**The Distribution of Education and Health Services in Madagascar over the 1990s:
Increasing Progressivity in an Era of Low Growth**

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Abstract

While a number of benefit incidence studies of public expenditures have been carried out for African countries, there are very few studies that look at how the incidence of such expenditures has been changing over time. We analyze three rounds of nation-wide household surveys in Madagascar over the 1990s, a period of weak economic growth but significant changes in social sector organization and budgets. Education and health services for the most are distributed more equally than household expenditures, hence they serve to redistribute welfare from the rich to the poor. By stricter standards of progressivity, however, public services do poorly. Few services other than primary schooling accrue disproportionately to the poor in absolute terms. When further adjusted for differences in the numbers of potential beneficiaries in different expenditure quintiles (e.g., school-age children), none of the education or health benefits considered appear to target the poor while several target the non-poor. With regard to changes over the decade, however, primary enrollments not only rose sharply but also became significantly more progressive; since the country experienced little or no growth in household incomes during the period, this reflects supply rather than demand side factors. The improvement in equity in public schooling occurred in part because the enrollment growth was in effect regionally targeted: it occurred only in rural areas, which are poorer.

1. Introduction

It is generally agreed that governments in poor countries should heavily subsidize education and health services, both of which are understood to be essential for economic growth and poverty reduction. This reflects considerations both of efficiency, because of positive externalities to improved education and health status, and equity, because many of the poor in developing countries would not be able to pay privately for services that could improve their well-being and help to break the intergenerational transmission of poverty. Also from an equity standpoint, governments in poor countries usually lack the capacity to mitigate income inequalities through transfer payment systems. In these contexts, directing social service spending to the poor offers a politically and administratively feasible means of redistributing welfare (Younger, 1999).

For Africa, benefit incidence studies from a number of countries have shown that social spending in education and health does serve to redistribute welfare in this sense. However, the magnitude of the redistribution is modest (Sahn and Younger, 2000; F. Castro-Leal *et. al.*, 1999), and even this degree of progressivity has much to do with the generally highly unequal distribution of incomes against which public subsidies are compared. In fact, while many services are distributed more equally than incomes, they still accrue disproportionately to the well-off in absolute terms.

What is generally lacking in this literature, especially for Africa, are intertemporal analyses, that is, studies of how the incidence of these services have been changing over time. Given that the use of education and (especially children's) health services represent investments in human capital, such changes may have important implications for future levels of poverty and inequality. We provide such an analysis in this paper for

Madagascar for the decade of the 1990s, using three rounds of comparable, nation-wide household surveys, from 1993, 1997, and 1999. Madagascar during the 1990s provides an interesting setting to examine these changes. Although this period was for the most part one of stagnant incomes, it witnessed significant changes in social sector budgets and organization. In health, the government undertook a major overhaul of the public health system beginning in the mid-1990s. This included a decentralization of both resources and decision-making to local health districts, and it also involved a major expansion of cost recovery (fee increases) at all public facilities. It is important to understand how this has affected program coverage (utilization) as well as its progressivity. The impacts on progressivity are not clear *a priori.* On the one hand, decentralization should favor the poor by shifting resources and control from urban centers to rural areas, which are poorer. On the other hand, poor households are often found to be more sensitive to prices of services (Strauss and Thomas, 1995), so we might anticipate that fee increases, at least in the absence of significant quality improvements, would lead to a less pro-poor pattern of utilization of these services.

In education, a similar plan for decentralization has not proceeded as far, but there have been significant changes in budgetary allocations for education. Public expenditures in education rose sharply starting in the mid-90s after a number of years of steady decline. Official statistics indicate a significant rise in primary enrollments over the same period (World Bank, 2002). It is of significant interest to policymakers to understand how this expansion of benefits has affected the progressivity of education expenditures. Have the new benefits been targeted to the poor, or instead were they, in the terminology of Lanjouw and Ravallion (1999), "captured" by the well-off?

To address these questions, we employ a methodology for analyzing benefit incidence that uses standard tools, Lorenz curves and benefit concentration curves, supplemented by statistical dominance tests based on estimators that have appeared recently in the literature. We use these methods to compare the progressivity of different forms of education and health expenditures both at a given point in time and across survey years. Standard benefit incidence is a very useful tool for examining how tax or subsidy policy alters the current distribution of welfare in the population. However, schooling and many types of health services also represent investments in human capital (hence in future well-being) that are targeted at specific groups in the population, e.g., school age children, pregnant women, infants. From this perspective the usual benefit incidence approaches are less informative. These considerations lead us to also apply our methodological tools to analyze the distribution of program 'coverage' of the target population across the income distribution. This sometimes leads to different inferences about equity in the distribution of benefits than the standard approach.

The data used here come from three nationally and regionally representative household surveys collected by the Malagasy national statistical office (Direction des Statistiques des Ménages, Institut National de la Statistics) in 1993/94, 1997 and 1999. We refer to the surveys collectively, by their common acronym, EPM.[1] The EPM are standard comprehensive surveys that include detailed information on household consumption expenditures and utilization of education and health services. We are able

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[1] The surveys are repeated cross-sections, not a panel. The first, *Enquete Permanente Aupres des Menages*, was collected from April 1993 to April 1994 and sampled 4,500 households. The 1997 and 1999 surveys, *Enquete Prioritaire Aupres des Menages*, were three-month priority surveys of 6,350 and 5,120 households, respectively.

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to consider different levels of education (primary, secondary, university), hospital and basic health care, public prenatal services, and childhood vaccinations.

2. Methodology

Benefit Incidence

As noted, benefit incidence analysis (BIA) strictly defined seeks to assess whether public spending is progressive, that is, whether it improves the distribution of welfare, proxied by household income or expenditures—or more pointedly, whether this spending serves to redistribute income to the poor. For our analysis we use a simple but frequently applied method of representing the benefit with a binary (0,1) indicator for whether a particular public service is used. The binary approach has some disadvantages: in particular, it imposes the assumption that the benefit is the same for all recipients, thereby ignoring, among other things, quality differences that may be associated with income level. On the other hand, it is very simple to implement since we only require household survey data on enrollments and health care consultations. Further, the binary method has been shown—including for Madagascar using the first EPM survey—to yield results very similar to more complex (and often equally questionable) approaches, such as using the unit cost of provision derived from budgetary data or valuation based on compensating variations estimation (Younger, 1999; Sahn and Younger, 2000).

The next step in BIA is to rank individuals in the population from poorest to richest. In keeping with the majority of previous studies for developing countries, we use household expenditures per capita as our measure of individual welfare. This simple per capita scaling, while standard in the literature, ignores possible economies of scale in

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consumption. This can affect rankings in the welfare distribution, since economies of scale make larger households better off, all things equal. However, we found that our results with regard to progressivity rankings were generally robust to the use of different scalings of household consumption (Glick and Razakamanantsoa, 2002).

The final step is to compare public services with regard to their progressivity. This can be done graphically using benefit concentration curves. A clear illustration (to jump ahead to some of our results) is provided by Figure 2, which considers schooling for the 1999 EPM sample. The x-axis plots the cumulative shares of individuals in the population, ranked by per capita household expenditures, while the y-axis shows the cumulative shares of the benefits, or simply, the cumulative share of enrollments, for public primary and secondary schooling; the latter form the benefit concentration curves.[2] Also depicted is the Lorenz curve for expenditures, which shows the cumulative share of expenditures (or welfare) in the population. The degree of convexity of the Lorenz curve indicates the extent of inequality in consumption in Madagascar.[3]

Two measures of progressivity can be defined. The more standard definition, which we will call "expenditure progressivity" or simply "progressivity", involves comparing the distribution of the benefit to the distribution of welfare (expenditures). If the benefit concentration curve is at all points above the curve for household expenditures—that is, if it dominates the expenditure curve—the benefit is said to be progressive. For 1999, this is the case both for secondary and (far more strongly)

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[2] Formally, let B represent the sum of the benefits received by the entire population (e.g., total primary enrollments) and B_j represent benefits received by the poorest j percent of the population. The benefit concentration curve shows the share of the benefit going to the population up to jth percentile of the expenditure distribution, or B_j/B.

[3] The Gini coefficient for Madagascar was 0.39, which compares favorably with the average for sub-Saharan African countries as a whole for the 1990s (0.47); the latter figure is from Deninger and L. Squire (1996).

primary school. The school subsidies are distributed more equally than initial welfare or expenditures, so they serve to make the distribution of welfare more equal.

The second measure, which following Sahn and Younger (2000) we will call "per capita progressivity", is stricter and compares the distribution of the benefits to the distribution of the population rather than expenditures. For a benefit to be per capita progressive the benefit curve must lie everywhere above (dominate) the 45-degree line. This condition appears to be satisfied for primary schooling in 1999 but is clearly not for seconday schooling. The condition insures that, for any definition of the poverty line, the "poor" will receive a disproportionate share of the benefit: picking any ordinate on the x-axis to define the share of the population that is poor, the share of total primary benefits, measured by the height of the primary school curve, is above the population share, given by the distance to the 45-degree line.

In addition to comparing the distributions of the benefits for each service to these two benchmarks, we also want to rank different services according to their progressivity. A given subsidy is said to dominate another if its concentration curve is everywhere above the concentration curve for the other. The implications of welfare dominance for redistributive policies are established formally by Yitzhaki and Slemrod (1991). They prove that for any social welfare function that favors an equitable distribution of income, marginally raising the subsidy of x while reducing that of y will improve social welfare if x's concentration curve is everywhere above y's.

Published benefit incidence analyses routinely fail to assess differences in the curves statistically. However, the benefit and Lorenz curves are generated from samples rather than from the entire population, so it is important to apply statistical tests of

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dominance. These involve testing whether the differences in the ordinates of two curves are statistically significant at a given number of points (abscissa). We conduct the tests at 19 evenly spaced ordinates on the X-axis, from 0.05 to 0.95, and reject the null of equality (no dominance) only if all ordinate pairs are significantly different (in the correct direction).[4] The covariance matrix of the ordinate estimates we use is the one proposed by Davidson and Duclos (1997). This estimator has the advantage that it allows for the possible statistical dependence of the two curves, which is relevant here since we often will be comparing curves drawn from the same sample (i.e., from the same survey year).

Rejection of the null in favor of dominance is robust in these tests in that one can conclude, for any social welfare function that favors progressivity, that marginal changes in subsidies of the type described above will improve social welfare. However, this robustness comes at a price: it tends to be hard to reject the null, leading to few definitive statistical conclusions that one type of service is more progressive than others, hence few recommendations for policy. Therefore some authors also compare distributions using less demanding cardinal measures. The most common of these is the Gini coefficient, which in this context is essentially a measure of the correlation of individuals' benefit levels and their rankings in the expenditure distribution. The Gini represents a specific welfare function (aversion to inequality) so it leads to inferences about progressivity that are less general than in the dominance approach. To achieve greater generality, we use the extended Gini coefficent. Different values of the "parameter of inequality aversion" (Duclos, 1999) in the extended Gini formula change the weight given to each point in the expenditure or welfare distribution; by comparing results for progressively larger values

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[4] The number of such points is arbitrary, but the more points at which one tests for differences, the stronger the test. Ours is the same criterion used in similar studies by Younger (1999) and Sahn and

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of this parameter we can get an idea of how more progressive social welfare functions

would rank distributions.[5] We compare the distributions of different services (and of

these services with the 45-degree line and Lorenz curve benchmarks) using the extended

Gini, allowing the inequality aversion parameter to take values ranging from 1.01 to 4.0.

We do this in increments of 0.5, yielding 7 pairs with which to compare the two benefits.

Statistically, one benefit is deemed more progressive than another if the Gini is

significantly lower for the former at each of these values.

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Limitations of Benefit Incidence Analysis

While it is a valuable tool for assessing the distributional impacts of social

spending, BIA is subject to a number of well-known limitations. One, already alluded to,

is the inherent difficulty of valuing benefits. Equally important, BIA is static: it only

presents a picture of who currently receives benefits from a given service. It is usually

not possible to infer what would happen to the distribution of benefits, and of welfare, as

a result of changes in public expenditures on the service.[6] With our multiple year (cross-

section) data, we are able to deal, at least in part, with the criticism that BIA is static. We

can track changes in benefit incidence over time. Essentially these exercises portray the

recent historical record; they are not counterfactual policy simulations in which the

effects of specific policies (e.g., improving one dimension of quality), holding other

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Younger (2000).
      [5]Sahn and Younger (2000) provide another application of the extended Gini.
      [6]This involves both the supply side—how the additional spending is allocated among income
groups—and behavior, i.e., the demand side—how response to supply changes differ among income
groups. See Van de Walle (1998).

factors equal, are assessed.[7] However, where possible we try to relate observed changes in the distribution of benefits to specifics of education and health sector policy over the period.

A perhaps more fundamental criticism of the standard BI approach to education and health services concerns its treatment of the provision of these services as income transfers that augment current incomes or consumption. This is quite problematic conceptually, particularly for education. While schooling of children may bring some direct current utility to parents, it is better characterized as an investment in an asset (human capital) that yields future returns through, among other benefits, higher labor market incomes. For this to be equivalent to a current benefit to household incomes requires a number of less than appealing assumptions, including that capital markets allow parents to borrow against the future returns to education of their children (Bourguignon *et. al*., 2002). Instead, one might prefer to recognize the intergenerational (and intertemporal) nature of education investments and view the gains from education subsidies as accruing primarily to the direct recipients when they become adults.   This implies a concern with the future distribution of welfare among those who are now of school age; hence it is the distribution of schooling benefits among this subpopulation that is of interest from this perspective.

Neither measure of progressivity defined above considers this: both expenditure and per capita progressivity are concerned with the distribution of benefits over the entire population, of school-age children and others. It is necessary to look instead at education benefits specifically among children in different income groups, i.e., a *per child* rather

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[7]Glick and Sahn (forthcoming) and Glick *et al.* (2000) do attempt this counterfactual analysis, using estimates from provider choice models that include information on supply characteristics such as

than per capita approach.[8]   A similar reasoning applies to many types of health services

that represent investments in children's human capital, for example childhood

immunizations and prenatal care. An appealing aspect of this approach is that we are

really examining, not the distribution of future incomes, which are in any case

unknowable as well as endogenous to individual preferences, but of future capabilities in

the sense of Sen (1985), which are a function of education and health.[9]

A different path that also leads to the per child focus is to frame the issue in terms

of 'needs' (see Castro-Leal *et al.,* 1999). From this perspective, the allocation of benefits

across the income distribution should be compared with the distribution of the need for

the service. For schooling, this would be the number of children who must be educated.

Given differences in fertility, family size is usually inversely correlated with welfare

level, so there tend to be disproportionate numbers of children in lower income quantiles;

consequently the need for education services is greater among these quantiles. Because

of these typical demographic patterns, it is possible for public subsidies or enrollments

per capita to be equally distributed across the income distribution—or even

disproportionately allocated to poorer income quantiles—while enrollments *per child*

remain significantly lower among the poor. In this situation one might hesitate to

conclude that the school subsidy is well targeted to the poor, or at least to the poor among

the population of interest, which is school-age children. The needs perspective extends easily to health services such as vaccinations or curative care (e.g., Van Doorslaer *et al.*, 1993). One would be likely to argue from this perspective that an equitable distribution of benefits would exist when different socioeconomic groups receive benefits in proportion, not to their population (or to their incomes) but rather to their needs for the service.[10] This criterion is obviously different—and in many cases, less likely to be met—than progressivity in either of the two senses discussed above.

We can evaluate benefits according to the per child (or more generally, per member of the target population) criterion using the same graphical and statistical methods discussed above. For example, Figure 2 includes a curve representing the cumulative share of the target population—primary school-age children in this example, defined broadly to be children age 6 to 14. This curve lies everywhere above the 45-degree line, indicating that the lower percentiles of the expenditure distribution account for a disproportionate share of the school age population. Although the concentration curve for primary school lies well above the expenditure curve and appears as well to be *per capita* progressive (it lies above the 45-degree line), this pro-poor bias essentially disappears when we look through a per child lens: the curves representing the cumulative shares of primary enrollment and of primary age children are very close to each other, meaning that public primary benefits per child are not different for lower and higher quintiles. Therefore the public education subsidy, while not inequitable, is not especially targeted to poor children.

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[10]Actually, this is one of several possible definitions of equity using this general framework; see Cuyler and Wagstaff (1993). A difficulty with many of these definitions is that needs are usually endogenous to individual preferences and behavior, though since income is as well, this problem applies also to the standard benefit incidence approach (see Bourguignon 2002).

These comparisons of benefits to target population essentially bring us to the notion of program coverage: that is, the degree to which a government program is successful in reaching its intended beneficiaries (school age children, pregnant women, etc). In our analysis, however, the focus is on differences in coverage by income quantile.[11] With regard to dominance testing, we can apply the same statistical tests described above to determine if the benefit curve dominates the target population curve.

3. Education and Health Sectors in Madagascar

Despite being endowed with a rich natural resource base, Madagascar remains one of the poorest countries in the world. Persistent poverty reflects the generally very poor performance of the economy over the last three decades, a period which encompasses (since the mid-1980s) a program of economic liberalization and reform. The period (1993-1999) covered by our surveys, as noted, is not marked overall by significant growth in incomes (see Razafindravonona, Stifel and Paternostro 2001). With exchange rate liberalization and other reforms, the economic picture began to improve in 1997, leading to modest growth in per capita income of approximately 1% per annum. Growth was not strong enough to have had much of an effect on poverty rates, which nationally were about 70% both at the start and end of the period.

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[11]To explicitly relate coverage to the concentration curves, denote the cumulative share of enrollment benefits to the jth quintile as E_j/E, where E_j is the total enrollments for children up to j and E represents all enrollments, and the target population share up to j as N_j/N, where N is the total number of school-age children up to j. The ratio of benefit share to target population share through j , or $\dfrac{E_j/E}{N_j/N}$, is shown on the graph as the ratio of the height of the schooling concentration curve at j to the height of the school-age child curve. Since the ratio can be written equivalently as $\dfrac{E_j/N_j}{E/N}$, it shows the per child enrollment rate (or "coverage rate") up to j, divided by the overall enrollment rate.

Corresponding to the decline in Madagascar's economic fortunes beginning in the early 1980s was a sharp decline in school enrollments at all levels, reversing impressive gains that had been made after Independence in 1960. Although increasing poverty was an important factor, is it likely also that the declines reflect the deterioration in the quality of public schools, which in turn reflects declines in government education spending as shares of the budget and of GDP through the early 90s (World Bank, 2002). Since then, however, spending has increased rather sharply, leading to a pronounced U-shaped pattern over the decade. For example, recurrent education expenditure as a share of total public recurrent (non-interest) expenditure dropped from 28 percent in 1990 to 15 percent in 1994 before rising again to 24 percent in 1999. Increases in capital expenditures have been even larger in proportional terms. At the same time, allocations shifted sharply from higher education to lower levels.

With regard to health services, the government undertook a major overhaul of the public health sector beginning in the mid-1990s to address serious quality deficiencies caused by lack of qualified personnel and supplies, especially of medicines. Budgetary allocations to 111 newly created health districts increased significantly at the expense of the central administration after 1995. However, lags in the development of local administrative capacities appear to be constraining the effectiveness of the decentralization process to date (World Bank, 2001). The other plank of the health sector reorganization, cost-recovery at all public facilities (referred to officially as *participation financière usagers)*, was put into effect at the start of 1998, primarily to finance purchases of medicines. The PFU was temporarily suspended due to the political and

economic crisis following the disputed presidential election of December 2001, but has since been reinstated.

Coverage for Education Services

As Table 1 indicates, for the country as a whole, the primary gross enrollment ratio in the most recent survey (1999) was 114 percent—quite favorable compared with the averages for all other developing countries (84.0), and even more so when compared with the sub-Saharan African average of 74.9.   For secondary school the gross enrollment ratio was 21 in 1999, which is about the same as the average for sub-Saharan Africa of 20.0. Rural enrollments in each survey year were well below urban enrollments (Table 2), reflecting differences in income and, especially at post-primary levels, local availability of schools. Unlike in most African countries, at each school level girls in Madagascar are equally as likely as boys to be enrolled.

Comparison across survey years reveals that there has been a large increase in school enrollments since 1993. This occurred mostly between 1993 and 1997, mostly among younger children (hence mostly for primary enrollment), and almost exclusively in rural areas, with a consequent narrowing of the rural-urban gap. For rural children 6-14, school enrollment rates (in public or private schools) rose from 46% in 1993 to 63% in 1997 (Table 2) while there was essentially no change in urban areas. Since rural households also tend to be poorer, this contributed to a disproportionate gain in enrollments among children in lower income quintiles. As Table 1 indicates, this has reduced, though far from eliminated, the significant gaps in gross and net primary enrollments between the poorest and wealthiest quintiles. Table 1 also shows that while

primary gross enrollment advanced from 83.0 to 114.4 over the 1993-99 period, secondary gross enrollment as well as university enrollment barely changed.

All of these patterns receive confirmation from the detailed school records kept by the Ministry of Education (MINESEB). As reported in Glick and Razakamanantsoa (2002), from 1993/4 to 1998/9 (the interval covered by our three EPM surveys) these data show a 34 percent proportional increase in the number of primary enrollments. With an estimated growth of the primary age population of approximately 3 percent per year, this translates into a rise in the primary gross enrollment rate of about 16 percent. Also as in the EPM, the official data indicate that the gains were basically a rural phenomenon, and that increases in secondary enrollments were much smaller. The only difference is that the imputed increase in the gross enrollment rate using the official data, while still impressive, is lower than that seen in the EPM data.[12]

The EPM data and the official statistics suggest that a fairly remarkable rise in enrollments—specifically, primary enrollments—occurred in rural areas between 1993 and 1997, followed by a more modest increase in 1997-99. Why did these improvements occur? Changes in household incomes are not the answer as incomes were largely stagnant through the decade, at least in rural areas where the improvements in enrollments occurred (see Glick and Razakamanantsoa 2002). However, on the supply side, the recovery of government education expenditures since the early 90s, discussed earlier, should have resulted in improvements in service availability or quality,

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[12]Glick and Razakamanantsoa (2002) undertake a more detailed assessment of the validity of the large recorded changes in enrollments in the EPM, in particular to rule out the possibility of spurious changes caused by the change in the sampling frame that occurred between the 1993 and subsequent EPMs. They do this using, first, pooled multi-year enrollment regressions to control for possible spurious effects of changes in sampling, and second, an analysis of changes in enrollment status over time by cohort. Results from both methods support the notion, already confirmed by the ministry statistics, of true rather than spurious increases in rural enrollment rates from 1993-1999. See these authors for details.

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encouraging enrollment.[13] It has been suggested that enrollments were also responding to increasing levels of community and NGO project activity in education during the period (UNDP/INSTAT, 1999). Finally, the period 1991-93 in Madagascar witnessed substantial political turmoil, resulting in a new constitution and populist government. The renewal of political stability and its promise of economic growth may have made more parents willing to enroll their children in primary school by raising the expected returns to schooling.[14]

Coverage for Health Services

We now look at coverage for three forms of health services: curative care, prenatal care, and childhood immunizations. The top panel of Table 3 indicates that among individuals reporting a recent illness or injury, those in higher expenditure quintiles are more likely to seek formal care, especially from private doctors (public care includes hospital and basic care centers). The percentage of the self-reported ill seeking treatment is substantially higher in 1999 than 1993/94 (43 vs. 34 percent).   Does this indicate that the net effect of health sector reform and cost-recovery was an increase in the demand for health services? Interpretation of these figures is difficult because the 1993/4 EPM was year round while the later surveys were limited to October to

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[13]The expenditure data show a sharp rise for primary and secondary school combined, but these data are not kept disaggregated by level. Questions have been raised regarding the extent to which the primary level specifically benefited, based on the evidence that most of the new teachers hired during this period went to secondary schools (World Bank, 2002). However, non-salary recurrent spending may have increased for the primary level, and some of the new spending on construction or renovation (which rose even faster for the two levels than recurrent spending) presumably was directed toward primary schools. In addition, primary enrollments may respond to improvements in secondary school quality since the former is the key to entry into the latter (see Appleton et. al., 1996)

[14] During the crisis, government employees, including teachers, went on strike. However, the rise in school enrollment is not explained simply by the return of teachers to work, since the government data indicate that the increases did not occur until at least 1995-96.

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December, and there may be seasonal differences in illness severity and treatment seeking. However, the pattern is maintained even if we compare only the October-December period in each survey. An alternative measure would be rates of health care utilization not conditioning on reporting an illness, i.e., consultations per capita. Using this measure, we find that formal care consultations were actually very similar in 1993 and 1999: .062 and .060. Our conclusion, based on numerous other cuts of the data (see Glick and Razakamanantsoa 2002), is that in its first several years, the new health sector policies of cost recovery and decentralization did not have major impacts on the utilization of formal (combined public and private) curative care. This applies to the population overall as well as to individual expenditure quantiles. It is possible that the negative impact of fee increases was compensated for by increases in service quality, a conjecture that has some empirical backing from alternative sources.[15]

The middle panel of Table 3 indicates that only two thirds of women consulted a formal care provider for a recent pregnancy in 1999, down from 72 percent in 1993. Despite the overall decline, there was a marked improvement in utilization by women in the poorest quintile. Public care, particular basic care centers, dominates prenatal care, accounting for all but 8 percent of formal prenatal consultations in 1999.[16] It is also evident that women in rural areas are at a significant disadvantage in terms of access to such care. For vaccinations, the level of coverage of the target population is quite poor in Madagascar and is lower than the average for the region. As shown in the bottom

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[15] In a small health sector assessment survey (INSTAT/Cornell University 2001) a large majority of respondents agreed that the quality of public health services had improved and that medicines were more available than before the cost recovery program. We should note though that the same survey suggests (though less conclusively) that the number of consultations declined, and declined more among the poor, in contrast to our inferences from the EPM data.

panel of the table, one fourth of children in 1999 received no completed vaccinations at all, while only 26 percent got all four. Nevertheless, as the table shows, these numbers represent a noticeable improvement over 1993/94. This probably reflects in part a major donor-supported campaign against polio in 1998. While immunization coverage has risen everywhere, it remains significantly higher in urban areas, consistent with the pattern seen for other services.

4. Progressivity of Public Services 1993-1999

Education

To save space, we present selected concentration curves and discuss key statistical results in the text; complete results can be found in Glick and Razakamanantsoa (2002). In what follows, references to statistical significance should be taken to mean statistical dominance testing unless otherwise indicated, i.e., unless the extended Gini tests are specified. The benefit concentration curves for schooling for 1993/94 and 1999 are shown in Figures 1 and 2. The most obvious pattern in the graphs is that as the level of schooling increases, the concentration curves become sharply more convex. In other words, primary schooling is more progressive than secondary, which is more progressive than university. Statistically, we can establish dominance of primary over secondary for both years, and secondary over university for 1999. This ordering is a standard pattern for developing countries in general and Africa in particular (see Sahn and Younger, 2000).

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[16] There is a large array of provider categories, especially in the 1993 survey. Several of these, such as birthing post and *maternité*, may include private providers. Since we include these categories among public providers, we may be using an overly broad definition of public benefits.

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Evaluating these curves relative to our benchmarks of the Lorenz curve for per capita expenditures and the 45-degree line, primary schooling easily dominates the Lorenz for each survey, meaning that primary schooling is (expenditure) progressive. Further, for 1999 the primary concentration curve lies above the 45-degree line, so primary school is per capita progressive as well for that year (confirmed statistically). Secondary schooling, at least in 1999, statistically dominates the curve for expenditures, i.e., is expenditure progressive, though as the graph makes obvious it is per capita regressive. University enrollments are extremely inequitable, as they are distributed more unequally than even expenditures. Clearly, post-primary schooling benefits in Madagascar accrue very disproportionately to the well-off.

How did the progressivity of public education change over the decade? As Figure 3 shows, the curves for primary schooling for 1997 and 1999 actually both cross the 1993 curve, meaning we cannot establish dominance of the later distributions over the 1993 distribution. However, for the lower half of the expenditure distribution the primary schooling curves for the two later surveys lie mostly well above the curve for 1993, and the difference between 1999 and 1993/94 is significant for all ordinate pairs in this range. In this sense, primary schooling is confirmed statistically to have become more progressive, a shift that reflects the pro-rural bias in the increase in enrollments noted above. Secondary schooling also appears to have become more progressively distributed in 1999, though the dominance tests do not support this statistically.

Figures 1 and 2 also show for 1993/4 and 1999 the cumulative shares of children age 6 to 14 and 11 to 20, which are broadly defined target populations for primary and secondary schooling, respectively. Comparing these curves to the benefit curves for

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schooling, for primary in particular we see a significant change between the two survey years. For 1993/4, the curve for children 6 to 14 and the curve for primary schooling cross at the left of the figure, but throughout the bottom half of the expenditure distribution the target population curve lies above expenditures and the differences are significant at each pair of ordinates tested in this range. In contrast, in 1999, as already noted in Section II, the two curves lie close to each other, meaning that quintile shares of public primary enrollments are now similar to their shares of primary age children. It should be kept in mind, however, that this apparent 'equity' refers specifically to public enrollments. Children from upper quintiles disproportionately attend private schools, so their overall enrollment rates remain significantly higher, as we saw in Table 1.

In comparing distributions of benefits at two points in time as in Figure 3, we should be clear about what exactly we are showing. We have compared 'average' incidence in different years, finding that the poor enjoy a larger share of total public primary enrollments now than they did earlier. This is not the same thing as saying that most of the change in the subsidy (the increase in aggregate enrollments) went to the poor. Consider the case of a benefit that initially is quite regressive, so the poor have a very low share. Increasing the subsidies in equal amounts for rich and poor, or even increasing them more for the rich, can still raise the share of the poor in the total benefit. This is because the poor start from a low base, hence experience a larger proportional change, which is what determines the change in the shares. From a targeting perspective we may care more about whether the incremental or marginal benefits accrue disproportionately to the poor than simply whether the average incidence becomes more progressive; in the example just given, the former is the stricter criterion. To assess the

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distribution of the *changes* in benefits we can calculate a concentration curve for the marginal benefits, analogous to the curves for the average benefits.[17] Such a curve is graphed for public primary school enrollments in Figure 4. The bulk of the increase in enrollments from 1993 to 1999 indeed was quite disproportionately distributed among the poor: the graph shows that the bottom 40 percent of the population accounted for about two thirds of the aggregate change. Hence even by this stricter criterion, the poor were the clear beneficiaries of the expansion of primary enrollment in the 90s.

Curative Health Care

Figures 5 and 6 show concentration curves for public health services for 1993/94 and 1999, distinguishing hospital outpatient care from basic health centers. The wide gap between the benefit concentration curves in 1999 suggest that basic care services are more progressive than outpatient hospital care. Statistically, this is confirmed by the extended Gini tests but not the dominance tests. This result, which is in agreement with findings from other countries in the region (Sahn and Younger, 2000; Castro-Leal *et al*., 1999) reflects to a large extent the urban location of hospitals. Still, both hospital care and basic care, as well as combined public care, generally dominate the Lorenz curve, i.e., both sources of outpatient care are expenditure progressive. On the other hand, neither hospital or basic care are per capita progressive; in fact, the extended Gini tests

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[17] The standard benefit concentration curve shows the share of the benefit going to the population up to the jth percentile of the expenditure distribution, or B_j/B, where B represents the total benefit and B_j represents the benefits received by the population up to *j*. The concentration curve for the *change* in benefits (the marginal benefits) from year *t* to year *t+1* is $(B_j^{t+1} - B_j^t)/(B^{t+1} - B^t)$. The numerator is the change in the benefits for the population to *j,* while the denominator is the total change in the benefit. Note this is not a true concentration curve since the cumulative gain can actually be negative; strictly speaking, it shows the cumulative gains normalized by the total gain. Both Younger (2002) and Glick and Sahn (forthcoming) also analyze marginal benefits in this way; Glick and Sahn provide an analytical discussion of these concepts.

suggest that hospital care (in the latest survey) is per capita *regressive*, that is, the well-off account for a disproportionate share of outpatient hospital consultations.

Unlike the case of education, there was little change in the degree of progressivity of these health services over time (Figure 7). Statistically we cannot reject the null of no dominance for any pair of surveys, whether for all public care or for basic or hospital care individually.[18] Thus it appears that the incidence of public health spending has not, or at least, not yet, been significantly affected by the reorganization of the health sector and the cost recovery policy. As with education, it is important to keep in mind that progressivity refers only to public health services. It is entirely possible, in principle, for the progressivity of the public subsidy to remain unchanged while fee increases sharply cut *overall* (private and public) health care consultations of the poor relative to those of the non-poor. This could occur if the poor reduced their visits to public centers while the non-poor in contrast substituted out of the public sector in favor of private providers. However, this was not the case here: as noted above, overall formal health care consultations per capita were stable for all quintiles over the period.

Prenatal Care

Figures 8 and 9 present concentration curves for public prenatal care in 1993/94 and 1999. These public services include hospitals, maternities, basic care centers, birth posts, and a few less common types of facilities.[19] Also shown is the cumulative share of the target population, defined here as women who reported a pregnancy resulting in a live

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[18]The only exception is that by the extended Gini test (but not the dominance test), basic care was more progressive in 1997 and 1999 than in 1993.

birth in the past year. This curve lies well above the 45-degree line, reflecting again the higher fertility among women in low-income households. For 1993/94, the concentration curve for prenatal services is near the 45-degree line and in fact crosses it, so these services are not per capita progressive. However, they are expenditure progressive (dominance of the Lorenz curve is confirmed statistically). Expenditure progressivity is found for 1999 as well (Figure 9). In fact, public prenatal care in 1999 also appears to have become *per capita* progressive, though statistically this is found only when using the extended Gini test criterion.

Hence there is some indication of an improvement in the targeting of public prenatal services. Because the curves converge at the upper end of the expenditure distribution (see Figure 10) we cannot reject the null of no dominance, but the extended Gini tests do suggest greater progressivity in 1999. This is consistent with the increase in consultation rates for the poorest quintile seen earlier; it also reflects an apparent shift to private providers among women in the highest quintile (see Table 3). It should be kept in mind that this increase in progressivity of public prenatal care services occurred during a time when overall (public or private) rates of prenatal care visits actually fell slightly. Finally, comparing the cumulative share of benefits to the target population share, note that the concentration curve for all public prenatal care in 1999 fairly closely tracks the concentration curve for recent births. Therefore while public expenditures on this service may be progressive in per capita terms, they do not effectively target poor women.

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[19]Because both the categorization of provider responses and their institutional names changed between the two surveys (for example, 'basic care centers' took over from SMI and PMI centers), we do

Vaccinations

The two benefit indicators shown for immunizations are having had at least one completed immunization, and having all four completed. The distributions of these two indicators are very similar, in each survey (Figures 11 and 12). In both 1993/4 and 1999, vaccinations were clearly expenditure progressive but they were not per capita progressive. Dominance as well as extended Gini tests confirm that there was no change in progressivity between 1993 and 1999. However, note for the later year that the concentration curve representing the cumulative shares of the target population (children age 12 to 23 months) generally lies above the benefit curves. Because the lines cross near the bottom decile, dominance cannot be established, but the figure suggests that despite the fact that vaccinations are (expenditure) progressive and in per capita terms are not regressive, the benefits per child are lower for the lower expenditure quintiles. Statistically, the less stringent extended Gini test indicates that distribution of the one or more immunizations indicator is less progressive than the 'distribution' of children in the target population age group.

5. Summary and Conclusion

When we make comparisons with the distribution of income (consumption) in Madagascar, most public services do appear to be progressive. Primary and secondary education, basic health care consultations and outpatient hospital care, prenatal care, and vaccinations are all more equally distributed than consumption expenditures. Only university enrollments among the services considered are more concentrated among the wealthy than is consumption. Therefore it can be said that most public education and

not attempt to disaggregate by public facility type here.

health services serve to redistribute welfare from the rich to the poor. However, this is somewhat less impressive when one takes into account the initial skewed distribution of consumption expenditures in Madagascar, to which public expenditures are being compared.

From the stricter standard of per capita progressivity—meaning that a benefit accrues disproportionately to the poor in absolute terms rather than merely relative to their consumption expenditures—public services in Madagascar mostly make a poor showing. Primary schooling at the end of the decade qualifies as per capita progressive, but more services—including secondary and university schooling, and possibly, outpatient hospital care—are actually per capita regressive, i.e., accrue disproportionately to the well off. By this criterion, therefore, social services expenditure in Madagascar are generally not at all well targeted to the poor. These findings are consistent with those for the sample of sub-Saharan countries examined in Younger and Sahn (2000), both with respect to the progressivity rankings of different education and health services as well as to the evaluation of specific services in terms of per capita and expenditure progressivity. As elsewhere in the region, primary schooling in Madagascar is the most progressive of all education and health services, while post-secondary schooling is the most regressive.

Among the criticisms raised about standard benefit incidence analysis, several concern its treatment of public expenditures on services as equivalent to income transfers. From this vantage point it would be more relevant to compare quantile shares of benefits with shares of the target population for the service. Because of demographic differences between the poor and non-poor, in general this comparison presents a picture of equity in the distribution of services that is less favorable than using the yardstick of either per

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capita or expenditure progressivity. At best, a few services such as public primary schooling and prenatal care visits come close to being distributed among income quantiles in proportion to their shares of the target population, but none are disproportionately allocated to the poor within these target populations. Vaccinations are not regressive relative to consumption expenditures or in per capita terms but in fact 'target' non-poor children. In view of these differences, and the fact that the 'target population' approach is probably of greater interest to policymakers, it seems a good idea to extend the graphical and statistical methods of benefit incidence analysis in this way as a matter of course.

With regard to the evolution of the progressivity of public services over time, there was little reason to expect demand-induced changes, because incomes for the most part were stagnant during the period covered by our surveys. On the other hand, the period saw important policy changes, either organizational or budgetary, in the education and health sectors. In health care, despite significant changes on the supply side that included both decentralization and imposition of higher user charges, there does not seem to have been a change in either the level of coverage for public curative services or in the progressivity of these services. In education, in contrast, the period witnessed a significant increase in primary enrollment rates. This occurred almost completely in rural areas, which are poorer, serving to significantly reduce disparities among income groups; that is, primary education spending became more progressive. In other case studies looking at changes in benefit incidence over time, such as Van de Walle (1995) for Indonesia and Hammer *et al.* (1995) for Malaysia, utilization levels rose and equity improved at the same time that incomes were growing rapidly and/or significant rural

urban migration was taking place. This made it difficult to disentangle the role of public policies on the supply side from income-induced changes in demand.[20] In Madagascar, with little change in incomes over the decade (and relatively little rural-urban movement), the changes are more evidently policy-related. First, there were significant increases in public expenditures in the education sector during the period. Second, the political and economic situation improved, and economic growth resumed, albeit slowly. This may have increased households' expected economic returns to investments in human capital. Although somewhat speculative, this raises the possibility that policies that pave the way for growth (promising higher incomes in the future), not just policies that raise current household incomes, can induce parents to put their children in school.

A number of specific policy implications follow from our findings. Standard fiscal incidence analysis suggests that overall public spending can be made more progressive by lowering the cost (i.e., increasing the subsidy) of services used by the poor while raising the cost (reducing the subsidy) of services used by the rich. For the health sector in Madagascar, this suggests that a progressive strategy for cost-recovery would be to impose higher charges at hospitals, which are used more by the well-off, than at basic health care centers, which are the primary source of care for the poor. In education, both secondary and (especially) university enrollments are dominated by individuals from the upper expenditure quintiles. The implication is that budgetary reallocations to primary schooling will increase the progressivity of overall education spending.[21]

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[20]Though in the Malaysia study, the authors provide supplementary evidence that much of the improvement in educational equity was due to the government's policy of ethnic targeting.

[21] This does not solve the more difficult targeting problem of giving the poor greater access to services currently used mostly by the well-off—e.g., secondary schooling.

These are simple and powerful guides to policy and reveal the usefulness of benefit incidence analysis. They flow directly from information on current patterns of utilization of different services by the poor and non-poor. However, it is well recognized (Van de Walle, 1998) that the distribution at the margin of additional public expenditures for a service need not be the same as the average or current distribution. Predicting the distribution of new expenditures is further complicated by the fact that the changes required are clearly non-marginal. Despite recent increases, Madagascar still spends only about 3 percent of GDP on education, lower than the 4 percent average for sub-Saharan Africa. Public expenditures on health amount to just 1.3 percent of GDP. Even with the improvements documented in this study, enrollments at the end of the decade were below the levels achieved several decades before, a reflection of the depth of the country's long economic decline. The low levels of utilization of health services, especially by the poor, also point to a need for major increases in public (or donor) resources.

As the preceding paragraph implies, the additions to public expenditures must involve not merely a change in the subsidy to current users of various services (which is what standard fiscal incidence analysis assumes), but an expansion of services to those who currently lack access, for example, by building more schools or clinics in poor communities. It may also involve targeting investments in quality improvement to existing facilities that are used by the poor. Average incidence based on current patterns of utilization may not be a good guide to the distribution of an expansion of service supply or investments in quality. As Lanjouw and Ravallion (1999) note, the essential dilemma is that the rich also consume most types of public services; hence it is possible that they rather than the poor will "capture" the increases in the benefits, even for

services for which average incidence seems to favor the poor. The one significant

expansion we did observe—for primary enrollment—clearly avoided this problem. It did

so in part (whether as an outcome of intentional policy or not) by in effect targeting areas

where the poor live, that is, rural areas. As a means of insuring progressive program

expansion, geographical targeting has broad applicability to the social services. For

example, building more clinics in rural areas will reduce the currently large distances to

health care faced by poor rural residents (see Glick *et. al.,* 2000). Finally, new

developments in poverty mapping techniques, recently applied in Madagascar (Mistaen

et. al. 2001) promise to improve policymakers' ability to target the poor by allowing

poverty rates to be calculated at highly disaggregated geographical levels.

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Table 1: *Gross and net enrollment ratios by level and expenditure quintile 1993/94-1999*

Year		1	2	3	4	5	All
				Quintile			
				Primary			
1993/94	Gross enrollment ratio	51.3	82.2	101.7	98.8	93.7	82.9
	Net enrollment ratio	29.3	43.4	59.0	59.7	59.6	48.3
	private share[a]	0.12	0.18	0.18	0.19	0.44	0.21
1999	Gross enrollment ratio	98.7	109.9	117.9	123	131.6	114.4
	Net enrollment ratio	53.2	64.8	64.0	68.0	77.7	64.3
	private share[a]	0.10	0.14	0.19	0.21	0.36	0.19
				Secondary			
1993/94	Gross enrollment ratio	3.3	10.7	13.9	25.9	47.6	19.4
	Net enrollment ratio	2.9	7.3	10.6	18.6	34.5	14.1
	private share[a]	0.26	0.30	0.31	0.37	0.54	0.42
1999	Gross enrollment ratio	5.9	12.9	16.6	24.9	50.3	21.2
	Net enrollment ratio	4.3	10.0	11.1	18.5	33.6	14.8
	private share[a]	0.17	0.20	0.29	0.36	0.57	0.41
				University			
1993/94	Gross enrollment ratio	0.0	0.3	0.7	1.5	9.2	2.6
	Net enrollment ratio	0.00	0.29	0.00	0.72	3.22	0.93
1999	Gross enrollment ratio	0.0	0.2	0.2	2.0	5.2	1.6
	Net enrollment ratio	0.00	0.00	0.05	1.11	2.17	0.69

Notes:

Gross enrollment = total enrollments in the level divided by number of children at official age for the level, multiplied by 100. (official school ages are 6-10 for primary school, 11-17 for secondary, and 18-22 for university)

Net enrollment = total primary enrollments of primary school age children divided by number of primary age children multiplied by 100.

Table 2: Rural and urban enrollment rates, 1993/94-1999 (percent)

Year	Children 6-14		Primary[a]		Secondary[b]	
	Rural	Urban	Rural	Urban	Rural	Urban
1993/94	45.6	79.0	42.8	77.8	8.0	37.7
1997	62.7	79.3	60.3	74.9	n.a.	n.a.
1999	64.0	81.0	61.2	76.9	9.0	34.9
Change (99-93/94)	18.4	2.0	18.4	-0.9	1.0	-2.8

Notes

[a]Net primary school enrollment
1997 only: pre-school is included in primary.

[b]Net secondary enrollment.

Table 3: *Utilization of health services 1993-1999 by expenditure quintile and location (sample for calculations given in parentheses)*

Year		All	Quintile 1	2	3	4	5	rural	urban
Curative care									
(self-reported ill/injured in last two weeks)									
1993/4	% seeking formal care:	34.28	25.62	29.81	32.50	38.27	42.11	0.30	0.50
	of which, % private	0.27	0.16	0.18	0.25	0.27	0.38	0.22	0.39
1999	% self-reported ill/injured seeking formal care:	43.30	33.51	37.52	47.07	46.70	50.95	0.40	0.58
	of which, % private	0.31	0.23	0.20	0.32	0.27	0.48	0.31	0.33
Prenatal care									
(women 15-49 giving birth in previous 12 months)									
1993/4	% seeking formal prenatal care	71.8	57.7	71.3	80.8	77.1	74.8	69.6	84.6
	of which: % consulting:								
	Public care	93.2	95.0	93.6	95.3	89.7	91.9	94.9	85.0
	Private doctor or clinic[c]	6.8	5.0	6.4	4.7	10.3	8.1	5.1	15.1
1999	% seeking formal prenatal care	66.8	66.4	63.8	67.6	65.8	73.3	64.8	76.1
	of which: % consulting:								
	Public care	92.2	94.4	96.1	92.7	95.6	77.2	94.6	82.8
	Private doctor or clinic[c]	7.8	5.6	3.9	7.3	4.4	22.8	5.4	17.2
Immunizations									
(children age12-23 months)									
1993/94	% receiving no vaccinations	34.5	38.2	34.7	31.2	34.5	33.2	36.5	21.2
	% receiving some (1-3) vaccinations	45.7	46.8	38.9	54.3	44.1	43.5	43.3	60.9
	% receiving all (4) vaccinations	19.9	15.0	26.4	14.5	21.4	23.4	20.2	17.9
1999	% receiving no vaccinations	25.2	30.8	23.1	28.3	26.9	14.0	27.8	13.7
	% receiving some (1-3) vaccinations	48.9	43.7	55.0	47.5	53.0	44.3	48.5	50.5
	% receiving all (4) vaccinations	26.0	25.5	21.9	24.2	20.1	41.7	23.8	35.8

Notes:

Curative care:

Public care includes hospitals and basic care centers. Formal private care includes doctors, private clinics, and pharmacies.

"% private" figures refer to the sector of the first provider consulted.

Immunizations:

"Some vaccinations" means the child has completed the vaccination course at least one, but not all, of the following: tuberculosis, polio, measles, Dtcoq. "All vaccinations" means the child has received complete vaccinations for each of the four diseases.

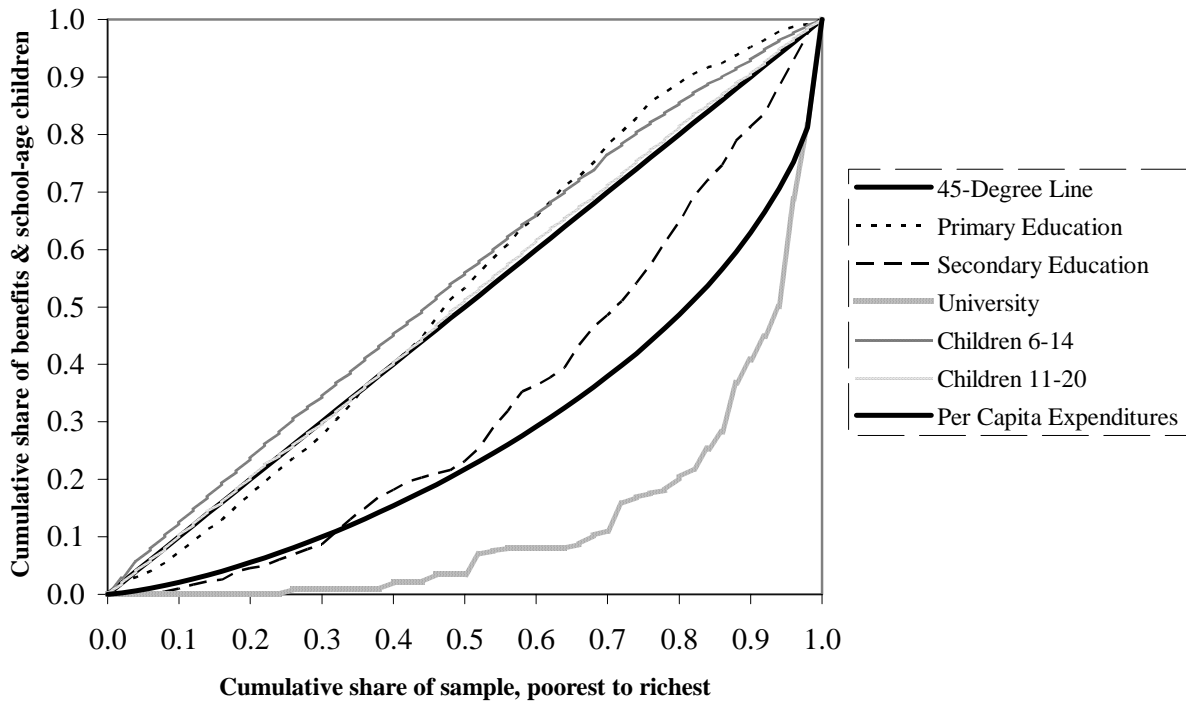**Figure 1 -** Concentration curves for public schooling, 1993/94

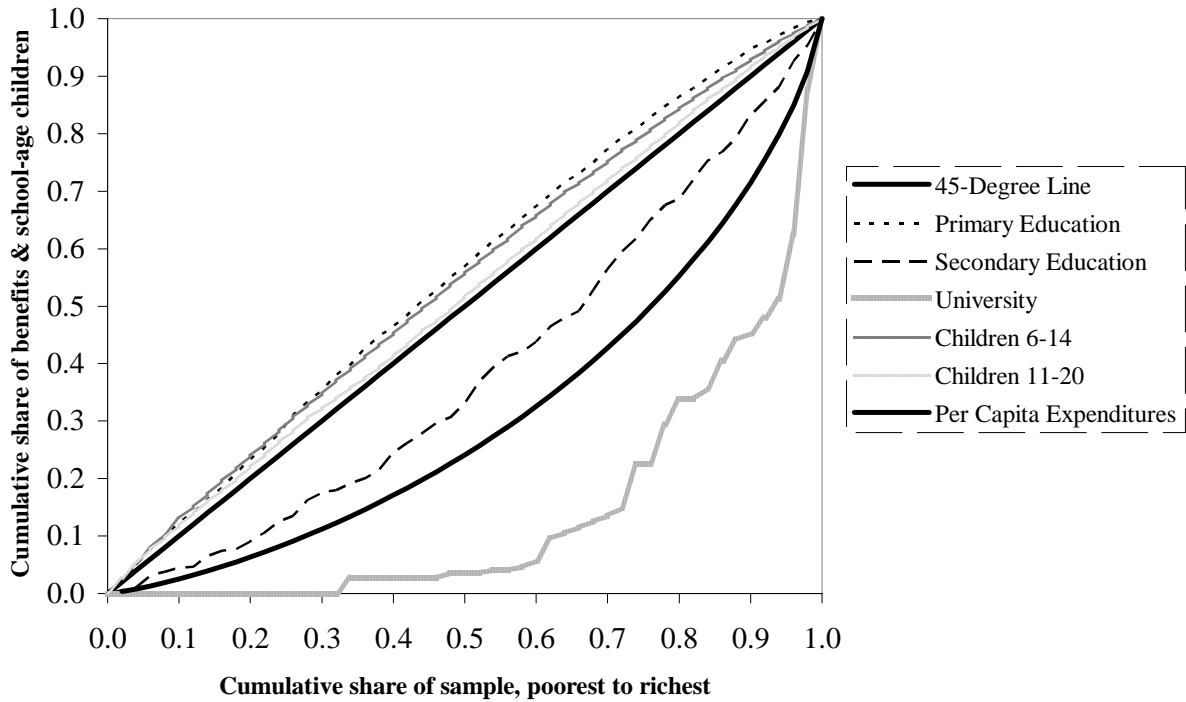**Figure 2 -** Concentration curves for public schooling, 1999

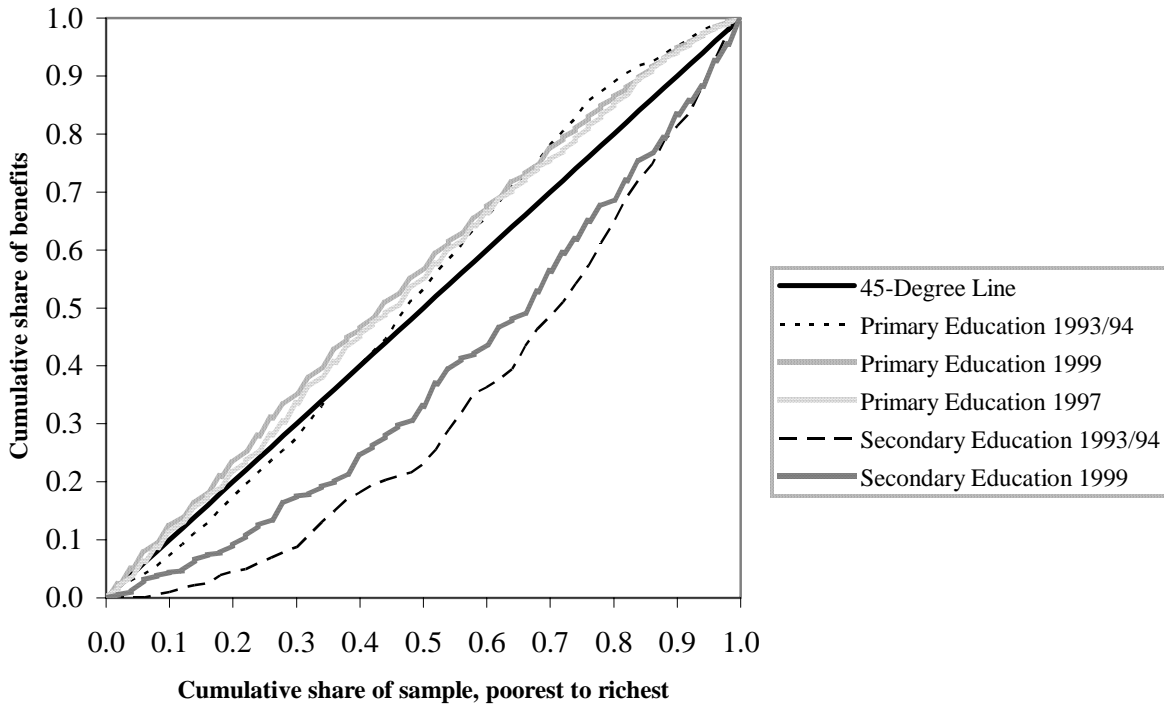**Figure 3 -** Concentration curves for public schooling, 1993/94 - 1999

Figure 4 - Concentration curves for marginal benefits: public primary
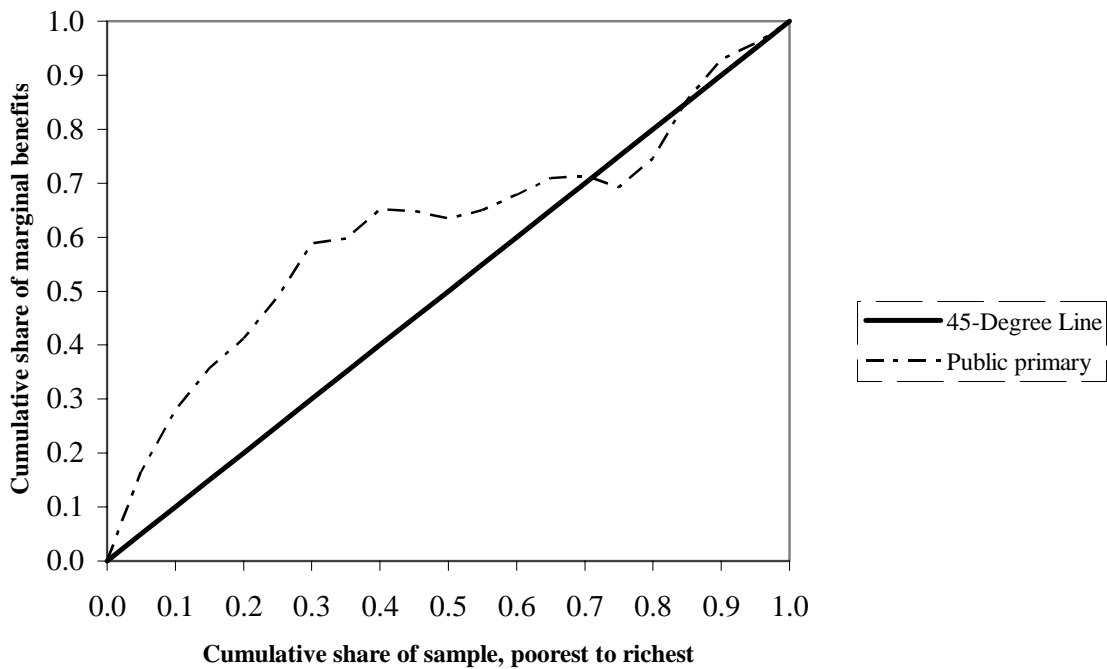enrollments, 1993/94-1999

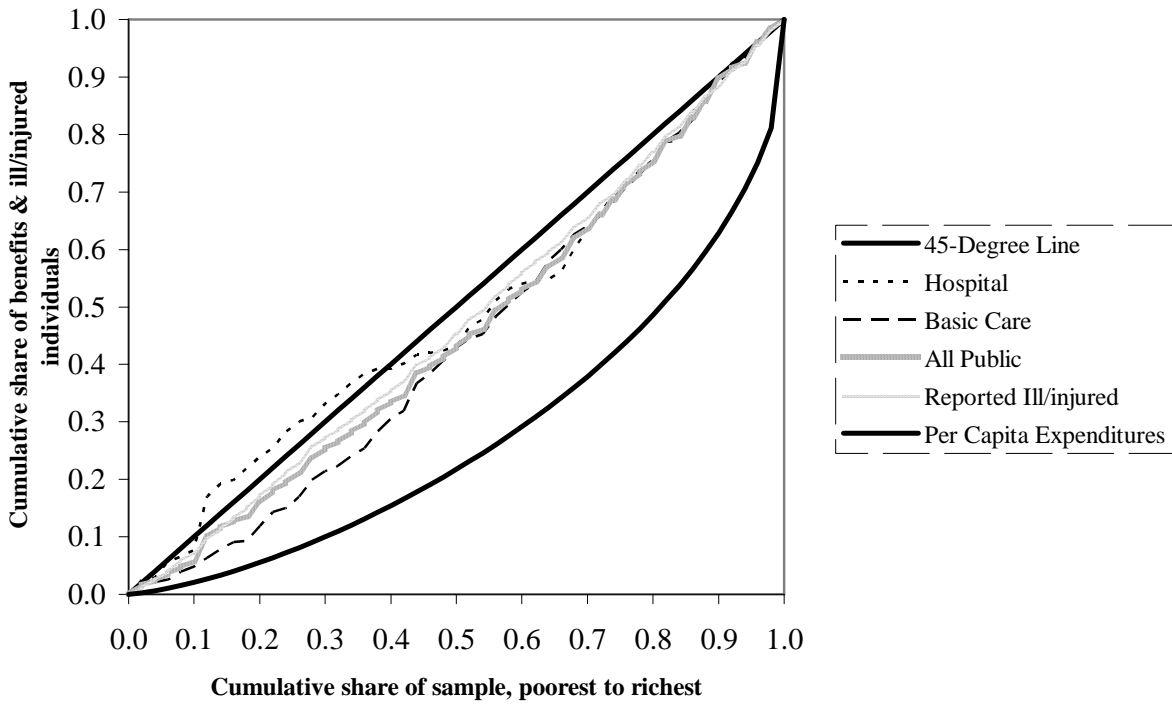**Figure 5 -** Concentration curves for out-patient public health services, 1993/94

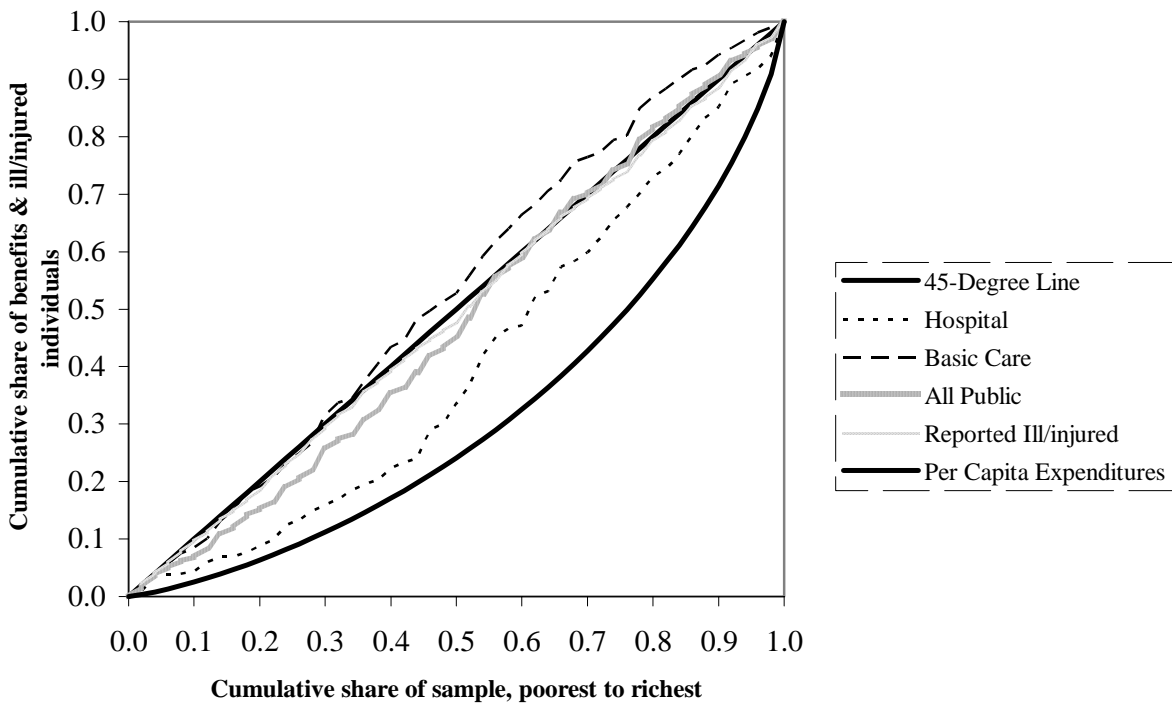**Figure 6 -** Concentration curves for out-patient public health services, 1999

Figure 7 - Concentration curves for out-patient public health services, 1993/94-1999
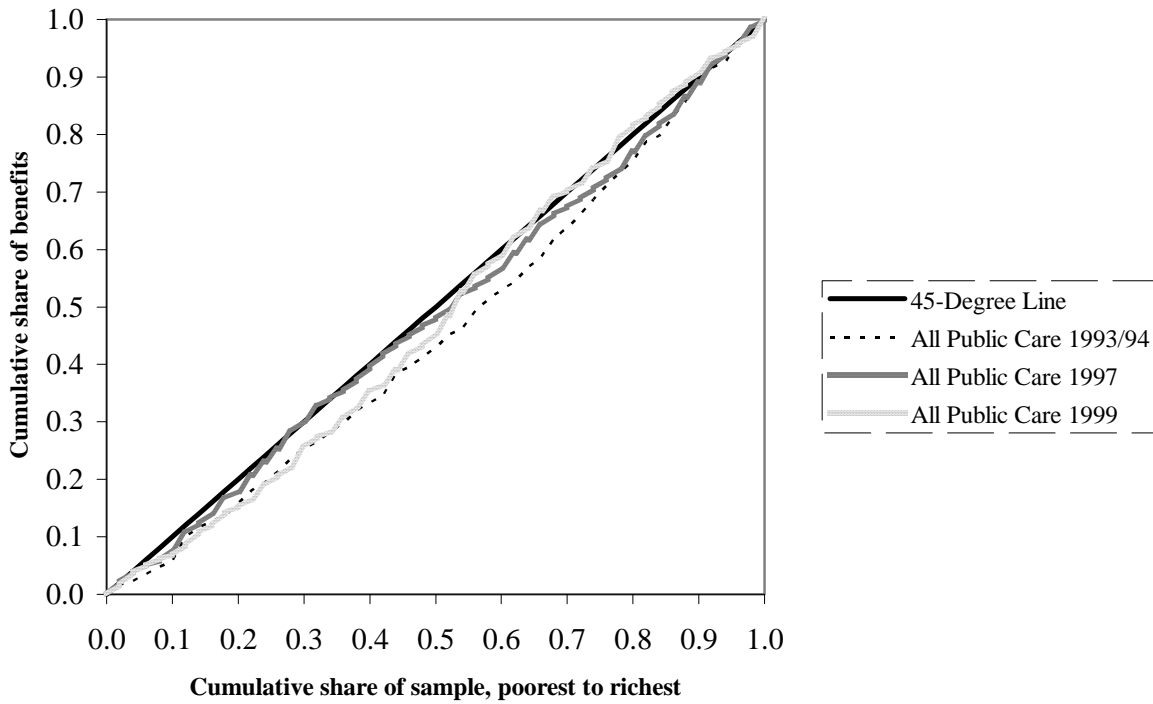

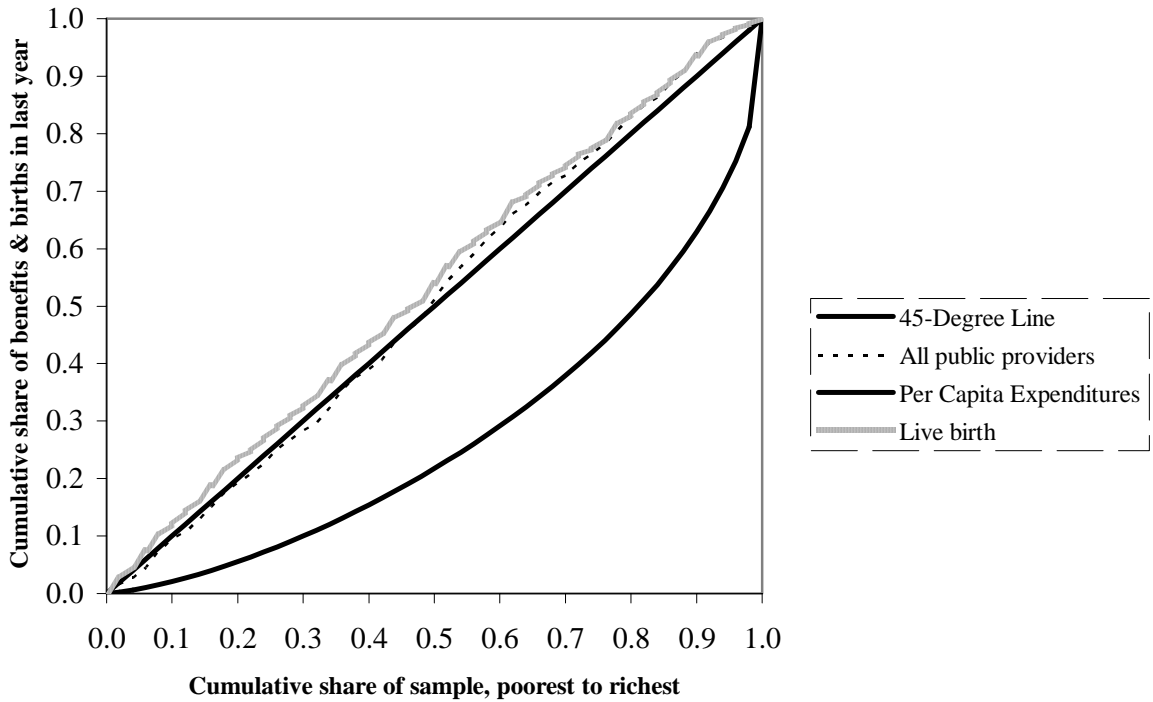**Figure 8 -** Concentration curves for public prenatal care, 1993/94

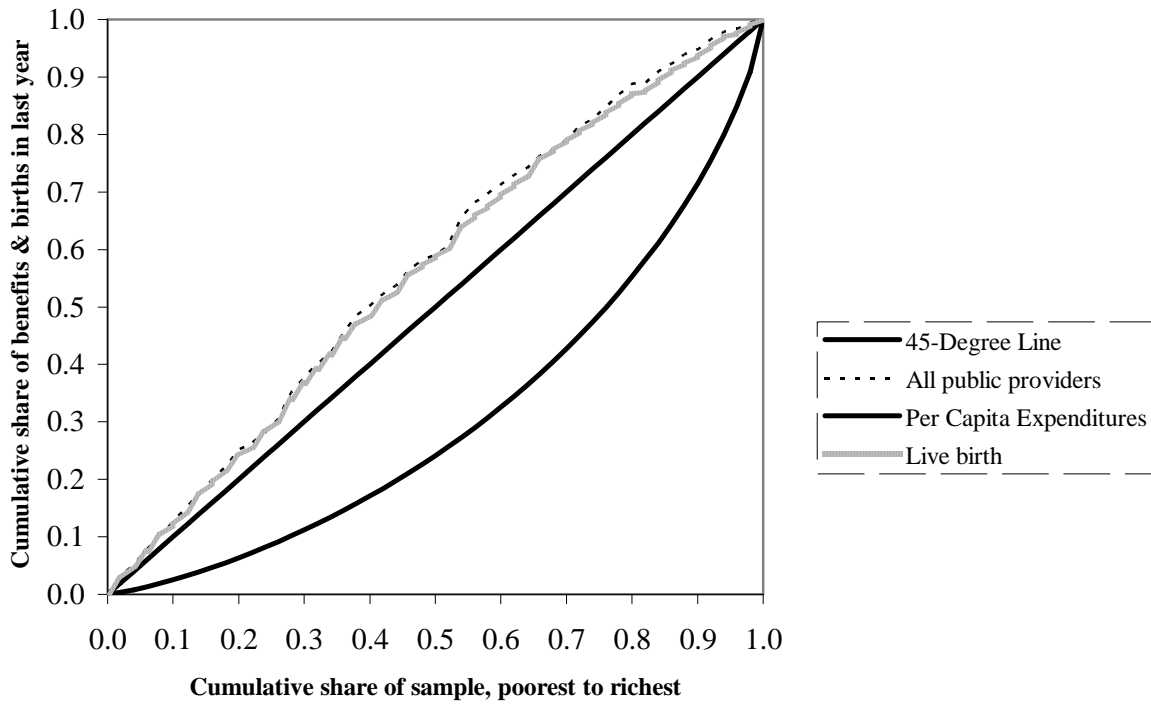**Figure 9 -** Concentration curves for public prenatal care, 1999

Cumulative share of benefits & births in last year

Cumulative share of sample, poorest to richest

45-Degree Line
All public providers
Per Capita Expenditures
Live birth

Figure 10 - Concentration curves for public prenatal care, 1993/94 -1999

Cumulative share of benefits

Cumulative share of sample, poorest to richest

45-Degree Line
All Public Providers 1993/94
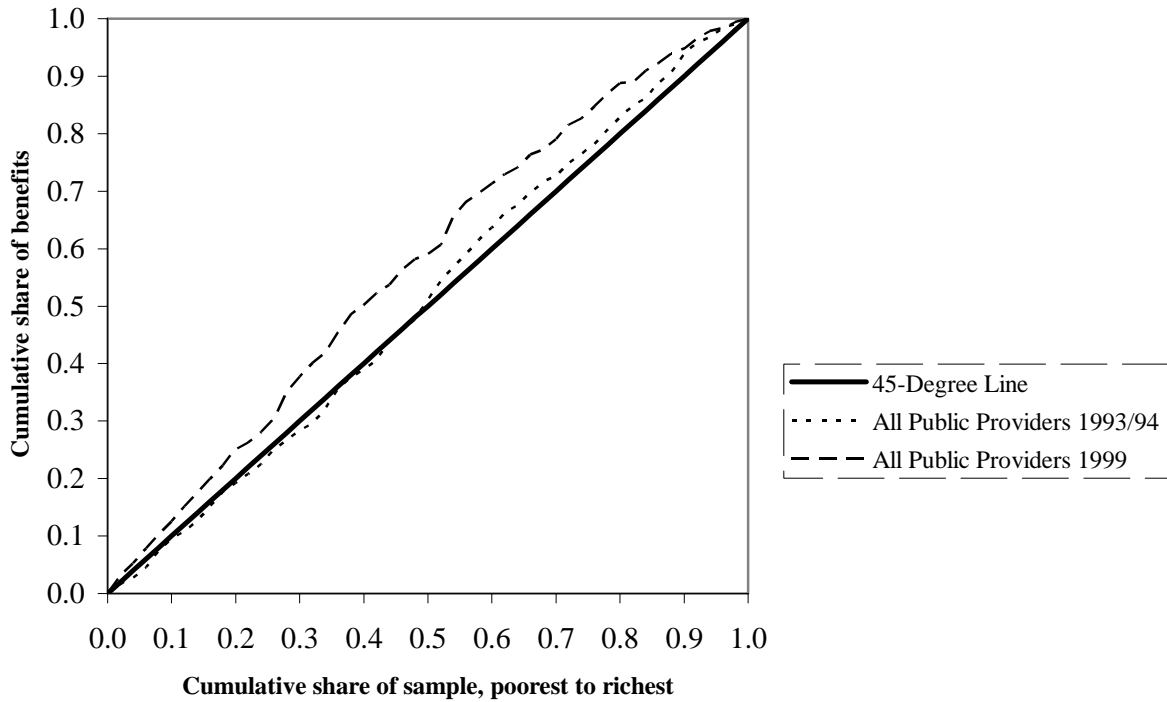All Public Providers 1999

Figure 11 - Concentration curves for vaccinations (children 12-23 months), 1993/94
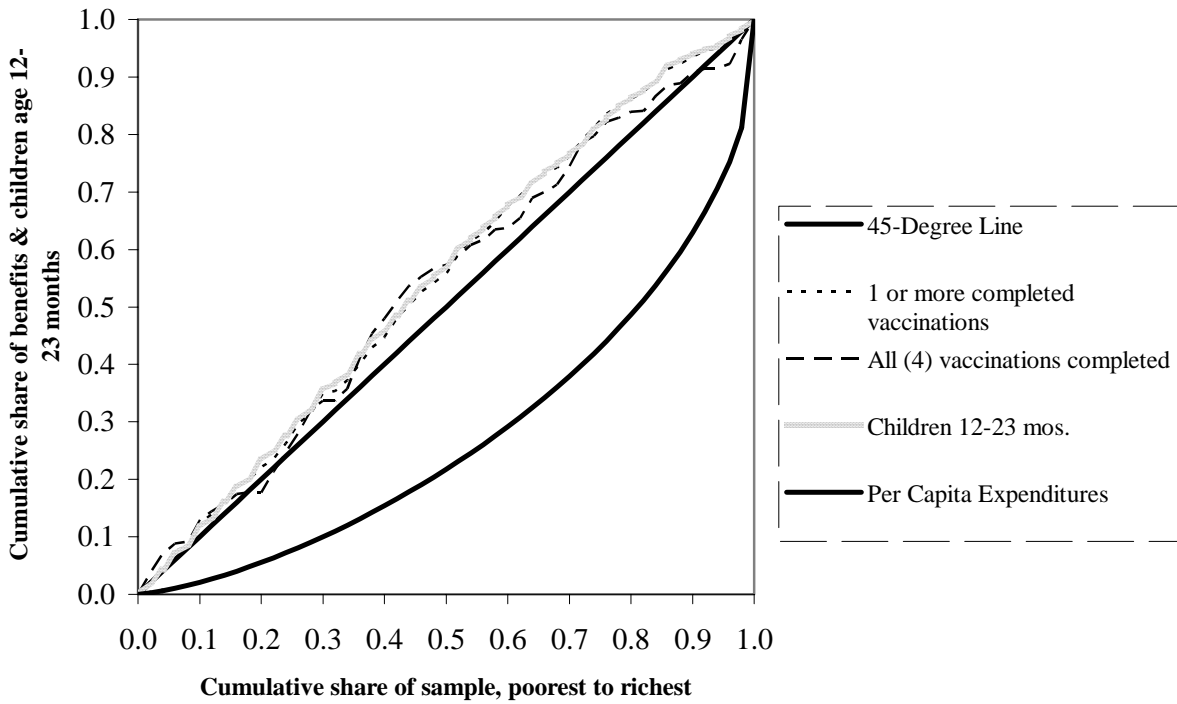

Figure 12 - Concentration curves for vaccinations (children 12-23 months), 1999