Cross-National Comparability of Health and Mortality Measures—Evidence from the Mexican Health and Aging Study (MHAS) and the Health and Retirement Study (HRS)

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Abstract

The goal of our paper is twofold: first, we present the Mexican Health and Aging Study (MHAS) as a unique source for a developing country to address the aging processes, health dynamics and mortality outcomes simultaneously with transitions in other life domains, including changes in economic well-being, marital and family status, migration histories, socioeconomic transfers. We discuss how measures of health such as symptoms, functional status, anthropometric and cognitive measures can be incorporated in research on health and mortality of the elderly and old population, and we present examples for Mexico. Second, we address the issue of comparability and equivalence of health measures and how these may bias conclusions about the determinants of health, morbidity and mortality in a cross-cultural comparison. Our analyses are based on a comparison between MHAS and the HRS which are nearly identical in design, contents and coverage because HRS served as a template for MHAS.

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1 Introduction

The value of cross-national studies has recently been argued by a special NAS panel whose charge was to develop a social and behavioral research agenda for an aging World (NAS 2000). By definition within-country studies can make only limited contributions to such an agenda focused on examining the interactions between aspects of the broad socioeconomic environment and health, morbidity and mortality

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dynamics. The socioeconomic environment cuts a wide swath across the life cycles of its members involving a number of factors that are common to all societies. Among these are national educational policies, provision and reimbursements for health care, and programs to reduce health risks, but even the richest of domestic data sets have a limited utility for pursuing this agenda. In contrast, cross-national research provides unique opportunities to relate variations in institutional, social, economic and cultural arrangements to the distribution of health outcomes, and from these to draw important conclusions about the determinants of morbidity and mortality differentials across populations or social strata. Thus, meaningful comparisons between countries are useful for setting goals for population health policies. Comparisons are also desirable within countries in order to understand differences in health and mortality outcomes between socioeconomic and other subgroups.

Besides the later merits of cross-national (or cross-population) health research, we often confront fundamental problems that prevent meaningful comparisons of various health domains across and within countries. These problems primarily arise from the nature of health. Health status and health outcomes, such as morbidity and mortality, are inherently multi-dimensional including physical, functional, affective, mental and social well-being, genotype and phenotype influences and social and cultural expectations, information, and knowledge. Very often, a unique cultural heritage is imprinted on the process by which health status is determined and by which members of a population group evaluate their own health. Even though in the last two decades several large panel studies have yielded data useful for describing health transitions in different populations, comparative/international research on health dynamics and mortality is still hampered by serious problems in comparability of measurement, as well as structural and cultural biases in the data. Moreover until recently, virtually no data sets were available that allowed researchers to simultaneously examine health dynamics, mortality outcomes and aging processes in a comparative perspective. Similarly, because of limitations in data, much less comparative research on the topic has been done between developed and developing countries.

In this paper, we address the above issues using data from Mexico and the U.S. In particular, we pursue two main goals: *a)* First, we present the Mexican Health and Aging Study (MHAS) as a unique source for a developing country to address the aging processes, health dynamics and mortality outcomes simultaneously with transitions in other life domains, including changes in economic well-being, marital and family status, migration histories, socioeconomic transfers, etc.; *b)* Second, by using examples from the Mexican Health and Aging Study (MHAS) and the Health and Retirement Study (HRS), we address and discuss important issues of comparability of health indicators and measurement issues across countries, and how cross-national differences in knowledge or cultural biases may bias research results. This second goal of the paper is possible because HRS served as a template for MHAS and thus, we can largely eliminate the differences due to methodology. The comparison and analysis of equivalence between HRS and MHAS is of a particular importance, because HRS is a main source of data that allows to study the determinants of health, morbidity and mortality of the elderly and old population in the U.S. MHAS is a equivalent in Mexico, and a unique source of information about the health dynamics in a developing country.

2 The Importance of Comparing Mexico and the U.S.

Despite obvious differences in the age structure (over 50% of the Mexican population is under age 20), level of economic development, incomplete of capital markets, and a fragmented health care system, a systematic comparative study of how health and mortality patterns at older ages differ between Mexico and the United States is warranted for several reasons. Mexico is the country of origin for more immigrants to the U.S. than any other country, accounting for a quarter of all immigrants in 1995 (Smith and Edmoston 1997). While Mexican migrants in the U.S. have among the lowest levels of education (about 8 years an average) of any immigrant group, the largest earnings gap relative to native-born workers (Smith and Edmoston 1997), and high rates of unhealthy behaviors, including smoking, alcohol consumption, and obesity (Markides et al. 1997), Mexican-born migrants appear to enjoy a morbidity and mortality advantage over native-born Hispanics and non-Hispanics whites (Elo and Preston 1997; Stephen et al. 1994). This paradox is often attributed to the selectivity of migrants for unobserved health factors and is known as the 'Hispanic paradox'.

Mexico is a country in the midst of the demographic and epidemiological transitions. The elderly population of Mexico consists of individuals who survived a mortality regime with high levels of infectious diseases (Palloni and Lu 1997). Those who will celebrate their 60th birthday in this century, on the other hand, will have reaped the benefits of an epidemiological regime dominated less by infectious diseases and substantially more by chronic conditions. Thus, the health dynamics of the elderly Mexican population are shaped by an unusual interaction between chronic conditions (such as for example very high prevalence of diabetes), which increasingly dominate the current schedule of morbidity and mortality risks, and infectious diseases which are residual to an early epidemiological regime. This 'epidemiological polarization' may yield a higher load of disease symptoms, physical limitations and functional disability for the elderly in Mexico than for example the older population in the U.S. or any other developed country. The health dynamics of the elderly cannot be considered in isolation from the substantial economic disparities which characterize Mexico and which correlate with disease risks, environmental conditions, nutrition, and utilization of health care. In addition, migration (both domestic and international) is a well established aspect of Mexican life and may reshape health expectations and health transitions. Remittances may improve living conditions by providing and accumulating human and social capital investments for whole families and communities.

We do not have complete knowledge how the exposure to such highly interactive environments as those observed in Mexico can affect health, aging and mortality of elderly persons. Thus, the study of health conditions and their social and economic determinants of health in an older population characterized by exposure to transitional health regimes is a potentially useful way to understand how structural changes in morbidity and mortality risks affects adult health and longevity, and how this process relates to social and economic determinants throughout the life course of the elderly individuals. *Ceteris paribus*, we would expect the load of disease symptoms, physical limitations, and functional disability to be higher in Mexico than in the United States, and this pattern should maintain across compa-

rable socioeconomic groups. The comparison of the health dynamics of the elderly population in both the U.S. and Mexico is of a particular importance for the cohorts of Mexican-born adults who now reside in the United States, and whom in all likelihood, experienced the same transitional health regime described above as the elderly in Mexico. The major difference between this very important subgroup of the American population and the Mexicans who never migrated is that the two groups were exposed during their adult years to quite different environments, behaviors, health care systems, occupational careers and options for accumulation of human capital over the life course. Thus, a systematic comparison of the health trajectory of elderly non-migrants in Mexico, Mexican migrants of varying lengths of stay in the U.S., and the elderly U.S. population of non-Mexican origin, within levels of socioeconomic groups may yield real world insights into how the correlated of education and status attainment modify the pace of the morbidity hazard.

While there has been considerable speculations about the better survival outcomes of Mexican-origin migrants relative to U.S.-born Hispanics, non-Hispanic Whites, and African-Americans, little is known how these survival probabilities differ by socioeconomic strata. The Mexican Health and Aging Study (MHAS) provides a unique opportunity to address the above issues in a comparative perspective.

3 The Mexican Health and Aging Study (MHAS)

The newly released Mexican Health and Aging Study (MHAS)[1] is a panel study that provides a unique opportunity to address a broad research agenda on the effects of individual behaviors, migration history, community characteristics, socioeconomic status and transfers on multiple health outcomes of elderly Mexicans.

The Mexican Health and Aging Study (MHAS)/Encuesta Nacional Sobre Salud y Envejecimiento en Mexico (ENSEM) is modeled after the Health and Retirement Study (HRS), which served as a template for MHAS. The general goal for initiating the study was to reconcile conflicting understandings of the health (Palloni and Morenoff 2002) and transfer behaviors of first-generation Mexican migrants relative to second and third generation Mexican-Americans. The overall goal of MHAS is to locate descriptions of migrant health and transfers from the HRS in the context of Mexico, a population characterized by burdens of both acute and chronic disease, substantial inequalities in health and wealth, virtually no capital markets, and dominance of the extended family as the institution providing social, human and financial capital. To assess the extent to which Mexican Americans import their family transfer culture or adapt it through assimilation, it was important that MHAS largely replicates the design, coverage, and content of the HRS.

At its baseline in 2001, MHAS was representative of the 13 million Mexicans born prior to 1951. Respondents were selected in conjunction with the 4th Quarter 2000 National Employment Study/Encuesta Nacional de Empleo, a nationally representative survey conducted by the Instituto Nacional de Estadistica, Geografia, e Informatica (INEGI), the counterpart of the U.S. Census. The ENE provides coverage of both urban and rural residents in all 32 states of Mexico. The entire MHAS sample was drawn from the 64,475 ENE households of which about 40.5% contained one or more persons eligible for MHAS. Interviews averaging 82 minutes

[1]Detailed information about the Mexican Health and Aging Study (MHAS) can be found at http://www.ssc.upenn.edu/mhas/.

in length were conducted with 15,186 eligibles and their spouse/partners for a 90.1% response rate. Households in the 6 Mexican states accounting for 40% of all migrants to the U.S. were oversampled at a rate slightly less than 2:1. All interviews were conducted in-person by full-time INEGI interviewers trained by MHAS Co-PIs and INEGI supervisors in the unique aspects of MHAS, e.g., securing appropriate contact information for follow-up, administering cognitive performance tests, and using unfolding brackets to reduce measurement error in reports of amounts (e.g., hours of time help and pesos earned or transferred). Field supervisors administered to a 20% random subsample a series of anthropometric measures, including height, weight, knee height, hip and waist circumference, and timed one-leg stands. The MHAS questions on use of health care services, pensions, sources of income and assets were customized to the infrastructure of the country, while the questions on various other social and economic attributes are identical to those in HRS. MHAS includes several performance tests, including learning and recall, also known as immediate and delayed word recall.

The follow-up interviews with surviving respondents started in June 2003 and are now nearly completed.[2] As in HRS, spouses or partners who separate are independently followed. New spouse/partners (and children from an earlier marriage or union) are also included in the second wave of MHAS in 2003. Next-of-kin interviews are also collected for the deceased respondents. The most current field report as of August 22, 2003 based on data for 7,728 households shows that 438 households or 5.67 per cent of the households included in the field report have experienced a death between the two panels of MHAS.

As a population health survey (in contrast to clinical studies), MHAS shares the goal to collect self-report data with credible validity. The major approach for designing MHAS is the comparability with HRS and other U.S. health surveys to test hypotheses regarding the migration selectivity, utilization of health services, knowledge and recognition of health problems and disease symptoms. The merits of MHAS are that the data do not only collect exhaustive listing of chronic diseases, but inventory major chronic conditions that are life-threatening, convey risk factors for other more lethal health conditions such as high blood pressure or diabetes. MHAS respondents are not asked to distinguish between disease categories (e.g., to distinguish between angina and congestive heart disease), but they report life time episodes of TB, cholera, rheumatic fever, and other health conditions common in Mexico earlier in this century which may have lagged effects on adult health and mortality.

Like HRS, MHAS includes several performance tests, including learning and recall, also known as immediate and delayed word recall. While the tests are identical in structure, the words are obviously different in the MHAS and HRS. MHAS also includes a performance test of basic reading ability for respondents who indicate that they had fewer than 2 years of schooling. Approximately 30% of self-respondents who were given this functional literacy test, failed the task. Self-respondents in MHAS also were asked to complete a test of "distractibility", a timed cancellation test (Glosser et al. 1993). The Proxy respondents were administered by the "Jorm-IQ" test for respondents in both MHAS and HRS who were unable or unwilling to complete the task for themselves (Jorm and Jacob 1989). MHAS collects also a

[2]Currently, the data from the follow-up interviews are computerized and processed and will be made publicly available in December 2003.

broad range of data on health symptoms measured on a free-standing scale rather then as a follow-up to a specific disease report. This procedure has an advantage as asking older people, many of whom have co-morbidities, to ascribe symptoms to a specific conditions is difficult even in a generally well-educated population.

In summary, MHAS collects a broad range of health and mortality relevant information on disease symptoms, functional status, sensory problems, cognitive status, anthropometric measures and hygienic behaviors of a nationally representative sample of elderly and old Mexicans age 50+. A major goal of this paper is to describe these measures and how they were "adjusted" to the Mexican context. In addition, we will discuss how measures of disease symptoms as well as physical and anthropometric measures in combination of a large array of socioeconomic indicators can be incorporated meaningfully in research on mortality.

4 Analysis of Equivalence and Bias in research on Health and Mortality—Evidence from a Comparison between MHAS and HRS

We distinguish between two major comparability issues that arise in cross-population studies of health, morbidity and mortality dynamics: *a)* First, there are substantial measurement issues related to cultural biases and validity biases that may confound the interpretation of results. For example, most nationally representative health surveys use different questions and response sets to assess health status. These strictly methodological issues make cross-national comparisons of health data substantially more difficult as initially perceived. In addition, because of cultural expectations and biases, the category cut-points of health and morbidity measures may vary between populations, even between socioeconomic groups within a single population. This may occur because different groups may be characterized by substantial differences in health and diseases perceptions.[3] *b)* Second, relational issues also may hamper the comparability of health data across countries. That is, populations may distinctly drift from each other in terms of the knowledge their members have about disease symptoms, health risks and health expectations.

With HRS and MHAS we have the possibility to reduce substantially response differences due to methodological issues. HRS served as the template for MHAS, and the two studies are nearly identical in design, coverage and content in the substantive areas relevant to the measurement of health and socioeconomic status. However, despite this methodological advantage, the data are not equivalent across these two different cultures. Thus, a second major goal of this paper is to determine if both studies actually measure the same underlying construct across groups. Using the example of MHAS and HRS, we show how cultural and structural issues may bias our conclusions about the observed health dynamics in different national context.

For instance, although each wave of HRS is translated into Spanish, and the MHAS questionnaire was translated and back-translated several times, identically worded items still yield very different distributions of the response set. An example of this is shown in Table 1 for the ubiquitous self-reported health item, "Would you say your health is excellent, very good, good, fair or poor?" This self-reported item is

[3]For example, there are considerable differences in how individuals use categorical scales to evaluate health status.

Table 1: Respondents age 50+ (Sampled and Spouse)

Current Health	**HRS**		
Assessment	Total	Males	Females
Excellent	12.7	13.5	12.1
Very good	26.3	26.1	26.4
Good	31.3	31.9	30.9
Fair	20.3	19.5	20.9
Poor	9.4	9.0	9.7
n	18,613	7,609	11,004
	MHAS		
	Total	Males	Females
Excellent	1.8	2.3	1.4
Very good	4.3	5.8	3.0
Good	30.8	36.0	26.4
Fair	46.8	41.7	51.1
Poor	16.3	14.2	18.1
n	12,482	5,720	6,762

a widely used indicator to assess the determinants of health and mortality (Thomas and Frankenberg 2002). Mexicans respondents are decidedly more pessimistic about their health that their U.S. counterparts. Note also that it is not simply the case that the distribution of the response set as a whole is shifted downward in the MHAS relative to HRS, but that there is a much tighter concentration of responses in the mid-range. This difference maintains for both males and females and by age (not shown). On one hand, this differential may reflect a true difference in health status across the two national samples and between males and females. On the other hand, it also is plausible that there are important, but unobserved aspects of cross-cultural psychology in the way elderly Mexicans and Americans view their health, e.g., taboos discouraging self-aggrandizing health reports or notions of fatalism that promote modest assessments of self attributes. If the later are not considered, our conclusions about differences in health dynamics between elderly Mexicans and Americans may be misleading.

Given only self-reported health data as shown in Table 1, we cannot evaluate whether this is only a reflection of non-random differences in reporting inducting differences in norms, expectations, or differences in true health. Thus, in our further analysis in the paper, we are going to evaluate the equivalence of health measures between the two data sets by using the confirmatory factor approach, a statistical procedure for analyzing equivalence of measures between data sets using structural equation modes. (Long 1983; Marcoulides and Schumacker 1996; Vijver 2003). Confirmatory factor analysis allows for a direct test of presumed relationships between variables and their underlying common latent variables. Two different procedures—the bottom-up versus the top-down procedure can be applied in this context. Both procedures consist of a hierarchy of nested models. The bottom-up procedure specifies the same structure between the two countries, and estimates the parameters without imposing initially equality constrains between the data sets, and then gradually and systematically imposes equality constrains in order to evaluate the equivalence of measures. Incremental fit measures are used to analyze whether the imposed equality constrains are appropriate. If the analysis shows a poor fit for one of the

countries, this indicates that the postulated model does not hold and at least some of the latent variables are not equivalent across the countries. The top-down procedure, in contrast, starts from the most restricted model in which all parameters are set to be equal between the countries, and then gradually and systematically relaxes the equality restrictions. Again, incremental fit indices can be used in order to evaluate the effect of relaxing the equality constrains. The confirmatory factor analysis allows using information about the measurement unit by analyzing covariance matrices, and the statistical procedures based on correlations and covariances address the structural equivalence. Structural equation modeling can be also used to examine more complicated issues occurring in cross-cultural comparisons, namely is the difference in measured scores due to method bias or due to real cross-cultural differences; that is we can distinct between measurement unit and full score bias.

5 Relevance of the Proposed Research

In this paper we present the Mexican Health and Aging Study (MHAS) which is one of the most comprehensive data sources on the determinants of health, morbidity, aging and mortality in a developing country. We compare selected aspects of MHAS to the Health and Retirement Study (HRS), which itself is the major source of information in the U.S. tracking individual change in the domains of health and physical functioning, employment, income and wealth, family structure, and transfers to and from relevant kin (Juster and Suzman 1995; Soldo et al. 1997). The merit of the two studies is that both are sharing nearly identical design and contents. We discuss the health measures collected in MHAS and how these can be used for comparative research with the HRS data set. In addition, we present analyses of comparability and equivalence of health measures and discuss how the cultural and socioeconomic context in a country may influence the way health status is reported. These later analyses of equivalence of health measures are of a particular relevance for cross-national comparisons, because if we do not consider contextual and cultural effects on the reporting of certain measures, this may lead to incorrect interpretation of results.

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