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Health Care Payments and Poverty

In the previous chapter we examined the issue of catastrophic payments for health care—the disruption to material living standards due to large out-of-pocket (OOP) payments for health care in the absence of adequate health insurance coverage. In the extreme, OOP payments could lead to poverty. This is not reflected in standard methods of measuring poverty, which compare total household expenditure with a poverty line that is not sensitive to highly variable health care needs. A household that at times of illness diverts expenditure to health care to an extent that its spending on basic necessities falls below the poverty threshold will not be counted as poor. Nor will a household that lives below the poverty threshold but borrows to cover health care expenses such that its total expenditure is raised above the poverty threshold. It has been estimated that 78 million people in Asia are not currently counted as poor despite the fact that their per capita household expenditure net of spending on health care expenditure falls below the extreme poverty threshold of $1 per day (van Doorslaer et al. 2006).

In this chapter we describe and illustrate methods to adjust measures of poverty to take into account spending on health care. In essence, this involves the measurement of poverty on the basis of household expenditure net of OOP spending on health care. The justification of this approach is that spending on health care is a response to a basic need that is not adequately reflected in the poverty line. The stochastic nature of health care needs means that they cannot be captured by a constant poverty line. Admittedly, not all spending on health care is for essential treatment. To the extent that it is not, the subtraction of all health spending from household resources before assessing poverty will result in an overestimate of poverty. But ignoring all health spending will result in an underestimate. Some households are classified as nonpoor simply because high expenses of vital health care raise total spending above the poverty line, while spending on food, clothing, and shelter is below the subsistence level.

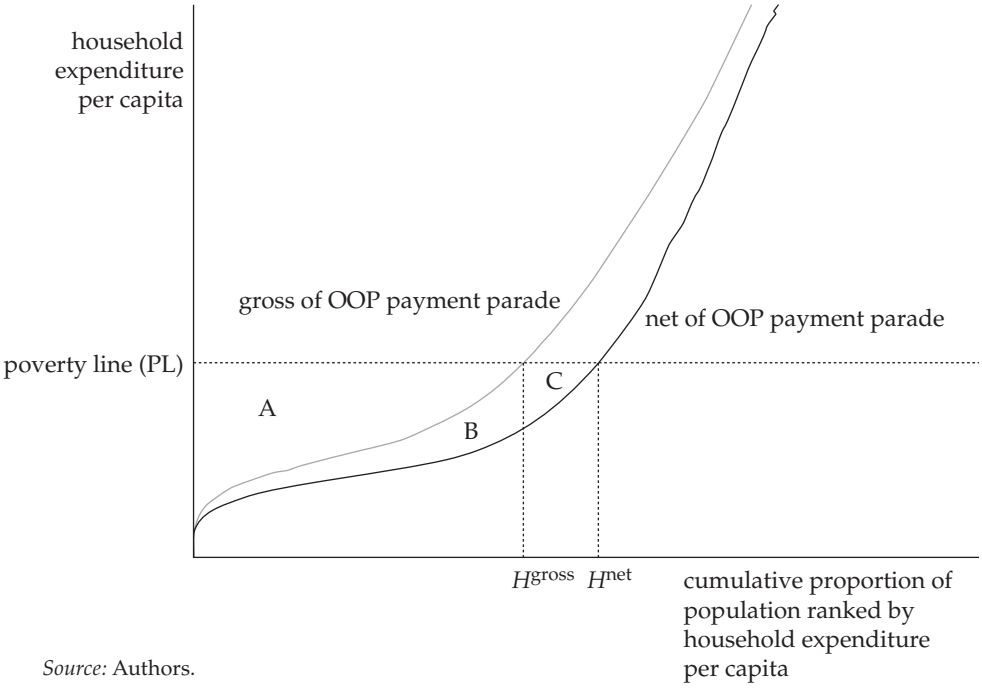
Under two conditions, the difference between poverty estimates derived from household resources gross and net of OOP payments for health care may be interpreted as a rough approximation of the impoverishing effect of such payments (Wagstaff and Van Doorslaer 2003). These conditions are (i) OOP payments are completely nondiscretionary and (ii) total household resources are fixed. Under these conditions, the difference between the two estimates would correspond to poverty due to health payments. Neither of the two conditions holds perfectly. A household that chooses to spend excessively on health care is not pushed into poverty by OOP payments. A household may borrow, sell assets, or receive transfers from friends or relatives to cover health care expenses. Then, household expenditure gross of OOP payments does not correspond to the consumption that would

be realized in the absence of those payments. For those and other reasons, a simple comparison between poverty estimates that do and do not take into account OOP health payments cannot be interpreted as the change in poverty that would arise from some policy reform that eliminated those payments. Nonetheless, such a comparison is indicative of the scale of the impoverishing effect of health payments.

Health payments–adjusted poverty measures

Let T be per capita household OOP spending on health care, and let x be the per capita living standards proxy that is used in the standard assessment of poverty—household expenditure, consumption, or income. For convenience, we will refer to the latter as household expenditure. Figure 19.1 provides a simple framework for examining the impact of OOP payments on the two basic measures of poverty—the head count and the poverty gap. The figure is a variant on Jan Pen's "parade of dwarfs and a few giants" (see, e.g., Cowell 1995). The two parades plot household expenditure gross and net of OOP payments on the y-axis against the cumulative proportion of individuals ranked by expenditure on the x-axis. For this stylized version of the graph, we assume that households keep the same rank in the gross and net of OOP expenditure distribution. Obviously, in reality rerankings will occur (see below). The point on the x-axis at which a curve crosses the poverty line (PL) gives the fraction of people living in poverty. This is the poverty head count ratio (H). This measure does not capture the "depth" of poverty, that is, the amount by which the poor households fall short of reaching the poverty line. A measure that does take that into account is the poverty gap (G), defined as the area below the poverty line but above the parade.

Figure 19.1 *Pen's Parade for Household Expenditure Gross and Net of OOP Health Payments*



Source: Authors.

Using household expenditure gross of OOP payments for health care, the poverty head count is H^{gross} and the poverty gap is equal to the area *A*. If OOP payments are subtracted from household expenditure before poverty is assessed, then the head count and gap must both rise—to H^{net} and *A*+*B*+*C*, respectively. So $H^{net} - H^{gross}$ is the fraction of individuals that are not counted as poor despite their household resources net of spending on health care lying below the poverty line. The respective underestimate of the poverty gap is *B*+*C*. The poverty gap increases both because those already counted as poor appear even poorer once health payments are netted out of household resources (area B) and because some who were not counted as poor on the basis of gross expenditures are assessed as poor after OOP payments (area C) are taken into account.

Let x_i be the per capita total expenditure of household *i*. An estimate of the gross of health payments poverty head count ratio is

$$H^{gross} = \frac{\sum_{i=1}^{N} s_i p_i^{gross}}{\sum_{i=1}^{N} s_i}, \tag{19.1}$$

where $p_i^{gross} = 1 \text{ if } x_i < PL$ and is 0 otherwise, s_i is the size of the household, and *N* is the number of households in the sample. Define the gross of health payments individual-level poverty gap by $g_i^{gross} = p_i^{gross}\left(PL - x_i\right)$, then the mean of this gap in currency units is

$$G^{gross} = \frac{\sum_{i=1}^{N} s_i g_i^{gross}}{\sum_{i=1}^{N} s_i}. \tag{19.2}$$

The net of health payments head count is given by replacing p_i^{gross} with $p_i^{net} = 1 \text{ if } \left(x_i - T_i\right) < PL$ (and 0 otherwise) in equation 19.1. In the next section, we discuss whether the poverty line should be adjusted downward when assessing poverty on the basis of expenditure net of health payments. The net of health payments poverty gap is given by replacing g_i^{gross} in equation 19.2 with $g_i^{net} = p_i^{net}\left(PL - \left(x_i - T_i\right)\right)$.

When making comparisons across countries with different poverty lines and currency units, it is convenient to normalize the poverty gap on the poverty line as follows:

$$NG^{gross} = \frac{G^{gross}}{PL}. \tag{19.3}$$

The net of payments normalized gap is defined analogously. The intensity of poverty alone is measured by the mean positive poverty gap,

$$MPG^{gross} = G^{gross} / H^{gross}. \tag{19.4}$$

In other words, the poverty gap (*G*) is equal to the fraction of the population who are poor (*H*) multiplied by the average deficit of the poor from the poverty line (*MPG*). The mean positive poverty gap can also be normalized on the poverty line.

Defining the poverty line

To compute poverty counts and gaps, a poverty line needs to be established. Poverty lines are either absolute or relative (Ravallion 1998). An absolute poverty line defines poverty in relation to an absolute amount of household expenditure per capita. An extreme absolute poverty line indicates the cost of reaching subsistence nutritional requirements (e.g., 2,100 calories a day) only. More

generous poverty lines make some allowance for nonfood needs. A relative poverty line is defined as some fraction of mean or median household expenditure. If such a poverty line were used in the present context, basically the analysis would amount to consideration of how health payments affect the distribution of expenditure. This may be of some interest, but it is likely that primary interest lies in how taking health payments into account affects poverty assessed against an absolute standard.

It might be argued that if poverty is to be assessed on the basis of household expenditure net of OOP payments for health care, then the poverty line should also be adjusted downward. This would be correct if the poverty line allowed for resources required to cover health care needs. Poverty lines that indicate resources required to cover only subsistence food needs clearly do not. Higher poverty lines may make some indirect allowance for expected health care needs, but they can never fully reflect these needs, which are inherently highly variable, both across individuals and across time. A common procedure for constructing a poverty line involves calculating expenditure required to meet subsistence nutrition requirements and the addition of an allowance for nonfood needs (Deaton 1997). More directly, the mean total expenditure of households just satisfying their nutritional requirements may be used as the poverty line. Implicitly, this takes into account the expected spending on health care of those in the region of food poverty. But there will be tremendous variation across households in health status and therefore in their health care needs, which will not be reflected in the poverty line. This may be less of a problem in high-income countries, in which explicit income transfers exist to cover the living costs of disability. But such transfers seldom exist in low-income countries. Further, the health care needs of a given household are stochastic over time. A person falling seriously ill faces health care expenses well above the average. Meeting these expenses can easily force spending on other goods and services below the poverty threshold level.

So, there is no reason to adjust a subsistence food poverty line, but higher poverty lines may make some implicit allowance for expected health care needs and, in this case, it would make sense to adjust the poverty line downward when assessing poverty on expenditure net of health payments. One option is to adjust the poverty line downward by the mean health spending of households with total expenditure in the region of the poverty line (Wagstaff and van Doorslaer 2003). If that practice

Box 19.1 *Health Payments–Adjusted Poverty Measures in Vietnam, 1998*

A demonstration of the sensitivity of poverty measures in Vietnam to the treatment of health payments is presented in the table below. The estimates are derived from the 1998 Vietnam Living Standards Survey and are taken from a study of the effect of health payments on the measurement of poverty in 11 Asian countries (van Doorslaer et al. 2006). Estimates are presented for the $1.08 and $2.15 per person per day poverty lines used by the World Bank for international poverty comparisons. The first of these is the poverty threshold used in the definition of the Millennium Development Goal with respect to extreme poverty. At the 1993 purchasing power parity exchange rate, the thresholds convert to 941,772 and 1,883,546 Vietnamese dong per year in 1998 prices. The living standards measure used is per capita household consumption. We do not adjust either poverty line when assessing poverty on the basis of household consumption net of health payments. The lower poverty line is sufficiently strict such that it would not cover even expected health care costs. The higher poverty line is not adjusted

Box 19.1 *(continued)*

because the analysis was part of an international comparison and, as explained above, adjustment would have created perverse results across countries.

When assessed on the basis of total household consumption, 3.6 percent of the population of Vietnam is estimated to be in extreme poverty (<$1.08). If OOP payments for health care are netted out of household consumption, this percentage rises to 4.68 percent. So about 1 percent of the Vietnamese population is not counted as living in extreme poverty but would be considered poor if spending on health care is discounted from household resources. This represents a substantial rise of 30 percent in the estimate of extreme poverty. The estimate of the poverty gap also rises by almost 30 percent, from 5,549 dong to 7,159 dong. Expressed as a percentage of the poverty line, the poverty gap increases from 0.59 percent of the $1.08 line to 0.76 percent when health payments are netted out of household consumption. The mean positive poverty does not increase. It falls slightly. This suggests that the rise in the poverty gap is due to more households being brought into poverty (area *C* in figure 19.1) and not because of a deepening of the poverty of the already poor (area *B* in figure 19.1).

At the $2.15 per day poverty line, the pattern of results is the same, but the relative difference in poverty is less and the intensity of poverty, as measured by MPG, no longer falls when poverty is assessed on consumption net of health care costs.

Standard errors are small relative to the point estimates, and for all measures the difference in the estimate of poverty based on household consumption gross and net of health payments is statistically significantly different from zero at 5 percent or less.

Measures of Poverty Based on Consumption Gross and Net of Spending on Health Care, Vietnam 1998

	Gross of health payments (1)	*Net of health payments (2)*	*Difference*	
			Absolute (3)=(2)−(1)	*Relative [(3)/(1)]*100*
$1.08 per day poverty line				
Poverty head count	3.60%	4.68%	1.08%	30.06%
standard error	0.58	0.69	0.23	
Poverty gap ('000 dong)	5.549	7.159	1.610	29.02%
standard error	1.258	1.374	0.260	
Normalized poverty gap	0.59%	0.76%	0.17%	29.99%
standard error	0.13	0.15	0.03	
Normalized mean positive gap	16.38%	16.25%	−0.13%	-0.80%
standard error	1.80	1.49		
$2.15 per day poverty line				
Poverty head count	36.91%	41.35%	4.45%	12.05%
standard error	1.65	1.62	0.33	
Poverty gap ('000 dong)	174.646	206.934	32.288	18.49%
standard error	12.806	13.634	1.827	
Normalized poverty gap	9.27%	10.99%	1.71%	18.28%
standard error	0.68	0.72	0.10	
Normalized mean positive gap	25.12%	26.57%	1.44%	5.74%
standard error	0.92	0.91		

Source: Authors.

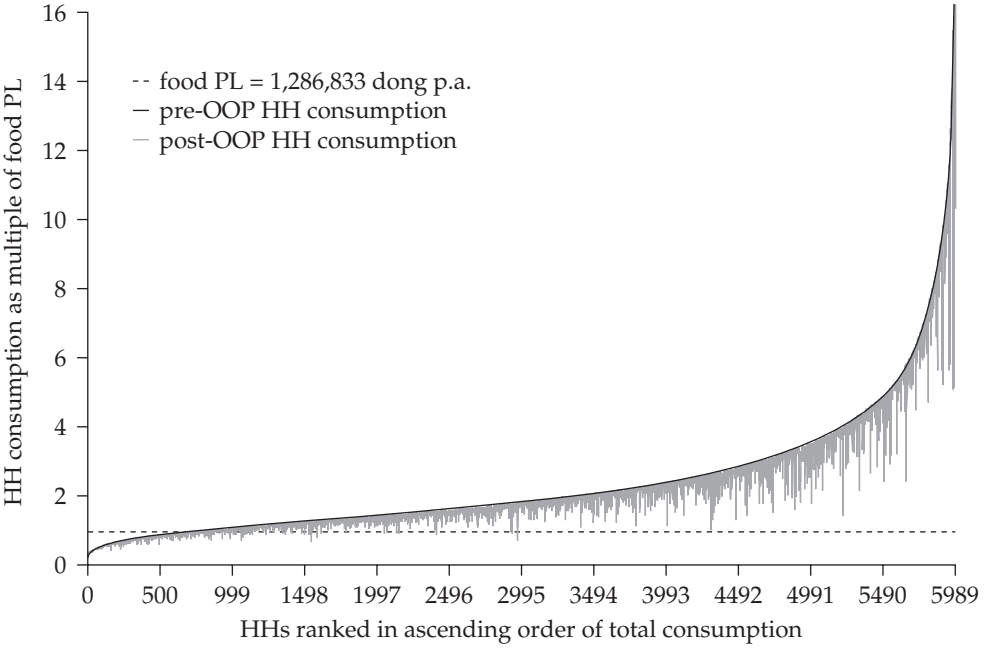
is adopted, then obviously some households who spend less on health care than this average can be drawn out of poverty when it is assessed on expenditure net of health care payments. That practice is not advisable if comparisons are being made across countries or time and the standard poverty line has not been adjusted to reflect differences in mean health payments in the region of food poverty. For example, the World Bank poverty lines of $1 or $2 per day clearly do not reflect differences across countries in poor households' exposure to health payments. Subtracting country-specific means of health spending from these amounts would result

Box 19.2 *Illustration of the Effect of Health Payments on Pen's Parade, Vietnam, 1998*

Figure 19.1 is a stylized version of the Pen Parade representation of the income distribution. When health payments produce reranking in the income distribution, it is still possible to visualize the effect of health care payments on the parade using what we refer to as a "paint drop" chart (Wagstaff and Van Doorslaer 2003). An example is given in the figure below for Vietnam in 1998. The graph shows the Pen Parade for household consumption gross of health payments. Household consumption is expressed here as multiples of a national extreme poverty line (PL) based on minimum food requirements, which is above the $1.08 threshold. For each household, the vertical bar, or "paint drip," shows the extent to which the subtraction of health payments reduces consumption. If a bar crosses the poverty line, then a household is not counted as poor on the basis of gross consumption but is poor on the basis of net consumption.

The graph shows that health payments are largest at higher values of total consumption, but it is households in the middle and lower half of the distribution that are brought below the poverty line by health payments.

Effect of Health Payments on Pen's Parade of the Household Consumption Distribution, Vietnam 1998



Source: Authors.

in lower poverty lines, and so less poverty, in countries that protect low-income households the least from the cost of health care.

Computation

Computation of the poverty head count and gap measures is straightforward and very similar to that of the corresponding catastrophic payments measures presented in the previous chapter. We describe computation in Stata, but it could easily be done in any statistical package. Assume that the data set is at the household level. Poverty is assessed on household resources on a per capita or per equivalent adult basis if an equivalence scale is applied. Let `x` be total household consumption (/expenditure/income) per capita, and `pcoop` be household OOP payments for health care per capita. Define a scalar for the poverty line value (`PL`) and generate household-level variables indicating gross of health payments poverty status (`gross _ h`), poverty gap (`gross _ g`), and normalized gap (`gross _ ng`):

```
sca PL = ###
gen gross_h = (x < PL)
gen gross_g = gross_h*(PL - x)
gen gross_ng = gross_g/PL
```

If the goal is to estimate poverty at more than one poverty line, another scalar can simply be created for the poverty line value and respective poverty indicator and gap variables. Now a variable can be created equal to per capita household consumption less OOP payments for health care, and the poverty indicator and gap variables can be generated on the basis of this variable:

```
gen net_x = x - pcoop
gen net_h = (net_x < PL)
gen net_g = net_h*(PL - net_x)
gen net_ng = net_g/PL
```

Differences between the two sets of poverty variables can then be computed:

```
gen diff_h = net_h - gross_h
gen diff_g = net_g - gross_g
gen diff_ng = net_ng - gross_ng
```

Sample means of the generated variables give estimates of the poverty head count and gap before and after taking into account health payments and the difference between the two. Stata's survey estimator can be used to obtain the standard errors of these point estimates.

```
svyset psu [pw=wt], strata(strata) || _n
svy: mean gross_h net_h diff_h gross_g net_g diff_g gross_ng
  net_ng diff_ng1
```

where `psu` is the variable indicating the primary sampling unit (if cluster sampling is used) and, in the case that the sample is stratified, `strata` identifies stratifying characteristic. By convention, poverty estimates are made for numbers of individuals and not for households. If the data set is at the household level, the sample weight variable should be multiplied by the household size. Application of this weight (`wt`)

will then give estimates for numbers of individuals. If the sample is self-weighting, then the household size should be used as the weight in computation.

The mean positive gap can be estimated by taking the mean gap over all households below the poverty line:

```
svy, subpop(gross_h): mean gross_g gross_ng
svy, subpop(net_h): mean net_g net_ng
```

There exists an ado file, `sepov`, which can be downloaded from the Stata Web site, that estimates the poverty head count and gap with standard errors without having to generate indicator and gap variables as was done above. The syntax is

```
sepov x [pw=wt], p(PL1) strata(strata) psu(psu)
sepov net_x [pw=wt], p(PL1) strata(strata) psu(psu)
```

This will not, however, provide a standard error for the difference in the estimates.

A figure such as that in box 19.2 can be generated most conveniently in a spreadsheet program such as Excel. It requires first sorting all households in the sample by gross of health payment total expenditure and copying both the gross and net of health payment household expenditure variables into an Excel worksheet. This is easily done simply by cutting and pasting. A cumulative distribution variable (weighted, if necessary) and the poverty line(s) can easily be generated in Excel. A line chart showing the distributions of the gross and net of payment expenditures by the cumulative proportion of households can then be generated.

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