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Estimating Individual Health Expenditures Age Profiles from Household Level Data in the Philippine National Health Accounts[1]

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Abstract

The Philippine National Health Accounts (PNHA) is a framework for the compilation of information on the country's health expenditures and has been providing data important to health policy-making for more than a decade now. To maintain and further expand its usefulness, the PNHA underwent major restructuring in 2005 specifically in terms of health expenditure classification by uses of funds. The revised PNHA now includes a breakdown by age group of the beneficiaries of health care expenditures. The primary sources of data for household out-of-pocket (OOP) spending for health are the two surveys regularly conducted by the National Statistics Office (NSO), namely: the Family Income and Expenditure Survey (FIES) and the Annual Poverty Indicator Survey (APIS). These two surveys, however, only report health expenditure totals at the household level and actual health expenditures of individual household members are not known. Thus, household health spending attributable to specific groupings of household members, such as by age group, cannot be estimated directly from available survey data. To generate the age breakdown of household OOP health expenditures for the PNHA, a number of approaches were explored including: (1) the household per capita approach, (2) the simple regression approach, and (3) the use of related health information such as weights in a modified household per capita approach. Results from the application of these three approaches to data from a nationally representative household expenditure survey were generally found to be consistent – the age profiles all had the J-shape or U-shape, with higher mean spending for the very young and the elderly relative to the rest of the age groups. These overall shapes of the (indirectly estimated) per capita age profiles of household health spending were consistent with and validated by a reference per capita age profile that was computed from

1 A paper prepared for the Tenth National Convention on Statistics held on 1-2 October 2007 at the EDSA Shangri-La Hotel, Metro-Manila organized by the National Statistical Coordination Board. This paper was subsequently revised in April 2009 and included material that has became available after the conference.

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a small sample household health survey that collected health expenditure data at the individual person level. Furthermore, the indirectly estimated age profile is improved and was closer to the actual profile as more health related information is utilized in the estimation procedure (Mason 1987, 1988, 2001; Modigliani 1988; Lee and Edwards 2001; Mason and Lee 2004).

Keywords: National Transfer Accounts, economic life cycle.

1. Introduction

The PNHA underwent restructuring in 2005 to include a breakdown of household health expenditures by age of the health care beneficiaries. National household income and expenditure surveys in the Philippines however collect health expenditure data only at the household level. Various methods were explored to estimate the mean per capita age profiles of household OOP health expenditures using data available from these household surveys. The estimated per capita age profiles of OOP health expenditures were then used in the PNHA to estimate the age breakdown (of household health expenditures) – estimated mean per capita values were multiplied by the population size at each age to obtain total health expenditures attributable to each age. This paper describes three methods explored for estimating the per capita age profile of household OOP health expenditures in the PNHA and compares the results obtained from each of these methods.

What are per capita age profiles?

Per capita age profiles are intended to show average patterns of, for example, earnings and consumption expenditures of individuals over their life cycle. Individual age profiles basically constitute the set of mean per capita values at different ages, where the mean per capita value for an age group is computed (from sample survey data) by taking the sum of, say, income, expenditures or specific expenditure items such as health care that are attributable to the age group and dividing the sum by the number of sampled individuals belonging to the age group. The ideal data for estimating per capita age profiles would obviously be data collected for individual persons.

The larger context of the study of age profiles

Age profiles of consumption expenditures, income and other related economic variables (e.g., taxes paid) are studied for various purposes. Currently, the study of such age profiles are intrinsic to research on the economic consequences of population age structure change, more particularly population aging. Some of these researches include those that examine saving over the life cycle, demographic dividends and fiscal implications such as on taxable resources

and provision of public services (Mason 1987, 1988, 2001; Modigliani 1988; Lee and Edwards 2001; Mason and Lee 2004).

The age profiles for income and consumption are used to determine the age groups that are economically dependent in a given population (i.e., age groups consuming more than they are earning) and to estimate the amount of resources required for their support. Furthermore, such analyses have been used to examine up to what extent dependent population needs are supported by family resources and what additional support systems (such as public provision) are needed. One set of studies that have recently emerged in this area of research used the National Transfer Accounts (NTA) which provides a comprehensive approach to estimating age profiles of consumption expenditure components, income, and asset accumulation among others, and to measuring all inter-age transfers at the aggregate level (Maliki 2004; Mason, Lee, Tung, Lai, and Miller 2005; Clark, Ogawa, and Matsukura 2007; Ogawa, Mason, Maliki, Matsukura, and Nemoto 2007; Racelis and Salas 2007; Ladusingh and Narayana 2008).

The methods applied in the NTA, including those for estimating per capita age profiles of household health expenditures, are described in a draft NTA manual (Mason, et al. 2009). The various methods described in the NTA manual had been developed in the course of applying NTA in many countries around the world – different methods to suit varying situations of data availability. The NTA has been applied in research done in 27 countries in Asia/Pacific, the Americas, Europe, and Africa.

The interest to study income and consumption patterns by age is expected to become more important in the near future as more countries experience rapid changes in their population age structure, more specifically aging of population. More national governments will be needing information to be able to formulate as well as implement appropriate and timely measures to contend with the economic impacts of population change. In the case of health care, for example, there is a need to determine the scale and timing of aggregate health expenditure increases as the proportion of the elderly in the population rises.

The PNHA and household health expenditures age profile

National Health Accounts (NHA) constitute a systematic compilation of health expenditure data for a country. In the Philippines the PNHA is produced annually by the National Statistical Coordination Board (NSCB). The PNHA was established in 1997 and has since then been useful for health policy making and monitoring. The design of the PNHA was revised in 2005 to expand its usefulness.

The revised PNHA now includes a table showing national health expenditures with a breakdown by age of beneficiary of health spending (Racelis, Dy Liacco, Sabeñano, Beltran, and Manaog 2006). This expenditure breakdown by age is shown in the PNHA for every type of payor for health services. Payors for health services in the Philippines include the national and local governments, Philippine Health Insurance Corporation (PhilHealth), private health insurance providers, employer-provided schemes, households (out-of-pocket or OOP for health care), and others such as non-profit institutions. This paper focuses only on showing how the age profile of household health expenditures may be estimated.

The primary sources of household OOP health expenditure data in the Philippines are the two household surveys regularly conducted by the NSO. FIES is conducted every three years, for example in the years 1997 and 2000, and the APIS is conducted during non-FIES years, starting in 1998. These two surveys collect health expenditure data only at the household level. That is, health expenditure data on individual household members are not available. Thus, the entries for household OOP health expenditures (column) in the new PNHA table showing the age breakdown cannot be computed directly from data in either the FIES or the APIS.

This data constraint in the Philippines is not uncommon. In the application of NTA in many countries, it was recognized that most expenditure data, including health expenditure data, are collected in surveys at the household level rather than at the individual level (Lee, Lee, and Mason 2004). Thus, various methods for estimating individual age profiles from household level expenditure data have been explored and tested such as those suggested in the NTA manual.

The minimum data needed from a household survey to be able to assign household level health expenditures to different age groups are (1) complete rosters of members for all households, and (2) age data for every household member. The method of allocating household health expenditures to age groups can be improved if there are additional health-related information on household members available from the survey, such as health/illness status and health care utilization. The additional health-related data can indicate each household member's consumption of health services and household health expenditures can then be assigned to each of the household members more appropriately.

The objective of this paper is to demonstrate feasible methods for estimating individual per capita age profiles from household level data for household OOP health expenditures. It focuses on three methods suggested in the NTA manual that were explored to estimate the age profile of household health

expenditures in the revised PNHA. The choice of methods tested was driven mainly by limitations in the data.

But how do the age profiles estimated using the different methods in fact compare with the true age profile? Data from the 1991 Philippine Institute of Development Studies-Department of Health (PIDS-DOH) Household Survey is used to establish the reference age profile for this assessment (i.e., a reference age profile as an approximation of the true age profile). The survey data was collected for the year 1991 and is unique because it contains health expenditure data at the individual person level. The reference age profile is estimated from individual level data.

Sections of the paper

The three methods explored for estimating the per capita age profile of household health spending for PNHA are discussed in Section 2. The resulting age profiles from applying the three methods to the 1999 APIS data, a nationwide household survey, are presented in Section 3. Section 4 presents the reference per capita age profile computed from the small sample survey containing individual level health expenditure data. Section 5 provides a summary of the findings and the conclusion.

2. Approaches to Estimating Individual Level Expenditures from Household Level Data

The first method uses only the minimum data possible – i.e., data for every household on household health spending and ages of its member. The second method may be applied using only the minimum data or with some additional health-related data if these are available. The third method involves the use of additional health-related data that may be available from the survey or from secondary sources.

Household per capita approach

In this approach (Racelis, et al. 2006; Mason, et al. 2009), the age profile of household health spending is generated in two steps. First, the total health expenditure of a household is divided by the total number of household members. The computed value for household per capita health spending is then assigned as an estimate of the individual spending of every member of the household. The simplifying assumption being made here is that all household members had incurred (equal) health expenditures during the survey year.

Second, when the individual health expenditure has been computed for all households (i.e., Step 1 completed for all households), all individual persons or members from all households are then pooled together and sorted by age. Then the average health expenditure for every single year age group using expenditures assigned in Step 1 to individuals is computed.

Simple regression approach

In the simple regression approach (Mason, et al. 2009), a purely demographic linear regression equation is estimated using ordinary least squares (OLS). Household health expenditure H is the dependent variable, the number of household members n_j at each age j (in single years) are the independent variables and the intercept is set to zero as follows:

$$H_i = \beta_0 n_0 + \beta_1 n_1 + \beta_2 n_2 + \ldots + \beta_p n_p + e_i, \qquad (1)$$

such that $e_i \sim \mathrm{N}(0,\sigma^2)$. The estimated regression coefficient β_j is the estimated average health expenditure per person for individuals age j years. That is, the estimated regression coefficients together constitute the age profile for OOP health spending.

The above regression specification uses the minimum data possible. The NTA manual however suggests this method only as a last resort. The manual also suggests using the regression method with additional data on health service utilization of household members. Instead of number of household members by age as explanatory variables, the number of household members using health services by age are used. The specification can be further modified to differentiate situations of households by including household income, health insurance coverage and other variables as explanatory variables (Racelis, Russo, and Mason 2003). The modified regression approach is feasible only if the data on additional variables are available in the survey dataset.

Modified per capita approach

In this approach the household per capita approach is modified by assuming varying shares instead of equal shares of the household health expenditures assigned to different household members (Racelis and Salas 2007). The age profile of household health spending is generated in three steps. First, the relative shares or weights for allocating household health expenditures to household members (of different ages) need to be obtained. The per capita age profile of health spending of another country with a similar health profile may be used as the age-specific weights. Or the relative weights can be generated using country data on health-related, non-expenditure variables. The age profile shown in this paper was estimated by taking the latter

approach in which health facility utilization rates by age were used as weights (Racelis and Salas 2007).

Second, as in the household per capita approach, the household health spending (H) is allocated to its members, but this time using the utilization rates f^k as weights to compute for the health expenditures H^k of household member with age k. The health expenditures of an individual household member of age j is estimated as follows:

$$H^j = H \times \frac{f^j}{\sum_j f^j} \qquad (2)$$

Third, as in the household per capita approach, after the assignment of household health expenditures to individual household members has been completed for all households, health spending of each member of all households are then pooled together and sorted by age. Average health expenditures at every age can then be computed.

3. Applications Using the 1999 Annual Poverty Indicator Survey (APIS)

This paper presents results from previous research for the PNHA that used the 1999 APIS, which was then the most recent household expenditure survey dataset available. For purposes of the PNHA, the household per capita, the simple regression and the modified household per capita methods were explored and the resulting age profiles generated are shown in Figure 1. The modified regression approach was not used because of data constraints.

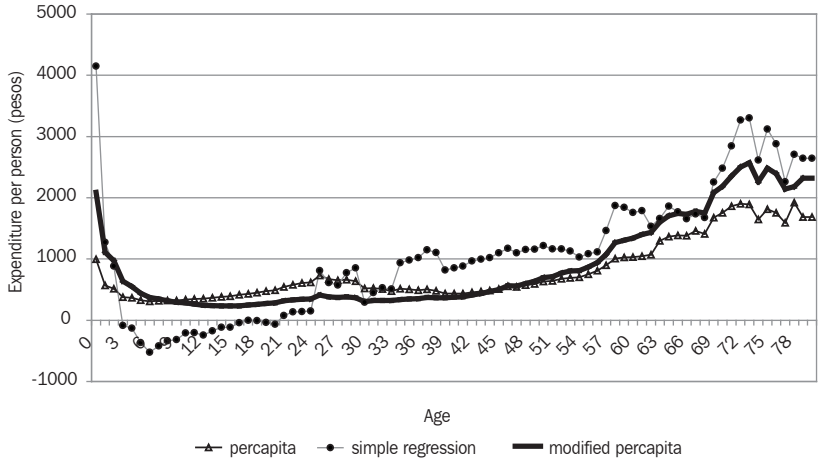
In general, the estimated age profiles of household health expenditures generated using all three approaches have J-shape or U-shape curves, where the per capita health expenditure for very young children and the elderly are generally higher than the rest of the population.

The J-shape or U-shape profile is captured in the results of the household per capita and the simple regression approaches because households with members who are "expensive" health-wise (i.e., the very young and the elderly) generally tend to have higher OOP spending for health. In the household per capita approach, the computed per capita health spending is higher for such households on average; and, on the contrary, (on average) lower for households where there are neither very young nor elderly members. In the simple regression approach, the estimated regression coefficients showed that the increase in the health expenditure of a household is higher with the addition of very young or elderly individuals as members of the household.

The age profile from the household per capita approach tends to be flatter compared to the other two profiles because of the "averaging" effect. The simple regression approach over-exaggerates the "smallness" of health spending for older children and teen-agers, presenting negative coefficients.

The household per capita and the simple regression approaches use only two sets of information to estimate the per capita health expenditure profile by age (i.e., total household spending for health and age composition of household members). The modified per capita approach, in addition to using total household health spending and members' age profile, incorporates information on differences in intensity of use of health services among persons of different ages. The per capita age profile for the third method is observed to lie between those based on the household per capita method and the simple regression method.

Figure 1 **Health Expenditure Per Person By Age: 1999 Annual Poverty Indicator Survey**



Source: Authors' computations using the 1999 Annual Poverty Indicator Survey.

4. The Reference Household Health Expenditures Per Capita Age Profile

The J-shape or U-shape patterns observed in the three estimated per capita age profiles for household expenditures in Section 3 may be assessed for validity by comparing these with the the age profile pattern generated directly from actual individual level health expenditures data. But as stated previously, household expenditure data have rarely been collected at the individual level in the Philippines and in other countries; thus, such data even if not recent, are most valuable. For purposes of this paper, the 1991 PIDS-DOH Household Survey was used to establish the reference household health expenditures per capita age profile. The survey covered 2,798 households in four provinces (with 14,227 individual household members) and collected household health expenditure data at the individual household member level.

The per capita age profile for household health expenditures was computed directly from the survey data by simply taking the total health expenditures of the sampled individuals by age and dividing the totals by the number of individuals in each age group. This actual per capita age profile is shown in Figure 2. (Note that the number of age groups has been reduced because of the relatively smaller sample size compared to the APIS.) In addition, the age profiles that would result from the household per capita method and the modified per capita method were simulated using data from the same survey by pooling individual health expenditures at the household level, and then applying the two methods as described in Section 2. The simulated age profiles could be compared directly with the actual profile.

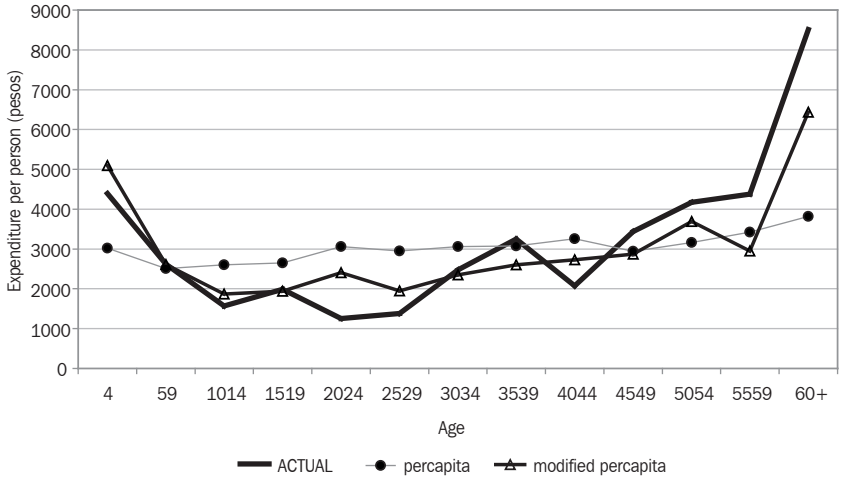
Examining the age profiles in Figure 1 and Figure 2, observations include the following: (1) the J-shape or U-shape pattern of per capita health expenditures over the life cycle in Figure 1 is validated by the actual per capita profile in Figure 2; (2) the household per capita approach shows the flattest profile in both Figure 1 and 2; and (3) the modified per capita method improves on the age profile derived from the household per capita method by pushing the profile closer to the actual (Figure 2).

5. Summary and Conclusion

The estimated Philippine age profiles for household OOP health expenditures generated by applying three different approaches to data from a nationally representative household survey have the J-shape or U-shape pattern. These overall patterns are validated by a per capita age profile computed from actual individual level data for household expenditures. The profile based on the household per capita approach is generally flatter compared to those

generated using the other two approaches for older children and teen-agers, and is recommended as a last resort. The age profile generated using the modified per capita approach (with health facility utilization rates as weights for household allocation of health expenditures) is, in general, situated between the profiles from the household per capita and simple regression methods.

Figure 2 **Health Expenditure Per Person By Age: 1991 PIDS-DOH Household Survey**



Source: Authors' computations using the 1999 PIDS-DOH Household Survey.

Given alternative approaches for indirectly estimating the age profile of OOP health spending, how should one choose which one to use? One important rule to follow in the selection of the approach is to use that method that would fully utilize every piece of data available. With the use of more information, the estimated age profile would be closer to and be a more realistic approximation of the true profile, as demonstrated by the age profiles presented in Section 4.

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