

# **Attacking Poverty in Papua New Guinea, But For How Long?**

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## **Abstract**

The issue of poverty is receiving increased attention in Papua New Guinea. But the existing evidence gives no indication of when poverty might be eliminated and has nothing to say about how economic growth might reduce poverty. This paper uses a new measure of poverty which shows the average time taken to exit poverty with a constant and uniform economic growth rate. Under historical growth rates, it would take an average of 20 years for poor Papua New Guineans to escape from poverty. The fight against rural poverty is likely to take even longer, because the rural poor are further below the poverty line and are likely to face lower economic growth rates. Limited temporal comparisons suggest that the time taken to escape poverty is rising rather than falling in Papua New Guinea.

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## **ATTACKING POVERTY IN PAPUA NEW GUINEA, BUT FOR HOW LONG?**

The issue of poverty is receiving increased attention in Papua New Guinea. The proposed Medium Term Development Strategy (MTDS) for 2003-2007 has a theme of poverty alleviation and rural development. The MTDS is formulated by the Department of National Planning and Monitoring, in cooperation with other government departments and community stakeholders, so the emphasis placed on poverty alleviation seems to indicate an acceptance by Papua New Guineans of the relevance of the poverty issue. In contrast, it was often assumed in the past that there was no poverty in Papua New Guinea because of the readily available land, the strength of subsistence production and cultural norms about redistribution (FAO/UNDP/DPI, 1983; Morauta, 1981). This questioning of old assumptions is also mirrored in some other countries in the South Pacific, where more attention is being paid to the issue of poverty (MacWilliam, 2002).

The heightened awareness of poverty may also reflect a realisation by local policy makers that international donors now place many of their activities within a framework of poverty reduction. For example, according to the World Bank, its dream “is a world free of poverty” and this emphasis is also apparent in the recent *World Development Report*, which is sub-titled “Attacking Poverty” (World Bank, 2000). Similarly, the Asian Development Bank promotes itself as “fighting poverty in Asia and the Pacific” and has recently issued a major report on poverty in the Pacific (ADB, 2001). Thus, poverty reduction is the catchphrase of the current era, just as “basic needs” and “structural adjustment” were in earlier periods.

Regardless of the motives for the new interest in poverty, it would seem to be useful to know just how long it might take to eliminate poverty in Papua New Guinea. Surprisingly, however, the existing evidence gives no indication of when poverty might be eliminated and

has nothing to say about how economic growth might reduce poverty. Hence, the government and donors are unlikely to know how long they will need to be “attacking poverty” and are also unlikely to know what the exact relationship is between growth and poverty reduction, despite the widespread interest in this topic (Dollar and Kraay, 2000).

The existing evidence on poverty in Papua New Guinea relies on the ‘head-count index’, which simply counts the poor, and on the ‘poverty gap index’, which shows their average shortfall from the poverty line (World Bank, 1999). Neither measure reflects changes in the distribution of incomes amongst the poor, yet a key feature of Papua New Guinea is the enclave nature of development with consequently high levels of inequality (Baxter, 2001). It is possible to produce a statistic that is sensitive to inequality by squaring the poverty gap index (Foster, Greer and Thorbecke, 1984) but this then destroys any intuitive interpretation of the resulting ‘poverty severity’ measure.

This paper uses a new measure of poverty to illustrate just how long the fight against poverty in Papua New Guinea might have to last. This measure, which has been developed by Morduch (1998), shows the average time taken to exit poverty under idealised conditions of a constant and uniform growth rate. This poverty measure is sensitive to inequality amongst the poor, which makes it well-suited for Papua New Guinea where there is a high but variable level of inequality. It is also desirable because it has an intuitive interpretation that gives an answer to a natural question – how long might it take to be free of poverty?

### **The Average Exit Time Measure of Poverty**

Morduch (1998) shows that if the income (or consumption) of a poor person,  $y_j$  grows at a constant positive rate  $g$  per year, the number of years it will take them to reach the poverty

line,  $z$  is:

$$t_g^j = \frac{\ln(z) - \ln(y_j)}{g}.$$

For example, if the poverty line is set at a consumption level of K400 per person per year, someone whose annual consumption level is initially K280 would reach the poverty line, and hence exit poverty, after 17.8 years if the growth rate is two percent per annum (see below for evidence on these particular values). The path taken to get to the poverty line under these assumptions is shown by the bold graph line in Figure 1. When a similar calculation is made for all poor people, the average exit time for the poor,  $\Gamma_g$  can be calculated as:

$$\Gamma_g = \frac{1}{q} \sum_{j=1}^q t_g^j$$

where  $q$  is the total number of the poor.

This exit time measure is sensitive to inequality amongst the poor, which is a desirable property of a poverty measure. Carrying on with the example of a poverty line of K400, two per cent growth and an initial consumption level of K280 per year, the impact of inequality can be demonstrated by taking K80 from one poor person and giving it to another. For the recipient of this transfer, their initial consumption level rises to K360 per year and it then takes them just 5.3 years to exit poverty. In contrast, the person who was made K80 worse off would see their starting annual consumption level fall to just K200, and from that point it would take 34.7 years to reach the poverty line. These two different paths to the poverty line are shown by the dashed lines in Figure 1. The average exit time in this unequal two-person society is 20.0 years  $[(5.3+34.7)/2]$ , which is higher than the 17.8 year average exit time that would apply if the consumption levels of these two persons were equalised at K280. The extra 2.2 years in the average exit time reflects the contribution of inequality. In fact, Morduch (1998) shows that if the exit time using the average income of the poor is denoted

$t_g^{avg}$  then the average exit time of the poor can be decomposed into two parts:

$$\Gamma_g = t_g^{avg} + L_g$$

where  $L_g$  is the Theil index of inequality amongst the poor, divided by the growth rate  $g$ .

### Relationship to Other Poverty Measures

If the average exit time measure is calculated over the whole population,  $N$  including the non-poor for whom  $t_g^j=0$ , the result is just a transformation of a previously defined poverty measure, known as the Watts index,  $W$ :

$$W = \frac{1}{N} \sum_{j=1}^q [\ln(z) - \ln(y_j)]$$

The transformation in this case is to divide  $W$  by the growth rate,  $g$  (Morduch, 1998). Despite being sensitive to inequality amongst the poor and decomposable amongst population sub-groups, the Watts measure was never as popular as the Foster, Greer and Thorbecke (1984) class of poverty measures (hereafter referred to as FGT). The FGT measures have previously been used in Papua New Guinea by the World Bank (1999) and have the general formula:

$$P_a = \frac{1}{N} \sum_{j=1}^q \left( \frac{z - y_j}{z} \right)^a \quad a \geq 0$$

where the parameter  $\alpha$  reflects poverty aversion, with larger values putting higher weight on the poverty gaps of the poorest people. If  $\alpha=0$ , the equation reduces to  $q/n$ , which corresponds to the commonly used head-count ratio that just indicates the proportion of the population that are poor. Setting  $\alpha=1$  amounts to aggregating the proportionate poverty gaps, which shows the average shortfall of the poor's consumption (or income) from the poverty line expressed as an average over the whole population. For example, with a poverty line of K400 and a population of four persons, two of whom have a consumption level of K280 and two of whom are above the poverty line,  $P_1 = (0.3 + 0.3) / 4 = 0.15$ . In other words, the

average poverty gap, when spread over both poor and non-poor, is equivalent to 15 per cent of the value of the poverty line.

It is possible to get a distributionally-sensitive measure by setting  $\alpha=2$ , which amounts to weighting each proportionate gap by itself. Continuing the previous example, if K80 is taken from one poor person and given to the other, the  $P_1$  measure will not change because the average shortfall from the poverty line is unchanged, but the squared poverty gap ( $P_2$ ) will increase from  $(0.3^2 + 0.3^2)/4 = 0.45$  to  $(0.1^2 + 0.5^2)/4 = 0.65$ . It is notable that whereas the head-count and poverty gap measures have some intuitive interpretation, the  $P_2$  index only has an ordinal meaning – no interpretation can be placed on the particular value of 0.65 except in comparison with some other values of the  $P_2$  index.

## **Data**

The existing evidence on poverty in Papua New Guinea comes from a 1996 survey, collected for a World Bank poverty assessment (World Bank, 1999). These same data are used here to calculate the poverty exit time and to illustrate the impact that economic growth can have on poverty reduction. The only additional data needed are the estimates of the growth rate,  $g$  used in the calculation of the average exit time. Baxter (2001) reports that between 1990-99, Papua New Guinea's GDP per person grew at an annual average rate of 2.3 per cent, although over the longer term the growth rate is rather lower. Some of the GDP growth is accounted for by investment and exports associated with resource projects, so the more relevant growth rate in private consumption is likely to be lower. Therefore, as an upper bound, we use a growth rate of two per cent in most of the calculations; using a lower growth rate would have the effect of raising the average time taken to escape from poverty.

The 1996 survey used by the World Bank (1999) measured the expenditures of a random

sample of 1144 households, located in 73 rural and 47 urban communities (weights are used to ensure that the results are nationally representative). The survey did not attempt to measure incomes, but this is no disadvantage because expenditure is the preferred monetary indicator of living standards when measuring poverty (Deaton, 2000). Full details on the collection and processing of the expenditure data are reported in Gibson (2000). Because of the considerable regional price variation in Papua New Guinea, a spatial price index (set for five different regions) was applied to the nominal expenditure estimates for each household, so as to convert them into national average prices prior to the calculation of the poverty measures. This spatial price index was based on a “cost-of-basic-needs” poverty line (Ravallion and Bidani, 1994) calculated from the cost of a diet of locally consumed foods providing 2200 calories per day, with an additional allowance for non-food spending. The non-food allowance used here is the lower of the two calculated by the World Bank (1999). The overall cost of the food and non-food components in this poverty line was K400 in 1996.

In 1996, the average value of (spatially-deflated) household expenditures was K900 per adult-equivalent per year. This figure makes allowance for differences in household size and composition by dividing by the number of adult-equivalents, where children aged 0-6 years count as 0.5 of an adult (Gibson, 2000). There is a considerable skew in the distribution of expenditures, so the median expenditure level is only K580 (or K510 in *per capita* terms when no allowance is made for differences in consumption needs of children and adults). This skew is also shown by the high degree of inequality, with the Gini coefficient of 0.49 being higher than that reported in other Asia-Pacific countries (World Bank, 1999).

### **Aggregate Poverty Estimates**

Table 1 reports the FGT and average exit time poverty measures for Papua New Guinea in

1996. The first two FGT poverty measures show that 30.4 per cent of the population are classified as poor (a higher figure of 37.5 per cent results from using the more generous non-food allowance in the poverty line). The aggregate poverty gap is equivalent to 9.1 per cent of the value of the poverty line averaged over the whole population (equivalently, a gap of 30 per cent averaged over just the poor). The aggregate shortfall from the poverty line can also be calculated in monetary terms, by multiplying the  $P_I$  index by the value of the poverty line and by the population size (4.3 million adult-equivalents). This calculation shows that in 1996 it would have required perfectly targeted (and costless) transfers of K160m per year to eliminate poverty in Papua New Guinea. It is likely that the amount needed now would be rather larger. Although the head-count and poverty gap measures are easily grasped, neither of them reflects the distribution of living standards amongst the poor. The poverty severity index, which is sensitive to inequality amongst the poor, had a value of 3.9 per cent in 1996 but this is simply a number with no interpretation except in comparison to other values of the same index.

The average exit time in Table 1 is calculated for a potential growth rate of real consumption per adult-equivalent of two per cent per year. The average time taken for the poor to exit poverty would be 20.5 years if this growth rate was continuous and uniform across the population. This is clearly an unrealistic, best-case, scenario because growth is rarely uniform and even more rarely continuous, especially in Papua New Guinea where boom and bust conditions often prevail. However, the poverty gap measure conveys meaningful information under equally unrealistic conditions – perfect targeting and costless redistribution – but that has not diminished its usefulness.

It is also possible to demonstrate the contribution of inequality to this average exit time. The

average expenditure level of the poor is K280 per adult-equivalent per year, and starting from this point and growing by 2% per year, it would take 17.8 years to reach the poverty line. Thus, in Papua New Guinea inequality amongst the poor adds just over three years to their average exit time.

### **Economic Growth and Rural and Urban Poverty Exit Times**

Even if poor people in rural and urban sectors face the same growth rate, the average exit time for the rural poor, at 21 years, is almost twice as long as for the urban poor, for whom the average exit time is only 11.9 years. The reason is that the rural poor are, on average, further below the poverty line; the average consumption level of the rural poor is K277 per adult equivalent per year, compared with K322 in the urban sector. Hence, while the rural sector contributed 85 per cent of the total population in 1996, it contributed 94 per cent of the total headcount poverty and 97 per cent of the total exit time.

The situation for the rural poor is potentially much worse than the above calculations suggestion because it is likely that they face a lower economic growth rate. In fact, the evidence suggests that the economic growth rate in large parts of the rural sector may even be negative (Baxter, 2001). Because the average exit time maps a static income distribution into the dimension of time, raising the growth rate in the calculation automatically reduces exit times (Morduch, 1998). Nevertheless, such exercises can demonstrate the potential effects of the unbalanced growth that seems to be occurring in Papua New Guinea. For example, if annual consumption growth in the rural sector is only, say, one per cent while in the urban sector it is three per cent, this unbalanced growth combines with the initially lower incomes in the rural sector to produce a large gap in exit times. This is apparent from Figure 2, which shows  $\Gamma_g$  for each sector as  $g$  varies. At a one per cent growth rate, the average exit time for

the poor in rural areas is 42 years, while at a three per cent growth rate the average exit time for the urban poor is only 7.5 years. This gap of 35 years in the expected time to exit from poverty indicates the substantial disadvantage facing the rural poor in Papua New Guinea.

The other striking feature of Figure 2 is the large reduction in the expected time taken to exit poverty as the growth rate increases. Of course, this calculation assumes that growth is continuous and uniformly distributed and a failure of those conditions will raise the expected exit time. Nevertheless, the potential for robust and widespread economic growth to make rapid inroads into Papua New Guinea's poverty problem should not be understated.

### **Temporal Poverty Comparisons**

The success of policies that are aimed at reducing poverty can be easily evaluated by measuring changes in the average exit time from one period to another. This is a better criteria than measuring temporal changes in the headcount index because the exit time will penalise any worsening of inequality amongst the poor. In contrast, targeting the headcount index can give a perverse incentive to direct efforts towards the *least* poor, who are the easiest to move above the poverty line.

In Papua New Guinea, the only previous poverty estimates are for the capital city, Port Moresby, and are based on a survey of 325 households in 1986 (Gibson, 1996). The expenditure estimates from this survey were collected from individuals recording their expenditures in diaries and do not include services from dwellings and durables (in contrast to the estimates used above). Moreover the poverty line that was set just for Port Moresby in 1986 has a more generous allowance for non-food items, and was valued at K620 (in the higher capital city prices rather than in national average prices). In the 1996 survey, 106

households had their expenditures collected in a similar manner to the 1986 survey and these households, along with an inflation-adjusted poverty line, are used for the comparisons.

With these adjusted expenditures and poverty lines, the head-count poverty rate in Port Moresby in 1986 is 33.7% and in 1996 it is 29.7%. While this difference is not statistically significant ( $p < 0.60$ ), policy makers might be tempted to conclude that there is at least an indication of some reduction in poverty. Such a conclusion would be tempered by the higher point estimates for the poverty gap and poverty severity measures, although in neither case are the changes statistically significant at usual levels.

However, a much different message about the change in poverty comes from the poverty exit time, which increased by 13.5 years during this period, and this is a statistically significant change ( $p < 0.02$ ). In other words, over the 10-year period from 1986, there appears to have been a significant increase in the permanence of the poverty problem in Port Moresby. Part of the increase in poverty exit time is due to a rise in inequality, as shown by the Theil index for the poor, which increased from 0.026 to 0.076. When rescaled into units of time, inequality amongst the poor added 1.3 years to their average exit time in 1986 and 3.8 years in 1996. The remaining 11-year increase in the exit time is due to the fall in the average living standards of the poor, with mean expenditures at only 59% of the poverty line in 1996, compared with 74% in 1986.

## **Conclusions**

The increased attention paid to poverty issues in Papua New Guinea has not yet been reflected in the adoption of official targets for poverty reduction. The evidence presented in this paper suggests that one sensible target to adopt would be the expected time for poor

people to exit poverty. This measure is easy to calculate and interpret, is sensitive to a worsening of living standards amongst the poor, and can help illustrate the potential for economic growth to reduce poverty.

In the empirical part of the paper, this exit time measure has been combined with existing evidence on the consumption levels of the poor in Papua New Guinea and on historical growth rates. The results suggest that the expected time taken to exit poverty in Papua New Guinea was approximately 20 years in 1996. Hence, any poverty reduction strategies have to recognise the long-term nature of the fight against poverty. These strategies also need to recognise the more difficult circumstances of the rural poor, who are both further below the poverty line and experiencing lower growth rates. Both of these factors combine to lengthen the time that a rural Papua New Guinean can expect to be poor. Only limited evidence on poverty in earlier periods is available but the comparisons suggest that the expected amount of time taken to exit poverty is getting longer rather than shorter.

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Figure 1 Time to Exit Poverty From Different Starting Levels of Consumption With a Continuous Two per cent per annum Growth Rate

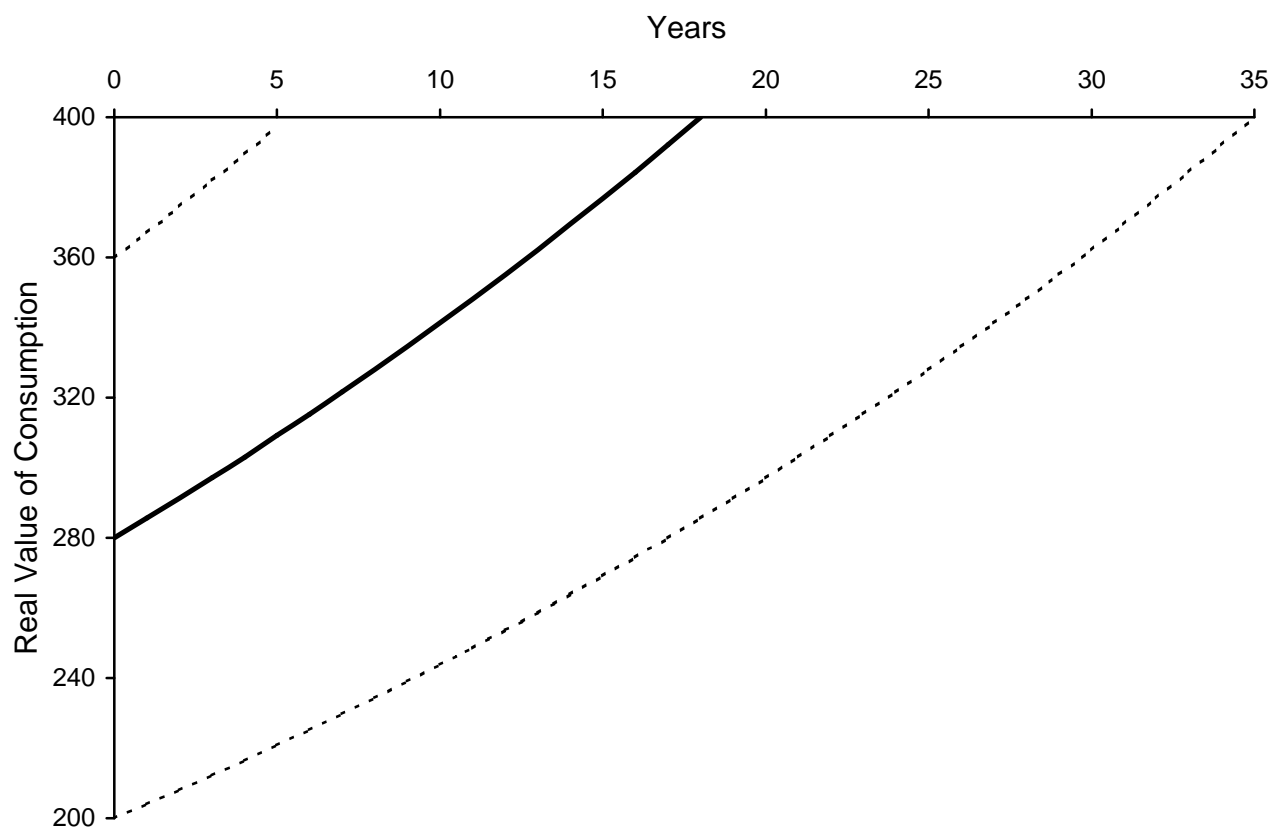


Figure 2 Average Exit Time of the Poor Population

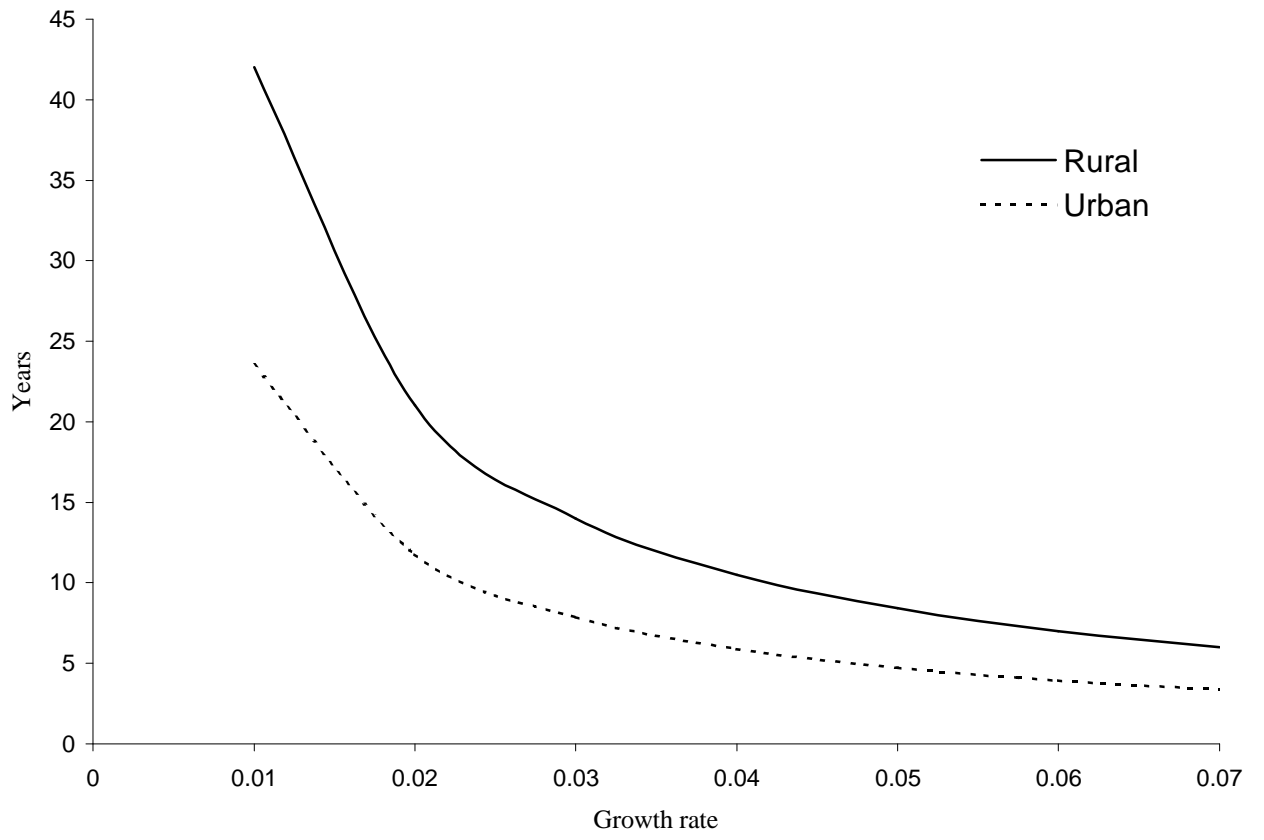


Table 1 **Aggregate Poverty In Papua New Guinea, 1996<sup>a</sup>**

FGT Poverty Measures			
<i>Headcount</i> ( <b>a=0</b> )	<i>Poverty Gap</i> ( <b>a=1</b> )	<i>Poverty Severity</i> ( <b>a=2</b> )	<i>Average Exit Time</i> ( <b>G<sub>2%</sub></b> )
30.4	9.1	3.9	20.5
[2.6]	[1.1]	[0.6]	[1.6]

<sup>a</sup> Standard errors in [ ] are adjusted for the clustering, weighting and stratification of the data.

Source: Author's calculations from 1996 Papua New Guinea household survey data.

Table 2 **Poverty Comparisons for Port Moresby, Papua New Guinea, 1986 and 1996<sup>a</sup>**

	FGT Poverty Measures			
	<i>Headcount</i> ( <b>a=0</b> )	<i>Poverty Gap</i> ( <b>a=1</b> )	<i>Poverty Severity</i> ( <b>a=2</b> )	<i>Average Exit Time</i> ( <b>G<sub>2%</sub></b> )
1986	33.7	8.9	3.1	16.5
	[3.7]	[1.3]	[0.6]	[1.3]
1996	29.7	12.1	6.3	30.0
	[6.7]	[2.9]	[1.8]	[5.1]
<i>t</i> -test for difference	<i>t</i> =0.53	<i>t</i> =1.04	<i>t</i> =1.71	<i>t</i> =2.58
<i>p</i> -value	0.60	0.30	0.09	0.01

<sup>a</sup> Standard errors in [ ] and *t*-tests are adjusted for the clustering, weighting and stratification of the data.

Source: Author's calculations from 1986 and 1996 Port Moresby household survey data.