the resulting self-reports depends on whether respondents know the relevant information, are able to recall it, and are willing to report it.

In an effort to assess the accuracy of self-reported data on illnesses and conditions, researchers have attempted to compare these data with "gold standards" such as medical or administrative records, medical provider surveys, or measurements obtained from physical examinations. Several notable problems have characterized the majority of these comparisons. Foremost is that few validation studies have been based on a representative sample of a national population. Vargas, C., Burt, V., Gillum, R. et al. [1] lament the lack of nationally representative data for validation studies. (There are some exceptions, such as the National Health and Nutrition Examination Survey (NHANES I) in the U.S.; see ()). Most studies have been limited to restricted geographic regions [2, 3, 4, 5, 6, 7]; relied on volunteers who sometimes comprise a relatively small proportion of the eligible population [4, 8]; or included only persons in good health [8], persons associated with a particular health organization such as an HMO or screening program [2, 9], or patients in hospitals [6]. A second shortcoming is that many validation studies have been based on small samples [4, 5, 8] that limit the ability of the analyst to identify characteristics of the respondents that are associated with inaccurate reporting. A third limitation

of existing research is that almost all studies have been carried out in wealthy Western populations, even though health interview surveys have become critical sources of data in developing and newly industrialized countries.

The objective of this study is to use a recent survey in Taiwan that includes both self-reported health information and a physical examination to validate respondents' reports of two major health conditions: hypertension and diabetes. Several earlier studies have indicated that these two conditions are generally reported more accurately than other chronic illnesses [10, 11, 12]. Taiwan provides an interesting case study for comparison with Western European and North American countries in that its rapid industrialization and economic growth have produced a society with a modern health care system and high life expectancy, yet a substantial fraction of the older population is illiterate or lacks any formal education. The large nationally representative sample on which the Taiwan study is based permits not only unbiased estimation of the sensitivity and specificity of self-reports of these two conditions, but also an examination of how demographic and social characteristics of participants affect the accuracy of the reports. The analysis includes an assessment of the extent to which respondents who participated in the physical examination represent a select subsample of those interviewed.

Materials and Methods

Data

The data used in this analysis are based on a follow-up of the Survey of Health and Living Status of the Near Elderly and Elderly in Taiwan. This longitudinal survey began in 1989 with a national sample (including the institutionalized population) of 4049 persons aged 60 and over and was extended in 1996 to include a national sample of 2462 near-elderly persons, aged

50 through 66 in 1996 [13]. Since the initial interview date, respondents have been re-interviewed at two to three-year intervals. The surveys contain extensive information on household composition and exchanges, emotional and instrumental support, physical and mental health, and health-related behaviors.

In 2000, a national subsample of elderly and near-elderly respondents from the Survey of Health and Living Status was selected randomly to participate in the Social Environment and Biomarkers of Aging Study (SEBAS 2000). These respondents, drawn from about half (27) the primary sampling units in the baseline surveys, were interviewed in their homes between July and December, 2000. Respondents who were willing and able collected 12-hour (overnight) urine samples in their homes and received physical examinations from physicians in nearby hospitals several weeks after their interviews. In order to provide a sufficiently large sample of elderly respondents (those who have been participating in the survey since 1989), this cohort was oversampled relative to their representation in the population – i.e., about half of the respondents selected for interview were elderly (ages 71 and older in the year 2000) and half near-elderly (ages 54 to 70). In addition, urban areas were oversampled relative to rural areas.

Among the 1713 respondents selected for this study, a total of 1497 provided interviews (a response rate of 92 percent among those alive in 1999), and 1023 supplied biomarkers (68 percent of those interviewed). Biomarkers include measures obtained from 12-hour urine samples and blood samples, blood pressure readings, and anthropometric measures such as height, weight, and waist and hip circumference.

The information used to assess the validity of self-reports of hypertension and diabetes in this study derives from both the home-based interviews and the physical examinations. In the interviews, respondents were asked whether they ever had, and whether they currently have, each of 14 specific medical conditions, including high blood pressure and diabetes. As part of the

physical examination, registered nurses took two blood pressure measurements (about one minute apart), using a mercury sphygmomanometer with the respondent in a seated position. These readings were taken at least 20 minutes after the respondent arrived at the hospital. A third blood pressure reading was taken during the physician's examination (at least five minutes later but often considerably longer). Blood samples, collected during the hospital examination, provided estimates of glycosylated hemoglobin (HbA_{1c}) – i.e., a measure of the percentage of hemoglobin molecules in the blood that are bound to glucose, obtained by HPLC assay (by Union Clinical Laboratory in Taipei). This test provides an integrated measure of glucose levels in the blood for the two-to-three month period prior to the test and is currently being used in the U.S. to monitor the effectiveness of diabetes treatment [14].

During the hospital visit, respondents also filled out questionnaires pertaining to their medical histories. As part of these questionnaires, respondents were asked to indicate all current medications. These data permit us to identify participants taking medication for hypertension and diabetes.

Statistical Methods

The estimates presented in this analysis are based on one or both of the following samples: (1) persons interviewed in their homes (1497); and (2) the subset of interviewed persons who participated in the physical exam (1023). The actual sample sizes used at each stage of the analysis are slightly smaller than these values because of the exclusion of persons who were interviewed by proxy (who, by definition, could not provide *self-reports* of illness) and of those with missing values on relevant variables. Proxy respondents constituted 5.4 percent of the interviewed sample and 1.7 percent of those participating in the physical exam.

Accuracy of self-reports.

In order to assess the accuracy of the self-reports, biomedical criteria for hypertension and diabetes are compared with the proportion of respondents who report that they *currently* have high blood pressure or diabetes. Because more than 90 percent of respondents who report that they ever had one of these two conditions also report that they currently have the condition, the estimates would change little if we were to consider self-reports in terms of respondents' ever having had the condition. Almost all respondents who report ever having had these conditions (96.3 percent for hypertension and 96.6 percent for diabetes) indicate that a physician diagnosed the condition.

Respondents were considered to have hypertension according to the definition given in the Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure [15]: systolic blood pressure equal to or greater than 140 mm Hg and/or diastolic blood pressure equal to or greater than 90 mm Hg and/or taking antihypertensive medication. The blood pressure readings were based on an average of the first two readings taken in the hospital, although we explored the robustness of findings to the inclusion of the third reading. Respondents were considered to have diabetes if HbA_{1c} values were greater than or equal to 7.0 percent. Although glycosylated hemoglobin is not routinely used as a screening procedure for diabetes, its high correlation with fasting plasma glucose levels suggests that HbA_{1c} values of about 6.5-7.0 percent indicate a need for diabetic treatment [14, 16].

Estimates of the sensitivity (the proportion of respondents fitting the medical criteria for hypertension/diabetes who report that they currently have the condition) and specificity (the proportion of respondents not fitting the medical criteria for the condition who report that they

do not currently have the condition) of self-reports of hypertension and diabetes are calculated for respondents who participated in the medical exam. Estimates are also presented for the prevalence of these two conditions, as determined separately from self-reports and from medical criteria. The estimates have been weighted by age group and urban vs. rural residence in order to reflect the sampling design of the survey.

Multivariate models.

Multivariate models are used in two stages of the analysis. In the first, logistic models are used to explore the factors that are associated with a respondent's participation in the hospital-based physical examination. In the second stage of the analysis, logistic models are used to identify characteristics that are associated with greater accuracy of reporting of hypertension and diabetes among respondents who participated in the physical exam. For each of these two health conditions, separate models are estimated for the subset of respondents who fit the medical criteria for the condition and the subset who do not. The rationale underlying the use of separate models is that different factors may be associated with a failure to report an existing medical condition and with a claim to have a condition that is not actually present.

The decision as to which explanatory variables to include in the model of participation derives partly from the survey protocol and from information given by respondents regarding the reasons that they declined to participate in the physical exam. Survey protocol prohibited the inclusion of respondents with severe health limitations. In addition, respondents who declined to participate offered the following reasons for their decisions: the examination was too much trouble; the respondent was healthy and hence had no need for the exam; the respondent just had

a physical exam or, in general, had regular checkups; and the respondent's family felt that there was no need for the respondent to participate.

Variables in the model of participation in the physical exam include: demographic characteristics (age, sex), socioeconomic factors (level of education, employment status), coresidence pattern (whether the respondent lives alone, with a spouse only, with children or grandchildren, or with others), timing of the most recent health examination (within the most recent three months, between three months and one year ago, or no visits during the past year), the number of social activities (out of eight) in which the respondent participates, and three measures of self-reported health status. These three health measures entail: (1) the respondent's assessment of his or her current health in terms of five categories ranging from poor to excellent; (2) the number of activities of daily living (out of six) for which the respondent reports having at least some difficulty performing; and (3) a score derived from 10 components of the CES-D scale, with higher values reflecting both more frequent experience of a given depressive symptom within the week prior to interview and experience with a greater number of distinct depressive symptoms during this time.

Given the relatively small sample sizes available for the models of accuracy of self-reports (because persons with and without the condition are considered separately from one another), and the expectation that some of the variables likely to affect participation in the physical exam are unlikely to affect the accuracy of reports (e.g., coresidence patterns), fewer variables are incorporated into the accuracy models. Four of the variables listed above for the participation model are also included in the accuracy models: age, sex, level of education, and recency of health exam. One additional variable is included: an index of cognitive function, calculated as the number of items that a respondent answers correctly. These items are derived

from three tests: the modified Short Portable Mental Status Questionnaire [17], the modified Rey Auditory Verbal Learning Test [18], and a modification of the Digits Backward test [19]. Similar variables have been included in earlier studies of the determinants of the accuracy of self-reports [2, 4, 6, 7]. Additional details pertaining to the construction of the explanatory variables is provided in the footnotes to Table 1.

In order to accommodate the fact that the sampling design for this survey involves weights for age and for urban-rural residence, we introduced these two sets of variables in the logistic models at an early stage of the analysis. However, because urban-rural residence showed little association with the likelihood of participating in the physical exam or with the accuracy of self-reports, this variable was subsequently dropped from the models.

Results

Participation in the physical examination

TABLE 1. Distribution and means of explanatory variables (unweighted) for participants and non-participants in the physical examination, SEBAS (2000).

	Percent or Mean				
Variables	Total	Participants	Non-participants	χ^2 test	*p*-value
Age					
54-59	19,6	22,0	13,8		
60-69	29,8	31,7	25,3		
70-79	40,8	38,4	46,9		
80+	9,7	8,0	14,0	30,08	0,00
Sex					
Male	56,5	58,3	52,1		
Female	43,5	41,7	47,9	4,50	0,03
*Education**					
No formal education	34,9	32,9	40,1		
Primary education	39,6	40,6	37,1		
Secondary education or higher	25,4	26,5	22,9	6,70	0,04

*Employment status**					
Working	20,4	21,9	16,7		
Not working	79,6	78,1	83,3	4,83	0,03
Coresidence					
Living alone	8,0	7,5	9,3		
Living with spouse only	18,1	19,1	15,5		
Living with child or grandchild	71,5	71,5	71,5		
Living with parent or relative or friend	2,4	1,9	3,7	7,25	0,06
Recency of last health exam					
In the past 3 months	20,3	19,5	22,1		
In the past 4 to 12 months	13,8	14,7	11,3		
Not in the past year	64,6	64,6	64,6		
Missing	1,4	1,1	2,0	5,08	0,17
Number of social activities†	0,6	0,7	0,5	30,63	0,00
Number of ADL difficulties‡	0,2	0,1	0,5	55,11	0,00
Self-assessed health					
Excellent	13,4	12,1	16,7		
Good	12,5	13,0	11,6		
Average	45,6	48,0	39,8		
Fair or poor	28,4	27,0	31,9	11,91	0,01
Depression score (CES-D)§	5,9	5,5	6,8	49,52	0,01
Number of correct memory items¶	16,1	16,6	15,1	63,20	0,00
Number of observations	1411	1004	407		

* These variables contain fewer than 10 missing values; missing values were replaced by the modal response according to whether the respondent was a participant or non-participant. village associations, elderly clubs, and elderly education.

‡ The six ADL activities include: bathing, dressing, eating, getting out of bed, moving about the house, and going to the toilet.

§ The 10 CES-D items include: having a poor appetite, feeling that doing anything was exhausting, sleeping poorly, being in a terrible mood, feeling lonely, feeling that people weren't friendly, feeling anguished, unable to gather energy, feeling joyful, and feeling that life was going well. The maximum possible score is 30 points. Respondents indicated whether these experiences occurred during the past week, and if so, whether they happened rarely (1 day), sometimes (2-3 days), or often (4 or more days).

¶ The 12 memory items include address, year, month, day, day of the week, age, mother's maiden name, current president, former president, subtraction by threes, number of items correctly recalled, and repetition of numbers in reverse order. The maximum possible score is 24 points.

Table 1 provides the distribution of explanatory variables used in the statistical models, for participants and non-participants in the physical examination. (All variables except the last are included in the model of participation; the last variable is included in the model of accuracy of self-reports). The overall distributions reveal the relatively large proportion of elderly respondents (owing to the weighted nature of the sample), an excess of males over females (because of the disproportionate migration of males after World War II when the Nationalist army came to Taiwan), the generally low levels of formal education among older Taiwanese, and the large proportion of Taiwanese that live in multi-generational households. Chi-square statistics and the associated p-values indicate whether or not participants are significantly different from non-participants with respect to each of these variables considered one at a time. These variables are considered in a multivariate framework in Table 2.

The estimates in Table 2 – odds ratios and the corresponding confidence intervals – show the effects of these factors on the likelihood that respondents participated in the physical exam when all of the variables are introduced simultaneously into a logistic model. The results indicate that, even in the presence of control variables for respondents' health status, persons older than 70 were much less likely to participate than persons aged 54 to 59 (the omitted category). Sex, level of education, and working status were not significantly related to participation in the health exam. Persons living with "others" (i.e., relatives except for children and grandchildren or non-relatives) were less likely to take part in the exam than those living with children or grandchildren. Surprisingly, the recency of the last health exam was not significantly related to participation. The higher the social activity of the respondent, the more likely he or she was

TABLE 2. Estimated odds ratios and 95% confidence intervals (CI) for

logistic model of the probability that a respondent participates in the physical examination, SEBAS (2000).

Variables	Odds Ratios	95% CI
Age		
54-59	1.00	
60-69	0.81	0.55
70-79	0.51 *	0.34
80+	0.43 *	0.26
Sex		
Male	1.00	
Female	0.81	0.62
Education		
No formal education	1.00	
Primary education	1.07	0.80
Secondary education or higher	1.19	0.84
Employment status		
Working	0.93	0.66
Not working	1.00	
Coresidence		
Living alone	0.89	0.58
Living with spouse only	1.17	0.84
Living with child or grandchild	1.00	
Living with parent or relative or friend	0.47 *	0.23
Recency of last health exam[†]		
In the past 3 months	0.79	0.58
In the past 4 to 12 months	1.18	0.81
Not in the past year	1.00	
Number of social activities	1.16 *	1.01
Number of ADL difficulties	0.72 *	0.62
Self-assessed health		

Excellent	0.52 *	0.36
Good	0.87	0.59
Average	1.00	
Fair or poor	1.05	0.77
Depression score (CES-D)	0.99	0.96
Number of observations	1411	

* p <.05, two-tailed tests

† A dummy variable indicating that the respondent has missing information on the time of the last health exam was also included in the model.

to participate. Consistent with the survey protocol, the results indicate that the greater the number of limitations with respect to activities of daily living (ADLs), the less likely the respondent was to undertake the physical exam. In contrast, the odds ratios for self-assessed health status reveal that respondents in excellent health – not those in fair or poor health – were much less likely to participate than their counterparts reporting average health. The net effect of these counteracting selection processes – the relative exclusion of respondents who perceive themselves to be in excellent health and of persons with numerous functional limitations – is that respondents who participated in the health exam have the same average level of self-assessed health as those who declined to participate. Specifically, the mean values of self-assessed health status (with 1 denoting excellent health, 2 good, 3 average, 4 fair and 5 poor) are virtually identical for the two groups: 2.94 for non-participants and 2.93 for participants (data not shown).

Accuracy of self-reports of hypertension and diabetes

TABLE 3. Comparison between self-reports and medical criteria for hypertension and diabetes (weighted estimates)*, SEBAS (2000).

	Hypertension			Diabetes		
	N	Percent	95% CI	N	Percent	95% CI
Self-reporting condition†	1003	28,8	25,7 , 31,8	1003	13,6	11,3 , 15,8
Medical criteria for condition†	1003	55,5	52,2 , 58,9	1003	14,9	12,5 , 17,3
Sensitivity of self-report	575	48,9	44,4 , 53,3	155	83,9	77,3 , 90,5
Specificity of self-report	428	96,3	94,6 , 98,1	848	98,8	98,1 , 99,5

* These estimates have been weighted by age and urban/rural residence.

† One respondent did not report whether or not they had hypertension and one respondent was missing a measure of glycosylated hemoglobin.

Table 3 presents the proportions of respondents reporting that they currently have hypertension and diabetes, as well as the proportions who satisfy the medical criteria for these two conditions. These estimates indicate that reliance on self-reporting would lead to a vast underestimate of the prevalence of hypertension (by almost 50 percent), but a fairly accurate estimate of the prevalence of diabetes.

The estimates of sensitivity and specificity reveal how the huge discrepancy for hypertension arises. Only half of those who fit the medical criteria for hypertension report having high blood pressure (i.e., the sensitivity is equal to 48.9 percent). In contrast, few respondents (100-96.3 or 3.7 percent) who do not satisfy the medical criteria self-report the condition. In the case of diabetes, not only is the specificity extremely high (98.8 percent), but also the sensitivity is much higher than for hypertension (83.9 percent in contrast to 48.9 percent).

The estimates for hypertension are robust to the use of the average of three rather than two blood pressure readings. Specifically, based on estimates for the 998 respondents with three blood pressure readings (five fewer respondents than shown in Table 3), a change from two to

three readings leads to a slight increase in sensitivity (from 48.7 to 52.2 percent), an even smaller increase in specificity (from 96.3 to 96.8 percent), and a modest decrease in the proportion satisfying the medical criteria for hypertension (from 55.6 to 52.0 percent; estimates not shown).

Table 4 presents the estimates from logistic models that examine the factors associated with accurate self-reports of hypertension and diabetes, separately among those who satisfy and those who do not satisfy the medical criteria for the condition. The respondent's age is significantly associated with the accuracy of reports of hypertension: older hypertensive respondents provide more accurate self-reports than persons below age 60 and older normotensive respondents provide less accurate reports than their younger counterparts.

That is, older respondents are more likely than those 54 to 59 to report hypertension, whether or not they actually have the condition. The results also indicate that, among hypertensive respondents, those with formal education (especially secondary schooling) are more likely to acknowledge the condition than uneducated respondents. Hypertensive respondents who had recent health exams (in the past three months) are more likely to self-report high blood pressure than those who did not have exams in the past year. Neither sex nor cognitive function is significantly related to the accuracy of reports of hypertension.

Only one of the odds ratios for diabetes is significant. The lack of significance of factors affecting the accuracy of self-reports of diabetes, even for variables with odds ratios that are far from unity, arises partly because self-reports of diabetes are so accurate (i.e., the number of inaccurate responses is small). Nevertheless, the odds ratios for age and education are generally in a similar direction to the corresponding values for hypertension. In the case of diabetes (but not hypertension), the results indicate that better cognitive function is associated with significantly higher accuracy of reporting among persons without the condition.

Factors associated with accuracy of self-reports

TABLE 4. Estimated odds ratios (OR) and 95% confidence intervals (CI) for logistic models of the probability that a respondent provides accurate self-reports of hypertension and diabetes, by whether or not the respondent has the condition (based on medical criteria), SEBAS (2000).

	Hypertension				Diabetes			
	With Condition		Without Condition		With Condition		Without Condition	
Variables	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Age								
54-59	1,00		1,00		1,00		1,00	
60-69	2,58 *	1,49 , 4,45	0,35	0,07 , 1,78	2,63	0,69 , 9,93	4,03	0,41 , 39,61
70-79	2,17 *	1,28 , 3,68	0,20 *	0,04 , 0,97	2,89	0,82 , 10,22	0,75	0,19 , 3,03
80+	1,22	0,58 , 2,60	0,53	0,04 , 6,53	4,29	0,41 , 44,82	1,26	0,16 , 9,82
Sex								
Male	1,00		1,00		1,00		1,00	
Female	1,12	0,77 , 1,63	1,02	0,36 , 2,88	0,58	0,19 , 1,73	0,76	0,22 , 2,60
Education								
No formal education	1,00		1,00		1,00		1,00	
Primary education	1,58 *	1,03 , 2,43	0,87	0,25 , 3,01	0,66	0,22 , 1,97	0,69	0,14 , 3,44
Secondary education or higher	2,90 *	1,69 , 4,96	0,56	0,15 , 2,13	1,76	0,36 , 8,65	0,28	0,05 , 1,57
Recency of last health exam†								
In the past 3 months	1,80 *	1,16 , 2,79	1,30	0,36 , 4,72	6,74	0,83 , 55,10	1,29	0,27 , 6,12
In the past 4 to 12 months	1,63	0,99 , 2,67	1,71	0,37 , 7,88	0,46	0,14 , 1,44	1,16	0,24 , 5,56
Not in the past year	1,00		1,00		1,00		1,00	
Number of correct memory items	0,95	0,90 , 1,00	1,07	0,92 , 1,24	0,98	0,85 , 1,12	1,21 *	1,06 , 1,39
Number of observations	572		428		153		839	

* $p < .05$, two-tailed tests

† A dummy variable indicating that the respondent has missing information on the time of the last health exam was also included in the model.

Discussion

A previous analysis [20] based on early waves of data from the Survey of Health and Living Status of the Elderly in Taiwan, as well as the First National Health and Nutrition Examination Survey (NHANES I), examined the consistency of reports of several chronic health conditions across successive interviews of these longitudinal surveys. Overall, the study identified a substantial degree of misreporting in both surveys: older persons who reported certain conditions at one interview (especially stroke and arthritis, and to a lesser extent hypertension and diabetes) frequently failed to acknowledge the condition at a subsequent interview. The present study, which examines the validity rather than the consistency of self-reports for two conditions, confirms this rather bleak assessment – in this case, with regard to hypertension. The accuracy of self-reports of hypertension is too low to provide a plausible estimate of prevalence or to incorporate self-reports into individual-level analyses. The problem stems from the failure of many hypertensive respondents to acknowledge the condition rather than from false claims made by normotensives.

It is possible that the low sensitivity for hypertension stems in part from the use of only two blood pressure readings as the "gold standard" of comparison. However, the robustness of our estimates to the inclusion of a third reading taken at a later time point, and the similarity of our estimate to that obtained by Wu et al. [4], who found a sensitivity of 49.3 percent for hypertension in three northern Taiwanese districts, suggest that other factors must be operative.

The inaccuracy of self-reports of hypertension in the Taiwanese population is unlikely to be attributable to low levels of blood pressure screening. Data for early waves of the Survey of Health and Living Status indicate that 77 percent of the elderly in 1989 (persons aged 60 and over) and 85 percent of this cohort in 1996 had their blood pressure checked within the previous

year. Corresponding estimates for the near-elderly population are a few percentage points lower. According to the 1999 wave of the survey, almost 90 percent of the elderly had visited a doctor in the past year – a frequency of contact with the health care system that is only slightly less than that in the U.S. [21]. However, data from the 1989 survey reveal that the vast majority of elderly persons were not aware of the levels of blood pressure associated with a diagnosis of hypertension or of the health risks associated with this condition. Thus, it is possible that many respondents who meet the medical criteria for high blood pressure in our study never received clear diagnoses from their physicians.

The results for diabetes stand in sharp contrast to those for hypertension. More than four-fifths of respondents whose levels of glycosylated hemoglobin are indicative of diabetes report having the condition and virtually all respondents (almost 99 percent) with normal levels of HbA_{1c} do not acknowledge having diabetes.

Comparison of these results for Taiwan with corresponding estimates for other countries is not straightforward because of the large variability in estimates for a given condition across studies. Nevertheless, our results for diabetes are generally consistent with several studies that find that self-reports of diabetes are more accurate than those for other chronic diseases [1, 7, 10]. However, our results for hypertension suggest much lower levels of accuracy than reported elsewhere – e.g., estimates of sensitivity range between 64 and 91 percent across several countries in Western Europe and North America in contrast to 49 percent for Taiwan [2, 4, 6, 8, 9, 10]. These findings also confirm an important result noted in previous research, namely that the accuracy of self-reports varies a great deal among chronic conditions.

Some insights regarding the poorer reporting of hypertension in Taiwan as compared with Western populations can be gleaned from the analysis of the determinants of the accuracy

of self-reports. The present study identified several significant correlates: age, education, recency of the last health exam, and cognitive function. The much higher acknowledgment of high blood pressure among hypertensive respondents with formal education, particularly those with a secondary education, suggests that the low accuracy of self-reports of hypertension may be attributable in part to the low levels of education among older Taiwanese.

The multivariate analysis also revealed that older respondents (with or without hypertension) are more likely than their younger counterparts to self-report hypertension. This finding stands in contrast to that of Beckett et al. [20] who determined that older Taiwanese respondents who reported chronic conditions at baseline were more likely than younger ones to *fail to* acknowledge these conditions at reinterview. The inconsistent self-reports given by older Taiwanese respondents are probably in part the result of poor recall. In contrast, the greater likelihood that older, as compared with younger, respondents report having high blood pressure (regardless of whether they actually do) is probably related to older individuals having more exposure than their younger counterparts to screening procedures. This finding suggests that memory problems may not be as salient a determinant of the accuracy of self-reports of certain chronic conditions as factors that affect whether respondents have ever received information or a diagnosis about their condition (or at least whether they regularly undergo the relevant screening procedures). However, we have no data to indicate whether Taiwanese with hypertension or other conditions are less likely to receive diagnoses than their counterparts in Western populations.

An important lesson to be drawn from this study is that it is possible to obtain detailed self-reported information *and* extensive medical data from a nationally representative sample of the population. Although about 30 percent of persons interviewed did not participate in the

medical exam in SEBAS 2000, this rate is considerably lower than corresponding values in other studies (for example, more than 80 percent of interviewed persons did not participate in Wu et al.'s [4] clinical study). Given that the vast majority of sampled persons in SEBAS responded to the pre-examination interview, the potential effects of nonparticipation in the medical examination can be readily assessed by a comparison of the characteristics of nonparticipants and participants. These comparisons reveal that respondents who received the medical exam reported the same health status, on average, as those who did not, a result that suggests that, in the aggregate, the resulting estimates from the medical data are not likely to be seriously biased. Thus, data collected in a sample survey of the general population such as SEBAS are much more suitable for an evaluation of the accuracy of self-reports than are the selective samples frequently used in other studies, such as those based on participation in health-care or screening programs. These latter samples, which are probably selective of persons who obtain regular medical care or are highly informed about their health, are likely to yield overly optimistic conclusions about the use of self-reports to estimate the prevalence of chronic conditions.

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