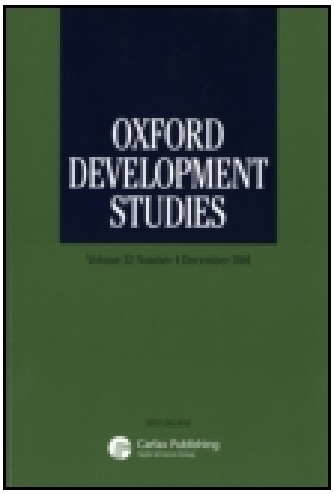

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Poverty and its many dimensions: The role of income as an indicator

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Poverty and its Many Dimensions: The Role of Income as an Indicator

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ABSTRACT *In this paper we analyse the choice of the dimension in which poverty is to be measured by reviewing some implications arising from the debate on the concept of welfare. By discussing Sen's capability approach, in particular, it is suggested that income or consumption are not necessarily the only indicators of interest in a poverty analysis. We then explore how comprehensive a picture of poverty can be gained by focusing on an income-based measure, using Chilean data from 1992. We analyse the role of income both as having a direct impact on a set of indicators of well-being and as proxying the relevant factors affecting them. In both cases the link is found to be weak. This suggests that poverty analysis is highly conditional on the indicators chosen and that the approach should be kept as broad as possible in order to capture more fully the multidimensional nature of such a complex phenomenon.*

> *In view of the difficulties in choosing a (poverty) indicator, one should know how much the choice matters.* (Lipton & Ravallion, 1994, *Handbook of Development Economics*, Amsterdam, Elsevier)

1. Introduction

It is important to explore the reasons underlying the choice of the dimension in which poverty is measured and to consider the consequences of that choice. Not as much thought has been given to this subject as to other key issues in poverty measurement, either because there appears to be something inherent in the concept of poverty which makes the choice an obvious one, or because poverty assessments are determined by the availability of data. Starting from consideration of the theoretical debate on welfare, it will be emphasized that there is rich potential in the view that "poverty is ... ultimately a matter of 'capability deprivation' " (Drèze & Sen, 1995). So far as measurement issues are concerned this implies that "even when we focus on economic poverty in the more conventional sense (in the form of insufficient incomes), the basic motivation will be its relevance as a substantial influence on capability deprivation" (Drèze & Sen, 1995). The investigation of whether an income indicator adequately captures this richer picture of deprivation, using data from Chile, follows in the second half of the paper.

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1.1 Poverty as Lack of Welfare

Intuitively, poverty seems to be a clear-cut concept, based on some objective fact, especially as it seems to refer to a dichotomous variable: either one is poor or one is not. The debate about identification has therefore focused on: choosing an appropriate dimension; and defining the point at which one should be considered to have changed status (this is the issue dealt with extensively in discussions of the poverty line) (Ravallion, 1993). The focus here is on the first of these issues.

There seems to be a general consensus that welfare is the perspective from which poverty should be measured. This can be conceptualized in two alternative ways: within a 'utilitarian' approach (based on the standard economic concept of a utility function), or through a 'capabilities' approach (based on positive rights). It has to be emphasized that choosing a 'space' also implies deciding which among the possible variables can be taken as a proxy of what happens in that 'space'.

1.1.1 Utilitarianism and welfare. Utilitarianism, in brief, can be described as incorporating a welfarist and individualistic representation of the world. The consumer is assumed to choose a consumption bundle and to define personal welfare on the basis of the same criterion. In addition, this valuation is the one to be adopted at the social level. However, it may be argued that considerations of agency (implying that the individual is not purely self-seeking since he/she can act on behalf of someone else, therefore adopting other values and objectives than his/her own), sympathy (with utility functions not being independent) and commitment (the attitude of one person choosing an action not because it will lead to a higher expected level of welfare but because of some 'external' consideration such as an ethical judgement) imply that choices and welfare encompass more considerations and objectives than personal well-being alone. Further, if utility functions are not independent—for example in Prisoner's Dilemma type situations—it is possible to cast doubt on the ability of market behaviour to reveal well-being or 'utility' through choices. Similarly, individuals' perceptions might be state contingent (if one basis of evaluation of reality is what it seems reasonable to expect, for example someone at risk of starvation being happy to survive), as well as being influenced by external factors (such as advertising or propaganda). Furthermore, from a rights-based perspective, the evaluation of advantage (i.e. what a person can do) should also have a bearing on welfare assessments.

1.1.2 The Capabilities Approach. The rights-based approaches—which start by assuming that every individual has some moral rights—appear to provide insights into interesting dimensions that are overlooked by the concept of utility. In this connection Sen's capabilities approach is immediately concerned with people's positive rights and attempts to transpose those rights into a space which is more easily measured by identifying the related concept of functioning.

Sen's argument can be described by what is now a well-known causal chain. Consumers desire goods not because of their direct utility, but for their instrumental value. If goods are represented as bundles of 'characteristics', then one can view the individual as transforming, through a specific production function, the characteristics embedded in the good itself into needs satisfaction (i.e. functionings), which determine what a person can or cannot do. As a result of a person's achievements with respect to functionings, the person also enjoys some happiness or desire fulfilment, i.e. utility. In

such a chain, therefore, the role of utility is not the objective of an individual or a social planner's control variable, it is a by-product of the process.

1.2 The Choice of an Indicator

There is a division between money indicators and non-monetary indicators of achievements in the functionings space. In practice the distinction between the two need not coincide with that between a utility-based and a capability approach to welfare, since we might look at an income poverty indicator because we believe that it is income *in itself* that matters (for example in the so-called opulence view of poverty, focusing on the possession of goods), or because income appears to be a good proxy for the variable we would like to observe but cannot (income indicators would therefore be considered instrumental to the attainment of the welfare objective).

With a capability approach one needs to "move from individual *commodity consumption* to individual *functioning*" (Sen, 1985). In measuring functioning, problems arise from differences in tastes and of aggregation when comparing vectors which differ in more than one dimension. As far as basic functionings are concerned (e.g. health, nutrition, etc.), we may agree that "people will tend to give priority to such elementary functionings and will value them in a similar way" (Anand & Ravallion, 1993), so that in assessing extreme poverty at least the problem of differing tastes may be less serious.

In addition to these theoretical issues the assessment of poverty in respect of basic functionings also faces problems of data availability. It is possible to identify ideal indicators to assess each dimension, but there is unlikely to be a survey available which would couple them together. For example, information on individual calorie requirements, calorie intakes, child anthropometric information, schooling, cognitive capacity, and logical skills is needed (jointly for the same statistical units) to assess the two functionings of 'being adequately fed' and the 'ability to process and use information'. Indeed it is rare to find surveys gathering all the information needed for adequate assessment of just one dimension. Hence researchers often look for ways of coupling data of a specific and of an economic nature to overcome data problems (for an application in the case of nutrition see, for example, Anand & Harris, 1992).

In practice evaluation of the capability set may therefore require the use of a measure of achieved functionings as reflecting the potential of the individual to participate in society. As an alternative a monetary income indicator may be adopted, either because of lack of information on other dimensions, or because income available to the individual in itself both represents the potential to spend and is the outcome of a production (and possibly also of an allocation) process. In that sense income is a proxy for the rights enjoyed.

Utilitarian analysis focuses on indicators that can be seen as inputs in the welfare production process, hence on income or consumption. A lively literature highlights some of the issues entailed by such an approach, of which some of the more debatable can be mentioned. Crucial assumptions are those about income being rationally spent and consumption smoothed along an optimal spending pattern. Generally, consumption indicators are preferred to income indicators even though all the components relevant to a welfare assessment (public goods, self-produced goods, common ownership goods, leisure) are rarely included. An interesting problem posed by the use of both income and consumption data occurs in those situations where, because of some kind of rationing, a change in welfare is not translated into a change in any monetary indicator. An example is a situation where the queuing time required to obtain some basic service rises sharply.

The method of data gathering may also present problems. Income data may be easily collected for individuals (provided the problem of valuation and attribution of domestic production can be solved), but it requires some form of pooling over a larger unit to obtain a realistic picture of the standard of living of dependent persons. The extent of pooling is then a further point of contention. The realism of the resulting picture then becomes a function of the plausibility of the assumptions about allocation mechanisms, typically within the household. This problem can be overcome in theory by use of data on individual consumption instead, but then the problem of valuing the contribution of household public goods to each individual's welfare arises. It is possible to use standard microeconomic assumptions to approach this issue by employing equivalence scales, though the estimates then become dependent on the methodologies adopted to derive the scales.

The major drawbacks of consumption indicators are that they conceal differences in the standard of living enjoyed by different individuals with the same level of expenditure, the possibility that people are in different phases of their life cycle, as well as the constraints (potentially different between individuals) faced in smoothing consumption over time according to the desired optimal pattern. Other kinds of heterogeneity among statistical units (mainly geographic and demographic) can be dealt with using microeconomic tools for correction which render them homogeneous in terms of welfare (Deaton & Muellbauer, 1980).

Despite the fact that, in theory, we can elucidate the advantages and shortcomings of adopting different dimensions in which poverty is to be measured, empirical analysis is often constrained by the availability of data. It is important, therefore, to conduct empirical tests to discover whether the theoretical differences matter in practice. Clearly, if the empirical answers provided by different approaches are similar then ultimately the capability approach to poverty measurement could be subsumed into the income-based one. Despite the theoretical difference between the two approaches, income could be taken as a good proxy for capability. This would greatly simplify the task of identifying the poor, the other implication being that the choice of the groups to be taken as targets of policy intervention would appear less complicated since the individuals who are capability-deprived would roughly coincide with those who are income-deprived. However, if the two theoretical approaches are shown, in practice, to identify different phenomena then the types of policy intervention needed for their alleviation would be different. For example, if poverty is understood to mean capability deprivation, then subsidies or employment creation for the more income-deprived would not be sufficient to alleviate poverty. They would need to be coupled with measures to improve basic functionings relating to the health, nutrition and education of those who lack them most.

2. An Empirical Analysis

Despite all the caveats that surround the choice of any method of measurement, statistical offices around the world need to monitor poverty and they usually do so by collecting data on income or consumption. In the first section of this paper it was noted that the choice of income may be justified on the grounds either that greater potential consumption implies greater utility and hence greater welfare, or that income can be seen as a proxy for the range of options one may undertake, hence for the capability a person has. It is, therefore, important to attempt to test the extent to which an income-based measure of poverty is able to capture some of the other essential dimensions of welfare suggested by the capability approach.

Table 1. Headcount index in the regions from which the sub-sample was drawn

	Rural zones		Urban zones	
Region	Extreme poverty	Poverty	Extreme poverty	Poverty
IX	10.4	32.9	10.6	39.2
XII	2.7	7.7	4.4	22.7

The simplest way of doing so (on the assumption that a person's capability manifests itself through achieved functionings and that among the set of achievable functionings some are of key importance) is to explore the relationship between an income measure and indicators of essential functionings.

The obvious criticism of such a procedure is that the dimension of freedom implied by the capabilities approach is lost in favour of some set of paternalistically chosen basic needs. It seems, however, that education, health and child nutrition are not only valuable in themselves, but are also so essential to individual capacity to achieve other possible functionings that they can be safely assumed to be chosen as priorities. Moreover, it can be argued that the choice and freedom dimensions ultimately pose an insoluble problem as far as children are concerned since their ability to formulate and implement choices is constrained for obvious reasons.

2.1 The Sample: A Descriptive Analysis

The material used is drawn from the Encuesta CASEN 1992, a very large household survey which is conducted in Chile every 2 years. A sub-sample has been randomly drawn from two of the 13 regions for which information was collected; it is composed of 1913 observations of personal information for 829 people living in rural areas and 1084 urban dwellers. Table 1 gives an idea of the characteristics of the two regions from which our sub-sample has been drawn.

Tables 2 and 3 describe poverty in the sample in terms of households and of individuals, respectively. Extreme poverty is measured by inability to afford the cost of a basic basket of food (calculated on the basis of the 1988 consumption pattern in the Great Santiago area) valued at different prices for the rural and urban areas. The second, and higher, poverty line which defines "the poor" is obtained rather crudely by multiplying the "extreme poverty" income level by 1.75 in the rural areas and 2 in the urban ones.

The CASEN includes further information about the households covering child undernutrition, morbidity and school enrolment, which have been chosen as key indicators of 'functionings'. The three dimensions are obviously of inherent interest (as

Table 2. Description of poverty in the sample by households (510 observations)

	Poor	Non-poor	Extremely poor	Non-extremely poor
Rural zones	50	186	14	222
Urban zones	145	129	51	223
Total	195	315	65	445

Source: Titelboin (1994).

Table 3. Description of poverty in the sample by individuals (1913 observations)

	Poor	Non-poor	Extremely poor	Non-extremely poor
Rural zones	236	593	64	765
Urban zones	653	431	261	824
Total	889	1024	325	1589

Source: Titelboin (1994).

a basic needs approach would suggest), though they also serve instrumentally as conditioners of each individual's potential earnings or, more generally, of his capability set.

The way the indicators have been constructed needs to be explained in some detail. Despite the richness of information of the CASEN an accurate analysis of each of the three dimensions would require much more detailed information. It is believed, however, that analysis based on indicators that are far from ideal can still provide useful insights about the relationships between the various dimensions of poverty and about the possibility of synthesizing them through an income-based measure.

The survey contains a malnutrition variable for children under 5 years (see Table 4), which records the different categories (normal, at biomedical risk, undernourished and overweight), which can be criticized. In the literature on nutrition emphasis is put either on input variables (such as average daily caloric input) or on output variables (such as child anthropometric measures), the latter being the more significant. Height-for-age, which is a measure of stunting, represents a good indicator of past nutrition and morbidity, while weight-for-height, a measure of wasting, not just correctly signals the current nutritional status, but is firmly believed to influence "morbidity and mortality risks for all age groups, at least at significantly low levels" (Dasgupta, 1993, p. 82). Our information is less detailed since it focuses on only one aspect of malnutrition, namely energy deficiency, which is essentially an input measure. Protein deficiency, however, is rarely present in the absence of energy deficiency, while a lack of micronutrients is not necessarily associated with poverty. Strictly speaking, being overweight can be a sign of malnutrition, but not of a kind easily accepted as denoting poverty, especially in poor countries. In the analysis the indicator chosen for malnutrition groups together the categories (B) and (C), with a loss of detail that was felt to be negligible given the surprisingly small numbers involved. The data suggest that urban children are the more malnourished, although, given the limited number of observations, such a finding would need to be confirmed by more evidence.

Table 4. Child malnutrition (241 observations)[a]

	Total (no.)	Rural zone (no.)	%	Urban zone (no.)	%
(A) Normal	206	98	93	108	79.4
(B) Biomedical risk	14	3	2.86	11	8.0
(C) Undernourished	7	2	1.9	5	3.4
(D) Overweight	5	1	0.95	4	2.9
(E) Not known	9	1	0.95	8	5.9

[a] Percentages are given out of total urban and rural observations for which that particular indicator has been recorded. Percentages not summing up to 100 are due to rounding errors.

Table 5. Self-reported morbidity (1913 observations)

	Total (no.)	Rural zone (no.)	%	Urban zone (no.)	%
(1) Yes (with m.a.)[a]	305	156	18.8	149	13.7
(2) Yes (m.a. not necessary)	119	68	8.2	51	4.7
(3) Yes (self-care)	4	1	0.12	3	0.28
(4) Yes (difficulties to get m.a)	5	2	0.24	3	0.28
(5) Yes (no m.a., other reason)	1476	599	72.3	877	80.9
(6) No	4	3	0.36	1	0.09%

Percentages are given out of total urban and rural observations for which that particular indicator has been recorded. Percentages not summing up to 100 are due to rounding errors.

[a] m.a., medical attention

The morbidity figures are based on self-reporting of illness suffered in the last 3 months, allied to reports of whether or not medical attention was involved (Table 5, lines 1 + 4). Since the aim of later analysis is to measure the incidence of "serious" illness a morbidity variable was constructed by assuming that searching for medical care is an index of seriousness of the disease in question. It can be seen that there are very few instances (line 4) of reported difficulty in obtaining medical care in both rural and urban regions. The problem with the material, however, is that there are negligible numbers reporting themselves not to have suffered from any illness, and a large number in the fifth category who did not seek medical assistance for "other reasons" which are not well specified. It can only be assumed that the afflictions were so trivial as not to be felt worthy of reporting in category 2 (medical attention not considered necessary). Clearly, however, it remains possible that some cases potentially interesting for our analysis might be concealed within category 5.

The other problem with self-reporting (which works in the opposite direction to the difficulty mentioned above) is the possibility that the extent of serious morbidity can be over-stated because of the existence of a positive correlation between affluence and self-reported illness. This feature (i.e. considering oneself to be sick) can be regarded as dependent on the interaction of a substitution effect (the higher the wage one receives, the higher the income foregone, and the less inclination there is to take time off) and an income effect (assiduously searching for health care as a "luxury good" is perhaps more common among the rich). The net effect is virtually impossible to determine since it also depends on the relative contribution of non-wage income to total income.

It was felt that the construction of a dichotomous variable by grouping categories 1 and 4 (instead of maintaining a polychotomous indicator) would be helpful in condensing information without causing significant difficulties in interpretation, but problems inherent in using self-reported data remain.

The third dimension to be considered is school enrolment, with a focus on secondary schooling since there is almost universal primary education in Chile. The CASEN records whether persons under the age of 24 years (note the age) are attending "an educational institution, a kindergarten or a crèche" and, if not, why not (Table 6).

To construct the educational variable the age group 12–18 years was isolated and the numbers not attending school were counted. Unfortunately, it was difficult to discriminate among the different reasons why a young person was not in secondary education. Clearly, therefore, the indicator used can be questioned. Work is obviously an alternative to secondary education, while those who are not interested in education, or find schoolwork difficult, may choose not to participate. It may be noted, however,

Table 6. Attendance at educational institutions of those under 24 (886 observations)

	Total (no.)	Rural zones (no.)	%	Urban zones (no.)	%
Attending educational institution	458	163	43.2	295	58
Total not attending	428	214	56.8	214	42
and why:					
Not a nearby institution	1			1	0.2
Economic difficulties	41	22	5.9	19	3.7
Working	98	46	12.2	52	10.2
Helping in the house	21	16	4.2	5	1.0
Need of a special institution	2	2	0.5		
Maternity/pregnancy	18	11	2.9	7	1.4
Not interested	27	7	1.9	20	3.9
Not sufficient age	205	101	26.8	104	20.4
Military service	4	4	1.1		
Illness	5	1	0.26	4	0.8
Looking for a job	1	1	0.26		
Others	5	3	0.8	2	0.4

Percentages are given out of total urban and rural observations for which that particular indicator has been recorded. Percentages not summing up to 100 are due to rounding errors.

that in a society where primary education is universal the lifelong earning potential of an individual could be significantly affected by acquiring secondary education. The issue to be explored is that of whether poverty lies at the root of non-attendance.

2.1.1 Basic Functionings' Indicators and Income Poverty. Having specified the variables to be used and considered their limitations the next step is to relate them to measured income poverty. Table 7 shows the absolute numbers of persons who appear to be in poverty according to one of the basic functioning indicators, divided into those who are 'poor' or 'extremely poor' on the basis of the income levels described earlier.

On the basis of their classification as 'poor' the numbers shown in Table 7 make up 76% of the undernourished, 51% of those not attending secondary school and 46% of those taken to have been seriously ill. Here it can be shown from Table 3 that 'extremely poor' people in the total sample (325) are 57% of the number of those who are 'poor without being extremely poor' (564). It might have been expected, therefore, that the percentages of undernourished, non-attenders at secondary school, and the sick, among the extremely poor would fall. On the very simple basis of a linear extrapolation (i.e. assuming no effect of the distinction between the income poverty levels) the percentages would be expected to be about half of those reported above (76, 52 and 46%). In fact the corresponding figures among those who are 'extremely poor'

Table 7. Shortfalls in basic functionings and income poverty (individual observations)

	Total sample (no.)			Poor (no.)			Extremely poor (no.)		
	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban
Nutrition	21	5	16	16	4	12	5		5
Secondary enrolment	54	26	28	28	9	21	8	2	6
Morbidity	310	113	207	144	33	111	54	13	41

Table 8. Income and the probability of falling short in one of three basic dimensions of well-being

	ASDUM		NUTRDUM		MORBDUM	
	Coefficient[a]	*Z*	Coefficient	*Z*	Coefficient[a]	*Z*
Constant	−0.6886[b]	−6.223	−1.1383[b]	−6.294	−1.0209[b]	−25.456
YPCH	−0.1975E−05	−0.848	−0.6336E−05	−1.279	0.9874E−06	1.730
Log-likelihood	−126.78		−69.125		−845.55	
Chi-squared (significance)	0.8665(0.3691)		2.6815 (0.1015)		2.5839(0.10794)	
pseudo-R^2	0.3501		0.3148		0.3081	

All the models were tested for heteroskedasticity.
[a] Heteroskedasticity corrected.
[b] Significant at the 5% level.

are 24%, 15% and 17%, respectively. Bearing in mind that the higher income-poverty line is equal to the lower times a coefficient of either 1.75 or 2 the disproportionate fall of those included in the extreme poverty category clearly suggests that the basic functionings indicators are not a linear function of income per capita. It implies that changes in income-poverty cannot, therefore, be used to extrapolate the pattern of poverty in other dimensions. The result also has clear implications for the choice of the econometric tools which can be applied to the data.

2.2 A Probit Analysis of the Determinants of Shortfalls in Basic Functionings

To determine whether or not income can be adopted as an indicator when the aim is to have a multidimensional picture of poverty we need to assess how income performs its two possible roles: to be an adequate proxy of deprivation in the other dimensions of interest or to determine how people fare in their attainment. From the simple descriptive analysis neither of these relationships appears to hold.

To explore the nature of the relation between income per capita and the chosen indicators probit analysis can be used. The questions that the method attempts to answer are: how much does income affect the probability of a child being malnourished, or not receiving secondary education, or of a person being seriously ill, other (relevant) things being equal? The last element is important. From a descriptive analysis alone it is not possible to discover whether there are mechanisms which do, in fact, regulate the relation between income and the chosen indicators which are obscured by the presence of other factors. Given the dichotomous nature of the variables and the non-linear relation they have with income, a probit model is the appropriate analytic tool. In particular it is preferable to the logit method in view of the unbalanced nature of our sample (i.e. in the sample there are low proportions of people faring badly in the chosen dimensions and a characteristic of the logit model is to be more sensitive to outliers than the probit).

The first stage was to run a very simple model. From the results in Table 8, we can investigate whether income per capita (YPCH) captures some of the factors that appear more significant in explaining the basic shortfalls in welfare, so effectively acting as a synthetic indicator for non-income dimensions.

The results seem to indicate that the association is weak, since the coefficients on income are not statistically significant nor is it possible to accept the joint significance of the regressors. There are, however, varying levels of significance of the income coefficients from which it can be suggested that the three phenomena are of a rather different nature. Note that the positive relationship of income with morbidity (Morbdum), which contrasts with the expected negative sign on attendance at school (Asdum) and nutrition (Nutrdum), should not come as a surprise since self-reporting is involved. It is likely to be due to the probability that poorer people can less afford to consider themselves sick and seek medical care, that they lack access, or are unaware of the potential benefits of treatment owing to lack of education and awareness of treatment possibilities. Generally, however, none of the results can be taken as more than indicative since they could be significantly biased by the omission of relevant variables.

The next step was to attempt to identify a *ceteris paribus* role for income in explaining the probability of falling short in one of the chosen indicators. This was done by adopting a fixed set of regressors to explain all the three indicators. These are shown below and the results appear in Table 9.

NUTRDUM: a variable taking value 1 if the child is malnourished, 0 otherwise.
MORBDUM: takes value 1 if the person has been seriously sick in the last 3 months.
ASDUM: 1 if the person does not go to secondary school.
REGION: takes value 1 if the observation belongs to region 12 of the CASEN survey, 0 if from region 9.
ZONA: takes value 1 if the observation is from a rural area
YPCH: household income per capita.
SEX: a dummy taking value 1 if the person is female.
AGE: age.
AGEH: age of the head of the household.
SEXH: takes the value of 1 if the head of the household is a woman.
EDUCH: years of education of the head of the household.
ROOMHAB: number of habitable rooms in the house to incorporate crudely a wealth dimension.
PERS: number of people in the household.
CHILDDEP: child-dependency ratio (number of children under 12 divided by the total number of people in the household).

The purpose of this analysis was to take into account not only income, but personal, familial and environmental factors, when explaining shortfalls in the three fundamental dimensions. All of the models have low explanatory power from the statistical point of view; very few coefficients appear to be significantly different from zero at the usual levels (especially in the model explaining secondary school enrolment). The joint significance of the regressors is equally disappointing.

When looking at the results, two points should be kept in mind. The first concerns the non-interpretability of a coefficient as the marginal effect of that regressor on the relevant probability (a point generally applicable to all non-linear models). The second has to do with the nature of the sample. Given that it is unbalanced there is the risk that anything that helps in predicting a '0' appears to be a good regressor. This is particularly true for the constant term—generally accepted as a sensible regressor in order not to impose an equality of marginal and average effects—which can be interpreted as the unconditional expectation of the variable whose probability is being explained (in a sample with a large majority of '0' observations the unconditional

Table 9. Probit results for the basic models

	ASDUM		NUTRDUM		MORBDUM	
	Coefficient[a]	*Z*	Coefficient	*Z*	Coefficient[a]	*Z*
Constant	−1.4879	−1.784	−5.2653[b]	−5.373	−0.5491[b]	−2.014
REGION	−0.3758	−1.127	−1.1394[b]	−2.229	0.1782[b]	−2.458
ZONA	−0.2399	−1.00	−0.2116	−0.772	−0.2349[b]	−3.200
YPCH	0.8590E−06	0.546	0.6572E−05	1.028	0.1616E−06	0.196
SEX	−0.1131	−0.553	−0.6357[b]	−2.400	0.9162E−01	1.294
AGE	0.11595E−01	1.919	0.2884E−01[b]	3.733	0.6242E−02[b]	3.152
AGEH	0.27611E−02	0.268	0.2112E−02	0.119	−0.6329E−02	−1.868
SEXH	−0.21350	−0.617	−0.5858E−01	−0.133	−0.5177E−01	−0.485
EDUCH	0.33469E−02	0.117	−0.1474E−01	−0.372	−0.1967E−01	−1.812
ROOMHAB	0.21510E−01	0.222	0.3477[b]	2.966	−0.6238E−01[b]	−2.050
PERS	0.84520E−01	1.421	0.2490[b]	4.537	0.1772E−01	0.932
CHILDDEP	0.38342	0.589	2.4727[b]	2.785	−0.1113	−0.542
Total observations	199		197		1909	
Log likelihood	−101.1147		−73.8833		−828.1195	
Chi-squared (significant)	10.5250(0.4838)				37.4629(0.9635E−04)	
Pseudo-R^2	0.3755		0.5475		0.3243	

All the models were tested for heteroskedasticity.

[a] Heteroskedasticity corrected.

[b] Significant at the 5% level.

expectation is closer to '0' than to '1'). Hence, the significance of the constant should be checked in alternatively specified models.

Since the coefficients cannot be interpreted as marginal effects, and since most of them do not appear as significantly different from zero, the results shown in Table 9 need not be discussed in more detail except to note that income, once again, appears not to affect significantly the probability of falling short under any of the three dimensions.

On the basis of these considerations, alternative specifications were sought using a general to specific approach, seeking to maximize the log-likelihood of the model by identifying significant regressors. All insignificant regressors were dropped to reach preferred specifications, except in the case of income since the objective was to explore its role in explaining shortfalls in important dimensions of welfare. Other criteria could have been adopted to reach the preferred specification, including that of maximizing the pseudo-R^2 measure of fit, despite the fact that theoretical reasons (Green, 1990, p. 683) and the unbalanced nature of the sample do not recommend it use.

2.2.1 Child malnutrition. Results for the preferred model in explaining child undernutrition are shown in Table 10. The constant term appeared insignificant and hence it was dropped in the general-to-specific procedure of reaching the preferred model. Several interaction terms were tried and three new variables appeared significant:

DUM9208: takes value 1 if the observation belongs to this particular community.
HCWOM: takes the value of 1 if the observation is of a female child in a female-headed household.
HWED: the education of the head of the household if she is a woman.

Child malnutrition seems to be significantly affected by regional factors. The probability of a child being malnourished is lower in the urban areas than in the rural ones,

Table 10. Probit results for child malnutrition

	Coefficient[a]	*Z*	Marginal effect	*Z*
REGION	−2.4627[b]	−5.090	−0.1490[b]	−3.222
ZONA	1.2692[b]	3.682	0.7678E−01[b]	2.817
DUM9208	1.4757[b]	3.780	0.8927E−01[b]	2.640
HCWOM	0.7628[b]	2.839	0.4614E−01[b]	2.450
SEXH	2.2128[b]	4.741	0.1339[b]	2.781
EDUCH	−0.2463[b]	−3.216	−0.1490E−01[b]	−2.123
HWED	0.2733[b]	3.269	0.1653E−01[b]	2.153
YPCH	0.6906E−06	0.324	0.4177E−07	0.321

Total observations = 232 (of which 21 = 1); log-likelihood = −55.1602; chi-squared = 30.6116 (significant at the 0.7331E−04 level); pseudo R^2 = 0.6549. All the models were tested for heteroskedasticity

[a] Heteroskedasticity corrected.

[b] Significant at the 5% level.

while significantly higher in one of the communities. This could be due either to the supply of social services (which in Chile is highly decentralized) or to some kind of systematic error in the data collection.

A higher level of education of the head of the household (EDUCH) reduces the probability of children being malnourished, though the effect is smaller if the head is a woman (HWED). The role of parents' education in reducing malnutrition by improving the hygienic conditions and the management of health expenditure, as well as proxying family-related endowments, is a common finding in the literature and this result conforms with expectations (Haddad & Hoddinott, 1994). The fact that education of the head seems to play a lesser role in female-headed households is likely to be explained by counteracting forces, one possibility being lack of time. The time constraint is crucial since it can affect the types of meals taken and the sharing arrangements in the household (Van Esterik, 1985) as well as affecting child care, which is important in determining nutritional outcomes, especially at the crucial time of weaning (Rohde & Kumar, 1995). Female children in female-headed households also have a higher probability of being malnourished. Intercountry comparisons (Kennedy & Peters, 1992; Kennedy & Haddad, 1994) have shown that this need not always be true and that a variety of factors influence the outcome by affecting household coping strategies, in particular child feeding practices and other nurturing behaviour.

Income again appears as not significantly affecting the probability of a child being undernourished. What is more the coefficient is positive, though small. One possible explanation, as suggested in studies focusing on nutritional intakes, is that higher income may result in substitution towards more expensive but not necessarily more nutritious foods, as well as in an increase in the food purchased by the household but consumed by non-household members (Buis & Haddad, 1992). Another is that the indicator used for nutrition depends on previous intakes, especially those in the first 18 months of life, which may reflect past rather than current circumstances of the households surveyed. It is also possible that there is a systematic bias in the way the data was collected. Since the nutritional variable was assessed by interviewers on the basis of the appearance of the child, it is possible that they were influenced by their impression of the household, tending to overestimate the way the child should look to be defined as 'normal', when visiting richer households. Another possible explanation,

Table 11. Probit results for morbidity

	Coefficient[a]	*Z*	Marginal effect	*Z*
REGION	−0.7524[b]	−7.570	−0.1659[b]	−7.739
ZONA	0.5749[b]	5.601	0.1267[b]	5.599
DUM9208	0.39695[b]	3.456	0.8748E−01[b]	3.431
AGE	−0.1587E−01[b]	−2.523	−0.3298E−02[b]	−2.535
AGES	0.2042E−03[b]	2.474	0.4502E−04[b]	2.481
SEAG	0.5977E−02[b]	2.646	0.1317E−02[b]	2.652
RHASEH	0.4819E−01[b]	−2.231	−0.1062E−01[b]	−2.250
PREVDUM	−0.2195[b]	−2.151	−0.4838E−01[b]	−2.159
PERS	−0.4095E−01[b]	−2.086	−0.9028E−02[b]	−2.095
YPCH	0.4847E−06	0.716	0.1068E−06	0.716

Total observations = 1242 (of which 195 = 1); log-likelihood = −493.6665; chi-squared = 92.3864 (significant at the 0.0000 level); pseudo-R^2 = 0.3705
All the models were tested for heteroskedasticity.
[a]Heteroskedasticity corrected.
[b]Significant at the 5% level.

though perhaps unlikely, is that richer households tend to allocate their resources more unequally.

2.2.2 Reported morbidity. Table 11 shows the results for the preferred model of morbidity. Further variables that proved significant are:

AGES: age squared.
SEAG: interaction term between sex and age.
RHASEH: number of habitable rooms in the house in female-headed households.
PREVDUM: takes value 0 if the person contributes to a public assistance scheme, 1 if private.

Reported morbidity again seems to be significantly affected by regional factors, with increases in rural areas. The relation with income is again insignificant (the positive coefficient may be noted) while in female-headed households there is a significant and positive relationship with the wealth indicator (RHASEH, i.e. ROOMHAB only for female-headed households). This probably stems from the tendency for the better off to face a lower opportunity cost of taking time to obtain medical care. People contributing to private health care systems report a lower morbidity; this could be due to higher user charges in the private systems or to a selection problem, where better off people contributing to the private system are also less likely (because of a wealthier lifestyle) to fall ill.

People in larger households report lower morbidity; there is no strong expectation about the sign of this coefficient, though the negative value shown appears somewhat counter-intuitive. This could arise from a failure to report illness rather than better health, since in larger households people can less afford to consider themselves sick, especially if there are children to be cared for.

The coefficients for age indicate an inverse relation (younger people reporting higher morbidity) although at a decreasing rate; this inverse relation is smaller for women. The result is again counter-intuitive, though there are four possible explanations: (i) there might be a truncation in that old people do not survive serious illnesses and, hence, do not appear in the survey; (ii) more old people are in the problematic fifth

Table 12. Secondary school dropout

	Coefficient[a]	*Z*	Marginal effect	*Z*
K	−9.2112	−5.155	−1.3060[b]	−4.341
REGION	−0.7716	−2.332	−0.1094[b]	−2127
AGE	0.5152	5.083	0.7304E−01[b]	4.129
ZOSE	0.8877	2.724	0.1259[b]	2.998
CHILDDEP	2.3445	2.936	0.3324[b]	2.652
HWED	−0.9439E−01	−2.472	−0.1338E−01[b]	−2.410
OH7DUM	1.8037	3.534	0.2257[b]	3.680
07HW	−1.8362	−2.791	−0.2603[b]	−3.190
YPCH	0.2866E−05	0.785	0.4064E−06	0.821

Total observations = 167 (of which 38 = 1); log-likelihood = −61.3272; chi-squared = 56.4669 (significant at the 0.0000 level); pseudo-R^2 = 0.6920.
All the models were tested for heteroskedasticity.
[a] Heteroskedasticity corrected.
[b] Significant at the 5% level.

category of Table 4 which was noted earlier; (iii) younger and better educated generations might be more prone to use medical facilities than those who are older because of greater confidence in medicine; (iv) the high correlation between the regressors, especially between age and age squared. On the last point it can be noted that for 'age' and 'age squared' to appear as having a strong linear relation the sample data need to be characterized by high reporting of young people being sick (i.e. a '1' in the morbidity dummy); so age could be picking up the important effect of child and infant morbidity, possibly because younger parents are more likely to search for medical care for their children. The risk of multicollinearity entailed by this high correlation is also not to be dismissed.

2.2.3 Secondary schooling. Table 12 shows the results for secondary schooling. Additional variables that proved significant were:

ZOSE: takes the value of 1 if the person lives in a rural area and is female.
OH7DUM: takes the value of 1 if the head of the household is a peasant, shepherd or fisherman.
07HW: takes the value of 1 for a female in a female-headed household where the head falls into the OH7DUM category.

The drop-out rate is significantly affected by regional factors, as well as being inversely related to age; being a woman in the rural areas significantly increases the probability of dropping out, so does belonging to a household with a high child dependency ratio. The household head's education significantly decreases the probability of dropping out.

It is interesting to note that although the probability of dropping out is increased when the head of the household works in the primary sector, the effect is reversed if both the head and the child are female.

3. The Results in a Broader Perspective

To sum up, it is apparent, first, that the income variable appears insignificant in all of the models of the determinants of shortfalls in health, schooling and child nutrition. However, reaching conclusions on this is rather more complex than it might appear.

The joint significance of the preferred specifications (as indicated by the Chi-squared tests used in each case, which suggest that all the regressors jointly matter even if income singularly does not) seems to agree with common sense ideas that income has a role to play in determining a person's shortfalls in one or more basic dimensions of well-being. This role, however, seems difficult to pin down, even by constructing various interaction terms.

Our aim has not been to prove the proposition that income does not matter, but to point to the fact that its role is not exclusive but depends on a plurality of personal, household and regional characteristics. What is clear, however, is that the links between the well-being indicators and income are difficult to identify and highly non-linear. Income in itself is not, therefore, a reliable indicator or, more accurately, not one conveying all the information of interest if the aim is to provide a comprehensive picture of poverty. On its own income appears not to be an adequate proxy for other variables that have more explanatory power in determining the probability of a person failing to achieve a given minimum level in one of the essential dimensions.

It would be interesting to explore whether this conclusion holds in different institutional contexts and for alternative measures of income. It is generally believed (Garcia, 1994) that Chilean public services are better targeted to the poor than in most other countries. For that reason income may be less significantly correlated with other dimensions of poverty in Chile than elsewhere. It is possible, also, that progress could be made by using alternative methods of measuring income itself, as suggested in recent literature on identifying the poor (Glewwe & Van der Gaag 1990). In the Chilean case there was no valid alternative such as an adult equivalent measure of income (which would have required the use of price or expenditure information which was not available).

What has been highlighted, however, is the difficulty of approaching the analysis of a multidimensional and complex phenomenon by a single route. That appears consistent with various indications in the cited literature that great importance attaches to household and institutional factors in the "production" of health, education and nutrition and suggests that there is more than income per capita underlying individual poverty.

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