Mortality Risk in Older Adults in Mexico: the Role of Communicable and Non-Communicable Diseases

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Introduction

A fast demographic transition occurred in Mexico and other countries of Latin America during the last century. In a few decades of intense changes, rates of mortality and fertility dropped from very high and irregular to very low and stable. As a consequence, the aging process is expected to accelerate and this inertia will continue during the first half of the twenty-first century. This rapid pace is best observed with the evolution of the relative participation of the group aged 60 and older in the total population. In 2008, this age group represented 7.6 percent of the total population and according with projections of the Mexican National Population Council (CONAPO), this proportion will increase to 17.1% in 2030 and 27.7% in 2050. The epidemiological transition in Mexico follows a polarized model, however, whereas infectious (communicable) and chronic (non-communicable) degenerative diseases coexist. Segments of the population with higher economic status are further into the epidemiological transition, while the poorer groups remain in the pre-transition stages. (CONAPO, 1999).

The cause-specific mortality data from Mexico indicates that the epidemiological transition is fully taking place. In the year 2000 for men and women the non-communicable diseases concentrated 89.0 and 92.9% of the mortality causes, respectively. This is followed by the communicable diseases with 5.8% for both, and finally accidents and injuries with 5.2 and 2.3% (Zuñiga y Partida 2004). These numbers show that chronic diseases are the leading causes of death; however, there is an additional burden of infectious diseases that remains high in older ages and may be undetected as a principal cause of death, perhaps even as a secondary. The combined effect of these two types of illnesses is magnified in the elderly, because this combination increases the risk to acquire more diseases, to consume more health care and economic resources, and the risk of mortality. Thus a traditional focus on chronic conditions in aging studies may mask the critical role that communicable diseases still play in developing countries. This is because developing countries like Mexico started to age quickly without having resolved the problems of economic deprivation faced by certain population sub-groups. Lack of social protection, poverty, and changes in household composition are common challenges in aging of developing countries such as Mexico.

In this paper, we focus on the elderly population and the relationship between mortality and non-communicable and communicable diseases. This issue represents a major concern because of the main feature of the biological aging process, that is, the decrease of the physiological reserve. Compared to healthy persons, when individuals with chronic illnesses face an acute disease, the physiological reserve tends to be quickly depleted, thus the risk of death and disability is higher. The motivation for this research hinges in the mixed epidemiological regime and economic inequality that still prevails in many developing countries. The paper is organized as follows: We motivate the research by documenting historical trends in communicable and non-communicable diseases as causes of death among older adults. We provide evidence of the prevalence and incidence of the two types of conditions in Mexico, using a national sample of adults aged 60 and older in Mexico. We estimate models of 2-year mortality that assess the relative contribution of communicable and non-communicable diseases, controlling for sociodemographic and economic covariates. We quantify the added effect of communicable diseases to the risk of mortality, and we conclude on the importance of this type of diseases in the current Mexican elderly. Finally, we discuss the implications for health care policies and the emphasis that communicable diseases should still have in current population-based aging studies in developing countries such as Mexico.

Data and Methods

The information source is the Mexican Health and Aging Study (MHAS), which contains statistical information for the population aged 50 years or older residing in Mexico in 2001. The survey has national and rural/urban representation. The study was designed to examine the aging process, evaluate the impact of disease on health outcomes, functional capacity, and mortality of this population group, among other aims. There are two waves of information in MHAS, a 2001 baseline and the follow up in 2003. This was the first national prospective panel study of health and aging in Mexico, allowing the study of the situation of the elderly population with a longitudinal approach.

This paper uses data from the two waves to construct the diseases variables and establish the relationship with mortality between 2001 and 2003. The information for 2003 was obtained using two different questionnaires, one through direct interviews for the 2003 survivors and another through a next-of-kin for those who died between 2001 and 2003. The main difference in these two questionnaires is the time reference, for the living questions refer to the two inter-wave years; for those who died, the questions refer to the last months of their life. The final sample is composed of adults 60 years and older with completed interviews in 2001 and 2003; with a total of 6,505 records representing 6,970,771 individuals. The average age for this population group in 2001 is 69.9 years, 47.7% are men, 58.6% have a spouse and 41.3% lives in urban localities.

Logistic regression models were used to estimate the probability of death between 2001 and 2003, at first a calculation of the odds ratio and then the probability. We chose these models to explore the effect of the explanatory variables on the probability of occurrence of an event, in this case death or no death. (Long & Freese 2006).

Variables

Because we want to calculate the probability of death, the dependent variable was defined as the vital status in 2003, with value 0 if alive in 2003 and code 1 if died between 2001 and 2003. The selected independent variables of this study were included because of their hypothesized association with mortality. The set of explanatory variables includes:

In MHAS, seven non-communicable diseases were asked: hypertension, diabetes, heart attack, cancer, lung disease, stroke, and arthritis. The survey also asked for communicable diseases: infection of the liver or kidney, tuberculosis and pneumonia. The non-communicable diseases survey question is: “has a doctor or medical personnel ever told you that you have…?” For communicable diseases the question is: “In the last two years, has a doctor or medical personnel told you that you have...?”

Dichotomous variables were created for the report of some single diseases in 2001 (hypertension, diabetes and arthritis); coded 1 if the disease is diagnosed, and 0 otherwise; the rest of the diseases were grouped into a single dichotomous variable labeled CLDHAS (Cancer, Lung Disease, Heart Attack and Stroke), with code 1 if at least one of these diseases was diagnosed and 0 otherwise.

For 2003, the information includes new cases of non-communicable diseases diagnosed between 2001 and 2003. In the same way as for 2001 non-communicable diseases, hypertension and diabetes were coded as dichotomous variables, arthritis is not included in the analysis because there is no information for those who died in 2003, and the remaining diseases were grouped in the new cases of CLDHAS.

For communicable diseases, two dichotomous variables were created, one for each wave of information. The variables were coded with 1 if at least one communicable disease is present and 0 otherwise. Using these variables, four more were constructed; they capture the presence of communicable diseases during the studied period:

1) No communicable diseases in 2001 and 2003;
2) Only communicable in 2001;
3) Only communicable in 2003;
4) With communicable diseases in both 2001 and 2003.

We further control for demographic characteristics: sex, age (60 to 69 years, 70 to 79 years and 80 years or older), education (0 years, 1 to 5 years, 6 years and 7 or more years), marital status (with spouse and without spouse) and urban/rural residence in 2001.

<u>Preliminary Results</u>

Table 1 presents the descriptive results for the analysis sample, according to living status in 2003. The bivariate results show that individuals who reported a chronic condition in 2001 were more likely to die by 2003 than those who did *not* report such condition. Something similar occurs with communicable conditions, however. Table 2 presents the results of the preliminary regression analysis, confirming that while the presence of chronic non-communicable conditions is a highly significant covariate of mortality, communicable conditions still have an independent effect on mortality. Diabetes, the major chronic conditions (CLDHAS), and communicable diseases at either wave have significan effects on the likelihood of mortality. This effect is even larger when a new diagnosis is made by the second wave. Younger ages, more years of education and having a partner are associated with decreased odds of death; men have higher mortality than women.

The Figure illustrates the estimated probability of death according to the presence of diseases, controlling for major socioeconomic conditions. The gap between curves (1) and (2) is the presence of chronic (non-communicable) diseases on the probability of death, in the absence of communicable consitions and holding all else constant. The distance between (2) and (3) is the added effect of a communicable condition in 2001. The distance between curves (2) and (5) is the estimated effect of a communicable disease in both 2001 and 2003, holding constant the presence of chronic conditions and other socioeconomic covariates.

The next version of the paper expands on these preliminary analyses, calculating estimated mortality for specific groups of the population, in particular men and women in poor rural and urban educated groups. In addition, we perform tests of the interaction between the two types of diseases and other sensitivity analyses. We conclude the paper with a discussion of the role that communicable conditions still play in the patterns of mortality of older adults in developing countries that age rapidly, such as Mexico, while their level of socioeconomic development still lags behind.

Table 1. Number and Percentage of Population 60 Years and Older by Vital Status in 2003

Characteristics in 2001	Vital status in 2003			
	Alive (6,377)		Dead[1] (450)	
	N	Mean or %	N	Mean or %
Non-communicable				
Hypertension	2,590	40.6	214	47.6
Diabetes	1,050	16.5	116	25.8
Cancer	108	1.7	21	4.7
Lung Disease	437	6.9	62	13.8
Heart Attack	260	4.1	42	9.3
Stroke	2,007	3.3	48	10.7
Arthritis	1,558	24.4	110	24.4
Communicable				
Kidney or Liver	608	9.5	70	15.6
Tuberculosis	21	0.3	5	1.1
Pneumonia	110	1.7	14	3.1
Demographic characteristics				
Age (mean)		69.1		75.4
Men		46.2		51.1
Education (mean years)		3.5		2.9
Urban		41.3		40.8

[1]Information for the deceased was obtained by a proxy.

Table 2. Logistic regression models for two year mortality of the population 60 years an older			
Explanatory variables	Odds ratio		
	Model 1	Model 2	Model 3
Hypertension (Wave 1)	0.934	0.87	0.929
Diabetes (Wave 1)	1.626***	1.461**	1.697***
Arthritis (Wave 1)	0.868	0.823	0.788
CDLHAS (Wave 1)	4.466***	4.080***	3.728***
New report of hypertension (Wave 2)	1.089	0.967	1.075
New report of diabetes (Wave 2)	2.430***	2.319***	2.581***
New report of CLDHAS (Wave 2)	12.505***	11.132***	10.567***
No communicable in 2001 nor in 2003		1.000	1.000
With communicable in 2001 and 2003		3.197***	3.861***
No communicable in 2001, with communicable in 2003		2.774***	2.786***
With communicable in 2001, no communicable in 2003		1.215	1.214
Women			1.000
Men			1.495***
60 to 69 years			0.201***
70 to 79 years			0.358***
80 years and older			1.000
Without spouse			1.000
With spouse			0.577***
0 years of education			1.000
1 to 6 years of education			0.744*
7+ years of education			0.888
Rural			1.000
Urban			1.026
Stats			
N	6,755	6,755	6,755
Chi2	442.091***	507.814***	705.822***
BIC[1]	2925.13	2885.861	2749.579
* p<0.05, ** p<0.01, *** p<0.001			

[1] Bayesian Information criterion: The model with the lower value of BIC is the one to be preferred.