Who benefits from health sector subsidies?

Benefit incidence analysis

Introduction

Subsidization of health care from the public purse is commonplace. The justification of health sector subsidies rests primarily on distributional arguments; sector specific equity objectives, such as equal treatment for equal need, as well as broader distributional goals. With respect to the latter, administrative constraints on redistribution through cash transfers can make sector specific subsidies an effective means of alleviating poverty and reducing inequality [1]. Such a justification requires that subsides are *target efficient* i.e. the poor and only the poor receive them. Benefit incidence analysis (BIA) is a methodology for assessing the target efficiency public subsidies.

BIA describes the distribution of health sector subsidies across individuals ranked by their living standards. On the basis of this distribution, one can assess whether health care subsidization is consistent with narrowing the relative, or even the absolute, gap between the living standards of the rich and the poor.

Conducting a health sector BIA involves four principal steps:

1. Categorize individuals according to some measure of living standards.
2. Describe the utilization of public health services in relation to living standards.
3. Weight each individual's use of a service by the value of the public subsidy she receives.
4. Evaluate the distribution of the subsidy against some target distribution.

Categorization of individuals

The incidence of health sector subsidies could be considered in relation to a number of characteristics e.g. gender, age, race and region. We will assume the goal is to establish the extent to which subsidies are an effective tool for tackling poverty and/or inequality and concentrate on incidence in relation to some indicator of living standards. In a developing country context, alternatives, in order of preference, are household consumption, expenditure and income (see *Technical Note 4*). Adjustment should be made for the size and age structure of the household through application of an equivalence scale. A wealth index could also be used as the ranking variable, although this would mean conclusions about the consequences of the subsidy for *relative* inequality could not be drawn.

The unit of analysis could be the household or the individual. The choice essentially depends upon whether the distribution of living standards across households or individuals is of underlying interest. In most applications, the individual is the unit of analysis.

Describing the utilization of public health services

Micro data from a health or multi-purpose household survey are required to establish the quantities of state subsidized health services utilized by individuals. Three factors deserve particular consideration in relation to the choice of survey. First, it must contain data on both health care use and some measure of living standards. Second, it should distinguish between public and private care. Third, to minimize small sample problems, the reference period for inpatient care should be sufficiently long, say 12 months.

Only health services that are subsidized from the state controlled budget are considered. Public health programs and services financed from Overseas Development Assistance (ODA), user fees and social insurance are relevant provided the respective revenues are used at the discretion of the state. Difficulties arise if a survey does not distinguish between public and private care. In this case, private insurance cover,

if available, might be used to distinguish between public and private patients. Otherwise, a BIA can only be conducted if the private sector is sufficiently small and so can be ignored.

Box 1: Example distribution of public health services – Vietnam, 1998

Data are from the 1998 Vietnam Living Standards Survey (VLSS). Living standards are approximated by household consumption per capita. Five categories of health care are examined: visits to hospital outpatients, commune health centers and polyclinics, inpatient days and a residual category (domestic medical visits and visits to "other government facilities"). For all categories, except inpatient care, the survey distinguishes between public and private care. Since there were only 4 private hospitals in Vietnam out of a total of more than 800 [2], we simply assume all inpatient care is public care. Inpatient days are reported for a 12-month reference period, the other categories for the previous 4 weeks. The question concerning visits to hospital in the previous 4 weeks does not distinguish between outpatient and inpatient visits. Outpatient visits are therefore approximated by the number of visits to hospital in the previous 4 weeks less 1 if the individual reports any inpatient stay in the previous 12 months.

In Table 1, we present, for each category of care, the percentage of total utilization accounted for by each quintile of household consumption per capita. Poorer groups get less than their population shares of hospital-based care and "other public care" but more than a proportionate share of care provided at commune health centers (CMHC). Pro-rich bias in the distribution of hospital-based care is a common finding across many countries [3-6].

Table 1: Quintile shares of household consumption and public health care utilisation, Vietnam 1998

	Household consumption per capita	Hospital care		Commune Health Centre	Polyclinic	Other public health
		Outpatient visits	Inpatient days	visits	visits	services
poorest 20%	9.09	9.37	10.74	23.78	20.50	12.97
2nd poorest	13.57	15.18	20.09	25.40	11.55	18.31
middle	16.81	18.58	18.31	27.51	28.79	25.94
2nd richest	21.36	21.81	23.46	18.19	20.10	19.66
richest 20%	39.16	35.07	27.39	5.12	19.06	23.11
CI	0.3459*	0.3043*	0.2279*	-0.1297*	0.0506	0.1459
Robust SE	*0.0088*	*0.0578*	*0.0443*	*0.0337*	*0.1181*	*0.0781*
Kakwani Index		-0.0408	-0.1171*	-0.4747*	-0.2945*	-0.1992*
Robust SE		*0.0585*	*0.0456*	*0.0359*	*0.1187*	*0.0787*

Notes: CI - concentration index, SE - standard error, * - significantly different from zero at 5%.

Quintile percentage shares, such as those in Table 1, can be computed from micro data using packages such as SPSS or Stata (see *Technical Notes 6* and *16*). To examine the (cumulative) distributions in greater detail, one could plot the respective concentration curves (*TN#6*). See below for interpretation of concentration and Kakwani indices.

Calculation of the public health subsidy

Examination of raw utilization data does not capture variation in the value of subsidies nor does it facilitate aggregation across services to determine the distribution of the total health sector subsidy. Both extensions require estimates of unit subsidies.

Definition of public subsidy

The service-specific public subsidy received by an individual is,

$$S_{ki} = q_{ki}c_{kj} - f_{ki}, \quad (1)$$

where q_{ki} indicates the quantity of service *k* utilized by individual *i*, c_{kj} represents the unit cost of providing *k* in the region *j* where *i* resides and f_{ki} represents the amount paid for *k* by *i*.

The total public subsidy received by an individual is

$$S_i = \sum_k \alpha_k (q_{ki}c_{kj} - f_{ki}), \quad (2)$$

where α_k are scaling factors that standardize utilization reference periods across services. One might standardize on the reference period that applies for the service accounting for the greatest share of the subsidy. For example, where this is inpatient care, reported over a one-year period, then $\alpha_k = 1$ for inpatient care and, for example, $\alpha_k = 13$ for services reported over 4 weeks.

Unit costs

The starting point for the costing component of a BIA is total public recurrent expenditure on health care. Ideally, this should be disaggregated down to geographic region, then to facility (hospital, health center, etc) and, finally, to service (inpatient / outpatient, etc.). At this disaggregate level, unit cost is calculated by dividing total recurrent expenditure by total units utilized. The weighted sum of the health services consumed by an individual, where the unit costs provide weights, gives public health expenditure per individual.

Aggregate health accounts data are required to determine total public expenditure on health and its disaggregation to regions and facilities. For accuracy and consistency, the data should come from a unified system of National Health Accounts (NHA). In practice, data limitations mean that this ideal scenario is rarely achieved. An exception is a pair of BIA studies for Bangladesh and Sri Lanka [5]. Moving from facility-specific to service-specific expenditures can be difficult given the joint use of many health resources across a range of services. The detailed information necessary to distinguish between expenditures on, for example, outpatient and inpatient services might only be available from facility level cost surveys. Data from such surveys can be used to estimate cost functions from which the unit costs of services can be recovered. Without NHA, disaggregation of public health expenditures down to the service level is likely to prove difficult and require the imposition of various assumptions and approximations. The robustness of results to these approximations should be checked through sensitivity analysis.

Aggregate service utilization figures can either be estimated from survey data or taken from administrative records. The relative accuracy of these two approaches will vary across services and countries. Application of survey utilization rates has the advantage of consistency. One calculates unit cost by dividing aggregate expenditure by total utilization. Expenditure on each (survey) individual is quantity multiplied by unit cost. Summing these individual expenditures across all observations and applying population expansion factors, one arrives back at total public expenditure on a service.

Box 2: Example derivation of unit costs – Vietnam, 1998

Total recurrent public expenditure on health was over 5 trillion Vietnamese dong (VND) in 1998 ($1=13987VND) [2, p.170 & p.177]. This covers all spending on health programs and services provided by public health facilities and financed from the state budget, user charges, social health insurance and external donors. The public accounts do not disaggregate by facilities within regions. We therefore impose the same unit costs across all users irrespective of their geographic location. While this is common practice in BIA studies [e.g. 3, 4], it is regrettable. It means no account is taken of geographic variations in the quality, as opposed to quantity, of health care. Such variations can be substantial [3].

At the national level, the public accounts disaggregate central and provincial government recurrent health spending by facility i.e. hospitals, polyclinics and commune health centers [2, p.179]. Public spending financed from other sources is not disaggregated by facility. Since health insurance finances hospital care only, total revenue from health insurance [2, p.145] is added to the government expenditure on hospitals. User fees, officially, are charged for hospital and polyclinic care only. We divide total user fee revenue [2, p.145] between hospitals and polyclinics in the same proportions as apply for government revenue. Finally, total public spending financed from ODA [2, p.145] is divided between hospitals, polyclinics and health centers in the same proportions as apply for central and provincial government expenditures. By this allocation method, we arrive at the facility-specific public expenditures given in the first column of Table 2. The total across facilities represents 59% of total recurrent public health spending.

Table 2: Public health expenditures, unit costs and subsidies, Vietnam 1998

	Recurrent public exp.	Total utilisation	Unit cost	Total user fees		Mean unit subsidy		
				Official	Reported	Method 1	Method 2	Method 3
	VND million	'000s	VND	VND m.	VND m.	VND	VND	VND
Hospital care	2704424			429128				
Inpatient		52779 (days)	49320		2464000	42988	23800	23800
Outpatient		35388 (visits)	2865		1154000	1990	1690	701
Comm. Health Centres	269101	43520 (visits)	6183		48762	6183	5393	1262
Regional ployclinics	34062	3973 (visits)	8572	7152	17039	7916	6402	2262
Total Allocated	3007587			436280	3634960			

Method 1: Calculated from user fees reported in VLSS scaled to sum to official user fee revenue.
Method 2: Calculated from actual user fees reported in VLSS (not scaled).
Method 3: Calculated from actual user fees and payments for drugs reported in VLSS (not sclaed).

Source: Authors' calculations from [2] and VLSS.

As is often the case, the accounts do not distinguish between hospital expenditures on inpatient and outpatient services. Cost function estimates from a survey of 80% of public hospitals [7] give the cost of an inpatient day at more than 17 times that of an outpatient visit. From this estimate of relative cost, plus aggregate public expenditure on hospitals and the total utilization of the respective services, the unit costs of an inpatient day and outpatient visits are derived (see Table 2). The unit costs of visits to health centers and to polyclinics are calculated by dividing total public expenditures on these facilities by respective total utilization figures, estimated from the VLSS. The resultant costs seem somewhat high in comparison to the estimated unit cost of a hospital outpatient visit. In a full report, sensitivity of results to these estimates of unit costs would be checked.

User fees

The simplest method of allocating user fees divides aggregate user fee revenue reported in official accounts by an estimate of total utilization and assigns the resulting average payment to all users. It is much preferable to exploit survey data on payments and so allow for variation in fees paid. Some surveys ask the amount paid for each public health service. In this case, the public subsidy can be calculated as in equations (1) and (2) above. Alternatively, if the survey only gives the total amount paid for all public health services, then modify equation (2) to,

$$S_i = \sum_k \delta_k q_{ki} c_{kj} - f_i \qquad (2')$$

where f_i is the payment for all public health care and δ_k is a scaling factor that standardizes the reference periods for the utilization variables on the reference period that applies to the total payment variable.

If there is no distinction between payments for public and private health care, then, unless the private sector is insignificant, one must proceed as if the survey contained no information on payments. In this case, an average payment must be allocated to all users. In such circumstances, aggregation across services is the only purpose served by application of unit subsidies. Within a particular service, the distribution of the subsidy and the distribution of raw utilization will differ only in their means. Nevertheless, such aggregation can still be informative, allowing the incidence of the total health sector subsidy to be established and this incidence to be decomposed into that arising from differential use of services and that arising from differential subsidies across services.

Survey estimates of aggregate user fee revenues may not match the official figures. Apart from sampling error, an important source of discrepancy may be unofficial payments. Since such payments do not provide revenue for the public health system, one might argue that they are irrelevant to the allocation of the public subsidy. Following this argument, subsidies would be calculated on the basis of official user fee revenue. Rather than simply allocate the same average payment to all users, the distribution of official user fee revenue could be estimated from distribution of actual user payments. That is, assume official user fees account for the same proportion of all payments and scale the latter by this proportion, estimated by the ratio of official user fee revenue to aggregate payments calculated from survey data. On the other hand, it is rather difficult to maintain that an individual paying a bribe equal, for example, to the exchequer cost of providing a health service is the beneficiary of a public subsidy. To establish the real, as opposed to the nominal, subsidy, the difference between the production cost and the amount actually paid for health care must be examined.

Finally, we must consider how to deal with individuals making payments in excess of production costs. If one is simply interested in who gets the (positive) subsidies from the health care system, then negative values of the subsidy should be set to zero. On the other hand, if one is interested in how the subsidy is financed and, in particular, the extent to which there is cross-subsidization, then the distributions of both positive and negative subsidies need to be examined.

Box 3: Example derivation of health sector subsidies – Vietnam, 1998

There is a tremendous difference between the nominal and real public subsidy in Vietnam. The official accounts indicate total user fee revenue of 436 billion VND in 1998 [2, p.145]. But this amount is only one-eighth of the total amount individuals report paying for care in public hospitals, polyclinics and commune health centers (excluding payments for drugs). In fact, the total amount reported in user payments exceeds total recurrent public expenditure on these services (see Table 2).

Given the difference between official and reported user payments, we experiment with three methods of calculating the public subsidy. In each case, we apply equations (1) and (2) above, but use different estimates of individual specific user payments. Under method 1, we set user fees in commune health centers to zero (officially they do not exist) and scale reported user fees in hospitals and polyclinics by the ratio of official to reported aggregate user payments for these services. Under method 2, we use the actual user fees reported for all services, not including payments for drugs. Patients are usually responsible for purchasing their own drugs. Method 2 is appropriate where the cost of drugs purchased by individuals is not included in the public expenditure figures. Since we cannot be sure that this is always the case, our third method involves subtracting both user fees and payments for drugs from public health expenditure on the individual. In all cases, we set negative values of the subsidy to zero.

Each mean unit subsidy given in Table 2 indicates the average, across users, of the subsidy per unit of the respective service. So, for example, by method 1, inpatients receive a subsidy, on average, equal to almost 43000 VND per day, or more than 80% of the cost. However, the value of this subsidy falls by almost 50% if it is calculated on the basis of what patients actually report paying (method 2).

Computation

First, get an estimate of aggregate population user payments. In Stata,

```
egen temp1=rsum(op_fee ip_fee cmhc_fee poly_fee)
egen agg_fee=sum(temp1*wt)
```

where `op_fee` etc. are individual payments for outpatient care, etc. and `wt` are population expansion factors (weights). Then, the scaling factor of official to actual user payments is simply,

```
gen scale=#/agg_fee
```

where # is official user fee revenue.

The (scaled) subsidy from, for example, outpatient care is,

```
gen temp2=(op*2.865)-(op_fee*scale)
gen zero=0
egen op_sub=rmax(zero temp2)
recode op_sub 0=. if temp2==.
```

where `op` is quantity of outpatient visits and `2.865` is the unit cost. The `egen` command transforms negative values to zero and the `recode` preserves missing values on the original variables.

A unit subsidy and descriptive statistics across all users are given by,

```
gen op_usub=op_sub/op
summ op_sub op_usub [fw=wt] if (op>0 & op~=.), detail
```

Repeating for the other services, the total subsidy, per individual, is given by,

```
egen tot_sub=rsum(op_sub ip_sub cmhc_sb poly_sb)
```

Evaluating the distribution of the health subsidy

Having categorized individuals by their living standards and calculated the value of the health sector subsidy received by each individual, one can trace the distribution of the subsidy in relation to living standards. For example, one might present absolute shares of the subsidy received by living standard quintiles (see Table 3). Alternatively, one can present the cumulative share of the subsidy received by cumulative proportions of the population ranked by living standards. That is, one can graph the health subsidy *concentration curve*, e.g. Figure 1 (see *TN#6*). In order to evaluate the distribution of the subsidy, one must refer to some target distribution and in doing so impose a distributional objective.

One alternative is to compare the distribution of the subsidy with population shares. Do the poorest 20% of individuals receive more or less than 20% of the subsidy? In Figure 1, this amounts to comparing a concentration curve with the 45^o line. This is appropriate if the distributional goal is to close the *absolute* gap in welfare between the rich and poor, which requires that the subsidy concentration curve lie above the 45^o line. Closing the *relative* gap between the rich and poor is less demanding, requiring that the share of subsidy received by the poor exceed its share of total consumption, or some other measure of living standards. That is, the subsidy concentration curve must lie above the *Lorenz curve* (see *TN#* 6 *& TN#16)*. This is referred to as *progressivity*, or *weak progressivity*, in the distribution of the subsidy, as opposed to *absolute or strong progressivity* in the case that the concentration curve is found above the 45^o line [3, 6]. Measures of absolute progressivity and weak progressivity in the distribution of health sector subsidies are given by the *concentration index* (*TN# 7*) and the *Kakwani index* (*TN#16*) respectively.

Box 4: The distribution of health sector subsidies in Vietnam, 1998

In Table 3, we present quintile shares of the service specific subsidies and for the total subsidy across all services. The service specific quintile shares are based on method 1 (see Box 3) of calculating the subsidy. These are broadly consistent with the shares of raw service utilization given in Table 1. Quintile shares of the total subsidy are given for all three methods of calculation. Irrespective of the method used, the poorest quintile receives the smallest share of the total subsidy. This is mainly a reflection of the facts that inpatient care accounts for by far the greatest share of the total subsidy (87% - see Table 3) and the poor make relatively little use of this service (Table 1). Using actual, as opposed to scaled, user fees diminishes but does not remove the imbalance.

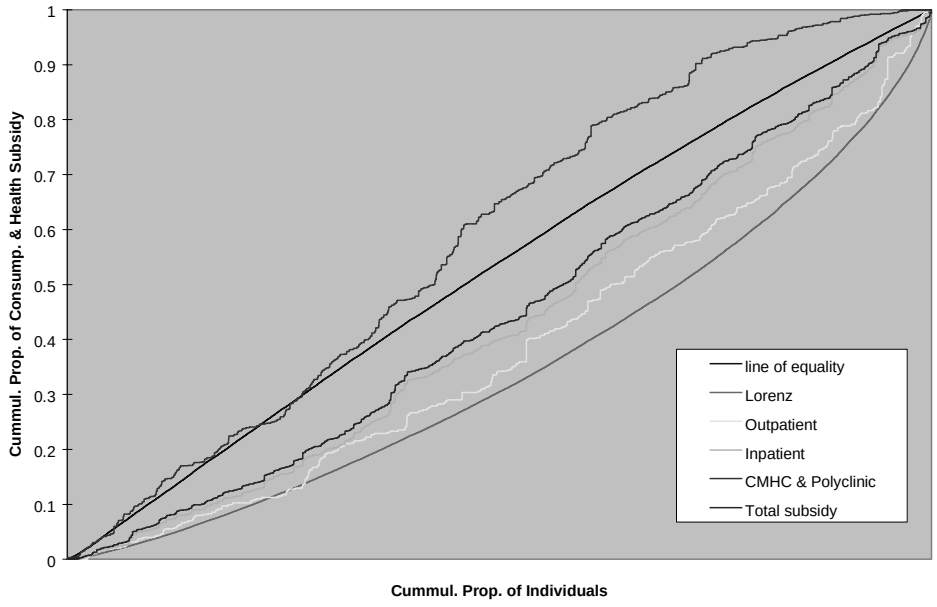
From the Kakwani indices given in Table 3, all services, with the exception of outpatient care are significantly (weakly) progressive. According to the concentration indices, however, only the subsidy to commune health centers is strongly progressive. The subsidies to the other services, and the total subsidy, are all significantly strongly regressive. That is, public health care subsidies in Vietnam help close the relative gap in welfare between rich and poor but raise the absolute gap.

Table 3: Quintile shares of household consumption and public health subsidy, Vietnam 1998

	Household consumption per capita	Hospital care		Commune Health Centre	Polyclinic	Total subsidy		
		Outpatient	Inpatient			Method 1	Method 2	Method 3
poorest 20%	9.09	10.23	11.51	23.78	18.03	12.78	14.87	14.42
2nd poorest	13.57	16.44	21.25	25.40	10.87	21.48	23.44	23.25
middle	16.82	18.49	19.15	27.51	37.69	20.14	21.91	21.06
2nd richest	21.36	20.46	23.41	18.19	22.04	22.81	22.31	22.66
richest 20%	39.16	34.37	24.67	5.12	11.37	22.78	17.48	18.61
CI	0.3459*	0.2846*	0.1952*	-0.1297*	0.0256	0.1606*	0.0886*	0.1068*
Robust SE	*0.0088*	*0.0665*	*0.0454*	*0.0337*	*0.0909*	*0.0395*	*0.0434*	*0.0477*
Kakwani Index		-0.0599	-0.1495*	-0.4747*	-0.3195*	-0.1853*	-0.2573*	-0.2390*
Robust SE		*0.0667*	*0.0471*	*0.0359*	*0.0922*	*0.0414*	*0.0458*	*0.0500*
Subsidy shares	(method 1)	0.0213	0.8688	0.1010	0.0088	1.0000		

Notes: CI - concentration index, SE - standard error, * - significantly different from zero at 5%.
See Table 2 for definitions of Methods 1-3

Figure 1: Lorenz Curve and Health Subsidy Concentration Curves, Vietnam 1998



Having created the subsidy variables, as described above, quintile shares, concentration curves and indices and Kakwani indices can be computed by the routines given in *Technical Notes 6, 7 and 16.*

Useful links and references

For a BIA bibliography see http://www.worldbank.org/poverty/health/library/incidence2.htm . For training material see http://www.worldbank.org/poverty/health/learning/index.htm and http://www.worldbank.org/education/economicsed/finance/public/ben_inc.htm .

Marginal BIA is a methodology for estimating the *marginal impact* on the distribution of benefits from the expansion or contraction of public programs. For example, this technique allows assessment of the extent to which the rich or the poor would gain from more spending on health programs. See,

Lanjouw, P and Ravallion, M., *Benefit Incidence and the Timing of Program Capture*, Washington DC, World Bank, 1998 (http://econ.worldbank.org/view.php?type=5&id=831).

Lanjouw, P. et al, *Poverty, Education and Health in Indonesia: Who Benefits from Public Spending?* Washington DC, World Bank, 2001 (http://econ.worldbank.org/view.php?type=5&id=3184)

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6. Sahn, D. and S. Younger, *Expenditure Incidence in Africa: Microeconomic Evidence*, Fiscal Studies 2000. 21(3), 329-347.
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