Chapter 39

Household Health System Contributions and Capacity to Pay: Definitional, Empirical, and Technical Challenges

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Introduction

In addition to improving population health, an important goal of health systems is to ensure that the financial burden of paying for health is distributed fairly across households. Exploring fairness in financial contribution requires the ability to measure each household’s financial contribution (HFC), defined as the ratio of a household’s health system contributions to its capacity to pay. This chapter, organized into five sections, introduces a method for estimating the HFC from household survey data. Section two presents the framework for analysis and the definition of the numerator and denominator of HFC. The third and fourth sections describe in detail the calculation of households’ health system payments through different payment mechanisms and the measurement of capacity to pay. In this context, the data required for estimation are also presented. The last section describes some remaining challenges concerning the measurement of capacity to pay, which are related to the quality of survey data.

Defining a Household’s Financial Contribution

The household financial contribution (HFC) represents the household’s financial burden due to health system payments. It is a ratio that relates total household expenditure for health (HE) through general taxes, social health insurance contributions, private health insurance premiums, and out-of-pocket payments, to the household’s capacity to pay (CTP). The capacity to pay of household i is essentially its effective income minus subsistence expenditure requirements (SE):

\[ HFC_i = \frac{HE_i}{CTP_i} \]  

Ideally HFC is defined over a period of one year, a unit of time that encompasses many predictable fluctuations in income and expenditure. The period of evaluation of health expenditure and effective non-subsistence income is of theoretical importance. Depending on the availability of various formal and informal mechanisms to borrow and save, households may behave as if they smoothed their income over longer periods of time. In the extreme, the life cycle consumption hypothesis claims that households smooth consumption over the stream of all future income. It is possible that in different countries the period over which permanent income is defined will vary, being generally longer in high-income countries. In practice, HFC must be estimated using data covering a shorter period, typically one month, because surveys seldom include questions about expenditures over an entire year, let alone over a longer period.

Household Expenditures for Health

The numerator (HEi) includes all financial contributions to the health system attributable to the household through taxes, social security contributions, private insurance, and out-of-pocket payments. These include financial outlays that the household itself is not necessarily aware of paying, such as the share of sales or value-added taxes that governments then devote to health. As taxes and social security contributions are rarely earmarked for their ultimate financing purpose, total household payments must be multiplied by the share of these revenues that goes to finance the health system.
The Concept of Effective Income

To operationalize the denominator of HFC, capacity to pay, it is necessary to define effective income and subsistence expenditure. The notion of effective income is meant to reflect household tendencies to smooth consumption over time, taking into account expected variations in income, the household’s assets (allowing for saving or non-saving), and future earnings potential.

There is a rich economic literature on different theories of how households make consumption decisions. For example, in the life cycle income hypothesis (4), households are assumed to smooth their consumption over the life cycle, so that expected consumption is equal in all subsequent time periods. One formulation of this theory of consumption behavior adapted to the circumstances of health financing is:

\[ C_0 = \frac{Y_0 + A_0 + \sum_{t=1}^{l} Y_t P_t \delta^t}{1 + \sum_{t=1}^{l} P_t \delta^t} \]  

where \( C_0 \) is the consumption of a household at time \( t = 0 \), given complete access to consumption smoothing mechanisms and the ability to consume assets, \( Y_t \) is income at time \( t > 0 \), \( P_t \) is the probability of being alive in each future year, \( A_0 \) is the annualized value of assets (savings or debts) at time \( t = 0 \), and \( \delta \) is \( 1/(1+r) \), where \( r \) is the market interest or discount rate.

The life cycle hypothesis is particularly important under three sets of circumstances: when households face predictable fluctuations in income during the course of the year; when their income in future years is expected to change; and when they have positive assets (savings) or negative assets (debts). In these circumstances the household’s consumption over the period of time that is usually incorporated into income and expenditure surveys—e.g. a month—could be lower or higher than its observed earnings over that period.

In order for a household to be able to smooth its consumption over long periods of time effective capital markets must be available. This involves access to formal or informal mechanisms that allows households to borrow on the basis of the present value of their future earnings, or to convert savings that are in the form of assets into monetary value. If the household possesses assets, these can be sold and converted into income although temporary problems that impede the sale and create liquidity problems for the household may exist. A more serious constraint is posed by the fact that in many countries mechanisms that allow households to adjust their consumption by borrowing may not be readily available.

Because of imperfections associated with formal and informal consumption smoothing mechanisms, the income that a household is able to consume and would seek to consume given its current income, assets and access to future earnings, could differ from that predicted by the life cycle hypothesis. Where no mechanisms exist to borrow or save, effective income equals income at that time; where imperfect mechanisms exist, effective income would be somewhere between current income and the expression given in equation [2] (5). The effects of limited access to a borrowing mechanism can be formulated as:

\[ C_0 = \min \left[ \frac{Y_0 + A_0 + \sum_{t=1}^{l} Y_t P_t \delta^t}{1 + \sum_{t=1}^{l} P_t \delta^t}, Y_0 + A_0 F_0 + \sum_{t=1}^{l} Y_t P_t F_t \delta^t \right] \]  

The expression means that a household would like to consume at the level suggested by the life cycle hypothesis, but when its access to borrowing is less than required, it is forced to consume less. \( F_t \) is a measure of the access a household has to future earnings at time \( t \). When \( F_t \) is zero, but \( F_0 > 0 \), the household cannot draw on future income, but is limited in its consumption to its current income and assets.

At first glance, the notion of consumption smoothing may seem confusing. Figure 39.1 shows an example of the movements of current income (\( Y \)), permanent income (\( PY \)), and effective income (\( EY \)) over time. Current income for the hypothetical household is expected to increase irregularly for the next 15 years and then steadily decrease. If the household has access to perfect consumption smoothing mecha-

Figure 39.1  Current income, permanent income, and effective income
nisms (and perfect foresight), it would be expected to consume along the dashed line (PY). During the first 8–10 years the household borrows money (or uses its savings), as indicated by the fact that the PY line lies above the Y line. Between the 10 and 25-year period, the household makes savings, as its current income is higher than its expenditure expressed by the permanent income line, PY. From the 25th year onwards, the household uses its savings (or borrows) to achieve a higher expenditure level than that allowed by its current income. With access to partial consumption smoothing mechanisms, the household’s effective consumption may follow the dotted line (EY). In the first third of the consumption cycle, the household does not take full advantage of the consumption smoothing mechanism, and its expenditure follows in part the current income trend. In the middle part of the cycle, the household saves but not at a rate that corresponds to the level that would be required by complete consumption smoothing. In the last years, the household dissipates and takes almost full advantage of the available consumption smoothing devices.

Because considerations of fairness in financial contribution are normative, the denominator in HFC needs to be defined in terms of some meaningful and comparable standard across households. In order to reflect the desire of households to smooth consumption over time and the limitations to consumption smoothing existing in many circumstances, we define effective income as the level of consumption that a household is able to achieve, based on a life cycle perspective, and assuming that all households share a standard discount rate. To avoid any ambiguity, it is assumed that effective income is as defined in equation [3] with the added constraint that all households face the market interest rate as the discount rate.

Because we define capacity to pay in terms of effective income, it leads naturally to certain conclusions about what should be included in the denominator. For example, subsidies raise a household’s net income and, therefore, its effective income. Likewise, tax payments lower the income the household receives. Because $F_i$ cannot be easily observed, estimating effective income presents a number of challenges. These are addressed in more detail in section five that discusses implementation and issues associated with data collection and quality.

**Subsistence Expenditure**

The second step in defining capacity to pay is to determine expenditure required for subsistence. There is an extensive literature on basic needs which addresses this question (6–9). Subsistence is often defined to include basic expenditures on food, shelter, and clothing. This expenditure is subtracted from household total expenditure in order to better capture the household’s economic resources available for health and other spending. Therefore, HFC can be considered as a ratio of health expenditure to the income left after expenditure necessary to keep the household alive has been subtracted. The choice of a measure of subsistence expenditure should also be based on definitions that are comparable across populations. Ways of estimating subsistence expenditure from survey data are discussed in the next section.

**Measuring Household Health Expenditures**

As mentioned earlier, household contributions (10–11) to the health system include all direct and indirect payment sources: general taxes, social security contributions, private insurance premiums, and out-of-pocket payments (12). This section describes how these components can be captured from a household survey.

**Government Spending on Health**

Household contributions to health that are channelled through government spending comprise income tax, property tax, value-added taxes (VAT), sales tax, excise duty, corporate income tax, and other tax sources. In order to distinguish the part of government spending that is used on health ($GHE$), each household’s tax payments are multiplied by the proportion of total government spending allocated to finance the health system (including any government subsidies or transfers to social health insurance):

$$GHE_i = \left( \frac{GHE}{GC} \right)_N \left( [\text{inctax} + \text{vat} + \text{excise} + \text{other}], scalar(x) \right)$$

The first bracketed term is simply the fraction of total government consumption ($GC$) that is allocated to health on a nationwide basis. The second bracket includes terms used for estimating the government revenue originating from the household. Usually only income tax ($\text{inctax}$), value-added tax ($\text{vat}$), and excise duties ($\text{excise}$) can be captured from a household survey. These constitute only a part of total taxes paid by the household. The remaining tax (such as corporate income, import duties or property taxes) and non-tax revenues (fees, fines, etc.) must be estimated indirectly. Even for income tax, it may be difficult to obtain
accurate figures from a household survey because: (a) people may under- or over-report their income and correspondingly the income tax will be underestimated or overestimated; (b) sometimes the tax treatment of an income source cannot be clearly identified for particular countries; (c) even when income subject to tax can be clearly identified, there may be various deductions that may be difficult to capture from the information provided in the survey, despite knowledge of a country’s tax laws.

The estimation on VAT/sales tax is more straightforward than the estimation of income tax because the official rates in a country can simply be applied to the reported purchases in the surveys. However, inconsistencies may still exist because of: (a) memory bias associated with certain expenditure items in the survey; (b) a complicated structure of applicable tax rates; (c) the fact that excise duties are sometimes levied on quantity purchased instead of price, but the household survey may only record the money value of that item.

Because of the likely under- and over-reporting in surveys, an adjustment scalar is used to approximate the total government revenue received from households. In doing so it is assumed that the distribution of the non-observed tax and non-tax revenue across households is identical to the distribution of the observed tax revenue from the survey.

The scalar is defined as the ratio of expected government revenue ($GC_e$) to the government revenue ($GC_s$) estimated from the survey:

$$scalar(x) = \frac{GC_e}{GC_s}$$  \[5\]

Expected government revenue shows how much government revenue would be generated by the tax payments of all households included in the survey, if the ratio of government revenue to GDP reported in National Account estimates applied. For the estimation of $GC_s$, the GDP implied by the expenditure reported in the survey ($gdp_s$) must be calculated. It is calculated combining survey and National Accounts information as follows:

$$gdp_s = \frac{pc_s}{(PC/GDP)_N} = \sum w_i(exp_i)/(PC/GDP)_N$$  \[6\]

$pc_s$ is private consumption from the survey, $PC/GDP_N$ is private consumption share of GDP at the national level, $exp_i$ is household consumption expenditure, and $w_i$ is the household weight from the survey. Survey weights are applied to account for estimation bias arising from sampling design and systematic non-response in the sample.

Once the survey GDP has been calculated, $GC_e$ can be derived from:

$$GC_e = gdp_s(\frac{GC}{GDP})_N$$  \[7\]

where $(GC/GDP)_N$ is the government consumption share of GDP at the national level. Government tax revenue from the survey is calculated as:

$$GC_s = \sum w_i(inctax_i + vat_i + excise_i + other_i)$$  \[8\]

When formulae [7] and [8] are substituted into formula [5], we have:

$$scalar(x) = \frac{(GC/GDP)_N \cdot gdp_s}{\sum w_i(inctax_i + vat_i + excise_i + other_i)}$$  \[9\]

As mentioned earlier, the scalar $x$ is designed to capture the part of government tax revenue that cannot be estimated from the survey data. However, it also includes any measurement error from the survey. In order to separate these effects, scalar $x$ could be decomposed into two parts—one comprising the survey measurement error (scalar $x_1$) and another comprising the missing tax information part from the survey (scalar $x_2$). In equations [10] to [12] national level data are denoted by uppercase letters and survey data by lowercase letters:

$$scalar(x_1) = \frac{[(INCTAX + VAT + EXCISE + OTHER)/GDP]_N \cdot gdp_s}{\sum w_i(inctax_i + vat_i + excise_i + other_i)}$$  \[10\]

This equation represents the extent to which the household tax contributions derived from the survey reflect total national receipts from those sources alone, and

$$scalar(x_2) = \frac{(GC/GDP)_N \cdot gdp_s}{\sum w_i(inctax_i + vat_i + excise_i + other_i)}$$  \[11\]

Substituting for scalar $x_1$ in equation [11] gives:

$$scalar(x_2) = \frac{GC_N}{(VAT + INCTAX + EXCISE + OTHER)_N}$$  \[12\]

that is the extent to which total government tax revenue is provided by the forms of taxes to which the households contribute directly and which were captured from the analysis of the surveys.

Scalar $x_2$ equals 1 if the government collects taxes only from households, while it is less than 1 if it collects revenue from other sources. It should be noted that scalar $x = (scalar(x_1)) \cdot (scalar(x_2))$. The advantage of decomposing the scalar is that the two sources of
under- or overestimation could be more clearly identified.

In the analysis, total household consumption is assumed to equal total private consumption. Strictly speaking, this is not the case since private consumption is the market value of all goods and services purchased, or received in kind, by households and non-profit institutions. If the non-profit component is large, the scalar will be underestimated as a result of underestimation of survey GDP.

Whenever income tax (\(\text{inctax}\)) is not available directly from a survey, it is estimated from reported income and the country’s tax schedule information. Reported income includes salaries and non-salary earnings from all employment activities. Non-salary earnings include in kind benefits. Employment includes self-employment as well as a second job when relevant. The income tax paid by each individual in the household is then aggregated to a monthly value at the household level. The question arises as to which individuals are subject to income tax. In many countries, particularly the poorer ones, only formal sector employees pay income taxes. The way to identify formal sector workers varies by country. Usually answers to the job classification questions in the surveys will indicate whether an individual works in the private, public or informal sector. Other methods of identification can be used in more difficult cases.

Sales tax or value-added tax (\(\text{vat}\)) and excise duties can be imputed from household expenditures on various categories of goods and services. This involves applying the tax rates derived from official tax documents to household expenditures on the corresponding commodities reported in the survey.

The information on other taxes (\(\text{other}\)), such as those paid on real estate, can often be obtained directly from the household survey. Otherwise, the value of property owned by the household can be estimated from the questionnaire. Tax rates obtained from the tax schedule of each country are then applied for the calculation.

Social Health Insurance Contributions

The second component of HE that needs to be estimated is the total social health insurance contribution of the household (\(\text{SSH}_i\)), which can be formulated as follows:

\[
\text{SSH}_i = \text{soc}_i(\text{scalar}(y)) \quad [13]
\]

Household social security contributions (\(\text{soc}_i\)) are computed similarly to income tax. If social security contributions are provided directly by the survey in the form of a specific question on payments or contributions, this information is used. When this is not the case, the official contribution rate is applied to the salary from the primary job of the individual (after determining whether the earnings are pre-tax or post-tax). The assumption is that only formal sector employees, or full-time permanent workers, contribute to social security.

Although contribution rates may vary with respect to level of income, and sometimes the sector of the economy in which the individual works, it is assumed that the employer’s contribution share is borne by the employee in the form of reduced net salaries. For the computation, this implies that employers’ contributions should be added to those of the employee. This assumption is generally applied in the tax incidence literature and it simplifies the analysis and comparison across countries (13). As with income tax, the social security contributions by individuals are summed to obtain the contributions at the household level.

Because only a share of social security payments are used in the health sector, the scalar \(y\) is introduced. It can be formalized as:

\[
\text{scalar}(y) = \frac{gdp_s(\text{SSH}/\text{GDP})_N}{\sum w_i(\text{soc}_i)} \quad [14]
\]

The numerator reflects the expected social security contributions to health for the GDP observed in the survey—the survey GDP \((gdp_s)\) multiplied by the share of health social security payments in GDP at the national level. The denominator is the weighted sum of the household contributions to social insurance of all forms.

This scalar also can be decomposed into two parts. The first is due to measurement error of social security contributions in the survey—in some household surveys, social security contributions reported at the household level can, in sum, differ from the value stated in the National Accounts. These discrepancies are essentially the result of under- or over-reporting social security contributions in the household survey. This can be expressed as:

\[
\text{scalar}(y_1) = \frac{gdp_s(\text{SOC}/\text{GDP})_N}{\sum w_i(\text{soc}_i)} \quad [15]
\]

or the extent to which reported household contributions sum to the contributions expected from national aggregates. This scalar could be higher or lower than unity.
The second part of scalar $y$ is related to the fact that only part of social security payments go to health. This component of the scalar $y$ can be expressed as:

$$scalar(y_2) = \frac{gdp_i(SSH/GDP)_N}{\sum scalar(y_1) w_i(soc_i)}.$$

[16]

After substituting for scalar $y_1$ in equation [16], scalar $y_2$ can be expressed as SSH/SOC, or the proportion of social security payments going to health. Note that, as in the case of the $x$ scalar, scalar $y = (scalar(y_1)) (scalar(y_2))$.

**Private Health Insurance**

The third component of HE is the private health insurance premiums paid by households ($PRV_i$). In most cases, data are available directly from the household survey. In some countries, employers contribute to private health insurance on behalf of their employees (we continue to assume that the employer’s contribution to private health insurance is de facto part of the employee’s income). Hence the employers’ contributions should also be included in the analysis. It is likely that excluding the employers’ part will lead to underestimation of this component of prepayment in countries where private health insurance plays a dominant role in health system financing, and employers subsidize employees’ private health insurance premiums. In the case of social health insurance and tax contributions, a scalar was used to adjust the level of household spending to nationally reported figures. This procedure, however, cannot be undertaken in the case of private insurance premiums since reliable sources of the employers’ contribution share at the national level are usually not available. The same applies to out-of-pocket payments.

To avoid an upward bias in the estimation of private health insurance contributions, premium refunds or credits granted from the private insurance company, for example for not using the services in a previous period, must be deducted from the declared level of household private health insurance premiums.

**Out-of-Pocket Payments**

Out-of-pocket payments ($OOP_i$) include all categories of health-related expenses paid directly by the household at the time the household receives the health service. Typically these include doctor’s consultation fees, purchases of medication, and hospital bills. Spending on alternative and/or traditional medicine is included in out-of-pocket spending, whereas expenditure on health-related transportation is excluded.

It is important to note that some people may be paying out-of-pocket for health care, but receiving a reimbursement later from social and/or private health insurance schemes. To avoid introducing an upward bias in health expenditures, reimbursements are deducted from household “gross” out-of-pocket payments. Details of these reimbursements are usually given in the surveys.

**Total Household Health Expenditures**

Putting the components together, household $i$’s health expenditure comprises its payments to government that are channelled to health, as well as its health-related social insurance contributions, private health insurance contributions, and out-of-pocket payments:

$$HE_i = GHE_i + SSH_i + PRV_i + OOP_i.$$  

[17]

**Measuring Household Capacity to Pay**

As mentioned in section two, household capacity to pay is defined as effective income net of subsistence expenditure. This section describes how to estimate effective income and subsistence expenditure from survey data.

**Effective Income**

It is not possible to try to estimate permanent income over the life cycle in a multi-country context with the surveys available, which would require information on likely future income, assets, and the potential to borrow or lend. To reduce the short-term fluctuations observed in income data as reported in surveys, however, household consumption expenditure is used as the proxy for effective income. This choice is based on two considerations. First, the variance of current expenditure is smaller than the variance of current income over time. Income data reflect random shocks while expenditure data conform better to the notion of effective income. In defining capacity to pay, it is important to try to eliminate the effect of random shocks on income to the greatest extent possible. Second, in most of the household surveys expenditure data are more reliable than income data. This is particularly true in developing countries where the informal sector is typically relatively large and survey
respondents may not wish to reveal their true income for various reasons (14–15).

**Subsistence Expenditure**

It was argued earlier that household capacity to pay for health services should not be determined with respect to its total effective income. The reason is that unless households first meet basic subsistence needs, they will not be in a position to finance health services. In *The World Health Report 2000*, actual food expenditure was used as a proxy for household subsistence expenditure (1).

However, food expenditure may not capture the actual subsistence expenditure of the household, even though effort was made to limit this expenditure to basic food only. A rich family may spend a greater absolute amount on food than a poor family although the food expenditure share of total household consumption expenditure still follows Engel’s law—i.e. the share of food to total income falls with increases in income (16). For this reason, the approach has been modified.

In order to eliminate spending on non-essential food and to improve international comparability, one possibility would be to use the international poverty line as a measure of subsistence expenditure. This poverty line is set at one international dollar per day per person in 1985 currency terms, first used by the World Bank in the *World Development Report 1990* (17). The one international dollar subsistence level is based on a study of absolute poverty lines in 33 countries (18).

This alternative was explored by adjusting the 1985 level to nominal units corresponding to the year of the household survey using an appropriate price deflator. To account for differences in consumption patterns and prices, food PPPs (Purchasing Power Parities) rather than general GDP PPPs, were used to convert the international poverty line expressed in international dollars into local currency units. This conversion was made to express subsistence expenditures in the same units as data collected in the surveys. Finally, an adjustment for household size was made to bring the poverty line, defined at the individual level, to the household level.

The introduction of the food poverty line eliminates the problem that actual food expenditure includes spending on non-essential food for many households. It also improves international comparability. Since the food poverty line stays the same as income increases, more progressivity is built into the distribution of HFC compared to the situation where actual food expenditure is used. Figure 39.2 shows the share of actual food expenditure and the share of the food poverty line in total household consumption expenditure across expenditure deciles. The food poverty level share of total expenditure declines more rapidly with increases in expenditure (income) than does actual food expenditure. This indicates that the capacity to pay of richer households would be underestimated by using actual food expenditure.

The problem with the international poverty line is that several causes of uncertainty are unavoidably built into estimation. These include various problems associated with the construction of food PPP conversion factors. For this reason, we explored an approach that partly resembles the assessment of national poverty lines. Using the observation that food expenditure as a proportion of total expenditure increases with increasing poverty, a food share based poverty line for each country was estimated. The poverty line for a given survey was set equal to the average food expenditure of households whose food share of total expenditure was in the 45 to 55 percentile range (used in preference to the single household at the 50th percentile). This was adjusted for household size using an equivalence scale of $\text{eqsize} = \text{hhsize}^\beta$. The adjustment factor $\beta$ was obtained from household survey data from all 59 countries using the following fixed-effects regression:

$$
\ln \text{food} = \ln k + \beta \ln \text{hhsize} + \sum_{j=1}^{n-1} \gamma_j \text{country}_j + \epsilon \quad [18]
$$

*Figure 39.2  Subsistence expenditure as a share of total consumption expenditure, Bangladesh*
The estimated value of $\beta$ was 0.564 with confidence interval 0.564–0.572. The estimation of food poverty line is explained further in Xu et al. (19).

This approach has the advantage that it does not require the estimation of PPPs for countries where price observations have not been made, nor does it require as many intermediate calculation steps that can introduce uncertainty in the analysis. In addition, it is an indicator estimated directly from the survey data. The food share based measure still eliminates luxurious food spending and introduces more progressivity to the underlying expenditure distribution than the original measure based on actual food expenditure.

**Household Capacity to Pay**

The numerator of the HFC comprises all health expenditures by the household, including those deducted at source (e.g. tax and social security payments). The denominator of HFC, household’s capacity to pay ($CTP_i$), is a measure of the non-subsistence effective income of the household (effective income minus subsistence expenditure). Total household expenditure is used as the proxy for effective income. However, the expenditure reported in household surveys does not include the health expenditures deducted from income at source, which are included in the numerator. In order, then, to maintain consistency between the numerator and the denominator, tax and social security contributions deducted at source must be added to the denominator which becomes:

$$CTP_i = EXP_i - SE_i + GHE_i - indtax_i (GHE_i/GC)_N + SSH_i [19]$$

The expression $GHE_i - indtax_i (GHE_i/GC)_N$ represents that part of household tax contributions which is deducted at source—indirect taxes ($indtax_i$) are included in $EXP_i$ and are not deducted at source.

Household expenditure information is available directly from the household survey and converted into a monthly value. Total household consumption expenditure ($EXP_i$) includes both monetary and in kind payments on all goods and services, as well as the money value of the consumption of household-made products. Household consumption expenditure includes indirect taxes such as the VAT/sales tax, excise duties, as these taxes are viewed as part of the household’s capacity to pay.

As a means of quality control, responses from households reporting zero expenditure or zero food expenditure were considered to be reporting errors and were excluded from the analysis.

**Additional Data Requirements and the Reference Period**

The way the household financial contribution (HFC) can be calculated using information from national household income and expenditure surveys was the focus of the last two sections. It was shown, however, that additional information was required including detailed government taxation documents, and national health accounts figures.

The main sources of this additional information are:

- Government taxation documents, including information on the systems of income tax, sales tax, value-added tax, excise tax, and property tax.

- National Health Accounts (NHA) figures. WHO provides yearly estimates of various components of health expenditure from private and public sources for all its Member States, and these were used to give a reference for checking the reliability of the survey data (1).

- Social security and health insurance laws that provide information on premiums and other contributions to the health system.

Ideally the HFC would be measured over a long enough period to allow smoothing of consumption. In practice, this is not possible where data must be taken from existing surveys, which ask about short recall periods, usually less than a year. For this reason, all the variables needed for computing HFC are converted into monthly figures regardless of the recall periods used in the individual surveys. If the recall period in any survey was greater than one month and the inflation rate differed between the months for which information was sought, expenditures were deflated to a common month using the local consumer price index.

**Summary and Conclusions**

In summary, the household financial contribution, or HFC, is defined as a ratio of health payments made by the household to its capacity to pay. Household health payments consist of four sources: general taxation, social security contributions, private health insurance premiums, and out-of-pocket payments. Household capacity to pay is measured as non-subsistence effective income, which is in practice calculated as total household expenditure net of the food poverty line. Most of the required information can be obtained
from household survey data combined with knowledge of the tax and social security systems in the different countries. However, a number of challenges associated with improving the quality of the data and comparability across countries remain.

Measurement error in the context of income or expenditure data derived from surveys is a well known problem (20–21). Measurement error could be introduced at any stage of the survey: design of the survey instrument, data collection or data entry. The typical problem with income survey data is underestimation. This is due to the design of the questions and the tendency of respondents to understate their true earnings. The more detailed the income question, for example the more income categories used, the more accurate the figures generated. Another problem associated with the construction of income questionnaires is whether the respondents understand the desired income concept correctly and in the same way. If the questions and the implementation of the survey are not carefully controlled, situations may arise where some of the respondents report their income gross of taxes while others are reporting their income net of taxes. These problems also complicate comparison of income-based measures between countries.

While expenditure may be reported more accurately by household book-keeping, certain expenditure items may be difficult to capture, or they may be only partly captured by the survey. It may, for example, be difficult to record and impute correctly the value of home production that is consumed in the home rather than sold. If consumption from own-production is substantial, it is possible to produce per capita expenditure figures that are higher than the corresponding GDP figures derived from national accounts. To the extent that these differences are real and they are due to the fact that home-production is not adequately imputed in the calculation of the country GDP, this discrepancy is acceptable. However, in some cases the value of own-production is clearly overestimated in surveys and it is then difficult to know how to treat the survey data.

The time period over which households are asked to recall their expenditures is not identical across surveys or countries. This has been a concern in the analysis of catastrophic expenditures. A short recall period will have a smaller memory bias than a long recall period, while the latter may capture catastrophic expenditures better than the former. The direction of biases generated by different recall periods is not self-evident.

In estimating government spending on health, it is assumed that government revenue comes from general taxes, which is true for the majority of countries. When revenue from other sources, however, such as the sale of oil or other national assets is substantial, the question arises as how or whether to assign such revenue to households. As there are no common guidelines on how best to deal with revenue accruing from nationally owned assets, it was decided in this context to exclude it from the calculation of HFC. This decision was based on the consideration that revenues arising from the sales of national assets do not represent either a financing burden to the household or an increase in capacity to pay that is freely at its disposal. The effect of this kind of government revenue will be reflected in the HFC since it will reduce health service prices in public facilities or increase health funds in public insurance, thereby reducing the out-of-pocket payments of households.

The application of scalars to adjust for the unobserved part of government (or social health insurance) revenue is necessary for obtaining estimates that are consistent with macro-level information. If, for some reason, the households’ tax outlays are overestimated or underestimated, this will have a corresponding impact on HFC and any summary measure of the distribution calculated on the basis of these ratios. Discrepancies between survey and national data can occur if substantial parts of government revenue accrue from state-owned enterprises, non-tax revenue, or external donations rather than from households. Bias may also be generated if the income data that are used for estimating income taxes, and in some cases the social health insurance contributions, are of poor quality. The adjustment scalar is critical to ensure that the level of the revenues is correct, although the distribution of this revenue is not known. The fact that the unobserved revenue is being contributed to households in the same proportions as the observed revenue, could in some cases lead to misleading estimates of the true distribution of the HFCs.

As explained above, the household financial contribution to the health system should include all the components paid directly or indirectly by the household. In principal, private health insurance premiums paid by both employer and employee should be included in the calculation. Information on employer’s contribution to private health insurance is very difficult to obtain from household surveys. In countries where private insurance is substantial and employers participate in its funding, like in the United States, household health expenditures and consequently HFC could be underestimated.

Because of the time lag between the recorded out-of-pocket payment and the insurance reimbursement
received at a later date, negative out-of-pocket payments could be estimated for some households. For the same reason, negative direct taxes might occur from income register data. Two possible solutions have been suggested: one is to delete the observations with negative values and the other is to set the negative value at zero. The currently followed practice in HFC calculation conforms to the latter approach.

Household surveys are a rich source of data that allows for a detailed micro-level analysis on a relatively comparative basis across countries. Nevertheless, differences in survey design and quality exist. In addition, some of the available surveys are not very recent and may not be suitable for analysing health system fairness if substantial health financing reforms have taken place since they were undertaken. It is important, therefore, to continually try to improve survey design and conduct so that the problems associated with data quality and comparability are reduced.

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