# CENTRE FOR
# SOCIAL SCIENCE RESEARCH

## Southern Africa Labour and Development Research Unit

# ASSET-BASED VERSUS MONEY METRIC POVERTY INDICES IN SOUTH AFRICA: AN ASSESSMENT USING THE CHRONIC POVERTY RESEARCH CENTRE RSA 2002 SURVEY

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# Asset-Based versus Money Metric Poverty Indices in South Africa: An Assessment using the Chronic Poverty Research Centre RSA 2002 Survey

## Abstract

*Using data from a detailed chronic poverty survey of three South African communities, this paper compares the correlations between traditional (i.e. income and expenditure) and wealth-based measures of poverty in ranking households as poor as well as their ability to explain additional qualitative measures of persistent poverty such as household hunger. We find significant locational differences in terms of the composition of household wealth measures and this complicates the derivation of appropriate wealth indices. Traditional money-metric measures of poverty that abstract from location appear to explain short-term measures of deprivation like household hunger relatively well, and consistently capture the bottom and top deciles of the distribution. On their own, wealth-based measures appear less suited to explaining household hunger, suggesting that liquid based measures for short-term indicators are more appropriate.*

## 1. Introduction

There is a substantial literature on the inadequacies of traditional quantitative income and expenditure measures in explaining chronic or persistent poverty, both because of difficulties in collecting the requisite data as well as their perceived inability to deal with the structural components of poverty. This has forced researchers to combine qualitative with quantitative approaches (see Carcallio and White (1997) and Sahn (2003) for good introductions), as well as to explore quantifiable non-money metric measures of poverty, including poverty rankings based on households' assets or wealth. Wealth-based measures

are often seen to provide a more reliable indicator of poverty than metric measures (see Filmer and Pritchet (2001) and Sahn & Steifel (2003)).

The literature on poverty in South African (see Aliber (2003) for a useful overview) reflects these international trends. Earlier research on poverty that focuses on money metric measures has been criticised, and more recent research (see, for example, Carter and May (2001)) has stressed the importance of assets rather than income in smoothing consumption and coping with household shocks. At the same time, researchers such as Du Toit (2005a) have questioned the entire modernist paradigm, and argued against the attempt to combine qualitative and quantitative approaches.

This paper has two inter-linked objectives: to compare three communities captured by a chronic poverty survey using three different measures of household wellbeing, and through this to reflect on the consistency of the three measures and their ability to say something about certain qualitative dimensions of chronic poverty.

The Chronic Poverty Research Centre (CPRC) RSA 2002 survey sampled just under 2000 households in three locations during 2002. These locations spanned the peri-urban townships of greater Cape Town, the commercial farming district of Ceres, and rural settlements around Mount Frere. The survey collected detailed information on household income, expenditure and wealth (see de Swart (2003) for an overview). This survey thus allows for a detailed analysis of both traditional and more wealth-based measures of poverty at the household level, as well as giving researchers scope to map these measures to nutritional and qualitative dimensions of wellbeing.

Table 1a gives basic information about the average household in each of the three locations. The survey does not collect information on the racial classification of the household. However, the location of the household and the language spoken by the individual is a useful predictor of race. The sample in Cape Town and Mount Frere consist exclusively of black households, while Ceres includes both coloured and black households.

The average household size in the rural Mount Frere is almost twice as large as that of both Cape Town and Ceres, and children and pensionable adults make up a greater proportion of households in Mount Frere.[1] This is especially true for pensioners where in Mount Frere as many as 1 in 3 households have a

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[1] Household size was constructed from Part 1 and Part 2 of the questionnaire. Part 1 lists the number of adults in the household, and Part 2 the number of children.

pensioner. In Cape Town this figure is closer to 1 in 20.[2] Working age adults without formal employment make up a significant proportion of the adults in the average household across all three regions. The mean is positively skewed for most of the above indicators, indicating the presence of positive outliers (households that earn substantially more than average).

*Table 1a: Summary of Household Mean Information (Medians in Brackets)*

|  | *Overall* | *Cape Town* | *Ceres* | *Mount Frere* |
|---|---|---|---|---|
| Household size | 5,5 (5) | 4,3 (4) | 4,2 (4) | 7,3 (7) |
| Pensioners | 0,2 (0) | 0,07 (0) | 0,2 (0) | 0,4 (0) |
| Children | 2,4 (2) | 1,6 (1) | 1,7 (2) | 3,7 (3) |
| Adults without formal jobs | 1,7 (1) | 1,6 (1) | 0,9 (1) | 2,3 (2) |
| Adults less than 1 year in h'hold | 0,2 (0) | 0,1 (0) | 0,3 (0) | 0,1 (0) |
| Adult Equiv.[3] | 3,8 (3,4) | 3,1 (2,9) | 3,1 (2,9) | 4,8 (4,7) |
| Sample size | 1892 | 624 | 537 | 731 |

*Source*: Own calculations using CPRC RSA 2002

A household is understood in the survey as representing a person or a group of people that ate together and shared resources.[4] This definition of what constitutes a household gives households (theoretically at least) considerable discretion as to who to include in the household, so household size could be seen as an important decision variable made by households. In this regard it is interesting to note that just 73 households include adults who are not related by birth. We also observe that the number of adults that joined the household in the past year is insignificant for the median household. Most households appear relatively stable in terms of household size over the past year (i.e. the period for which we have recall income and hunger data), although our measures are incomplete.[5]

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[2] In Mount Frere 210 households have one pensioner and 45 households have two. In Cape Town 40 households have one pensioner and 2 households have 2. For Ceres the figures are 62 and 13. No households have more than 2 pensioners.

[3] Following Woolard (2001), we set c = 0,75 and θ = 0,85 in the expression $E = (N_A + c\,N_C)^\theta$ to devise an adult equivalence scale.

[4] In the Afrikaans version of the survey the definition used by the interviewer was "'n Huishouding bestaan uit 'n persoon of 'n groep persone wat saam eet en hulpbronne deel".

[5] There is a measure in the survey that captures adults who have joined the household. However, children that joined or left, and adults that left, are not captured. This omission is unfortunate. Du Toit (personal communication) has stressed the importance of especially the urban-rural migrations of children.

We choose to assume that the household is a stable unit of analysis for the entire year and we do not adjust our adult equivalent scales. In effect, we are assuming that individuals who were present in the household in the past month are representative of those that were there over the past year. In fact, of the 1892 households in our sample[6] just 204 households had adults join the household in the past year, and 13 of these had all the adults joined in the past year, i.e. the household has been in existence for less than one year. Figure 1a describes households that adults joined over the past year as a percentage of the number of 'adults' in the household. In the majority of cases new arrivals to the household constituted a minority of household members.

The survey also collects information on the kinds of negative shocks households have experienced in the past year. Figure 1b summarises this information in a box-plot by aggregating the number of different kinds of shocks households have experienced.[7] The interquartile range is shown by the dark box, with the median indicated by a white line. Households falling outside the 'whiskers' are outliers in the sense that they are more than 1 ½ times from the interquartile value.

The chart shows that households in Ceres were least likely to have experienced negative shocks over the past year, with the median household experiencing one kind of shock and one quarter of households experiencing no shocks at all. However, a number of households in Ceres are outliers. In Cape Town the median household experienced two kinds of shocks in the past year. In Mount Frere the median household experienced three kinds of shocks in the past year, and a quarter of households experienced at least four shocks.

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[6] Two households in Mount Frere, internum 100 and internum 493, were dropped from the original sample because they contained no information on adults in the household.
[7] The shocks to the household are: natural disaster; death; serious illness; loss of work of breadwinner; general unemployment; theft; assault; witchcraft; violence in the household; serious accident; livestock loss; rape; and other. The survey also records shocks the household experienced over the past five years (not discussed here).

Fig 1a: Households with Adults Joining in Past Year
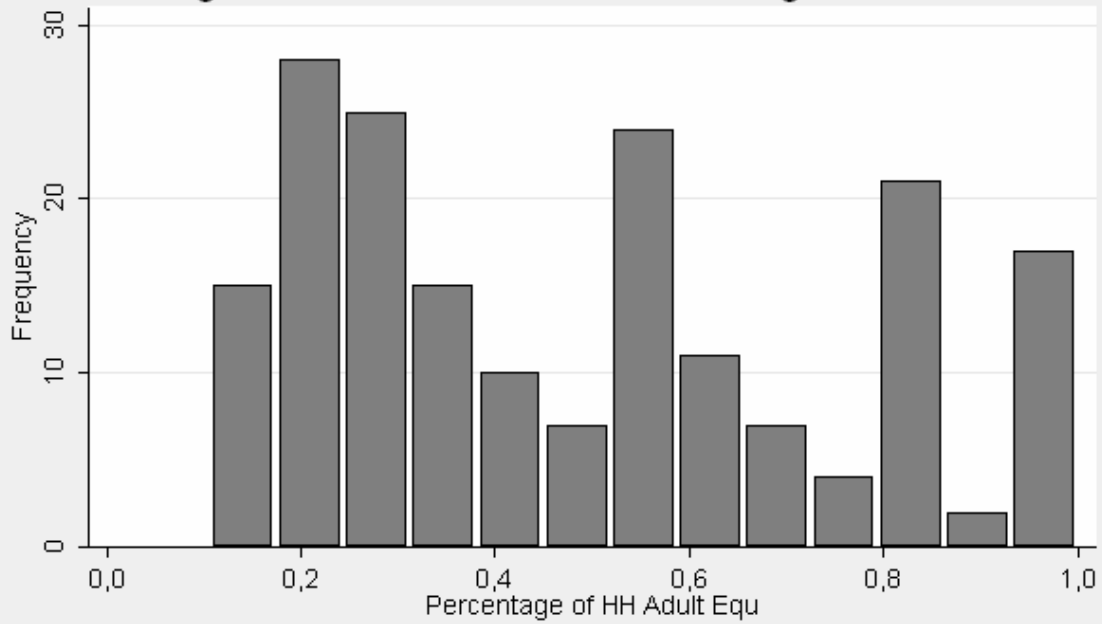
Households with no new adults not shown
Source: Own calculations using CPRC RSA 2002



Fig 1b: Household Shocks Last Year

Source: Own calculations using CPRC RSA 2002

Fig 1c: Household Ability to Cope with Shocks
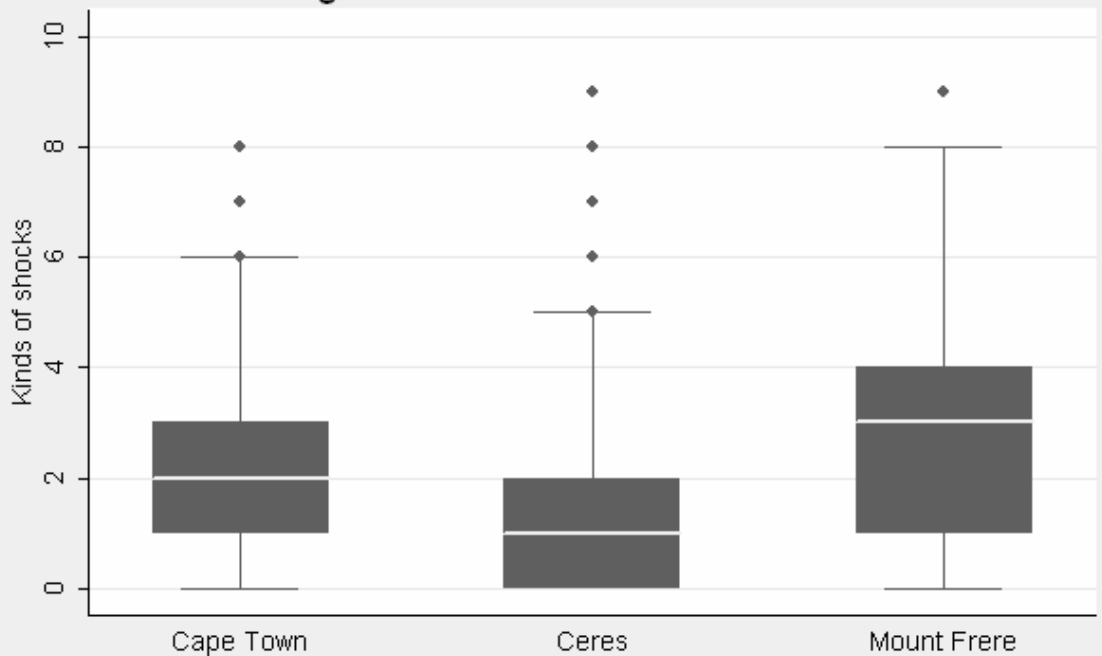
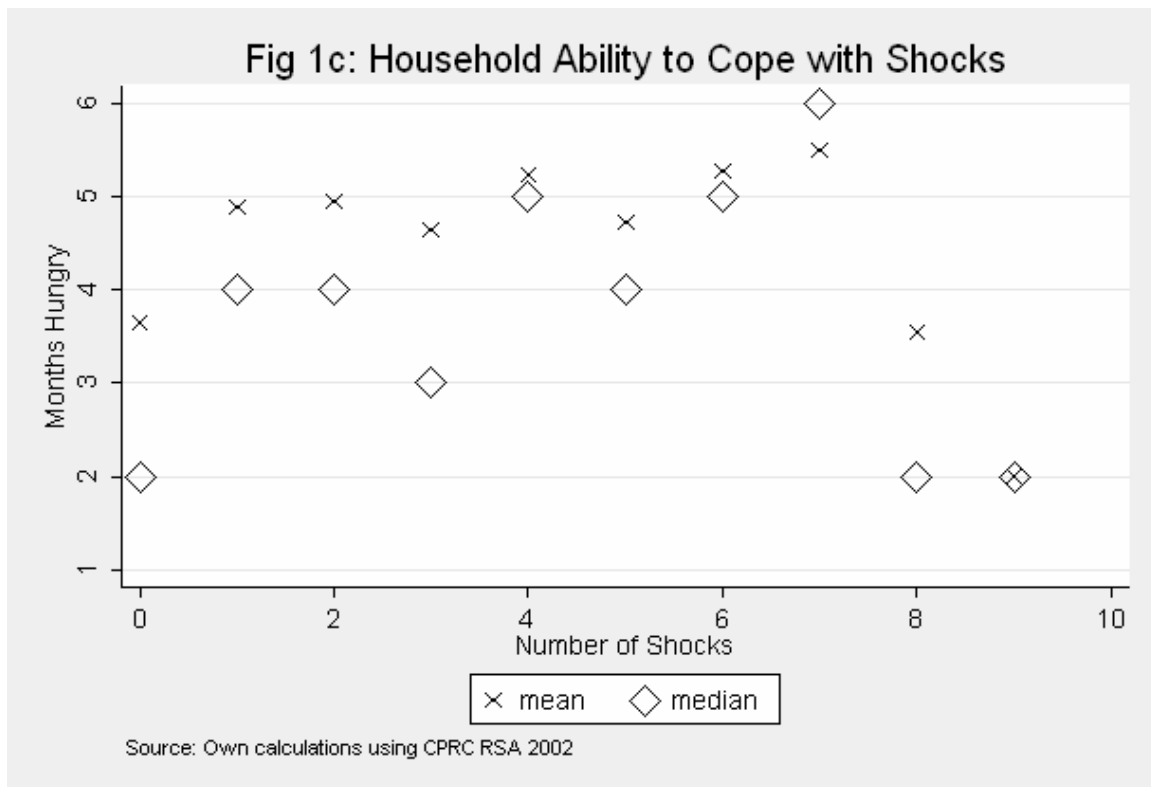Source: Own calculations using CPRC RSA 2002

Figure 1c finds no clear relationship between the number of shocks experienced by a household over the past year, and the extent to which it went hungry. Clearly, a household's ability to deal with shocks is also affected by the income and wealth available to the household, and its ability to maintain expenditure on food and other necessities. The following three sections will rank households in terms of these metrics to explore whether such a ranking affects their ability to provide for their basic needs.

# 2    Income-based rankings of poverty

Income-based measures of poverty are one of the traditional measures of household wellbeing. Our data collects information on income last month, as well as income each month over the past year.[8]   In addition, the survey identifies the source of income for each household in the past month.

Table 2a summarises the source of income from last month. While the survey collects information across nine separate categories, most households do not receive any income in each category. The table presents information for the entire sample, and across locations. Means and medians (in brackets) are

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[8] Last month's income does not refer to the same month for all households, but depends on when the household was interviewed. This month is correlated with the location of the household. The survey also collects information on last week's income.

shown.  Please note that averages are not calculated on households that did not have any income.  Instead, we show the number of households with zero income separately in the table (as n0=*x*).

One of the striking aspects about the table is households are more likely not to receive income from a particular category, than to receive income.  This is true across all nine categories, and true across all three locations.    The second striking feature is that permanent employment, with the exception of Mount Frere where grants predominate, is the most significant source of income for most households both in terms of number of households and amount of income.[9]

*Table 2a: Mean Monthly Adult Equivalent Household Income (Medians in round brackets)*

| Income Source | Total | Cape Town | Ceres | Mount Frere |
|---|---|---|---|---|
| Permanent | R420 (R278)  n=753 [n0 =1120] | R448 (R313) n=293 [n0=315] | R570 (R414) n=289 [n0=246] | R119 (R96) n=171 [n0=559] |
| Seasonal | R264 (R195) n=216 [n0=1661] | R85 (R55) n=7 [n0=604] | R332 (R276) n=163 [n=373] | R52 (R42) n=46 [n0=684] |
| Temporary | R143 (R85) n=315 [(n0=1562] | R171 (R111) n=118 [n0=493] | R163 (R127) n=120 [n0=416] | R68 (R36) n=77 [n=653] |
| Self (agriculture) | R69 (R35) n=62 [(n0=1816] | R79 (R69) n=16 [n0=597] | R248 (R242) n=6 [n0=529] | R38 (R25) n=40 [n0=690] |
| Self (non agric.) | R187 (R69) n=185 [(n0=1694] | R163 (R72) n=101 [n0=514] | R462 (R95) n=32 [n0=503] | R64 (R42) n=52 [n0=677] |
| Grants | R136 (R103) n=833 [n0=1045] | R131 (R78) n=252 [n0=361] | R210 (R174) n=139 [n0=396] | R116 (R102) n=442 [n0=288] |
| Rent | R64 (R29) n=28 [n0=1851] | R29 (R21) n=15 [n0=598] | R93 (R97) n=11 [n0=525] | R164 (R164) n=2 [n0=728] |
| Remittances | R88 (R64) n=265 [n0=1609] | R91 (R70) n=34 [n0=575] | R109 (R64) n=50 [n0=485] | R81 (R63) n=181 [n0=549] |
| Private pension | R188 (R133) n=58 [n0=1818] | R205 (R111) n=6 [n0=605] | R530 (R248) n=7 [n0=528] | R132 (R124) n=45 [n0=685] |
| Gifts | R69 (R42) n=107 [n0=1770] | R64 (R39) n=46 [n0=565] | R88 (R55) n=16 [n0=520] | R68 (R47) n=45 [n0=685] |
| Dagga | R81 (R81) n=1 [n0=1875] | n=0 [n0=611] | R81 (R81) n=1 [n0=534] | n=0 [n0=730] |
| Other | R119 (R71) n=83 [n0=1793] | R161 (R119) n=26 [n0=585] | R128 (R68) n=22 [n0=513] | R82 (R57) n=35 [n0=695] |

*Source*: Own calculations using CPRC RSA 2002
*Note*: Averages calculated on positive income [households with zero income shown in square brackets]

Figure 2a aggregates the sources of income somewhat and shows five sources of income plus total income last month.  Wage income includes temporary and

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[9] Notwithstanding the importance of seasonal employment in Ceres.  See du Toit (2005b).

seasonal income. Transfer income includes remittances and gifts. Again, we do not show income for households whose income is zero. The median household in Ceres that earns income is consistently better off across all five categories of income than in Cape Town or Mount Frere. The results are less unambiguous for the inter-quartile range, although in terms of total income, the interquartile range in Ceres lies consistently above that of Mount Frere.



Fig 2a: Sources of Income
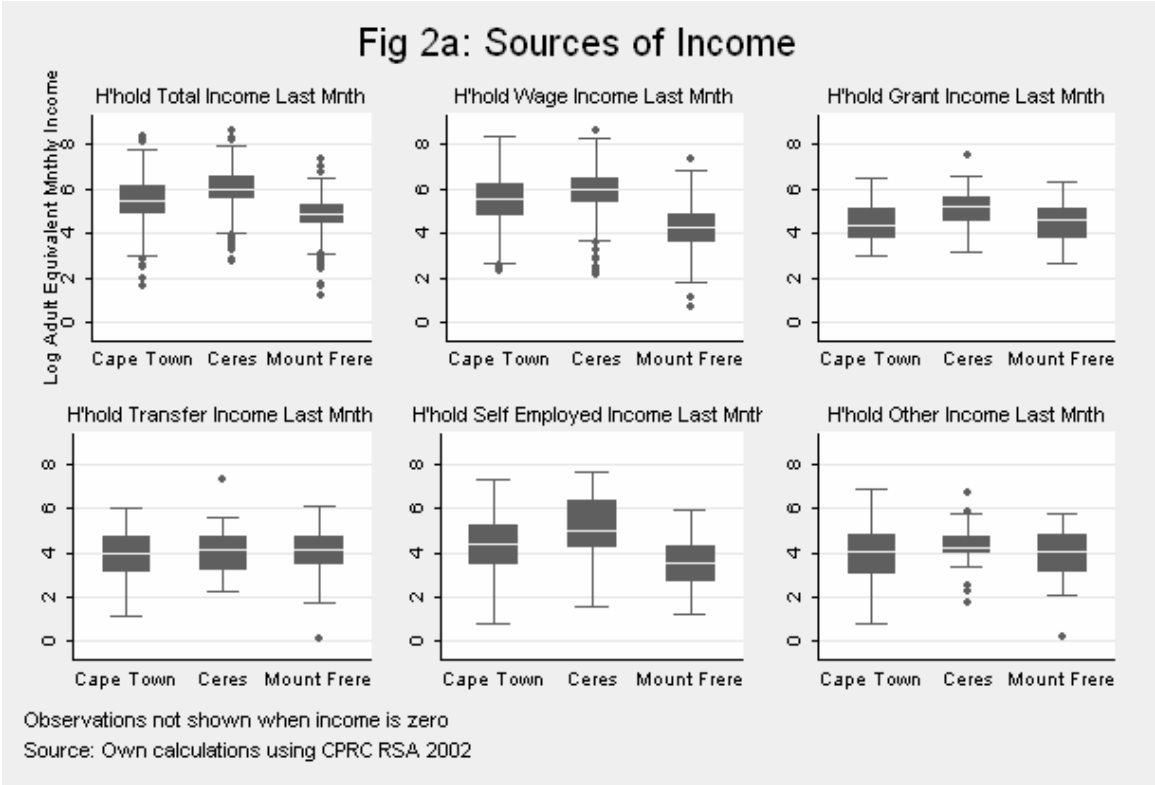
How useful are these measures of income in developing a poverty ranking? Clearly, having households that all have zero income impedes our ability to discriminate across households. This forces us to use aggregate income measures, as here households are much more likely to have some income, so we can disaggregate households into (for example) deciles.

Table 2b reports on two separate income measures, across the three regions. We also show total income last month calculated by aggregating all nine sources of income. Again, we show means and medians (in brackets), as well as the number of households that earned no income. Here our averages include households that earned no income.

*Table 2b: Summary of Monthly Adult Equivalent Household Income (Medians in Brackets)*

|  | *Overall* | *Cape Town* | *Ceres* | *Mount Frere* |
|---|---|---|---|---|
| Total Income Last Year | R260 (R155) n = 1767 [n0=75 ] | R285 (R185) n = 514 [n0=75 ] | R421 (R296) n = 525 [n0=9] | R126 (R103) n = 728 [n0=25] |
| Total Income Last Month | R333 (R204) n = 1857 [n0=83] | R359 (R241) n = 595 [n0=26] | R551 (R407) n = 535 [n0=14] | R151 (R125) n = 727 [n0=43] |
| Agg. Income Last Month | R333 (R201) n=1855 [n0=90] (dn=255) | R354 (R232) n=598 [n0=29] (dn=86) | R560 (R409) n=528 [n0=16] (dn=75) | R152 (R127) n=729 [n0=45] (dn=94) |

*Source*: Own calculations using CPRC 2002 RSA
*Note*: Averages calculated on positive income [households with zero income shown in square brackets]

Table 2b shows that less than 100 households did not earn income last month or last year.[10] The average household earned less than R400 per month per adult equivalent over the past year, and consequently could be described in monetary terms as poor.[11] In Ceres over the past year, the mean household earned more than R400, but the median less than R300. Income over the past month is consistently higher than when averaged over the past year. Income for the last month is also more complete (35 households have missing data) than over the past year.

Finally, we note that for 255 households (shown in bold as **dn=255** in the table), income last month and income aggregated by all nine measures of income do not correspond. However, it does not have a material effect on our summary statistics.

Figure 2b compares the distribution of these two income measures in more depth. Given the similarities between the two monthly income measures (they should be the same, after all), we don't pursue the aggregate measure further. The box plots confirm the information portrayed by the table. Once again, the interquartile range is shown by the box, with the median in white. Income last month is shown on the left graph and last year's income is normalised to a monthly average and shown on the right graph

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[10] Not all households reported income. 125 households did not report income last year and 35 households last month.
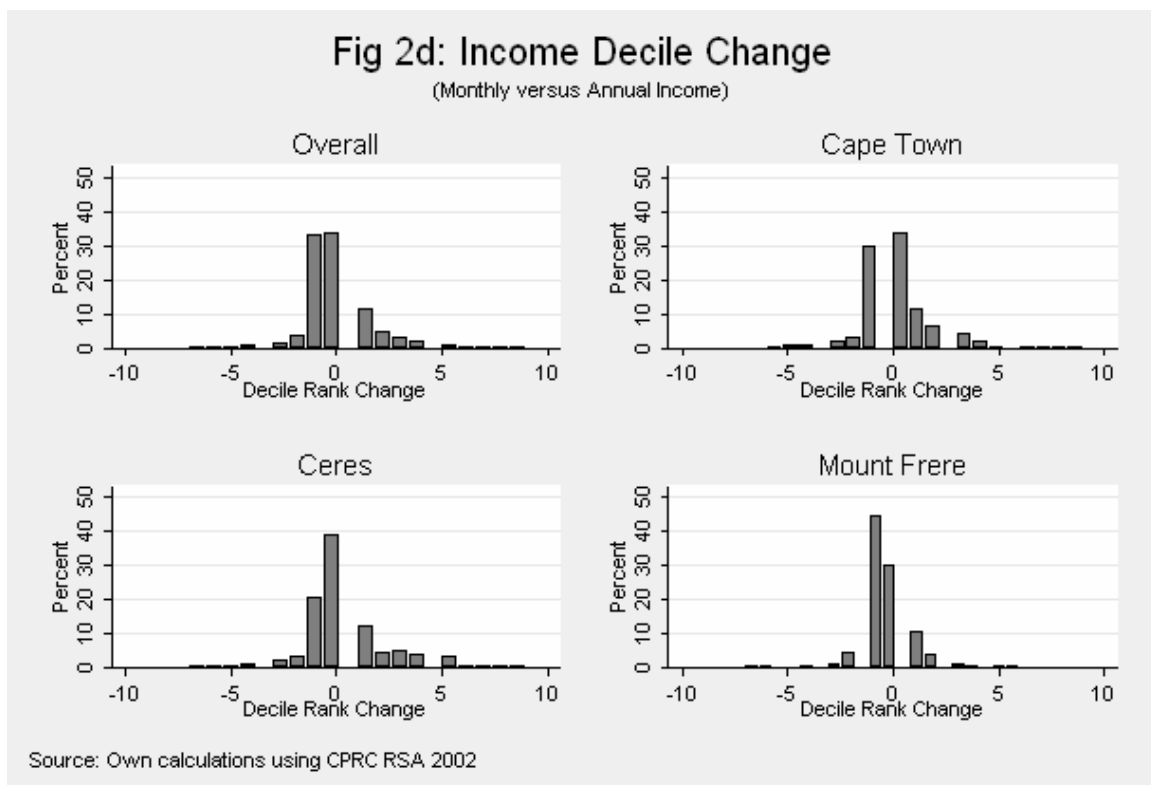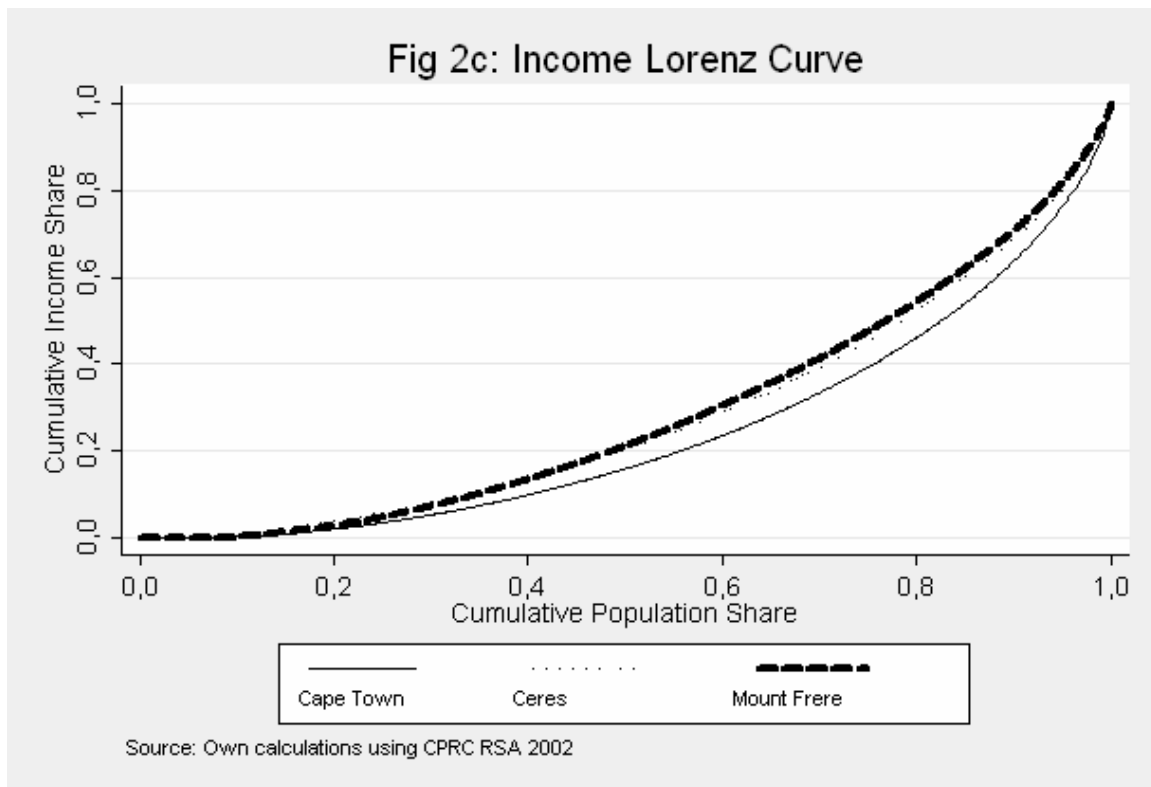[11] The amount of R400 (2002 rands) is based on a R212 1993 figure used in Woolard & Klasen (2004). This amount results in 40% of the population being classified as poor in the 1993 SALDRU survey. We adjust for inflation since 1993 using the general Consumer Price Index from Statistics South Africa. For the more stringent figure of R341 per month, see Du Toit (2005b).

Fig 2b: Comparing Income Measures
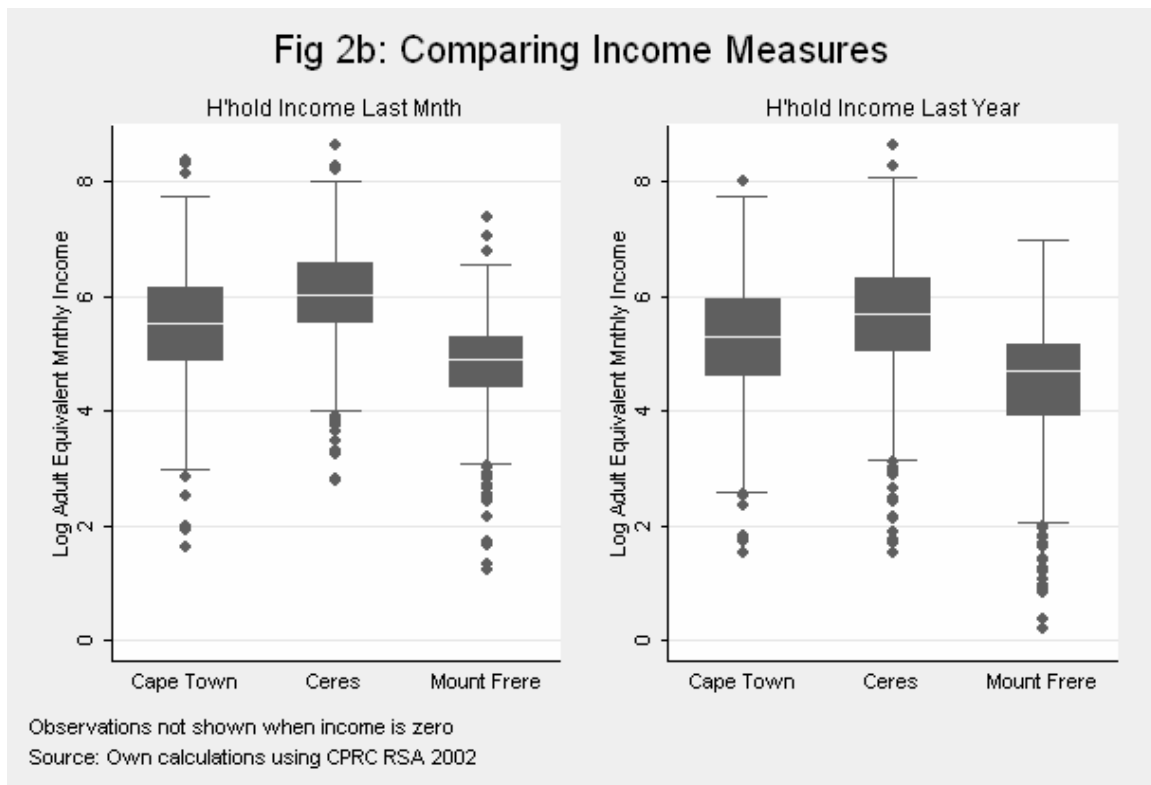
Income in Ceres is generally higher than in Cape Town, with Mount Frere having the lowest income. This is true whether last month or annual income is used. Most households declared less income on average over the past year than the past month. This is likely in part to be a recall problem, but we would also expect households whose income is more volatile (i.e. less regular) to suffer more from this bias. Note that income is logged, and adjusted for adult equivalent size. We also observe a significant number of households that fall below the whiskers of the distribution.

Figure 2c plots the share of total income going to each region using our measure of last month's income. For the graph we can see that Cape Town is consistently the least equal region. The results for Ceres and Mount Frere are ambiguous, with lines crossing at the lower end of the distribution.

How significant are the differences in these income measures in ranking households? Figure 2d tracks the change in decile rank of households when ranked by annual income rather than last month's income. Households that remain in the same decile rank when annual income is used instead of last month's income will have a rank change of zero.

## Fig 2c: Income Lorenz Curve



Cape Town ———     Ceres · · · · · · ·     Mount Frere ■■■■

Source: Own calculations using CPRC RSA 2002

## Fig 2d: Income Decile Change
(Monthly versus Annual Income)



Source: Own calculations using CPRC RSA 2002

Just over 30% of households (i.e. 597 households) do not change deciles when average annual income is used instead of last month's income. This result is broadly independent of household location, although households in Cape Town are more likely to move up and households in Mount Frere to move down when

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annual income is used. In Ceres, households are more likely to move up, but the result is not as strong as in Cape Town.

Table 2c explores the stability of the rankings across the deciles. Households that remain in the same decile are shown (in bold) along the diagonal of the matrix. Interestingly, households at low income deciles and households at high income deciles are more likely to remain in the same rank than households in the middle deciles. Households that do move are unlikely to move more than one decile in the distribution (1% corresponds to approximately two households in the decile).

*Table 2c: Transition Income Matrix (Annual Y. x-axis, Last Month Y. y-axis)*

|  | 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | 10th |
|---|---|---|---|---|---|---|---|---|---|---|
| **1st** | **53,7%** | 28,5% | 7,4% | 5,1% | 1,7% | 1,1% | 1,7% | 0,6% | 0,0% | 0,0% |
| **2nd** | 19,3% | **33,9%** | 32,2% | 4,7% | 3,5% | 2,3% | 1,2% | 1,2% | 1,8% | 0,0% |
| **3rd** | 6,8% | 17,1% | **21,6%** | 39,8% | 7,4% | 3,4% | 1,7% | 0,6% | 1,1% | 0,6% |
| **4th** | 5,0% | 6,7% | 11,1% | **19,4%** | 45,6% | 5,6% | 3,9% | 1,7% | 0,6% | 0,6% |
| **5th** | 4,5% | 6,7% | 9,5% | 9,5% | **17,3%** | 41,9% | 7,3% | 1,7% | 1,7% | 0,0% |
| **6th** | 0,6% | 3,4% | 6,9% | 9,1% | 9,1% | **20,6%** | 45,1% | 5,1% | 0,0% | 0,0% |
| **7th** | 1,1% | 4.0%% | 6,8% | 3,4% | 5,1% | 11,9% | **24,3%** | 40,7% | 1,7% | 1,1% |
| **8th** | 2,3% | 0,6% | 4,0% | 4,6% | 5,1% | 6,9% | 8,6% | **34,3%** | 33,1% | 0,6% |
| **9th** | 3,4% | 0,6% | 1,7% | 2,8% | 2,3% | 5,7% | 2,8% | 11,9% | **43,2%** | 25,6% |
| **10th** | 1,7% | 0,0% | 0,0% | 0,6% | 2,3% | 1,2% | 1,7% | 2,9% | 17,2% | **72,4%** |

*Source*: Own calculations using CPRC RSA 2002

This result is encouraging for a poverty measure as the ranking appears to consistently catch both poor households and well-off households. This is especially true of households in the upper part of the distribution where a change of rank of more than one decile is unlikely. More tellingly, the results hint at a structural basis to poverty – with both top and bottom deciles relatively immobile across income measures.

# 3   Expenditure-based rankings

An alternative measure of household wellbeing is to rank households according to household expenditure. Expenditure is thought to be more reliable than income in terms of measuring a longer-run, permanent concept of wellbeing (see, for example, Deaton (1997), and has been commonly applied to South African poverty work.

The CPRC survey collects information on 20 categories of expenditure per household in the last month. Table 3a breaks household expenditure down into six categories. Medians are shown in brackets. Again, the averages reflect expenditure if households have expenditure. 'Other' is a mixed bag of expenditure categories that includes discretionary spending. Expenditure is adjusted by adult equivalent.

*Table 3a: Summary of Mean Adult Equivalent Expenditure (Medians in Brackets)*

|  | *Overall* | *Cape Town* | *Ceres* | *Mount Frere* |
|---|---|---|---|---|
| Total expenditure | R254 (R174) n=1800 [n0=29] | R248 (R180) n=570 [n0=5] | R391 (R274) n=531 [n0=4] | R155 (R119) n=699 [n0=20] |
| Food expenditure | R104 (R79) n=1792 [n0=81] | R102 (80) n=589 [n0=22] | R148 (R118) n=518 [n0=17] | R68 (R61) n= [n0=42] |
| Energy expenditure | R30 (R21) n=1237 [n0=650] | R28 (R21) n=583 [n0=38] | R35 (R28) n=465 [n0=72] | R25 (n0=R15) n=189 [n0=540] |
| Health expenditure | R39 (R25) n=764 [n0=1108] | R40 (R26) n=216 [n0=392] | R37 (R23) n=217 [n0=320] | R41 (R26) n=331 [n0=396] |
| Education expenditure | R30 (R17) n=804 [n0=1077] | R36 (R24) n=149 [n0=466] | R31 (R17) n=161 [n0=376] | R28 (R15) n=494 [n0=235] |
| Debt expenditure | R19 (R0) n=580 [n0=1296] | R12 (R0) n=112 [n0=498] | R31 (R0) n=158 [n0=379] | R17 (R0) n=310 [n0=419] |
| Other expenditure | R103 (R42) n=1470 [n0=29] | R106 (R51) n=475 [n0=53] | R170 (R92) n=505 [n0=20] | R32 (R7) n=490 [n0=111] |

*Source*: Own calculations using CPRC RSA 2002
*Note*: Averages calculated on positive expenditure [household with zero expenditure in square brackets]
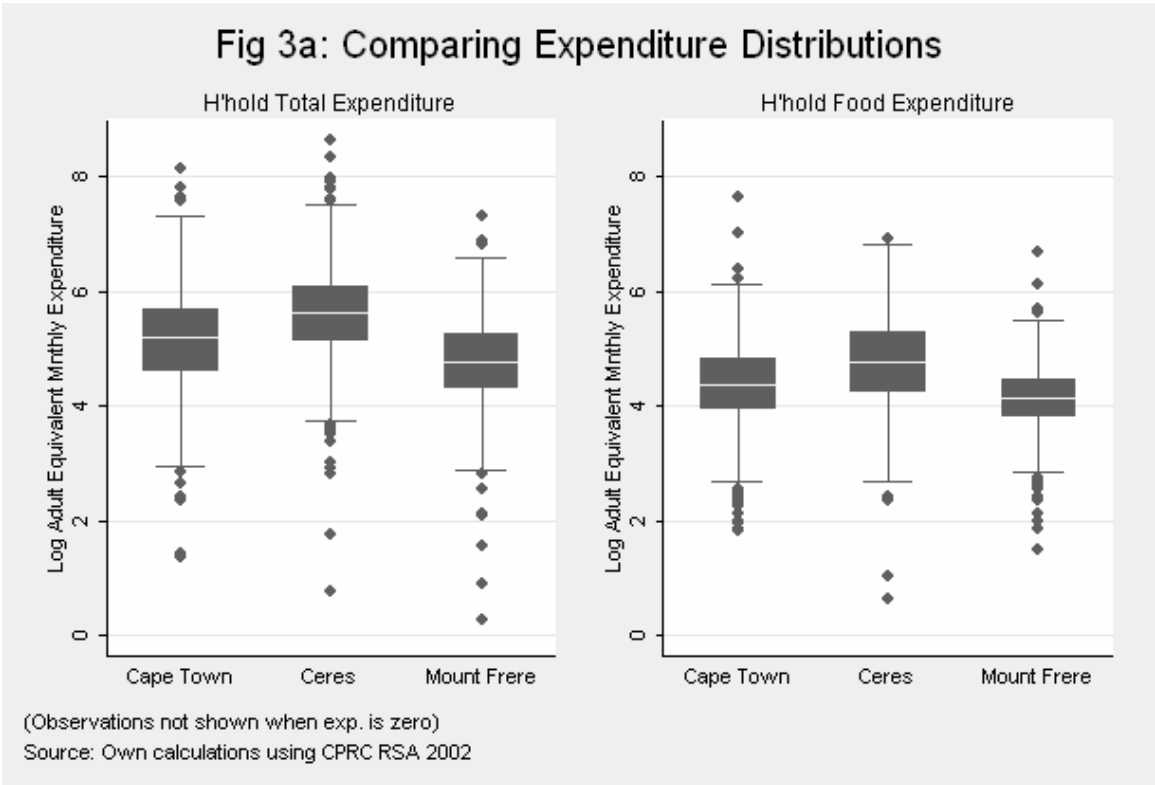
Household expenditure by adult equivalent tends to be lower than income by adult equivalent. This is surprising as savings by households are negligible.[12] There are a number of expenditure categories where the majority of households do not spend any income on that category.

Expenditure on food, energy, 'other' and total are the only categories where more households spend something rather than nothing. Here, Ceres appears substantially better off than the other two locations. Households tend to spend similar amounts on education and health across locations. The majority of households in Mount Frere don't spend income on energy. This is not true for Cape Town and Mount Frere. The means and medians in all four locations fall below our poverty line of R400 per month.

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[12] Just 16% of the households in the sample had some savings at the time of the survey.

As with income rankings, we want expenditure rankings to be able to discriminate between households (i.e. we don't want them all to have an expenditure of zero). This suggests we should compare rankings based on total expenditure and food expenditure, as these two categories have the largest positive sample size.

Figure 3a compares total expenditure with food expenditure using a box and whiskers plot that is similar to the ones shown earlier. Households in Ceres tend to enjoy greater expenditure per adult equivalent than in the other two regions. The differences are less stark when food expenditure is used, with poorer households clearly spending a higher percentage of their expenditure on food (and possibly using debt to finance food expenditure). This effect is clearly shown in the charts where the bottom outliers are reduced when food expenditure is graphed. Mount Frere is consistently shown to be worse off when expenditure measures are used to rank households.



Fig 3a: Comparing Expenditure Distributions

(Observations not shown when exp. is zero)
Source: Own calculations using CPRC RSA 2002

Fig 3b: Total Expenditure Lorenz Curve

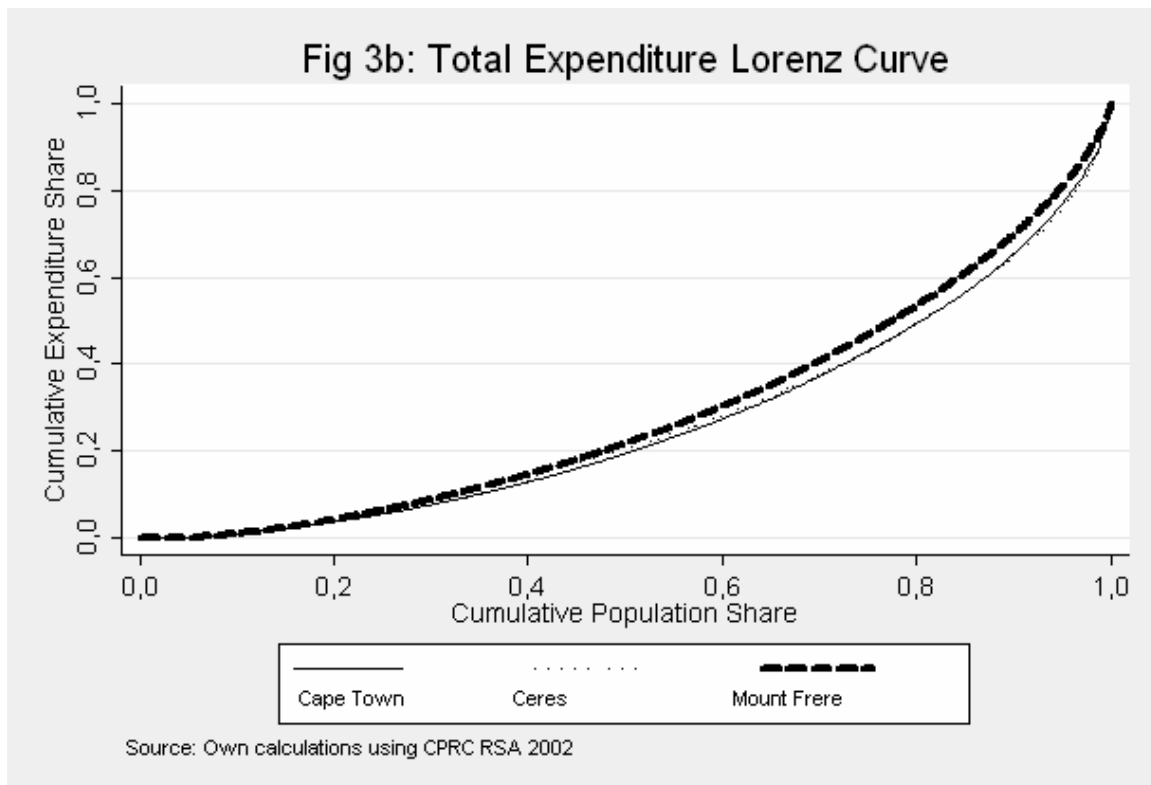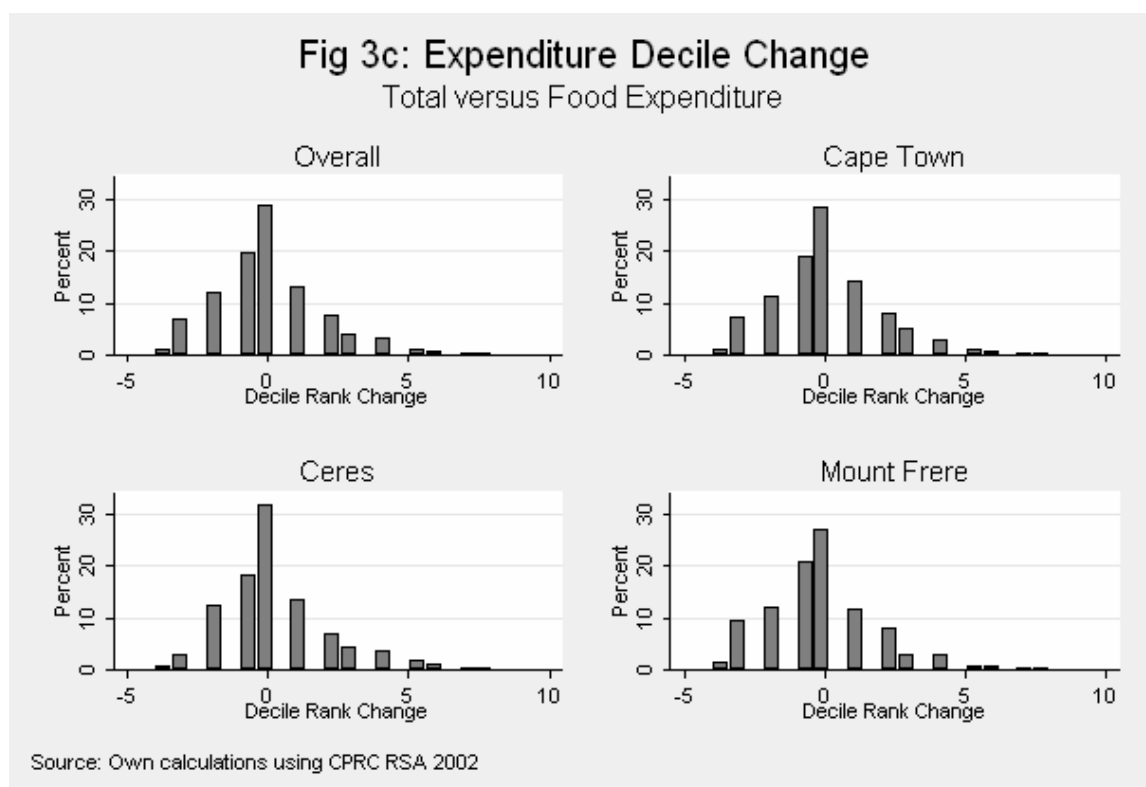Source: Own calculations using CPRC RSA 2002

Figure 3b plots the proportion of total expenditure going to each portion of the population. Mount Frere is consistently the most equal region. Note, however, that the bottom 30% in all three regions gets a similar share of expenditure. It is not clear whether Cape Town or Ceres is more unequal as the lines cross in the upper part of the distribution.

Figure 3c shows households are marginally less likely to stay in the same rank if food expenditure rather than total expenditure is used (when compared with the previous income measure). More strikingly, in Cape Town and Ceres households are equally likely to drop or improve in the rankings. However, in Mount Frere more households go down rather than up. Here there is a negative bias in the food expenditure ranking as Mount Frere households produce for own consumption.[13]

Table 3b explores the stability of the rankings across the deciles. As before, households that remain in the same decile are shown (in bold) along the diagonal of the matrix. The poorest households are most likely to remain in the bottom decile. In fact, no household in the bottom decile when ranked in terms of total expenditure moves above the 3rd decile when ranked by food expenditure.

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**Fig 3c: Expenditure Decile Change**
Total versus Food Expenditure

Source: Own calculations using CPRC RSA 2002

These two expenditure measures identify the lowest and highest decile consistently. The measure appears particularly good at identifying the bottom decile. Again, the measure appears to indicate a structural component to poverty.

*Table 3b:  Transition Expenditure Matrix (Food exp. x-axis, total exp. y-axis)*

|        | $1^{st}$ | $2^{nd}$ | $3^{rd}$ | $4^{th}$ | $5^{th}$ | $6^{th}$ | $7^{th}$ | $8^{th}$ | $9^{th}$ | $10^{th}$ |
|--------|------|------|------|------|------|------|------|------|------|------|
| $1^{st}$ | **68,9%** | 29,5% | 1,6% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% |
| $2^{nd}$ | 12,0% | **29,0%** | 31,2% | 16,4% | 9,8% | 1,6% | 0,0% | 0,0% | 0,0% | 0,0% |
| $3^{rd}$ | 6,0% | 13,1% | **23.0%** | 14,8% | 16,9% | 21,9% | 4,4% | 0,0% | 0,0% | 0,0% |
| $4^{th}$ | 4,4% | 10,9% | 14,8% | **20,2%** | 17,5% | 16,4% | 12,0% | 3,8% | 0,0% | 0,0% |
| $5^{th}$ | 1,6% | 4,9% | 10,9% | 15,3% | **15,9%** | 17,5% | 19,1% | 12,6% | 2,2% | 0,0% |
| $6^{th}$ | 0,6% | 6,6% | 6,0% | 12,0% | 13,1% | **13,1%** | 14,2% | 23,0% | 11,5% | 0,00% |
| $7^{th}$ | 2,7% | 1,6% | 9,8% | 8,2% | 12,0% | 10,4% | **18,0%** | 16,4% | 19,7% | 1,09% |
| $8^{th}$ | 1,6% | 1,6% | 2,7% | 5,5% | 4,4% | 9,8% | 14,8% | **23,0%** | 28,4% | 8,20% |
| $9^{th}$ | 2,7% | 0,6% | 2,2% | 5,5% | 6,0% | 6,56% | 10,93% | 16,39% | **23,50** | 25,68% |
| $10^{th}$ | 0,0% | 0,0% | 1,65% | 2,20% | 2,75% | 3,30% | 7,14% | 6,04% | 21,98% | **54,95%** |

As with income, the deciles exhibit the least stability in the middle of the distribution, with the least stability occurring in the sixth decile. Here households also appear more likely to move more than one decile in ranking.

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[13] We do not have data on the prices households pay for food. Du Toit (2005b) argues that in Ceres, seasonal workers often have limited choice where they can spend their 'credit'.

# 4   Wealth-based rankings

The survey collects a large amount of information on livestock, durable assets and the type of residential structure. Table 4a briefly summarises this information. We make no adjustment for the size of the household. We will make use of principal component analysis to summarise all asset based information into a single vector that allows us to rank each household in terms of an asset score. [14]

The average household in Cape Town tends to score better in terms of durable assets when compared with the other two locations. Mount Frere is ranked highest in terms of livestock assets, but otherwise fares poorly. Ceres tends to score better in terms of household structure.

*Table 4a: Summary of household assets*

|  | *Overall* | *Cape Town* | *Ceres* | *Mount Frere* |
|---|---|---|---|---|
| Number of durable assets | 3,3 (3) | 3,86 (4) | 3,71 (3) | 2,51 (2) |
| Kinds of livestock | 1,33 (0) | 0,49 (0) | 0,07 (0,24) | 3,0 (3) |
| Ceiling | 0,20 (0) | 0,20 (0) | 0,24 (0) | 0,08 (0) |
| Electricity | 0,54 (1) | 0,81 (1) | 0,83 (1) | 0,1 (0) |
| Windproof | 0,40 (0) | 0,35 (0) | 0,69 (1) | 0,16 (0) |
| Waterproof | 0,31 (0) | 0,36 (0) | 0,34 (0) | 0,25 (0) |
| Flush loo | 0,44 (0) | 0,60 (0) | 0,86 (1) | 0,00 (0) |

*Source*: Own calculations using CPRC 2002

Principal components analysis is a statistical technique that captures the common variability within a sample. If we assume an underlying 'wealth' index describes the variation of our household assets, we can use principal component analysis to capture this (see Filmer and Pritchet (2001) for a detailed explanation). This will allow us to construct rankings of the households in our sample based on how they score in terms of principal component technique.

Each variable used in the technique will be described by a coefficient (the coefficient can be positive or negative) such that the collective variability will be

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[14] The livestock information we use includes the number of cattle, sheep, goats, horses, donkeys, pigs, chicken, geese and other animals. Durable assets are dummy variables and include fridge, radio, television, microwave, landline, cellphone, car, sewing machine, coal stove, gas stove, electric stove and primus stove. We use windproof, waterproof, ceiling and flush toilet for the structural variables.

captured. The coefficient (and sign) on the variable is sensitive to which other variables are included in the procedure. Households are then ranked by summing the product of each coefficient on the variable and whether they lie above or below the mean for that particular variable. We can then test the sensitivity of our wealth ranking by including or excluding certain variables.

Figure 4a does just this. Our default is a ranking based on all three wealth components (livestock, durable assets and structural assets). We then see how households' ranking change if we base our technique purely one of the three components. Finally, we construct an Alternative Index based on the Total Index but excluding livestock. We exclude livestock because its signs are consistently negative in the Total Index. The negative sign is driven simply by the fact that household with no livestock (i.e. not in Mount Frere) tend to be better off.[15]

The top left graph shows that less than 30% of households stay in the same decile if they are ranked purely on their household structure, rather than a composite asset index. A similar picture is shown with a household durable index ranking. Ranking households solely on livestock invokes the largest change in the rankings, with few households staying in the same decile. The bottom right graph shows the effect of excluding livestock from the composite index on the ranking of households. The majority of households do not change rank, but certain households are penalised quite adversely.

Figure 4b looks more closely at the effect of using the Alternative Index (i.e. dropping livestock) across locations. All three locations have certain households substantially penalised by the exclusion of livestock when determining the ranking. But in Cape Town and Ceres the majority of households are better off with livestock excluded. In Mount Frere more households go down rather than up. This result is consistent with the notion that these households were 'boosted' in the previous analysis. But a substantial number of households still go up (i.e. these households had more than the mean amount of livestock).

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[15] Positive coefficients on the livestock variables are only obtained if Mount Frere is run as a separate sample. Negative coefficients are counter-intuitive as the household with more livestock than average will be penalised more than the household with less than average. This is a consequence of household with no livestock generally being better off than household's with livestock. But it does not follow that households with some livestock are better off than households with lots of livestock.

Fig 4a: Wealth Decile Change
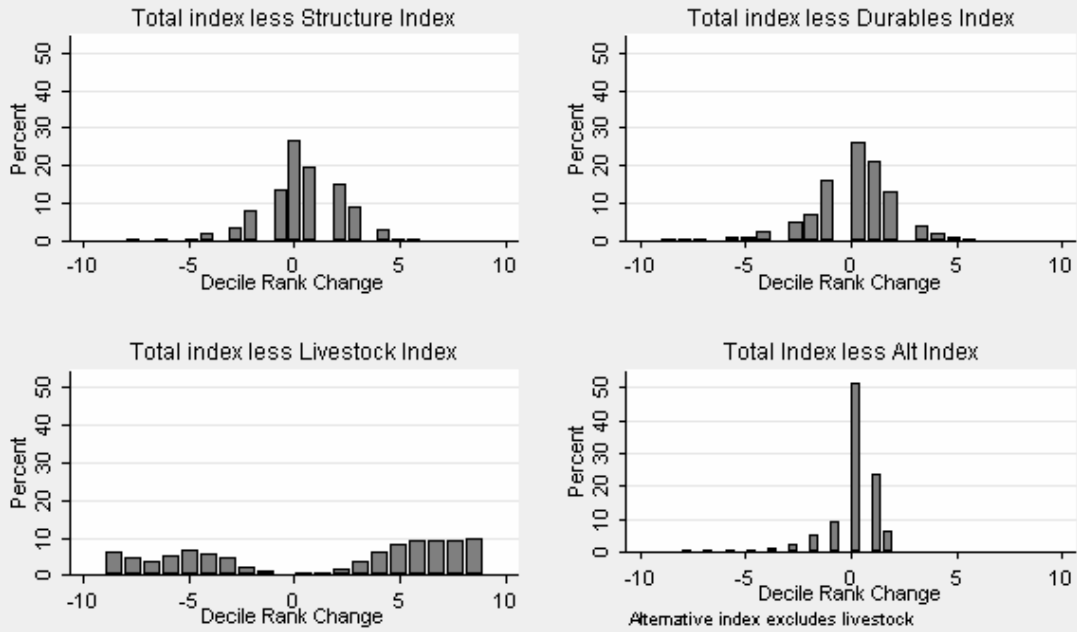
Source: Own calculations using CPRC RSA 2002



Fig 4b: Decile Change Using Alternative Wealth Index
Across Locations
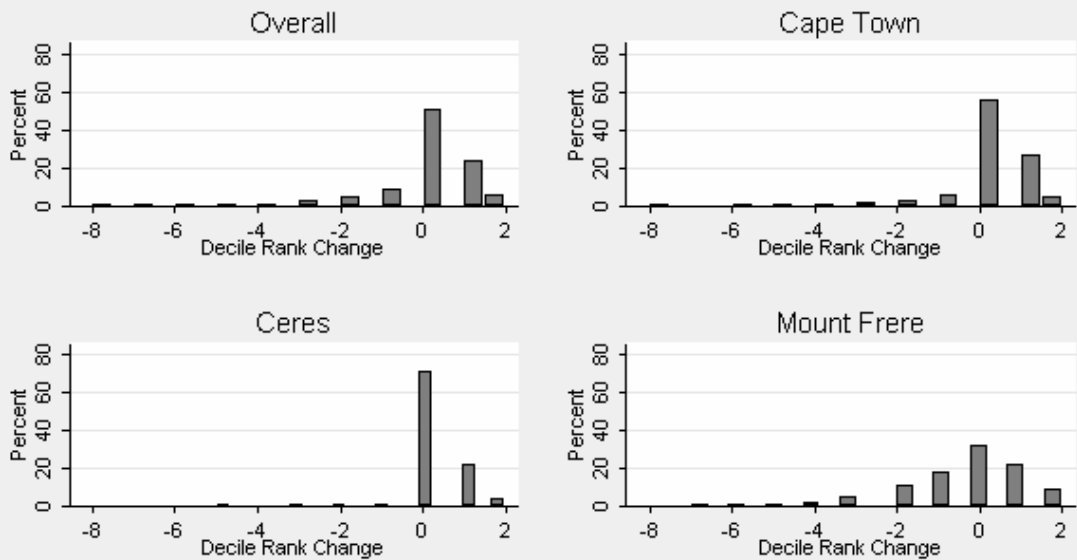
Alt Index excludes Livestock
Source: Own calculations usingCPRC RSA 2002

Table 4b shows that the effect of excluding livestock is negligible for higher decile households, but lower decile households are penalised. The perverse sign on livestock was not sufficient to dislodge high decile households, who do not have livestock or who have other assets in addition to livestock. Instead,

there was a lot of churn at the lower end of the distribution, with the $2^{nd}$ decile being particularly unstable.

*Table 4b: Transition Wealth Matrix (Alternative Index on x-axis)*

|           | 1st    | 2nd    | 3rd    | 4th    | 5th    | 6th    | 7th    | 8th    | 9th    | 10th   |
|-----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| $1^{st}$  | **39,4%** | 19,2%  | 19,7%  | 9,0%   | 8,0%   | 2,7%   | 0,5%   | 1,1%   | 0,5%   | 0,0%   |
| $2^{nd}$  | 42,0%  | **20,7%** | 22,9%  | 6,9%   | 4,8%   | 2,1%   | 0,5%   | 0,0%   | 0,0%   | 0,0%   |
| $3^{rd}$  | 31,4%  | 19,7%  | **28,7%** | 9,6%   | 6,9%   | 2,7%   | 0,0%   | 0,5%   | 0,5%   | 0,0%   |
| $4^{th}$  | 0,0%   | 28,7%  | 25,5%  | **27,7%** | 11,7%  | 3,2%   | 3,2%   | 0,0%   | 0,0%   | 0,0%   |
| $5^{th}$  | 0,0%   | 0,0%   | 3,2%   | 46,3%  | **30,9%** | 9,6%   | 6,4%   | 3,2%   | 0,5%   | 0,0%   |
| $6^{th}$  | 0,0%   | 0,0%   | 0,0%   | 0,0%   | 37,6%  | **50,8%** | 6,4%   | 4,2%   | 0,5%   | 0,5%   |
| $7^{th}$  | 0,0%   | 0,0%   | 0,0%   | 0,0%   | 0,0%   | 27,6%  | **64,6%** | 3,6%   | 2,6%   | 1,6%   |
| $8^{th}$  | 0,0%   | 0,0%   | 0,0%   | 0,0%   | 0,0%   | 0,0%   | 16,6%  | **75,0%** | 6,0%   | 2,2%   |
| $9^{th}$  | 0,0%   | 0,0%   | 0,0%   | 0,0%   | 0,0%   | 0,0%   | 0,0%   | 14,0%  | **82,4%** | 3,7%   |
| $10^{th}$ | 0,0%   | 0,0%   | 0,0%   | 0,0%   | 0,0%   | 0,0%   | 0,0%   | 0,0%   | 7,5%   | **92,5%** |

It is clear than that our principal components technique struggles to accommodate a rural/urban divide in that it does not arrive at sensible coefficients for the livestock variables. Households who have more livestock than average are correspondingly penalised. This effect is marginal at the upper deciles, but it penalises certain above average lower decile households. In contrast, households that have lower than average livestock are unfairly brought up in the distribution. This is the only case where our poverty measure struggles to identify the lowest end of the distribution.

In general, the wealth indexes produce fairly consistent results. There is not too much change whether one looks at durable assets or structural assets. Again, this gives hope that relatively simple measures can describe a lot in terms of household poverty.

# 5    Comparing the three measures

How well do the money metric and wealth-based measures rank against each other? For parsimony we compare last month's income ranking, last month's total expenditure ranking, and both the Total Wealth Index and the Alternative Wealth Index. Figure 5a shows that the income and expenditure measures produce similar results in terms of ranking households, but that there are important changes in rank when using either of the wealth indexes in comparison to income and expenditure. In particular, we find households are much more likely to change rank when based on wealth-based measures.

Fig 5a: Alternative Poverty Rankings Decile Change
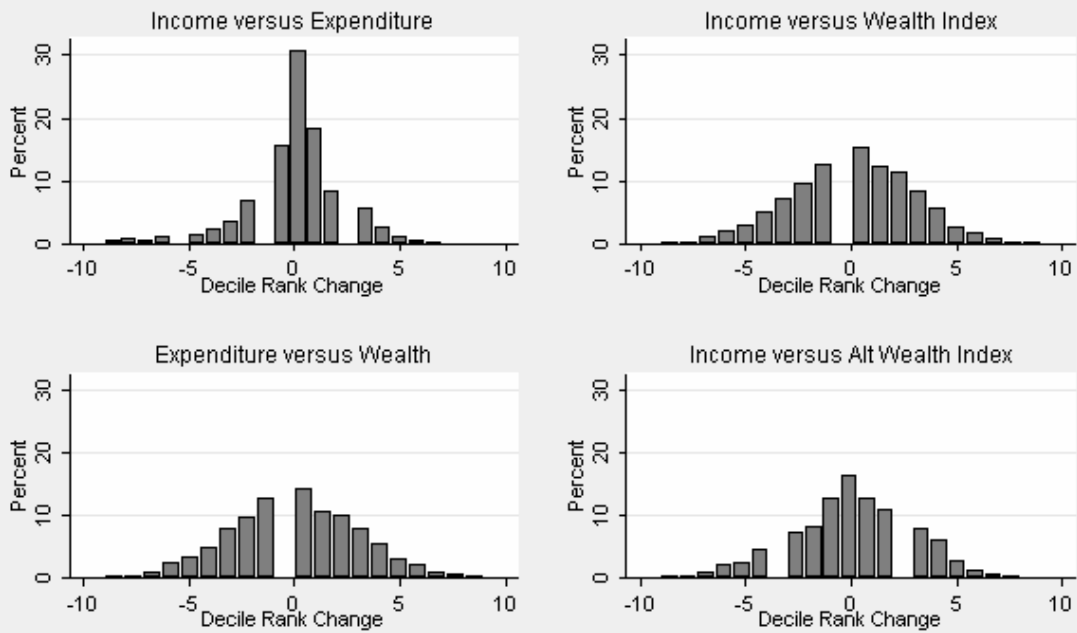
Source: Own calculations using CPRC RSA 2002



Fig 5b: Poverty Rankings Decile Change
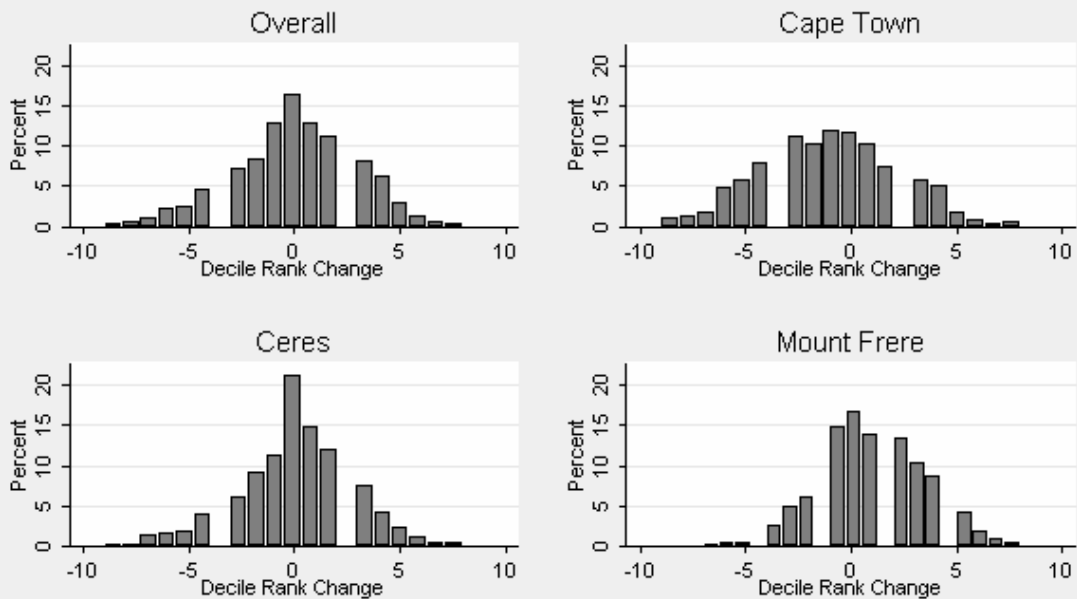
(Last Month's Income versus Alt Wealth Index)
Source: Own calculations using CPRC RSA 2002

Again, we explore whether there is a localised effect driving this. From Figure 5b it appears that households in Mount Frere are more likely to go up in the relative ranking when the Alternative Wealth Index is used instead of last month's income, but the effects are not overwhelming, and a large number of households in each location go up as well as down.

*Table 5a: Transition Matrix (Alternative Wealth x-axis, Total Wealth y-axis)*

| | 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | 10th |
|---|---|---|---|---|---|---|---|---|---|---|
| 1st | **39,4%** | 19,2% | 19,7% | 9,0% | 8,0% | 2,7% | 0,5% | 1,1% | 0,5% | 0,0% |
| 2nd | 39,4% | **20,7%** | 22,9% | 6,9% | 4,8% | 2,1% | 0,5% | 0,0% | 0,0% | 0,0% |
| 3rd | 42,0% | 19,7% | **28,7%** | 9,6% | 6,9% | 2,7% | 0,0% | 0,5% | 0,5% | 0,0% |
| 4th | 31,4% | 28,7% | 25,5% | **27,7%** | 11,7% | 3,2% | 3,2% | 0,0% | 0,0% | 0,0% |
| 5th | 0,0% | 0,0% | 3,2% | 46,3% | **30,9%** | 9,6% | 6,4% | 3,2% | 0,5% | 0,0% |
| 6th | 0,0% | 0,0% | 0,0% | 0,0% | 37,6% | **50,8%** | 6,4% | 4,2% | 0,5% | 0,5% |
| 7th | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 27,6% | **64,6%** | 3,7% | 2,6% | 1,6% |
| 8th | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 16,9% | **75,0%** | 6,0% | 2,2% |
| 9th | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 13,9% | **82,4%** | 3,7% |
| 10th | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 7,5% | **92,5%** |

*Source*: Own calculations using CPRC RSA 2002

The area most penalised is Cape Town, where substantially more households drop rank when an asset based measure is used.

The transition matrix of total versus alternative wealth rankings (see Table 5a) shows substantial changes in household rankings at the lower end of the distribution. In contrast, the upper deciles are much more stable.

# 6 How well do these measures 'explain' household hunger?

Carter and May (2001) for instance stress the importance of assets rather than income in smoothing consumption. Here we make use of a recall hunger question that asks households whether there were months in the past year they did not have enough to eat to explore how the poverty rankings explain a dimension of chronic poverty.

The median household went hungry four months out of the past twelve, and less than 1 in 5 households had sufficient food to eat in each of the past 12 months. Cape Town is the location most likely to have households that consistently have too little to eat, while households in Mount Frere are likely to be hungry less often than households in Cape Town and Ceres. Mount Frere households are more likely to be hungry for at least one month of the year. Agricultural production appears to smooth the volatility of expenditure based on income, but it also subject to seasonal variation.

*Table 6a: Summary of Months Households Went Hungry*

|  | *Overall* | *Cape Town* | *Ceres* | *Mount Frere* |
|---|---|---|---|---|
| Mean | 4,7 | 5,2 | 4,6 | 4,3 |
| Median | 4 | 4 | 4 | 3 |
| 25th percentile | 1 | 1 | 0 | 1 |
| 75th percentile | 7 | 9 | 8 | 6 |
| Sample size | 1888 | 623 | 535 | 730 |

*Source*: Own calculations using CPRC RSA 2002

Income and expenditure rankings appear better at explaining household hunger than wealth. Figure 6a ranks households by our three ranking measures and food expenditure and finds a clear negative relationship between the relative rank of households and the average number of months the household in that decile went hungry over the past year.



Source: Own calculations using CPRC RSA 2002
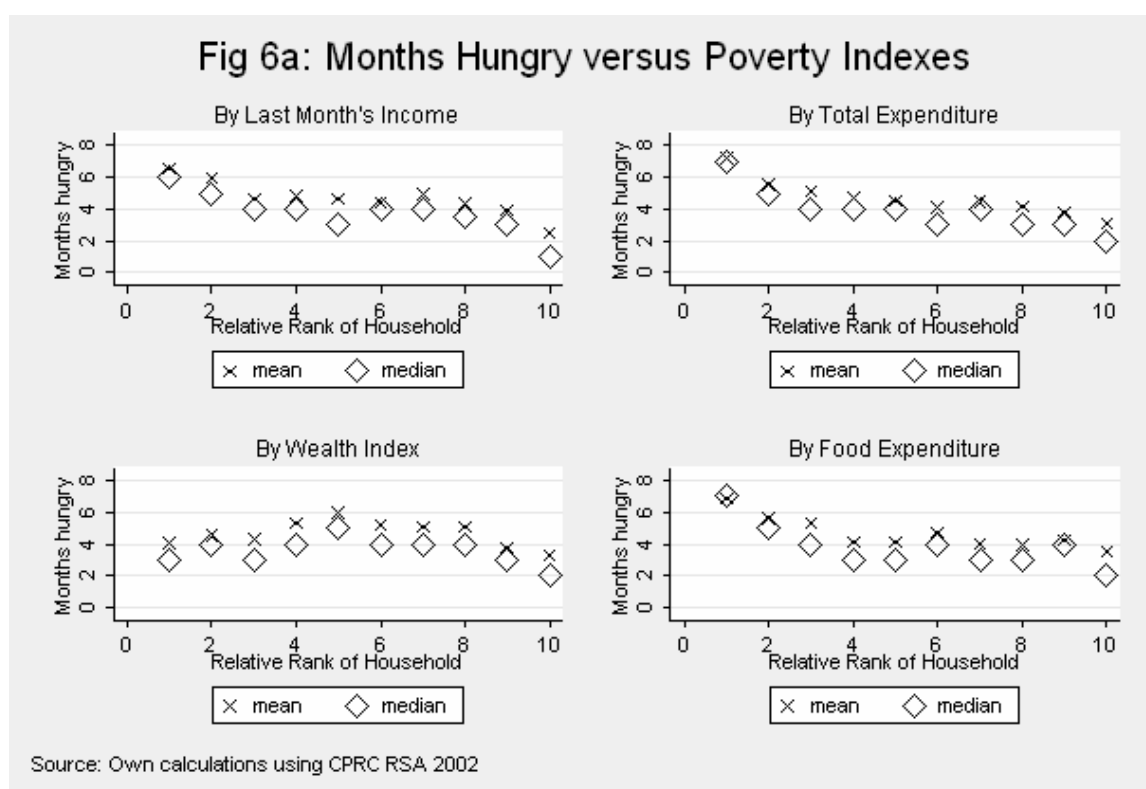
The relationship between household wealth and hunger appears more complex. We find household hunger increases as wealth increases, and then decreases. This result is somewhat different from that argued by Carter and May (2001) who stress the importance of household assets in smoothing consumption and minimising shocks. Possibly, the liquidity of the asset is important in its ability to smooth consumption. All of the assets included in our asset index are illiquid in the sense that they are hard to turn into cash.

An additional issue is how households finance their assets, and what effect this plays on their ability to service their basic needs. Assets could provide a safety net against poverty and shocks. Alternatively, they could be illiquid and a drain on resources, especially in the short-term.
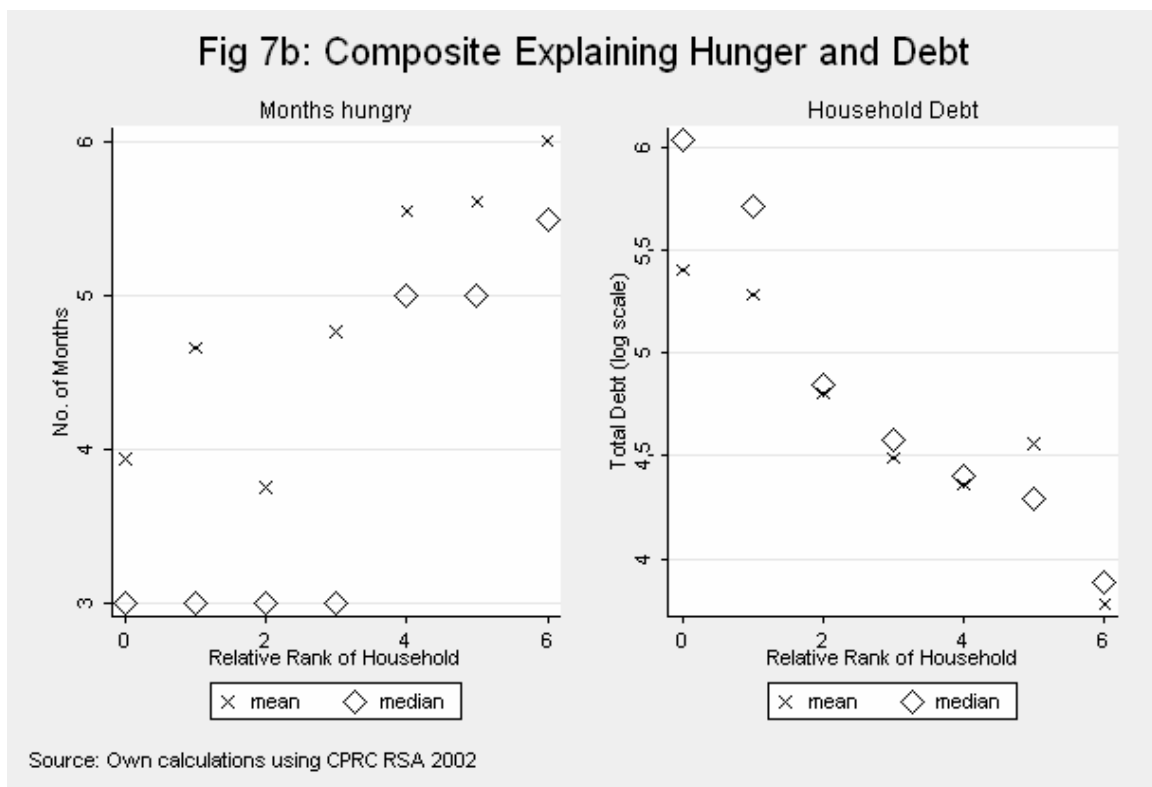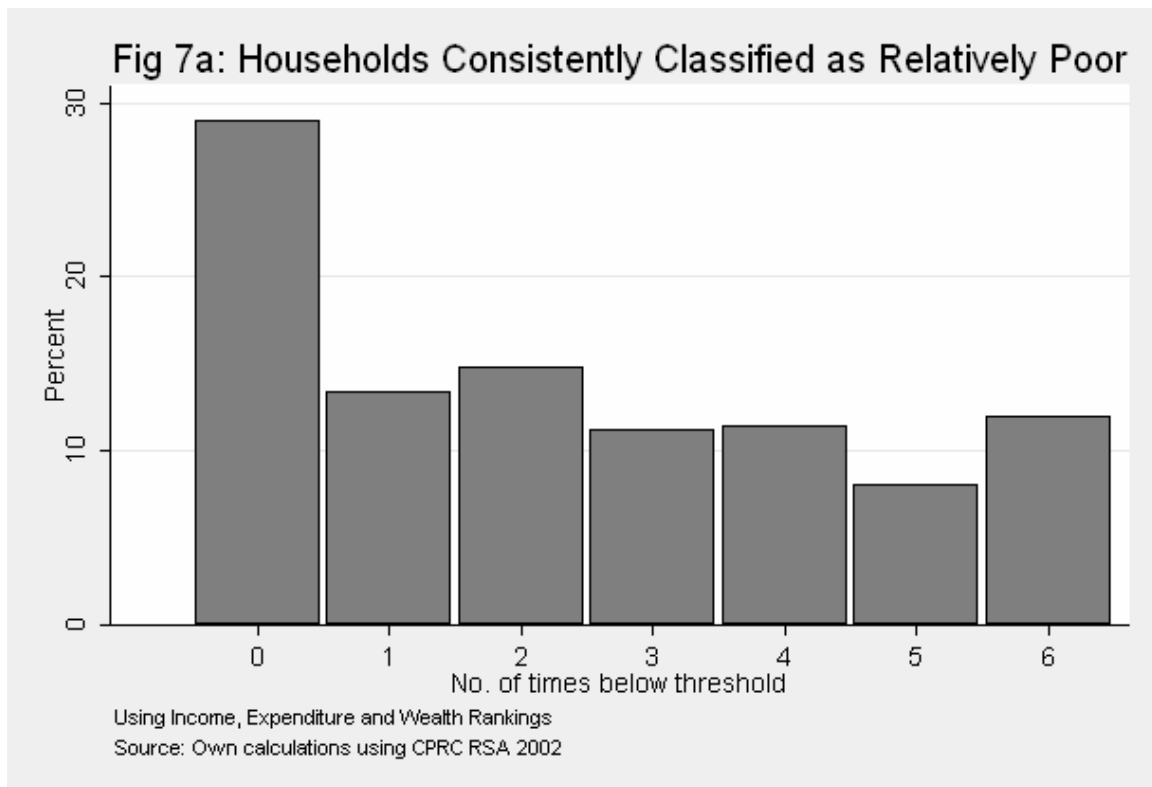
# 7 Poor by All Accounts: Developing Composite Indicators

How important is the movement we observe from our transition matrices? Visually, households that change deciles appear more likely to change in the middle part of the distribution, with the exception of the wealth-based measures. Figure 7a records households that consistently fall in the bottom 40% of our income, expenditure and wealth measures.[16]

Just 10% of households will be classified in the bottom 40% if all six measures are used. Importantly, 30% of households are never classified as in the bottom 40%. The composite index is less likely to classify rich households incorrectly than poor households.

How useful is our composite index in explaining household hunger. Figure 7b shows that households that always fall in the bottom 40% are indeed relatively poor. They are hungry more often, and have much less debt. In fact, our composite index shows a strong relationship between the relative rank of the household (how many times it falls in the bottom 40%) and its level of debt.

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[16] We use last month's income, last year's income, total expenditure, food expenditure, total wealth and alternative wealth.

Fig 7a: Households Consistently Classified as Relatively Poor

Using Income, Expenditure and Wealth Rankings
Source: Own calculations using CPRC RSA 2002



Fig 7b: Composite Explaining Hunger and Debt

Source: Own calculations using CPRC RSA 2002

The composite index is less useful in explaining household hunger, and it is only in the bottom half of the sample (i.e. households that fall into the bottom 40% at least three times) where we see a positive relationship between hunger and the index. This indirectly collaborates the finding that the money-metric measures

(and not the wealth measures) are important in explaining household hunger, but that wealth-based measures might help explain more long-term dimensions of poverty.

# 8   Conclusion

This paper has made use of descriptive statistics to compare the effectiveness of income, expenditure and wealth-based measures in identifying poverty in a sample that spans the urban-rural divide.  We find large locational differences in terms of household wealth.  Nevertheless, traditional money metric measures of poverty (based on income and expenditure) that abstract from location appear to explain certain relatively short-term dimensions of chronic poverty like household hunger relatively well.  Our analysis also leads us to believe that the traditional measures are relatively robust across locations and in isolating the bottom and top deciles of the distribution.   Wealth measures rank households differently from traditional measures, and are less able to straddle the urban/rural divide.  They also appear less suited to explaining household hunger. Future research needs to distinguish between liquid and illiquid assets.

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