

Cardiovascular Risk Factors, Health, and Well-Being in a Less Developed Setting

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Introduction

The central focus of this paper will be to evaluate the implications of cardiovascular risk factors for measures of health and well-being in a less developed country. As the epidemiologic transition progresses and the life expectancies rise, it is important to understand the health problems people with cardiovascular risk factors confront and the impact of these problems on social and economic well-being. Economic development and globalization may hasten the epidemiologic transition because these processes are often accompanied by changes in risk factors for cardiovascular disease such as modification of diet and exercise patterns, changes in smoking prevalence and intensity, and shifts in access to health facilities and treatment (Reddy and Yusuf, 1998). Poor physical and cardiovascular health among older adults in less developed countries have particularly serious economic consequences because labor opportunities, especially those available to individuals with low education, are physically demanding relative to those in developed countries (Strauss and Thomas, 1998).

The primary data source for this work will be the Indonesia Family Life Survey (IFLS). The IFLS provides a wide array of economic, demographic and health information for a national sample representative of 85% of the Indonesian population over a period of 8 years. The IFLS provides direct measures of obesity and hypertension assessed by medical personnel, as well as other cardiovascular risk factors such as physical activity level and tobacco use. The implications for functional status, labor force participation, and social prosperity among people who exhibit risk factors for cardiovascular disease can be evaluated using these rich data sources. I will focus on three research questions:

- 1) What are the levels and prevalence of established risk factors for cardiovascular disease and socioeconomic covariates of health in the community of study?
- 2) How do physically assessed and self-reported health characteristics differ among individuals with different cardiovascular risk factors profiles?
- 3) How do individuals with different levels of cardiovascular risk respond to exogenous economic stimuli?

Links between Health and Economic Outcomes

Health throughout the life course is important in determining well-being at the individual and household level. Labor activities in less developed countries often rely heavily on strength and endurance. Thus, people in developing countries are more likely to suffer economically from being in poor health than people in developed countries where many types of labor do not require intense physical output (Strauss and Thomas, 1998). Complicating the relationship between productivity and health is the fact that adults in developing countries are more likely to be affected by health problems, some of which may occur in early childhood. The consequences of these early shocks to health are likely to be felt over the entire life course (Elo and Preston, 1992).

Improvements in general health and economic development lead to population aging, changes in lifestyle, and increased prevalence of cardiovascular risk factors. Evidence from the developed world suggests that these demographic and epidemiologic forces affect a population in heterogeneous ways along gender, ethnic, and socioeconomic lines (Sorensen et al. 1985; Thomas et al. 2001; McKinlay, 1996; Preston, 1970). These pathways are less well documented in the developing world. The IFLS data provide a unique opportunity to explore the relationship among a rich set of individual, household, and community level characteristics and the presence of several important CVD risk factors. The background characteristics will allow us to describe how respondents with CVD risk factors are different from those without CVD risk factors in important ways such as socioeconomic status or prior physical fitness.

Causal factors for CVD that are modifiable are important routes of inquiry for social scientists, medical practitioners, and health policy makers because behavioral modification is more cost effective than pharmaceutical or surgical treatment. Maximizing the improvements available from behavior modification is important in developing countries where pharmacological treatment is financially out of reach for many people, diagnosis does not occur until later in the disease progression thus reducing the effectiveness of treatments, and surgical specialists are relatively rare compared to developed countries. Cessation of tobacco use reduces the risk of CHD by 50% within months of quitting, these benefits increase over time, and cessation has a variety of other health benefits (US DHHS, 1990; Ebbert, et al. 2003). Improvements in physical fitness are important for maintaining cardiovascular

health and physical fitness has an impact on other determinants of CVD such as blood pressure and obesity (Katzel, et al., 1995).

Data

In order to observe the relationship between health over the life course and economic productivity, the availability of longitudinal data is essential. The IFLS supports observation of the emergence and development of risk factors for chronic disease, physical limitations, and other health conditions as well as changes in prosperity and economic productivity. In addition to the rich individual, household, and community level information collected by the two studies, the IFLS spans a distinct exogenous shock to health: an economic crisis. Careful analysis of the data from IFLS shows several distinct impacts on adult health during a period of social and economic unrest (Frankenberg, Thomas, and Beegle, 1999).

The Indonesia Family Life Survey (IFLS) is a longitudinal survey of individuals, households, and communities in Indonesia conducted by RAND, in collaboration with UCLA, The Demographic Institute of the University of Indonesia, and the University of Gadjah Mada. The first wave of the IFLS (IFLS1) was conducted in 1993/94 and covered over 7,000 households. IFLS2 was conducted in 1997 and relocated and reinterviewed 94% of the IFLS1 sample. IFLS3 was fielded in later half of 2000 and contacted over 7,700 households and 94% of the IFLS1 original households.

The IFLS spans an exogenous economic shock. The financial crisis that occurred during the late 1990's resulted in dramatic changes in prices for medical services, wage rates, food prices, and access to social programs. These changes affected the entire population, but the health impacts were heterogeneous (Frankenberg, Thomas, and Beegle, 1999). The presence of CVD risk factors may be an intervening factor in individuals' responses to this shock. For instance, during a financial crisis, labor demand is likely to be lower than normal, leading to increased competition among workers for the fewer available positions. If CVD risk factors reduce productivity or are otherwise associated with diminished physical capacity, individuals with CVD risk factors are likely to fare worse in the labor market than those without CVD risk factors. The relationship may go in the other direction, however, due to certain background characteristics. In a less developed setting such as Indonesia, individuals who are economically capable of maintaining a high fat diet, smoking regularly, and participating in low levels of physical activity might also be less threatened by uncertainty during such a crisis. Using the data from the financial crisis, we might also discover socioeconomic grades of elasticity for participating in behaviors that affect health, such as smoking and high fat diets.

Another strong aspect of the IFLS is the observations made by health professionals. In addition to height and weight, which are available in all rounds, from the IFLS2 on, a nurse recorded blood pressure, pulse, lung capacity, waist-to-hip ratio, and took a blood sample to determine hemoglobin levels. In addition to these observations, the health personnel made several other observations of general health. Respondents were timed while they rose from a sitting to a standing position five times (a physical assessment developed by WHO). The nurse also evaluated the individuals' health status on a 9-point scale and recorded comments about the individual's health.

Analyses

The first step of analysis will be to document the levels and patterns of emergence of certain risk factors for cardiovascular disease over time. Such information, derived from representative samples, is rare in the developing world where relatively few studies focus on the health of the elderly. Many diagnostic techniques to identify heart disease are expensive and unavailable to individuals in less developed countries. Consequently, of particular interest are those conditions that do not require complex diagnostic techniques, but are epidemiologically related to serious cardiovascular morbidities. The IFLS provides appropriate information for a wide variety of risk factors such as height and weight, pulse, blood pressure, tobacco use, reports of chest pain, and extensive background information about individuals that are commonly used in epidemiological reports from developed countries. Among the generally established health measures that are unavailable to this project are serum cholesterol and ventricular hypertrophy (measured by an electrocardiogram). Despite these limitations, the health information routinely collected by IFLS and the care and technical expertise with which it is collected are rare in developing countries.

Second, I will assess the performance of individuals with different levels of cardiovascular risk on a battery of other measures of physical health and functioning. These measures can include several self-reported health items that may not be directly related to cardiovascular disease, but may reduce normal day-to-day functioning.

$$\theta_{i,t2} = \beta_0 + \beta_1 X_{i,t0} + \beta_2 CVD_{i,t1} + \varepsilon_i$$

where $\theta_{i,t2}$ are a series health and economic outcomes including mortality, cognitive functioning, functional limitations, physical fitness tests such as lung capacity and sit-to-stand times, anemia, self-rated health status, nurse-rated health status, wages, and time-allocation observed during IFLS3 (2000).

Although the data are rich in control variables, any model may fail to incorporate some important factor that might explain the outcome of interest, thus leading to bias. One way of compensating for omitted variables as a source of error is to consider changes in outcomes for an individual over time as a function of changes in CVD risk factors. Unobserved factors that are fixed over time will be differenced out of such a model. Epidemiological evidence suggests that changes in blood pressure measured over just two years convey significant information about health status (Sesso et al., 2000; Vasan et al., 2001). Thus, a model that incorporates changes in cardiovascular risk factors can be specified as follows:

$$\theta_{i,t2} - \theta_{i,t1} = \beta_1 (X_{i,t1} - X_{i,t0}) + \beta_2 (CVD_{i,t1} - CVD_{i,t0}) + (\varepsilon_{i,t1} - \varepsilon_{i,t0})$$

where $\theta_{i,t2} - \theta_{i,t1}$ is a change in health or economic status over some interval and $\beta_2 (CVD_{i,t1} - CVD_{i,t0})$ represents changes in CVD risk factors over time. The term $\beta_1 (X_{i,t1} - X_{i,t0})$ incorporates changes in other individual characteristics over time.

The third objective is to investigate how individuals with different levels of cardiovascular risk factors respond to an economic change (the economic crisis). Of particular interest are individuals' health responses, labor force participation, and time allocation to the identified exogenous influences. For instance, are individuals with fewer cardiovascular risk factors more capable of adapting to economic shocks? Using various modules recorded in the IFLS, I can observe changes in behavior both in and outside of the formal labor force in response to changes in health. A framework for analyzing such relationships is to consider differences across time periods, treatment groups, and CVD risk categories.

Identifying the "treatment" that characterizes the financial crisis in the IFLS data is somewhat difficult. Respondents were not randomly assigned in the same way as the groups are assigned in treatment and control studies. There is, however, regional variation in the magnitude of the changes that occurred as a result of the economic downturn. This regional variation can be exploited to identify areas that experienced large and small differences in economic factors during the financial crisis. Regional price variation and consumption levels aggregated from the household level are economic indicators that are useful for describing the magnitude of the effect of the economic crisis and identifying areas that experienced the crisis in a more or less severe way.

Having established groups of respondents who experienced a shock of different magnitudes, we can proceed to examine differences among groups with different cardiovascular disease risks. The mean treatment effect is interesting from a policy perspective, but differences among groups within the treatment and control groups are quite important for extrapolating the potential of the intervention for a larger target population.

Summary

The analyses outlined above will provide a several contributions to knowledge concerning interactions between health and economic status. Specifically, I have proposed to conduct an investigation of trends in several chronic disease risk factors such as tobacco use, BMI, and blood pressure, as well as more general health indicators such as disability, physical fitness, and mortality. Changes over time in health behaviors such as tobacco use, diet, and physical activity are likely to be different in a developing country than historically observed in developed countries. Using IFLS and WISE data, we will gain some understanding of the magnitude of chronic disease burdens in the older portion of the population in a developing country and, more generally, the impact of health on economic development. The panel nature of the data will allow us to explore trajectories in non-communicable disease and risk factors in a way rarely possible in a developing country.

The proposed research has a variety of policy implications. Factors associated with higher risk for CVD including a higher fat diet, sedentary lifestyle, and increased tobacco use increase concurrent with economic development. Persons in developing countries are less aware of the implications of adopting these behaviors, are diagnosed with chronic diseases when the conditions are at a more advanced stage, and have fewer and less effective treatments available to them after diagnosis than persons in developed countries. Demonstrating the implications of adopting behaviors that are associated with higher risk for chronic disease and implementing prevention strategies to slow or reverse these trends within populations still in transition would be cost effective compared to improving tertiary medical services to treat the conditions at a later stage in the epidemiologic transition.

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