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Final Report

Validation of Behavioral Risk Factor Surveillance System (BRFSS) HRQOL Measures in a Statewide Sample

Craig J. Newschaffer, Ph.D.
Saint Louis University School of Public Health
Prevention Research Center
and
Jefferson Medical College
Center for Research in Medical Education and Health Care

Collaborators:

Jeanette Jackson-Thompson, Ph.D
Division of Chronic Disease Prevention and Control
Missouri Department of Public Health

Michael Counte, Ph.D.
Saint Louis University School of Public Health

Consultant:

Colleen McHorney, Ph.D.
Department of Preventive Medicine
University of Wisconsin-Madison Medical School

Submitted to:

Catherine Hennessy, Dr.P.H., M.A.
Project Officer
Health Care and Aging Studies Branch
Center for Chronic Disease Prevention and Health Promotion
Centers for Disease Control and Prevention
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Precis

This study evaluated the validity of the Behavioral Risk Factor Surveillance System's (BRFSS) core and supplemental health related quality of life (HRQOL) survey measures in a statewide sample of 588 Missouri adults using the Medical Outcomes Study (MOS) Short Form 36 (SF-36) HRQOL assessment as a gold standard. BRFSS items and SF-36 scales varied in similar fashion over sample characteristics believed *a priori* to be associated with HRQOL. BRFSS items also explained the majority of the variation of summary SF-36 measures in this sample. Based on this comparison with the SF-36, the BRFSS HRQOL module appears to have acceptable construct, criterion, and known-groups validity.

Executive Summary

Study goal

The goal of this study was to assess the validity of the Behavioral Risk Factor Surveillance System's (BRFSS) core and supplemental health related quality of life (HRQOL) survey measures in a statewide sample using the Medical Outcomes Study (MOS) Short Form 36 (SF-36) HRQOL assessment as a gold standard.

Methods

A random digit dial telephone survey of 558 Missouri adults was administered. Subjects completed both the BRFSS HRQOL and the SF-36 assessment during the course of a 20-minute interview. Analyses were conducted in different subsets of these 558 interviews, including a representative statewide sample of 401 respondents and subgroups defined on whether or not chronic disease or depression symptoms were self-reported.

Validity is the degree to which an instrument measures what it was intended to measure. Validity can be assessed in several ways. In this study the criterion and construct validity of the BRFSS HRQOL items were evaluated. *Criterion validity* explores the relationships between two or more measures of a concept. Criterion validity assessment of the BRFSS items (using the SF-36 health status module as the standard) was performed in the statewide sample by directly correlating responses to BRFSS and SF-36 questions.

Construct validity explores the underlying concepts the instrument is truly measuring. Commonly, construct validity involves the formation of testable hypotheses about variables the instrument should be associated with and/or predict. Initial analyses of construct validity for each BRFSS HRQOL item and each SF-36 scale/summary were completed using demographic data

collected for the statewide sample. A special type of construct validity assessment, ***known groups validity*** analyses, were performed by examining how BRFSS and SF-36 measures varied in subgroups known to differ on health status.

Findings

- Multiple item SF-36 scales are more resistant to missing values than are single-item BRFSS questions

- Ceiling and floor effects for BRFSS questions and individual SF-36 scales are comparable; but SF-36 summary component scales, as expected, are not subject to this limitation.

- Patterns in BRFSS HRQOL items and SF-36 scales across demographic sub-groups are consistent with expectation and, consequently, are generally consistent with each other. For example, BRFSS items and SF-36 scales both suggested a consistent, positive correlation between increasing household income and better HRQOL.

- The majority (60-65%) of the variation in SF-36 physical and mental component summary (PLS and MCS) measures is explained by distinct subsets of four BRFSS HRQOL questions.

- With respect to PCS, core questions C1 and C2 (general health limitations and not good physical health days) plus optional module questions M1 and M6 (any limitation and pain-limited activity days) form the most coherent, parsimonious, and predictive set of questions.

- With respect to MCS, core question C3 (not good mental health days) and optional module questions M7, M8, and M10 (days sad/depressed/blue,

days with anxiety, and days were health was very good/full of energy) form the most coherent, parsimonious, and predictive set of questions

- Both SF-36 scales and BRFSS items discriminate between the ostensible well group and groups with chronic physical or mental health problems.

Conclusion and Implications

BRFSS HRQOL measures appear to have acceptable construct, criterion and known-groups validity based on this study comparing these items to the SF-36 HRQOL measures in several common population samples. The satisfactory validity of the BRFSS items found in analyses based on this Missouri sample should be generalizable to the US population as a whole. However, the findings here may not have external validity to other specific population groups (e.g., children, institutionalized adults). Further validation studies should focus on the applicability of the BRFSS items in special populations, the sensitivity of the questions to detecting change over time in population HRQOL, and the feasibility and utility of combining BRFSS HRQOL items into summary indices.

Chapter 1

BACKGROUND

1.1. BRFSS measures of health related quality of life (HRQOL)

Recognizing that relevant outcome data for chronic diseases was still lacking in its existing surveillance systems, the Centers for Disease Control and Prevention (CDC) in 1993 expanded the Behavioral Risk Factor Surveillance System (BRFSS) core survey to include four questions designed to assess health-related quality of life (HRQOL) which all states use.[1] The CDC developed an additional 10-question HRQOL module for optional use by the States beginning in the 1995 BRFSS. Over the 1995-1997 period several states incorporated the optional module into their BRFSS survey in one or more years. In 1998 it is anticipated that more than 15 states will use the optional module. The text of the core and optional module BRFSS HRQOL questions is shown in Appendix A.

1.2. Validity Assessment

Validity is the degree to which an instrument measures what it was intended to measure. There are three basic types of validity assessment.[1] The first is ***content*** validity. This refers to the representativeness the items used in an instrument have with respect to the full range of the characteristic being measured. ***Face*** validity is a subjective assessment of content validity performed, typically, by experts in the content area being assessed. The BRFSS HRQOL items were developed through an expert consensus process that was intended to identify or develop brief HRQOL measures covering key global concepts which could be used by states and communities.[2,3] The questions, therefore, have ostensible face validity from that perspective. Section 1.3, below, lists the health dimensions the validation study team felt were touched upon to some degree by the BRFSS questions. Further content validity analyses were not a part of this project.

The second form of validity assessment is ***criterion*** validity. This explores the relationships between one measure of a concept and another of the same phenomenon. ***Concurrent criterion*** validity is an examination of this relationship cross-sectionally, while ***predictive criterion*** validity explores the relationship between the first measure at baseline and the second in the future. Most commonly, these checks compare a new measure to an existing standard. Examination of the concurrent criterion validity of the BRFSS HRQOL questions was one of the two principal comparisons undertaken in this project. The choice of the standard HRQOL measure is discussed in Section 1.3 and 1.4, below.

The third type of validity assessment is ***construct*** validity. This is used to explore the underlying concepts the instrument is truly measuring. Commonly, construct validity involves the formation of testable hypotheses about variables the instrument should be associated with and/or predict. When known groups believed a priori to differ on the construct being measured by the instrument in question are assembled, in order to perform construct validity tests, this is often referred to as ***known groups*** validity. Initial construct validity tests have been performed on the four core questions with respect to their relationships to each other and to respondent demographic characteristics using early responses from the 1993 survey.[4-6] Items in the optional module have also been shown to correlate in expected directions with the self-perceived overall health status item from the core module.[7] This project expands the construct validity assessment of the BRFSS HRQOL items primarily by examining how BRFSS HRQOL is associated with self-reported disease status. In other words, does BRFSS HRQOL discriminate among groups of individuals with and without disease? We will also compare the discriminating ability of the BRFSS HRQOL questions to a criterion measure. Section 1.3 discusses the selection of this criterion measure and section 1.5 discusses the indications of physical and

mental disease used to assemble the populations for known groups validity comparisons.

1.3 HRQOL conceptual models and choice of a comparison measure for criterion validity assessment

A number of different models exist for conceptualizing quality of life. The CDC developed their own working model that included individual, personal-network, and societal/community domains.[2,3] Given the surveillance mission of the BRFSS, the ultimate focus of BRFSS HRQOL questions was placed on objective, individual-level information.[3,5] Table 1.1. displays major individual-level HRQOL dimensions frequently incorporated into measurement systems and indicates which dimensions some common measurement systems capture. The conceptual approach underlying HRQOL measurement via the Medical Outcomes Study Short Form 36 (SF-36) appears to be fairly congruent to that used in the BRFSS modules, at least with respect to these broad dimensions.

While some variation across measurement approaches is beneficial to criterion validity assessments, common adherence to a fundamental conceptual approach is also desirable. This, plus the SF-36's proven psychometric and empirical strength[8,9] as well as the existence of standardized data collection and scoring procedures along with documented telephone survey norms, led to the selection of the SF-36 as the proposed HRQOL standard for the criterion validity assessment of BRFSS HRQOL items.

1.4. The SF-36

The SF-36 is a 36-question instrument which generates eight multi-item scales, each assessing a specific health-related dimension.[10] The individual

Table 1.1. Comparison of health-related dimensions covered by selected health status scales

Health -related HRQOL dimension	CDC-Core (1993)	CDC-Optional (1994)	SF-36 (1992)	Duke 17-Item (1990)	Nottingham Profile (1980)	McMaster Index (1988)
Physical health/functioning	X		X	X	X	X
Mental health	X		X	X	X	X
Self-esteem				X	X	X
Role functioning		X	X			
Social functioning			X	X		
General health	X	X	X			
Pain		X	X	X	X	
Vitality		X	X	X	X	
Sleep		X		X		

Adapted from a presentation by Colleen McHorney at the Saint Louis University School of Public Health 4/95. Used with permission

SF-36 items are shown in Appendix B and the eight scales, with conventional abbreviations, are listed below.

Scale	Abbreviation
Physical functioning	PF
Social functioning	SF
Role limitation due to physical problems	RP
Role limitations due to emotional problems	RE
Mental health	MH
Energy/vitality	VI
Bodily pain	BP
General health perception	GH

Table 1.2 (on the following page) shows these dimensions, plus any additional dimensions we believe are tapped through the BRFSS HRQOL items but not measured directly as a discrete SF-36 scale, with an indication of the number of individual questions on each instrument pertaining to each dimension. The BRFSS consistently relies on fewer items per concept than the SF-36. In addition to the eight dimension-specific eight SF-36 scales, two summary scales capturing underlying physical and mental health have also recently been developed. These two scales (abbreviated respectively as PCS and MCS) were incorporated as dependent variables for certain analyses. SF-36 scales are discussed in more detail in Section 3.4.

1.5. The SF-12

The project also included a comparison of BRFSS questions to SF-12 measures. The SF-12 is a shorter HRQOL assessment instrument comprised of a subset of the 36 questions on the SF-36. The SF-12 generates two summary measures analogous to the

Table 1.2. Comparison of number of items devoted to specific HRQOL dimensions in the SF-36 and BRFSS HRQOL modules

	Number of items	
Health -related concept	SF-36	BRFSS
Physical health		1
Physical functioning	10	
Mental health	4	3
General role functioning (physical and emotional)		2
Daily role functioning (physical and emotional)		2
Daily role functioning (physical)	4	
Daily role functioning (emotional)	3	
Personal care functioning		1
Social functioning	2	
General health	5	1
Sleep		1
Pain	2	1
Vitality	4	1

PCS and MCS (abbreviated as the PCS_12 and the MCS_12). It does not produce scales for the eight health dimensions underlying the SF-36.

Chapter 2

RESEARCH OBJECTIVES

The research completed under this project involved a telephone survey of 558 Missouri residents. Data from a representative statewide sample (n=401) were used in several analyses, while others employed the full data set typically divided into relevant analytic subgroups. The four analytic subgroups most commonly used are: 1) individuals reporting chronic conditions but no depression indications, n=195; 2) individuals with depression indications but no listed chronic conditions, n=70; 3) individuals with both chronic disease and depression indications, n=117; and 4) individuals not reporting chronic disease also without indications of depression/dysthymia, n=176). Comparisons within and across these groups were used to assess the criterion and known-groups validity of the BRFSS HRQOL modules.

From the data gathered through this survey the following analyses were performed:

- descriptive analysis of demographics in the two samples and four primary analysis subgroups and descriptive, construct validity analyses of each BRFSS HRQOL item and each SF-36 scale/summary in the statewide sample;
- assessment of criterion validity (using the SF-36 health status module as the standard) in the statewide sample
- evaluation of the ability of the BRFSS HRQOL items to discriminate between known health status groups (chronic-disease, depression/dysthymia, and disease-free) as compared to the SF-36.

Each of these analytic areas is covered in a distinct chapter of this report (Chapters 4-6). Within each of the four analytic areas, analyses were performed as described in the project proposal. In addition, certain supplemental analyses were performed. These will be described in the chapters devoted to the relevant analytic area.

Chapter 3

DATA COLLECTION AND MEASURES

3.1 Study Samples

Three samples from the Missouri adult population were drawn for this study, each using two-stage random cluster telephone sampling technique following Mitofsky-Waksberg method.[11] Primary sampling units (PSUs or "clusters") were identified based on the first eight digits of Missouri phone numbers (area code, exchange and the next two digits following the exchange). The last 1493 of these PSUs remaining from the 1995 BRFSS CDC Missouri phone seed list (6000 phone numbers) were used to establish a sampling frame of PSUs containing residential phone numbers. Seed phone numbers in these PSUs were screened for residential phone numbers with 243 PSUs identified as residential clusters. Each of these PSUs contained one hundred potential phone numbers. In the first stage for a given sample, a PSU is randomly selected. Than from within this PSU of 100 possible phone numbers, single phone numbers were randomly selected and called until three completions were registered. At that point another PSU is randomly selected. This process continued until the desired number of responses was achieved.

The first two samples were drawn to be representative of the Missouri adult population, involving no over-sampling, and were combined to form the "general population" analysis group. The first sample used 67 clusters and garnered 199 completions while the second sample used 67 clusters for 202 completions. Our goal was to have a single 400-person analysis group representative of Missouri adults. However, we wanted to vary randomly the order in which respondents were asked the two HRQOL instruments of prime interest, the BRFSS and the SF-36. Consequently, two separate samples were used to facilitate this random ordering, as one sample received the

BRFSS early in the interview and the second received the SF-36 first. However, the intent was always to create a single general population sample by combining these two smaller samples. This combined general population sample is referred to throughout the remainder of the report as the "Statewide sample." It had a final *n* of 401.

The third sample was constructed to oversample individuals reporting chronic disease or depression. The distribution of these conditions in the general population sample was reviewed to help set the size of the oversample. Our goal was to have approximately 200 individuals reporting chronic physical disease, 200 individuals with indications of depression, and 200 with indications of neither. While we had nearly 200 individuals reporting chronic disease in the general population group (n=197), for approximately 40 percent of these the only condition reported was either hypertension or arthritis. Because we wanted to be sure that our final chronic disease analysis group included enough individuals whose quality of life would be affected by chronic disease, we decided to proceed with oversampling on chronic disease as well as depression.

The first module of the interview instrument (see Section 3.2, below) was used as a screener for the oversample. Fifty-five clusters were selected and 157 interviews completed in order to ascertain an additional 115 individuals reporting at least one chronic condition and 96 individuals screening positive for depression. These 157 respondents are referred to throughout the remainder of this report as the "Special Sample."

3.2 Survey Instrument

The survey instrument, included in Appendix C, was comprised of seven modules. The first module included the chronic disease questions and depression screening items mentioned in Section 3.1 and served as the screener for the oversample. The initial question in this module was the

standard self-rated health question ("Would you say that your general health is: excellent, very good, good, fair or poor?") which also is the first item on the BRFSS and the SF-36. Next was a general health transition question (last year compared to this year) that is included as the second question on the SF-36. Following these general health questions came the chronic disease and depression items. Respondents were read a list of ten conditions (hypertension, angina, heart attack, congestive heart failure, cancer except for skin cancer, stroke or cerebrovascular accident, problems with lungs or respiratory system like chronic bronchitis, asthma, emphysema, or tuberculosis, arthritis or rheumatism, diabetes, or hearing impairment) and indicated for each whether they were ever told by a doctor or another health professional that they had that condition. Conditions were picked because of their anticipated association with HRQOL. In addition, multiple cardiovascular conditions, which vary in terms of average severity, were included to explore the HRQOL measures' ability to discriminate severity within a single disease category.

Following the chronic condition checklist was a three-question initial screen for depression/dysthymia (heretofore referred to as depression). The questions in the three-item depression screener are drawn from the Diagnostic Interview Schedule (DIS) and have been validated as a screen for depression in the Epidemiologic Catchment Area sample and subsequently used in the Medical Outcomes Study.[12] This screener is sufficient for establishing groups for the known-groups validation analysis, with 93% sensitivity and 72% specificity against the full DIS.[13]

This second module included five chronic disease behavioral risk factor questions. One question was on physical activity/exercise participation, three on cigarette smoking (ever, current, amount), and one on daily fruit and vegetable consumption.

Next came one set of HRQOL questions, either the remaining items from the BRFSS or those remaining from the SF-36. The BRFSS questions were

given exactly as in a BRFSS interview, with the only exception being the administration earlier in the interview of the general health question. The SF-36 items were taken from the interview script provided in the *SF-36 Health Survey Manual and Interpretation Guide.*[14] A typographical error in Q23 of the published version was corrected ("physical activities" changed to "social activities"). In addition, pretesting revealed difficulties with the suggested probe for the series of questions on activity limitations. The SF-36 guide suggests when confronted with a response such as "I don't do any vigorous activities so I don't know how limited I am!" to prompt with "Is that because of your health?" In the pretest, although the probe was not often needed, when it was used the responses were still insufficient to code in the given categories. Therefore, we inserted a different probe, which was "if you tried to do (substitute in the particular activity) would you be limited a lot, limited a little, or not at all limited." This probe was more effective at minimizing respondent and interviewer frustration. It does, however, change the type of speculation involved, putting the onus on the respondent rather than instituting assumptions such as a response to the original probe that a lack of a given activity is not because of health should translates into "not limited." Given the overall infrequency of the need to probe on these items and the multi-item nature of SF-36 scales, this change likely had very limited impact on scale scores.

Following the first HRQOL module, another series of 14 questions, largely soliciting sociodemographic data, were asked. Wording for sociodemographic questions was drawn directly from the BRFSS. Also imbedded in this module were two questions on height and weight.

The set of eight questions covered unmet health needs and was adapted from an unmet health care needs module developed for the BRFSS.[15] It includes a question asking respondents to identify where they usually go for a health problem, the same item historically used on BRFSS surveys, and continues with five questions on the presence (Yes/No) of specific unmet

health service needs. The unmet need module developed by S. Diwan included two follow-up questions in each of the five health service areas, but these were omitted in the interest of space. This section ends with two questions on health insurance coverage (presence and duration uninsured if no coverage). These questions were drawn from a special telephone survey of health insurance status conducted by the Missouri Department of Health in the months preceding the fielding of this validation study.

The next set of questions comprises a short module on social support. We were interested in capturing received and perceived social support as well as being able to look at emotional, instrumental and intellectual support. Most instruments that cover all of these aspects of social support are unacceptably (extremely) long. Therefore, we developed a new eight-question tool. The first two items ask for number of contacts with family and friends, respectively, in the last two-week period. Then a series of three questions ask for respondent's perceptions on the amount of emotional, instrumental and intellectual support followed by three questions on satisfaction with that support. Using a new tool brings with it the obvious disadvantages of unproven reliability and validity. Since correlations between social support and HRQOL are just one type available to support the more minor goal of construct validity assessment, we felt comfortable using untested, original questions in this single area.

Following the social support questions comes the second HRQOL module. If the respondent was earlier given the BRFSS HRQOL questions, then SF-36 questions are given here and vice versa. Questions here begin with the second item in the BRFSS or the third item in the SF-36 module since, as mentioned above, the common first question, self-rated health, was already given as part of the initial module. The interview concludes with the last question on the second HRQOL module.

3.3. Field Procedures

Two pilot studies of twenty interviews each were completed in February 1996. The first pilot study was used to reveal overt problems in item ordering, skip patterns, etc., and was done with hard copy questionnaires. After modifications were made to the questionnaire, as discussed above in 3.2., the second pilot was done using the Computer Assisted Telephone Interview software and hardware. This second phase tested the CATI programming and confirmed our estimated completion time The mean completion on the second pilot was 19 minutes with a full distribution of completion times included in Appendix D.

Study interviews were conducted in March and April of 1996. Selected phone numbers were called up to five times to reach an adult who could verify eligibility criteria. If interviews could not be completed immediately, arrangements for callbacks were made.

3.4 Common analysis variables

Appendix E includes the variable codebook created for survey data sets. The majority of questions translated directly into dichotomous, categorical, or continuous analysis variables. Some of these single-item variables were used in alternative forms in different analyses. For example, the self-rated health question (C1) was considered as a five-category ordinal item in most analyses, but was also viewed as a continuous score variable ranging from one to five in a limited number of analyses. Infrequently used alternative coding schemes will be described in more detail within the methods subsection of the analysis chapters (Chapters 4-6) where that coding was used.

Questions from the first (screener) module were recoded to form a disease status summary variable with the following levels: 1) one or more reported

chronic disease and depression screen positive; 2) one or more reported chronic disease but depression screen negative; 3) no reported chronic disease but depression screen positive; and 4) no reported chronic disease and depression screen negative. This variable was used to define four principal analytic subgroups created by pooling the Statewide and Special samples and stratifying by chronic disease/depression screen status. These analytic groups were created to allow for comparison of groups expected, *a priori*, to have differing health related quality of life. It was not necessary that all members of any one group be completely homogenous on chronic disease or depressive symptoms, but it was intended that across-group variation exceed within-group variation. Note, that there was no attempt to define a completely disease free group. The ostensible most-healthy group was comprised of individuals who did not self-report one of a fixed list of common chronic conditions (individuals may have been diagnosed with other, rarer chronic diseases) or who may have been false negatives on the depression screen (3 out of 10 depression screen negatives are believed to be false negatives).

BRFSS HRQOL questions were typically analyzed as discrete items. Continuous "numbers of days" in the past month variables were categorized in some analyses using cutpoints previously developed by CDC: 0 days; 1-2 days; 3-7 days; and >= 8 days. The "good health days" measure, also previously developed by CDC, was created and used in a number of project analyses. This variable is equal to 30 minus the sum of the number of "not good" physical and "not good" mental health days reported by a respondent. If either or these values were missing, then the good health days measure was missing. Good health days are set to "0" if respondents report more than 30 combined "not good" physical and mental health days. This algorithm only partly accounts for the fact that poor physical and mental health days may overlap and, as such, is a conservative estimate of the number of "good

health" days. No other algorithms have been developed for combining BRFSS items into summary measures of HRQOL.

Responses to the SF-36 questions were used to create the eight standard scales mentioned in Section 1.3. These eight scales represent the most important health concepts out of a larger set of 40 studied as part of the Medical Outcomes Study (MOS). Psychometric techniques were used to select the best, limited subset of items from MOS interviews to reproduce each scale. Each scale in the SF-36 is summative (i.e., a Likert scale), which involves the inherent assumption that responses to specific component items are linearly related to the underlying concept. All scale scores are standardized and range from 0 to 100, with increasing score implying more optimal status. Multi-item measurement approaches for complex characteristics (such as quality of life) are believed to be superior to single items because they are less likely to be correlated with extraneous factors, more likely to allow finer distinctions on the characteristic being measured, and generally more reliable.[16] Each of these scales has been shown to be internally consistent in community-populations.[8,17]

Following the development and application of the initial eight SF-36 scales, researchers constructed component summary scales from factor analyses of the correlations among the eight component scales. These analyses appeared to identify two distinct factors; one more correlated with the "physical" SF-36 scales the other more correlated with the "mental" SF-36 scales. Hence, these were referred to as the physical component summary (PCS) and the mental component summary (MCS). The PCS correlates most closely with the physical functioning, role physical, and bodily pain scales while the MCS correlates most closely with the mental health, role-emotional, and social functioning scales. The other two SF-36 scales (general health and vitality) have substantive correlations with both PCS and MCS. It is also noteworthy that the social functioning scale does show significant correlation with the PCS, as well as the MCS.[18]

Like the SF-36 scales, the PCS and MCS range from 0 to 100 with higher score indicative of better health status. However, unlike the SF-36 scales, these measures are transformed so that a value of 50 is equivalent to an estimate of the US population average for that measure based on SF-36 validation study populations. For a given individual, these measures are constructed by first calculating that individual's SF-36 scale scores, then converting those into a standardized normal deviate (using the US population mean and standard deviation from SF-36 validation study), then multiplying each of those Z scores by the corresponding factor coefficient from the factor analyses used to derive the PCS and MCS. The final step is the transformation mentioned above.

The PCS and MCS are believed by SF-36 researchers to be the best single measures, respectively, of physical and mental health (based on the psychometric and clinical validation studies of McHorney, Ware and Raczek[8]). However, the eight component scales are clearly capturing additional aspects of HRQOL above those measured by the PCS and MCS and are also related, to varying degrees, to physical and mental health. Ware et al.[10] indicates that the PCS and the MCS have been shown to be internally consistent and to discriminate between known health status groups as expected. However, the PCS and MCS measures do have some psychometric limitations (e.g., for an individual to have a "perfect" physical health summary score the scaling algorithm *requires* there to have been some responses unfavorable with respect to mental health). This suggests that they are not "pure" measures of the underlying dimensions of physical and mental health.

The SF-12 versions of the PCS and the MCS (the PCS_12 and MCS_12) explain 90% of the variance of the full PCS and MCS, respectively, in validation studies.[19] The SF-12 uses two items to estimate scores for four of

the eight SF-36 scales and one item to estimate the score for the other four scales.

Chapter 4

DESCRIPTIVE ANALYSES

4.1 Overview

The descriptive analyses discussed in this section serve several purposes. First, they present a picture of the study population, useful for considering the generalizability of the analyses done here and for comparison of these findings to those in other populations. Second, many of them provide initial assessments of construct validity as observed patterns in HRQOL measures across certain demographic categories (e.g., age, income) can be informally compared with *a priori* expectations about relationships between these characteristics and HRQOL.

There are three types of tables included in this section. First are general characteristics of the two study samples (Statewide and Special) and the four analytic subgroups defined by chronic disease/depression-screen status. Next are a series of tables presenting detailed descriptive statistics for the continuous and categorical BRFSS HRQOL items in the statewide sample. These are followed by detailed descriptive statistics for SF-36 scales and component summaries in the statewide sample. Finally, a table is included showing the difference between the distribution of SF-36 HRQOL scales and component summary scores across the Missouri statewide and a published U.S. national sample.

4.2 Methods

Despite the fact that a complex sampling design was used to collect these data, all descriptive statistics presented are unweighted. The unweighted estimates are adequate for discerning general patterns in estimates, with post-weighting fluctuation of estimates likely to be minimal, but any standard errors calculated from proportions or standard errors shown would

not reflect the true standard error. Sampling weights are available should the need for developing weighted estimates in this data set ever arise.

Frequency distributions for each demographic and disease status variable are displayed in each study sample and analysis subgroup. Detailed descriptive statistics for HRQOL variables (BRFSS and SF-36) are shown for the statewide sample. For continuous HRQOL variables (e.g., SF-36 scale scores or BRFSS health days variables) means, standard deviations, medians, and quartiles are shown. Also included are the proportions of responses at the most extreme possible values (the "floor" and "ceiling" percentages). Information on the number of valid respondents (and, conversely, number missing are also shown). A subset of these continuous variable descriptives (mean, standard deviation, median, and sample size) are also presented for demographic subgroups within the statewide sample defined by sex, race, age, and household income.

For the BRFSS categorical HRQOL variables (e.g., self-rated health and activity limitation questions), frequency distributions are shown for the full state-sample and demographic subgroups based on the same variables mentioned previously.

Finally, in order to gain some general inferences on generalizability of findings in this Missouri population to the nation as a whole, a comparison of the central tendency and distribution of the SF-36 HRQOL scales and component summaries in the Missouri sample used in this study and published values from full United States samples is provided. No statistical testing of Missouri-United States differences is done because, as mentioned, the Missouri data are unweighted.

4.3 Findings

Table 4.1 presents demographics of study samples and subgroups. The overall distribution of demographic variables in the statewide sample

Table 4.1. Demographic characteristics of study samples and analytic subgroups

	Study Sample/Analytic Group					
BRFSS Question	Statewide Sample (%) (n=401)	Special Sample (%) (n=157)	Both Chronic Disease & Depression Pos. (%) (n=117)	Any Chronic Disease & Depression Neg. (%) (n=195)	No Chronic Disease & Depression Pos. (%) (n=70)	No Chronic Disease & Depression Neg. (%) (n=176)
Sex						
Male	40.1	34.4	30.8	41.0	34.3	42.6
Female	59.9	65.6	69.2	59.0	65.7	57.4
(n missing)	(0)	(0)	(0)	(0)	(0)	(0)
Age						
18-29	19.5	18.1	12.9	5.7	32.1	30.7
30-44	30.0	23.2	26.7	13.5	37.1	41.5
45-64	31.5	31.0	36.2	37.3	22.9	25.0
65+	19.0	27.7	24.1	43.5	2.9	2.8
(n missing)	(1)	(2)	(1)	(2)	(0)	(0)
Race						
White	86.5	89.7	85.5	85.6	92.9	88.1
Black	10.0	7.7	12.8	9.2	5.7	8.5
Other races	3.5	2.6	1.7	5.1	1.4	3.4
(n missing)	(0)	(1)	(0)	(0)	(1)	(0)
Domestic partner						
Yes	54.8	50.3	42.9	61.0	41.4	56.7
No	45.2	49.7	57.0	38.5	58.6	43.4
(n missing)	(6)	(2)	(3)	(1)	(0)	(3)
Education						
<H.S.	13.7	21.8	21.5	21.5	12.9	7.4
H.S. grad	32.4	37.8	37.1	36.4	28.6	31.3
Some college	27.2	25.0	25.9	24.1	32.9	27.3
College grad	26.7	15.4	15.5	17.9	25.7	34.1
(n missing)	(0)	(1)	(1)	(0)	(0)	(0)

-continued-

Table 4.1. (continued) Demographic characteristics of study samples and analytic subgroups

	Study Sample/Analytic Group					
BRFSS Question	Statewide Sample (%) (n=401)	Special Sample (%) (n=157)	Any Chronic Disease & Depression Pos. (%) (n=117)	Any Chronic Disease & Depression Neg. (%) (n=195)	No Chronic Disease & Depression Pos. (%) (n=70)	No Chronic Disease & Depression Neg. (%) (n=176)
Employment status						
Employed	61.8	45.9	42.7	44.6	65.7	77.6
Unemployed	4.2	3.2	6.0	3.1	4.3	3.4
Out of labor force	33.9	51.0	51.3	52.3	30.0	18.8
(n missing)	(0)	(0)	(0)	(0)	(0)	(0)
Household Income						
<$15,000	31.5	48.5	53.4	38.3	36.9	22.9
$15,001-$24,999	27.9	23.5	22.3	24.6	30.8	30.1
$25,000-$50,000	30.4	23.5	19.4	31.7	27.7	31.3
>$50,000	10.1	4.4	4.9	5.4	4.6	15.7
(n missing)	(36)	(21)	(14)	(28)	(5)	(10)

generally reflects that known for the Missouri population. The group is 60 percent female with an average age of 47 years. The group is predominately white. Just over half the respondents had a domestic partner and, similarly, just over half attended college. Over sixty percent were currently working and the median household income is interpolated to be approximately $32,000.

The change in the distribution of these variables in the oversample and analytic subgroups are as expected. The oldest subgroup are those with a chronic disease and depression negative, while the youngest are the no chronic disease and depression negative subgroup. Women are disproportionately represented among both groups defined in part by a depression screen positive as are individuals without domestic partners, despite the fact that these groups tend to be younger. The ostensibly healthiest group has the greatest proportions of college-attending, employed, and more affluent individuals, respectively.

Table 4.2 shows the distribution of specific chronic conditions and depression screen positive in the two samples and four analytic groups. The most prevalent conditions in all samples and analytic groups including individuals reporting these conditions were arthritis, hypertension and chronic respiratory problems. Hearing impairment, diabetes and cancer histories are the next most commonly reported conditions from our screener. The prevalences in the statewide sample are generally similar to those in the published prevalences from the 1994 National Health Interview Survey for the median adult age group (age 45-64).[20] For example, the national estimates for hypertension, stroke, arthritis, diabetes and hearing loss are 22.2%, 1.8%, 23.9%, and 6.3% compared to 23.9%, 3.3%, 26.0%, and 8.2% in the statewide sample.

Table 4.3 shows data on the few, basic chronic disease risk factors for which data were solicited. Interestingly, the analytic group comprised of

Table 4.2. Distribution of prevalent chronic conditions in study samples and analytic subgroups.

	Study Sample/Analytic Group					
BRFSS Question	Statewide Sample (%) (n=401)	Special Sample (%) (n=157)	Any Chronic Disease & Depression Pos. (%) (n=117)	Any Chronic Disease & Depression Neg. (%) (n=195)	No Chronic Disease & Depression Pos. (%) (n=70)	No Chronic Disease & Depression Neg. (%) (n=176)
Chronic Disease						
Any	49.1	73.2	100	100	0	0
Hypertension	23.9	30.1	45.4[1]	47.0	0	0
Angina	4.5[3]	11.0[3]	13.0[2]	8.8[3]	0	0
MI* History	3.5[1]	10.9[1]	9.3[1]	11.2[1]	0	0
Congestive Heart failure	2.3[1]	7.7[1]	4.1[1]	11.2[1]	0	0
Cancer	5.7	14.6	14.9	14.5	0	0
Stroke	3.3[1]	5.8[1]	7.2[1]	6.9[1]	0	0
Chronic lung disease	14.0	26.8	29.2	35.0	0	0
Arthritis	26.0[1]	36.5[1]	58.5[1]	53.8	0	0
Diabetes	8.2	13.4	16.4	18.8	0	0
Hearing loss	6.8[1]	16.0[1]	17.0[1]	16.2	0	0[1]
Depression screen positive	22.7	61.1	0	0	100	0

* Myocardial infarction or "heart attack"

1-3, 5: superscripts indicate number of missing values when present.

Table 4.3. Chronic disease risk factor distribution in study samples and analytic subgroups

	Study Sample/Analytic Group					
BRFSS Question	Statewide Sample (%) (n=401)	Special Sample (%) (n=157)	Both Chronic Disease & Depression Pos. (%) (n=117)	Any Chronic Disease & Depression Neg. (%) (n=195)	No Chronic Disease & Depression Pos. (%) (n=70)	No Chronic Disease & Depression Neg. (%) (n=176)
Ever smoked						
Yes	48.3	52.2	55.5	46.4	52.9	47.2
No	51.8	47.8	44.4	53.6	47.1	52.8
(n missing)	(1)	(0)	(0)	(1)	(0)	(0)
Current smoker						
Yes	22.0	28.7	29.9	28.0	31.4	23.3
No	78.0	71.3	70.1	82.0	68.6	76.7
(n missing)	(1)	(0)	(0)	(1)	(0)	(0)
Amount smoked among current smokers						
<=10 cig/day	28.7	22.2	17.6	31.4	22.7	31.7
11-20 cig/day	50.6	48.9	50.0	42.4	54.5	53.7
21-39 cig/day	14.9	15.6	17.6	20.5	13.6	9.8
>=40 cig/day	5.7	13.3	14.7	5.7	9.1	4.9
(n missing)	(1)	(0)	(1)	(0)	(0)	(0)
Physical activity in last month						
Yes	65.0	66.2	53.0	63.9	62.9	76.1
No	35.0	33.8	47.0	36.1	37.1	23.9
(n missing)	(1)	(0)	(0)	(1)	(0)	(0)
Daily fruit and vegetable servings						
0-2	39.1	47.9	49.5	35.2	44.1	42.9
3-4	40.9	33.6	34.2	40.7	41.2	38.7
5-6	11.9	11.4	8.1	16.5	7.4	10.7
6+	8.0	7.1	8.1	7.7	7.4	7.7
(n missing)	(15)	(17)	(6)	(13)	(2)	(8)

individuals reporting one or more chronic disease without depressive symptoms had the most favorable smoking and fruit and vegetable intake patterns. This suggests that these individuals might have made lifestyle changes in response to their diseases. However, this hypothesis does not account for the low prevalence of ever smoking which is, perhaps, reflective of a social desirability bias on this item in this group.

Table 4.4 shows the descriptive statistics for continuous BRFSS HRQOL items in the statewide sample. The letter and number prior to the question description indicate whether the item is from the core (C) or optional module (M) and the order the item is asked. Note that the small sample sizes for questions C4 and M3 reflect the fact that these questions are only asked of subjects providing specific responses to the preceding items. Many of these items have large floor or ceiling effects. For example over 65% of all respondents reported zero "not good" physical health or zero "not good" mental health days. Given this the 50% ceiling effect for good health days is expected.

Table 4.5 displays summary descriptive statistics on continuous BRFSS HRQOL items stratified by sex, race, age and income. While presented as descriptive tables, these give some indications of face validity as the pattern in BRFSS HRQOL items over these groups can be compared to a priori expectation and the pattern seen for the SF-36 variables over these same demographic groups (Table 4.8). Women, on average, tend to have mean values on all items, except for M10, consistent with poorer HRQOL. Although the sample size is small, Blacks also tend to have values more consistent with poorer HRQOL than whites. The expected trends over income levels also materialize. Age trends are also fairly striking and consistent with expectations; except, perhaps for the days full of energy item. Days without sleep is interesting in that it is higher at higher incomes and younger ages.

Table 4.4. Descriptive statistics for continuous Core and optional Module BRFSS HRQOL questions in the **STATEWIDE SAMPLE**

BRFSS Question	Mean	S.D.	Median	25th %	75th %	Min	% Floor	Max	% Ceiling	n	n miss
C2. "Not Good" physical health days	3.4	7.7	0	0	2	0	65.3	30	6.1	395	6
C3. "Not Good" mental health days	3.0	7.1	0	0	2	0	68.2	30	3.8	393	8
Good health days	23.6	10.1	29	23	30	0	8.8	30	50.4	387	14
C4. Days kept from activities	1.5	4.9	0	0	0	0	81.5	30	1.8	399	2
M3. Length of limitation (months)	101.5	165.7	60	1	10	0.01	0	39	0	65	3
M6. Pain-limited activity days	2.3	6.5	0	0	0	0	76.3	30	4.0	397	4
M7. Days sad, blue, depressed	2.5	6.1	0	0	2	0	67.1	30	2.3	392	9
M8. Days anxious, worried, tense	4	7.6	1	0	4	0	48.2	30	5.1	392	9
M9. Days without enough sleep	6.2	8.9	3	0	7	0	38.9	30	7.3	398	3
O10. Days full of energy	20.5	10.3	25	15	30	0	7.9	30	29.3	392	9

Table 4.5. (continued) Descriptive statistics for continuous Core and Optional BRFSS HRQOL questions on the **STATE SAMPLE** stratified by key demographic variables.

BRFSS Question	Age											
	18-29			30-44			45-64			65+		
	Mean	S.D.	Median	Mean	S.D.	Median	Mean	S.D.	Median	Mean	S.D.	Median
C2. "Not Good" physical health days	2.2 (n=78) (nmiss=0)	4.5	0	2.9 (n=120) (nmiss=0)	6.3	0	3.2 (n=123) (nmiss=3)	7.9	0	5.8 (n=73) (nmiss=3)	11.1	0
C3. "Not Good" mental health days	2.7 (n=77) (nmiss=1)	5.8	0	3.7 (n=119) (nmiss=1)	7.7	0	3.3 (n=121) (nmiss=5)	8.0	0	1.6 (n=75) (nmiss=1)	5.6	0
Good health days	25.1 (n=77) (nmiss=1)	7.2	28	24.1 (n=119) (nmiss=1)	9.1	28	25.2 (n=118) (nmiss=2)	9.3	30	23.6 (n=72) (nmiss=4)	11.3	30
C4. Days kept from activities	1.0 (n=78) (nmiss=0)	3.7	0	1.3 (n=119) (nmiss=1)	3.6	0	1.9 (n=125) (nmiss=1)	5.7	0	1.8 (n=76) (nmiss=0)	6.3	0
M3. Length of limitation (years)	3.8 (n=4) (nmiss=0)	6.8	0.5	10.0 (n=17) (nmiss=0)	10.4	9	5.3 (n=23) (nmiss=1)	5.1	3	7.3 (n=21) (nmiss=2)	8.2	4
M6. Pain-limited activity days	1.2 (n=78) (nmiss=0)	4.1	0	1.6 (n=119) (nmiss=1)	5.1	0	3.2 (n=123) (nmiss=3)	7.8	0	2.9 (n=76) (nmiss=0)	7.8	0
M7. Days sad, blue, depressed	1.9 (n=77) (nmiss=1)	4.4	0	2.8 (n=117) (nmiss=3)	6.4	0	2.8 (n=122) (nmiss=4)	6.4	0	6.6 (n=75) (nmiss=1)	3.7	0
M8. Days anxious, worried, tense	4.2 (n=76) (nmiss=2)	7.5	2	4.3 (n=119) (nmiss=1)	8.0	1	4.8 (n=124) (nmiss=2)	8.1	1	5.8 (n=72) (nmiss=4)	4.2	0
M9. Days without enough sleep	7.5 (n=78) (nmiss=0)	8.6	5	7.6 (n=117) (nmiss=3)	9.3	3	6.4 (n=126) (nmiss=0)	9.2	3	2.7 (n=76) (nmiss=0)	7.5	0
M10. Days full of energy	20.0 (n=77) (nmiss=1)	9.2	22	18.9 (n=118) (nmiss=2)	10.0	22	21.4 (n=124) (nmiss=2)	10.6	27	21.8 (n=72) (nmiss=4)	11.0	28

The categorical BRFSS items (Table 4.6) generally behave as expected over age and sex categories. An exception is personal care limitations where, among those with any limitation, the oldest individuals reported needing assistance with personal care more frequently than younger people. These age-specific proportions are based on small numbers, e.g., only 23 respondents age 65 or older with any limitations from which to estimate the proportion needing assistance with personal care, and hence are quite imprecise. Limitation questions exhibit large differences across race groups while the self-rated health question is more similar across races. A tendency toward better HRQOL with higher income is suggested by the distribution of self-rated health and limitation questions across the household income subgroups.

Table 4.7 provides the more detailed distribution data (e.g., skew, floor and ceiling percentages) on the SF-36 scales. The values, central tendency and floor and ceiling effects, for the individual scales are similar to published data for the SF-36 scales in a US national sample[21] as shown in Table 4.8. Standard deviations are fairly comparable larger in the Missouri and national samples despite the smaller sample size in Missouri. Note that the individual SF-36 scales are less-susceptible to missing values because, based on tested missing value imputation algorithms, 50% or more of the component items in these multi-item scales need to be missing before the scale itself is set to missing. There are considerable ceiling effects to individual SF-36 scales, but the summary component measure components are, as expected, free from floor and ceiling effects (note that there are no values at the extreme).

Table 4.9 shows descriptive information on the SF-36 scales and summary components stratified by key descriptive characteristics. The age trends in most SF-36 scales are generally as expected. Interestingly, the Vitality scale,

Table 4.6 Frequency distributions of Core and optional Module categorical BRFSS HRQOL questions on the **STATE SAMPLE** stratified by key demographic variables

BRFSS Question	Full State Sample (%)	Age (%)				Sex (%)	
		18-29	30-44	45-64	65+	Men	Women
C1. General Health							
Excellent	22.5	26.9	23.3	23.8	14.7	23.0	22.2
Very Good	41.0	46.2	47.5	42.1	22.7	41.6	40.6
Good	22.3	23.1	24.7	17.5	26.7	23.0	21.8
Fair	9.8	3.9	4.2	9.5	25.3	8.0	10.9
Poor	4.5	0	0.8	7.1	10.7	4.4	4.6
(n)	(400)		(399)				(400)
(n miss)	(1)		(2)				(1)
M1. Limited in Any Way							
Yes	17.0	5.1	14.2	19.1	30.3	18.0	16.3
No	83.0	94.9	85.8	81.0	69.7	82.0	83.8
(n)	(401)		(400)				(401)
(n miss)	(0)		(1)				(0)
M2. Major Impairment							
Arthritis/rheumatism	14.7	0	0	12.5	30.4	10.3	18.0
Back or neck problems	17.6	25.0	35.3	12.5	8.7	13.8	20.5
Fractures, bone/joint injury	5.9	0	0	8.3	8.7	0	10.3
Walking problem	7.4	0	6	16.7	0	3.5	10.3
Lung/breathing problems	5.9	0	0	8.3	8.7	10.3	2.6
Hearing problems	0	0	0	0	0	0	0
Eye/vision problem	4.4	0	5.9	4.2	4.4	3.5	5.1
Heart problem	8.8	0	0	16.7	8.7	17.2	2.6
Stroke problem	0	0	0	0	0	0	0
Hypertension/high blood pressure	0	0	0	0	0	0	0
Diabetes	4.4	0	5.9	4.2	4.4	6.9	2.6
Cancer	1.5	0	0	0	4.4	0	2.6
Depression... ...emotional problem	0	0	0	0	0	0	0
Other impairment/problem	29.4	75.0	47.1	16.7	21.7	34.5	25.6
(n)	(68)		(68)				(68)
(n miss)	(0)		(0)				(0)

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Table 4.6. (continued) Frequency distributions of Core and optional Module categorical BRFSS HRQOL questions on the **STATE SAMPLE** stratified by key demographic variables.

		Age (%)				Sex (%)	
BRFSS Question	Full State Sample (%)	18-29	30-44	45-64	65+	Men	Women
M4. Personal Care Limitations							
Yes	10.3	0	5.9	16.7	8.7	10.3	10.3
No	89.7	100	94.1	83.3	91.3	89.7	89.7
(n)	(68)		(68)			(68)	
(n miss)	(0)		(0)			(0)	
M5. Routine need limitations							
Yes	30.9	0	11.8	37.5	43.5	13.8	43.6
No	69.1	100	88.2	62.5	56.5	86.2	56.4
(n)	(68)		(68)			(68)	
(n miss)	(0)		(0)			(0)	

Table 4.5. Descriptive statistics for continuous Core and optional Module BRFSS HRQOL questions on the **STATE SAMPLE** stratified by key demographic variables

BRFSS Question	Sex						Race					
	Male			Female			White			Black		
	Mean	S.D.	Median	Mean	S.D.	Median	Mean	S.D.	Median	Mean	S.D.	Median
C2. "Not Good" physical health days	2.6 (n=161) (nmiss=3)	6.5	0	4.0 (n=240) (nmiss=3)	8.4	0	3.2 (n=347) (nmiss=0)	7.7	0	5.0 (n=39) (nmiss=1)	86	0
C3. "Not Good" mental health days	1.7 (n=161) (nmiss=0)	5.6	0	3.8 (n=240) (nmiss=5)	7.8	0	2.8 (n=347) (nmiss=6)	6.9	0	5.0 (n=38) (nmiss=2)	9.6	0
Good health days	26.1 (n=155) (nmiss=6)	8.0	30	23.5 (n=232) (nmiss=8)	9.8	28	24.7 (n=336) (nmiss=11)	9.2	30	22.3 (n=37) (nmiss=3)	10.7	28
C4. Days kept from activities	2.4 (n=161) (nmiss=0)	4.1	0	1.9 (n=238) (nmiss=2)	5.4	0	1.3 (n=345) (nmiss=2)	4.6	0	3.1 (n=40) (nmiss=0)	7.3	0
O3. Length of limitation (years)	8.2 (n=29) (nmiss=0)	9.2	5	6.1 (n=36) (nmiss=3)	6.8	36	7.0 (n=58) (nmiss=3)	7.6	5	5.1 (n=4) (nmiss=1)	6.3	2.8
O6. Pain-limited activity days	1.7 (n=161) (nmiss=2)	5.2	0	2.7 (n=240) (nmiss=2)	7.2	0	2.2 (n=344) (nmiss=3)	6.5	0	2.8 (n=39) (nmiss=1)	7.0	0
O7. Days sad, blue, depressed	1.4 (n=161) (nmiss=1)	4.3	0	3.2 (n=240) (nmiss=8)	7.0	0	2.3 (n=340) (nmiss=7)	5.8	0	4.8 (n=39) (nmiss=1)	8.5	0
O8. Days anxious, worried, tense	2.9 (n=161) (nmiss=2)	5.9	0	4.7 (n=240) (nmiss=7)	8.5	1	3.8 (n=340) (nmiss=7)	7.6	1	5.3 (n=39) (nmiss=1)	8.7	1
O9. Days without enough sleep	5.7 (n=161) (nmiss=0)	8.4	2	6.6 (n=240) (nmiss=3)	9.3	3	6.1 (n=344) (nmiss=3)	8.7	2	8.6 (n=40) (nmiss=0)	11.4	3
O10. Days full of energy	20.6 (n=161) (nmiss=1)	10.2	25	20.4 (n=240) (nmiss=8)	10.4	25	20.7 (n=339) (nmiss=8)	10.0	25	17.2 (n=40) (nmiss=0)	11.8	20

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Table 4.5. (continued) Descriptive statistics for continuous Core and optional Module BRFSS HRQOL questions on the **STATE SAMPLE** stratified by key demographic variables.

	Income											
	<$15,000			$15,000 - $24,999			$25,000 - $49,999			≥$50,000		
BRFSS Question	Mean	S.D.	Median	Mean	S.D.	Median	Mean	S.D.	Median	Mean	S.D.	Median
C2. "Not Good" physical health days	5.2 (n=115) (nmiss=3)	9.6	0	3.0 (n=102) (nmiss=1)	7.5	0	2.0 (n=111) (nmiss=1)	4.6	0	2.1 (n=37) (nmiss=0)	5.6	0
C3. "Not Good" mental health days	4.4 (n=115) (nmiss=5)	9.1	0	3.4 (n=102) (nmiss=2)	7.5	0	2.1 (n=111) (nmiss=1)	5.4	0	1.4 (n=37) (nmiss=0)	3.6	0
Good health days	22.5 (n=107) (nmiss=8)	11.2	29	24.5 (n=99) (nmiss=3)	9.2	29	26.3 (n=109) (nmiss=2)	7.1	30	26.5 (n=37) (nmiss=0)	6.5	30
C4. Days kept from activities	3.3 (n=114) (nmiss=1)	7.3	0	1.2 (n=102) (nmiss=0)	4.8	0	0.5 (n=110) (nmiss=1)	1.6	0	0.4 (n=37) (nmiss=0)	1.2	0
M3. Length of limitation (years)	6.2 (n=26) (nmiss=3)	7.2	4.5	9.0 (n=14) (nmiss=0)	7.4	9.5	3.3 (n=14) (nmiss=0)	3.5	2	10.9 (n=3) (nmiss=0)	8.8	15
M6. Pain-limited activity days	3.2 (n=115) (nmiss=1)	7.5	0	2.3 (n=102) (nmiss=0)	6.8	0	1.8 (n=111) (nmiss=3)	5.7	0	0.3 (n=37) (nmiss=0)	1.1	0
M7. Days sad, blue, depressed	4.0 (n=115) (nmiss=1)	7.9	0	1.8 (n=102) (nmiss=5)	5.1	0	2.0 (n=111) (nmiss=1)	5.0	0	0.6 (n=37) (nmiss=1)	1.4	0
M8. Days anxious, worried, tense	5.0 (n=115) (nmiss=5)	9.2	1	4.2 (n=100) (nmiss=2)	7.7	1	3.1 (n=111) (nmiss=0)	5.7	1	3.9 (n=37) (nmiss=0)	8.0	0
M9. Days without enough sleep	5.9 (n=115) (nmiss=0)	8.9	2	5.7 (n=102) (nmiss=3)	8.8	2	6.0 (n=111) (nmiss=0)	8.1	3	7.4 (n=37) (nmiss=0)	8.6	5
M10. Days full of energy	19.0 (n=115) (nmiss=4)	11.5	25	21.5 (n=102) (nmiss=3)	9.3	25	21.9 (n=111) (nmiss=0)	9.1	25	18.9 (n=37) (nmiss=2)	10.0	20

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Table 4.6. (continued) Frequency distributions of Core and optional Module categorical BRFSS HRQOL questions on the **STATE SAMPLE** stratified by key demographic variables.

BRFSS Question	Full State Sample (%)	Household Income (%)				Race (%)	
		<$15,000	$15,000-$24,999	$25,000-$49,999	$50,000+	White	Black
C1. General Health							
Excellent	22.5	14.0	23.5	25.2	37.8	22.5	20.0
Very Good	41.0	33.3	45.1	51.3	32.4	40.4	42.5
Good	22.3	26.3	19.6	19.8	21.6	23.0	20.0
Fair	9.8	14.0	10.8	2.7	8.1	9.5	12.5
Poor	4.5	12.3	1.0	0.9	0	4.6	5.0
(n)	(400)		(364)			(387)	
(n miss)	(1)		(37)			(14)	
O1. Limited in Any Way							
Yes	17.0	24.4	13.7	12.6	8.1	17.3	12.5
No	83.0	75.7	86.3	87.4	91.9	82.7	87.5
(n)	(401)		(365)			(387)	
(n miss)	(0)		(36)			(14)	
O2. Major Impairment							
Arthritis/rheumatism	14.7	10.7	14.3	7.2	0	15.0	20.0
Back or neck problems	17.6	14.3	42.9	7.1	33.3	16.7	20.0
Fractures, bone/joint injury	5.9	10.7	7.1	0	0	5.0	20.0
Walking problem	7.4	3.6	7.1	14.3	0	8.3	0
Lung/breathing problems	5.9	3.6	7.1	7.1	0	6.7	0
Hearing problems	0	0	0	0	0	0	0
Eye/vision problem	4.4	3.6	0	7.1	33.3	5	0
Heart problem	8.8	10.7	0	14.3	0	8.3	20.0
Stroke problem	0	0	0	0	0	0	0
Hypertension/high blood pressure	0	0	0	0	0	0	0
Diabetes	4.4	7.1	0	7.1	0	3.3	20.0
Cancer	1.5	3.6	0	0	0	0	0
Depression... ...emotional problem	0	0	0	0	0	0	0
Other impairment/problem	29.4	32.1	21.4	35.7	33.3	32.7	0
(n)	(68)		(59)			(3)	
(n miss)	(0)		(0)			(0)	

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Table 4.6. (continued) Frequency distributions of Core and optional Module categorical BRFSS HRQOL questions on the **STATE SAMPLE** stratified by key demographic variables.

		Household Income (%)				Race (%)	
BRFSS Question	Full State Sample (%)	<$15,000	$15,000-$24,999	$25,000-$49,999	$50,000+	White	Black
M4. Personal Care Limitations							
Yes	10.3	10.7	7.1	7.1	0	8.3	40.0
No	89.7	89.3	92.9	92.9	100	91.7	60.0
(n)	(68)		(59)				(65)
(n miss)	(0)		(9)				(3)
M5. Routine need limitations							
Yes	30.9	42.9	14.3	21.4	33.3	26.7	80.0
No	69.1	57.1	85.7	78.6	66.7	73.3	20.0
(n)	(68)		(59)				65
(n miss)	(0)		(9)				(3)

Table 4.7. Descriptive statistics for SF-36 and SF-12 scales in the **STATE SAMPLE**

SF-36 scale	No. items	Mean	S.D.	Median	25th %	75th %	Min	% Floor	Max	% Ceiling	n	n miss
General Health (SF-36)	5	70.4	16.9	7.2	62	82	10	0.7	93.8	0.2	401	0
Physical Functioning (SF-36)	10	86.1	21.8	95	85	100	0	0.5	100	41.4	401	0
Role Physical (SF-36)	4	83.7	32.6	100	100	100	0	9.0	100	76.6	401	0
Mental Health (SF-36)	4	81.4	17.4	88	76	92	4	0.2	100	8.0	401	0
Role Emotional (SF-36)	3	89.2	27.7	100	100	100	0	6.8	100	84.5	399	2
Social Functioning (SF-36)	2	91.2	19.5	100	100	100	0	0.5	100	75.8	401	0
Pain (SF-36)	2	78.9	23.4	84	72	100	0	0.5	100	40.6	401	0
Vitality (SF-36)	4	64.8	22.9	70	50	80	0	1.5	100	3.2	401	0
Physical component summary (SF-36)	35	49.6	9.2	52.1	46.5	55.6	7..9	0	70.4	0	399	2
Mental component summary (SF-36)	35	53.8	9.8	56.7	51.8	59.5	0.6	0	68.8	0	399	2
Physical component summary (SF-12)	12	50.1	9.0	53.5	48.1	55.6	13.0	0	64.6	0	401	0
Mental component summary (SF-12)	12	47.7	8.1	50.3	45.3	52.5	11.6	0	66.2	0	401	0

Table 4.8: Differences between SF-36 Scale Scores in the Missouri Sample* and U.S. Norms**

	General Health		Physical Functioning		Role Physical		Mental Health		Role Emotional		Social Functioning	
	MO score	MO-US	MO score	MO-US	MO score	MO-US	MO score	MO-US	MO score	MO-US	MO score	MO-US
mean	70.4	-3.4	86.1	-0.9	83.7	-3.3	81.4	4.2	89.2	2.2	91.2	3.1
s.d.	16.9	-2.4	21.8	0.4	32.6	3.3	17.4	-0.8	27.7	-1.4	19.5	-0.8
25th %	62.0	0.0	85.0	-10.0	100.0	25.0	76.0	8.0	100.0	0.0	100.0	0.0
median	72.0	-3.0	95.0	0.0	100.0	0.0	88.0	8.0	100.0	0.0	100.0	0.0
75th%	82.0	-5.0	100.0	0.0	100.0	0.0	92.0	0.0	100.0	0.0	100.0	0.0

* n = 401 ** Based on n = 782 as reported in McHorney et al. Med Care 1994;32:551-567.

Table 4 8 (continued) Differences between SF-36 Scale Scores in the Missouri Sample* and U.S. Norms

	Pain		Vitality		Physical Component Summary (PCS) SF-36		Mental Component Summary (MCS) SF-36	
	MO score	MO-US	MO score	MO-US	MO score	MO-US	MO score	MO-US
mean	78.9	-0.6	64.8	0.7	49.6	-0.4	53.8	3.8
s.d.	23.4	0.0	22.9	1.8	9.2	-0.8	9.8	-0.2
25th %	72.0	10.0	50.0	0.0	46.5	3.7	51.8	8.8
median	84.0	0.0	70.0	0.0	52.1	-0.5	56.7	4.1
75th%	100.0	0.0	80.0	0.0	55.6	-0.4	59.5	3.5

* n = 401 ** Based on n = 782 as reported in McHorney et al. Med Care 1994;32:551-567.

Table 4.9. Descriptive statistics for SF-36 and SF-12 scales in the **STATEWIDE SAMPLE** stratified by key demographic variables.

SF-36 / SF-12 Scale	Age											
	18-29			30-44			45-64			65+		
	Mean	S.D.	Median	Mean	S.D.	Median	Mean	S.D.	Median	Mean	S.D.	Median
General Health (SF-36)	74.8	12.9	77	73.4	13.3	75	69.4	19.6	72.0	62.5	18.2	67.0
	(n=78) (nmiss=0)			(n=120) (nmiss=0)			(n=126) (nmiss=0)			(n=76) (nmiss=0)		
Physical Functioning (SF-36)	92.6	15.6	100	91.7	17.1	100	85.6	21.5	95.0	71.3	26.8	80.0
	(n=78) (nmiss=0)			(n=120) (nmiss=0)			(n=126) (nmiss=0)			(n=76) (nmiss=0)		
Role Physical (SF-36)	90.7	25.2	100	86.0	30.0	100	81.8	35.2	100	76.4	37.4	100
	(n=78) (nmiss=0)			(n=120) (nmiss=0)			(n=126) (nmiss=0)			(n=76) (nmiss=0)		
Mental Health (SF-36)	80.2	17.8	84	79.8	16.9	84	82.0	18.6	88	83.8	15.9	88
	(n=78) (nmiss=0)			(n=120) (nmiss=0)			(n=126) (nmiss=0)			(n=76) (nmiss=0)		
Role Emotional (SF-36)	88.8	27.9	100	88.0	29.3	100	89.2	27.3	100	91.7	26.2	100
	(n=77) (nmiss=1)			(n=119) (nmiss=1)			(n=126) (nmiss=0)			(n=76) (nmiss=0)		
Social Functioning (SF-36)	93.0	16.1	100	92.1	17.1	100	90.1	22.2	100	89.8	21.4	100
	(n=78) (nmiss=0)			(n=120) (nmiss=0)			(n=126) (nmiss=0)			(n=76) (nmiss=0)		
Pain (SF-36)	85.8	20.2	100	80.1	22.2	84	76.8	25.0	84	73.2	24.3	74
	(n=78) (nmiss=0)			(n=120) (nmiss=0)			(n=126) (nmiss=0)			(n=76) (nmiss=0)		
Vitality (SF-36)	64.0	19.2	65	62.4	22.6	70	66.1	24.4	75	66.9	24.3	70
	(n=78) (nmiss=0)			(n=120) (nmiss=0)			(n=126) (nmiss=0)			(n=76) (nmiss=0)		

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Table 4.9. (continued) Descriptive statistics for SF-36 and SF-12 scales in the **STATEWIDE SAMPLE** stratified by key demographic variables.

SF-36 / SF-12 Scale	Age Group											
	18-29			30-44			45-64			65+		
	Mean	S.D.	Median	Mean	S.D.	Median	Mean	S.D.	Median	Mean	S.D.	Median
Physical component summary (SF-36)	53.1	6.7	54.2 (n=77) (nmiss=1)	51.7	6.7	53.2 (n=119) (nmiss=1)	48.8	9.7	51.6 (n=126) (nmiss=0)	43.9	10.9	48.6 (n=76) (nmiss=0)
Mental component summary (SF-36)	52.2	10.2	55.1 (n=77) (nmiss=1)	52.3	9.8	55.3 (n=119) (nmiss=1)	54.2	9.8	57.4 (n=126) (nmiss=0)	56.9	8.8	58.7 (n=76) (nmiss=0)
Physical component summary (SF-12)	53.0	6.4	54.5 (n=78) (nmiss=0)	52.1	6.5	53.9 (n=120) (nmiss=0)	49.5	9.8	53.7 (n=126) (nmiss=0)	44.8	11.1	50.1 (n=76) (nmiss=0)
Mental component summary (SF-12)	46.5	8.3	48.9 (n=78) (nmiss=0)	46.5	8.1	49.4 (n=120) (nmiss=0)	48.2	8.1	51.5 (n=126) (nmiss=0)	49.9	7.4	51.9 (n=76) (nmiss=0)

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Table 4.9. (continued) Descriptive statistics for SF-36 and SF-12 scales in the **STATEWIDE SAMPLE** stratified by key demographic variables.

SF-36 / SF-12 Scales	Sex						Race					
	Male			Female			White			Black		
	Mean	S.D.	Median	Mean	S.D.	Median	Mean	S.D.	Median	Mean	S.D.	Median
General Health (SF-36)	69.4	16.2	72	71.0	17.3	76.0	70.5	13.7	72.0	67.2	16.5	72.0
	(n=161) (nmiss=0)			(n=240) (nmiss=0)			(n=347) (nmiss=0)			(n=40) (nmiss=0)		
Physical Functioning (SF-36)	90.1	17.7	95	83.3	23.7	95	89.9	21.6	95	86.2	24.0	95.0
	(n=161) (nmiss=0)			(n=240) (nmiss=0)			(n=347) (nmiss=0)			(n=40) (nmiss=0)		
Role Physical (SF-36)	86.4	29.7	100	81.9	34.4	100	78.6	32.1	100	84.2	35.1	100
	(n=161) (nmiss=0)			(n=240) (nmiss=0)			(n=347) (nmiss=0)			(n=40) (nmiss=0)		
Mental Health (SF-36)	83.0	14.9	88.0	80.2	18.9	88.0	88.4	17.3	88.0	81.1	20.5	88.0
	(n=161) (nmiss=0)			(n=240) (nmiss=0)			(n=347) (nmiss=0)			(n=40) (nmiss=1)		
Role Emotional (SF-36)	93.8	19.8	100	86.2	31.6	100	97.6	28.4	100	88.8	25.5	100
	(n=160) (nmiss=1)			(n=239) (nmiss=1)			(n=347) (nmiss=1)			(n=40) (nmiss=1)		
Social Functioning (SF-36)	92.4	17.6	100	90.4	20.6	100	94.6	19.0	100	91.6	24.6	100
	(n=161) (nmiss=0)			(n=240) (nmiss=0)			(n=347) (nmiss=0)			(n=40) (nmiss=0)		
Pain (SF-36)	80.9	21.8	84	77.5	24.4	84	77.4	22.9	84	79.3	28.0	84.0
	(n=161) (nmiss=0)			(n=240) (nmiss=0)			(n=347) (nmiss=0)			(n=40) (nmiss=0)		
Vitality (SF-36)	69.1	21.4	75	61.8	23.5	65.8	68.7	22.2	70	65.1	29.1	70.0
	(n=161) (nmiss=0)			(n=240) (nmiss=0)			(n=347) (nmiss=0)			(n=40) (nmiss=0)		

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Table 4.9. (continued) Descriptive statistics for SF-36 and SF-12 scales in the **STATEWIDE SAMPLE** stratified by key demographic variables.

SF-36 / SF-12 Scales	Sex						Race					
	Male			Female			White			Black		
	Mean	S.D.	Median	Mean	S.D.	Median	Mean	S.D.	Median	Mean	S.D.	Median
Physical component summary (SF-36)	50.4 (n=160) (nmiss=0)	7.8	52.4	49.0 (n=239) (nmiss=1)	9.9	51.7	49.7 (n=239) (nmiss=0)	9.1	52.1	48.2 (n=239) (nmiss=1)	10.6	52.1
Mental component summary (SF-36)	54.9 (n=160) (nmiss=0)	7.9	57.0	53.0 (n=239) (nmiss=1)	10.8	56.4	53.7 (n=346) (nmiss=0)	9.8	56.7	53.3 (n=239) (nmiss=1)	10.7	55.7
Physical component summary (SF-12)	50.9 (n=161) (nmiss=0)	8.1	53.5	49.5 (n=240) (nmiss=0)	9.6	53.2	50.2 (n=347) (nmiss=0)	8.9	53.5	48.5 (n=239) (nmiss=0)	10.7	53.5
Mental component summary (SF-12)	48.7 (n= 161) (nmiss=0)	6.0	51	46.9 (n=240) (nmiss=0)	9.1	49.7	47.5 (n=339) (nmiss=0)	8.1	50.3	47.5 (n=40) (nmiss=0)	8.6	49.9

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Table 4.9. (continued) Descriptive statistics for SF-36 and SF-12 scales in the **STATEWIDE SAMPLE** stratified by key demographic variables.

	Household Income											
	<$15,000			$15,000-$24,999			$25,000-$49,999			≥$50,000		
SF-36 / SF-12 Scale	Mean	S.D.	Median	Mean	S.D.	Median	Mean	S.D.	Median	Mean	S.D.	Median
General Health (SF-36)	64.4	20.2	70	72.9	14.8	75	73.9	14.0	77	73.0	14.6	77
	(n=115) (nmiss=0)			(n=102) (nmiss=0)			(n=111) (nmiss=0)			(n=37) (nmiss=0)		
Physical Functioning (SF-36)	76.6	27.9	90	89.9	17.3	95	93.3	9.5	95	94.9	9.0	100
	(n=115) (nmiss=0)			(n=102) (nmiss=0)			(n=111) (nmiss=0)			(n=37) (nmiss=0)		
Role Physical (SF-36)	76.7	37.6	100	87.0	30.8	100	88.1	28.4	100	89.2	26.7	100
	(n=115) (nmiss=0)			(n=102) (nmiss=0)			(n=111) (nmiss=0)			(n=37) (nmiss=0)		
Mental Health (SF-36)	77.5	21.4	84	83.3	14.7	88	81.6	16.7	88	85.5	12.3	88
	(n=115) (nmiss=0)			(n=102) (nmiss=0)			(n=111) (nmiss=0)			(n=37) (nmiss=0)		
Role Emotional (SF-36)	80.5	37.2	100	92.5	23.4	100	92.2	23.3	100	94.6	14.7	100
	(n=113) (nmiss=2)			(n=102) (nmiss=0)			(n=111) (nmiss=0)			(n=37) (nmiss=0)		
Social Functioning (SF-36)	85.9	24.2	100	91.3	17.9	100	94.6	14.9	100	97.0	8.0	100
	(n=115) (nmiss=0)			(n=102) (nmiss=0)			(n=111) (nmiss=0)			(n=37) (nmiss=0)		
Pain (SF-36)	76.0	27.4	84	79.6	21.7	84	79.2	23.0	84	88.5	14.2	100
	(n=115) (nmiss=0)			(n=102) (nmiss=0)			(n=111) (nmiss=0)			(n=37) (nmiss=0)		
Vitality (SF-36)	59.8	25.3	65	67.0	22.4	70	68.3	20.4	75	65.5	16.7	65
	(n=115) (nmiss=0)			(n=102) (nmiss=0)			(n=111) (nmiss=0)			(n=37) (nmiss=0)		

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Table 4.9. (continued) Descriptive statistics for SF-36 and SF-12 scales in the **STATEWIDE SAMPLE** stratified by key demographic variables.

	Household Income											
	<$15,000			$15,000-$24,999			$25,000-$49,999			≥$50,000		
SF-36 / SF-12 Scale	Mean	S.D.	Median	Mean	S.D.	Median	Mean	S.D.	Median	Mean	S.D.	Median
Physical component summary (SF-36)	46.8	12.2	51.2	50.6	8.0	53.2	51.7	6.0	52.8	52.5	5.1	54.1
	(n=113) (nmiss=2)			(n=102) (nmiss=0)			(n=111) (nmiss=0)			(n=37) (nmiss=0)		
Mental component summary (SF-36)	51.8	12.7	56.1	54.4	7.7	56.2	54.1	9.2	56.9	54.9	6.1	56.3
	(n=113) (nmiss=2)			(n=102) (nmiss=0)			(n=111) (nmiss=0)			(n=37) (nmiss=0)		
Physical component summary (SF-12)	46.9	12.2	52.4	51.2	7.3	53.7	52.4	6.0	54.5	52.8	5.1	54.0
	(n=115) (nmiss=0)			(n=102) (nmiss=0)			(n=111) (nmiss=0)			(n=37) (nmiss=0)		
Mental component summary (SF-12)	46.0	10.6	49.7	48.4	5.9	49.8	47.8	7.5	50.9	48.5	6.0	50.9
	(n=115) (nmiss=0)			(n=102) (nmiss=0)			(n=111) (nmiss=0)			(n=37) (nmiss=0)		

like the BRFSS energy item, exhibits the least striking trend with age. The age-pattern in the SF-36 scales and summary components capturing mental health dimensions do, however, appear to differ from BRFSS items referring to similar health dimensions.

For example, the oldest age group tended to have slightly better HRQOL ratings on mental health and role-emotional items than younger age groups. This is not entirely consistent with the patterns seen in BRFSS items covering similar health dimensions. Older groups reported greater numbers of depressed and anxiety days per month in the BRFSS optional HRQOL module. However, the core question querying on "not good" mental health days, indicates similar mental HRQOL patterns with age as the SF-36 with the oldest group reporting the lowest average number of BRFSS "not good" mental health days. SF-36 scales and summary components suggested, although somewhat less consistently than the BRFSS items, a positive correlation between household income and HRQOL.

4.4 Conclusions

- Not surprisingly, SF-36 scales are more resistant to missing values than are single-item BRFSS questions

- Ceiling and floor effects for BRFSS questions and individual SF-36 scales are comparable; but SF-36 summary component scales, as expected, are not subject to this limitation.

- Patterns in BRFSS HRQOL items and SF-36 scales across demographic sub-groups are consistent with expectation and, consequently, are generally consistent with each other.

Chapter 5

CRITERION VALIDITY ANALYSES

5.1 Overview

This section presents results of direct comparisons of BRFSS items with SF-36 scales in the statewide sample. There are two basic types of analyses discussed here. The first involve bivariate comparisons of variables across sources. The second involves the construction of multivariable statistical models designed to determine the best subset of BRFSS items predicting SF-36 physical and mental health component summary scores. In the interpretation of both of these analyses the SF-36 is viewed as a gold-standard, albeit an imperfect one, for HRQOOL assessment (a "criterion" measure). It is, therefore, the extent to which a BRFSS item (or, in the case of the multivariable models, "items") correlates with or explains this criterion that form the comparisons of interest.

5.2. Methods

5.2.1. *Bivariate comparisons*

For categorical BRFSS items, mean SF-36 scale and component summary scores were compared across levels. For dichotomous BRFSS variables simple t-tests of differences in means were calculated while an ordinary least squares (OLS) regression-based test of trend (where a score of 1 is assigned to the lowest category and n to the nth highest category) was used when more than two ordinal categories existed. For comparing continuous BRFSS variables to SF-36 scales and component summary scores, correlation coefficients were estimated. Rank correlation coefficients were used since they are easily calculated and avoid assumptions of normality of underlying distributions in estimate sampling variation. The matrix of

coefficients comparing correlations of BRFSS continuous items and SF-36 scales and summaries resembles a multi-trait multimethod (MTMM) correlation matrix commonly used in psychometric validation studies.[16] The difference between what is shown here and a traditional MTMM is that the analyses here focus on correlation across methods (i.e., BRFSS vs. SF-36), so correlations across traits (i.e., health concepts) but within methods (e.g., correlation between BRFSS optional module sleep question and core module "bad" physical health days question) are not displayed. The type I error threshold for statistical significance testing is an alpha of 0.05 with all tests being two-tailed. Note, however, that, as is convention in criterion validity comparisons, design effects were not considered in these statistical tests. Were they, standard errors and p-values would likely be slightly larger than those calculated here.

5.2.2. *Multivariable models*

In the second type of criterion validity analysis, OLS regression models were fit to the general population sample data (n=401) using the SF-36 physical and mental component summary scales (PCS and MCS, respectively) as the dependent variables and core and optional BRFSS HRQOL questions as independent variables. Separate models were constructed for PCS and MCS.

As can be seen from the mean and medians displayed previously in table 4.7, both PCS and MCS are longtailed to the left; with the MCS variable exhibiting marked skew. Skewed dependent variables are often not used in OLS regression in their untransformed form for fear of violating one of two key OLS regression assumptions: homogeneity of variances and/or normality of residuals. However, OLS regression is a remarkably robust statistical technique. Given this, OLS models were fit to these data and, prior to interpreting model results, residual plots were carefully examined for indications that either of these assumptions were grossly violated. Use of the

dependent variable's native scale has considerable interpretive appeal, especially when the transformation achieving near-normality has little intuitive meaning (e.g., the power transformation that brought symmetry to the MCS distribution was an exponent of 4.5).

Table 5.1 lists the BRFSS HRQOL questions considered in each of the two models and indicates how these variables were coded. *A priori* decisions were made as to which BRFSS questions were conceptually distinct from each dependent variable. The optional questions on depressed days and anxiety days were excluded from the physical health model. Because the goal of this analysis was to determine what BRFSS questions best captured physical and mental HRQOL as summarized by PCS and MCS, irrespective of specific diseases, BRFSS question M2 (condition responsible for reported activity limitation) was not considered as an independent variable for either model. No additional questions were excluded from the MCS model. While the item on pain clearly taps a physical health concept, the decision was made to retain it in mental health models because of the close relationship between pain (especially, chronic pain), stress, and depression. Note that in this analysis the core general health question was coded as a single ordinal term. Inspection of side-by-side boxplots of PCS and MCS stratified by the general health question responses suggested a linear, monotonic relationship. There was some plateauing in PCS and MCS scores above the "very good" response, but this was not to an extent that collapsing these categories appeared justified. Independent variables were entered in their native form. Distributional issues with respect to independent variables are less of a concern for independent variables when transformations are generally performed to improve the fit of the model (e.g., if the relationship between independent and dependent variables is known or suspected to be non-linear) or to combat collinearity among independent variables. Neither independent variable transformations nor the addition of polynomial terms

Table 5.1 BRFSS HRQOL questions used to predict SF-36 physical component summary (PCS) and mental component summary (MCS) scales

Dependent variable	Candidate independent variables	Independent variable coding
SF-36 Physical component summary (PCS)	C1 General health	Ordinal categorical 1 - 5 (with each increase implying improved health)
	C2 Days per month physical health "not good"	Number of days (0 to 30)
	C4 Days per month activities limited due to "not good" physical or mental health	Number of days (0 to 30)
	O1 Any limitations due to health	Yes vs. No
	O3 Length of limitation	Length in months (those not reporting limitation coded as 0)
	O4 Limitation in routine needs	Yes vs. No (those not reporting limitation coded as 0)
	O5 Limitation in personal care needs	Yes vs. No (those not reporting limitation coded as 0)
	O6 Days per month with pain	Number of days (0 to 30)
	O9 Days per month with not enough sleep	Number of days (0 to 30)
	O10 Days energy level good	Number of days (0 to 30)
SF-36 Mental component summary (MCS)	C1 General health	Ordinal categorical 1 - 5 (with each increase implying improved health)
	C3 Days per month mental health "not good"	Number of days (0 to 30)
	C4 Days per month activities limited due to "not good" physical or mental health	Number of days (0 to 30)
	M1 Any limitations due to health	Yes vs. No
	M3 Length of limitation	Length in months (those not reporting limitation coded as 0)
	M4 Limitation in routine needs	Yes vs. No (those not reporting any limitation coded as "No")
	M5 Limitation in personal care needs	Yes vs. No (those not reporting any limitation coded as "No")
	M7 Days per month sad/ blue/depressed	Number of days (0 to 30)
	M8 Days per month with anxiety	Number of days (0 to 30)
	M9 Days per month with not enough sleep	Number of days (0 to 30)
	M10 Days energy level good	Number of days (0 to 30)

were used in these analyses. Since there were no *a priori* reasons to suspect nonlinearity in the relationships and since systematic consideration of transformed or polynomial terms would have made the model-building process unwieldy.

Model-building approach

Because the validity of *all* BRFSS HRQOL questions is of interest, rather than there being just one or two key independent variables, a regression model building approach using BRFSS variables to find the best and most parsimonious fit to the SF-36 data was appropriate. Several alternative approaches are available for selecting a "best" combination of candidate independent variables in an OLS regression. These include: forward selection, backward selection, stepwise forward or backward selection, and all-possible model subset selection based on either R^2 or C_p criteria. All of these have limitations, but when there are no *a priori* criteria for model building, they offer a reasonable approach to build an understanding of the data. In this analysis a forward stepwise regression approach with expanded, step-by-step reporting of findings (as suggested by Hauck and Mike[22]) was used. This approach was chosen because, when augmented with the step-by-step reporting, a stepwise selection not only yields a best model, but also reveals which independent variables may be closely related in their association with the outcome. An oft-cited limitation of stepwise regression has been that the final model has often been considered as containing the *only* variables among the candidate terms that are important in predicting the outcome. If there are three correlated independent variables associated with the outcome, the stepwise procedure, and most other automated selection procedures, will select at most one of the three. It makes good sense, especially in a validation analysis such as this where there is interest in the relationship between all of the BRFSS items and the outcome (e.g., no independent variables are being thought of as merely potential confounders), to give consideration to those other correlated

independent variables. This involves deciding which term is most conceptually appealing and determining whether these correlated variables represent a similar underlying concept.

The stepwise approach begins with an intercept-only model and calculates an F-statistic for the addition of each variable, adding at that step the variable whose F-statistic has the smallest p-value. A p-value cutpoint is established above which no variables are added to the model. Here the cutpoint for all models was 0.10. When a variable is added, all existing variables are re-examined and any whose F-statistic p-value at the current step has moved above a second analyst-established cutpoint is deleted. Here this cutpoint was set at 0.15. The process continues until no variables meet the criteria for entry or deletion. The use of step-by-step reporting reveals for each variable entered at a given step what other variables may have been previously associated with the outcome but lost their strength and significance of association after the entry was made. These variables are highlighted and discussed along with the variables actually entered and retained.

Interactions

It is quite possible that the association between one BRFSS question and a SF-36 summary component score is modified by the respondent's status on a health dimension captured by another BRFSS question. For example, increasing numbers of days with pain may have a negative effect on HRQOL only when low-energy days is sufficiently high; implying that when energy level is good, pain may be coped with to the extent that HRQOL is not adversely effected but, if energy is low, the pain can not be similarly tolerated. It should be noted that the criterion summary measures themselves (PCS and MCS) are constructed using a scoring algorithm that does not imply interaction among the component scales. Nonetheless, a preliminary exploration of statistical interactions between BRFSS items was undertaken. The goal was not to completely understand the conceptual

nature of revealed interactions among BRFSS HRQOL questions, but to get an initial assessment of the extent to which they might be important in explaining HRQOL. An additional model was constructed where the final BRFSS HRQOL variables from the main effects stepwise model were forced into all models and the same stepwise regression procedure (i.e., the same statistical cutpoints as used for main effects) was used to chose from predictors from all possible interactions between the forced-in terms. In addition, pairwise interactions among all candidate BRFSS HRQOL terms were assessed in a series of individual three-variable OLS models. Those interactions significant (at $p<0.10$) in these three-variable models that were not considered *de facto* in the stepwise procedure (i.e., because one or both of the main effect terms were omitted from the final main effects model) were added along with any necessary main-effect terms and evaluated for bringing about significant improvement to model fit (partial F-test, $p<0.05$)).

Adjustment

The role adjustment in criterion validity analyses is slightly different than that in a typical epidemiologic study of HRQOL. In the latter, non-mediating factors known or suspected to be associated with both the independent variable of interest and HRQOL are considered potential confounders. In a criterion validation study where the independent and dependent variables are attempting to assess the same outcome (HRQOL), any third variable suspected of being associated with HRQOL is *expected* to be associated with both HRQOL measures. This would lead to empirical confounding, but, conceptually, adjusting for this confounder doesn't make sense. For example, if older individuals are more likely to have lower HRQOL and to report so through the gold standard assessment, we would hope that they were also more likely to report lower HRQOL on the metric being tested (in fact, this observation may itself be construed as a test of "known-groups" validity). Therefore, adjusting the "age effect" out of the association between the new and standard metric would inappropriately

lower the extent to which these measures are truly associated. This situation is in some ways analogous to the inappropriate adjustment for a mediating variable (i.e., one that lies on the causal path) in an analysis of some independent variable suspected to be causally related to an outcome. Nonetheless, since demographic characteristics as measured in surveys are likely to account for a portion of the total variation in HRQOL, demonstrating a persistent association between BRFSS and SF-36 assessments of physical and mental HRQOL beyond what is explained by these known groups can be interpreted as an indication of the robustness of the association between the two measures. However, were adjustment to reduce substantively the association between the two measures, this can not be taken as an indication of their divergence.

The analytic approach to adjustment used entailed exploring the empirical association between demographic variables suspected to be associated with HRQOL with the SF-36 summary variables. Although data on the presence of chronic conditions and depression/dysthymia were available these were not considered as potential adjustment factors because of the hypothesized strength of the relationship between these factors and HRQOL. The demographic variables considered are listed with the coding used for each in Table 5.2 on the following page. To be consistent in modeling approach, a stepwise OLS regression on the adjustment variables was performed to determine which subset of the above should be used in examining the adjusted association between BRFSS questions and the SF-36 summary scale scores. These adjustment factors were then forced-in as background variables before replicating the stepwise procedure described above.

Table 5.2 Candidate adjustment variables considered in stepwise OLS regression models of SF-36 summary component scores using BRFSS HRQOL questions

Candidate adjustment variable	Adjustment variable coding
Age	18-29 30-44 45-64 ≥65
Sex	Female vs. Male
Race	Black vs. White (individuals of other races were excluded)
Education	<High school degree HS graduate Some college College graduate
Income	<$15,000 $15,000-24,999 $25,000-49,999 ≥$50,000
Employment status	Unemployed Employed Out of the labor force

5.3 Findings

5.3.1 *Bivariate comparisons*

Tables 5.3 displays the SF-36 scale means by level of BRFSS HRQOL categorical variables in the full statewide sample. Statistically significant trends, for self-rated health, and differences, for presence of limitation, in SF-36 scale and summary scores are indicated. Lower self-rated health or the presence of limitation results is associated with a lower scores on every SF-36 scale, individual or summary. For the general health and any limitation question where the full sample size is available, statistically significant trend or difference is evident across levels for all scales except the SF-12 MCS which does not differ significantly in the no limitation and any limitation group. Of note is the fact that there is a stronger trend in the PCS rather than the MCS summary scales with decreasing self-rated health suggesting, perhaps, that the self-rated health question more typically evokes consideration of physical rather than mental health dimensions. Also of interest is that SF-36 scales exhibiting the largest differences with the presence of limitations tend to be on physical health dimensions.

Table 5.4 shows these same comparisons stratified by the key demographic subgroups of age, sex, race and household income. Because stratification reduces effective sample size considerably, stratified means were not included for personal and routine limitation questions asked among the small subgroup of 68 reporting any limitation. The pattern in scale and summary scores across self-rated health and limitation questions observed in the full sample generally held in all age groups. There seemed to be more of an association between self-rated health and limitation report with mental health dimensions in the 45-64 age group than in other age groups, but the strong association with physical health dimensions also remained in this age group. Men and women had very similar SF-36 patterns, consistent with the full sample, with respect to self-rated health (C1) and report of any limitations (M1). The SF-36 patterns in blacks and whites were also

Table 5.3 Mean SF-36 / SF-12 HRQOL scale scores by response to categorical BRFSS HRQOL questions in the STATEWIDE sample

	General Health	Physical Functioning	Role Physical	Mental Health	Role Emotional	Social Functioning	Pain	Vitality	PCS** SF-36	MCS** SF-36	PS SF-12	MS SF-12
Population mean	70.4	86.1	83.7	81.4	89.2	91.2	78.9	64.8	49.6	53.8	50.1	47.7
BRFSS question												
C1. Self-rated health (n=401)												
Excellent	83.3†	95.0†	90.0†	87.2†	94.1†	96.4†	87.9†	75.1†	53.8†	56.2†	54.6†	49.6†
Very good	76.9	92.1	89.4	83.9	94.0	95.2	80.7	68.3	51.8	55.1	52.4	48.5
Good	63.7	83.9	90.2	78.7	86.5	90.2	80.7	60.8	49.7	52.1	50.2	46.1
Fair	48.0	66.8	57.1	72.3	82.1	79.8	63.4	49.9	39.7	51.1	39.7	45.9
Poor	27.8	42.4	25.5	61.9	50.0	58.3	40.8	33.7	29.4	44.3	28.5	41.3
M1. Any limitation (n=401)	53.6*	59.9*	49.0*	72.2*	76.0*	77.0*	52.3*	44.4*	37.1*	50.7*	38.3*	46.2
Yes	73.8	91.4	90.8	83.2	91.9	94.1	84.3	68.9	52.1	54.4	52.5	47.9
No												
M4. Personal care Limitation (n=68)	52.6	38.6*	35.7	61.0	61.9	57.1	46.4	35.0	33.0	45.2	34.7	43.0
Yes	53.7	62.4	50.5	73.5	77.6	79.3	53.0	45.5	37.6	51.3	38.7	46.6
No												
M5. Routine care Limitation (n=68)	45.3*	39.9*	28.6*	66.3	68.3	58.9*	38.4*	33.4*	29.4*	48.1	30.7*	46.5
Yes	57.3	68.9	58.2	74.8	79.4	85.1	58.5	49.3	40.5	51.8	41.6	46.1
No												

Statistically significant linear trend in mean score from "Poor" to "Excellent" groups (OLS regression, two-tailed test, $\alpha = 0.05$)

* Statistically significant difference between "Yes" and "No" groups (Students t-statistic, two-tailed test, $\alpha=0.05$)

** PCS = Physical Component Summary Scale; MCS = Mental Component Summary Scale

Table 5.4. Mean SF-36 / SF-12 HRQOL scale scores by response to categorical BRFSS HRQOL questions in the STATEWIDE sample stratified by descriptive characteristics

	General Health	Physical Functioning	Role Physical	Mental Health	Role Emotional	Social Functioning	Pain	Vitality	PCS** SF-36	MCS** SF-36	PCS** SF-12	MCS** SF-12
Population mean	70.4	86.1	83.7	81.4	89.2	91.2	78.9	64.8	49.6	53.8	50.1	47.7
BRFSS question by demographic group												
AGE: 18-29												
C1. Self-rated health (n=79)												
Excellent	83.8†	98.8†	89.3	85.5†	90.5	97.0	94.1†	75.5†	55.7†	54.7†	55.7†	48.6†
Very good	78.0	93.8	91.0	82.0	92.4	94.4	78.3	64.2	52.3	53.7	52.5	47.3
Good	63.0	87.8	97.2	72.2	83.3	84.7	93.2	53.6	53.6	47.3	53.3	42.8
Fair	45.0	65.0	58.3	68.0	66.7	95.8	72.0	43.3	41.6	48.9	37.8	43.3
Poor	-	-	-	-	-	-	-	-	-	-	-	-
M1. Any limitation												
Yes	52.3*	71.3*	43.8*	75.3	75.0	93.8*	54.8*	30.4*	38.2*	50.8	36.9*	44.8
No	76.0	93.8	93.2	80.4	89.5	92.9	87.4	65.8	54.0	52.4	53.9	46.5
AGE: 30-44												
C1. Self-rated health (n=120)												
Excellent	84.1†	94.1†	82.1	84.3†	92.8†	92.4	86.2†	68.0†	53.0†	54.4†	53.6†	48.7†
Very good	76.4	92.9	88.6	80.6	89.9	93.9	78.6	64.8	52.3	53.2	52.6	47.0
Good	62.5	92.6	92.2	77.2	86.2	90.5	81.3	56.6	51.6	50.2	52.0	44.5
Fair	54.0	76.0	60.0	67.2	60.0	77.5	65.0	48.0	44.6	45.1	41.2	42.0
Poor	15.0	10.0	0	48.0	33.3	100.0	41.0	10.0	21.6	45.0	25.9	23.4
M1. Any limitation												
Yes	68.7	74.8†	57.4†	77.9	88.2	85.3	62.0†	49.4†	42.5†	53.1	44.3†	47.4
No	74.2	94.5	90.8	80.1	87.9	93.2	83.1	64.5	53.2	52.2	53.4	46.3

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Table 5.4 (continued) Mean SF-36 / SF-12 HRQOL scale scores by response to categorical BRFSS HRQOL questions in the STATEWIDE sample stratified by key demographic groups

	General Health	Physical Functioning	Role Physical	Mental Health	Role Emotional	Social Functioning	Pain	Vitality	PCS** SF-36	MCS** SF-36	PCS** SF-12	MCS** SF-12
Population mean	70.4	86.1	83.7	81.4	89.2	91.2	78.9	64.8	49.6	53.8	50.1	47.7
BRFSS question by demographic group												
AGE: 45-64												
C1. Self-rated health (n=126)												
Excellent	84.1†	95.0†	94.2†	90.8†	95.6†	99.6†	87.3†	78.0†	53.8†	57.9†	54.7†	50.7†
Very good	77.2	93.5	89.3	85.8	97.5	95.8	82.9	70.9	51.9	56.1	52.7	49.3
Good	62.7	82.3	86.4	80.0	86.4	92.6	71.1	65.5	47.4	53.9	48.8	47.4
Poor	95.8	64.1	56.3	75.3	94.4	77.1	66.2	52.1	38.2	53.6	38.5	48.0
Fair	22.1	43.6	19.4	43.9	18.5	36.1	38.9	17.8	31.2	31.3	29.8	34.8
M1. Any limitation												
Yes	47.0*	56.9*	41.0*	63.8*	61.1*	66.2*	45.2*	39.8*	35.8*	45.6*	36.6*	43.2*
No	74.7	92.3	91.4	86.3	95.8	95.7	84.3	72.3	51.9	56.2	52.5	49.3
AGE: 65+												
C1. Self-rated health (n=76)												
Excellent	78.2†	90.0†	100.0†	88.0†	100.0†	96.6†	82.1†	84.2†	52.2†	58.6	54.7†	50.8
Very good	75.4	80.9	91.2	92.5	100.0	99.3	86.9	79.7	49.3	60.7	50.6	53.2
Good	67.4	69.5	85.0	85.2	90.0	91.9	78.9	68.2	45.8	57.0	46.4	50.0
Fair	48.4	66.3	56.6	72.4	82.5	79.6	59.8	50.1	39.1	51.3	39.6	46.0
Poor	35.8	45.1	35.4	83.9	87.5	78.1	48.5	54.6	28.3	58.9	27.3	50.2
M1. Any limitation												
Yes	49.7*	50.2*	52.2*	76.3*	82.6	79.3*	52.2*	47.9*	34.3*	54.2	35.7*	48.8
No	68.1	80.4	86.9	87.1	95.6	94.3	82.4	75.1	48.1	58.0	48.7	50.3

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Table 5.4 (continued) Mean SF-36 / SF-12 HRQOL scale scores by response to categorical BRFSS HRQOL questions in the statewide sample stratified by key demographic characteristics

	General Health	Physical Functioning	Role Physical	Mental Health	Role Emotional	Social Functioning	Pain	Vitality	PCS** SF-36	MCS** SF-36	PCS** SF-12	MCS** SF-12
Population mean	70.4	86.1	83.7	81.4	89.2	91.2	78.9	64.8	49.6	53.8	50.1	47.7
BRFSS question by demographic group												
SEX: MALE												
C1. Self-rated health (n=161)												
Excellent	82.2†	94.3†	90.5†	89.3†	98.2†	97.0†	88.1†	79.3†	53.2†	57.9†	54.2†	51.5
Very good	74.9	94.9	91.0	84.2	95.5	95.5	81.3	71.1	52.4	55.4	52.9	48.9
Good	61.6	89.1	92.6	79.4	91.9	90.5	82.4	64.8	50.5	52.8	51.2	47.1
Fair	50.7	80.0	67.3	77.2	97.4	86.5	69.2	61.5	43.0	54.6	42.7	47.2
Poor	25.0	47.1	22.6	67.4	57.1	58.9	52.7	32.1	30.1	45.8	27.8	44.0
M1. Any limitation												
Yes	55.1*	70.9*	55.2*	74.3*	85.1	78.4*	59.1*	52.2*	40.2*	51.9	40.8*	47.5
No	72.5	94.4	93.2	84.8	95.7	95.5	85.7	72.8	52.6	55.5	53.1	49.0
SEX: FEMALE												
C1. Self-rated health (n=240)												
Excellent	84.1†	95.5†	89.6†	85.7†	91.2†	96.0†	87.8†	72.1†	54.2†	55.0†	54.9†	48.3†
Very good	78.3	90.2	88.2	83.7	93.1	95.0	80.4	66.3	51.5	54.8	52.0	48.2
Good	65.3	80.2	88.5	78.2	82.7	89.9	79.4	57.9	49.1	51.6	49.5	45.4
Fair	46.7	60.2	51.9	69.8	74.4	76.4	60.4	44.1	38.1	49.3	38.2	45.3
Poor	29.5	39.4	27.3	58.4	45.5	58.0	33.2	34.7	28.9	43.4	28.9	39.6
M1. Any limitation												
Yes	52.5*	51.8*	44.4*	70.6*	69.2*	76.0*	47.3*	38.5*	34.8*	49.8	36.3*	45.3
No	74.6	89.5	89.2	82.1	89.5	93.2	83.3	66.4	51.8	53.7	52.1	47.2

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Table 5.4 (continued) Mean SF-36 / SF-12 HRQOL scale scores by response to categorical BRFSS HRQOL questions in the statewide sample stratified by key demographic characteristics

	General Health	Physical Functioning	Role Physical	Mental Health	Role Emotional	Social Functioning	Pain	Vitality	PCS** SF-36	MCS** SF-36	PCS** SF-12	MCS** SF-12
Population mean	70.4	86.1	83.7	81.4	89.2	91.2	78.9	64.8	49.6	53.8	50.1	47.7
BRFSS question by demographic group												
RACE: White												
C1. Self-rated health (n=347)												
Excellent	83.3†	94.5†	91.0†	85.9†	93.2†	96.2†	88.6†	74.1†	54.1†	55.5†	54.7†	49.0†
Very good	76.8	91.9	89.3	83.7	93.5	95.6	81.0	68.3	51.8	55.0	52.5	48.5
Good	64.1	84.1	90.6	78.6	85.8	90.2	81.8	61.6	50.0	52.0	50.4	46.1
Fair	49.7	69.2	59.8	73.7	83.8	81.1	62.3	52.0	40.3	51.7	40.5	46.1
Poor	29.1	40.7	25.5	63.9	52.1	63.3	41.9	37.0	29.0	46.2	28.2	42.2
M1. Any limitation												
Yes	53.9*	60.6*	50.6*	72.6*	76.1*	77.7*	53.5*	46.2*	37.6*	50.9*	38.6*	46.5
No	74.0	91.5	91.3	82.9	91.5	94.5	84.7	69.0	52.3	54.3	52.7	47.7
RACE: Black												
C1. Self-rated health (n=40)												
Excellent												
Very good	83.1†	98.8†	90.6†	96.5†	100.0†	96.9†	86.4†	81.9†	52.9†	59.9†	54.3†	53.4
Good	77.0	91.6	95.6	83.3	97.9	91.2	82.6	68.8	53.2	55.1	52.6	47.9
Fair	61.4	84.4	84.4	80.5	91.7	95.3	67.1	53.8	46.4	53.8	48.3	46.3
Poor	38.0	46.0	30.0	60.8	66.7	67.5	62.8	31.0	33.8	45.5	32.8	43.7
	16.9	56.4	25.0	46.0	33.3	18.8	31.5	7.5	32.0	29.2	30.9	34.0
M1. Any limitation												
Yes	37.8*	43.0*	15.0*	60.8*	60.0	57.5*	32.0*	21.0*	27.8*	44.4*	29.7*	40.8
No	71.4	90.0	90.0	83.5	94.1	90.7	81.4	66.3	51.2	54.6	51.2	48.4

-continued-

Table 5.4 (continued) Mean SF-36 / SF-12 HRQOL scale scores by response to categorical BRFSS HRQOL questions in the statewide sample stratified by key demographic characteristics

	General Health	Physical Functioning	Role Physical	Mental Health	Role Emotional	Social Functioning	Pain	Vitality	PCS** SF-36	MCS** SF-36	PCS** SF-12	MCS** SF-12
Population mean	70.4	86.1	83.7	81.4	89.2	91.2	78.9	64.8	49.6	53.8	50.1	47.7
BRFSS question by demographic group												
INCOME: <$15,000												
C1. Self-rated health (n=115)												
Excellent	80.9†	96.6†	95.3†	85.8†	91.7†	93.0†	91.1†	73.8†	55.1†	54.4†	56.0†	48.7†
Very good	77.5	87.6	88.8	82.1	86.1	90.5	83.9	67.0	52.3	53.4	52.2	47.1
Good	67.0	79.0	90.0	79.2	83.3	89.6	81.3	62.4	49.4	52.4	49.0	46.5
Fair	43.4	61.5	51.0	69.0	77.1	78.9	62.7	45.1	38.1	49.7	37.6	44.8
Poor	28.6	38.7	22.0	61.6	50.0	64.3	40.4	36.4	28.4	45.8	28.4	40.4
M1. Any limitation												
Yes	45.1*	46.3*	40.8*	67.6*	69.0	73.2*	46.8*	41.5*	32.8*	49.7	33.5*	45.2
No	70.6	86.4	88.3	80.7	84.3	89.9	85.4	65.7	51.5	52.5	51.2	46.3
INCOME: $15,000-$24,999												
C1. Self-rated health (n=102)												
Excellent	82.7†	97.5†	89.6†	89.7†	93.1†	98.4†	85.7†	77.5†	53.6†	57.1†	54.8†	50.0
Very good	77.8	91.8	92.9	86.0	97.8	95.1	81.2	70.4	51.8	56.2	52.3	49.6
Good	64.9	92.8	93.8	78.0	95.0	89.4	85.1	59.3	52.0	51.5	51.8	46.2
Fair	51.4	67.3	50.0	70.9	72.7	70.5	53.6	49.1	38.9	48.8	40.3	44.3
Poor	10.0	15.0	25.0	44.0	0.0	12.5	32.0	5.0	25.7	27.5	24.9	39.8
M1. Any limitation												
Yes	56.6*	67.4*	44.6*	71.7*	69.0*	72.3*	49.7*	42.9*	38.5*	48.4	40.7*	45.0
No	75.5	93.5	93.8	85.1	96.2	94.3	84.3	70.8	52.5	55.4	52.9	48.9

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Table 5.4 (continued) Mean SF-36 / SF-12 HRQOL scale scores by response to categorical BRFSS HRQOL questions in the statewide sample stratified by key demographic characteristics

	General Health	Physical Functioning	Role Physical	Mental Health	Role Emotional	Social Functioning	Pain	Vitality	PCS** SF-36	MCS** SF-36	PCS** SF-12	MCS** SF-12
Population mean	70.4	86.1	83.7	81.4	89.2	91.2	78.9	64.8	49.6	53.8	50.1	47.7
BRFSS question by demographic group												
INCOME: $25,000-$49,999												
C1. Self-rated health (n=111)												
Excellent	85.0†	96.3†	92.9†	84.0†	92.9†	96.9†	88.3†	74.3†	55.0†	54.9†	55.5†	48.3
Very good	76.8	95.0	88.3	84.0	97.1	97.8	78.0	69.4	51.6	55.7	52.4	49.1
Good	58.4	88.6	89.8	74.0	80.3	89.8	73.0	61.1	49.7	49.9	51.4	43.6
Fair	41.7	76.7	50.0	70.7	100.0	66.7	68.7	58.3	40.0	51.4	39.6	49.1
Poor	40.0	65.0	25.0	76.0	33.3	37.5	64.0	25.0	37.3	39.1	27.5	47.6
M1. Any limitation												
Yes	62.1*	83.5*	63.1*	72.9	85.7	82.1	57.8*	51.8*	44.2*	50.4	44.7*	46.6
No	75.6	94.7	91.8	82.8	93.1	96.4	82.3	70.7	52.7	54.6	53.5	48.0
INCOME:≥$50,000												
C1. Self-rated health (n=37)												
Excellent	85.7†	97.5	92.9	88.6	97.6	100.0†	90.0	71.8	54.7†	56.6	55.2†	49.8
Very good	73.7	94.4	85.4	83.7	91.7	96.9	84.5	62.1	51.9	53.9	52.5	47.4
Good	59.6	91.9	93.8	82.0	91.7	93.8	87.8	59.4	51.2	52.7	52.0	46.8
Fair	46.7	93.0	75.0	88.0	100.0	91.7	100.0	66.7	48.4	56.2	45.3	51.1
Poor	-	-	-	-	-	-	-	-	-	-	-	-
M1. Any limitation												
Yes	68.0	80.8	58.3*	88.0	100.0*	91.7	78.0	53.3	43.9*	57.2	43.6	51.9
No	73.4	96.1	91.9	85.3	94.1	97.4	89.5	66.6	53.3	54.6	53.6	48.2

† Statistically significant linear trend in mean score from "Poor" to "Excellent" groups (OLS regression, two-tailed test, $\alpha = 0.05$)

* Statistically significant difference between "Yes" and "No" groups (Students t-statistic, two-tailed test, $\alpha=0.05$)

** PCS = Physical Component Summary Scale; MCS = Mental Component Summary Scale

1 n for this row = 1

consistent with that seen in the full sample. What was striking in this subgroup analysis was that blacks with limitations or rating their health as fair or poor tended to have consistently lower SF-36 scale or summary scores than did the whites in the same BRFSS response categories. Finally, with respect to the household income subgroups, the full sample pattern holds the first three income categories. In the highest income category, SF-36 scale and summary scores are not as consistently associated with the self-rated health (C1) and any limitations (M1) questions. There are only 37 observations in this income stratum, so chance could play a part in this attenuated association. Note, however, that the physical summary scale is still significantly associated with these items, despite this sample size.

Table 5.5 presents rank correlations between continuous BRFSS items and SF-36 scales and summary components in the full statewide sample. Correlations that are significantly different from the null are noted. Note that since SF-36 scale are scored to always increase with improved HRQOL while the BRFSS days variables (except for good health days and days full of energy) are expected to decrease as HRQOL increases, the sign on correlations will typically be negative. The patterns in the coefficients indicate that BRFSS items correlate with individual SF-36 scales in a manner consistent with *a priori* expectations. For example, days depressed correlates most strongly with mental health and role emotional scales and least with physical functioning. Days without sleep and days full of energy both correlate most strongly with the SF-36 Vitality scale. Note also that BRFSS question C4, days kept from activities, which is phrased to be based in both physical and mental health, correlates most consistently with all SF-36 scales. One interesting, somewhat unexpected observation, based on table 5.5 is that the "not good" physical functioning variable correlates more strongly with role physical than physical functioning. Apparently, respondents consider the way in which physical problems affect their ability

Table 5.5 Rank correlation coefficients between BRFSS HRQOL continuous items and SF-36 / SF-12 HRQOL scales in the STATEWIDE sample.

	General Health	Physical Functioning	Role Physical	Mental Health	Role Emotional	Social Functioning	Pain	Vitality	PCS** SF-36	MCS** SF-36	PCS** SF-12	MCS** SF-12
C2. "Not Good" Physical Days	-0.22	-0.25	-0.55	-0.30	-0.29	-0.41	-0.35	-0.37	-0.33	-0.25	-0.31	-0.21
C3. "Not Good" Mental Days	-0.14	-0.08	-0.16	-0.45	-0.48	-0.36	-0.14	-0.31	0.00	-0.45	0.00	-0.44
C4. Days kept from activities	-0.15	-0.20	-0.42	-0.26	-0.38	-0.41	-0.25	-0.30	-0.24	-0.23	-0.24	-0.19
Good Health Days	0.20	0.19	0.45	0.40	0.40	0.47	0.31	0.40	0.44	0.21	0.34	0.19
M3. Length of limitation (yrs)	-0.04	-0.08	0.18	0.12	0.06	0.07	0.09	0.11	0.02	0.07	0.10	0.09
M6. Pain-limited activity days	-0.19	-0.23	-0.47	-0.19	-0.25	-0.32	-0.56	-0.31	-0.39	-0.12	0.36	-0.09
M7. Days sad, blue, depressed	-0.17	-0.10	-0.21	-0.53	-0.55	-0.43	-0.21	-0.35	-0.01	-0.50	0.01	-0.50
M8. Days anxious, worried, tense	-0.18	-0.08	-0.15	-0.44	-0.42	0.30	-0.16	-0.31	-0.02	-0.41	-0.02	-0.39
M9. Days without enough sleep	-0.05	-0.04	-0.11	-0.21	-0.12	-0.16	-0.16	-0.31	-0.07	-0.24	-0.05	-0.19
M10. Days full of energy	0.29	0.19	0.28	0.42	0.34	0.34	0.26	0.50	0.16	0.40	0.18	0.37

[1]Kendall Tau b Coefficients

All b statistically significant at $\propto < 0.05$ are shaded

** PCS = Physical Component Summary Scale; MCS = Mental Component Summary Scale

to meet their daily role requirements (e.g., school, work, etc.) when tallying their "not good" days. Supporting this notion is the fact that not good physical health days also correlate more strongly with social functioning than physical functioning. Note that the magnitude of the correlation of the "good health days" variable with SF-36 PCS and MCS is below that of the "not good day" item, physical or mental health, conceptually congruent with the summary component. Also note that the magnitude of "good health days" correlation with individual scales that cross cut physical and mental health (e.g., vitality and social functioning) are greater than either the physical or mental health not good days items.

As shown in table 5.6 the patterns in correlation of BRFSS items with SF-36 scales are generally similar across demographic subgroups defined by sex, age, income, and race. Note that notation indicating statistical significance of correlation coefficients varies from sub-group to subgroup (for estimates stratified by sex and race coefficients that are *not* statistically significant are flagged, whereas for estimates stratified by age and income coefficients that *are* significantly different from zero are flagged). Women tended to have stronger correlations between BRFSS questions and conceptually similar SF-36 scales than men. Blacks tended to have stronger correlations between BRFSS questions and conceptually similar SF-36 scales than whites. Correlations between BRFSS questions and conceptually similar SF-36 scales tend to increase with age through the 45-64 age group; then the trend becomes somewhat attenuated in the oldest age group. Patterns in the magnitude of correlations with income were less discernable. These patterns suggest that perhaps correlations between BRFSS and SF-36 are stronger in demographic groups with greater prevalence of chronic health problems. To explore this hypothesis, correlations between BRFSSS items and SF-36 scales and summaries were estimated in the analytic subgroups,

Table 5.6 Rank correlation coefficients between BRFSS HRQOL continuous items and SF-36 / SF-12 HRQOL scales in the **STATE SAMPLE** stratified by key demographic characteristic

BRFSS question by demographic group	General Health	Physical Functioning	Role Physical	Mental Health	Role Emotional	Social Functioning	Pain	Vitality	PCS** SF-36	MCS** SF-36	PCS** SF-12	MCS** SF-12
Sex: Female												
C2. "Not Good" Physical Days	-0.24	-0.25	-0.57	-0.27	-0.29	-0.37	-0.39	-0.38	-0.36	-0.22	-0.34	-0.16
C3. "Not Good" Mental Days	-0.20	-0.04	-0.19	-0.51	-0.51	-0.38	-0.18	-0.35	-0.02	-0.51	-0.02	-0.49
C4. Days kept from activities	-0.19	-0.19	-0.43	-0.26	-0.40	-0.41	-0.28	-0.33	-0.24	-0.23	-0.26	-0.19
Good Health Days	0.22	0.15	0.47	0.42	0.42	0.48	0.35	0.41	0.22	0.39	0.21	0.34
M3. Length of limitation (yrs)	-0.03	-0.16	0.12	0.08	-0.07	0.06	-0.08	0.08	-0.03	0.03	0.03	0.07
M6. Pain-limited activity days	-0.25	-0.26	-0.51	-0.19	-0.23	-0.35	-0.56	-0.34	-0.43	-0.10	-0.40	-0.07
M7. Days sad, blue, depressed	-0.21	-0.05	-0.21	0.61	-0.60	-0.47	-0.27	-0.39	-0.02	-0.59	0.01	-0.58
M8. Days anxious, worried, tense	-0.19	-0.02	-0.13	-0.48	-0.46	-0.31	-0.14	-0.30	0.02	-0.46	0.00	-0.46
M9. Days without enough sleep	-0.03	-0.02	-0.09	-0.18	-0.07	-0.17	-0.11	-0.29	-0.04	-0.22	-0.03	-0.17
M10. Days full of energy	0.26	0.18	0.31	0.40	0.37	0.38	0.25	0.45	0.15	0.37	0.15	0.36

[1]Kendall Tau b Coefficients

*All b statistically significant at $\alpha < 0.05$ are shaded

** PCS = Physical Component Summary Scale; MCS = Mental Component Summary Scale

Table 5.6 (continued) Rank correlation coefficients between BRFSS HRQOL continuous items and SF-36 / SF-12 HRQOL scales in the **STATE SAMPLE** stratified by key demographic characteristic

BRFSS question by demographic group	General Health	Physical Functioning	Role Physical	Mental Health	Role Emotional	Social Functioning	Pain	Vitality	PCS** SF-36	MCS** SF-36	PCS** SF-12	MCS** SF-12
Sex: Male												
C2. "Not Good" Physical Days	-0.19	-0.23	-0.53	-0.36	-0.29	-0.47	-0.28	-0.33	-0.29	-0.29	-0.23	-0.27
C3. "Not Good" Mental Days	-0.05	-0 10	-0.11	-0.37	-0.42	-0.34	-0.07	-0.21	0.05	-0.29	0.06	-0.35
C4. Days kept from activities	-0.10	-0.19	0.38	-0.27	-0.32	-0.41	-0.19	-0.24	-0.22	-0.21	-0.20	-0.17
Good Health Days	0.19	0.23	0.43	0.40	0.36	0.47	0.22	0.35	0.19	0.35	0.15	0.33
M3. Length of limitation (yrs)	-0.1	-0.12	0.16	0.11	0.17	0.03	0.18	0.06	-0.02	0.11	0.08	0.08
M6. Pain-limited activity days	0.09	-0.17	-0.38	-0.20	-0.27	-0.27	-0.54	-0.26	-0.33	-0.14	-0.30	-0.13
M7. Days sad, blue, depressed	-0.11	-0.11	-0.20	-0.40	-0.42	-0.36	-0.09	-0.25	0.02	-0.34	0.02	-0.33
M8. Days anxious, worried, tense	-0.18	-0.14	-0.19	-0.38	-0.32	-0.30	-0.18	-0.30	-0.06	-0.32	-0.04	-0.26
M9. Days without enough sleep	-0.08	-0.06	-0.15	-0.26	-0.20	-0.15	-0.23	-0.34	-0.11	-0.26	-0.07	-0.22
M10. Days full of energy	0.33	0.22	0.26	0.44	0.29	0.29	0.26	0.57	0.18	0.44	0.21	0.38

[1]Kendall Tau b Coefficients

*All b statistically significant at $\alpha < 0.05$ are shaded

** PCS = Physical Component Summary Scale; MCS = Mental Component Summary Scale

Table 5.6 (continued) Rank correlation coefficients between BRFSS HRQOL continuous items and SF-36 / SF-12 HRQOL scales in the **STATE SAMPLE** stratified by key demographic characteristic

BRFSS question by demographic group	General Health	Physical Functioning	Role Physical	Mental Health	Role Emotional	Social Functioning	Pain	Vitality	PCS** SF-36	MCS** SF-36	PCS** SF-12	MCS** SF-12
Race: White												
C2. "Not Good" Physical Days	-0.20	-0.25	-0.55	-0.31	-0.29	-0.41	-0.34	-0.36	-0.31	-0.25	-0.29	-0.21
C3. "Not Good" Mental Days	-0.10	-0.06	-0.17	-0.44	-0.47	-0.37	-0.15	-0.31	0.01	-0.44	0.02	-0.43
C4. Days kept from activities	-0.12	-0.16	-0.42	-0.24	-0.38	-0.39	-0.23	-0.27	-0.20	-0.21	-0.20	-0.17
Good Health Days	0.17	0.18	0.44	0.40	0.39	0.45	0.29	0.39	0.19	0.36	0.17	0.33
M3. Length of limitation (yrs)	-0.07	-0.14	0.11	0.05	0.02	0.00	0.04	0.05	-0.03	0.04	0.04	0.06
M6. Pain-limited activity days	-0.19	-0.22	-0.44	-0.19	-0.24	-0.29	-0.54	-0.29	-0.37	-0.11	-0.33	-0.09
M7. Days sad, blue, depressed	-0.15	-0.07	-0.21	-0.52	-0.54	-0.43	-0.21	-0.35	0.00	-0.50	0.03	-0.50
M8. Days anxious, worried, tense	-0.16	-0.08	-0.16	-0.45	-0.41	-0.30	-0.15	-0.32	0.00	-0.42	0.00	-0.39
M9. Days without enough sleep	-0.01	-0.01	-0.08	-0.20	-0.10	-0.14	-0.12	-0.28	-0.03	-0.23	0.00	-0.19
M10. Days full of energy	0.27	0.15	-0.29	0.42	0.33	0.33	0.23	0.49	0.13	0.41	0.14	0.37

[1]Kendall Tau b Coefficients

*All b statistically significant at $\alpha < 0.05$ are shaded

** PCS = Physical Component Summary Scale; MCS = Mental Component Summary Scale

Table 5.6 (continued) Rank correlation coefficients between BRFSS HRQOL continuous items and SF-36 / SF-12 HRQOL scales in the **STATE SAMPLE** stratified by key demographic characteristic

BRFSS question by demographic group	General Health	Physical Functioning	Role Physical	Mental Health	Role Emotional	Social Functioning	Pain	Vitality	PCS** SF-36	MCS** SF-36	PCS** SF-12	MCS** SF-12
Race: Black												
C2. "Not Good" Physical Days	-0.52	-0.42	-0.60	-0.52	-0.46	-0.52	-0.48	-0.55	-0.47	-0.50	-0.50	-0.44
C3. "Not Good" Mental Days	-0.43	-0.14	-0.23	-0.53	-0.58	-0.56	-0.26	-0.41	-0.13	-0.56	0.12	-0.49
C4. Days kept from activities	-0.34	-0.36	-0.51	-0.51	-0.52	-0.47	-0.48	-.044	-0.42	-0.44	-0.47	-0.35
Good Health Days	0.48	0.32	0.49	0.62	0.53	0.61	0.45	0.53	0.36	0.63	0.32	0.51
M3. Length of limitation (yrs)	-0.33	0.00	0.71	0.67	0.55	0.33	0.33	-0.33	0.00	0.33	0.33	0.00
M6. Pain-limited activity days	-0.28	-0.47	-0.53	-0.34	-0.37	-0.47	-0.65	-0.47	-0.53	-0.25	-0.54	-0.19
M7. Days sad, blue, depressed	-0.36	-0.20	-0.40	-0.65	-0.64	-0.52	-0.37	-0.41	-0.15	-0.54	-0.22	-0.52
M8. Days anxious, worried, tense	-0.28	-0.10	-0.21	-0.49	-0.57	-0.35	-0.25	-0.32	-0.11	-0.45	-0.15	-0.48
M9. Days without enough sleep	-0.28	-0.34	-0.33	-0.29	-0.21	-0.33	-0.51	-0.50	-0.45	-0.29	-0.38	-0.23
M10. Days full of energy	0.46	0.54	0.42	0.49	0.50	0.42	0.50	0.60	0.48	0.40	0.44	0.45

[1]Kendall Tau b Coefficients

*All b statistically significant at $\alpha < 0.05$ are shaded

** PCS = Physical Component Summary Scale; MCS = Mental Component Summary Scale

Table 5.6 (continued) Rank correlation coefficients between BRFSS HRQOL continuous items and SF-36 / SF-12 HRQOL scales in the **STATE SAMPLE** stratified by key demographic characteristic

BRFSS question by demographic group	General Health	Physical Functioning	Role Physical	Mental Health	Role Emotional	Social Functioning	Pain	Vitality	PCS** SF-36	MCS** SF-36	PCS** SF-12	MCS** SF-12
Age: 18-29												
C2. "Not Good" Physical Days	-0.17	-0.08	-0.41	-0.22	-0.01	-0.17	-0.20	-0.32	-0.18	-0.18	-0.12	-0.22
C3. "Not Good" Mental Days	-0.12	-0.05	-0.20	-0.44	-0.43	-0.48	0.06	-0.31	0.17	-0.49	0.09	-0.45
C4. Days kept from activities	-0.11	-0.12	-0.21	-0.18	-0.22	-0.20	0.01	-0.22	-0.05	-0.24	-0.05	-0.22
Good Health Days	0.13	0.08	0.44	0.41	0.25	0.42	0.17	0.41	0.04	0.40	0.05	0.41
M3. Length of limitation (yrs)	-0.33	0.33	0.61	0.00	-0.24	0.00	0.00	-0.33	0.67	-0.67	0.67	-0.67
M6. Pain-limited activity days	-0.21	-0.34	0.42	-0.08	-0.15	-0.15	-0.65	-0.40	-0.45	-0.82	-0.36	-0.07
M7. Days sad, blue, depressed	-0.11	-0.09	-0.21	-0.47	-0.42	-0.45	-0.05	-0.30	0.14	-0.49	0.09	-0.49
M8. Days anxious, worried, tense	-0.13	-0.06	-0.33	-0.52	-0.39	-0.41	0.07	-0.25	0.07	-0.48	-0.01	-0.48
M9. Days without enough sleep	-0.07	-0.09	-0.16	-0.02	0.05	0.01	-0.14	-0.16	-0.13	-0.03	-0.10	-0.05
M10. Days full of energy	0.31	0.28	0.14	0.42	0.22	0.29	0.13	0.44	0.03	0.41	0.12	0.33

[1]Kendall Tau b Coefficients

*All b statistically significant at $\alpha < 0.05$ are shaded

** PCS = Physical Component Summary Scale; MCS = Mental Component Summary Scale

Table 5.6 (continued) Rank correlation coefficients between BRFSS HRQOL continuous items and SF-36 / SF-12 HRQOL scales in the **STATE SAMPLE** stratified by key demographic characteristic

BRFSS question by demographic group	General Health	Physical Functioning	Role Physical	Mental Health	Role Emotional	Social Functioning	Pain	Vitality	PCS** SF-36	MCS** SF-36	PCS** SF-12	MCS** SF-12
Age: 30-44												
C2. "Not Good" Physical Days	-0.08	-0.28	-0.54	-0.22	-0.21	-0.35	-0.34	-0.23	-0.34	-0.14	-0.31	-0.11
C3. "Not Good" Mental Days	-0.07	-0.18	-0.20	-0.39	-0.44	-0.25	-0.24	-0.30	-0.06	-0.37	-0.08	-0.38
C4. Days kept from activities	-0.01	-0.20	-0.41	-0.28	-0.37	-0.37	-0.30	-0.25	-0.24	-0.22	-0.27	-0.16
Good Health Days	0.06	0.28	0.38	0.28	0.35	0.36	0.32	0.27	0.24	0.25	0.21	0.24
M3. Length of limitation (yrs)	-0.35	-0.30	0.07	-0.05	0.08	-0.27	-0.25	-0.05	-0.08	-0.10	0.04	0.05
M6. Pain-limited activity days	-0.02	-0.14	-0.46	-0.18	-0.18	-0.28	-0.50	-0.15	-0.32	-0.05	-0.33	-0.04
M7. Days sad, blue, depressed	-0.15	-0.20	-0.29	-0.57	-0.62	-0.43	-0.35	-0.40	-0.06	-0.50	-0.03	-0.49
M8. Days anxious, worried, tense	-0.21	-0.18	-0.10	-0.50	-0.43	-0.29	-0.19	-0.37	0.00	-0.45	-0.03	-0.48
M9. Days without enough sleep	-0.12	-0.19	-0.02	-0.27	-0.07	-0.15	-0.23	-0.37	-0.11	-0.22	-0.09	-0.18
M10. Days full of energy	0.27	0.26	0.22	0.48	0.32	0.35	0.28	0.59	0.15	0.45	0.15	0.42

[1]Kendall Tau b Coefficients

*All b statistically significant at $\alpha < 0.05$ are shaded

** PCS = Physical Component Summary Scale; MCS = Mental Component Summary Scale

Table 5.6 (continued) Rank correlation coefficients between BRFSS HRQOL continuous items and SF-36 / SF-12 HRQOL scales in the **STATE SAMPLE** stratified by key demographic characteristic

	General Health	Physical Functioning	Role Physical	Mental Health	Role Emotional	Social Functioning	Pain	Vitality	PCS** SF-36	MCS** SF-36	PCS** SF-12	MCS** SF-12
Age: 45-64												
C2. "Not Good" Physical Days	-0.32	-0.39	-0.67	-0.33	-0.47	-0.58	-0.47	-0.44	-0.48	-0.29	-0.46	-0.22
C3. "Not Good" Mental Days	-0.31	-0.24	-0.30	-0.51	-0.62	-0.50	-0.27	-0.38	-0.19	-0.49	-0.15	-0.45
C4. Days kept from activities	-0.28	-0.30	-0.60	-0.29	-0.46	-0.58	-0.39	-0.40	-0.39	-0.27	-0.37	-0.21
Good Health Days	0.34	0.29	0.54	0.50	0.55	0.66	0.40	0.45	0.32	0.46	0.29	0.38
M3. Length of limitation (yrs)	-0.19	-0.15	-0.01	0.00	-0.02	-0.03	-0.07	-0.05	-0.14	0.00	-0.07	-0.05
M6. Pain-limited activity days	-0.30	-0.35	-0.55	-0.29	-0.42	-0.49	-0.63	-0.41	-0.49	-0.22	-0.48	-0.17
M7. Days sad, blue, depressed	-0.32	-0.22	-0.36	-0.60	-0.64	-0.54	-0.31	-0.42	-0.17	-0.54	-0.13	-0.52
M8. Days anxious, worried, tense	-0.25	-0.18	-0.19	-0.35	-0.41	-0.32	-0.23	-0.29	-0.15	-0.32	-0.08	-0.27
M9. Days without enough sleep	-0.14	-0.17	-0.27	-0.22	-0.26	-0.30	-0.27	-0.33	-0.21	-0.23	-0.14	-0.20
M10. Days full of energy	0.38	0.31	0.41	0.36	0.40	0.49	0.35	0.49	0.33	0.33	0.27	0.32

[1]Kendall Tau b Coefficients

*All b statistically significant at $\alpha < 0.05$ are shaded

** PCS = Physical Component Summary Scale; MCS = Mental Component Summary Scale

Table 5.6 (continued) Rank correlation coefficients between BRFSS HRQOL continuous items and SF-36 / SF-12 HRQOL scales in the **STATE SAMPLE** stratified by key demographic characteristic

	General Health	Physical Functioning	Role Physical	Mental Health	Role Emotional	Social Functioning	Pain	Vitality	PCS** SF-36	MCS** SF-36	PCS** SF-12	MCS** SF-12
Age: 65+												
C2. "Not Good" Physical Days	-0.40	-0.41	-0.60	-0.38	-0.47	-0.51	-0.39	-0.46	-0.44	-0.28	-0.41	-0.20
C3. "Not Good" Mental Days	-0.27	-0.03	-0.04	-0.41	-0.36	-0.26	-0.10	-0.17	0.03	-0.40	0.10	-0.42
C4. Days kept from activities	-0.30	-0.33	-0.35	-0.21	-0.43	-0.28	-0.23	-0.28	-0.31	-0.13	-0.27	-0.11
Good Health Days	0.41	0.33	0.51	0.41	0.43	0.51	0.39	0.44	0.38	0.34	0.32	0.27
M3. Length of limitation (yrs)	0.18	-0.07	0.34	0.17	0.12	0.27	0.01	0.29	0.14	0.13	0.14	0.07
M6. Pain-limited activity days	-0.38	-0.26	-0.37	-0.17	-0.16	-0.30	-0.50	-0.33	-0.40	-0.06	-0.33	-0.03
M7. Days sad, blue, depressed	-0.13	-0.02	0.03	-0.40	-0.39	-0.26	-0.08	-0.18	-0.07	-0.44	0.16	-0.46
M8. Days anxious, worried, tense	-0.38	-0.18	-0.22	-0.43	-0.38	-0.25	-0.26	-0.37	-0.19	-0.35	-0.18	-0.33
M9. Days without enough sleep	-0.23	-0.25	-0.16	-0.19	0.00	-0.16	-0.21	-0.34	-0.27	-0.12	-0.25	-0.07
M10. Days full of energy	0.41	0.14	0.33	0.35	0.38	0.11	0.28	0.40	0.23	0.29	0.27	0.29

[1]Kendall Tau b Coefficients

*All b statistically significant at $\alpha < 0.05$ are shaded

** PCS = Physical Component Summary Scale; MCS = Mental Component Summary Scale

Table 5.6 (continued) Rank correlation coefficients between BRFSS HRQOL continuous items and SF-36 / SF-12 HRQOL scales in the **STATE SAMPLE** stratified by key demographic characteristic

	General Health	Physical Functioning	Role Physical	Mental Health	Role Emotional	Social Functioning	Pain	Vitality	PCS** SF-36	MCS** SF-36	PCS** SF-12	MCS** SF-12
Household Income Level: <$15,000												
C2. "Not Good" Physical Days	-0.37	-0.37	-0.61	-0.37	-0.30	-0.39	-0.46	-0.42	-0.37	-0.28	-0.37	-0.22
C3. "Not Good" Mental Days	-0.16	-0.03	-0.23	-0.54	-0.59	-0.39	-0.20	-0.37	0.01	-0.54	0.01	-0.51
C4. Days kept from activities	-0.26	-0.27	-0.47	-0.39	-0.49	-0.50	-0.38	-0.47	-0.28	-0.39	-0.29	-0.29
Good Health Days	0.26	0.25	0.52	0.47	0.39	0.47	0.42	0.47	0.24	0.39	0.23	0.31
M3. Length of limitation (yrs)	-0.13	-0.22	0.09	0.01	-0.02	0.00	-0.14	0.08	-0.08	0.00	0.03	0.03
M6. Pain-limited activity days	-0.29	-0.30	-0.52	-0.33	-0.28	-0.43	-0.63	-0.43	-0.40	-0.25	-0.35	-0.18
M7. Days sad, blue, depressed	-0.16	-0.02	-0.24	-0.59	-0.64	-0.46	-0.26	-0.41	0.03	-0.59	0.01	-0.57
M8. Days anxious, worried, tense	-0.09	0.00	-0.16	-0.55	-0.54	-0.32	-0.21	-0.36	0.06	-0.53	0.02	-0.51
M9. Days without enough sleep	-0.10	-0.14	-0.20	-0.31	-0.24	-0.30	-0.19	-0.40	-0.10	-0.35	-0.10	-0.30
M10. Days full of energy	0.38	0.20	0.36	0.52	0.40	0.38	0.28	0.49	0.16	0.45	0.19	0.40

[1]Kendall Tau b Coefficients

*All b statistically significant at $\alpha < 0.05$ are shaded

** PCS = Physical Component Summary Scale; MCS = Mental Component Summary Scale

Table 5.6 (continued) Rank correlation coefficients between BRFSS HRQOL continuous items and SF-36 / SF-12 HRQOL scales in the **STATE SAMPLE** stratified by key demographic characteristic

	General Health	Physical Functioning	Role Physical	Mental Health	Role Emotional	Social Functioning	Pain	Vitality	PCS** SF-36	MCS** SF-36	PCS** SF-12	MCS** SF-12
Household Income Level: $15,000-$24,999												
C2. "Not Good" Physical Days	-0.19	-0.23	-0.56	-0.25	-0.19	-0.39	-0.26	-0.34	-0.30	-0.24	-0.30	-0.21
C3. "Not Good" Mental Days	-0.22	-0.20	-0.04	-0.35	-0.29	-0.31	-0.16	-0.31	-0.11	-0.37	-010	-0.38
C4. Days kept from activities	-0.25	-0.24	-0.50	-0.18	-0.33	-0.39	-0.19	-0.24	-0.29	-0.16	-0.27	-0.16
Good Health Days	0.23	0.18	0.37	0.31	0.27	0.42	0.28	0.33	0.25	0.34	0.21	0.35
M3. Length of limitation (yrs)	-0.08	0.29	0.25	0.12	0.14	0.09	0.03	0.17	0.10	0.10	0.28	-0.01
M6. Pain-limited activity days	-0.22	-0.29	-0.51	-0.14	-0.30	-0.33	-0.52	-0.32	-0.43	-0.11	-0.42	-0.05
M7. Days sad, blue, depressed	-0.25	-0.12	-0.09	-0.40	-0.26	-0.32	-0.16	-0.28	-0.07	-0.38	0.00	-0.41
M8. Days anxious, worried, tense	-0.15	-0.03	0.13	-0.38	-0.33	-0.26	-0.10	-0.26	0.02	-0.39	0.02	-0.36
M9. Days without enough sleep	-0.05	-0.04	-0.15	-0.09	0.02	-0.12	-0.20	-0.18	-0.13	-0.08	-0.07	-0.06
M10. Days full of energy	0.25	0.18	0.20	0.33	0.24	0.29	0.19	0.41	0.14	0.33	0.19	0.37

[1]Kendall Tau b Coefficients

*All b statistically significant at $\propto < 0.05$ are shaded

** PCS = Physical Component Summary Scale; MCS = Mental Component Summary Scale

Table 5.6 (continued) Rank correlation coefficients between BRFSS HRQOL continuous items and SF-36 / SF-12 HRQOL scales in the **STATE SAMPLE** stratified by key demographic characteristic

	General Health	Physical Functioning	Role Physical	Mental Health	Role Emotional	Social Functioning	Pain	Vitality	PCS** SF-36	MCS** SF-36	PCS** SF-12	MCS** SF-12
Household Income Level: $25,000 - $49,999												
C2. "Not Good" Physical Days	-0.14	-0.10	-0.51	-0.21	-0.29	-0.40	-0.35	-0.37	-0.31	-0.20	-0.22	-0.17
C3. "Not Good" Mental Days	-0.11	-0.07	-0.17	-0.44	-0.56	-0.39	-0.11	-0.27	0.05	-0.43	0.07	-0.43
C4. Days kept from activities	-0.01	-0.01	-0.32	-0.15	-0.30	-0.26	-0.25	-0.18	-0.17	-0.08	-0.18	-0.09
Good Health Days	0.13	0.11	0.43	0.38	0.49	0.53	0.24	0.40	0.15	0.38	0.10	0.34
M3. Length of limitation (yrs)	-0.25	-0.41	0.50	0.17	0.09	0.37	0.29	0.18	0.00	0.18	0.16	0.18
M6. Pain-limited activity days	-0.09	-0.08	-0.38	-0.18	-0.14	-0.28	-0.57	-0.21	-0.39	-0.08	-0.36	-0.09
M7. Days sad, blue, depressed	-0.10	-0.07	-0.23	-0.57	-0.61	-0.53	-0.19	-0.35	0.04	-0.53	0.07	-0.52
M8. Days anxious, worried, tense	-0.23	-0.26	-0.22	-0.41	-0.47	-0.42	-0.17	-0.33	0.10	-0.37	-0.04	-0.34
M9. Days without enough sleep	-0.05	-0.06	-0.09	-0.14	-0.11	-0.15	-0.11	-0.29	-0.07	-0.16	-0.05	-0.13
M10. Days full of energy	0.19	0.15	0.27	0.41	0.37	0.36	0.25	0.54	0.14	0.44	0.12	0.39

[1]Kendall Tau b Coefficients

*All b statistically significant at $\propto < 0.05$ are shaded

** PCS = Physical Component Summary Scale; MCS = Mental Component Summary Scale

Table 5.6 (continued) Rank correlation coefficients between BRFSS HRQOL continuous items and SF-36 / SF-12 HRQOL scales in the **STATE SAMPLE** stratified by key demographic characteristic

	General Health	Physical Functioning	Role Physical	Mental Health	Role Emotional	Social Functioning	Pain	Vitality	PCS** SF-36	MCS** SF-36	PCS** SF-12	MCS** SF-12
Household Income Level: ≥$50,000												
C2. "Not Good" Physical Days	-0.01	-0.21	-0.53	-0.19	-0.22	-0.47	-0.30	-0.16	-0.32	-0.12	-0.28	-0.09
C3. "Not Good" Mental Days	-0.05	-0.06	-0.18	-0.53	-0.50	-0.16	-0.14	-0.21	0.15	-0.47	0.18	-0.51
C4. Days kept from activities	0.14	-0.13	-0.20	-0.28	-0.05	-0.31	-0.20	-0.08	-0.13	-0.12	-0.04	-0.13
Good Health Days	0.04	0.19	0.45	0.40	0.35	0.45	0.29	0.34	0.10	0.34	0.11	0.33
M3. Length of limitation (yrs)	-0.33	0.82	0.33	-0.33	-	0.00	0.33	0.00	1.00	-1.00	0.33	-1.00
M6. Pain-limited activity days	0.07	-0.24	-0.58	0.02	-0.18	0.11	-0.40	-0.06	-0.35	0.16	-0.35	0.17
M7. Days sad, blue, depressed	-0.03	-0.17	-0.30	-0.52	-0.63	-0.23	-0.30	-0.27	-0.04	-0.44	0.07	-0.42
M8. Days anxious, worried, tense	-0.23	-0.03	-0.12	-0.33	-0.28	-0.12	-0.04	-0.24	-0.01	-0.24	-0.09	-0.26
M9. Days without enough sleep	-0.08	0.06	0.17	-0.31	0.02	0.13	-0.17	-0.39	0.02	-0.29	0.11	-0.26
M10. Days full of energy	0.28	0.26	0.23	0.28	0.24	0.30	0.17	0.51	0.21	0.37	0.11	0.27

[1]Kendall Tau b Coefficients

*All b statistically significant at $\alpha < 0.05$ are shaded

** PCS = Physical Component Summary Scale; MCS = Mental Component Summary Scale

defined based on disease status. Table 5.7 displays correlations in three of the analytic subgroups for select BRFSS items and SF-36 scales. It appears that correlations between physical and mental health concepts across instruments are consistently stronger in diseased groups. This is logical and suggests that there is less variation in HRQOL among diseased groups, at least as measured by these tools than among well populations.

5.3.2 *Multivariable statistical models*

Predicting SF-36 physical components summary (PCS)

Table 5.8 shows the step-by-step reporting of the p-values in the stepwise OLS model for PCS. The table will not be reviewed cell-by-cell because the key findings from this table are summarized, along with other key data from the regression models, in Table 5.9. However, a few initial observations directly from Table 5.6 data will be made as a guide to its interpretation. Note first that all the BRFSS items under consideration are independently associated with PCS (see p-values prior to step 1). The first variable entered into the model is the presence of any limitation. After this term is entered, the p-values for the limitation length and personal care limitation terms become quite large (see p-values prior to step 2). This suggests that these terms might be considered as close alternatives to the "any limitation" variable. This is not surprising given the nature of these questions. Limitation length is zero for those without limitations and reflects the number of months limited for those with limitations. Similarly, individuals with no limitations, by definition, also have no personal care limitations, while roughly 10 percent of those with limitations report personal care limitation. The fact that "any limitation" was selected does not necessarily mean that it is a *better* variable than the close alternatives. It means only that among these three correlated variables "any limitation" is the variable whose association with PCS had the smallest propensity for type I error (i.e., smallest p-value) based on this sample. Neither does this imply it has the largest effect -- in fact, forcing a personal care limitation term into the model (data not shown) shows that the decrement in PCS associated with this very serious activity limitation is an order of magnitude larger than that

Table 5.7: Correlations between select BRFSS items and select SF-36 scales in analytic subgroups

	Physical Functioning	Role Physical	Mental Health	Role Emotional	Vitality	PCS** SF-36	MCS** SF-36
No Chronic Disease & Depression negative							
C2. "Not Good" Physical Days	-0.30	-0.39	-0.13	-0.02	-0.18	-0.25	-0.06
C3. "Not Good" Mental Days	-0.06	-0.09	-0.30	-0.23	-0.20	0.04	-0.27
Good Health Days	0.12	0.31	0.23	0.16	0.22	0.15	0.17
M7. Days sad, blue, depressed	-0.13	-0.13	-0.38	-0.32	-0.29	-0.05	-0.34
M10. Days full of energy	0.22	0.11	0.38	0.11	0.43	0.13	0.37
Chronic Disease & Depression negative							
C2. "Not Good" Physical Days	-0.16	-0.47	-0.19	-0.15	-0.30	-0.31	-0.16
C3. "Not Good" Mental Days	0.02	0.05	-0.27	-0.20	-0.16	0.04	-0.25
Good Health Days	0.14	0.40	0.29	0.14	0.35	0.25	0.23
M7. Days sad, blue, depressed	0.16	0.05	-0.32	-0.21	-0.14	0.18	-0.33
M10. Days full of energy	0.17	0.28	0.23	0.20	0.41	0.25	0.19
No Chronic Disease & Depression positive							
C2. "Not Good" Physical Days	-0.10	-0.49	-0.17	0.14	-0.26	-0.26	-0.06
C3. "Not Good" Mental Days	-0.16	-0.26	-0.53	-0.42	-0.26	-0.03	-0.27
Good Health Days	0.23	0.44	0.42	0.34	0.33	0.21	0.40
M7. Days sad, blue, depressed	0.14	-0.32	-0.59	-0.53	-0.29	0.05	-0.34
M10. Days full of energy	0.10	0.21	0.41	0.32	0.45	0.08	0.37

[1]Kendall Tau b Coefficients

*All b statistically significant at $\alpha < 0.05$ are shaded

** PCS = Physical Component Summary Scale; MCS = Mental Component Summary Scale

Table 5.8 Expanded, step-by-step reporting of p-values in stepwise regression of BRFSS HRQOL items on SF-36 physical component summary score (PCS)

		p - values prior to step:						
Variable		1	2	3	4	5	6	7
C1	General health	<0.001	<0.001	[<0.001]	<0.001	<0.001	<0.001	<0.001
C2	Not good physical days	<0.001	[<0.001]	<0.001	<0.001	<0.001	<0.001	<0.001
C4	Days kept from activities	<0.001	<0.001	0.048 ^	0.156	0.766	0.688	0.564
M1	Any limitation	[<0.001]	<0.001	<0.001	<0.001	<0.001	<0.001	0.001
M3	Limitation length	<0.001 ^	0.652	0.888	0.547	0.090	0.093	0.137
M4	Personal care limitation	<0.001 ^	0.440	0.447	0.174	0.424	0.947	0.732
M5	Routine care limitation	<0.001	<0.001	<0.001	<0.001	[0.011]	0.010	0.011
M6	Pain-limited days	<0.001	<0.001	<0.001	[<0.001]	<0.001	<0.001	<0.001
M9	Days w/o enough sleep	<0.001	0.002	<0.011	0.012	0.041	[0.035]	0.035
M10	Days full of energy	<0.001	0.001 ^	0.102	0.999	0.997	0.948	0.505

[ ] signifies a variable entered at the step indicated by the column heading

^ Indicates variable was near statistical significance ($p<0.05$) at prior step but experienced an noteworthy increase in p-value at the subsequent step

Table 5.9. Summary of stepwise regression results of BRFSS HRQOL items on SF-36 physical components summary score (PCS)

Step	Variable		Final model *b*	Final model p-values	Close alternative variables		Model R^2 at step variable added
1	O1	Any limitation	-6.06	<0.001	M3 M4	Limitation level Personal care limitation	0.38
2	C2	Not good physical health days	-0.31	<0.001	M10	Days full of energy	0.50
3	C1	General health	2.20	<0.001	C4	Days kept from activities	0.56
4	M6	Pain-limited days	-0.24	<0.001			0.59
5	M5	Routine care limitation	-4.91	0.010			0.60
6	M9	Days w/o enough sleep	-0.07	0.04			0.60

associated with any limitation. It is possible that in a larger sample these variables would remain in a stepwise model. However, as will be discussed further below, it does not appear that refinements in data on health-related limitations (like length or severity) has much potential to improve the BRFSS HRQOL module's ability to explain variation in PCS once other variables are considered

In addition to summarizing key information from Table 5.8, Table 5.9 adds data on the direction and size of the effect (the *b* coefficient) of retained BRFSS variables. It also includes information on the coefficient of determination (R^2) at each step. R^2 gives an indication of the overall goodness of fit of the model. It is commonly interpreted as the proportion of variance in the dependent variable explained by the independent variables.

The table shows that the associations between retained BRFSS questions and PCS are all in expected directions. Presence of limitations ("any" and "routine"), "not good" health days, pain-limited days, and days without sufficient sleep were associated with decreases in the PCS score. Following the entry of the any limitation variable, the two core questions, number of days where physical health is "not good" and self-rated general health are brought into the model next. Days "very healthy and full of energy" appear to be a close alternative to days where health was "not good." This is imminently logical as one question is nearly the converse of the other. Number of days during the past month when usual activities were limited for health reasons appears to be a close alternative to the self-rated health question -- at least when controlling for any limitation and not good physical health days. Days limited because of pain, the presence of a routine care limitation, and the number of days per month with insufficient sleep are then brought into the model, in that order. Note that the model R^2 increases substantively through the fourth step, then, although additional variables significantly associated with PCS are still entered and retained, the improvement in overall fit appears to be negligible.

Table 5.10 presents the summary of results from the stepwise model including adjustment factors. Of the candidate adjustment factors, age, education and employment were included as these factors were significantly associated with PCS in the covariate- only stepwise model (results not shown). While variables not significantly associated with an outcome can, when the association with the independent variable is very strong, still be important adjustment factors, this is not likely here since extreme associations between demographics and BRFSS questions are not anticipated. Note that these adjustment factors alone account for just 10 percent of the variation in PCS. The BRFSS items entered and retained in the adjusted model are very similar to the set from the unadjusted analysis. Limitation length, the last term entered, replaces the presence of routine care limitation and, like the routine care term in the unadjusted model, it adds little to the model fit. Adjustment reduces slightly the magnitude of all retained BRFSS variables common to both unadjusted and adjusted models except for the "not enough sleep" variable. There were no changes in coefficient signs.

Table 5.11 presents a brief summary of findings from the interaction model based on the BRFSS variables highlighted in Table 5.9. This model suggests that several interactions among BRFSS HRQOL measures are significantly associated with PCS. The coefficients on some of these terms (not shown) imply that there is potential for qualitative interaction; meaning that a BRFSS HRQOL variable may increase PCS at a given, plausible level of a second BRFSS term but also be associated with a decrease in PCS at a different level of the second variable. Interpreting these multiple interactions is, however, complex and speculative. Further, it is notable that the addition of the 9 interactions adds relatively little explanatory power as evidenced by the relatively small increase in R^2 at each step.

Table 5.10 Summary of stepwise regression results of BRFSS HRQOL items on SF-36 physical component summary (PCS) -- adjusting for age, education, and employment status

Step Added	Variable		Four Model *b*	Final Model p-value	Close Alternative Variables	Model R^2 at Step Variable Added
	Sex					
	Reference group:	Female	---			
		Male	-0.23	0.71		
	Age					
	Reference group:	65+	-			
		45-64	2.70	0.249		
		30-34	4.33	0.068		
		18-29	4.88	0.040		
	Education					
	Reference group:	<HS	-			
		HS graduate	-0.62	0.575		
		Some graduate	0.30	0.791		
		College graduate	1.32	0.240		0.10
	Employment					
	Reference group:	Unemployed	-			
		Out of labor force	-2.32	0.122		
		Employed	-0.83	0.529		
1	O1 Any limitation		-5.83	<0.001	O3 Limitation length O4 Personal care limitation	0.41
2	O6 Pain-limited days		-0.371	<0.001	O5 Routine care limitation	0.51
3	O9 Days w/o enough sleep		-0.124	<0.001	C4 Day kept from activities	0.54
4	C2 Not good physical health days		-0.214	0.001	O10 Days full of energy	0.56
5	C1 General health		1.32	<0.001		0.58
6	O3 Limitation length		-0.019	0.035		0.59

Table 5.11. Interaction terms added and retained by stepwise selection regression on physical component summary (PCS) from all possible interactions based on the main effects model plus single forced-in interaction

Step Added	Interactions (Question numbers)	Final Model p-value	Model R^2 Step Variable Added
1	C2*M6	<0.007	0.62
3	M5*M6	0.002	0.63
4	C1*M1	0.002	0.64
5	M6*M9	0.003	0.64
7	C1*C2	0.043	0.64
8	M5*M9	0.034	0.64
Forced	C4,C4*M1	0.003*	0.66

* p-value for partial F-statistic on addition of C4 plus C4*O1
C2 = not good physical days
M6 = Pain-limited days
M5 = Any routine care limit
C1 = Self-rated general health
M1 = Any limitation
M9 = Days without enough sleep
C4 = Days kept from activies

Predicting SF-36 mental components summary (MCS)

Table 5.12 provides the expanded step-by-step reporting of p-values for the stepwise OLS modeling of MCS and Table 5.13 gives the summary results. The first variable entered into the MCS model is that capturing the number of days per month sad/blue or depressed. Close alternatives to this variable are the general health assessment term and the routine limitation indicator. In this case, the variable entered clearly has a closer conceptual link to the dependent variable than either of the close alternatives. Next entered are the "very healthy/high energy days" variable and the variable capturing the days per month where mental health is self-assessed as having been "not good." A close alternative to the very healthy days is days where health (emotional or physical) limited usual activities. It is difficult to assess which of these variables is conceptually closer tied to MCS given the questions' wordings and the fact that both emerged as close alternatives early in the PCS model building. Number of "not good" mental health days is selected next with no close alternatives among the remaining unselected terms. Next selected is days where pain limits activity with close alternatives being three other variables that were, like pain, important in the PCS model: the presence of any limitation, the presence of routine limitations, and personal care limitations (a close alternative to any limitation in the PCS modeling). Interestingly, the direction of the association (of both the pain variable as well as the close alternatives if they are forced in lieu of the selected term) is somewhat counterintuitive, with more pain days associated with *improved* MCS. However, note that this association emerges after controlling for the BRFSS items already entered into the model. The unadjusted association between each of these variables and MCS are statistically significant and in the opposite direction (data not shown). The interpretation, therefore, being that after the physical effects on mental health operating through constructs tapped by the first three variables (e.g., physical problems leading to increased depressed days and

Table 5.12. Expanded step-by-step reporting of p-values in stepwise regression of BRFSS HRQOL items on SF-36 mental components summary (MCS)

Variable		p - values prior to step: 1		2		3	4		5	6	7
C1	General Health	<0.001	^	0.144		0.265	0.111		0.552	0.325	0.5949
C3	Not good mental health days	<0.001		<0.001		[<0.001]	0.001		<0.001	<0.001	<0.001
C4	Days activity limited	<0.001		0.006	^	0.108	0.738		0.154	0.185	0.112
M1	Any limitation	0.080		0.297		0.003	0.001	^	0.103	[0.083]	0.083
M3	Limitation level	0.889		0.722		0.241	0.107		0.266	0.339	0.797
M4	Personal care limitation	0.086		0.022		0.019	0.042	^	0.191	0.229	0.421
M5	Routine care limitation	0.013	^	0.315		0.070	0.050	^	0.993	0.885	0.381
M6	Pain-limited days	0.002		0.022		<0.001	[<0.001]		<0.001	<0.001	0.002
M7	Days sad/blue/ depressed	[<0.001]		<0.001		<0.001	<0.001		<0.001	<0.001	<0.001
M2	Days with anxiety	<0.001		<0.001		<0.001	<0.001		[<0.001]	<0.001	<0.001
M9	Days w/o enough sleep	<0.001		0.016	^	0.405	0.760		0.404	0.584	0.496
M10	Days full of energy	<0.001		[<0.001]		0.001	<0.001		<0.001	<0.001	<0.001

[ ] signifies a variable entered at the step indicated by the column heading

^ Indicates variable was near statistical significance ($p<0.05$) at prior step but experienced an noteworthy increase in p-value at the subsequent step

Table 5.13 Summary of stepwise regression results of BRFSS HRQOL items on SF-36 mental component summary (MCS)

Step added	Variable		Final model *b*	Final model p-values	Close alternative variables		Model R^2 at step variable added
1	M7	Days sad/blue depressed	-0.520	<0.001	C1 M5	General health Routine limitations	0.52
2	M10	Days full of energy	0.270	<0.001	C4	Days kept from activities	0.60
3	C3	Not good mental health days	-0.391	<0.001			0.64
4	M6	Pain-limited days	0.187	0.002	M1 M5 M4	Any limitation Routine limitations Personal care limitations	0.66
5	M8	Days with anxiety	-0.230	<0.001			0.67
6	M1	Any limitation	1.63	0.083			0.67

diminished energy) are controlled for, other aspects of physical health decrements are associated with improved mental HRQOL. A hypothesized mechanism might be that the residual emotional impact (again, those not operating through depressed days, poor energy days, and not good mental health days) of physical health challenges might actually add to mental health resiliency. Admittedly, this logic is not entirely satisfactory. Note that after the anxiety term is brought into the model (having an effect in the expected direction) the any limit term re-emerges, is entered, and retained. While its p-value is marginal, the direction of its effect is consistent with the other term clearly associated with PCS, pain. Given the convoluted hypothesis linking these variables (pain and limitation) with MCS combined with the fact that both pain and any limitation are brought in after R^2 has neared it's peak, it would be plausible to postulate a model comprised only of the remaining four variables. When fit to the data, this four-term model actually attains an R^2 of 0.67 (data not shown); a value equal to that of the six-term, final stepwise model that included the two variables closely associated with physical health.

As with PCS modeling, adjustment for demographic factors (see Table 5.14) did little to alter the variables selected and the magnitude and direction of the associations in the final stepwise model. Note that the same set of adjustment factors was used here as in PCS modeling, with the sole addition of a gender variable. Again, as seen in the construction of the PCS models, a number of interaction terms were significantly associated with MCS (See Table 5.15), but were difficult to interpret and provided little improvement in fit relative to that provided by the main effects variables.

Finally, regression diagnostics including residual plots (residuals and studentized residuals against predictive values as well as normal probability plots of residuals), Cook's distance plots (for influential values) and collinearity diagnosis based on eigen value analysis were performed on final main effects, adjusted, and interaction models for each dependent variable.

Table 5.14 Summary of stepwise regression results of BRFSS HRQOL items on SF-36 mental components summary (MCS) -- adjusting for sex, age, education, and employment status

Step Added	Variable	Final Model *b*	Final Model p-value	Close Alternative Variables	Model R^2 at Step Variable Added
	Sex				
	Reference group: Male	-			
	Female	-0.041	0.950		
	Age				
	Reference group: 65+	-			
	45-64	-4.18	0.084		
	30-34	-5.62	0.021		
	18-29	-6.49	0.008		
	Education				
	Reference group: <HS	-			
	HS graduate	-0.973	0.412		
	Some graduate	-0.514	0.672		
	College graduate	-2.80	0.021		
	Employment				0.12
	Reference group: Un-employed	-			
	Out of labor force	-1.29	0.445		
	Employed	0.199	0.897		
1	M7 Days sad/blue/depressed	-0.742	<0.001	C4 Day kept from activities M3 Any limitation M4 Personal care limitation M5 Routine care limitation M9 Days w/o enough sleep	0.63

-continued-

Table 5.14 (continued) Summary of stepwise regression results of BRFSS HRQOL items on SF-36 mental components summary (MCS) -- adjusting for sex, age, education, and employment status

Step Added	Variable	Final Model *b*	Final Model p-value	Close Alternative Variables	Model R^2 at Step Variable Added
2	M10 Days with energy	0.283	<0.001	C1 General health	0.68
3	M8 Days with anxiety	-0.194	0.002	M4 Personal care limitation	0.70
4	M6 Pain-limited days	0.206	0.003	M5 Routine care limitation	0.72
5	C3 Poor mental health days	-0.219	0.012		0.72
6	M1 Any limitation	2.381	0.034		0.73

Table 5.15 Interaction terms added and retained by stepwise selection from all possible interactions based on the main effects model plus single forced-in interaction -- SF-36 mental health components summary (MCS)

Step Added	Interactions (Question numbers)	Final Model p-value	Model R^2 Step Variable Added
1	M6*M7	<0.001	0.68
2	M10*M7	0.008	0.69
3	M7*M8	<0.001	0.69
4	M6*M8	<0.001	0.70
Forced	C4,M1*C4	0.050	
	M9, M9*M10	0.086	0.71

* p-value for partial F-statistic for the addition of the four additional terms = 0.039

M6 = Pain-limited days
M7 = Days sad, depressed
M10 = Days full of energy
M8 = Days anxious, worried, tense
C4 = Days kept from activities
M9 = Days without enough sleep

While there was slight heteroskedasticity evident in the PCS models, the heterogeneity in variance was far from extreme (i.e., if three or four observations are omitted the funnel pattern virtually disappears). Occasionally, single observations had notably higher leverage than others in the data set, but in no instance did Cook's distance values exceed 0.8, a minimum cutoff for detecting points with substantial leverage.[23] Lastly, there were no indications of substantive collinearity which would affect model estimates or variance estimates.

5.4 Conclusions

5.4.1. *Bivariate comparisons*

- Associations between BRFSS questions and SF-36 individual and summary scales are consistently in expected directions.
- Generally, this consistency with expectation holds in all important demographic sub-groups. However, there is some variation in the correlation/association between BRFSS items and conceptually congruent SF-36 scales and summaries by demographic subgroup. This variation may be in part attributable to differences in chronic disease prevalence across these groups.

5.4.2. *Multivariable models*

- The majority of the variation in SF-36 physical and mental summary component variables is explained by distinct subsets of BRFSS HRQOL questions.

- With respect to PCS, core questions C1 and C2 (general health limitations and not good physical health days) plus optional questions M1 and M6 (any limitation and pain-limited activity days) form the most coherent, parsimonious, and predictive set of questions.

- With respect to MCS, core question C3 (not good mental health days) and optional questions M7, M8, and M10 (days sad/depressed/blue, days with anxiety, and days were health was very good/full of energy) form the most coherent, parsimonious, and predictive set of questions.

- There are indications in both models that interactions between BRFSS variables might be significantly associated with the SF-36 outcome. Hence, these interactions may be important in predicting any one individual's HRQOL. However, these terms do not add much in terms of explaining summary HRQOL (as measured by the SF-36) at the population-level.

Chapter 6

ANALYSES OF KNOWN GROUPS VALIDITY

6.1 Overview

The analyses presented in this chapter are based on comparison of HRQOL measures across groups believed *a priori* to differ on health-related quality of life. These analyses involve combined data from the statewide sample and the special survey oversampling individuals with chronic disease or an indication of depression. The four principal analytic subgroups formed from these combined data, as introduced earlier, are: 1) individuals reporting one or more common chronic diseases who did not screen positive for depressive disorders; 2) individuals screening positive for depressive disorders not reporting an chronic disease; 3) individuals with both chronic disease and depression indications; and 4) persons reporting with neither health problem. Descriptive analyses also include the two larger subgroups of individuals reporting any chronic disease (irrespective of depression screen status) and individuals screening positive for depression (irrespective of chronic disease status). Descriptive analyses presenting summary statistics for BRFSS and SF-36 HRQOL measures across these groups are first presented, followed by a known-groups validity analysis using the technique of relative validity.

6.2. Methods

6.2.1. *Descriptive analyses*

Frequency distributions of categorical BRFSS items are displayed stratified by the disease status-based analytic subgroups. Included in the chronic disease checklist were five cardiovascular conditions of varying average severity: hypertension, angina, myocardial infarction history, transient ischemic attack (TIA)/stroke history, and congestive heart failure.

Although sample sizes are small for all but hypertension, distributions of categorical BRFSS questions are displayed for the groups with these specific cardiovascular problems. Means, standard deviations, medians, and interquartile ranges are calculated and displayed for continuous BRFSS variable, again stratified by the analytic subgroups. Means and standard deviations are also shown for the five specific cardiovascular disease subgroups. Descriptive displays of SF-36 scales and summary scores across these analysis subgroups are formatted as those were for the continuous BRFSS items.

6.2.2. *Relative validity analyses*

Relative validity analyses is a method for conducting known-groups validity comparisons that captures the relative statistical efficiency of alternative measures of an underlying health concept.[8] Like any other known-groups-validity analysis, statistics for one measure which summarize data on a concept of interest across two groups known to differ on that concept are compared. Under the relative validity approach, the ratio of between-group to within-group variance (F statistics) for alternative, continuous measures across two groups are compared. The comparison of F-statistics typically used in the relative validity analysis is itself a ratio, where the individual measure having the largest F (i.e., the measure best discriminating across the two groups) serves as the denominator for the F's of all other measures. These relative validity ratios, therefore, estimate, in proportional terms, how much less valid a given measure is relative to the most valid measure.

Observations in the four primary analytic subgroups were combined to allow pairwise contrasts between these groups. The no chronic disease and depression screen negative group was included as the reference for all comparisons. Therefore, relative validity comparisons were based on contrast between the chronic disease, depression, and both chronic disease and depression with the group without indication of either class of conditions.

These contrasts should give us insight into measures that can validly discriminate individuals on dimensions of physical and mental health. To obtain the *F* estimates, a series of unweighted, general linear models were fit to the SF-36 scales intended to capture general physical or mental health (physical functioning, mental health, general health PCS_36, MCS_36, PCS_12, MCS_12) and each of the continuous BRFSS items. Note that in these models the HRQOL variable is the dependent variable and an indicator of analytic subgroup (i.e., disease status) is the sole independent variable. Also Included as a dependent variable was a scored version of the categorical general health perceptions question (BRFSS core item C1). A value of one was assigned to self-rated "poor" health with unitarily increasing scores up to the value of five for "excellent." In order for comparisons of *F* ratios to be valid, estimates must be generated from the same set of observations. Therefore, observations missing on any of the measures were deleted from the analysis. Finally, on the tables presenting the relative validity measure (F statistic ratio) we also display the ratio of the dependent variable mean in the group reporting chronic conditions and/or depression screen positive to the common reference group with no such indications. Therefore, the magnitude of the HRQOL suggested by the most and least valid measures can be compared.

6.3. Findings

6.3.1. *Descriptive analyses*

Patterns in SF-36 scales and component summary scales across known health status groups (Table 6.1) conform to expectations. Individuals in any of the health problem groups have lower average (and median) scale and summary component scores than the group without any listed chronic conditions or a positive depression screen. Similarly, the group with both chronic disease and a positive depression screen has the lowest score on all

Table 6.1. Mean and median SF-36 and SF-12 scale scores in analytic subgroups (defined by chronic disease and depression screen status)

	No listed chronic disease / depression screen negative (n = 176)		1+ listed chronic disease (n = 312)		1+ listed chronic disease/ depression screen negative (n = 195)		Depression screen positive (n = 187)		No listed chronic disease/ depression screen positive (n = 70)		1+ listed chronic disease / depression screen positive (n = 117)	
MOS Scale	Mean (sd)	Median (interquartile range)	Mean (sd)	Median (interquartile range)	Mean (sd)	Median (interquartile range)	Mean (sd)	Median (interquartile range)	Mean (sd)	Median (interquartile range)	Mean (sd)	Median (interquartile range)
General Health (SF-36)	77.0 (10.9)	78.5 (73, 87)	61.0 (19.5)	67 (50, 75)	66.3 (16.2)	67 (57, 77)	58.9 (21.0)	65 (42, 75)	70.2 (14.7)	72 (62, 80)	52.3 (21.3)	57.0 (35, 67.9)
Physical Functioning (SF-36)	95.1 (8.6)	100 (95, 100)	73.7 (26.9)	85 (55, 95)	78.2 (24.0)	88.9 (65, 95)	74.7 (28.2)	90 (55, 100)	89.2 (18.0)	95 (90, 100)	66.1 (29.7)	70 (45, 95)
Role Physical (SF-36)	91.8 (23.7)	100 (100, 100)	70.7 (39.9)	100 (29.2, 100)	79.0 (35.8)	100 (75, 100)	66.1 (40.8)	100 (25, 100)	81.5 (32.1)	100 (75, 100)	56.9 (42.7)	75 (0, 100)
Mental Health (SF-36)	86.0 (10.8)	88 (80, 92)	76.4 (21.8)	84 (64, 92)	86.9 (11.0)	92 (84, 92)	62.7 (23.1)	64 (48, 80)	69.0 (20.3)	76 (56, 84)	58.9 (23.9)	60 (40, 76)
Role Emotional (SF-36)	96.4 (16.2)	100 (100, 100)	83.8 (32.0)	100 (100, 100)	96.4 (14.5)	100 (100, 100)	66.6 (39.3)	100 (33.3, 100)	73.1 (35.8)	100 (66.7, 100)	62.7 (40.9)	66.7 (33.3, 100)
Social Functioning (SF-36)	97.1 (8.7)	100 (100, 100)	84.4 (26.5)	100 (75, 100)	92.3 (18.6)	100 (100, 100)	75.2 (29.2)	87.5 (62.5, 100)	82.1 (22.6)	87.5 (75, 100)	71.2 (31.9)	75 (50, 100)
Pain (SF-36)	86 (19.1)	100 (74, 100)	69.9 (27.3)	72 (51, 100)	76.5 (23.8)	84 (62, 100)	65.7 (27.9)	72 (42, 84)	77.2 (21.1)	84 (72, 100)	58.8 (29.2)	61 (32, 84)
Vitality (SF-36)	70.5 (17.1)	75 (60, 80)	56.3 (27.0)	60 (40, 80)	65.8 (21.2)	70 (50, 80)	44.6 (26.7)	47.5 (25, 65)	51.7 (22.5)	55 (35, 70)	40.4 (28.1)	35 (15, 65)

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Table 6.1. (continued) Mean and median SF-36 and SF-12 scale scores in analytic subgroups (defined by chronic disease and depression screen status)

	No listed chronic disease / depression screen negative (n = 176)		1+ listed chronic disease (n = 312)		1+ listed chronic disease/ depression screen negative (n = 195)		Depression screen positive (n = 187)		No listed chronic disease/ depression screen positive (n = 70)		1+ listed chronic disease / depression screen positive (n = 117)	
MOS Scale	Mean (sd)	Median (interquartile range)	Mean (sd)	Median (interquartile range)	Mean (sd)	Median (interquartile range)	Mean (sd)	Median (interquartile range)	Mean (sd)	Median (interquartile range)	Mean (sd)	Median (interquartile range)
Physical component summary (SF-36)	53.0 (5.4)	54.2 (51.3, 56.4)	44.4 (11.5)	47.8 (37.3, 53.0)	45.8 (10.0)	49.2 (41.3, 52.8)	45.8 (12.5)	48.8 (38.6, 55.5)	51.9 (7.6)	52.5 (47.7, 56.6)	42.1 (13.4)	43.7 (29.4, 53.7)
Mental component summary (SF-36)	55.8 (5.4)	56.8 (54.0, 59.0)	52.1 (11.7)	55.9 (46.8, 60.1)	57.6 (5.7)	58.4 (55.1, 61.2)	44.0 (12.6)	45.7 (34.8, 54.1)	45.5 (10.8)	47.3 (39.2, 55.0)	43.1 (13.4)	45.4 (31.5, 53.5)
Physical component summary (SF-12)	53.1 (5.6)	54.9 (52.4, 56.2)	45.1 (11.4)	49.6 (36.6, 54.0)	46.6 (10.1)	50.7 (41.9, 53.9)	46.4 (12.1)	51.3 (35.7, 55.4)	52.6 (7.1)	53.8 (50.5, 56.9)	42.7 (13.0)	46.2 (29.7, 54.6)
Mental component summary (SF-12)	49.3 (5.0)	50.8 (47.2, 51.6)	46.9 (9.5)	50.1 (42.8, 53.0)	51.0 (5.4)	51.6 (49.2, 53.6)	40.4 (10.5)	42.3 (32.9, 48.7)	40.9 (9.7)	42.8 (34.1, 49.3)	40.1 (10.9)	42.0 (32.9, 48.4)

scales. The relative sizes of the declines in these measures of central tendency compared to the "disease free" reference also are sensible. For example, depression screen positive groups have larger declines on scales designed to tap emotional health concepts and chronic disease groups have comparably larger declines on physical health scales. The group comprised of individuals reporting chronic disease but not screening positive for depression show decrement relative to the "disease free" group on the physical summary component but not on the mental summary component. Similarly, the group screening positive for depression without chronic disease shows little decrement on the physical component summary but large decrements on the mental health component summary relative to the "disease free" group. These patterns are somewhat less striking when individual SF-36 scales are examined.

Patterns in BRFSS questions (tables 6.2 and 6.3) are also generally consistent with expectation. The distributions of responses to the self-rated health question are reasonable. Comparing the chronic disease "only" to the depression screen positive "only" a group (table 6.2) suggests, again, that responses to the self-rated health question are more influenced by physical rather than emotional health. Similarly, physical health decrements seems more likely to be associated with report of limitation although the group with chronic disease self-report and indications of depression is the most likely to report any limitation and, among those with limitations, to note personal or routine care limitations.

There are some contrasts in continuous item means (table 6.3) that are not entirely congruent with obvious hypotheses. For example, individuals depression screen positive who did not report a chronic disease had similar numbers of not good physical health days as those who report a chronic condition without screening depression positive (means of 3.1 vs. 3.7). However the former group does report substantively more "not good" mental health days on average than the latter (8.1 vs. 1.1). Across-group patterns in

Table 6.2. Percent distribution of categorical BRFSS items in analytic subgroups (defined by chronic disease and depression screen status)

BRFSS Item	No listed chronic disease / depression screen negative (n = 176)	1+ listed chronic disease (n = 312)	1+ listed chronic disease/ depression screen negative (n = 195)	Depression screen positive (n = 187)	No listed chronic disease/ depression screen positive (n = 70)	1+ listed chronic disease / depression screen positive (n = 117)
C1. Self-rated health						
Excellent	33.5	11.0	13.4	14.0	25.7	6.9
Very good	48.3	28.7	33.5	28.5	41.4	20.7
Good	15.9	30.6	30.9	28.0	24.3	30.2
Fair	2.3	18.4	15.5	16.7	5.7	23.3
Poor	0	11.3	16.7	12.9	2.9	19.0
(Missing)	(0)	(2)	(1)	(1)	(0)	(1)
M1. Any limitation						
Yes	5.1	34.9	28.7	33.7	14.3	45.3
No	94.9	65.1	71.3	60.3	85.7	54.7
(Missing)	(0)	(0)	(0)	(0)	(0)	(0)
M4. Personal care limitation*						
Yes	11.1	11.9	3.6	17.5	0	20.8
No	88.9	88.1	96.4	82.5	100	79.2
(Missing)	(0)	(0)	(0)	(0)	(0)	(0)
M5. Routine care Limitation*						
Yes	11.1	41.3	33.9	44.4	20	49.1
No	88.9	58.7	66.1	55.6	80	50.9
(Missing)	(0)	(0)	(0)	(0)	(0)	(0)

*Among those with any limitation

Table 6.3. Means and medians of continuous BRFSS items in analytic subgroups (defined by chronic disease and depression screen status)

	No listed chronic disease / depression screen negative (n = 176)		1+ listed chronic disease (n = 312)		1+ listed chronic disease/ depression screen neg. (n = 195)		Depression screen positive (n = 187)		No listed chronic Disease/ depression screen pos. (n = 70)		1+ listed chronic disease / depression screen pos. (n = 117)	
BRFSS Item	Mean (sd)	Median (interquartile range)	Mean (sd)	Median (interquartile range)	Mean (sd)	Median (interquartile range)	Mean (sd)	Median (interquartile range)	Mean (sd)	Median (interquartile range)	Mean (sd)	Median (interquartile range)
C2. "Not Good" physical health days	1.3 (3.5)	0 (0,0)	6.2 (10.6)	0 (0, 7)	3.7 (8.3)	0 (0, 2)	7.7 (11.4)	1 (0, 13)	3.1 (7.4)	0 (0, 2)	10.5 (12.5)	3 (0, 26)
C3. "Not Good" mental health days	0.8 (2.0)	0 (1, 0)	4.4 (8.4)	0 (0, 4)	1.1 (3.7)	0 (0, 0)	9.3 (10.7)	5 (0, 15)	8.1 (10.3)	3 (0, 14)	10.0 (10.9)	5 (0, 15)
C4. Days kept from activities	0.6 (2.7)	0 (0,0)	3.3 (7.8)	0 (0,1)	1.0 (3.6)	0 (0,0)	5.4 (9.8)	0 (0,5)	2.3 (6,8)	0 (0,0)	7.2 (10,9)	0 (0,10)
Good health days	27.9 (4.1)	30 (28, 30)	21.2 (11.6)	28 (15, 30)	25.1 (9.0)	30 (25, 30)	16.3 (12.2)	20 (0, 28)	19.7 (11.2)	25 (11.5, 29)	14.1 (12.3)	15 (0, 27)
M3. Length of limitation (years)	0.3 (2.0)	0 (0, 0)	1.2 (4.2)	0 (0, 0)	1.2 (4.0)	0 (0, 0)	0.9 (4.1)	0 (0, 0)	0.5 (3.3)	0 (0, 0)	1.2 (4.5)	0 (0, 0)
M6. Pain-limited activity days	0.6 (2.1)	0 (0, 0)	3.8 (8.5)	0 (0, 2)	2.6 (6.9)	0 (0, 0)	5.0 (9.6)	0 (0, 5)	2.0 (5.8)	0 (0, 1)	6.9 (11.0)	0 (0, 8)
M7. Days sad, blMe, depressed	0.7 (1.7)	0 (0, 0)	3.2 (7.3)	0 (0, 2)	0.6 (2.8)	0 (0, 0)	8.9 (9.9)	4.5 (2, 15)	7.5 (8 8)	4 (2, 10)	9.8 (10.5)	5 (2, 20)
M8. Days anxious, worried, tense	1.9 (3.8)	0 (0, 2)	4.9 (8.9)	1 (0, 5)	2.4 (5.6)	0 (0, 2)	10.7 (11.3)	5 (2, 20)	9.8 (10.1)	5 (3, 14)	11.3 (12.0)	5 (1, 25)
M9. Days without enough sleep	6.0 (8.2)	3 (0, 6)	6.3 (9.7)	1 (0, 8.5)	4.2 (8.0)	0 (0, 4)	10.0 (10.4)	6 (0, 15)	7 3 (7 6)	5 (0, 14)	11.6 (11 5)	10 (0, 20)
M10. Days full of energy	22.3 (8.7)	25 (20, 30)	19.6 (11.3)	25 (10, 30)	22.7 (9.8)	27 (20, 30)	13.4 (10.8)	10 (3. 24)	15 6 (9 4)	15 (8, 25)	12.1 (11.4)	10 (0, 20)

the BRFSS items closest, conceptually, to specific SF-36 scales were very similar to the across group patterns in the corresponding SF-36 scale as shown in table 6.1.

Trends in SF-36 scales with respect to cardiovascular disease severity (Table 6.4) are not dramatic, however sample sizes are quite small. Generally, myocardial infarction history, stroke and congestive heart failure groups did have lower scale means; especially on physical health related measures, than hypertension or angina groups. Patterns in BRFSS questions (Tables 6.5 and 6.6) were similar, but somewhat less consistent. The pattern in the good health days variable was very similar to the SF-36 physical component summary measures.

6.3.2. *Relative validity analyses*

Table 6.7 presents results from the relative validity analysis. The most valid distinction of physical health quality-of-life dimensions (as proxied by the established known groups comparison) is achieved with the SF-36 physical functioning scale. The SF-36 physical component summary appears to be the next most valid measure. Third, with a relative validity 88% that of the SF-36 physical functioning scale, is the scored general health perception question. This is yet another piece of evidence tying this question to the "physical" aspects of HRQOL. Note that the "not good" physical health days variable is not shown to be a particularly valid measure of physical health in this analysis. Pain-limited activity days (M6) is the BRFSS question with the highest relative validity statistic, yet this measure is only 15% as valid as the SF-36 physical functioning scale. Interestingly, the component SF-36 physical functioning scale questions and the self-reported general health question ask for self-assessment without defining a specific time period (e.g., "now" or "over the last four weeks,' etc.) while the BRFSS "not good" physical health and pain-limited days is grounded in a last 30 day reporting period.

Table 6.4. Mean SF-36 and SF-12 scale scores among subgroup reporting specific cardiovascular problems -- stratified by type of cardiovascular disease reported[1]

	Hypertension (n=101)		Angina (n=12)		MI history (n=15)		TIA/stroke (n=15)		CHF (n=20)	
MOS Scale	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd
General Health (SF-36)	62.0	19.0	61.3	15.8	52.0	14.9	51.2	17.1	40.9	19.0
Physical Functioning (SF-36)	77.7	25.7	65.6	24.5	58.1	30.5	47.5	29.2	51.3	25.3
Role Physical (SF-36)	75.7	38.5	68.1	40.0	38.9	42.0	56.1	46.6	50.4	34.1
Mental Health (SF-36)	77.6	20.5	88.0	8.4	82.1	18.3	76.1	20.2	65.4	23.8
Role Emotional (SF-36)	85.8	30.7	97.2	9.6	77.8	37.1	91.1	20.0	73.3	38.4
Social Functioning (SF-36)	88.5	21.9	89.6	26.6	80.8	26.7	76.7	28.3	72.5	31.6
Pain (SF-36)	70.4	27.7	66.7	22.5	51.0	30.1	59.9	33.0	64.5	28.6
Vitality (SF-36)	59.8	26.5	56.1	21.9	38.7	31.9	58.3	18.1	39.5	25.6
Physical component summary (SF-36)	45.5	11.1	41.5	9.4	33.9	11.3	35.1	13.8	36.6	10.7
Mental component summary (SF-36)	53.2	10.1	59.0	4.3	54.0	10.5	55.9	8.6	47.8	13.2
Physical component summary (SF-12)	46.6	11.1	40.8	11.7	35.2	10.9	36.1	12.5	36.1	10.9
Mental component summary (SF-12)	46.6	9.1	52.2	5.2	49.3	7.3	50.7	7.7	45.2	10.2

[1] If reporting multiple cardiovascular disease subject was assigned to the most severe category (table displays increasing severity moving from leftmost to rightmost columns)

Table 6.5. Percent distribution of categorical BRFSS items among subgroups reporting specific cardiovascular problems -- stratified by type of cardiovascular disease reported[1]

BRFSS question	Hypertenson (n=101)	Angina (n=12)	MI history (n=15)	TIA/stroke (n=15)	CHF (n=20)
C1. Self-rated health					
Excellent	12.0	9.1	10.3	5.0	0
Very good	30.0	9.1	13.3	10.0	33.3
Good	32.0	27.3	33.3	15.0	20.0
Fair	16.0	27.3	40.0	35.0	26.7
Poor	10.0	27.3	13.3	35.0	20.0
(Missing)	(0)	(1)	(0)	(0)	(0)
M1. Any limitation					
Yes	27.7	58.3	66.7	46.7	70
No	72.3	41.7	33.3	53.3	30
(Missing)	(0)	(0)	(0)	(0)	(0)
M4. Personal care Limitation*					
Yes	17.9	0	20	0	14.3
No	82.1	100	80	100	85.7
(Missing)	(0)	(0)	(0)	(0)	(0)
M5. Routine care Limitation*					
Yes	57.1	28.6	30	42.9	42.9
No	42.9	71.4	70	57.1	57.1
(Missing)	(0)	(0)	(0)	(0)	(0)

[1] If reporting multiple cardiovascular disease subject was assigned to the most severe category (table displays increasing severity moving from leftmost to rightmost columns)

*Among those with any limitation

Table 6.6. Means of continuous BRFSS items among subgroup reporting specific cardiovascular problems -- stratified by type of cardiovascular disease reported[1]

	Hypertenson (n=101)		Angina (n=12)		MI history (n=15)		TIA/stroke (n=15)		CHF (n=20)	
BRFSS question	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd
C2. "Not Good" physical health days	5.4	9.9	2.1	4.0	15.7	15.0	13.4	13.7	9.7	12.1
C3. "Not Good" mental health days	3.9	7.8	0.3	0.6	0.1	0.4	2.2	4.8	5.5	10.2
Good health days	22.5	11.0	27.7	4.1	14.2	14.9	14.0	14.5	18.1	13.0
C4. Days kept from activities	3.2	7.7	0.8	2.0	3.2	5.0	0.4	1.1	7.2	12.6
O3. Length of limitation (years)	1.0	3.0	0.2	0.4	4.2	7.8	2.9	5.6	0.9	2.0
O6. Pain-limited activity days	4.1	8.8	3.3	8.9	11.9	12.6	5.9	11.1	5.9	10.3
O7. Days sad, blue, depressed	3.9	7.5	2.8	8.6	3.1	8.4	3.9	6.0	6.4	5.5
O8. Days anxious, worried, tense	6.0	9.5	4.1	9.1	3.6	6.3	3.3	5.6	6.2	9.5
O9. Days without enough sleep	7.6	11.0	3.5	8.5	6.9	11.2	7.4	12.0	6.9	9.7
O10. Days full of energy	17.9	11.9	16.2	12.3	12.0	11.3	20.3	12.2	12.4	10.9

[1] If reporting multiple cardiovascular disease subject was assigned to the most severe category (table displays increasing severity moving from leftmost to rightmost columns)

6.7. Relative validity (F statistic) and mean ratios comparing each of the three indicated disease positive analytic subgroups with the group without a listed chronic disease or a positive short depression screen.

	1+ listed chronic disease/ depression screen negative (n = 332)[1]		No listed chronic disease/ depression screen positive (n = 226)[1]		1+ listed chronic disease / depression screen positive (n = 260)[1]	
	Relative Validity	Ratio of Means[2]	Relative Validity	Ratio of Means[2]	Relative Validity	Ratio of Means[2]
Physical Functioning (SF-36)	1.00	0.85	0.13	0.93	0.76	0.73
Mental Health (SF-36)	0.09	1.03	0.74	0.79	0.94	0.71
General health (SF-36)	0.67	0.88	0.18	0.90	0.86	0.71
Physical component summary (SF-36)	0.94	0.88	0.02	0.98	0.41	0.83
Mental component summary (SF-36)	0.30	1.04	1.00	0.80	0.67	0.78
Physical component summary (SF-12)	0.74	0.90	0.01	0.99	0.41	0.83
Mental component summary (SF-12)	0.25	1.04	0.87	0.82	0.51	0.83
C1. Scored general health perception	0.88	0.83	0.07	0.92	0.69	0.70
C2. "Not Good" physical health days	0.09	0.95	0.08	0.93	0.39	0.74
C3. "Not Good" mental health days	0.01	0.99	0.73	0.78	0.76	0.70
Good health days	0.10	0.94	0.67	0.72	1.00	0.55
C4. Days kept from activities	0.02	0.99	0.10	0.93	0.31	0.80
M6. Pain-limited activity days	0.15	0.94	0.11	0.92	0.29	0.80
M7. Days sad, blue, depressed	0.02	1.01	0.86	0.79	0.84	0.70
M8. Days anxious, worried, tense	0.01	0.99	0.62	0.74	0.53	0.70
M9. Days without enough sleep	0.02	1.01	0.86	0.79	0.84	0.70
O10. Days full of energy	0.00	0.99	0.40	0.62	0.48	0.52

1 These n's reflect, after excluding any observations with a missing value on any measure listed in the first column, the number of subjects in the group listed combined with subjects in the reference group (n=170).

2 Ratio has mean value in a given group reporting conditions in the numerator and the group not reporting chronic conditions or depression screen positive in the denominator

With regard to valid measurement of emotional dimensions of HRQOL, again as embodied in the known groups comparison, the SF-36 mental component summary followed by the same summary as derived from the SF-12. Next are the days sad and depressed and the days without sleep questions (M7 and M9) from the BRFSS optional module. This is not surprising given that a depression screener was used to form the group believed likely to have mental health related HRQOL deficits. The "not good" mental health days item from the BRFSS, with a relative validity 73% of the MCS measure, also performs reasonably well. Note that the scored general health item performs poorly in this relative validity comparison. As expected, the overtly "physical" measures also perform poorly.

Although perhaps less valuable in the conceptual framework of relative validity analyses, the inclusion of the third contrast comparing the group of subjects with indications of both chronic physical and mental health problems to the "disease free" group has some practical significance. Note that the "good health days" indicator from BRFSS, which combines the "not good" physical and mental health days variables, emerges as the most valid measure of quality of life deficit in a mixed population with concurrent physical and mental health problems.

6.4. Conclusions

- Both SF-36 scales and BRFSS items discriminate between ostensible well groups and groups with chronic physical or mental health problems.

- Specific SF -36 scales or component summaries emerge as the most valid measure of physical and mental health concepts in relative validity analyses, but BRFSS items are reasonable performers, especially given

the fact that they are single items and, as such, would be expected to have more within group variance than scale measures.

- The "not good health days" does not appear to be a good approach toward assessment of the physical dimensions of HRQOL. However, several of the "days" questions (depression, not enough sleep, and "not good") appear to work fairly well for mental health related HRQOL deficits – at least those potentially associated with depression. For overall HRQOL deficits combining aspects of both mental and physical health, the "good health days" index was the most valid measure.

- To the extent that there is a focus on HRQOL assessment in groups with comorbid physical and mental health problems, as intuition would suggest, it appears that summary HRQOL measures should include elements designed to tap physical and mental health dimensions.

Chapter 7

CONCLUSIONS

7.1 Summary conclusions

The BRFSS HRQOL measures appear to have acceptable construct, criterion and known-groups validity based on this study comparing these items to the SF-36 HRQOL survey in several common population samples. Patterns in BRFSS items across demographic categories are similar to those of SF-36 scales and summary components with conceptually similar measures exhibiting more congruent patterns. In criterion validity analyses comparing BRFSS items and SF-36 scales in a general population BRFSS items were correlated in expected directions with SF-36 scales. Criterion validity statistical models showed that small subsets of four BRFSS items explained 60 percent of the variance in the SF-36 physical component summary score and over 65 percent of the variance in the mental health component summary in the general population sample. In known-groups validity analyses, BRFSS items exhibited the same general patterns as the SF-36 scales across analytic subgroups defined by disease status. In relative validity analyses, key BRFSS items were nearly as valid as the best-performing SF-36 scales. The multi-item SF-36 scales did, as expected, show some more desirable psychometric properties in terms of missing values and ceiling and floor effects. The deficits single-item BRFSS questions experienced in these properties were clearly not substantive enough to drastically impede their validity.

From the set of analyses completed here, BRFSS core questions C1, C2, C3 (self-rated health, "not good" physical and mental health days) and optional module questions M1, M6, M7 and M8 (any limitation, as well as pain, depression, and anxiety days) were the items that appeared to give the most insight into the physical and mental dimensions of HRQOL. This is not

to say that the BRFSS "energy days" measure was a poor measure of vitality (in fact it was the BRFSS item most strongly correlated with the SF-36 vitality scale), but the vitality concept itself is apparently not as crucial to a BRFSS item's ability to measure the physical and mental health constructs as embodied in the SF-36.

7.3 Study limitations

The satisfactory validity of the BRFSS items found in analyses based on this Missouri sample should be generalizable to the US population as a whole. However, the findings here may not have external validity to other specific population groups. For example, certain ethnic minorities, e.g., Latinos and Asians, were poorly represented in the study samples. Also, while diseased and non-diseased groups were examined, we did not have large numbers of subjects from specific disease groups to examine sufficiently the validity of the BRFSS HRQOL in specific diseased groups. Further, it is unclear whether the SF-36 would be the appropriate criterion for such comparisons. Children and institutionalized populations were also not represented in our study group. While the SF-36 appears to be a reasonable choice as a criterion for general population HRQOL assessment, this validity study is only as valid as the gold standard. Similarly, the known-groups comparisons hinge upon the "known" groups differing on HRQOL. The diseased groups constructed appear to separate reasonably on HRQOL dimensions, but it is unclear whether known groups comparisons would be as congruent were samples more disparate in health status used. However, for general population surveillance, the diseased groups selected would appear to be the most appropriate for these analyses.

7.3 Implications for future work

This study's findings suggest that the BRFSS HRQOL instrument is providing a valid assessment of population HRQOL. It does however raise a

number of issues for further consideration and does not address certain key questions.

BRFSS HRQOL measurement issues for further study include the following:

- Can effective HRQOL surveillance be accomplished with a subset of existing BRFSS core and supplemental items? Tradeoffs between parsimony, interpretability, and policy value of individual items should be examined.
- Can BRFSS be combined into scale measures in a manner that improves their validity in measuring HRQOL? Psychometric evaluation of this and or other BRFSS data could be valuable in helping to address this question.
- Exploration of the validity of the BRFSS measures in other populations defined by age, ethnicity, and health or functional status is an important researchable area.
- The sensitivity of the BRFSS HRQOL items to detecting change in population HRQOL, perhaps as compared to other HRQOL measures, is an important area for further research.

Finally, while this work supports the BRFSS as a reasonable alternative to the SF-36, the converse, that the SF-36 (and perhaps even the shorter SF-12) is a reasonable alternative to the BRFSS module is also true. BRFSS items are scaled in native units that have excellent heuristic interpretation (e.g., poor health days, presence of limitation, etc.). Given the descriptive goals of a surveillance system, this is no insignificant feature. However, interpretability of units does not guarantee validity, and consequently, interpretability of the measure.

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VALIDATION OF THE BRFSS HRQOL MODULE IN STATEWIDE TELEPHONE SAMPLES: PRELIMINARY RESULTS FROM THE MISSOURI GENERAL POPULATION SAMPLE

Craig J. Newschaffer, Ph.D.
Assistant Professor
Saint Louis University School of Public Health

Jeanette Jackson-Thompson, Ph.D.
Chief, Office of Surveillance Research and Evaluation,
Missouri Department of Health

13th Annual BRFSS Conference, Atlanta 1996

Study goal

To provide information on the validity of the Behavioral Risk Factor Surveillance System (BRFSS) survey's health-related quality of life (HRQOL) questions in population samples using the Medical Outcomes Study Short-form 36 (SF-36) health status assessment as the criterion measure of HRQOL

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ATLAN96.PPS SO1/96 SLIDE 1

Comparison of health-related dimensions covered by selected health status scales

Health-related HRQOL dimension	CDC-Core	CDC-Optional	SF-36	Duke 17-Item	Notingham Profile
Physical functioning	X		X	X	X
Mental health	X		X	X	X
Self-esteem	X	X	X	X	X
Role functioning		X	X	X	X
Social functioning	X	X	X	X	
General health	X	X	X		
Pain		X	X	X	X
Vitality		X	X	X	X
Sleep		X		X	

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ATLAN96.PPS SO1/96 SLIDE 2

Comparison of number of items devoted to specific HRQOL dimensions on the SF-36 and BRFSS HRQOL modules

Health-related concept	Number of items	
	SF-36	BRFSS
Physical health		1
Physical functioning	10	
Mental health	4	3
General role functioning (physical and emotional)		2
Daily role functioning (physical and emotional)		2
Daily role functioning (physical)	4	
Daily role functioning (emotional)	3	
Personal care functioning		1
Social functioning	2	
General health	5	1
Sleep		1
Pain	2	1
Vitality	4	1

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1993 BRFSS data on self-rated health in Missouri and the United States

	Self-rated health (%)				
	Excellent	Very good	Good	Fair	Poor
Missouri	22	34	27	13	5
United States	25	34	28	10	4

Source US data: CDC
Source Missouri data: Missouri Department of Health

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Study objectives

- assess criterion validity in a Missouri statewide adult sample of BRFSS HRQOL items and SF-36 scale scores
- evaluate the ability of the BRFSS HRQOL items to discriminate between chronic-disease, depression/dysthymia, and disease-free groups
- assess construct validity of BRFSS items with respect to chronic disease risk factors, social support, and unmet health care needs.

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ATLANTA.PPT 5/31/96 SLIDE 5

Missouri statewide sample

	%	n		%	n
Sex			**Race**		
Male	40.1	161	White	85.8	343
Female	59.9	240	Other races	14.2	57
Age			**Education**		
18-29	19.5	78	<H.S.	17.4	70
30-44	30.0	120	H.S. grad	32.4	130
45-64	31.5	126	Some college	27.2	109
65+	19.0	76	College grad	26.7	107

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ATLANTA.PPT 5/31/96 SLIDE 6

Differences between SF-36 Scale Scores in the Missouri Sample* and U.S. Norms** (Slide 1)

	Scale							
	Physical Functioning		Physical Role-Disability		Bodily Pain		General Health	
	MO Score	MO-US	MO Score	MO-US	MO Score	MO-US	MO Score	MO-US
Mean	86.1	-0.9	83.9	-3.1	78.9	-0.6	70.4	-3.4
S.D.	21.8	0.4	32.4	3.1	23.4	0.0	16.9	-2.4
25th Percentile	85.0	-10.0	100.0	25.0	72.0	10.0	62.0	0.0
Median	95.0	0.0	100.0	0	84.0	0.0	72.0	-3.0
75th Percentile	100.0	0.0	100.0	0	100.0	0.0	82.0	-5.0

*n=401 **Based on n=782 as reported in McHorney et al. Med Care 1994;32:551-567

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Differences between SF-36 Scale Scores in the Missouri Sample* and U.S. Norms** (Slide 2)

	Scale							
	Vitality		Social Functioning		Emotional Role - Disability		General Mental Health	
	MO Score	MO-US	MO Score	MO-US	MO Score	MO-US	MO Score	MO-US
Mean	64.8	0.7	91.2	3.1	89.2	2.2	81.4	4.2
S.D.	22.9	1.8	19.5	-0.8	27.7	-1.4	17.4	-0.8
25th Percentile	50.0	0.0	100.0	0.0	100.0	0.0	76.0	8.0
Median	70.0	0.0	100.0	0.0	100.0	0.0	88.0	8.0
75th Percentile	80.0	0.0	100.0	0.0	100.0	0.0	92.0	0.0

*n=401 **Based on n=782 as reported in McHorney et al. Med Care 1994;32:551-567

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ATLANTA.PPT 5/31/96 SLIDE 8

Analysis methods

- Comparison of mean SF-36 scale scores across levels of categorical BRFSS HRQOL items (core and supplemental)
- Multi-trait, multimethod correlation: continuous BRFSS HRQOL items (core and supplemental) and SF-36 scale scores
  - Nonparametric methods of correlation

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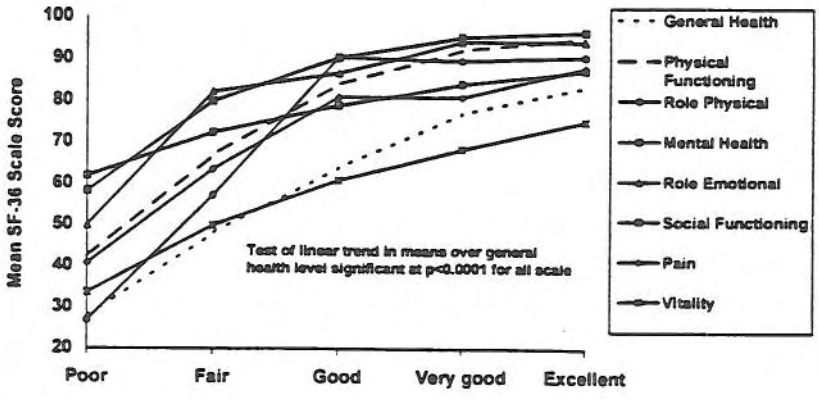
ATLANTA.PPT 5/31/96 SLIDE 9

SF-36 Scale Means by Self-Rated Level of General Health



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ATLANTA.PPT 5/31/96 SLIDE 10

Rank Correlation Coefficients between BRFSS HRQOL Core Items and SF-36 HRQOL Scales

	General Health	Physical Functioning	Role Physical	Mental Health	Role Emotional	Social Functioning	Pain	Vitality
"Not Good" Physical Health Days	-0.22	-0.25	-0.56	-0.30	-0.29	-0.41	-0.35	-0.37
"Not Good" Mental Health Days	-0.14	-0.06*	-0.16	-0.45	-0.48	-0.36	-0.14	-0.31
Days kept from activities	-0.41	-0.39	-0.34	-0.32	-0.35	-0.53	-0.33	-0.50
Good Health Days	0.20	0.19	0.45	0.40	0.40	0.47	0.31	0.40

[1] Kendall Tau b Coefficients
* $p > 0.05$

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ATLANTA.PPT 5/31/96 SLIDE 11

Correlation between BRFSS HRQOL Core Items and SF-36 HRQOL Scales - Stratified analyses

- **Initial stratification by age quartiles, sex, race, marital status**
  - Only change in sign (relative to full population estimates) occurred between good-health days and the body pain scale
  - Size of estimates generally similar across subgroups

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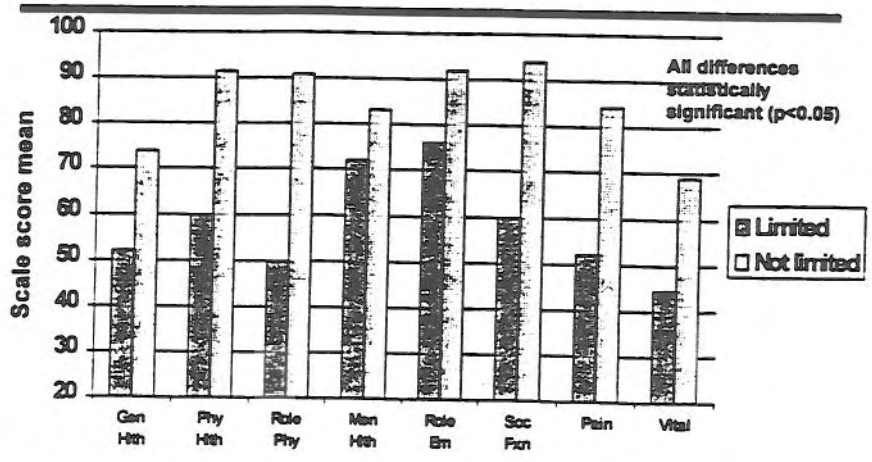
ATLANTA.PPT 5/31/96 SLIDE 12

SF-36 Scale Means by Categorical BRFSS Supplemental Questions: LIMITED IN ANY WAY



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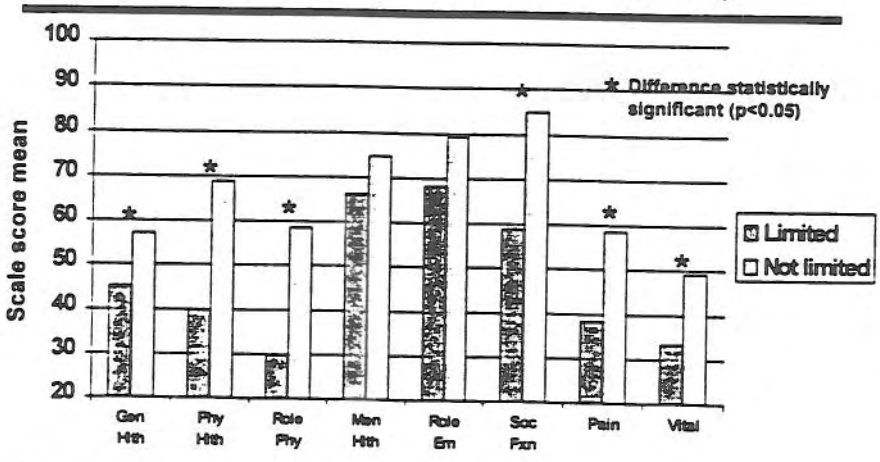
ATLANTA.PPT 5/31/96 SLIDE 13

SF-36 Scale Means by Categorical BRFSS Supplemental Questions: ROUTINE NEED LIMITATIONS (n=68)



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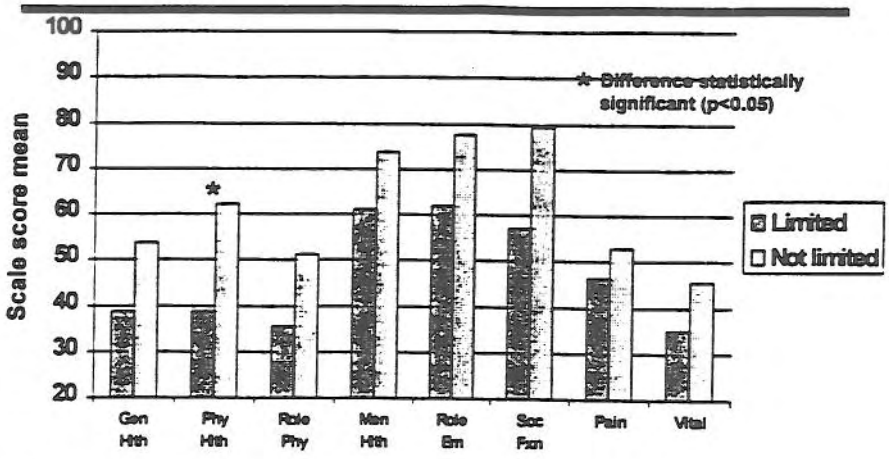
ATLANTA.PPT 5/31/96 SLIDE 14

SF-36 Scale Means by Categorical BRFSS Supplemental Questions: PERSONAL CARE LIMITATIONS (n=68)



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ATLANTA.PPT3 5/31/96 SLIDE 15

Rank Correlation Coefficients between BRFSS HRQOL Supplemental Items and SF-36 HRQOL Scales

	General Health	Physical Functioning	Role Physical	Mental Health	Role Emotional	Social Functioning	Pain	Vitality
Length of limitation	-0.04*	-0.08*	0.18*	0.12*	0.06*	0.07*	0.09*	0.11*
Pain-limited activity days	-0.19	-0.23	-0.47	-0.19	-0.25	-0.32	-0.56	-0.31
Days sad, blue, depressed	-0.17	-0.10	-0.21	-0.53	-0.55	-0.43	-0.21	-0.35
Days anxious, worried, tense	-0.18	-0.08	-0.15	-0.44	-0.42	0.30	-0.16	-0.31
Days without enough sleep	-0.05*	-0.04*	-0.11	-0.21	-0.12	-0.16	-0.16	-0.31
Days full of energy	0.29	0.19	0.28	0.42	0.34	0.34	0.26	0.50

' Kendall Tau b Coefficients
* p > =0.05 (correlation coefficients NOT statistically different from 0)

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ATLANTA.PPT3 5/31/96 SLIDE 16

Conclusions

- **Appears to be good criterion validity between individual BRFSS HRQOL items and component SF-36 scales in the general population sample**
  - correlations/associations consistently in expected directions
  - supplemental BRFSS questions focused on more specific dimensions of HRQOL correlate most closely with SF-36 scales designed to measure those dimensions

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ATLAN96.PPG SG1/96 SLIDE 17

APPENDIX G:

SLIDES FROM 1997 CDC PRESENTATION

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VALIDATION OF THE BRFSS HRQOL MODULE IN A STATEWIDE TELEPHONE SAMPLE

Craig J. Newschaffer, Ph.D.
Research Assistant Professor, Jefferson Medical College
Adjunct Assistant Professor, Saint Louis University School of Public Health

Jeanette Jackson-Thompson, Ph.D.
Chief, Office of Surveillance Research and Evaluation, Missouri Department of Health

The Behavioral Risk Factor Surveillance System (BRFSS)

- Annual RDD telephone survey begun in 1984
- Standard protocol
- Core questions / optional modules / state-developed components
- Independently administered by States

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BRFSS HRQOL Items

Core module

- General health
- Days physical health no good
- Days mental health no good
- Days with activity limitation

Optional Module

- Any limitation
- Major impairment
- Length of limitation
- Personal care limitation
- Routine need limitation
- Pain days
- Sad days
- Worried days
- Not enough sleep days
- Very health days

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Validation of HRQOL measures

- Content
  - Face
  - Sampling
- Criterion
  - Concurrent
  - Predictive
- Construct
  - Known-groups or clinical validity
- Psychometric

(Don't forget reliability!)

Bergner M. *Ann Rev Public Health* 8:191-210; 1987
McHorney CA et al. *Medical Care* 31:247-263; 1993.

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Study goal

To provide information on the criterion validity of the Behavioral Risk Factor Surveillance System (BRFSS) survey's health-related quality of life (HRQOL) questions in a general population sample using the Medical Outcomes Study Short-form 36 (SF-36) health status assessment as the criterion measure of HRQOL

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Specific aims

- **Assess *criterion validity* in a Missouri statewide adult sample of BRFSS HRQOL items and SF-36 scale scores**
- **Assess, *known-groups, construct validity* by evaluating the ability of the BRFSS HRQOL items to discriminate between chronic-disease, depression/dysthymia, and disease-free groups**
- **Compare BRFSS HRQOL known groups validity to that of the SF-36**
- **Assess other aspects of BRFSS HRQOL item construct validity and compare to criterion**

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SF-36 overview (cont.)

- **Conceptual basis in physical and mental health:**
  - Function
  - Well-being
  - Disability
  - Personal evaluation
- **Emergent scales:**
  - Physical functioning
  - Role-physical
  - Bodily Pain
  - General health
  - Vitality
  - Social functioning
  - Role-emotional
  - Health transition
  - PHYSICAL AND MENTAL HEALTH SUMMARY SCALES

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Comparison of number of items devoted to specific HRQOL dimensions on the SF-36 and BRFSS HRQOL modules

Health-related concept	Number of items	
	SF-36	BRFSS
Physical health		1
Physical functioning	10	
Mental health	5	3
General role functioning (physical and emotional)		2
Daily role functioning (physical and emotional)		2
Daily role functioning (physical)	4	
Daily role functioning (emotional)	3	
Personal care functioning		1
Social functioning	2	
General health	5	1
Sleep		1
Pain	2	1
Vitality	4	1

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Interview

- **Telephone**
  - Followed BRFSS protocols
- **Four sections**
  - Screener (chronic disease / depression)
  - First HRQOL component
  - Demographics, risk factors
  - Second HRQOL component
- **Pre-tested**
- **Interview time: 20 minutes**

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Screener

Chronic diseases

- Hypertension
- Angina
- Heart attack
- CHF
- Cancer
- Stroke / CVD
- Respiratory problems
- Arthritis
- Diabetes
- Hearing Impairment

Depression screener

- 2+ weeks out of past year "sad, blue, depressed" or "lost all interest..."
- 2+ years "depressed, or sad on most days even if OK sometimes"
- In past year, "depressed or sad much of the time"
- If first or second and third item are affirmative then screen +

Burnham MA et al. *Med Care* 26:775-789; 1988.

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Analysis Groups

- Population sample (n=401)
- Chronic disease only (n=195)
- Depression screen + only (n=70)
- No chronic disease and depression + (n=117)
- No chronic disease and depression - (n=176)

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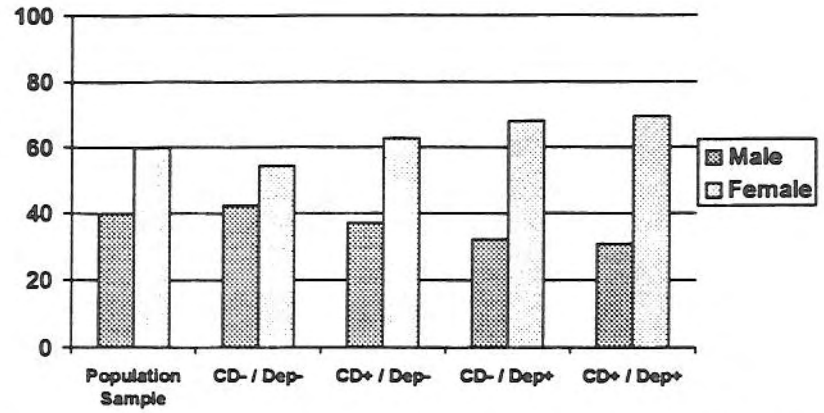
Analysis groups: gender distribution



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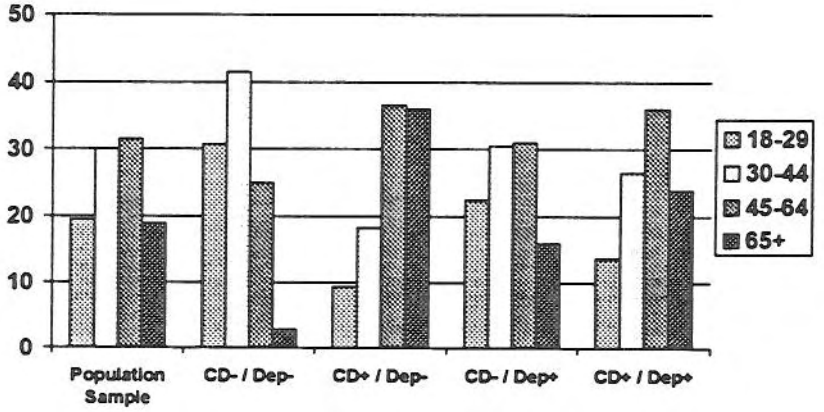
Analysis groups: Age distribution



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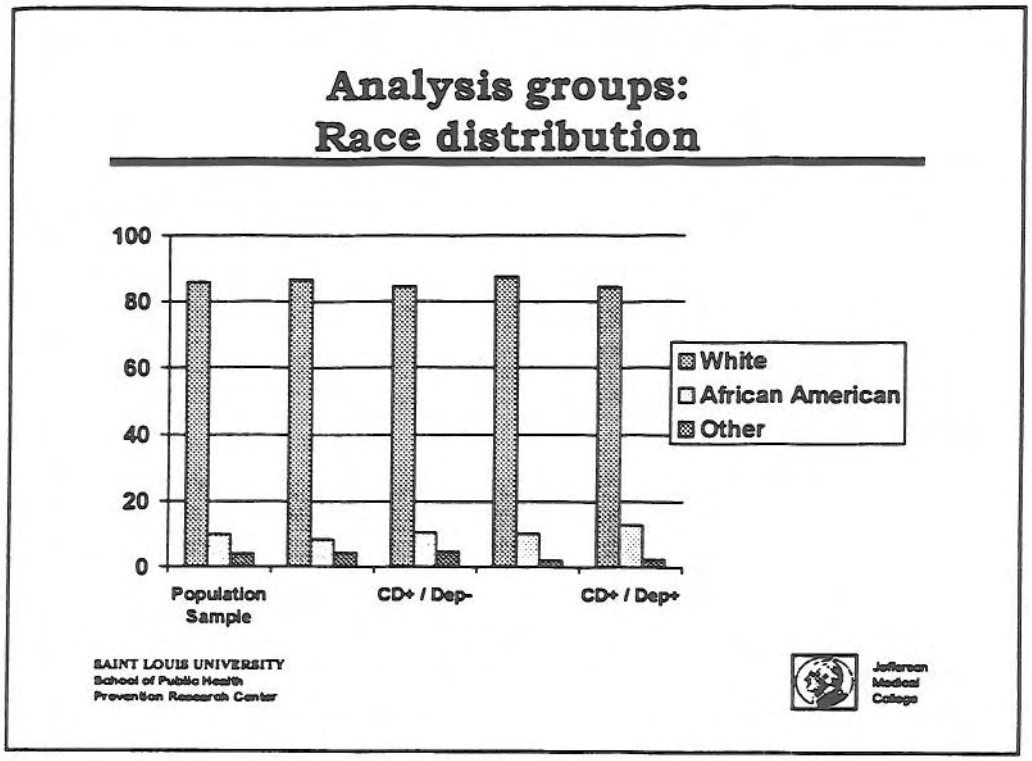
Analysis groups:
Race distribution
100
80
60
40
20
0
Population Sample
CD+ / Dep-
CD+ / Dep+
White
African American
Other
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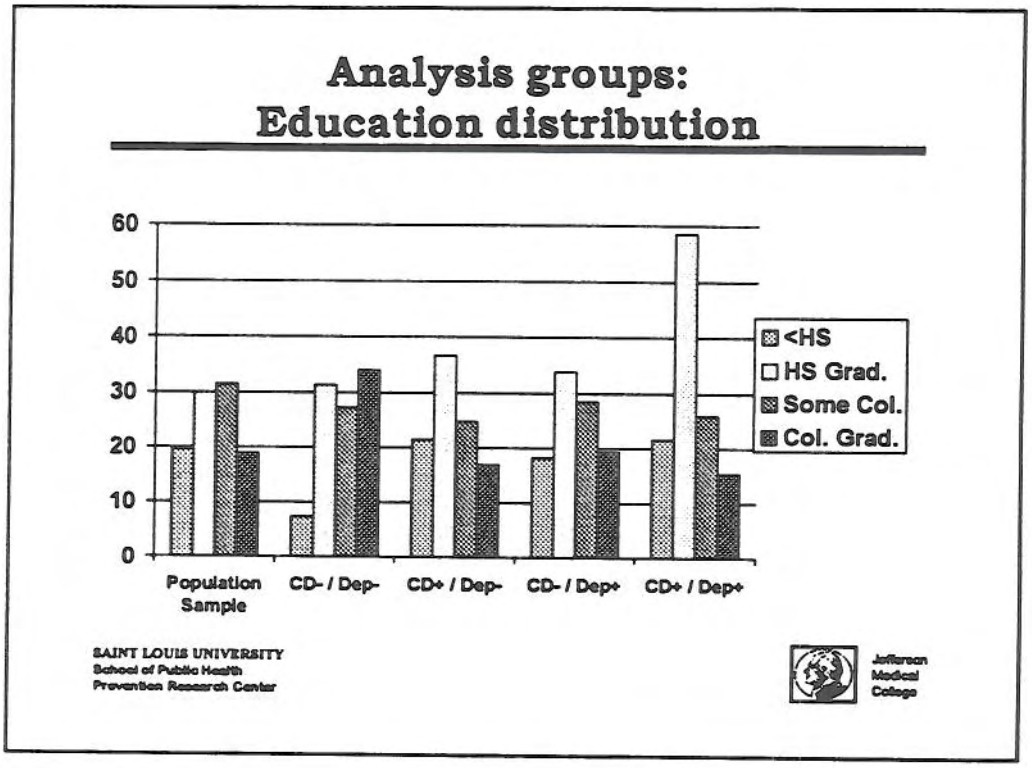
Analysis groups:
Education distribution
60
50
40
30
20
10
0
Population Sample
CD- / Dep-
CD+ / Dep-
CD- / Dep+
CD+ / Dep+
<HS
HS Grad.
Some Col.
Col. Grad.
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1993 BRFSS data on self-rated health in Missouri and the United States

	Self-rated health (%)				
	Excellent	Very good	Good	Fair	Poor
Missouri	22	34	27	13	5
United States	25	34	28	10	4

Source US data: CDC
Source Missouri data: Missouri Department of Health

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Differences between SF-36 Scale Scores in the Missouri Sample* and U.S. Norms** (Slide 1)

	Scale							
	Physical Functioning		Physical Role-Disability		Bodily Pain		General Health	
	MO Score	MO-US	MO Score	MO-US	MO Score	MO-US	MO Score	MO-US
Mean	86.1	-0.9	83.9	-3.1	78.9	-0.6	70.4	-3.4
S.D.	21.8	0.4	32.4	3.1	23.4	0.0	16.9	-2.4
25th Percentile	85.0	-10.0	100.0	25.0	72.0	10.0	62.0	0.0
Median	95.0	0.0	100.0	0	84.0	0.0	72.0	-3.0
75th Percentile	100.0	0.0	100.0	0	100.0	0.0	82.0	-5.0

*n=401 **Based on n=782 as reported in McHorney et al. Med Care 1994;32:551-567

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Differences between SF-36 Scale Scores in the Missouri Sample* and U.S. Norms** (Slide 2)

	Scale							
	Vitality		Social Functioning		Emotional Role - Disability		General Mental Health	
	MO Score	MO-US	MO Score	MO-US	MO Score	MO-US	MO Score	MO-US
Mean	64.8	0.7	91.2	3.1	89.2	2.2	81.4	4.2
S.D.	22.9	1.8	19.5	-0.8	27.7	-1.4	17.4	-0.8
25th Percentile	50.0	0.0	100.0	0.0	100.0	0.0	76.0	8.0
Median	70.0	0.0	100.0	0.0	100.0	0.0	88.0	8.0
75th Percentile	80.0	0.0	100.0	0.0	100.0	0.0	92.0	0.0

*n=401 **Based on n=782 as reported in McHorney et al. Med Care 1994;32:551-567

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Analysis methods

- Comparison of mean SF-36 scale scores across levels of categorical BRFSS HRQOL items (core and supplemental)
- Multi-trait, multimethod correlation: continuous BRFSS HRQOL items (core and supplemental) and SF-36 scale scores
- Statistical modeling to determine whether there is a best subset of BRFSS items predicting SF-36 physical and mental health summary scales

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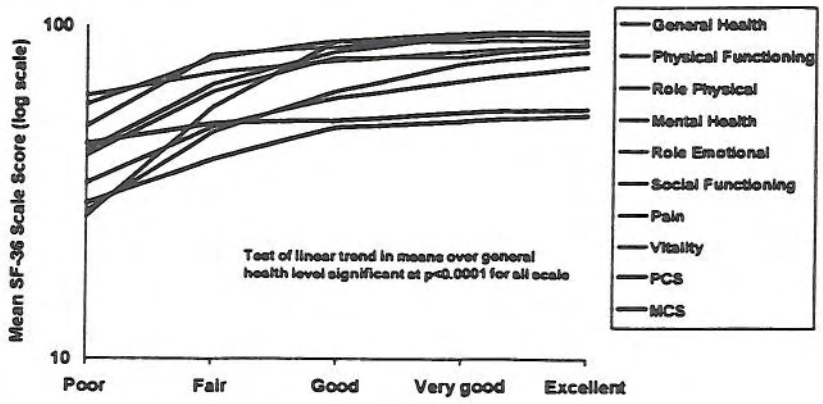
SF-36 Scale Means by Self-Rated Level of General Health



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Rank Correlation Coefficients between BRFSS HRQOL Core Items and SF-36 HRQOL Scales

	General Health	Physical Functioning	Role Physical	Mental Health	Role Emotional	Social Functioning	Pain	Vitality	PCS	MCS
"Not Good" Physical Health Days	-0.22	-0.25	-0.56	-0.30	-0.29	-0.41	-0.35	-0.37	-0.55	-0.31
"Not Good" Mental Health Days	-0.14	-0.08*	-0.16	-0.45	-0.48	-0.36	-0.14	-0.31	-0.16	0.00*
Days kept from activities	-0.41	-0.39	-0.34	-0.32	-0.35	-0.53	-0.33	-0.50	-0.35	-0.40
Good Health Days	0.20	0.19	0.45	0.40	0.40	0.47	0.31	0.40	0.44	0.21

[1] Kendall Tau b Coefficients
* $p > 0.05$

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Correlation between BRFSS HRQOL Core Items and SF-36 HRQOL Scales - Stratified analyses

- **Stratification by sex, age group, race, household income:**
  - Categorical items
    - Largest difference in PCS by general health in oldest group; 45-65 for MCS
    - Highest income group had smaller difference in PCS and MCS across general health classes
  - Continuous items:
    - No systematic change in sign or magnitude of estimates (relative to full population estimates)
    - Loss of statistical significance attributed to diminished sample size not change in magnitude

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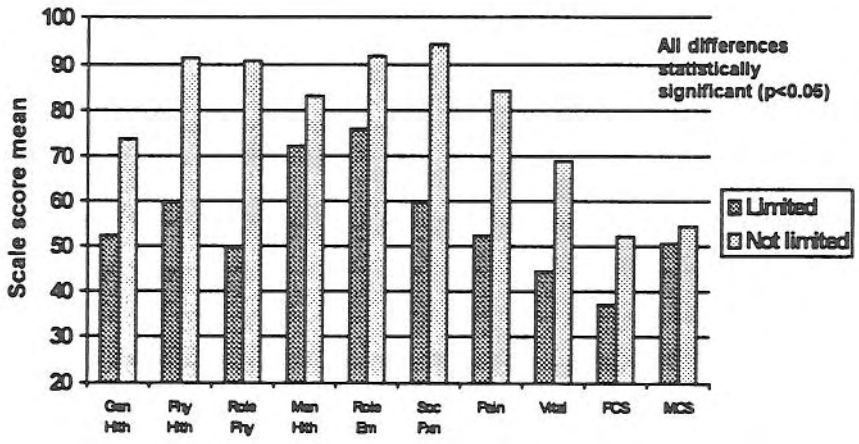
SF-36 Scale Means by Categorical BRFSS Optional Questions: LIMITED IN ANY WAY



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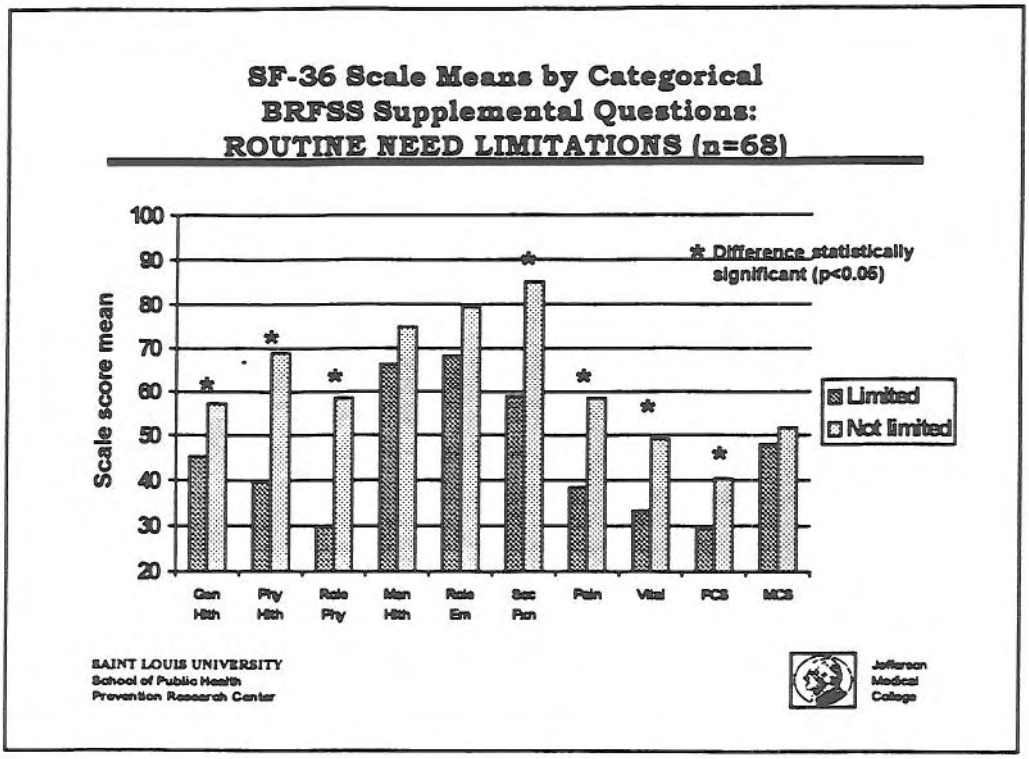
SF-36 Scale Means by Categorical
BRFSS Supplemental Questions:
ROUTINE NEED LIMITATIONS (n=68)
Scale score mean
100
90
80
70
60
50
40
30
20
* Difference statistically significant (p<0.05)
Limited
Not limited
Gen Hlth
Phy Hlth
Role Phy
Man Hlth
Role Em
Soc Fun
Pain
Vital
PCS
MCS
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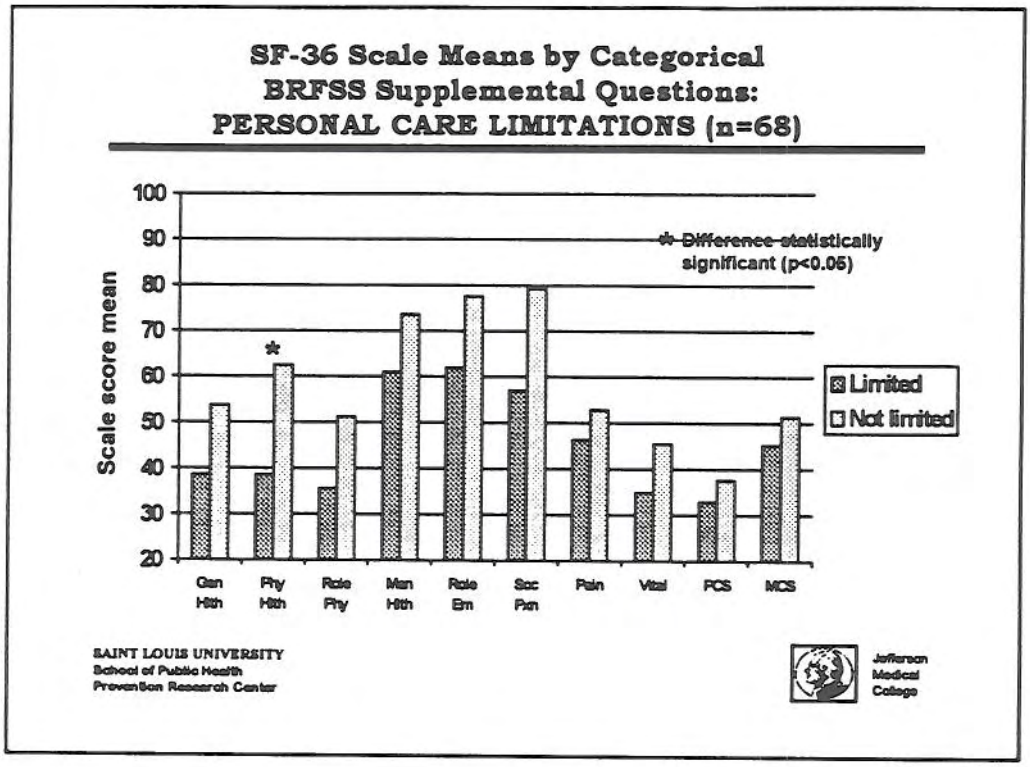
SF-36 Scale Means by Categorical
BRFSS Supplemental Questions:
PERSONAL CARE LIMITATIONS (n=68)
Scale score mean
100
90
80
70
60
50
40
30
20
* Difference statistically significant (p<0.05)
Limited
Not limited
Gen Hlth
Phy Hlth
Role Phy
Man Hlth
Role Em
Soc Fun
Pain
Vital
PCS
MCS
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Rank Correlation Coefficients between BRFSS HRQOL Supplemental Items and SF-36 HRQOL Scales

	General Health	Physical Functioning	Role Physical	Mental Health	Role Emotional	Social Functioning	Pain	Vitality	PCS	MCS
Length of limitation	-0.04*	-0.08*	0.18*	0.12*	0.06*	0.07*	0.09*	0.11*	0.02*	0.07*
Pain-limited activity days	-0.19	-0.23	-0.47	-0.19	-0.25	-0.32	-0.56	-0.31	-0.39	-0.12
Days sad, blue, depressed	-0.17	-0.10	-0.21	-0.53	-0.55	-0.43	-0.21	-0.35	-0.01*	-0.50
Days anxious, worried, tense	-0.18	-0.08	-0.15	-0.44	-0.42	0.30	-0.16	-0.31	-0.02	-0.41
Days without enough sleep	-0.05*	-0.04*	-0.11	-0.21	-0.12	-0.16	-0.16	-0.31	-0.07*	-0.24
Days full of energy	0.29	0.19	0.28	0.42	0.34	0.34	0.26	0.50	0.16	0.40

[1] Kendall Tau b Coefficients
* p > =0.05 (correlation coefficient NOT statistically different from 0)

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Correlation between BRFSS HRQOL Optional Items and SF-36 HRQOL Scales - Stratified analyses

- **Stratification by sex, age group, race, household income:**
  - Patterns largely similar
  - Continuous items:
    - Women tend to have stronger correlations between BRFSS items and conceptually similar SF-36 then men
    - African-Americans tend to have stronger correlations between BRFSS items and conceptually similar SF-36 then whites
    - Magnitude of correlations between BRFSS questions and conceptually similar SF-36 scales tend to increase thorough the 45-54 age group

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Predicting SF-36 PCS and MCS with BRFSS HRQOL Measures

- OLS regression!?!?
- Stepwise selection
  - from conceptually appropriate BRFSS items
  - ...look into the black box
- Examine betas
- Incremental improvement in R^2

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Predicting SF-36 PCS with BRFSS HRQOL Measures

Step added	Varaible	Final model *b*	Final model *p*	Close alternatives	R^2
1	Any limit. (O)	-6.06	< 0.001	Limit. level (O) Pers. care limit (O)	0.38
2	"Not good" phys. health days (C)	-0.31	< 0.001	Days full of energy (O)	0.50
3	General health (C)	2.20	< 0.001	Days kept from activities (C)	0.56
4	Pain days (O)	-0.24	< 0.001		0.59
5	Routine limits (O)	-4.91	0.010		0.60
6	Not enough sleep days (O)	-0.07	0.04		0.60

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Predicting SF-36 MCS with BRFSS HRQOL Measures

Step added	Varaible	Final model *b*	Final model *p*	Close alternatives	R^2
1	Days sad/blue depressed (O)	-0.526	< 0.001	General health (C) Routine limits (O)	0.52
2	Days full of energy (O)	0.31	< 0.001	Days kept from activities (C)	0.60
3	Not good mental days (C)h	-0.391	< 0.001		0.64
4	Pain days (O)	0.187	< 0.001	Any limitation (O) Routine limitation (O)	0.66
5	Days with anxiety (O)	-0.23	< 0.001		0.67
6	Any limitation (O)	1.63	0.083		0.67

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Findings

- **Appears to be good criterion validity between individual BRFSS HRQOL items and component SF-36 scales in the general population sample**
  - correlations/associations consistently in expected directions
  - supplemental BRFSS questions focused on more specific dimensions of HRQOL correlate most closely with SF-36 scales designed to measure those dimensions

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Findings (cont.)

- **The majority of the variation in SF-36 summary variables is explained by distinct subsets of HRQOL questions**
- **However, all 13 candidate BRFSS questions were identified as parsimonious predictors or as close alternatives**

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Analytic Methods

- **Focus on contrasting analysis groups**
  - No chronic disease/depression - vs.
    - chronic disease only
    - depression positive only
    - both
- **Relative validity method**
  - Continuous variables
  - Ratio of *F*-statistics
  - General health (BRFSS) treated as an ordinal score
- **Relative mean comparison**
- **Logistic regression models**
  - Predict known group status with BRFSS items
  - Predict known group status with SF-36 scales
  - Compare "fits"
  - Determine if SF-36 adds to best BRFSS model
- **Compare means across other risk groups**

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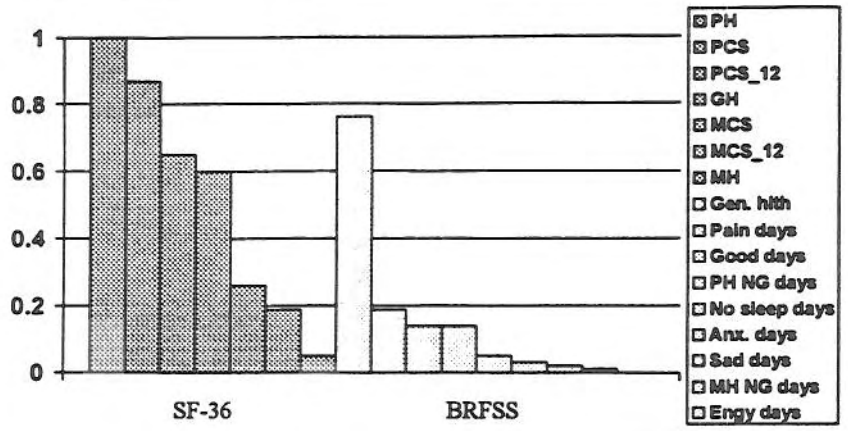
Relative validity: CD+/Dep- vs. CD-/Dep- (n=289)



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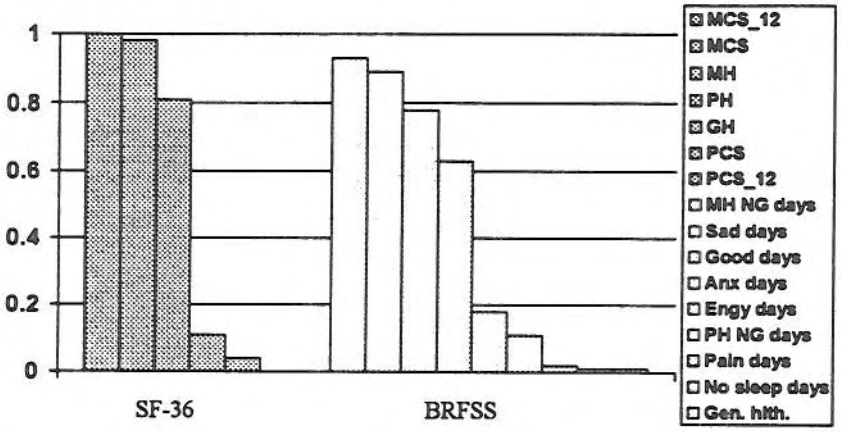
Relative validity: Dep+/CD- vs. CD-/Dep- (n=191)



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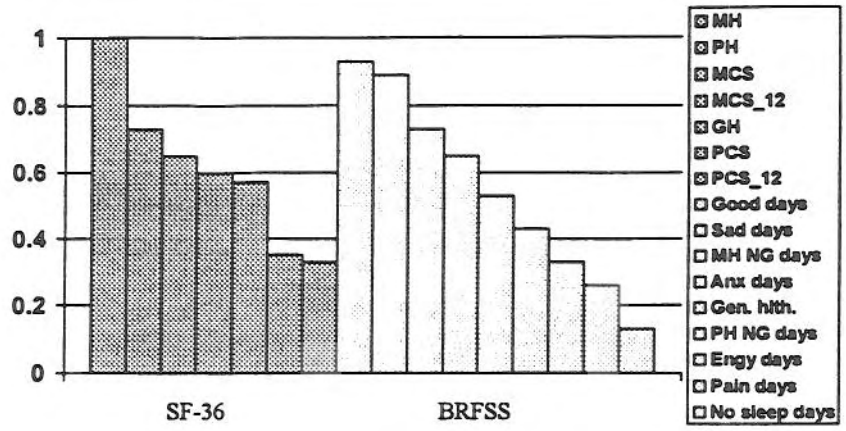
Relative validity: Dep+/CD+ vs. CD-/Dep- (n=209)



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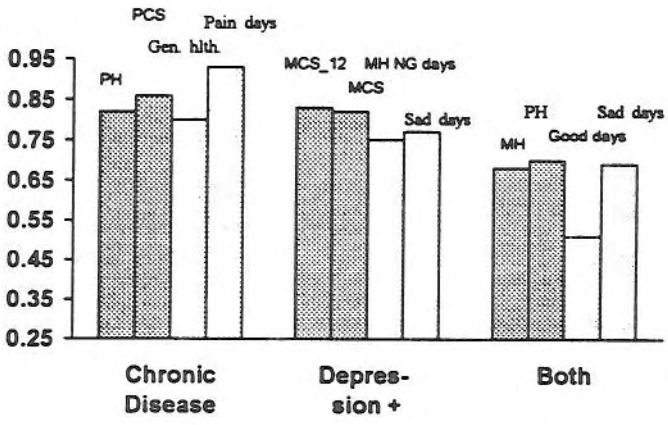
Relative mean differences for select BRFSS and SF-36 measures across disease groups



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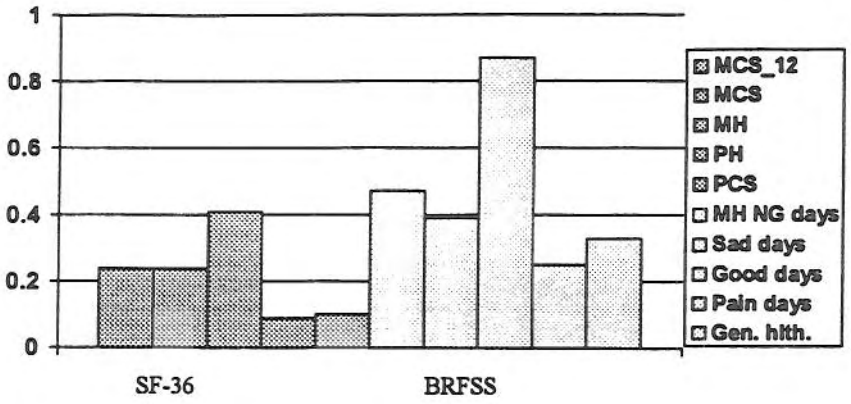
Coefficient of Variation
Select BRFSS and SF-36 measures



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Known-groups validity: findings

- SF-36 scales and BRFSS items had generally comparable known groups validity (SF-36 appeared superior for chronic disease)
- Known physical differences explain BRFSS general health item variation
- Known mental health differences appear to explain good health days variation

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Known-groups validity: findings (cont)

- Trends in HRQOL point estimates similar for SF-36 scales and BRFSS items
- SF-36 scales more "reliable" than single BRFSS items

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Conclusion

BRFSS HRQOL modules appear to have reasonably good criterion validity with respect to the SF-36

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APPENDIX A:

BRFSS HRQOL MODULE ITEMS

Health-Related Quality-of-Life Measure (HRQOL-14)

Health Care and Aging Studies Branch
Division of Adult and Community Health
National Center for Chronic Disease Prevention and Health Promotion
Centers for Disease Control and Prevention

The 4-item set of health-related quality-of-life questions (HRQOL-4) below has been in continuous use in the state-based Behavioral Risk Factor Surveillance System (BRFSS) since January, 1993. As of November 1997 over 500,000 adults aged 18 and older have responded to these core BRFSS questions. The following page presents a conceptually-related 10-item Quality of Life/ Functional Status (QOL) module that has been available for optional use in the BRFSS since January 1995. When used together, the HRQOL-4 and the supplemental 10-item module form the expanded HRQOL-14 set of questions that many states and communities are now beginning to use in their surveys, providing a large public-domain source of population data.

The CDC HRQOL-14 questions are now undergoing several reliability and validity studies, including 3 studies that are cross-validating the questions with the widely-used Rand Corporation's Medical Outcomes Study Short-Form 36 (SF-36). Results to date indicate that the HRQOL-14 questions have reasonably good criterion validity with respect to the SF-36 in a community sample study. It is believed that the BRFSS QOL questions will significantly extend the utility of the BRFSS, which is now administered and used by all 50 states and the District of Columbia.

The interview will only take a short time, and all the information obtained in this study will be confidential.

Section 1: Health Status

1. Would you say that in general your health is: (33)

Please Read

a. Excellent 1
b. Very good 2
c. Good 3
d. Fair 4

or

e. Poor 5

Do not read these responses

Don't know/Not sure 7
Refused 9

2. Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good? (34-35)

a. Number of days __
b. None 8 8
Don't know/Not sure 7 7
Refused 9 9

3. Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good? (36-37)

a. Number of days __
b. None **If Q. 2 also "None," skip next question** 8 8
Don't know/Not sure 7 7
Refused 9 9

4. During the past 30 days, for about how many days did poor physical or mental health keep you from doing your usual activities, such as self-care, work, or recreation? (38-39)

a. Number of days __
b. None 8 8
Don't know/Not sure 7 7
Refused 9 9

Supplemental Quality-of-Life Module

These next questions are about limitations you may have in your daily life.

1. Are you LIMITED in any way in any activities because of any impairment or health problem?
   a. Yes 1
   b. No **Go to Q. 6** 2
   Don't know/Not sure **Go to Q. 6** 7
   Refused **Go to Q. 6** 9

2. What is the MAJOR impairment or health problem that limits your activities?
   Do Not Read. Code Only One Category.
   a. Arthritis/rheumatism 01
   b. Back or neck problem 02
   c. Fractures, bone/joint injury 03
   d. Walking problem 04
   e. Lung/breathing problem 05
   f. Hearing problem 06
   g. Eye/vision problem 07
   h. Heart problem 08
   i. Stroke problem 09
   j. Hypertension/high blood pressure 10
   k. Diabetes 11
   l. Cancer 12
   m. Depression/anxiety/emotional problem 13
   n. Other impairment/problem 14
   Don't know/Not sure 77
   Refused 99

3. For HOW LONG have your activities been limited because of your major impairment or health problem?
   Do Not Read. Code using respondent's unit of time.
   a. Days 1 _ _
   b. Weeks 2 _ _
   c. Months 3 _ _
   d. Years 4 _ _
   Don't know/Not sure 777
   Refused 999

4. Because of any impairment or health problem, do you need the help of other persons with your PERSONAL CARE needs, such as eating, bathing, dressing, or getting around the house?
   a. Yes 1
   b. No 2
   Don't know/Not sure 7
   Refused 9

5. Because of any impairment or health problem, do you need the help of other persons in handling your ROUTINE needs, such as everyday household chores, doing necessary business, shopping, or getting around for other purposes?
   a. Yes 1
   b. No 2
   Don't know/Not sure 7
   Refused 9

6. During the past 30 days, for about how many days did PAIN make it hard for you to do your usual activities, such as self-care, work, or recreation?
   a. Number of days
   b. None 8 8
   Don't know/Not sure 7 7
   Refused 9 9

7. During the past 30 days, for about how many days have you felt SAD, BLUE, or DEPRESSED?
   a. Number of days
   b. None 8 8
   Don't know/Not sure 7 7
   Refused 9 9

8. During the past 30 days, for about how many days have you felt WORRIED, TENSE, or ANXIOUS?
   a. Number of days
   b. None 8 8
   Don't know/Not sure 7 7
   Refused 9 9

9. During the past 30 days, for about how many days have you felt you did NOT get ENOUGH REST or SLEEP?
   a. Number of days
   b. None 8 8
   Don't know/Not sure 7 7
   Refused 9 9

10. During the past 30 days, for about how many days have you felt VERY HEALTHY AND FULL OF ENERGY?
    a. Number of days
    b. None 8 8
    Don't know/Not sure 7 7
    Refused 9 9

QOLMOD.97Q

END

APPENDIX B:

SF-36 ITEMS

THE MOS 36-ITEM SHORT-FORM HEALTH SURVEY (SF-36)

INSTRUCTIONS: This survey asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities.

Answer every question by marking the answer as indicated. If you are unsure about how to answer a question, please give the best answer you can.

1. In general, would you say your health is:

(circle one)

Excellent 1

Very good 2

Good 3

Fair 4

Poor 5

2. Compared to one year ago, how would you rate your health in general now?

(circle one)

Much better now than one year ago 1

Somewhat better now than one year ago 2

About the same as one year ago 3

Somewhat worse now than one year ago 4

Much worse now than one year ago 5

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3. The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

(circle one number on each line)

ACTIVITIES	Yes, Limited A Lot	Yes, Limited A Little	No, Not Limited At All
a. **Vigorous activities**, such as running, lifting heavy objects, participating in strenuous sports	1	2	3
b. **Moderate activities**, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	1	2	3
c. Lifting or carrying groceries	1	2	3
d. Climbing **several** flights of stairs	1	2	3
e. Climbing **one** flight of stairs	1	2	3
f. Bending, kneeling, or stooping	1	2	3
g. Walking **more than a mile**	1	2	3
h. Walking **several blocks**	1	2	3
i. Walking **one block**	1	2	3
j. Bathing or dressing yourself	1	2	3

4. During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

(circle one number on each line)

	YES	NO
a. Cut down on the **amount of time** you spent on work or other activities	1	2
b. **Accomplished less** than you would like	1	2
c. Were limited in the **kind** of work or other activities	1	2
d. Had **difficulty** performing the work or other activities (for example, it took extra effort)	1	2

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5. During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

(circle one number on each line)

	YES	NO
a. Cut down the **amount of time** you spent on work or other activities	1	2
b. **Accomplished less** than you would like	1	2
c. Didn't do work or other activities as **carefully** as usual	1	2

6. During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

(circle one)

Not at all 1

Slightly 2

Moderately 3

Quite a bit 4

Extremely 5

7. How much bodily pain have you had during the past 4 weeks?

(circle one)

None 1

Very mild 2

Mild 3

Moderate 4

Severe 5

Very severe 6

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8. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

(circle one)

Not at all 1

A little bit 2

Moderately 3

Quite a bit 4

Extremely 5

9. These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the past 4 weeks -

(circle one number on each line)

	All of the Time	Most of the Time	A Good Bit of the Time	Some of the Time	A Little of the Time	None of the Time
a. Did you feel full of pep?	1	2	3	4	5	6
b. Have you been a very nervous person?	1	2	3	4	5	6
c. Have you felt so down in the dumps that nothing could cheer you up?	1	2	3	4	5	6
d. Have you felt calm and peaceful?	1	2	3	4	5	6
e. Did you have a lot of energy?	1	2	3	4	5	6
f. Have you felt downhearted and blue?	1	2	3	4	5	6
g. Did you feel worn out?	1	2	3	4	5	6
h. Have you been a happy person?	1	2	3	4	5	6
i. Did you feel tired?	1	2	3	4	5	6

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10. During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc.)?

(circle one)

All of the time 1

Most of the time 2

Some of the time 3

A little of the time 4

None of the time 5

11. How TRUE or FALSE is each of the following statements for you?

(circle one number on each line)

	Definitely True	Mostly True	Don't Know	Mostly False	Definitely False
a. I seem to get sick a little easier than other people	1	2	3	4	5
b. I am as healthy as anybody I know	1	2	3	4	5
c. I expect my health to get worse	1	2	3	4	5
d. My health is excellent	1	2	3	4	5

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APPENDIX C:

VALIDATION STUDY SURVEY INSTRUMENT

BRFSS Health-related Quality Of Life Validation Survey

GLOBAL SELF-RATED HEALTH, SELECT AND CHRONIC DISEASES AND PSYCHOLOGICAL STRESS SCREENERS

The first questions are about your personal health.

1. First, would you say that in general your health is:

Please read

a.	Excellent	1
b.	Very Good	2
c.	Good	3
d.	Fair	4
	OR	
e.	Poor	5

Do not read

Don't know/Not sure	7
Refused	9

2. Compared to one year ago, how would you rate your general health now? Is it:

Please read

a.	Much better now than one year ago	1
b.	Somewhat better now than one year ago	2
c.	About the same	3
d.	Somewhat worse now than one year ago	4
	OR	
e.	Much worse now than one year ago	5

Do not read

Don't know/Not sure	7
Refused	9

I'm going to read you a list of health conditions. For each condition tell me whether a doctor or another health care provider has ever told you that you have that problem...

3. ...hypertension or high blood pressure....

   a. Yes 1

   b. No 2

   Don't know/Not sure 7

   Refused 9

4. ...angina

   a. Yes 1

   b. No 2

   Don't know/Not sure 7

   Refused 9

5. ...a heart attack

   a. Yes 1

   b. No 2

   Don't know/Not sure 7

   Refused 9

6. ...congestive heart failure

   a. Yes 1

   b. No 2

   Don't know/Not sure 7

   Refused 9

7. ...any cancer except for skin cancer

   a. Yes 1

   b. No 2

   Don't know/Not sure 7

   Refused 9

8. ...a stroke or cerebrovascular (se-re-bro-vas-cue-ler) accident

a. Yes 1

b. No 2

Don't know/Not sure 7

Refused 9

9. ...problems with your lungs or respiratory system like chronic bronchitis, asthma, emphysema, or tuberculosis

a. Yes 1

b. No 2

Don't know/Not sure 7

Refused 9

10. ...arthritis or rheumatism of any kind

a. Yes 1

b. No 2

Don't know/Not sure 7

Refused 9

11. ...diabetes

a. Yes 1

b. Yes, but female only told during pregnancy 2

c. No 3

Don't know/Not sure 7

Refused 9

12. ...a hearing impairment

a. Yes 1

b. No 2

Don't know/Not sure 7

Refused 9

49. ...dental care

a. Yes 1

b. No 2

Don't know/Not sure 7

Refused 9

50. ...eye care

a. Yes 1

b. No 2

Don't know/Not sure 7

Refused 9

51. ....prescription medicines

a. Yes 1

b. No 2

Don't know/Not sure 7

Refused 9

52. ...special equipment such as canes, walkers, eyeglasses, hearing aids, or dentures?

a. Yes 1

b. No 2

Don't know/Not sure 7

Refused 9

53. Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMO's, or government plans such as Medicare, Medicaid, or Veteran's care?

a. Yes ..... Go to Q. 45 1

b. No 2

Don't know/Not sure 7

Refused 9

54. About how long has it been since you had health care coverage?

Read only if necessary

a. Within the past 6 months (0 to 6 months) 1

b. Within the past year (6 to 12 months ago) 2

c. Within the past 2 years (1 to 2 years ago) 3

d. Within the past 5 years (2 to 5 years ago) 4

e. 5 or more years ago 5

Never 8

Don't know/Not sure 7

Refused 9

SOCIAL SUPPORT MODULE

The next few questions ask about your contact with family and friends...

55. In the past two weeks, how often have you gone out to visit family or had family visit you?

a. Number ..... ___

None 88

Don't know/Not sure 77

Refused 99

56. In the past two weeks, how often have you gone out to visit friends or had friends visit you?

a. Number ..... ___

None 88

Don't know/Not sure 77

Refused 99

57. How often does someone express interest and concern in your well-being?

Please read:

a. Very often 1

b. Fairly often 2

c. Once in a while 3

OR

d. Never 4

Do not read

Don't know/Not sure 7

Refused 9

58. How often does someone pitch in to help you do something that needs to get done, like household chores or yardwork?

Please read:

a. Very often 1

b. Fairly often 2

c. Once in a while 3

OR

d. Never 4

Do not read

Don't know/Not sure 7

Refused 9

59. How often does someone give you information that makes a complicated situation, choice, or problem easier to understand?

If respondent hesitates, prompt: Maybe something like buying a car, finding a doctor, doing your taxes, looking for a job, or picking an insurance policy.

Please read:

a. Very often 1

b. Fairly often 2

c. Once in a while 3

OR

d. Never 4

Do not read

Don't know/Not sure 7

Refused 9

60. How satisfied are you with the level of concern others express for you?

Please Read

a. Very satisfied.. 1

b. Somewhat satisfied. 2

c. Somewhat dissatisfied. 3

OR

d. Very dissatisfied.. 4

Do not read

Don't know/Not sure 7

Refused..... 9

61. How satisfied are you with the help you receive getting things like household chores done?

Please Read

a. Very satisfied.. 1

b. Somewhat satisfied. 2

c. Somewhat dissatisfied. 3

OR

d. Very dissatisfied.. 4

Do not read

Don't know/Not sure 7

Refused..... 9

62. How satisfied are you with the information you receive to help you out with complicated situations, choices, or problems?

Please Read

a. Very satisfied.. 1

b. Somewhat satisfied. 2

c. Somewhat dissatisfied. 3

OR

d. Very dissatisfied 4

Do not read

Don't know/Not sure 7

Refused..... 9

QOL MODULE 2
IN THIS DRAFT: SF36 ITEMS

Next I'm going to read you a list of activities you might do during a typical day. As I read each item, please tell me if your health now limits you a lot, a little, or does not limit you at all in these activities

63. First, vigorous activities, such as running, lifting heavy objects, participating in strenuous sports. Does your health limit you a lot, a little, or not limit you at all?

If respondent says s/he doesn't do activity probe with: If you tried to do any vigorous activities, would you be limited a lot, limited a little, or not at all limited?

a. Yes, limited a lot 1

b. Yes, limited a little 2

c. No, not limited at all 3

Don't know/Not sure 7
Refused 9

64. ... moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf. Does your health limit you a lot, a little, or not limit you at all?

If respondent says s/he doesn't do activity probe with: If you tried to do any moderate activities, would you be limited a lot, limited a little, or not at all limited?

a. Yes, limited a lot 1

b. Yes, limited a little 2

c. No, not limited at all 3

Don't know/Not sure 7
Refused 9

65. ...lifting or carrying groceries. Does your health limit you a lot, a little, or not limit you at all?

If respondent says s/he doesn't do activity probe with: If you tried to lift or carry groceries, would you be limited a lot, limited a little, or not at all limited?

a. Yes, limited a lot 1

b. Yes, limited a little 2

c. No, not limited at all 3

Don't know/Not sure 7
Refused 9

66. ...climbing <u>one</u> flight of stairs. Does your health limit you a lot, a little, or not limit you at all?

If respondent says s/he doesn't do activity probe with: If you tried to climb one flight of stairs, would you be limited a lot, limited a little, or not at all limited?

a. Yes, limited a lot 1

b. Yes, limited a little 2

c. No, not limited at all 3

Don't know/Not sure 7

Refused 9

67. ...climbing <u>several</u> flights of stairs. Does your health limit you a lot, a little, or not limit you at all?

If respondent says s/he doesn't do activity probe with: If you tried to climb several flights of stairs, would you be limited a lot, limited a little, or not at all limited?

a. Yes, limited a lot 1

b. Yes, limited a little 2

c. No, not limited at all 3

Don't know/Not sure 7

Refused 9

68. ...bending, kneeling, or stooping. Does your health limit you a lot, a little, or not limit you at all?

If respondent says s/he doesn't do activity probe with: If you tried to bend, kneel, or stoop would you be limited a lot, limited a little, or not at all limited?

a. Yes, limited a lot 1

b. Yes, limited a little 2

c. No, not limited at all 3

Do not read

Don't know/Not sure 7

Refused 9

69. ...walking one block. Does your health limit you a lot, a little, or not limit you at all?

If respondent says s/he doesn't do activity probe with: If you tried to walk one block, would you be limited a lot, limited a little, or not at all limited?

a. Yes, limited a lot 1

b. Yes, limited a little 2

c. No, not limited at all 3

Do not read

Don't know/Not sure 7

Refused 9

70. ...walking several blocks. Does your health limit you a lot, a little, or not limit you at all?

If respondent says s/he doesn't do activity probe with: If you tried to walk several blocks, would you be limited a lot, limited a little, or not at all limited?

a. Yes, limited a lot 1

b. Yes, limited a little 2

c. No, not limited at all 3

Do not read

Don't know/Not sure 7

Refused 9

71. ...walking more than one mile. Does your health limit you a lot, a little, or not limit you at all?

If respondent says s/he doesn't do activity probe with: If you tried to walk more than one mile, would you be limited a lot, limited a little, or not at all limited?

a. Yes, limited a lot 1

b. Yes, limited a little 2

c. No, not limited at all 3

Do not read

Don't know/Not sure 7

Refused 9

72. ...bathing or dressing yourself. Does your health limit you a lot, a little, or not limit you at all?

If respondent says s/he doesn't do activity probe with: If you tried to bathe or dress yourself, would you be limited a lot, limited a little, or not at all limited?

a. Yes, limited a lot 1

b. Yes, limited a little 2

c. No, not limited at all 3

d. Don't do, but not related to health 4

Do not read

Don't know/Not sure 7

Refused 9

The next set of questions ask you about your physical health and your daily activities...

73. During the past four weeks, have you had to cut down the <u>amount of time</u> you spent on work or other regular daily activities as a result of your physical health?

a. Yes 1

b. No 2

Don't know/not sure 7

Refused 9

74. During the past four weeks, have you accomplished less than you would like as a result of your physical health?

a. Yes 1

b. No 2

Don't know/not sure 7

Refused 9

75. During the past four weeks, were you limited in the kind of work or other regular daily activities you do as a result of your physical health?

a. Yes 1

b. No 2

Don't know/not sure 7

Refused 9

76. During the past four weeks, have you had difficulty performing work or other daily activities as a result of your physical health, for example, it took extra effort?

a. Yes 1

b. No 2

Don't know/not sure 7

Refused 9

The next three questions ask about your emotions and your daily activities...

77. During the past four weeks, have you had to cut down the amount of time you spent on work or other regular daily activities as a result of any emotional problems, such as feeling depressed or anxious?

a. Yes 1

b. No 2

Don't know/not sure 7

Refused 9

78. During the past four weeks, have you accomplished less than you would like as a result of any emotional problems, such as feeling depressed or anxious?

a. Yes 1

b. No 2

Don't know/not sure 7

Refused 9

79. During the past four weeks, did you not do work or other regular daily activities as carefully as usual as a result of any emotional problems, such as feeling depressed or anxious?

a. Yes 1

b. No 2

Don't know/not sure 7

Refused 9

80. During the past four weeks, to what extent has your physical health or emotional health interfered with your normal social activities with friends, family, neighbors, or groups? Has it interfered...

Please read

a. Not at all 1

b. Slightly 2

c. Moderately 3

d. Quite a bit 4

OR

e. Extremely 5

Do not read

Don't know/not sure 7

Refused 9

81. During the past four weeks, how much did pain interfere with your normal work, including both work outside the home and housework? Did it interfere...

Please read

a. Not at all 1

b. Slightly 2

c. Moderately 3

d. Quite a bit 4

OR

e. Extremely 5

Do not read

Don't know/not sure 7

Refused 9

82. How much bodily pain have you had during the past 4 weeks? Have you had...

Please read

a. None 1

b. Very mild 2

c. Mild 3

d. Moderate 4

e. Severe 5

OR

f. Very severe 6

Do not read

Don't know/not sure 7

Refused 9

83. During the past four weeks, how much of the time has your physical health or emotional health interfered with your social activities like visiting with friends or relatives? Has it interfered...

Please read

a. All of the time..... 1

b. Most of the time..... 2

c. A good bit of the time..... 3

d. Some of the time..... 4

e. A little of the time..... 5

OR

f. None of the time..... 6

Do not read

Don't know/not sure 7

Refused..... 9

The next questions are about how you feel and how things have been with you during the past 4 weeks. As I read each statement, please give me the one answer that comes closest to the way you have been feeling; is it all of the time, most of the time, a good bit of the time, some of the time, a little of the time, or none of the time?

84. How much of the time during the past four weeks... did you feel full of pep?

Please read

a. All of the time..... 1

b. Most of the time..... 2

c. A good bit of the time..... 3

d. Some of the time..... 4

e. A little of the time..... 5

OR

f. None of the time..... 6

Do not read

Don't know/not sure 7

Refused..... 9

85. How much of the time during the past four weeks... have you been a very nervous person?

Please read

a. All of the time..... 1

b. Most of the time..... 2

c. A good bit of the time..... 3

d. Some of the time..... 4

e. A little of the time..... 5

OR

f. None of the time..... 6

Do not read

Don't know/not sure 7

Refused..... 9

86. How much of the time during the past four weeks... have you felt so down in the dumps that nothing could cheer you up?

Read only if necessary

a. All of the time..... 1

b. Most of the time..... 2

c. A good bit of the time..... 3

d. Some of the time..... 4

e. A little of the time..... 5

f. None of the time..... 6

Don't know/not sure 7

Refused..... 9

87. How much of the time during the past four weeks... have you felt calm and peaceful?

Read only if necessary

a. All of the time..... 1

b. Most of the time..... 2

c. A good bit of the time..... 3

d. Some of the time..... 4

e. A little of the time..... 5

f. None of the time..... 6

Don't know/not sure 7

Refused..... 9

88. How much of the time during the past four weeks... did you have a lot of energy?

Read only if necessary

a. All of the time..... 1

b. Most of the time..... 2

c. A good bit of the time..... 3

d. Some of the time..... 4

e. A little of the time..... 5

f. None of the time..... 6

Don't know/not sure 7

Refused..... 9

89. How much of the time during the past four weeks... have you felt downhearted and blue?

Read only if necessary

a. All of the time..... 1

b. Most of the time..... 2

c. A good bit of the time..... 3

d. Some of the time..... 4

e. A little of the time..... 5

f. None of the time..... 6

Don't know/not sure 7

Refused..... 9

90. How much of the time during the past four weeks... did you feel worn out?

Read only if necessary

a. All of the time..... 1

b. Most of the time..... 2

c. A good bit of the time..... 3

d. Some of the time..... 4

e. A little of the time..... 5

f. None of the time..... 6

Don't know/not sure 7

Refused..... 9

91. How much of the time during the past four weeks... have you been a happy person?

Read only if necessary

a. All of the time..... 1

b. Most of the time..... 2

c. A good bit of the time..... 3

d. Some of the time..... 4

e. A little of the time..... 5

f. None of the time..... 6

Don't know/not sure 7

Refused..... 9

92. How much of the time during the past four weeks... did you feel tired?

Read only if necessary

a. All of the time..... 1

b. Most of the time..... 2

c. A good bit of the time..... 3

d. Some of the time..... 4

e. A little of the time..... 5

f. None of the time..... 6

Don't know/not sure 7

Refused..... 9

These next questions are about health-related matters... I'm going to read a list of statements. After each one, please tell me if it is definitely true, mostly true, mostly false, or definitely false, or if you don't know.

93. I seem to get sick a little easier than other people. Would you say that's...

Please read

a. Definitely true 1

b. Mostly true 2

c. Mostly false 3

OR

d. Definitely false 4

Do not read

Don't know/not sure 7

Refused 9

94. I am as healthy as anybody I know. Would you say that's...

Please read

a. Definitely true 1

b. Mostly true 2

c. Mostly false 3

OR

d. Definitely false 4

Do not read

Don't know/not sure 7

Refused 9

95. I expect my health to get worse. Would you say that's...

Please read

a. Definitely true 1

b. Mostly true 2

c. Mostly false 3

OR

d. Definitely false 4

Do not read

Don't know/not sure 7

Refused 9

96. My health is excellent. Would you say that's...

Please read

a. Definitely true 1

b. Mostly true 2

c. Mostly false 3

OR

d. Definitely false 4

Do not read

Don't know/not sure 7

Refused 9

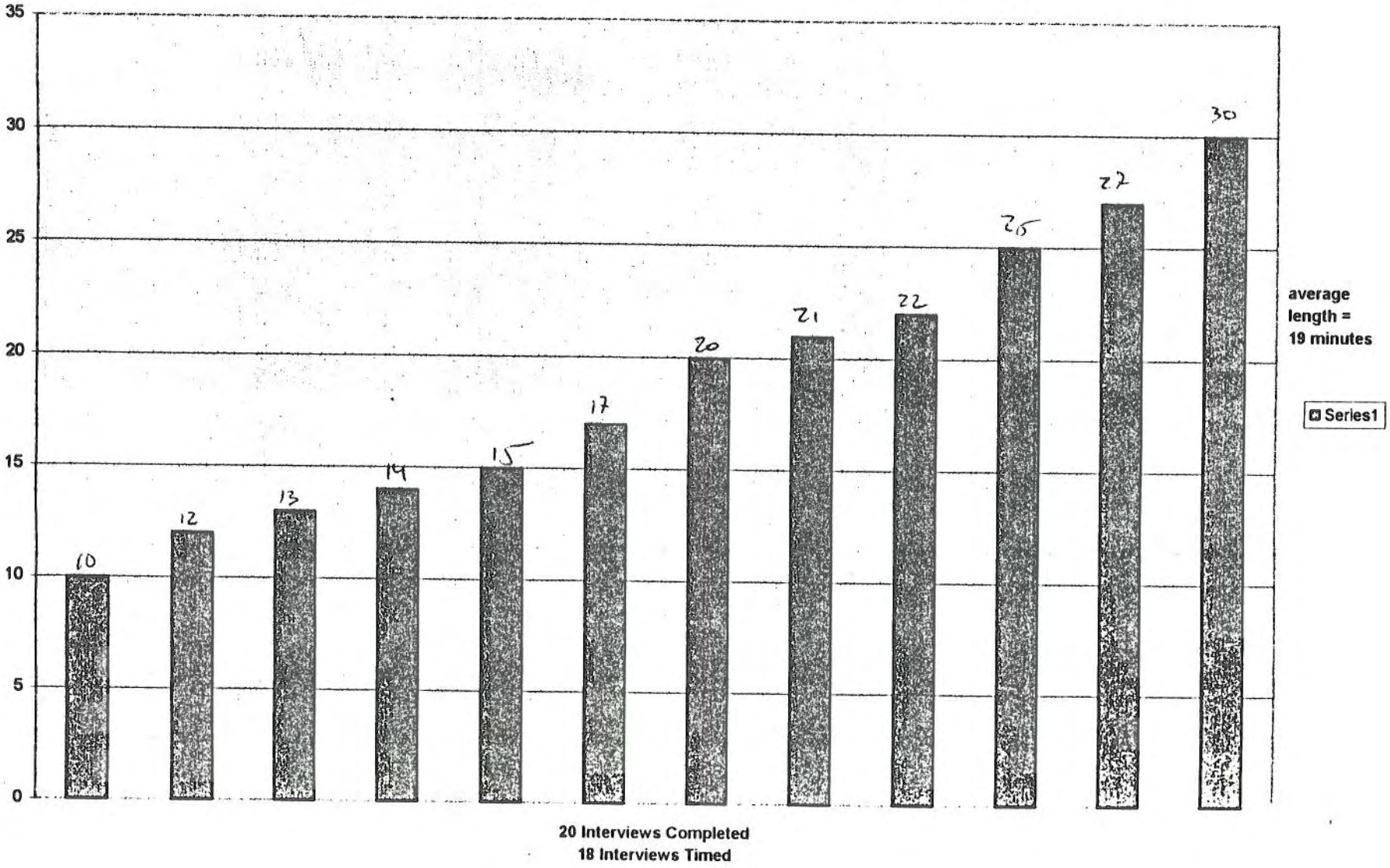
Closing Statement

That's my last question. Everyone's answers will be combined to give us information about the health practices of people in this state. Thank you very much for your time and cooperation.

APPENDIX D:

DISTRIBUTION OF INTERVIEW TIME (PILOT STUDY)

Validation Survey- 2nd Pilot



20 Interviews Completed
18 Interviews Timed

APPENDIX E:

CODE BOOK

SELF-RATED GLOBAL HEALTH STATUS

VARIABLE NAME	Q#	DESCRIPTION	VALID RESPONSES
GENH LTH	1	Would you say that in general your health is	1 Excellent 2 Very Good 3 Good 4 Fair 5 Poor 7 Don't know/Not sure 9 Refused
GENHLNOW	2	Compared to one year ago, how would you rate your general health now	1 Much better now 2 Somewhat better 3 About the same 4 Somewhat worse 5 Much worse now 7 Don't know/Not sure 9 Refused

SELECT CHRONIC DISEASES

VARIABLE NAME	Q#	DESCRIPTION	VALID RESPONSES
HIGHBP	3	Prevalent hypertension (ever told by doctor or other health care provider condition is present)	1 Yes 2 No 7 Don't know/Not sure 9 Refused
ANGINA	4	Prevalent angina (ever told by doctor or other health care provider condition is present)	1 Yes 2 No 7 Don't know/Not sure 9 Refused
HRTATTAC	5	Prevalent MI history (ever told by doctor or other health care provider condition is present)	1 Yes 2 No 7 Don't know/Not sure 9 Refused
HRTFAIL	6	Prevalent CHF (ever told by doctor or other health care provider condition is present)	1 Yes 2 No 7 Don't know/Not sure 9 Refused
CANCER	7	Prevalent cancer except for skin cancer (ever told by doctor or other health care provider condition is present)	1 Yes 2 No 7 Don't know/Not sure 9 Refused

SELECT CHRONIC DISEASES (continued)

VARIABLE NAME	Q#	DESCRIPTION	VALID RESPONSES
STROKE	8	Prevalent stroke (ever told by doctor or other health care provider condition is present)	1 Yes 2 No 7 Don't know/Not sure 9 Refused
LUNGPROB	9	Prevalent respiratory disease (ever told by doctor or other health care provider condition is present)	1 Yes 2 No 7 Don't know/Not sure 9 Refused
ARTHRITS	10	Prevalent arthritis told by doctor or other health care provider condition is present)	1 Yes 2 No 7 Don't know/Not sure 9 Refused
DIABETES	11	Prevalent diabetes (ever told by doctor or other health care provider condition is present)	1 Yes 2 Yes, but female during pregnancy 3 No 7 Don't know/Not sure 9 Refused
HEARLOSS	12	Prevalent hearing impairment (ever told by doctor or other health care provider condition is present)	1 Yes 2 No 7 Don't know/Not sure 9 Refused

DEPRESSION

VARIABLE NAME	Q#	DESCRIPTION	VALID RESPONSES
DEPRESED	13	In the past year, have you had <u>two weeks</u> or more during which you felt sad, blue, or depressed; or when you lost all interest or pleasure in things you usually cared about or enjoyed?	1 Yes 2 No 7 Don't know/Not sure 9 Refused
SADMOST	14	Have you had <u>two years or more</u> in your life when you felt depressed or sad on most days, even if you felt okay sometimes?	1 Yes 2 No 7 Don't know/Not sure 9 Refused
SADYEAR	15	Have you felt depressed or sad much of the time <u>in the past year</u>?	1 Yes 2 No 7 Don't know/Not sure 9 Refused

BEHAVIOR RISK FACTORS

VARIABLE NAME	Q#	DESCRIPTION	VALID RESPONSES
PHYSACT	16	During the past month, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?	1 Yes 2 No 7 Don't know/Not sure 9 Refused
SMOKSTAT	17	Have you smoked at least 100 cigarettes in your entire life?	1 Yes 2 No 7 Don't know/Not sure 9 Refused
SMOKENOW	18	Do you smoke cigarettes now?	1 Yes 2 No 9 Refused
SMOKENUM	19	On the average, about how many cigarettes a day do you now smoke?	__ __ # of cigarettes 77 Don't know/Not sure 88 Don't smoke regularly 99 Refused
VEGGIES	20	How many servings of fruits and vegetables do you eat each day? Include all fruits and vegetables you eat, both at home and away from home.	__ __ # of servings 44 Less than one a day 77 Don't know/Not sure 88 None 99 Refused

CDC CORE HRQOL

VARIABLE NAME	Q#	DESCRIPTION	VALID RESPONSES
PHYSHLTH	21	Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?	__ __ # of days 88 None 77 Don't know/Not sure 99 Refused
MENHLTH	22	Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?	__ __ # of days 88 None 77 Don't know/Not sure 99 Refused
POORHLTH	23	During the past 30 days, for about how many days did poor physical or mental health keep you from doing your usual activities, such as self-care, work, or recreation?	__ __ # of days 88 None 77 Don't know/Not sure 99 Refused

CDC SUPPLEMENTAL HRQOL

VARIABLE NAME	Q#	DESCRIPTION	VALID RESPONSES
LIMITS	24	Are you LIMITED in any way in any activities because of any impairment or health problem?	1 Yes 2 No 7 Don't know/Not sure 9 Refused
MAJPROB	25	What is the major impairment or health problem that limits your activities?	1 Arthritis/rheumatism 2 Back or neck problems 3 Fractures, bone/joint injury 4 Walking problem 5 Lung/breathing problems 6 Hearing problems 7 Eye/vision problem 8 Heart problem 9 Stroke problem 10 Hypertension/high blood pressure 11 Diabetes 12 Cancer 13 Depression/anxiety/emotional problem 14 Other impairment/problem 77 Don't know/Not sure 99 Refused
LIMLNGTH	26	For HOW LONG have your activities been limited because of your major impairment or health problem?	1 ___ ___ # of Days 2 ___ ___ # of Weeks 3 ___ ___ # of Months 4 ___ ___ # of Years 777 Don't know/Not sure 999 Refused
PERSCARE	27	Because of any impairment or health problem, do you need the help of other persons with your PERSONAL CARE needs, such as eating, bathing, dressing, or getting around the house?	1 Yes 2 No 7 Don't know/Not sure 9 Refused
ROUTINE	28	Because of any impairment or health problem, do you need the help of other persons in handling your ROUTINE needs, such as everyday household chores, doing necessary business, shopping, or getting around for other purposes?	1 Yes 2 No 7 Don't know/Not sure 9 Refused
PAINDAYS	29	During the past 30 days, for about how many days did PAIN make it hard for you to do your usual activities, such as self-care, work, or recreation?	__ __ # of days 88 None 77 Don't know/Not sure 99 Refused
SADDAYS	30	During the past 30 days, for about how many days have you felt SAD, BLUE, or DEPRESSED?	__ __ # of days 88 None 77 Don't know/Not sure 99 Refused

CDC SUPPLEMENTAL HRQOL (continued)

VARIABLE NAME	Q#	DESCRIPTION	VALID RESPONSES
ANXDAYS	31	During the past 30 days, for about how many days have you felt WORRIED, TENSE, or ANXIOUS?	__ __ # of days 88 None 77 Don't know/Not sure 99 Refused
NSLPDAYS	32	During the past 30 days, for about how many days have you felt you did NOT get ENOUGH REST or SLEEP?	__ __ # of days 88 None 77 Don't know/Not sure 99 Refused
ENGYDAYS	33	During the past 30 days, for about how many days have you felt VERY HEALTHY AND FULL OF ENERGY?	__ __ # of days 88 None 77 Don't know/Not sure 99 Refused

SOCIODEMOGRAPHICS

VARIABLE NAME	Q#	DESCRIPTION	VALID RESPONSES
AGE	34	What is your age?	__ __ # of years 77 Don't know/Not sure 99 Refused
RACE	35	What is your race?	1 White 2 Black 3 Asian, Pacific Islander 4 American Indian, Alaskan Native 6 Other (Specify) 7 Don't know/Not sure 9 Refused
LATINO	36	Are you of Spanish/Hispanic Origin?	1 Yes 2 No 7 Don't know/Not sure 9 Refused
MARSTAT	37	What is your marital status?	1 Married 2 Divorced 3 Widowed 4 Separated 5 Never been married 6 A member of unmarried couple 7 Don't know/Not sure 9 Refused

SOCIODEMOGRAPHICS (continued)

VARIABLE NAME	Q#	DESCRIPTION	VALID RESPONSES
YEARSED	38	What is the highest grade or year of school you completed?	1 Never or kindergarten 2 Grades 1 - 8 3 Grades 9 - 11 4 Grade 12 or GED 5 College 1 - 3 yrs. (No AA /RN) 6 College 2 or more (AA/RN, etc.) 8 College 4 or more (BS/MA/PhD) 9 Refused
DOUWORK	39	What is your current employment status?	1 Employed for wages 2 Self-employed 3 Out of work > one year 4 Out of work < one year 5 Homemaker 6 Student 7 Retired 8 Unable to work 9 Refused
INCOME	40	Which of the following categories best describes your annual household income from all sources?	01 Less than $5,000 02 $ 5,000 to < $10,000 03 $10,000 to < $15,000 04 $15,000 to < $20,000 05 $20,000 to < $25,000 06 $25,000 to < $35,000 07 $35,000 to < $50,000 08 $50,000 to $75,000 09 Over $75,000 77 Don't know/Not sure 99 Refused
NUMPHON1	41	Do you have more than one telephone number in your household?	1 Yes 2 No 9 Refused
NUMPHON2	42	How many residential telephone numbers do you have?	___ # of phones 9 Refused
ZIPCODE	43	What is your zip code?	_____ 7 Don't know/Not sure 9 Refused
WEIGHT	44	About how much do you weigh without shoes?	___ ___ ___ Pounds 777 Don't know/Not sure 999 Refused
HEIGHT	45	About how tall are you without shoes?	___/___ ___ Feet/inches 777 Don't know/Not sure 999 Refused
SEX	46	Indicate sex of respondent.	1 Male 2 Female

UNMET HEALTHCARE NEEDS

VARIABLE NAME	Q#	DESCRIPTION	VALID RESPONSES
WHERCARE	47	Where do you usually go for regular health care?	1 Private physician 2 Emergency room 3 Hospital Clinic/Satellite Clinic 4 Neighborhood Health Center/ Federally Funded Clinic 5 City/County/Local Health Dept. 6 V. A. Hospital 7 University Student Health Clinic 8 Planned Parenthood 9 Convenience Clinic/Mediquick/ Walk-in Medical Clinic 10 Other 44 No usual source of care 55 Don't get sick 66 Don't get treatment 77 Don't know/Not sure 99 Refused
DRVISIT	48	In the past year did you ever go without any of the following health services you thought you needed? .....doctor's visit	1 Yes 2 No 7 Don't know/Not sure 9 Refused
DENTAL	49	In the past year did you ever go without any of the following health services you thought you needed? .....dental care	1 Yes 2 No 7 Don't know/Not sure 9 Refused
EYECARE	50	In the past year did you ever go without any of the following health services you thought you needed? .....eye care	1 Yes 2 No 7 Don't know/Not sure 9 Refused
MEDICINE	51	In the past year did you ever go without any of the following health services you thought you needed? .....prescription medicines	1 Yes 2 No 7 Don't know/Not sure 9 Refused
SPCEQUIP	52	In the past year did you ever go without any of the following health services you thought you needed? .....special equipment such as canes, walkers, eyeglasses, hearing aids, or dentures	1 Yes 2 No 7 Don't know/Not sure 9 Refused
HLTHCARE	53	Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMO's, or government plans such as Medicare, Medicaid, or Veteran's care?	1 Yes 2 No 7 Don't know/Not sure 9 Refused

UNMET HEALTHCARE NEEDS (continued)

VARIABLE NAME	Q#	DESCRIPTION	VALID RESPONSES
NOCOVER	54	About how long has it been since you had health care coverage?	1 0-6 months 2 6-12 months 3 1-2 years 4 2-5 years 5 5 or more years 8 Never 7 Don't know/Not sure 9 Refused

SOCIAL SUPPORT

VARIABLE NAME	Q#	DESCRIPTION	VALID RESPONSES
VISITS	55	In the past two weeks, how often have you gone out to visit family or had family visit you?	___ ___ Number of times 88 None 77 Don't know/Not sure 99 Refused
VISITYOU	56	In the past two weeks, how often have you gone out to visit friends or had friends visit you?	___ ___ Number of times 88 None 77 Don't know/Not sure 99 Refused
CONCERN	57	How often does someone express interest and concern in your well-being?	1 Very often 2 Fairly often 3 Once in a while 4 Never 7 Don't know/Not sure 9 Refused
HELPED	58	How often does someone pitch in to help you do something that needs to get done, like household chores or yardwork?	1 Very often 2 Fairly often 3 Once in a while 4 Never 7 Don't know/Not sure 9 Refused
INFORM	59	How often does someone give you information that makes a complicated situation, choice, or problem easier to understand?	1 Very often 2 Fairly often 3 Once in a while 4 Never 7 Don't know/Not sure 9 Refused
CARING	60	How satisfied are you with the level of concern others express for you?	1 Very satisfied 2 Somewhat satisfied 3 Somewhat dissatisfied 4 Very dissatisfied 7 Don't know/Not sure 9 Refused

SOCIAL SUPPORT (continued)

VARIABLE NAME	Q#	DESCRIPTION	VALID RESPONSES
CHORHELP	61	How satisfied are you with the help you receive getting things like household chores done?	1 Very satisfied 2 Somewhat satisfied 3 Somewhat dissatisfied 4 Very dissatisfied 7 Don't know/Not sure 9 Refused
HARDHELP	62	How satisfied are you with the information you receive to help you out with complicated situations, choices, or problems?	1 Very satisfied 2 Somewhat satisfied 3 Somewhat dissatisfied 4 Very dissatisfied 7 Don't know/Not sure 9 Refused

LIMITATIONS

VARIABLE NAME	Q#	DESCRIPTION	VALID RESPONSES
HEAVYACT	63	First, vigorous activities, such as running, lifting heavy objects, participating in strenuous sports. Does your health limit you a lot, a little, or not limit you at all?	1 Yes, limited a lot 2 Yes, limited a little 3 No, not limited at all 7 Don't know/Not sure 9 Refused
MEDACT	64	...moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf. Does your health limit you a lot, a little, or not limit you at all?	1 Yes, limited a lot 2 Yes, limited a little 3 No, not limited at all 7 Don't know/Not sure 9 Refused
GROCERY	65	...lifting or carrying groceries. Does your health limit you a lot, a little, or not limit you at all?	1 Yes, limited a lot 2 Yes, limited a little 3 No, not limited at all 7 Don't know/Not sure 9 Refused
ONESTAIR	66	...climbing one flight of stairs. Does your health limit you a lot, a little, or not limit you at all?	1 Yes, limited a lot 2 Yes, limited a little 3 No, not limited at all 7 Don't know/Not sure 9 Refused
SEVSTAIR	67	...climbing several flights of stairs. Does your health limit you a lot, a little, or not limit you at all?	1 Yes, limited a lot 2 Yes, limited a little 3 No, not limited at all 7 Don't know/Not sure 9 Refused
BENDING	68	...bending, kneeling, or stooping. Does your health limit you a lot, a little, or not limit you at all?	1 Yes, limited a lot 2 Yes, limited a little 3 No, not limited at all 7 Don't know/Not sure 9 Refused

LIMITATIONS (continued)

VARIABLE NAME	Q#	DESCRIPTION	VALID RESPONSES
WALKING1	69	...walking one block. Does your health limit you a lot, a little, or not limit you at all?	1 Yes, limited a lot 2 Yes, limited a little 3 No, not limited at all 7 Don't know/Not sure 9 Refused
WALKING2	70	...walking several blocks Does your health limit you a lot, a little, or not limit you at all?	1 Yes, limited a lot 2 Yes, limited a little 3 No, not limited at all 7 Don't know/Not sure 9 Refused
WALKING3	71	...walking more than one mile. Does your health limit you a lot, a little, or not limit you at all?	1 Yes, limited a lot 2 Yes, limited a little 3 No, not limited at all 7 Don't know/Not sure 9 Refused
DRESBATH	72	...bathing or dressing yourself. Does your health limit you a lot, a little, or not limit you at all?	1 Yes, limited a lot 2 Yes, limited a little 3 No, not limited at all 4 Don't do, but not related to health 7 Don't know/Not sure 9 Refused

ACTIVITIES

VARIABLE NAME	Q#	DESCRIPTION	VALID RESPONSES
LIMIT ACT	73	During the past four weeks, have you had to cut down the amount of time you spent on work or other regular daily activities as a result of your physical health?	1 Yes 2 No 7 Don't know/Not sure 9 Refused
DONELES	74	During the past four weeks, have you accomplished less than you would like as a result of your physical health?	1 Yes 2 No 7 Don't know/Not sure 9 Refused
KINDWORK	75	During the past four weeks, were you limited in the kind of work or other regular daily activities you do as a result of your physical health?	1 Yes 2 No 7 Don't know/Not sure 9 Refused
HARDWORK	76	During the past four weeks, have you had difficulty performing work or other daily activities as a result of your physical health? For example, it took extra effort.	1 Yes 2 No 7 Don't know/Not sure 9 Refused

VARIABLE NAME	Q#	DESCRIPTION	VALID RESPONSES
EMOTIONS	77	During the past four weeks, have you had to cut down the amount of time you spent on work or other regular daily activities as a result of any emotional problems, such as feeling depressed or anxious?	1 Yes 2 No 7 Don't know/Not sure 9 Refused
LESSDONE	78	During the past four weeks, have you accomplished less than you would like as a result of any emotional problems, such as feeling depressed or anxious?	1 Yes 2 No 7 Don't know/Not sure 9 Refused
CARELESS	79	During the past four weeks, did you not do work or other regular daily activities as carefully as usual as a result of any emotional problems, such as feeling depressed or anxious?	1 Yes 2 No 7 Don't know/Not sure 9 Refused
SOCACTS	80	During the past four weeks, to what extent has your physical health or emotional health interfered with your normal social activities with friends, family, neighbors, or groups?	1 Not at all 2 Slightly 3 Moderately 4 Quite a bit 5 Extremely 7 Don't know/Not sure 9 Refused
PAINWORK	81	During the past four weeks, how much did pain interfere with your normal work, including both work outside the home and housework?	1 Not at all 2 Slightly 3 Moderately 4 Quite a bit 5 Extremely 7 Don't know/Not sure 9 Refused
BODYPAIN	82	How much bodily pain have you had during the past 4 weeks?	1 None 2 Very mild 3 Mild 4 Moderate 5 Severe 6 Very severe 7 Don't know/Not sure 9 Refused
SOCIAL	83	During the past four weeks, how much of the time has your physical health or emotional health interfered with your social activities like visiting with friends or relatives?	1 All of the time 2 Most of the time 3 A good bit of the time 4 Some of the time 5 A little of the time 6 None of the time 7 Don't know/Not sure 9 Refused

FEELINGS

VARIABLE NAME	Q#	DESCRIPTION	VALID RESPONSES
FEELINGS	84	How much of the time during the past four weeks...did you feel full of pep?	1 All of the time 2 Most of the time 3 A good bit of the time 4 Some of the time 5 A little of the time 6 None of the time 7 Don't know/Not sure 9 Refused
NERVOUS	85	How much of the time during the past four weeks...have you been a very nervous person?	1 All of the time 2 Most of the time 3 A good bit of the time 4 Some of the time 5 A little of the time 6 None of the time 7 Don't know/Not sure 9 Refused
DUMPS	86	How much of the time during the past four weeks...have you felt so down in the dumps that nothing could cheer you up?	1 All of the time 2 Most of the time 3 A good bit of the time 4 Some of the time 5 A little of the time 6 None of the time 7 Don't know/Not sure 9 Refused
FELTCALM	87	How much of the time during the past four weeks...have you felt calm and peaceful?	1 All of the time 2 Most of the time 3 A good bit of the time 4 Some of the time 5 A little of the time 6 None of the time 7 Don't know/Not sure 9 Refused
ENERGY	88	How much of the time during the past four weeks...did you have a lot of energy?	1 All of the time 2 Most of the time 3 A good bit of the time 4 Some of the time 5 A little of the time 6 None of the time 7 Don't know/Not sure 9 Refused
FELTBLUE	89	How much of the time during the past four weeks...have you felt downhearted and blue?	1 All of the time 2 Most of the time 3 A good bit of the time 4 Some of the time 5 A little of the time 6 None of the time 7 Don't know/Not sure 9 Refused

VARIABLE NAME	Q#	DESCRIPTION	VALID RESPONSES
WORNOUT	90	How much of the time during the past four weeks...did you feel worn out?	1 All of the time 2 Most of the time 3 A good bit of the time 4 Some of the time 5 A little of the time 6 None of the time 7 Don't know/Not sure 9 Refused
HAPPY	91	How much of the time during the past four weeks...have you been a happy person?	1 All of the time 2 Most of the time 3 A good bit of the time 4 Some of the time 5 A little of the time 6 None of the time 7 Don't know/Not sure 9 Refused
TIRED	92	How much of the time during the past four weeks...did you feel tired?	1 All of the time 2 Most of the time 3 A good bit of the time 4 Some of the time 5 A little of the time 6 None of the time 7 Don't know/Not sure 9 Refused

GLOBAL

VARIABLE NAME	Q#	DESCRIPTION	VALID RESPONSES
AMSICKER	93	I seem to get sick a little easier than other people.	1 Definitely true 2 Mostly true 3 Mostly false 4 Definitely false 7 Don't know/Not sure 9 Refused
HEALTHY	94	I am as healthy as anybody I know.	1 Definitely true 2 Mostly true 3 Mostly false 4 Definitely false 7 Don't know/Not sure 9 Refused
GETWORSE	95	I expect my health to get worse.	1 Definitely true 2 Mostly true 3 Mostly false 4 Definitely false 7 Don't know/Not sure 9 Refused
HLTHXCLT	96	My health is excellent.	1 Definitely true 2 Mostly true 3 Mostly false 4 Definitely false 7 Don't know/Not sure 9 Refused

APPENDIX F:

SLIDES FROM 1996 BRFSS CONFERENCE PRESENTATION

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VALIDATION OF THE BRFSS HRQOL MODULE IN STATEWIDE TELEPHONE SAMPLES: PRELIMINARY RESULTS FROM THE MISSOURI GENERAL POPULATION SAMPLE

Craig J. Newschaffer, Ph.D.
Assistant Professor
Saint Louis University School of Public Health

Jeanette Jackson-Thompson, Ph.D.
Chief, Office of Surveillance Research and Evaluation,
Missouri Department of Health

13th Annual BRFSS Conference, Atlanta 1996

Comparison of number of items devoted to specific HRQOL dimensions on the SF-36 and BRFSS HRQOL modules

Health-related concept	Number of items SF-36	BRFSS
Physical health		1
Physical functioning	10	
Mental health	4	3
General role functioning (physical and emotional)		2
Daily role functioning (physical and emotional)		2
Daily role functioning (physical)	4	
Daily role functioning (emotional)	3	
Personal care functioning		1
Social functioning	2	
General health	5	1
Sleep		1
Pain	2	1
Vitality	4	1

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1993 BRFSS data on self-rated health in Missouri and the United States

	Self-rated health (%)				
	Excellent	Very good	Good	Fair	Poor
Missouri	22	34	27	13	5
United States	25	34	28	10	4

Source US data CDC
Source Missouri data: Missouri Department of Health

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Differences between SF-36 Scale Scores in the Missouri Sample* and U.S. Norms** (Slide 1)

	Scale							
	Physical Functioning		Physical Role-Disability		Bodily Pain		General Health	
	MO Score	MO-US	MO Score	MO-US	MO Score	MO-US	MO Score	MO-US
Mean	86.1	-0.9	83.9	-3.1	78.9	-0.6	70.4	-3.4
S.D.	21.8	0.4	32.4	3.1	23.4	0.0	16.9	-2.4
25th Percentile	85.0	-10.0	100.0	25.0	72.0	10.0	62.0	0.0
Median	95.0	0.0	100.0	0	84.0	0.0	72.0	-3.0
75th Percentile	100.0	0.0	100.0	0	100.0	0.0	82.0	-5.0

*n=401 **Based on n=782 as reported in McHorney et al. Med Care 1994;32:551-567

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Differences between SF-36 Scale Scores in the Missouri Sample* and U.S. Norms** (Slide 2)

	Scale							
	Vitality		Social Functioning		Emotional Role - Disability		General Mental Health	
	MO Score	MO-US	MO Score	MO-US	MO Score	MO-US	MO Score	MO-US
Mean	64.8	0.7	91.2	3.1	89.2	2.2	81.4	4.2
S.D.	22.9	1.8	19.5	-0.8	27.7	-1.4	17.4	-0.8
25th Percentile	50.0	0.0	100.0	0.0	100.0	0.0	76.0	8.0
Median	70.0	0.0	100.0	0.0	100.0	0.0	88.0	8.0
75th Percentile	80.0	0.0	100.0	0.0	100.0	0.0	92.0	0.0

*n=401 **Based on n=782 as reported in McHorney et al. Med Care 1994;32:551-567

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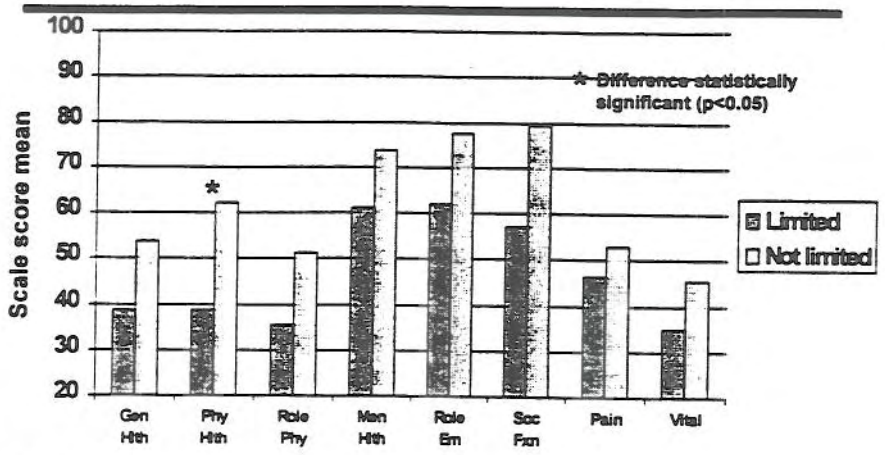
SF-36 Scale Means by Categorical BRFSS Supplemental Questions: PERSONAL CARE LIMITATIONS (n=68)



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Rank Correlation Coefficients between BRFSS HRQOL Supplemental Items and SF-36 HRQOL Scales

	General Health	Physical Functioning	Role Physical	Mental Health	Role Emotional	Social Functioning	Pain	Vitality
Length of limitation	-0.04*	-0.08*	0.18*	0.12*	0.06*	0.07*	0.09*	0.11*
Pain-limited activity days	-0.19	-0.23	-0.47	-0.19	-0.25	-0.32	-0.56	-0.31
Days sad, blue, depressed	-0.17	-0.10	-0.21	-0.53	-0.55	-0.43	-0.21	-0.35
Days anxious, worried, tense	-0.18	-0.08	-0.15	-0.44	-0.42	0.30	-0.16	-0.31
Days without enough sleep	-0.05*	-0.04*	-0.11	-0.21	-0.12	-0.16	-0.16	-0.31
Days full of energy	0.29	0.19	0.28	0.42	0.34	0.34	0.26	0.50

' Kendall Tau b Coefficients
* p > =0.05 (correlation coefficients NOT statistically different from 0)

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