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Survey Attrition and Attrition Bias in Young Lives

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Young Lives
An International Study of Childhood Poverty

Contents

Executive summary

Longitudinal studies, such as the Young Lives study of childhood poverty, help us to analyse welfare dynamics in ways that are not possible using time-series or cross-sectional samples. However, analysis based on panel datasets can be heavily compromised by sample attrition. On the one hand, the number of respondents who do not participate in each round of data collection (wave non-response) will inevitably cumulate over time, resulting in falling sample sizes, which will undermine the precision of any research undertaken using such samples. On the other hand, unless it is random, attrition might lead to biased inferences. Analysts often presuppose that attrition is correlated with observable characteristics such as household education, health or economic well-being, resulting in samples that include only a selected group of households. However, even if that is the case, non-random attrition does not necessarily lead to attrition bias. Attrition bias is model-specific and, as previous studies have shown, biases might be absent even if attrition rates are high.

We investigate the incidence and potential bias arising from attrition in Young Lives following the completion of the second round of data collection. Young Lives is a study concerned with analysing childhood poverty in four countries, Ethiopia, India, Vietnam and Peru. The study, which measures a range of child, household, and household-member characteristics , is following two cohorts of children in each country over 15 years – a younger cohort of 2,000 children who were born in 2001 to 2002 (i.e. aged 6 to 18 months when first surveyed) and 1,000 older children born in 1994-95 (i.e. aged 7.5 to 8.5 at the start of the survey).

Sample attrition is particularly concerning in the context of a longitudinal study such as Young Lives where cohort sample sizes are modest and individuals are tracked over a relatively long period of time. This paper seeks to:

- document the rates of attrition of the Young Lives study following completion of the second round of data collection;
- investigate the extent to which sample attrition is non-random;
- analyse whether non-random attrition in the Young Lives sample might lead to attrition bias.

Attrition bias and methodology

Attrition bias arises when sample attrition is non-random and the variables affecting attrition might be correlated with the outcome variable of interest such as household education, health or economic well-being. More formally, attrition bias will occur if the error term in the equation of interest is correlated with the error term in the selection or attrition equation. In this respect, attrition bias is model specific as the correlation between the error terms will depend on the precise specification of the model.[1]

In analysing attrition bias, we follow the framework set out in Fitzgerald, Gottschalk and Moffitt (1998). In their seminal study on attrition bias in the US Panel Study of Income Dynamics (PSID) sample, they distinguish between attrition on unobservables and observables, and provide a series of tests designed to assess incidence of attrition bias.

In this paper, we focus on attrition on observables. We assess attrition bias on two types of child welfare models. For the younger cohort we estimate models of child health as

[1] J. Wooldridge (2002) *Econometric Analysis of Cross Section and Panel Data*, Cambridge MA: MIT Press

measured by anthropometric height-for-age and weight-for-height z-scores. For the older cohort, we estimate a model of school enrolment at the age of eight.

In assessing attrition bias, we use two complementary types of tests. First, we carry out attrition probit tests proposed by Fitzgerald, Gottschalk and Moffitt (1998) (FGM tests). Second, we perform the tests first suggested by Becketti, Gould, Lillard and Welch (1988) (known as the BGLW test). As pointed out by Fitzgerald, Gottschalk and Moffitt (1998), both set of tests are related and tend to provide broadly consistent results.

Main evidence

Table 1 reports tracking and attrition figures for the Young Lives countries by cohort between the first wave (round of data collection) in 2002 and the second wave in 2007. We observe that attrition rates are relatively modest although they vary significantly across countries. A distinction should be made between cohorts. In particular, the younger cohort can be expected to experience higher death rates. Consequently, attrition rates become more similar across cohorts when child deaths are excluded.

Table 1. *Attrition rates by categories, by country between 2002 and 2007 data collection rounds*

All Young Lives children

Country	Number in sample	Traced	Child died	Refused	Un-traceable	Attrition rate (%)	Attrition rate (excluding deaths) (%)
Ethiopia	2,998	2,889	67	11	31	3.64	1.43
India	3,019	2,945	35	14	25	2.45	1.31
Peru	2,766	2,663	6	64	33	3.72	3.51
Vietnam	3,000	2,968	13	3	16	1.07	0.64
All Countries	11,783	11,465	121	92	105	2.70	1.69

Younger cohort

Country	Number in sample	Traced	Child died	Refused	Un-traceable	Attrition rate (%)	Attrition rate (excluding deaths) (%)
Ethiopia	1,998	1,908	61	5	24	4.50	1.50
India	2,011	1,950	32	7	22	3.03	1.47
Peru	2,052	1,975	5	46	26	3.75	3.52
Vietnam	2,000	1,975	11	1	13	1.25	0.7
All Countries	8,061	7,808	109	59	85	3.14	1.81

Older cohort

Country	Number in sample	Traced	Child Died	Refused	Un-traceable	Attrition rate (%)	Attrition rate (excluding deaths) (%)
Ethiopia	1,000	981	6	6	7	1.90	1.31
India	1,008	995	3	7	3	1.29	1.00
Peru	714	688	1	18	7	3.64	3.51
Vietnam	1,000	993	2	2	3	0.70	0.50
All Countries	3,722	3,657	12	33	20	1.75	1.43

Note: Figures for Peru include one child who is yet to be followed-up.

We find that attrition rates in Young Lives are not only small in absolute terms, but are also low when compared with attrition rates for other longitudinal studies in less developed countries. Table 2 reports annualised attrition rates for the Young Lives sample and a number of longitudinal studies. We note that although the Young Lives Peru sample has higher attrition rates than other Young Lives countries, even these remain very modest compared to other longitudinal studies.

Table 2. *Comparison of attrition rates: Young Lives and other longitudinal studies, annualised attrition rates*[2]

Longitudinal study (with start date)	Level of observation	Attrition rate per annum (%)	Attrition rate per annum (%) (excluding deaths)	Description
Young Lives - 2002, All countries	Individual	0.50	0.30	1 follow-up after 4 years
Young Lives - 2002, Peru only	Individual	0.74	0.72	1 follow-up after 4 years
KIDS, South Africa - 1993	Household	3.40	3.40	1 follow-up after a 5 year interval
Proyecto Integral de Desarrollo Infantil (PIDI), Bolivia - 1996,	Individual	19.40		1 follow-up after a 2 year interval
Kenyan Ideational Change Survey (KICS), Kenya – 1994	Household	23.20		1 follow-up after a 2 year interval
Kagera Health and Development Survey (KHDS), Tanzania – 1991	Household	0.88	0.70	4 rounds of follow-up in 4-year period
Kagera Health and Development Survey (KHDS), Tanzania – 1994	Individual	2.85	1.60	1 follow-up after 10-year interval
Kagera Health and Development Survey (KHDS), Tanzania – 1994, children below 10 years	Individual	2.29	1.50	1 follow-up after 10-year interval
Birth to Twenty (BT20), South Africa - 1990	Individual	1.90	1.80	16 years of follow-up, up to 2006
IFORD Yaounde Survey, Cameroon – 1978	Individual	22.50	18.70	7 rounds of follow-up within 2 years
Pelatos Birth Cohort, Brazil, 1982-1986	Individual	5.30	4.20	2 follow-ups of entire sample within 4 years in 1984 and 1986.
Cebu Longitudinal Health and Nutrition Survey (CLHNS), Philippines - 1983	Individual	2.60		11 year study, 14 rounds in first 2 years, 2 others at varying intervals

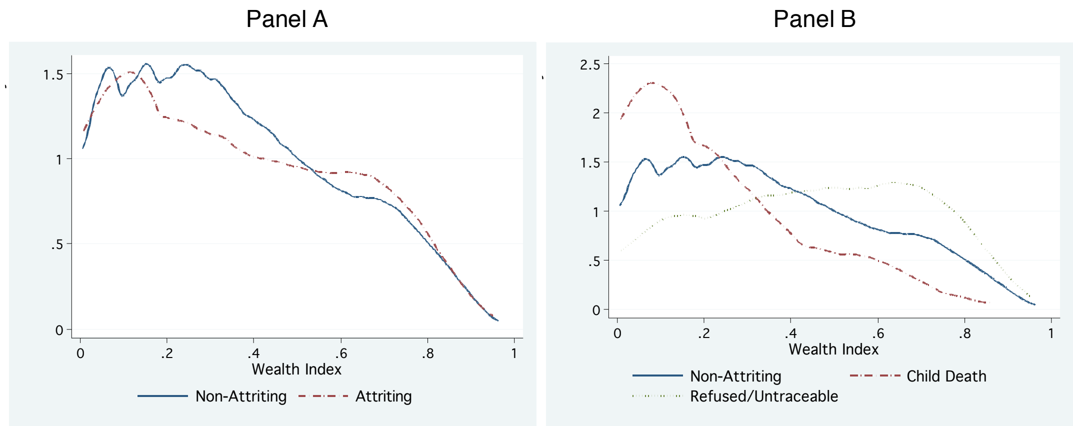
Source: Young Lives data; various studies and own calculations

We investigate non-random attrition by searching for patterns in outcome variables and household characteristics of attriting households. In Figure 1, we plot kernel densities for the wealth index for the younger cohort for all countries. Panel A shows that attriting households

[2] Rates per annum follow the formula suggested by Alderman et al. (2000) – (1-(1- q))/Γ. Where q and Γ respectively stand for attrition rate and year covered by the panel. See Appendix A to the main text of this report for details of sources.

have on average a lower wealth index than non-attriting households. A more complex picture appears when attriting households are split between those where a child has died or those who refused to participate in the second round of data collection or were untraceable. Here we find that 'child deaths' are correlated with lower wealth index, while households that refused or were untraceable are correlated with higher values of the wealth index. Further analysis indicates that, in general, attrition is an urban phenomenon. When split by category, we find that child deaths mostly occur in rural areas, while untraceable households are located in urban areas.

Figure 1. *Wealth index kernel densities by attrition status (Panel A) and attrition categories (Panel B). All countries, younger cohort only*



More systematically, we compute means of outcome and predetermined variables for the non-attriting and attriting households, as well as by attrition category. We find that in general, attriting households tend to have fewer assets, have poorer access to services and utilities and are less educated, while at the same time their children have poorer health and are less likely to attend school. These patterns of non-random attrition are particularly strong for Ethiopia and India, but less so for Peru and Vietnam. As indicated in Figure 1, these averages hide substantial variation between different types of attriting households. However, differences in variable means across attrition type, although in some cases substantial, are not always statistically significant. In summary, we find substantial evidence of non-random attrition across most countries, although few variables other than urban/rural location and ethnic background appear to correlate systematically with attrition.

The presence of non-random attrition does not necessarily imply attrition bias. In fact, the results from probit and BGLW tests provide only very limited evidence of attrition bias. Furthermore, the R-Square values in the probit regressions provide an indication of the proportion of attrition that can explained with a full set of child and household characteristics and the lagged endogenous variable. We find that across different models and countries, the fitted models explain less than ten per cent of the observed attrition. In other words, even if it follows some non-random patterns, attrition remains overwhelmingly a random phenomenon.

Table 3. *Attrition probits, predicting likelihood of attrition, by country and dependent variable (younger cohort only)*

Country	Variables		Predicting likelihood of attrition			Likelihood of attrition (excluding deaths)	
			(1)	(2)	(3)	(4)	(5)
Ethiopia	Height-for-age	Coef	-0.1129		-0.0969	-0.0716	
		P-Value	0.001 ***		0.0080 ***	0.2690	
	Weight-for-height	Coef		-0.0984	-0.0846		0.1482
		P-Value		0.022 **	0.0560 *		0.0650 *
India	Height-for-age	Coef	-0.0268		-0.0265	-0.0320	
		P-Value	0.523		0.5280	0.6420	
	Weight-for-height	Coef		-0.0121	-0.0117		0.0612
		P-Value		0.833	0.8390		0.4610
Peru	Height-for-age	Coef	0.0232		0.0215	0.0340	
		P-Value	0.615		0.6430	0.4760	
	Weight-for-height	Coef		-0.0053	-0.0222		0.0118
		P-Value		0.913	0.6530		0.8150
Vietnam	Height-for-age	Coef	-0.1433		-0.1068	-0.0141	
		P-Value	0.161		0.3160	0.9230	
	Weight-for-height	Coef		-0.1087	-0.0812		-0.0697
		P-Value		0.363	0.5060		0.6800

Note: All regressions include as controls household predetermined variables (including information on household head age and education, household size, household asset holdings, child vaccination and sibling information), as well as caste/ethnic group dummies. Figures highlighted with (***), (**) and (*) indicate significance at one, five and ten per cent level respectively.

Table 3 reports the results for the attrition probit tests for dependent variables height-for-age and weight-for-height z-scores. Reported are only figures for the lagged endogenous variables. Statistical significance of the coefficients for these variables indicates that attrition bias might be present when modelling child anthropometrics. The table shows that no evidence of such attrition bias is found, except in Ethiopia where we find that child deaths, linked to poor child anthropometrics, could lead to biased inferences when fitting child anthropometric models.

Evidence from the BGLW tests generally supports the findings from the attrition probit tests. When fitting determinants of outcome variable models, the impact of predetermined variables on the dependent variables for the full sample and non-attriting sample are statistically similar. This is true when coefficients are tested both individually and jointly. Moreover, in spite of the earlier findings, BGLW tests provide no evidence of significant biases in child anthropometrics in Ethiopia. We interpret this mixed evidence, as a warning for the potential for biases due to non-random attrition, which at the moment remain weak thanks to modest rates of attrition.

Conclusion

Although they range widely across countries and attrition category, we find that Young Lives attrition rates are small in absolute terms. Furthermore, attrition rates are modest when compared with other longitudinal studies in developing countries. In fact, in all study countries Young Lives has attrition rates lower than any of the comparison studies.

Second, our analysis indicates that attrition is to some extent non-random. In particular, we find that attrition is primarily an urban phenomenon and that attriting households tend to be poorer and less educated than non-attriting households.

Third, in spite of non-random attrition we find very limited evidence of attrition bias when tested on child anthropometric and school enrolment models. On the one hand, very low R-Squares in the attrition probit models indicate that attrition remains overwhelmingly a random phenomenon. On the other hand, attrition probit and BGLW tests suggest that attrition on observables is unlikely to lead to significant biases. Further, limited evidence of attrition bias found in Ethiopia using attrition probit tests are not corroborated by the BGLW tests; indicating that, although uncovered patterns of non-random attrition could lead to biases, modest rates of attrition ensure that attrition bias remains very weak.

In summary, our detailed analysis of the attrition bias of the Young Lives sample strongly indicates that current attrition is highly unlikely to bias research inferences. However, some weak evidence of bias alerts us to the importance of ensuring that we continue to track the children between survey rounds to maintain our current low rates of attrition and not exacerbate the uncovered non-random patterns of attrition we have noticed to date.

1. Introduction

Longitudinal studies, such as the Young Lives study of childhood poverty, help us to analyse welfare dynamics in ways that are not possible using time-series or cross-sectional samples. However, analysis based on panel datasets can be compromised by sample attrition. On the one hand, wave non-response (the number of participants who do not respond in each round of data collection) will inevitably cumulate, resulting in falling sample sizes over time. This will undermine the precision of any research undertaken using such samples. On the other hand, unless it is random, survey attrition might lead to biased inferences based on non-attriting samples. Analysts often presuppose that attrition is correlated with observable characteristics such as household education, health or economic well-being, resulting in samples that include only a selected group of households. However, even if that is the case, non-random attrition does not necessarily lead to attrition bias. Statistical theory suggests that attrition bias is model specific, and, as previous non-response and attrition studies have shown, biases mayt be absent even if attrition rates are high.

In this paper, we investigate the incidence and potential bias arising from attrition in the Young Lives study following the conclusion of the second round of data collection in 2007. Young Lives is concerned with analysing childhood poverty dynamics in four countries – Ethiopia, India, Vietnam and Peru. Country surveys initiated in 2002 are following two cohorts of children, 2,000 one-year olds and 1,000 seven-year olds in each country over a period of 15 years and measure a range of child, household and household-member characteristics.

Sample attrition is particularly concerning for a study such as Young Lives, where cohort sample sizes are modest and individuals are tracked over a relatively long time. This paper has three purposes: first, to document the rates of attrition in Young Lives between the 2002 baseline survey and the second round of data collection in 2006/77; second, to investigate the extent to which sample attrition might be non-random; and finally, to analyse whether non-random attrition might lead to biased inferences.

In our analysis we follow Fitzgerald, Gottschalk and Moffitt's seminal work (1998) on attrition in the US longitudinal Panel Study of Income Dynamics (PSID). First, we uncover any patterns of non-random attrition by comparing first round profiles between those households that remained in the sample and those that eventually attrited. Second, we analyse whether attrition on observables could lead to biased inferences in the Young Lives sample. We test for attrition bias in the context of two common child welfare models – child anthropometrics and school enrolment – using two complementary types of tests, the attrition probit tests and the tests first suggested by Becketti, Gould, Lillard and Welch (1998) (BGLW tests).

Our analysis indicates that while varying significantly across the four Young Lives countries, attrition rates are very modest. In fact, to the best of our knowledge, Young Lives attrition rates are the lowest ever reported in the longitudinal studies literature. Further, we find attrition to be correlated with some observable household and child characteristics, suggesting that patterns of attrition might be non-random. Finally, in spite of non-random attrition, we find very limited evidence of attrition bias when tested on child anthropometric and school enrolment models. On the one hand, very low R-Squares from the probit models indicate that attrition remains overwhelmingly random. On the other hand, both attrition bias tests reject the existence of significant biases in the Young Lives sample. In particular, the limited evidence of attrition bias found using attrition probit tests are not corroborated by the BGLW tests. This indicates that, although the patterns of non-random attrition we uncovered could potentially lead to biases, the low rates of attrition ensure that attrition bias remains weak.

The remainder of this paper is structured as follows. Section 2 sets out the appropriate theoretical framework in which attrition should be analysed and provides a brief summary of the available literature. Section 3 introduces the Young Lives study and describes the sampling and follow-up methodologies applied. Section 4 documents the Young Lives attrition rates and analyses the extent to which attrition might be non-random. Section 5 presents the results from the tests on attrition bias, and, finally, section 6 concludes.

2. Attrition bias: framework and literature

In their work, Fitzgerald, Gottschalk and Moffitt (1998) develop a theoretical framework for the analysis of attrition bias, developing a typology whereby attrition on unobservables and observables can be distinguished. While both types of attrition do not necessarily lead to biased inferences, when they do it is attrition on observables that is more easily addressed. Fitzgerald, Gottschalk and Moffitt proposed a series of statistical tests that help determine whether attrition on observables is likely to lead to biased inferences. They suggested a Weighted Least Square (WLS) estimation methodology to correct for the potential biases.

Attrition bias can be analysed within a selection model:

(1) $y = b0 + b1x + e$, $\quad$ y observed if $A = 1$

(2) $A^* = a0 + a1x + v$

Equation (1) represents the model of interest, whereby the outcome variable (y) is only observable for the sample of selected households. Equation (2) is a selection model that determines the likelihood of an observation being observable in the main equation. Latent index A^* is not measurable in practice, but we only observe whether a household has been selected or not, $A = 1$ if $A^* < 0$ and $A = 0$ if $A^* > 0$. Coefficient estimates of model (1) will be biased due to sample selection if the error terms e and v are correlated. Intuitively this will be the case when a variable, other than x, affects both selection to and the outcome variable of the model. It also means that non-random selection does not necessarily lead to biased estimates. Treating y as an outcome variable from the second period of a longitudinal sample and equation (2) as an attrition model, we have the equivalent result for attrition bias in a panel data context (see Maluccio 2000).

The framework presented here makes it particularly clear that attrition bias is model specific. That is, whether non-random selection is correlated with e depends on the precise model estimated.

Fitzgerald, Gottschalk and Moffitt build upon this model to distinguish between attrition on observables and unobservables. Rewriting equation (2) as

(3) $A^* = d0 + d1x + d2z + u$

Selection on observables occurs if z is not independent of $e|x$ but u is independent of $e|x$. As the name suggests, selection on observables indicates that all variables that might affect both the selection equation and the main equation are observable. Stated alternatively, selection on observables occurs if

(4) $\Pr(A=0|y, x, z) = \Pr(A=0|x, z)$

Selection on unobservables, on the other hand, occurs if z is independent of e|x but u is not independent of e|x. That is, equation (4) does not hold and the attrition function cannot be reduced from Pr(A=0|y, x, z).[3] This will be the case if a number of unobserved variables, such as individual motivation or household entrepreneurship, affect both selection into the model and the outcome variable of interest.

Under attrition on unobservables, unbiased estimation crucially relies on the existence of a set of variables z, which affects attrition but does not affect the outcome variable. That is, z should not be part of x. This is the basis for the widely used sample selection model estimators (Heckman 1976; Hausman and Wise 1979). However, meeting such exclusionary restrictions in the context of attrition is more complicated than in other cases, since there are fewer variables that affect attrition but do not credibly affect the outcome variable. To correct for this bias, it has been suggested to use data on interviewers and the interviewing process (see Fitzgerald, Gottschalk and Moffitt 1998; and Zabel 1998).[4] However, this route is not available to us, as no information on the interview process is collected by Young Lives except in Peru.[5]

Under attrition on observables, we can address attrition bias, without the need to resort to exclusionary restricts. If there is selection on observables, the critical variable is z, a variable which affects the likelihood of attrition but is also related to the density of y conditional on x. In other words, z is endogenous to the outcome variable, y. Good candidates for z are lagged values of y, y(-1), as long as they affect attrition but don't belong in the main equation.[6]

It is possible to exploit the properties of the variable z to design tests on the existence of biases due to attrition on observables. Sufficient conditions for the absence of this type of attrition bias are either (a) z does not affect the likelihood of attrition, A, or (b) z is independent of y conditional on x. Based on these conditions, Fitzgerald, Gottschalk and Moffitt suggest the following tests.

First, attrition probit tests rely on the first condition. In this type of test, probit regressions predicting attrition, A, are fitted including a number of predetermined variables, x, plus a candidate variable z, typically a lagged dependent variable. Evidence that the z variable has a significant impact on the likelihood of attrition would indicate that we might encounter significant attrition bias when modelling variable y.

Further, the R-Square values of the attrition probit regressions provide additional insight into attrition bias. R-Square values can be interpreted as an estimate of the proportion of attrition which is non-random - explained by predetermined and lagged endogenous variables. For example, a low R-Square value would indicate that, even if it partly follows non-random patterns, attrition is primarily a random phenomenon.

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3 See Fitzgerald, Gottschalk and Moffitt (1998); Maluccio (2000); and Wooldridge (2002) among others.

4 An alternative methodology for testing attrition on unobservables is suggested in Verbeek and Nijman (1992). For multiple wave surveys they propose 'variable addition tests' whereby information on previous wave response behaviour are added to the main regression equation. See Rendtel (2002) and Wooldridge (2002).

5 The Young Lives team in Peru has collected information on enumerators and field supervisors for Rounds 1 and 2. While outside the scope of this note, such data could form the basis of a future study of attrition on unobservables in the Peru Young Lives sample.

6 More specifically, for a lagged dependent variable to qualify as a suitable z variable, we require, first y-lagged to be correlated with attrition. Second, y-lagged should be sufficiently correlated with y |x, which would be the case, if we are willing to assume serial correlation in the data generating process of y. And third, y-lagged should not enter the model in its own right. Hence, for dynamic models in y, higher order lags might be required instead. See Fitzgerald, Gottschalk and Moffitt (1998: 19).

Secondly, the BGLW test originally suggested by Becketti, Gould, Lillard and Welch (1988) relies on the second condition. This is a type of 'pooling test', in that the impact of the determinants of outcome variable y at the initial wave of the survey are compared between two samples, the full sample and the non-attriting sample. In other words, the BGLW test analyses whether the remaining sample, the non-attriting sample, sufficiently differs from the full sample in its model parameters. In doing so, tests of equality of coefficients are carried out both individually and jointly.

The two tests are closely related. In a loose way, each test can be interpreted as the inverse of the other. For example, the BGLW test can be viewed as shorthand for deriving the implications on the available sample of the attrition probit estimated differences between attritors and non-attritors. The tests are therefore likely to provide broadly consistent results.[7]

No evidence of attrition bias from these tests indicates that estimates of the outcome variable of interest will be accurate. However, Fitzgerald, Gottschalk and Moffitt (1998) also note that even if attrition bias is generated by selection on observables, these biases can be corrected using weighted least squares (WLS) estimators.[8]

In summary, the theoretical framework indicates that even if attrition follows a non-random pattern, it does not necessarily lead to biased inferences. Whether it does so will depend on how strongly attrition is correlated with the residuals in the main equation. Attrition bias is therefore not the property of a particular sample, but specific to the particular model of interest.

There has been much written about testing for attrition bias in longitudinal surveys. Although mostly focused on large surveys in developed countries, a growing number of studies have analysed attrition in developing countries. Studies have shown that attrition rates in developed economies are high – driven primarily by high wave refusal rates – and partly follow non-random patterns. However, the growing consensus in the literature is that the effect of attrition on the resulting estimates is relatively benign.

Fitzgerald, Gottschalk and Moffitt (1998) and other contributors to the special issue of *The Journal of Human Resources* on attrition in longitudinal surveys (Spring 1998) share this view. Fitzgerald, Gottschalk and Moffitt (1998) tested attrition bias on the US longitudinal PSID study and found that in spite of attrition rates as high as 50 per cent and clear patterns of non-random attrition on a number of observables, attrition bias was relatively small when tested on models of earnings, welfare participation and marital status. They conclude that:

> The major reasons for the lack of effect are that the magnitude of the attrition effect, once properly understood, are quite small (most attrition is random); and that much attrition is based on transitory components that fade away from regression-to-the-mean effects both within and across generations.[9]

More recent studies typically support these findings. For example, Jones, Koolman and Rice's study (2005) on health-related non-response in the British Household Panel Survey (BHPS) and the European Community Household Panel (ECHP) indicates that while poor-

7 Fitzgerald, Gottschalk and Moffitt (1998) discuss under which conditions the tests are the exact inverse of each other.

8 The weights suggested by Fitzgerald, Gottschalk and Moffitt in the WLS estimator are obtained from the estimated equations for the probability of attrition. Further, this insight provides the basis for an additional test for attrition bias. Differences between WLS and OLS estimates would indicate the presence of significant attrition bias. See Wooldridge (2002) for a modern application of this type of test.

9 See Fitzgerald, Gottschalk and Moffitt (1998: 2). Other studies in the special issue reach similar conclusions when analysing attrition in the PSID survey for other outcome variables (see Lillard and Panis 1998; Ziliak and Kniesner 1998; or Falaris and Peters 1998), or when applying similar methodologies to other longitudinal studies (Van den Berg and Lindeboom (1998) on the Netherlands).

health households are more likely to drop out of the survey, wave non-response does not appear to distort the magnitudes of the estimated dynamics of self-assessed health and its relation with socio-economic status.[10] Other studies concerned with the ECHP sample conclude that attrition and wave non-response have little effect on a range of variables of interest (see, for example, Behr et al. (2005) on income mobility and Rendtel et al. (2004) on poverty and inequality).

However, not all studies are equally reassuring. A number of papers have found significant biases due to non-random attrition, and the issue ought therefore not to be dismissed out of hand when designing any new longitudinal survey. However, it is striking that many of these studies share in common the fact that their variables of interest are defined for relatively small sub-samples of individuals in the surveys tested.[11] Overall, this could then still be consistent with the conclusions reached by Fitzgerald, Gottschalk and Moffitt quoted above, as well as other studies that have found that, while attriting agents are significantly different from non-attriting agents, group mix effects and regression-to-the-mean effects imply that parameter estimates of non-attriting samples are not as likely to be biased as one would have originally expected.

It has been argued that attrition bias might be a greater concern in developing countries (see for example Ashenfelter, Deaton and Solon (1986) and Thomas, Frankenberg and Smith (1999)). Poor information and communications and high mobility, especially between rural and urban areas, complicate survey tracking in developing economies. However, much lower refusal rates imply that overall wave attrition is substantially smaller than in developed economies.

The evidence indicates that these early concerns might have been unfounded. Recent studies show that attrition bias is relatively modest among a wide number of surveys from developing economies. Alderman et al. (2000) analyse attrition in three longitudinal surveys from Bolivia, Kenya and South Africa which experience relatively high attrition rates.[12] In spite of substantial evidence of non-random attrition, using both attrition probit and BGLW type tests, they find no evidence of attrition bias on child-health (for the Bolivia and South Africa samples) or fertility-related outcome models (for the Kenya sample). Similarly, Falaries (2003) tests for attrition bias in three Living Standards Measurement Survey (LSMS) studies by comparing parameter estimates of behavioural models between the non-attriting and attriting households.[13] Applied to a range of outcome models, including school attainment, labour force participation, wages and fertility, he again concludes that attrition bias is not a serious phenomenon.

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10 It is worth pointing out that they find significant non-response biases when using 'variable addition tests' based on Verbeek and Nijman (1992), which test for attrition on unobservables. However, BGLW type of tests based on the impact of attrition on parameter estimates conclude that attrition bias is not sufficiently important.

11 See McCulloch (2001) on biases in psychiatric morbidity for the BHPS sample, Antonovics et al. (2000) on biases in health problems for a sub-sample of disability beneficiaries in the US New Beneficiary Study, or Burkam and Lee (1998) on biases in the Black-White achievement disparity for the High-School and Beyond survey. See also Watson (2003).

12 The samples involved are the Proyecto Integral de Desarrollo Infantil (PIDI) in Bolivia, the Kenyan Ideational Change Survey (KICS) and the Kwazulu-Natal Income Dynamics Study (KIDS) in South Africa. Alderman et al. (2000) report attrition rates of 35 per cent of children in the PIDI sample, 28 per cent of women in the KICS sample, and 22 per cent of preschool children in the KIDS sample.

13 Note that this procedure is similar to the BGLW tests described earlier. However, as pointed out in Fitzgerald, Gottschalk and Moffitt (1998), the 'full sample vs. non-attriting sample' formulation of the test, provides a more accurate formulation of the biases that the available sample would be subject to. This is implicitly recognised in Falaris (2003) when the latter formulation is also discussed. The samples tested are the LSMS Peru (1991–94 and 1985/86–1990), Côte d'Ivoire (1985–88) and Vietnam (1992/93–1997/98).

Caution is required, however. The methodologies applied in these studies analyse attrition on observables but say little about potential biases due to attrition on unobservables. Maluccio (2000) is a welcome exception. Using information on the quality of the interview as an exclusionary restriction, he analyses attrition on unobservables in the South African KIDS sample. In contrast to the findings in Alderman et al. (2000) – which investigate the effect of attrition on child health in the same sample – he uncovers substantial biases when estimating household expenditure functions. His findings indicate that the effects of attrition are not only model-specific but can also vary depending on the type of attrition considered. They also provide a clear warning against dismissing attrition and its potential biases as unimportant.[14]

3. Young Lives

Young Lives is a longitudinal research project investigating the changing nature of childhood poverty. The study is tracking the development of 12,000 children in Ethiopia, Peru, the Indian state of Andhra Pradesh, and Vietnam through qualitative and quantitative research over a 15-year period. Since 2002 the study has been following two cohorts in each study country. The younger cohort consists of 2,000 children per country aged between 6 and 18 months in 2002. The older cohort consists of 1,000 children per country aged between 7.5 and 8.5 in 2002. The key objectives of Young Lives are: (i) to improve the understanding of causes and consequences of childhood poverty, (ii) to examine how policies affect children's well-being and (iii) to inform the development and implementation of future policies and practices that will reduce childhood poverty.

The sampling methodology applied in most countries is known as a sentinel site surveillance system. It consists of a multi-stage sampling procedure, whereby households within a sentinel site are randomly selected, while sentinel sites themselves are chosen based on a number of predetermined criteria, informed by the objectives of the study. To ensure the sustainability of such long-term study, and for resurveying to remain manageable, a number of well-defined sites were chosen. The sites were selected to ensure that the agro-climatic and cultural differences, as well as the rural and urban divide in each country were appropriately reflected. Further, and following the aims of the Young Lives project, sites were over-proportionally selected from more deprived areas.[15]

Between the first and the second waves of the study, a thorough review of the study resulted in the baseline questionnaires being substantially expanded making them longer to administer. It was in this challenging context that the second wave of the study was undertaken.

In this note, we assess attrition between the first and the second waves of the Young Lives. The baseline survey took place in 2002 and the follow-up was undertaken in late 2006 and early 2007, with pilot runs carried out in all countries in 2006.

[14] Other studies testing attrition on unobservables (in developed economies) have reached more reassuring conclusions. Zabel's work (1998) on attrition on unobservables in the PSID sample supports the conventional view. Using information on interview quality to instrument models of labour market behaviour, he finds that although labour market behaviour differed between attriting and non-attriting individuals, attrition on unobservables did not bias model estimates. Other recent studies include Capellari and Jenkins (2004) who use changes in interviewer as instrument. Neukirch (2002) uses alternative samples and interview information and Jones, Koolman and Rice (2005) use previous response patterns in a Verbeek-Nijman type of test.

[15] All countries except Peru followed this sampling methodology. Peru applied instead a multi-stage, cluster-stratified random sampling methodology which randomised both households and site location. In order to ensure a higher proportion of poorer households, randomisation of sites was carried out over a sub-sample of Peru sites that excluded the five per cent, in population terms, richest areas in the country.

3.1 Attrition rates

A unique characteristic of the Young Lives Study is that it aspires to minimise attrition rates by tracing all children even if they change location. It has a number of mechanisms to do so. In between survey rounds a system was implemented whereby each child was tracked and some basic information was collected. The 2004 tracking exercise collected crucial information for the second survey round, updating information about the child's location and providing an early warning system for potential challenges during the survey.[16] Additionally, care was taken to retain the same enumerators between the first and second rounds, which helped in terms of building skills in data-gathering and local understanding, Pilot surveys helped train enumerators with the new questionnaires as well as reduce refusal rates. Finally a set of clear follow-up protocols were put in place which allowed fast and effective tracking of individuals.

We find that overall attrition rates between the first and the second survey rounds remained very low. In 2002 a total of 11,783 children and households were interviewed. Five years later, 11,465 were successfully re-interviewed. These figures translate into an overall attrition rate of 2.7 per cent for all countries and cohorts. By any standards, this is a very low attrition rate. Table 1 reports attrition rates by country, cohort and attrition category. We observe that attrition rates, while remaining modest overall, vary significantly across countries, ranging from 1.1 per cent in Vietnam to 3.6 or 3.7per cent in Ethiopia and Peru.

Comparing the two cohorts, we find that overall attrition is higher for the younger cohort. This is driven primarily by higher mortality rates among the younger children. Accordingly, when child deaths are excluded, attrition rates become more comparable. Nevertheless, we also find some differences for the untraceable and refusal categories. Incidence of untraceable households appears to be higher among the younger cohort, possibly due households being at earlier stages of their life-cycle. Rates of refusal, on the other hand, are slightly higher among the older cohort.

Attrition rates not only vary across countries but the distribution between attrition categories is also different. These differences are likely to reflect idiosyncrasies of the individual countries. Variations in mortality rates reflect differences in living standards and childhood life expectancy prevalent in each country. While country-specific patterns of internal mobility and urbanisation will lead to differences in rates of refusal and untraceable households, some of the variation might also reflect particular features of the country projects. For example, feedback from the tracking process suggests that high rates of refusals in Peru could be linked, at least to some extent, to poor community understanding of the study's purpose. Similarly, particularly low rates of refused and untraceable households in Vietnam can be partly explained by the prevailing limitations on internal migration, but can also be linked to the close relation with local authorities that Young Lives has developed.

Attrition rates in Young Lives are not only low in absolute terms, but a comparison with other longitudinal studies indicates they can also be considered low in relative terms. Table 2 reports annualised attrition rates for a number of longitudinal studies in comparable countries reported in the attrition literature.[17] We find that attrition rates for the Young Lives countries are substantially lower than the rates reported for other studies. This is the case even for Peru, which experienced the highest rates of attrition in Young Lives. In particular, we find that the

16 Tracking movers has been found to be a very effective way of reducing attrition rates. See for example Thomas et al. (2001) for a detailed account of tracking and follow-up protocols implemented in an Indonesian longitudinal study.

17 Annualised rates are computed following the formula suggested in Alderman et al. (2000) for comparison of attrition rates – (1-(1- q))/ . Where q and   respectively stand for attrition rate and year covered by the panel. See Appendix A for details on the sources for Table 2.

Young Lives annual rate of attrition amounts to only 0.5 per cent, 0.7 per cent for Peru, while the study with the otherwise lowest individual attrition – the Birth to Twenty study in South Africa – experienced annual rates of 1.9 per cent. However, being a 16-year annual survey, Birth to Twenty might not be the best survey for comparison. Surveys with follow-up frequencies closer to Young Lives also report substantially higher attrition rates. For example, the KIDS South African household survey and the PIDI Bolivian child survey, both with follow-ups after five and two years, experienced annual rates of attrition of 3.4 per cent and 19.4 per cent respectively. Similarly, the KHDS survey, with considerably lower attrition rates at the household and child level than most other studies, is still well above the Young Lives attrition rates.

3.2 Patterns of non-random attrition

Even with rates of attrition as low as the ones found in the Young Lives sample, non-random attrition could lead to biased inferences. In this section we investigate non-random attrition by searching for patterns in outcome variables and household characteristics of attriting households. First, we do so by tabulating attriting and non-attriting households over a number of important dimensions. Second, and more rigorously, we carry out statistical tests for the equality of means for a large range of predetermined and outcome variables.

Figure 1 plots kernel densities for the wealth index for the younger cohort for all countries. The wealth index provides an indication of a household’s socio-economic status and is a composite of different variables measuring the quality of the housing, availability of services, and consumer durables that households can access. Panel A shows that attriting households have on average lower wealth index than non-attriting households. While differences are not large, the kernel distribution for attriting households is slightly skewed towards the lower wealth index values. A richer picture emerges when households are split by attrition categories. Panel B shows that ‘child deaths’ are clearly correlated with lower wealth index, while ‘refused’ and ‘untraceable’ households can be linked to higher values of the wealth index.

Table 3 investigates the rural-urban dimension of attrition. We find that attrition is primarily an urban phenomenon. Although urbanisation varies greatly across countries, attriting households are over-proportionally located in urban areas in all countries but Ethiopia. Analysis by attrition categories indicates that these patterns are mostly driven by refusal and untraceable households. This analysis also includes child deaths, which we find to be primarily a rural phenomenon in all of our study countries.

More systematically, we test for the equality of means between non-attriting and attriting households. We also carry out tests whereby we compare non-attriting households with households in each of the three attrition categories. In our comparisons we use a range of household predetermined and outcome variables that include household head, Young Lives children and household demographic characteristics, different measures of household assets as well as indicators of quality of housing and services.

Younger cohort

In Tables 4.1a to 4.1d we report the results of the tests for a selection of indicators. The full set of comparisons can be found in Appendix B. Our analysis shows that attriting households tend to hold fewer assets, have poorer access to services and utilities, and are less educated, while at the same time children have poorer health and are less likely to attend school. Although stronger for Ethiopia and India, these patterns are not always statistically significant. At the same time, we also uncover some variation across attrition categories.

For Ethiopia, attriting children are more likely to live in a household that has less livestock, is female-headed, and has fewer household members. Further, attriting children are themselves more likely to have poorer height-for-age and weight-for-height z-scores than non-attriting children. Interestingly, when attrition is split by categories, a richer pattern emerges concerning children anthropometrics. While the children who died had very poor anthropometric z-scores, the 'untraceable' children appear to have better weight-for-height z-scores than the non-attriting children. It would appear that for these households the change of location was preceded by a sustained period of better nutritional intake.

In India attriting households appear to own less livestock, and are less likely to own their own house or land, although they benefit from higher measures of wealth index. These trends appear to be driven mostly by the profiles of untraceable households. While child anthropometrics are not significantly different between attriting and non-attriting children, the former are less likely to be vaccinated against measles and tuberculosis.

In spite of high reported rates of attrition, few systematic differences are found between attriting and non-attriting households in Peru. Furthermore, it would appear that attrition due to household refusal – the most important contributor to attrition in Peru – is, to a large extent, random. Nevertheless, attriting households are found to own less livestock, are less likely to own their own house but household heads appear to be better educated.

Finally, in Vietnam the reliability of the results is questionable considering the sample sizes involved – only 25 attriting households. Nevertheless, we find that attriting households are less educated, and are less likely to own livestock or their own house. When split by attrition categories, deaths are found to occur among children with lower height-for-age z-scores, lower tuberculosis vaccination rates and caregivers are less educated.

The tables reported in Appendix B also include tests on household ethnic background. The evidence reveals this dimension to be a strong correlate of household attrition. For Ethiopia we find that attrition rates among the Amhara population are over-proportionally high, linked primarily to higher rates of refusals and untraceable households. Although statistically insignificant, the Amhara also experience over-proportionally higher rates of child deaths – the most important attrition category in Ethiopia. For the Oromo and Tigrayans none of the differences are significant although they appear to experience lower rates of attrition.

In India, we find that attrition is over-proportionally high among those who are officially catergorised as belonging to other castes (OC) and that this is primarily linked to higher rates of untraceable and refusal households. On the other hand, those who belong to what the Indian authorities call Backward Castes (BC) appear to experience significantly lower rates of attrition for all attrition categories.[18] For Peru we find that untraceable households are over-proportionally from white ethnic backgrounds, as opposed to the majority ethnic Mestizo group. No other patterns appear to be significant. Finally, for Vietnam we find that child deaths affect over-proportionally the H'Mong minority. Although, as before the few observations involved (four child deaths among the H'Mong) cast doubts on the validity of the results.

Older cohort

Households in the older cohort are likely to be at a later stage in their life-cycle, and are thus likely to be larger and more mature, perhaps holding more assets and having access to better housing. These differences across cohorts could be reflected in their patterns of attrition. However, in our case uncovering these differences is made difficult by the small

[18] The Young Lives Indian sample includes also members of the ST (Scheduled Tribes).

number of households involved. With so few households attriting among the older cohort, statistical tests become imprecise and less reliable, as they become more sensitive to outliers. For completeness, we report these findings, but results from these tests should be interpreted with caution, as they are likely to have less relevance.

Tables 4e to 4h in Appendix B report comparisons for the older cohort. For Peru and Vietnam, as for the younger cohort, few variables are significant. For Ethiopia, as with with the younger cohort, we find that attriting households own less land, are less likely have a male head of household, and have fewer household members. For India, unlike the younger cohort, we find that attriting households not only hold fewer assets and have poorer access to services, but are also significantly less educated. We also find that differences across ethnic groups in all countries are not statistically significant.

Finally, we specifically consider school enrolment as a variable among the eight-year-old children. While there appears to be no significant differences between attriting and non-attriting households, when split by attrition category, child deaths seems to occur among children who were less likely to be enrolled in school in Ethiopia and India.[19]

In summary, our analysis indicates that Young Lives attrition rates are very modest. At the same time, we find that attriting households typically hold less assets, have poorer access to services, caregivers are less educated, and their children have poorer health and are less likely to attend school. That said, few variables other than urban/rural location and ethnic background appear to systematically correlate with attrition.

4. Testing for attrition bias

As discussed earlier, the presence of non-random attrition does not necessarily lead to biased inferences. A number of studies have shown that even when rates of attrition are high and non-random, inferences might nevertheless remain unbiased. This is generally understood to be an indication that, even though partly non-random, attrition in these samples is primarily a random phenomenon.

In this section we present the results from attrition probit and BGLW tests applied to two child welfare models for each Young Lives country.[20] For the younger cohort we estimate models of child health as measured by anthropometric height-for-age (HAZ) and weight-for-height (WHZ) z-scores. For the older cohort, we estimate a model of school enrolment at the age of eight. By applying our attrition bias tests on this type of model, we effectively pose the question of whether observed non-random attrition might lead to biased inferences when estimating child anthropometrics or school enrolment. We focus on these two models because they are two of the most common child welfare models used by economists and other empirical social scientists. How attrition affects inferences in these models is therefore a particularly relevant question to be asking.

19 In Peru there appears to be little association between attrition categories and school enrolment. On the other hand, in Vietnam lower school enrolment is significantly related to refusal households. However, this test is based on two single observations, casting doubt on its precision.

20 We treat each Young Lives country as a distinct sample due to the substantial socio-economic and cultural differences that separate them. This is also reflected in the large differences in attrition patterns reported in the previous section. Evidence from other studies supports this approach. For example, Watson (2003) and Behr et al. (2005) report substantial differences in attrition correlates across countries in the ECHP sample.

4.1 Models of child anthropometrics

For the younger cohort we model child anthropometrics with a number of predetermined child and household specific variables. In particular, we use as model controls information on the household's wealth index, housing quality and asset holdings, education and age of household head and caregivers, child-specific characteristics, as well as ethnic background dummies.[21]

Attrition probit tests

For this type of tests we estimate probit equations for the likelihood of attrition in Round 2 using as determinants control variables measured in Round 1 plus lagged dependent variables – i.e. measures of height-for-age and weight-for-height in Round 1. Table 5.1 reports the results for a number of different model specifications. For the attrition probit tests, the key variables of interest are the lagged dependent variables. If these are statistically significant it suggests that attrition bias might be present when modelling child anthropometric models. Accordingly, the table only reports results for the HAZ and WHZ variables.[22]

Columns (1) and (2) present specifications in which only one lagged dependent variable is included at a time alongside the full set of controls. For all countries except Ethiopia we find little evidence of attrition bias in any of these specifications. Although in most cases we find that attrition is related to poor child anthropometrics, these effects do not appear to be significant.

For Ethiopia, columns (1) and (2) show that poor child HAZ and WHZ z-scores are significantly associated with future attrition among the younger cohort. These results indicate that when estimating child anthropometric models with the same set of controls applied here, the residuals will be significantly correlated with attrition, giving rise to biased inferences. Similar conclusions can be drawn when both lagged endogenous variables are included simultaneously. Coefficients reported in column (3) are both individually and jointly significant.[23,24]

Further, when estimating the probit models for attrition excluding child deaths – see columns (4) and (5) – we find that the original patterns uncovered for Ethiopia disappear. This would appear to be consistent with the profiles reported in the previous section, whereby child deaths were correlated with significantly poorer anthropometrics. Also as before, we find that refusal and untraceable households are correlated with high levels of WHZ but not of HAZ,

21 The full set of control variables used in the models include: Child characteristics (measles vaccination, BCG vaccination, sex of child, single child); Household member characteristics (age of household head, age of household head (squared), age of mother, age of mother (squared), education of caregiver, education of partner of caregiver); Household characteristics (wealth index, housing quality index, household owns house, household owns land, household owns livestock, number of rooms in dwelling, household size, number of adults, number of females, plus ethnic background dummies).

22 Note that coefficients reported are Probit coefficients. In other words, coefficients do not report marginal effects. For the full results of the Probit regressions we refer to tables in Appendix C.

23 Tests for joint significance are significant at standard levels of confidence. The Chi-Square statistic for the joint significance of lagged-HAZ and lagged-WHZ for Ethiopia amounted to 9.76, implying a p-value of 0.002. (Results not reported in this paper.)

24 It should be noted we have devoted little attention to making a clear distinction between predetermined variables and actual control variables used. It is reasonable to believe that some of the variables described as controls in our models are themselves endogenous. When viewed from this perspective, coefficient estimates for these variables gain a different interpretation as they could be considered tests for potential attrition biases in those endogenous variables, included simultaneously with child health variables. Appendix C provides the relevant coefficient estimates for this exercise. We observe that candidate endogenous variables such as household liquid assets or household size tend to be insignificant. Perhaps the exception is household size in Ethiopia which is marginally significant.

possibly indicating that recent improvements in living conditions might have prompted households to become more mobile.[25]

BGLW tests

BGLW tests invert the nature of the attrition probit tests. That is, they analyse the bias that attrition might cause on the model coefficients. Specifically, for the BGLW test we estimate the determinants of child anthropometrics separately for the full sample and the non-attriting sample, and test for the equality of the coefficients individually and jointly.

Tables 6.1a to 6.1d report the results from this exercise for each country. Differences in individual coefficients and the corresponding p-values between the full sample and the non-attriting sample are reported in Columns (3) and (6); for dependent variables HAZ and WHZ respectively. At the bottom of these columns F-test for the joint significant of the parameter differences are also reported.

The evidence from these tests generally support the findings from the attrition probit tests. We find that when fitting determinants of outcome variable models, the joint impact of predetermined variables for the full sample and non-attriting sample are statistically indistinguishable. F-tests reported at the bottom of each table fail to reject the equality of coefficients. This is also the case when we include the constant term, indicating that attrition not only does not affect significantly slope coefficients, but does not seem to be a location shifter either. Tests for individual coefficients report few differences between the full and non-attriting sample. While some variables do appear to have significantly different effects, the number of variables is very limited and do not point to any systematic patterns.

For the Ethiopian case, the F-tests for joint significance indicate that differences are not significant at standard levels of confidence, for both HAZ and WHZ models. This is also the case for tests where intercepts are excluded. Nevertheless, it would appear that coefficients for individual variables might have been significantly affected. For example, for the HAZ model we find that the effect of the carer's partner education is significantly reduced due to attrition, although the reduction is not large in magnitude. Perhaps more important in magnitude is the effect of attrition on the coefficient of land ownership on WHZ. Attrition increases this coefficient from 0.018 to 0.0881. However, a further sign of the weakness of attrition bias is the fact that land ownership itself is not a significant determinant of WHZ in neither of the samples.

We therefore conclude that, in spite of the findings from the attrition probit tests, BGLW tests for Ethiopia indicate that attrition has had no discernible effect on model parameters of child anthropometrics. We interpret this mixed evidence as an indication that while patterns of attrition could potentially lead to attrition bias, current rates in Ethiopia are modest enough for attrition not to lead to biased inferences. It should be noted that this type of mixed evidence is not uncommon in the literature. For example in Fitzgerald, Gottschalk and Moffitt (1998), attrition probit tests suggest that labour income among male household heads aged 25 to 64 could suffer from attrition bias. However, the inversion of the exercise appears to indicate that these effects might not be sufficiently strong to lead to substantial biases in the determinants of labour income.

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25 We reach a similar conclusion when we follow Maluccio (2000) and estimate multinomial logit models. In such cases, we use as dependent variables a categorical variable indicating whether a household belongs to one of the following attrition categories: traced, child death, and refusal or untraceable. We find that only for Ethiopia lagged endogenous variables are significant. In particular, and consistent with Table 5.1, HAZ and WHZ appear to be negatively linked with child deaths, while WHZ appear to be positively associated with refusal and untraceable households. (Results not reported in this paper.)

BGLW tests, of course, provide model estimates of the determinants of child anthropometrics. Results appear to uncover a number a common patterns across countries.[26] First, child specific variables, such as gender and measles or TB vaccination tend to be strong determinants of both HAZ and WHZ z-scores. Second, while in some cases household assets appear to have a significant effect, variables measuring the quality of the services (wealth index) and quality of the housing (house quality index and number of rooms) appear to be stronger determinants of child anthropometrics. Third, the education level of the primary caregiver is also significant although not always with the expected sign. Fourth, household demographic and household life-cycle variables appear to be relevant in Peru and Vietnam, but less so in the other countries. Finally, we find that in most countries HAZ and WHZ z-scores vary significantly across the different ethnic groups.

Attrition probit R-square

Attrition probit R-squares provide further evidence of the limited impact of non-random attrition. Table 5.2 reports R-square values corresponding to the probits regression reported in columns (1) to (3) in Table 5.1. They indicate that lagged endogenous and predetermined variables only explain a small proportion of the observed variation. In particular, we find that, for three Young Lives countries probit models do not explain more than ten per cent of the observed attrition.[27] In other words, even if it follows some non-random patterns, attrition remains overwhelmingly a random phenomenon.

4.2 Models of school enrolment

For completeness we now turn to the older cohort and estimate models of school enrolment using a similar set of predetermined variables as in models of child anthropometrics. Given the very small number of attriting households involved, we do not expect to uncover significant biases. Moreover, small sample sizes also imply that several attrition tests are poorly identified and might therefore provide unreliable estimates. In particular, a number of attrition probit tests on school enrolment are either not identified (Vietnam) or rely on a single observation for identification (India and Peru).[28] In this section, we therefore focus exclusively on the BGLW tests. These results also should be interpreted with care.

Tables 7a to 7c in Appendix D report the results from probit regressions on the determinants of school enrolment for the full and the non-attriting sample. The tables also report the differences in coefficients between the two samples and the corresponding equality tests. F-tests for the joint difference of all coefficients are reported at the bottom of the tables. Note that no results are included for the Peru sample. Sample size problems implied that BGLW tests for Peru were also insufficiently identified. [29]

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[26] See Appendix D for the results for the full set of variables used in the BGLW test.

[27] The exception is Vietnam with R-squares around 0.19. We should note that these estimates are based on a small number of attriting households (25). At the same time, as discussed earlier, little evidence of systematic biases are uncovered in the Vietnam sample using both attrition Probit and BGLW tests.

[28] As discussed in earlier sections, attrition Probit tests are mainly preoccupied with the significance of lagged dependent variables when fitting Probit models of the likelihood of attrition. Identification of the effect of the lagged endogenous variable, in this case 'school enrolment', on attrition therefore relies on having sufficient variation in school enrolment conditional on a household attriting. Table 8 shows the number of observations for these cells. We find that for Vietnam no identification would be possible, while for India and Peru, the school enrolment coefficient would be identified by a single observation.

[29] We found that the variation in school enrolment in the Peru sample was not sufficient; from a total of 714 eight-year old children (already a smaller sample) only 7 were not enrolled. This was not sufficient for the Probit regression to be identified. In fact, school enrolment was perfectly predicted by the model. Although not as severe, we encountered similar problems in the case

As expected, considering the small differences in the sample sizes between the full sample and the non-attriting sample, we find no significant differences between the two models. This is also the case, for most individual coefficients.

Further, the estimated models indicate that household life-cycle variables, such as age and age squared of the household head, and 'single child' are important determinants of school enrolment. We also find that enrolment is significantly linked to household assets and household wealth index, as well as to ethnic background dummies.

5. Conclusion

Although modest, we find that attrition in the Young Lives sample is to some extent non-random. Even though not always significant, attriting households typically are located in urban areas, have a low wealth index, own fewer assets, are less educated, have poorer access to services, and their children have poorer health and are less likely to attend school. Furthermore, we uncover substantial differences in household profiles across attrition categories.

However, our detailed analysis of attrition bias, using attrition probit and BGLW tests, indicates that attrition on observables is unlikely to lead to significant biases when estimating models of child anthropometrics for the younger cohort or school enrolment for the older cohort. Furthermore, we find that R-squares in the attrition probit regressions are low, indicating that Young Lives attrition is primarily a random phenomenon.

Nevertheless, results from attrition bias tests for Ethiopia provide a warning against complacency. Although BGLW tests do not corroborate these findings, attrition probit tests show that child deaths in Ethiopia might lead to biases in child anthropometric models. We interpret this mixed evidence as an indication that patterns of non-random attrition could lead to biases, but modest rates of attrition currently ensure that these remain sufficiently weak.

The Ethiopia case highlights the importance of ensuring that future survey rounds maintain the current modest levels of attrition. Future tracking must be carefully designed in order to avoid exacerbating current patterns of attrition.

Finally, notwithstanding the evidence presented in this paper, a word of caution is warranted. Our analysis, which focused on testing biases caused by attrition on observables, says little about the effect of attrition on unobservables. In this respect, Maluccio's evidence (2000) provides a healthy warning. Lacking the means to test the presence of biases due to attrition on unobservables, we can only speculate that, given the modest attrition rates found in the Young Lives sample between 2002 and 2007, this type of bias will also be relatively unimportant.

of Vietnam, for which only 15 children were not enrolled. Accordingly Probit regressions for Vietnam drop a number of variables that perfectly predicted the dependent variable, namely 'single child', 'primary school – carer?', 'primary school – partner of carer?' and 'own house'.

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Appendix A

Attrition in selected Longitudinal Studies

Country, date	Attrition rate (%) per annum (including loss due to death)	Attrition rate (%) per annum (excluding loss due to death)	Survey length	Sample description and reasons for attrition	References
South Africa, 1990 Birth to Twenty	1.9%	1.8%	16 years of follow-up, up to 2006	Largest and longest running birth cohort study in Africa. Initial sample 3,275 children born to women who were residents of the Greater Johannesburg area. Commonest reason for attrition was that the mother/child moves out of the area—but there was follow-up later if the migration was circular. Attrition also if mother/child dies, child adopted or abandoned and study fatigue. Better off families less reluctant to participate in repeat interviews. Tracking done through extensive links with the community, school, incentives for participation, etc.	Norris, S.A., Richter L.M and Fleetwood, S. A. (2007); Richter, L.M, Norris, S.A. and De Wet, T (2004)
Cameroon, IFORD Yaounde Survey, 1978	22.5%	18.7%	7 rounds of follow-up within 2years	Initial sample of 9774 children. 13.3% of the sample lost for follow-up due to emigration, 8.5% due to moving within the survey area, 6% death. No information on 12.4% of the sample that has been lost for follow-up majority of them during the first round). Overall attrition by the end of the survey was 40% (including 6% attrition due to death)	Kuate Defo (1992)
Brazil Pelatos Birth Cohort, 1982-1986[2]	5.3%	4.2%	2 follow-ups of entire sample within 4 years in 1984 and 1986.	Initial sample 5,914 live births in hospital between January to December 1982 in the city of Pelatos. Main sampling strategy was daily visits to all city hospitals during this period. Follow-up in 1984 and 1986 was by visiting every household in the city in search of children born in 1982 (i.e., a census of all households in the city). Overall attrition by the end of 1986 was 19.8% (including 3.9% attrition due to death)	Barros, et.al (2006)
Bolivia 1996, El Proyecto Integral de Desarrollo Infantil	19.4%		1 follow-up after a 2 year interval	Initial sample 2,047 households with urban pre-school children attending child-care centres	Alderman et.al (2001)
Kenya 1994, Kenyan Ideational Change Survey (KICS)	23.2%		1 follow-up after a 2 year interval	Initial sample 900 women and their partners.	Alderman et.al (2001)
South Africa, 1993 KIDS	3.4%	3.4%	1 follow-up after a 5 year interval	Initial sample 1,393 black Africans and Indians living in KwaZulu-Natal	Alderman et.al (2001), May et.al.(2000)
Philippines 1983, Cebu Longitudinal Health and Nutrition Survey (CLHNS)	2.6%		11 year study, 14 rounds in first 2 years, 2 others at varying intervals	Initial sample 3,080 births in metropolitan Cebu between 1983-4	http://www.cpc.unc.edu/projects/cebu
Kagera Health and Development Survey (KHDS), Tanzania – 1991	0.88%	0.70%	4 rounds of follow-up in 4 year period	Initial sample of 480 households in the Kagera region of Tanzania.	User Guide KHDS data, Wold Bank, 2004
Kagera Health and Development Survey (KHDS), Tanzania – 1994	2.85%	1.60%	1 follow-up after 10 year interval	Initial sample of 6,204 individuals in the Kagera region of Tanzania, 1994	Beegle et al. (2006)
Kagera Health and Development Survey (KHDS), Tanzania – 1994, children under 10 years of age	2.29%	1.50%	1 follow-up after 10 year interval	Initial sample of 6,204 individuals in the Kagera region of Tanzania, 1994	Beegle et al. (2006)

Notes

1. Annual attrition rate calculated as $1-(1-q)^{1/\Gamma}$ where q is the overall attrition rate and Γ is the years covered by the panel.

2. The Brazilian Pelatos birth cohort data collection was assumed over, after the 1986 round. However, data-gathering had been initiated again in for the full initial-sample of 5914 in 2004-5. Since no tracking procedures had been followed and overall follow-up had been haphazard and subject to funding, the attrition rate for the 2004-5 round of data collection was as high as 77 per cent. The survey remains on-going.

Appendix B

Non-random Attrition: Variable Means

Table 4a. *Ethiopia: Comparison of predetermined and outcome variables by attrition category (younger cohort only)*

Variables	Non-Attriting HHS	Attriting HHs	Of which		
			Child Death	Refused	Untraceable
Male HH head?	0.8420	0.9600	0.9091	1.0000	1.0000
Age of HH Head	37.9635	35.3200	35.1818	34.0000	35.5385
HH Head - No Schooling	0.3175	0.2400	0.4545	0.0000	0.0769 *
Prim. School - Carer	0.7261	0.6800	0.4545 **	1.0000	0.8462
Prim. School - Partner Carer	0.7408	0.6400	0.4545 **	1.0000	0.7692
HH Size	4.8982	5.0000	5.1818	3.0000	5.0000
Nr HH Females	2.5570	2.6400	2.8182	1.0000	2.6154
Nr HH Adults	2.9665	3.0400	2.7273	2.0000	3.3846
HH Water - Unprotected	0.6719	0.5600	0.6364	0.0000	0.5385
HH Electricity?	0.8456	0.8000	0.6364 *	1.0000	0.9231
HH Toilet - No Facilities	0.5104	0.3600	0.5455	0.0000	0.2308 **
HH owns Livestock?	0.6572	0.5200	0.7273	0.0000	0.3846 **
Nr Rooms in House	1.9068	1.8800	1.7273	1.0000	2.0769
HH owns House?	0.7656	0.7600	0.9091	1.0000	0.6154
HH owns Land?	0.7403	0.7200	0.9091	1.0000	0.5385 *
Irrigated Land?	0.7510	0.8333	0.9000	1.0000	0.7143
Wealth Index	0.4264	0.4726	0.3099	0.5463	0.6270 **
Housing Quality Index	0.5326	0.5342	0.4009	0.8056	0.6261
Child Sex	0.5134	0.6400	0.7273	1.0000	0.5385
Child Age	11.6360	10.7200	11.5455	11.0000	10.0000 *
Child HAZ	-0.8085	-1.1988	-2.0810 ***	-0.1900	-0.5977
Child WHZ	-0.5175	-0.5109	-0.6467	-1.7300	-0.3231
Child BCQ Vacc.	0.8907	0.7917	0.7273 *	-	0.8462
Child Measles Vacc.	0.6810	0.6800	0.6364	1.0000	0.6923
Eth. Dummy - Other	0.0349	0.0400	0.0909	0.0000	0.0000
Eth. Dummy - Kinh	0.8572	0.7600	0.5455 ***	1.0000	0.9231
Eth. Dummy - H'Mong	0.0552	0.2000 ***	0.3636 ***	0.0000	0.0769
Sample Size	**1,975**	**25**	**11**	**1**	**13**

Note: (***), (**) and (*) indicate one per cent,five5 per cent and ten per cent level of significance of means relative to default group - non-attriting HHs. Reported sample sizes correspond to the total number of households; sample sizes for individual variables might be smaller. Missing entries indicate that no observations are available for that particular category (younger cohort only).

Table 4.1b. *India: Comparison of predetermined and outcome variables by attrition category (younger cohort only)*

Variables	Non-Attriting HHS	Attriting HHs	Of which		
			Child Death	Refused	Untraceable
Male HH head?	0.8420	0.9600	0.9091	1.0000	1.0000
Age of HH Head	37.9635	35.3200	35.1818	34.0000	35.5385
HH Head - No Schooling	0.3175	0.2400	0.4545	0.0000	0.0769 *
Prim. School - Carer	0.7261	0.6800	0.4545 **	1.0000	0.8462
Prim. School - Partner Carer	0.7408	0.6400	0.4545 **	1.0000	0.7692
HH Size	4.8982	5.0000	5.1818	3.0000	5.0000
Nr HH Females	2.5570	2.6400	2.8182	1.0000	2.6154
Nr HH Adults	2.9665	3.0400	2.7273	2.0000	3.3846
HH Water - Unprotected	0.6719	0.5600	0.6364	0.0000	0.5385
HH Electricity?	0.8456	0.8000	0.6364 *	1.0000	0.9231
HH Toilet - No Facilities	0.5104	0.3600	0.5455	0.0000	0.2308 **
HH owns Livestock?	0.6572	0.5200	0.7273	0.0000	0.3846 **
Nr Rooms in House	1.9068	1.8800	1.7273	1.0000	2.0769
HH owns House?	0.7656	0.7600	0.9091	1.0000	0.6154
HH owns Land?	0.7403	0.7200	0.9091	1.0000	0.5385 *
Irrigated Land?	0.7510	0.8333	0.9000	1.0000	0.7143
Wealth Index	0.4264	0.4726	0.3099	0.5463	0.6270 **
Housing Quality Index	0.5326	0.5342	0.4009	0.8056	0.6261
Child Sex	0.5134	0.6400	0.7273	1.0000	0.5385
Child Age	11.6360	10.7200	11.5455	11.0000	10.0000 *
Child HAZ	-0.8085	-1.1988	-2.0810 ***	-0.1900	-0.5977
Child WHZ	-0.5175	-0.5109	-0.6467	-1.7300	-0.3231
Child BCQ Vacc.	0.8907	0.7917	0.7273 *	-	0.8462
Child Measles Vacc.	0.6810	0.6800	0.6364	1.0000	0.6923
Eth. Dummy - Other	0.0349	0.0400	0.0909	0.0000	0.0000
Eth. Dummy - Kinh	0.8572	0.7600	0.5455 ***	1.0000	0.9231
Eth. Dummy - H'Mong	0.0552	0.2000 ***	0.3636 ***	0.0000	0.0769
Sample Size	**1,975**	**25**	**11**	**1**	**13**

Variables	Non-Attriting HHS	Attriting HHs	Of which		
			Child Death	Refused	Untraceable
Male HH head?	0.9144	0.9508	1.0000 *	0.8571	0.9091
Age of HH Head	39.9077	41.7213	40.9687	38.1429	43.9545
HH Head - No Schooling	0.5826	0.5082	0.6250	0.0000 ***	0.5000
Prim. School - Carer	0.3938	0.4754	0.3125	0.7143 *	0.6364 **
Prim. School - Partner Carer	0.5108	0.5738	0.5000	1.0000 **	0.5455
HH Size	5.4246	5.3279	5.2812	5.2857	5.4091
Nr HH Females	2.7149	2.4426	2.5313	2.4286	2.3182
Nr HH Adults	3.5103	3.3667	3.4194	3.1429	3.3636
HH Water - Unprotected	0.1631	0.1311	0.1563	0.0000	0.1364
HH Electricity?	0.8210	0.8361	0.7813	1.0000	0.8636
HH Toilet - No Facilities	0.7072	0.4918 ***	0.7500	0.0000 ***	0.2727 ***
HH owns Livestock?	0.4482	0.2623 ***	0.4688	0.0000 **	0.0455 ***
Nr Rooms in House	1.7959	1.8852	1.6250	2.4286	2.0909
HH owns House?	0.8210	0.6230 ***	0.7188	0.7143	0.4545 ***
HH owns Land?	0.5795	0.3770 ***	0.6250	0.0000 ***	0.1364 ***
Irrigated Land?	0.5805	0.4783	0.5000	-	0.3333
Wealth Index	0.3382	0.3952 **	0.2720 *	0.6677 ***	0.4877 ***
Housing Quality Index	0.4083	0.4434	0.3280	0.7952 ***	0.4994
Child Sex	0.5369	0.5574	0.5313	0.4286	0.6364
Child Age	11.8205	11.8852	11.6875	10.4286	12.6364
Child HAZ	-1.0710	-1.1295	-1.3234	-0.7714	-0.9877
Child WHZ	-1.1278	-1.1136	-1.3762	-1.0443	-0.7895
Child BCQ Vacc.	0.9297	0.7377 ***	0.6563 ***	0.8571	0.8182 **
Child Measles Vacc.	0.7313	0.5902 **	0.5313 **	0.8571	0.5909
Eth. Dummy - SC	0.1836	0.1967	0.2500	0.1429	0.1364
Eth. Dummy - ST	0.1472	0.0984	0.1875	0.0000	0.0000 *
Eth. Dummy - BC	0.4646	0.2951 ***	0.3438	0.2857	0.2273 **
Eth. Dummy - OC	0.2046	0.4098 ***	0.2188	0.5714 **	0.6364 ***
Sample Size	**1,950**	**61**	**32**	**7**	**22**

Note: (***), (**) and (*) indicate one per cent, five per cent and ten per cent levels of significance of means relative to default group - non-attriting HHs. Reported sample sizes correspond to the total number of households; sample sizes for individual variables might be smaller. Missing entries indicate that no observations are available for that particular category. (younger cohort only).

Table 4.1c. *Peru: Comparison of predetermined and outcome variables by attrition category (younger cohort only)*

Variables	Non-Attriting HHS	Attriting HHs	Of which		
			Child Death	Refused	Untraceable
Male HH head?	0.8765	0.8831	1.0000	0.8696	0.8846
Age of HH Head	35.5571	33.5789	33.0000	33.4000	34.0000
HH Head - No Schooling	0.0603	0.0130 *	0.0000	0.0217	0.0000
Prim. School - Carer	0.9144	0.9610	0.8000	0.9565	1.0000
Prim. School - Partner Carer	0.8157	0.7922	1.0000	0.7609	0.8077
HH Size	5.7195	5.3117	6.0000	5.1957	5.3846
Nr HH Females	2.9099	2.8052	3.2000	2.9130	2.5385
Nr HH Adults	2.9830	2.8158	3.0000	2.7111	2.9615
HH Water - Unprotected	0.1073	0.1558	0.0000	0.2174 **	0.0769
HH Electricity?	0.6516	0.6623	0.8000	0.5870	0.7692
HH Toilet - No Facilities	0.2152	0.2078	0.2000	0.2391	0.1538
HH owns Livestock?	0.6997	0.6104 *	0.8000	0.6087	0.5769
Nr Rooms in House	2.5357	2.2078 *	2.2000	2.0652 **	2.4615
HH owns House?	0.6673	0.5455 **	1.0000	0.6522	0.2692 ***
HH owns Land?	0.5210	0.4545	0.6000	0.5000	0.3462 *
Irrigated Land?	0.5634	0.4545	0.6667	0.5238	0.2222 **
Wealth Index	0.4633	0.4583	0.4394	0.4150	0.5385
Housing Quality Index	0.4576	0.4659	0.3683	0.4335	0.5419
Child Sex	0.5023	0.4416	0.4000	0.4130	0.5000
Child Age	11.5458	11.4286	12.4000	11.5435	11.0385
Child HAZ	-1.0757	-0.9005	-1.6100	-1.0716	-0.4746 **
Child WHZ	0.6099	0.6200	0.0400	0.4731	0.9858
Child BCQ Vacc.	0.9740	0.9733	1.0000	0.9773	0.9615
Child Measles Vacc.	0.3469	0.3333	0.6000	0.3409	0.2692
Eth. Dummy - White	0.0557	0.0909	0.2000	0.0435	0.1538 **
Eth. Dummy - Mestizo	0.9175	0.8961	0.8000	0.9565	0.8077 **
Eth. Dummy - Amazon Native	0.0223	0.0000	0.0000	0.0000	0.0000
Eth. Dummy - Negro	0.0041	0.0000	0.0000	0.0000	0.0000
Eth. Dummy - Asiatic	0.0005	0.0130 ***	0.0000	0.0000	0.0385 ***
Sample Size	**1,975**	**77**	**5**	**46**	**26**

Note: (***), (**) and (*) indicate one per cent, five per cent and ten per cent levels of significance of means relative to default group - non-attriting HHs. Reported sample sizes correspond to the total number of households; sample sizes for individual variables might be smaller. Missing entries indicate that no observations are available for that particular category (younger cohort only).

Table 4.1d. *Vietnam: Comparison of predetermined and outcome variables by attrition category (younger cohort only)*

Variables	Non-Attriting HHS	Attriting HHs	Of which		
			Child Death	Refused	Untraceable
Male HH head?	0.8420	0.9600	0.9091	1.0000	1.0000
Age of HH Head	37.9635	35.3200	35.1818	34.0000	35.5385
HH Head - No Schooling	0.3175	0.2400	0.4545	0.0000	0.0769 *
Prim. School - Carer	0.7261	0.6800	0.4545 **	1.0000	0.8462
Prim. School - Partner Carer	0.7408	0.6400	0.4545 **	1.0000	0.7692
HH Size	4.8982	5.0000	5.1818	3.0000	5.0000
Nr HH Females	2.5570	2.6400	2.8182	1.0000	2.6154
Nr HH Adults	2.9665	3.0400	2.7273	2.0000	3.3846
HH Water - Unprotected	0.6719	0.5600	0.6364	0.0000	0.5385
HH Electricity?	0.8456	0.8000	0.6364 *	1.0000	0.9231
HH Toilet - No Facilities	0.5104	0.3600	0.5455	0.0000	0.2308 **
HH owns Livestock?	0.6572	0.5200	0.7273	0.0000	0.3846 **
Nr Rooms in House	1.9068	1.8800	1.7273	1.0000	2.0769
HH owns House?	0.7656	0.7600	0.9091	1.0000	0.6154
HH owns Land?	0.7403	0.7200	0.9091	1.0000	0.5385 *
Irrigated Land?	0.7510	0.8333	0.9000	1.0000	0.7143
Wealth Index	0.4264	0.4726	0.3099	0.5463	0.6270 **
Housing Quality Index	0.5326	0.5342	0.4009	0.8056	0.6261
Child Sex	0.5134	0.6400	0.7273	1.0000	0.5385
Child Age	11.6360	10.7200	11.5455	11.0000	10.0000 *
Child HAZ	-0.8085	-1.1988	-2.0810 ***	-0.1900	-0.5977
Child WHZ	-0.5175	-0.5109	-0.6467	-1.7300	-0.3231
Child BCQ Vacc.	0.8907	0.7917	0.7273 *	-	0.8462
Child Measles Vacc.	0.6810	0.6800	0.6364	1.0000	0.6923
Eth. Dummy - Other	0.0349	0.0400	0.0909	0.0000	0.0000
Eth. Dummy - Kinh	0.8572	0.7600	0.5455 ***	1.0000	0.9231
Eth. Dummy - H'Mong	0.0552	0.2000 ***	0.3636 ***	0.0000	0.0769
Sample Size	**1,975**	**25**	**11**	**1**	**13**

Note: (***), (**) and (*) indicate one per cent, five per cent and ten per cent levels of significance of means relative to default group - non-attriting HHs. Reported sample sizes correspond to the total number of households; sample sizes for individual variables might be smaller. Missing entries indicate that no observations are available for that particular category (younger cohort only).

Table 4e. *Ethiopia: Comparison of predetermined and outcome variables by attrition category: (older cohort only)*

Variables	Non-Attriting HHS	Attriting HHs	Of which		
			Child Death	Refused	Untraceable
Male HH head?	0.7554	0.5789 *	0.5000	0.5000	0.7143
Age of HH Head	42.6551	40.8889	44.6667	35.0000 *	43.0000
HH Head - No Schooling	0.5607	0.5789	0.6667	0.8333	0.2857
Prim. School - Carer	0.1600	0.2105	0.1667	0.0000	0.4286 *
Prim. School - Partner Carer	0.2161	0.1579	0.1667	0.0000	0.2857
HH Size	6.4587	5.5263 *	5.0000	5.0000	6.4286
Nr HH Females	3.3293	3.1053	2.3333 *	3.0000	3.8571
Nr HH Adults	2.8500	2.5882	2.1667	2.3333	3.4000
HH Water - Unprotected	0.4455	0.3684	0.1667	0.5000	0.4286
HH Electricity?	0.3507	0.4737	0.3333	0.1667	0.8571 ***
HH Toilet - No Facilities	0.6327	0.5789	0.8333	0.8333	0.1429 ***
HH owns Livestock?	0.7064	0.7895	0.8333	0.6667	0.8571
Nr Rooms in House	1.6524	1.6842	1.5000	1.3333	2.1429
HH owns House?	0.6911	0.5789	0.6667	0.6667	0.4286
HH owns Land?	0.5980	0.3158 **	0.5000	0.5000	0.0000 ***
Irrigated Land?	0.0688	0.1667	0.3333 *	0.0000	-
Wealth Index	0.1747	0.2125	0.1699	0.0836	0.3596 ***
Housing Quality Index	0.2451	0.2644	0.2181	0.1787	0.3776 *
Child Enroled in School?	0.6585	0.5263	0.3333 *	0.5000	0.7143
Eth. Dummy - Other	0.0345	0.0000	0.0000	0.0000	0.0000
Eth. Dummy - Amhara	0.2738	0.4211	0.5000	0.5000	0.2857
Eth. Dummy - Gurage	0.0888	0.0526	0.0000	0.1667	0.0000
Eth. Dummy - Hadiva	0.0512	0.0000	0.0000	0.0000	0.0000
Eth. Dummy - Oromo	0.2027	0.2105	0.1667	0.1667	0.2857
Eth. Dummy - Sidama	0.0543	0.0000	0.0000	0.0000	0.0000
Eth. Dummy - Tigrian	0.2278	0.2105	0.1667	0.1667	0.2857
Eth. Dummy - Wolavta	0.0669	0.1053	0.1667	0.0000	0.1429
Sample Size	**981**	**19**	**6**	**6**	**7**

Note: (***), (**) and (*) indicate one per cent,five per cent and ten per cent levels of significance of means relative to default group - non-attriting HHs. Reported sample sizes correspond to the total number of households; sample sizes for individual variables might be smaller. Missing entries indicate that no observations are available for that particular category (younger cohort only).

Table 4f. *India: Comparison of predetermined and outcome variables by attrition category (older cohort only)*

Variables	Non-Attriting HHS	Attriting HHs	Of which		
			Child Death	Refused	Untraceable
Male HH head?	0.9206	1.0000	1.0000	1.0000	1.0000
Age of HH Head	40.1417	42.3846	38.0000	48.4286 **	32.6667
HH Head - No Schooling	0.5879	0.2308 ***	0.6667	0.1429 **	0.0000 **
Prim. School - Carer	0.2915	0.7692 ***	0.3333	1.0000 ***	0.6667
Prim. School - Partner Carer	0.4231	0.8462 ***	0.3333	1.0000 ***	1.0000 **
HH Size	5.5487	5.2308	4.6667	5.0000	6.3333
Nr HH Females	2.8322	2.2308	2.0000	2.1429	2.6667
Nr HH Adults	2.8513	2.5385	2.0000	2.7143	2.6667
HH Water - Unprotected	0.1719	0.0000	0.0000	0.0000	0.0000
HH Electricity?	0.8191	0.9231	0.6667	1.0000	1.0000
HH Toilet - No Facilities	0.6935	0.1538 ***	0.3333	0.0000 ***	0.3333
HH owns Livestock?	0.4291	0.0000 ***	0.0000	0.0000 **	0.0000
Nr Rooms in House	1.7688	2.3077 *	1.3333	3.0000 ***	1.6667
HH owns House?	0.8553	0.6154 **	0.6667	0.7143	0.3333 **
HH owns Land?	0.5457	0.3077 *	0.0000 *	0.4286	0.3333
Irrigated Land?	0.6266	0.0000 **	-	0.0000 *	0.0000
Wealth Index	0.3403	0.5998 ***	0.3541	0.7440 ***	0.5091
Housing Quality Index	0.4017	0.6282 ***	0.4639	0.7679 ***	0.4667
Child Enroled in School?	0.9749	0.9231	0.6667 ***	1.0000	1.0000
Eth. Dummy - SC	0.2111	0.1538	0.3333	0.1429	0.0000
Eth. Dummy - ST	0.1075	0.1538	0.3333	0.0000	0.3333
Eth. Dummy - BC	0.4653	0.3846	0.0000	0.4286	0.6667
Eth. Dummy - OC	0.2161	0.3077	0.3333	0.4286	0.0000
Sample Size	**995**	**13**	**3**	**7**	**3**

Note: (***), (**) and (*) indicate one per cent ,five per cent and ten per cent level of significance of means relative to default group - non-attriting HHs. Reported sample sizes correspond to the total number of households; sample sizes for individual variables might be smaller. Missing entries indicate that no observations are available for that particular category (younger cohort only).

Table 4g. *Peru: Comparison of predetermined and outcome variables by attrition category (older cohort only)*

Variables	Non-Attriting HHS	Attriting HHs	Of which		
			Child Death	Refused	Untraceable
Male HH head?	0.8183	0.7692	0.0000 **	0.8333	0.7143
Age of HH Head	39.0966	41.1923	30.0000	42.3889	39.7143
HH Head - No Schooling	0.0480	0.0385	0.0000	0.0556	0.0000
Prim. School - Carer	0.8881	0.9615	1.0000	0.9444	1.0000
Prim. School - Partner Carer	0.7907	0.6538 *	0.0000 *	0.6667	0.7143
HH Size	5.7035	5.6923	3.0000	5.7778	5.8571
Nr HH Females	2.8110	2.9231	3.0000	3.0556	2.5714
Nr HH Adults	2.7724	2.9615	2.0000	2.7778	3.5714
HH Water - Unprotected	0.0683	0.0385	0.0000	0.0556	0.0000
HH Electricity?	0.7369	0.6923	1.0000	0.6111	0.8571
HH Toilet - No Facilities	0.1657	0.1538	0.0000	0.2222	0.0000
HH owns Livestock?	0.6977	0.6154	0.0000	0.6667	0.5714
Nr Rooms in House	2.6453	2.8077	2.0000	2.5000	3.7143 *
HH owns House?	0.7224	0.8077	1.0000	0.7778	0.8571
HH owns Land?	0.4367	0.4615	1.0000	0.5000	0.2857
Irrigated Land?	0.5552	0.5455	0.0000	0.5556	1.0000
Wealth Index	0.5092	0.5767	0.7593	0.5279	0.6761 **
Housing Quality Index	0.4883	0.5956 **	0.8611	0.5885	0.5761
Child Enroled in School?	0.9913	0.9615	1.0000	0.9444 **	1.0000
Eth. Dummy - White	0.0422	0.0385	0.0000	0.0000	0.1429
Eth. Dummy - Mestizo	0.9243	0.9615	1.0000	1.0000	0.8571
Eth. Dummy - Amazon Native	0.0291	0.0000	0.0000	0.0000	0.0000
Eth. Dummy - Negro	0.0044	0.0000	0.0000	0.0000	0.0000
Sample Size	**688**	**26**	**1**	**18**	**7**

Note: (***), (**) and (*) indicate one per cent, five per cent and ten per cent levels of significance of means relative to default group - non-attriting HHs. Reported sample sizes correspond to the total number of households; sample sizes for individual variables might be smaller. Missing entries indicate that no observations are available for that particular category (younger cohort only).

Table 4h. *Vietnam: Comparison of predetermined and outcome variables by attrition Category (older cohort only)*

Variables	Non-Attriting HHS	Attriting HHs	Of which		
			Child Death	Refused	Untraceable
Male HH head?	0.8389	1.0000	1.0000	1.0000	1.0000
Age of HH Head	38.9738	40.1429	36.0000	43.5000	40.6667
HH Head - No Schooling	0.2628	0.2857	0.0000	0.5000	0.3333
Prim. School - Carer	0.6838	0.8571	1.0000	1.0000	0.6667
Prim. School - Partner Carer	0.7321	0.7143	1.0000	0.5000	0.6667
HH Size	4.9275	5.2857	4.5000	6.0000	5.3333
Nr HH Females	2.5418	2.5714	2.0000	3.5000	2.3333
Nr HH Adults	2.5297	2.5714	2.0000	3.0000	2.6667
HH Water - Unprotected	0.6415	0.5714	0.5000	0.0000 *	1.0000
HH Electricity?	0.8862	1.0000	1.0000	1.0000	1.0000
HH Toilet - No Facilities	0.5005	0.4286	0.0000	0.5000	0.6667
HH owns Livestock?	0.6858	0.7143	1.0000	0.5000	0.6667
Nr Rooms in House	1.8409	2.2857	2.0000	2.5000	2.3333
HH owns House?	0.8560	1.0000	1.0000	1.0000	1.0000
HH owns Land?	0.7402	0.7143	1.0000	0.5000	0.6667
Irrigated Land?	0.7510	0.4000 *	0.5000	1.0000	0.0000 **
Wealth Index	0.4425	0.5421	0.5093	0.6493	0.4815
Housing Quality Index	0.5462	0.6851	0.7000	0.8229	0.5833
Child Enroled in School?	0.9849	1.0000	1.0000	1.0000	1.0000
Eth. Dummy - Other	0.0292	0.0000	0.0000	0.0000	0.0000
Eth. Dummy - Kinh	0.8721	0.8571	1.0000	1.0000	0.6667
Eth. Dummy - H'Mong	0.0423	0.0000	0.0000	0.0000	0.0000
Eth. Dummy - Cham	0.0020	0.0000	0.0000	0.0000	0.0000
Eth. Dummy - Ba Na	0.0030	0.0000	0.0000	0.0000	0.0000
Eth. Dummy - Nung	0.0131	0.0000	0.0000	0.0000	0.0000
Eth. Dummy - Tay	0.0101	0.0000	-0.0101	-0.0101	-0.0101
Eth. Dummy - Dao	0.0282	0.1429 *	-0.0282	-0.0282	0.6385 ***
Sample Size	**993**	**7**	**2**	**2**	**3**

Note: (***), (**) and (*) indicate one per cent ,five per cent and ten per cent levels of significance of means relative to default group - non-attriting HHs. Reported sample sizes correspond to the total number of households; sample sizes for individual variables might be smaller. Missing entries indicate that no observations are available for that particular category (younger cohort only).

Appendix C

Attrition Probit Regressions

Table 5a. *Ethiopia: Attrition probit tests, determinants of attrition (younger cohort only, probit coefficients only)*

Variables		Predicting Likelihood of Attrition			Likelihood of Attrition (excl child deaths)	
		(1)	(2)	(3)	(4)	(5)
HAZ z-score	Coef	-0.1129		-0.0969	-0.0716	
	P-Value	0.001		0.008	0.269	
WHZ z-score	Coef		-0.0984	-0.0846		0.1482
	P-Value		0.022	0.056		0.065
Male Child	Coef	-0.1061	-0.1692	-0.2175	-0.0266	-0.0024
	P-Value	0.454	0.236	0.145	0.918	0.993
Single Child	Coef	0.2836	0.2859	0.2950	0.4262	0.4610
	P-Value	0.095	0.102	0.097	0.153	0.129
Measles Vaccination	Coef	-0.0812	-0.0710	-0.0773	0.3858	0.4738
	P-Value	0.539	0.598	0.578	0.128	0.069
BCG Vaccination	Coef	0.1161	0.1514	0.1492	0.1964	0.1664
	P-Value	0.442	0.331	0.350	0.558	0.625
HH Head - Male	Coef	-0.0180	-0.0556	-0.0448	0.5194	0.5612
	P-Value	0.920	0.759	0.811	0.117	0.097
HH Head - Age	Coef	0.0100	0.0131	0.0134	-0.0371	-0.0401
	P-Value	0.762	0.697	0.701	0.347	0.311
HH Head - Age Squared	Coef	-0.0001	-0.0002	-0.0002	0.0003	0.0004
	P-Value	0.688	0.631	0.634	0.392	0.360
Age - Mother	Coef	0.0185	0.0496	0.0538	0.1459	0.1457
	P-Value	0.787	0.493	0.477	0.412	0.432
Age Squared - Mother	Coef	0.0000	-0.0005	-0.0006	-0.0026	-0.0026
	P-Value	0.970	0.661	0.609	0.442	0.458
Primary Sch. - Carer	Coef	0.0503	0.0112	0.0334	0.1144	0.1777
	P-Value	0.777	0.949	0.853	0.665	0.507
Primary Sch. - Partner	Coef	-0.4021	-0.4782	-0.4201	-0.7577	-0.9252
	P-Value	0.033	0.011	0.029	0.014	0.004
HH owns Livestock?	Coef	-0.1708	-0.2077	-0.1753	-0.3676	-0.3703
	P-Value	0.227	0.143	0.228	0.134	0.135
HH owns House?	Coef	0.2390	0.2807	0.2724	0.5270	0.6333
	P-Value	0.115	0.067	0.082	0.028	0.010
HH owns Land?	Coef	-0.1994	-0.2236	-0.2429	-1.0752	-1.0365
	P-Value	0.249	0.197	0.170	0.001	0.001
Nr Rooms	Coef	-0.0087	-0.0218	0.0018	-0.1023	-0.1353
	P-Value	0.925	0.813	0.985	0.563	0.456
Wealth Index	Coef	0.1773	0.0684	0.3334	0.0130	-0.2245
	P-Value	0.833	0.936	0.700	0.992	0.866
House Quality Index	Coef	-0.0505	0.1896	0.0175	0.0632	0.0252
	P-Value	0.939	0.770	0.979	0.952	0.981
HH Size	Coef	-0.1265	-0.1152	-0.1225	-0.2465	-0.2214
	P-Value	0.071	0.089	0.088	0.162	0.215
Nr HH Adults	Coef	0.0466	0.0700	0.0656	0.1937	0.1477
	P-Value	0.617	0.451	0.502	0.334	0.469
Nr HH Females	Coef	0.0601	0.0072	0.0170	0.0243	0.0112
	P-Value	0.432	0.925	0.832	0.881	0.946
Eth. Dummy - Amhara	Coef	-0.0142	-0.1747	-0.0641	0.2749	0.3749
	P-Value	0.963	0.546	0.839	0.581	0.456
Eth. Dummy - Gurage	Coef	0.1724	-0.1200	0.0851	0.2997	0.3307
	P-Value	0.611	0.706	0.805	0.587	0.554
Eth. Dummy - Oromo	Coef	-0.2804	-0.3388	-0.2703	0.0379	0.0593
	P-Value	0.384	0.252	0.405	0.941	0.909
Eth. Dummy - Sidama	Coef	0.0430	0.0558	0.1393		
	P-Value	0.910	0.879	0.719		
Eth. Dummy - Tigrian	Coef	-0.2143	-0.3965	-0.2508	-0.3961	-0.4378
	P-Value	0.520	0.199	0.458	0.480	0.437
Eth. Dummy - Wolavta	Coef	0.0171	-0.0785	0.0371	-0.3616	-0.3255
	P-Value	0.962	0.816	0.919	0.582	0.623
_cons	Coef	-1.9842	-2.2006	-2.5233	-3.3523	-3.1183
	P-Value	0.077	0.061	0.040	0.162	0.207
Nr. Obs		1,709	1,631	1,609	1,604	1,524
R-Square		0.0839	0.0786	0.0933	0.2625	0.2743

Note: R-Squares reported are pseudo R-Squares. Coefficients reported are probit coefficients; no marginal effects reported (younger cohort only).

Table 5b. *India: Attrition probit tests, determinants of attrition (younger cohort only, probit coefficients only)*

Variables		Predicting Likelihood of Attrition			Likelihood of Attrition (excl child deaths)	
		(1)	(2)	(3)	(4)	(5)
HAZ z-score	Coef	-0.0268		-0.0265	-0.0320	
	P-Value	0.523		0.528	0.642	
WHZ z-score	Coef		-0.0121	-0.0117		0.0612
	P-Value		0.833	0.839		0.461
Male Child	Coef	-0.2645	-0.2588	-0.2631	-0.2848	-0.2715
	P-Value	0.093	0.100	0.095	0.224	0.244
Single Child	Coef	-0.1254	-0.1167	-0.1251	-0.1134	-0.0893
	P-Value	0.463	0.492	0.464	0.654	0.724
Measles Vaccination	Coef	-0.0792	-0.0779	-0.0816	-0.0701	-0.0695
	P-Value	0.600	0.606	0.589	0.753	0.754
BCG Vaccination	Coef	-0.5922	-0.5926	-0.5942	-0.4465	-0.4387
	P-Value	0.002	0.002	0.002	0.155	0.162
HH Head - Male	Coef	0.2224	0.2229	0.2224	-0.1690	-0.1690
	P-Value	0.416	0.415	0.416	0.615	0.613
HH Head - Age	Coef	0.0098	0.0092	0.0099	-0.0372	-0.0380
	P-Value	0.730	0.747	0.729	0.364	0.355
HH Head - Age Squared	Coef	0.0000	0.0000	0.0000	0.0005	0.0005
	P-Value	0.956	0.979	0.956	0.233	0.224
Age - Mother	Coef	0.0708	0.0666	0.0716	0.5720	0.5711
	P-Value	0.563	0.577	0.558	0.059	0.061
Age Squared - Mother	Coef	-0.0013	-0.0012	-0.0013	-0.0109	-0.0109
	P-Value	0.584	0.599	0.579	0.068	0.070
Primary Sch. - Carer	Coef	-0.0624	-0.0570	-0.0603	-0.0397	-0.0567
	P-Value	0.698	0.723	0.708	0.868	0.814
Primary Sch. - Partner	Coef	0.0374	0.0396	0.0362	-0.1460	-0.1581
	P-Value	0.799	0.788	0.806	0.519	0.485
HH owns Livestock?	Coef	-0.0774	-0.0663	-0.0769	-0.6633	-0.6599
	P-Value	0.652	0.698	0.654	0.118	0.119
HH owns House?	Coef	-0.2539	-0.2619	-0.2560	-0.2616	-0.2625
	P-Value	0.106	0.095	0.103	0.206	0.205
HH owns Land?	Coef	-0.1885	-0.1963	-0.1898	-0.7496	-0.7600
	P-Value	0.263	0.243	0.260	0.018	0.017
Nr Rooms	Coef	0.0396	0.0377	0.0400	0.1294	0.1239
	P-Value	0.509	0.529	0.505	0.138	0.157
Wealth Index	Coef	0.2570	0.2137	0.2498	0.3232	0.2796
	P-Value	0.667	0.720	0.676	0.700	0.736
House Quality Index	Coef	-0.2414	-0.2146	-0.2300	-0.2409	-0.2406
	P-Value	0.515	0.564	0.536	0.666	0.665
HH Size	Coef	0.0825	0.0884	0.0815	0.2288	0.2462
	P-Value	0.374	0.336	0.379	0.092	0.068
Nr HH Adults	Coef	-0.0347	-0.0415	-0.0337	-0.1296	-0.1496
	P-Value	0.747	0.698	0.754	0.419	0.346
Nr HH Females	Coef	-0.2007	-0.2013	-0.2005	-0.3368	-0.3347
	P-Value	0.037	0.036	0.037	0.029	0.030
Eth. Dummy - ST	Coef	-0.0905	-0.0893	-0.0864		
	P-Value	0.694	0.697	0.707		
Eth. Dummy - BC	Coef	-0.1491	-0.1588	-0.1497	-0.0317	-0.0454
	P-Value	0.419	0.388	0.417	0.914	0.877
Eth. Dummy - OC	Coef	0.2913	0.2808	0.2906	0.3936	0.3865
	P-Value	0.149	0.162	0.150	0.185	0.193
_cons	Coef	-2.2299	-2.1508	-2.2508	-7.7601	-7.6249
	P-Value	0.191	0.200	0.189	0.047	0.051
Nr. Obs		1,945	1,954	1,941	1,661	1,669
R-Square		0.0974	0.0971	0.0976	0.2461	0.2475

Note: R-Squares reported are pseudo R-Squares. Coefficients reported are probit coefficients; no marginal effects reported (younger cohort only).

Table 5c. *Peru: Attrition probit tests, determinants of attrition (younger cohort only, probit coefficients only)*

Note: R-Squares reported are pseudo R-Squares. Coefficients reported are probit coefficients; no marginal effects reported (younger cohort only).

Variables		Predicting Likelihood of Attrition			Likelihood of Attrition (excl child deaths)	
		(1)	(2)	(3)	(4)	(5)
HAZ z-score	Coef	0.0232		0.0215	0.0340	
	P-Value	0.615		0.643	0.476	
WHZ z-score	Coef		-0.0053	-0.0222		0.0118
	P-Value		0.913	0.653		0.815
Male Child	Coef	-0.1057	-0.0868	-0.1101	-0.0971	-0.0753
	P-Value	0.435	0.519	0.418	0.491	0.590
Single Child	Coef	-0.0206	0.0044	-0.0198	0.0173	0.0450
	P-Value	0.896	0.977	0.900	0.915	0.780
Measles Vaccination	Coef	-0.0068	-0.0003	-0.0157	-0.0369	-0.0282
	P-Value	0.955	0.998	0.899	0.773	0.821
BCG Vaccination	Coef	-0.0546	-0.0494	-0.0578	-0.0834	-0.0755
	P-Value	0.873	0.885	0.866	0.809	0.827
HH Head - Male	Coef	0.1810	0.1897	0.1889	0.1644	0.1689
	P-Value	0.386	0.366	0.368	0.439	0.429
HH Head - Age	Coef	-0.0353	-0.0356	-0.0355	-0.0282	-0.0290
	P-Value	0.221	0.217	0.223	0.347	0.331
HH Head - Age Squared	Coef	0.0004	0.0004	0.0004	0.0003	0.0003
	P-Value	0.290	0.282	0.288	0.439	0.415
Age - Mother	Coef	-0.0751	-0.0792	-0.0736	-0.0407	-0.0455
	P-Value	0.265	0.238	0.277	0.582	0.535
Age Squared - Mother	Coef	0.0012	0.0012	0.0012	0.0006	0.0006
	P-Value	0.299	0.272	0.311	0.666	0.620
Primary Sch. - Carer	Coef	0.6496	0.6840	0.6531		
	P-Value	0.082	0.067	0.083		
Primary Sch. - Partner	Coef	-0.1264	-0.0999	-0.1277	-0.1752	-0.1438
	P-Value	0.514	0.606	0.511	0.380	0.469
HH owns Livestock?	Coef	-0.1239	-0.1307	-0.1257	-0.1413	-0.1462
	P-Value	0.396	0.371	0.390	0.349	0.332
HH owns House?	Coef	-0.0861	-0.0774	-0.0836	-0.1483	-0.1396
	P-Value	0.499	0.543	0.512	0.257	0.285
HH owns Land?	Coef	-0.0494	-0.0547	-0.0539	-0.0513	-0.0572
	P-Value	0.728	0.698	0.704	0.726	0.693
Nr Rooms	Coef	-0.0536	-0.0529	-0.0534	-0.0493	-0.0491
	P-Value	0.244	0.250	0.247	0.294	0.296
Wealth Index	Coef	-0.5262	-0.5434	-0.5097	-0.7357	-0.7487
	P-Value	0.306	0.289	0.323	0.167	0.157
House Quality Index	Coef	0.3398	0.3323	0.3350	0.4797	0.4687
	P-Value	0.403	0.414	0.411	0.253	0.264
HH Size	Coef	0.0242	0.0225	0.0221	0.0311	0.0296
	P-Value	0.702	0.720	0.727	0.639	0.653
Nr HH Adults	Coef	-0.0672	-0.0730	-0.0652	-0.0747	-0.0813
	P-Value	0.406	0.363	0.421	0.374	0.330
Nr HH Females	Coef	0.0149	0.0276	0.0150	0.0140	0.0277
	P-Value	0.844	0.713	0.843	0.860	0.725
Eth. Dummy - Mestizo	Coef	-0.2470	-0.2457	-0.2482	-0.1606	-0.1619
	P-Value	0.253	0.253	0.251	0.488	0.481
Eth. Dummy - Asiatic	Coef	1.5705	1.6523	1.5759	1.6949	1.7857
	P-Value	0.086	0.070	0.085	0.067	0.053
_cons	Coef	0.1431	0.1044	0.1338	0.2470	0.2353
	P-Value	0.906	0.931	0.912	0.845	0.850
Nr. Obs		1,901	1,893	1,889	1,756	1,749
R-Square		0.0458	0.0459	0.0457	0.0419	0.0412

Table 5d. *Vietnam: Attrition probit tests, determinants of attrition (younger cohort only, probit coefficients only)*

Variables		Predicting Likelihood of Attrition			Likelihood of Attrition (excl child deaths)	
		(1)	(2)	(3)	(4)	(5)
HAZ z-score	Coef	-0.143		-0.107	-0.014	
	P-Value	0.1610		0.3160	0.9230	
WHZ z-score	Coef		-0.109	-0.081		-0.070
	P-Value		0.3630	0.5060		0.6800
Male Child	Coef	0.599	0.567	0.554	0.083	0.116
	P-Value	0.0440	0.0590	0.0680	0.8370	0.7780
Single Child	Coef	-0.321	-0.380	-0.357	-0.785	-0.771
	P-Value	0.3170	0.2380	0.2740	0.1470	0.1550
Measles Vaccination	Coef	0.098	0.113	0.098	0.246	0.235
	P-Value	0.7120	0.6680	0.7150	0.4900	0.5100
BCG Vaccination	Coef	0.059	0.164	0.201		
	P-Value	0.8820	0.7010	0.6460		
HH Head - Male	Coef	0.337	0.354	0.342		
	P-Value	0.4070	0.3850	0.4030		
HH Head - Age	Coef	-0.025	-0.028	-0.028	-0.009	-0.007
	P-Value	0.6740	0.6430	0.6460	0.9460	0.9590
HH Head - Age Squared	Coef	0.000	0.000	0.000	0.000	0.000
	P-Value	0.7720	0.7290	0.7400	0.8960	0.8840
Age - Mother	Coef	0.022	-0.043	-0.031	-0.192	-0.206
	P-Value	0.9020	0.7980	0.8560	0.4000	0.3740
Age Squared - Mother	Coef	-0.001	0.001	0.000	0.003	0.003
	P-Value	0.8440	0.8540	0.9090	0.3860	0.3600
Primary Sch. - Carer	Coef	0.055	0.070	0.063	-0.054	-0.006
	P-Value	0.8900	0.8610	0.8750	0.9290	0.9920
Primary Sch. - Partner	Coef	-0.287	-0.308	-0.298	-0.279	-0.310
	P-Value	0.3230	0.3000	0.3140	0.5430	0.5040
HH owns Livestock?	Coef	-0.544	-0.523	-0.534	-5.136	-5.100
	P-Value	0.1150	0.1340	0.1290	0.0000	0.1850
HH owns House?	Coef	-0.203	-0.206	-0.210	-0.199	-0.198
	P-Value	0.4730	0.4700	0.4620	0.6110	0.6140
HH owns Land?	Coef	-0.126	-0.129	-0.123	-0.308	-0.311
	P-Value	0.6480	0.6410	0.6600	0.4210	0.4180
Nr Rooms	Coef	-0.119	-0.173	-0.160	-0.206	-0.209
	P-Value	0.3640	0.2060	0.2450	0.2930	0.2840
Wealth Index	Coef	2.470	2.477	2.655	2.782	2.884
	P-Value	0.0260	0.0290	0.0210	0.0700	0.0610
House Quality Index	Coef	-1.005	-0.974	-1.055	-1.011	-1.089
	P-Value	0.2300	0.2540	0.2190	0.4180	0.3900
HH Size	Coef	-0.176	-0.196	-0.195	-0.427	-0.445
	P-Value	0.3660	0.3250	0.3330	0.2760	0.2580
Nr HH Adults	Coef	0.115	0.172	0.170	0.618	0.631
	P-Value	0.5670	0.4060	0.4160	0.1490	0.1420
Nr HH Females	Coef	0.247	0.216	0.216	-0.005	0.009
	P-Value	0.1580	0.2260	0.2300	0.9850	0.9710
Eth. Dummy - Kinh	Coef	-0.679	-0.724	-0.730	3.677	3.746
	P-Value	0.1950	0.1740	0.1660	0.0000	0.3440
Eth. Dummy - H'Mong	Coef	0.704	0.814	0.691	9.520	9.602
	P-Value	0.1820	0.1270	0.2030	0.0000	0.0000
_cons	Coef	-1.960	-0.916	-1.209	-2.110	-2.067
	P-Value	0.5000	0.7460	0.6760	0.5900	0.0000
Nr. Obs		1,420	1,420	1,419	1,071	1,071
R-Square		0.1902	0.1732	0.1789	0.2443	0.2459

Note: R-Squares reported are pseudo R-Squares. Coefficients reported are probit coefficients; no marginal effects reported (younger cohort only).

Appendix D

BGLW Test Regressions

Table 6a. *Ethiopia: BGLW Tests, determinants of child anthropometrics (younger cohort only)*

Variables		Determinants of HAZ			Determinants of WHZ		
		Full Sample	Non-Attriting Sample	Difference	Full Sample	Non-Attriting Sample	Difference
Male Child	Coef	-0.4569	-0.4464	0.0105	-0.0382	-0.0156	0.0226
	P-Value	0.000	0.000	0.610	0.609	0.836	0.183
Measles Vaccination	Coef	-0.2514	-0.2428	0.0086	-0.1873	-0.2004	-0.0131
	P-Value	0.009	0.013	0.698	0.014	0.010	0.424
BCG Vaccination	Coef	0.0602	0.0411	-0.0191	0.2055	0.2129	0.0074
	P-Value	0.575	0.709	0.341	0.011	0.009	0.660
Single Child	Coef	0.0428	0.0595	0.0167	0.0338	0.0206	-0.0133
	P-Value	0.726	0.631	0.597	0.728	0.834	0.626
Primary Sch. - Carer	Coef	0.0624	0.0692	0.0068	-0.1102	-0.0923	0.0179
	P-Value	0.616	0.585	0.833	0.243	0.334	0.497
Primary Sch. - Partner	Coef	0.3289	0.2823	**-0.0466**	0.0910	0.0945	0.0035
	P-Value	0.013	0.037	**0.0775 ***	0.310	0.296	0.876
Wealth Index	Coef	1.5673	1.5922	0.0249	2.7388	2.6817	-0.0572
	P-Value	0.008	0.008	0.835	0.000	0.000	0.598
HH owns Livestock?	Coef	0.0074	-0.0241	-0.0314	-0.0049	-0.0217	-0.0168
	P-Value	0.944	0.823	0.173	0.951	0.790	0.443
HH owns Land?	Coef	-0.1249	-0.1443	-0.0194	0.0180	0.0881	**0.0701**
	P-Value	0.324	0.266	0.558	0.854	0.373	**0.013 ** **
HH owns House?	Coef	-0.1810	-0.1586	0.0224	-0.1409	-0.1487	-0.0079
	P-Value	0.097	0.156	0.389	0.080	0.070	0.690
Constant	Coef	-1.9924	-1.6866	0.3058	-1.4837	-1.4671	0.0166
	P-Value	0.015	0.044		0.028	0.031	
Nr Rooms	Coef	0.1330	0.1487	0.0158	-0.0393	-0.0445	-0.0053
	P-Value	0.039	0.026	0.259	0.422	0.348	0.792
House Quality Index	Coef	-0.5492	-0.6914	-0.1422	-0.5624	-0.4434	0.1190
	P-Value	0.243	0.143	0.154	0.102	0.200	0.122
HH Head - Male	Coef	0.2749	0.2310	-0.0439	0.0398	-0.0091	-0.0489
	P-Value	0.055	0.117	0.199	0.717	0.934	0.166
HH Head - Age	Coef	-0.0137	-0.0182	-0.0045	0.0041	0.0079	0.0037
	P-Value	0.498	0.377	0.369	0.796	0.617	0.425
HH Head - Age Squared	Coef	0.0001	0.0001	0.0000	-0.0001	-0.0001	0.0000
	P-Value	0.696	0.571	0.431	0.708	0.520	0.382
Age - Mother	Coef	0.0277	0.0200	-0.0077	0.0246	0.0221	-0.0024
	P-Value	0.576	0.692	0.469	0.582	0.623	0.823
Age Squared - Mother	Coef	-0.0005	-0.0003	0.0001	-0.0004	-0.0004	0.0000
	P-Value	0.560	0.684	0.407	0.585	0.616	0.858
HH Size	Coef	0.0890	0.0853	-0.0037	-0.0703	-0.0813	-0.0110
	P-Value	0.064	0.080	0.663	0.056	0.026	0.267
Nr HH Adults	Coef	-0.0062	-0.0042	0.0020	0.0714	0.0968	**0.0253**
	P-Value	0.919	0.946	0.859	0.154	0.052	**0.0733 ***
Nr HH Females	Coef	-0.0308	-0.0187	0.0121	0.0694	0.0742	0.0047
	P-Value	0.589	0.747	0.146	0.069	0.053	0.550
Eth. Dummy - Amhara	Coef	-0.1476	-0.1680	-0.0203	0.1655	0.1043	-0.0612
	P-Value	0.544	0.503	0.667	0.255	0.473	0.224
Eth. Dummy - Gurage	Coef	0.5359	0.4915	-0.0444	-0.8092	-0.8728	-0.0636
	P-Value	0.050	0.083	0.364	0.000	0.000	0.333
Eth. Dummy - Hadiva	Coef	1.3697	1.3204	-0.0493	-0.0021	-0.0653	-0.0632
	P-Value	0.000	0.000	0.196	0.991	0.717	0.201
Eth. Dummy - Kambata	Coef	0.1446	0.0804	-0.0642	-0.3606	-0.3997	-0.0391
	P-Value	0.862	0.924	0.155	0.679	0.646	0.426
Eth. Dummy - Oromo	Coef	-0.0722	-0.0860	-0.0138	0.0271	-0.0543	**-0.0814**
	P-Value	0.769	0.734	0.735	0.852	0.707	**0.097 ***
Eth. Dummy - Sidama	Coef	-0.5789	-0.6403	-0.0614	1.0615	0.9890	-0.0725
	P-Value	0.048	0.032	0.315	0.000	0.000	0.159
Eth. Dummy - Tigrian	Coef	0.5327	0.5426	0.0099	0.0909	0.0549	-0.0360
	P-Value	0.049	0.052	0.843	0.564	0.726	0.516
Eth. Dummy - Wolavta	Coef	-0.2924	-0.2937	-0.0013	0.1344	0.1388	0.0045
	P-Value	0.280	0.294	0.981	0.504	0.480	0.954
F-Test (no const)				0.393			0.591
F-Test (with const)				0.380			0.643
Nr Observations		1,805	1,730		1,727	1,655	
R-Square		0.0894	0.0859		0.1425	0.1473	

Note: 'Other' ethnic group is default category. F-tests analyse whether coefficients are joint significantly different across samples; F-test p-values reported. Column of 'Differences' highlighted with (***), (**) and (*) indicate significance at one per cent, five per cent and ten per cent levels respectively

Table 6b. *India: BGLW Tests, Determinants of child anthropometrics (younger cohort only)*

Variables		Determinants of HAZ			Determinants of WHZ		
		Full Sample	Non-Attriting Sample	Difference	Full Sample	Non-Attriting Sample	Difference
Male Child	Coef	-0.1967	-0.1827	0.0139	-0.1613	-0.1766	-0.0154
	P-Value	0.020	0.034	0.394	0.007	0.004	0.130
Measles Vaccination	Coef	-0.1207	-0.1193	0.0014	-0.2067	-0.2049	0.0019
	P-Value	0.127	0.137	0.924	0.001	0.001	0.863
BCG Vaccination	Coef	0.1378	0.1305	-0.0073	0.1218	0.1072	-0.0146
	P-Value	0.314	0.361	0.857	0.222	0.312	0.500
Single Child	Coef	-0.1502	-0.1366	0.0136	-0.0449	-0.0407	0.0041
	P-Value	0.112	0.151	0.469	0.512	0.557	0.713
Primary Sch. - Carer	Coef	0.0908	0.1122	0.0214	0.0836	0.0642	**-0.0194**
	P-Value	0.304	0.214	0.120	0.197	0.330	**0.0748 ***
Primary Sch. - Partner	Coef	0.0689	0.0906	0.0217	0.0476	0.0628	0.0152
	P-Value	0.393	0.267	0.181	0.417	0.294	0.137
Wealth Index	Coef	1.2142	1.1509	-0.0633	0.3559	0.3644	0.0085
	P-Value	0.000	0.000	0.314	0.148	0.145	0.847
HH owns Livestock?	Coef	-0.1677	-0.1653	0.0024	0.1215	0.1177	-0.0038
	P-Value	0.057	0.063	0.867	0.044	0.054	0.602
HH owns Land?	Coef	0.1064	0.1055	-0.0009	-0.0289	-0.0212	0.0077
	P-Value	0.225	0.235	0.942	0.652	0.744	0.352
HH owns House?	Coef	0.0897	0.0744	-0.0152	-0.0105	-0.0079	0.0027
	P-Value	0.328	0.428	0.357	0.886	0.917	0.841
Constant	Coef	-2.5537	-2.5830	-0.0293	-1.8545	-1.8131	0.0414
	P-Value	0.050	0.047		0.003	0.004	
Nr Rooms	Coef	0.0614	0.0517	-0.0097	0.0106	0.0059	-0.0047
	P-Value	0.047	0.099	0.145	0.662	0.810	0.363
House Quality Index	Coef	-0.6617	-0.6825	-0.0208	0.2432	0.2430	-0.0002
	P-Value	0.000	0.000	0.573	0.096	0.103	0.993
HH Head - Male	Coef	-0.0253	-0.0330	-0.0078	-0.1362	-0.1497	-0.0135
	P-Value	0.841	0.796	0.517	0.160	0.127	0.190
HH Head - Age	Coef	0.0304	0.0320	0.0016	-0.0137	-0.0144	-0.0007
	P-Value	0.044	0.039	0.520	0.268	0.258	0.725
HH Head - Age Squared	Coef	-0.0004	-0.0004	0.0000	0.0001	0.0001	0.0000
	P-Value	0.014	0.013	0.479	0.351	0.346	0.803
Age - Mother	Coef	0.0539	0.0537	-0.0002	0.0805	0.0795	-0.0011
	P-Value	0.592	0.590	0.984	0.059	0.066	0.850
Age Squared - Mother	Coef	-0.0006	-0.0005	0.0001	-0.0016	-0.0015	0.0000
	P-Value	0.761	0.793	0.698	0.049	0.059	0.654
HH Size	Coef	-0.1592	-0.1473	0.0119	-0.0411	-0.0385	0.0026
	P-Value	0.002	0.005	0.266	0.302	0.342	0.727
Nr HH Adults	Coef	0.2076	0.2038	-0.0037	0.0830	0.0815	-0.0015
	P-Value	0.000	0.000	0.631	0.048	0.054	0.806
Nr HH Females	Coef	-0.0274	-0.0407	-0.0133	-0.0518	-0.0559	-0.0041
	P-Value	0.593	0.430	0.368	0.181	0.161	0.584
Eth. Dummy - ST	Coef	-0.2478	-0.2906	**-0.0428**	0.1078	0.1202	0.0124
	P-Value	0.043	0.019	**0.0672 ***	0.217	0.176	0.265
Eth. Dummy - BC	Coef	-0.0001	-0.0283	-0.0283	0.0581	0.0692	0.0111
	P-Value	0.999	0.780	0.152	0.412	0.337	0.219
Eth. Dummy - OC	Coef	0.2075	0.1884	-0.0191	0.1472	0.1620	0.0148
	P-Value	0.083	0.123	0.338	0.100	0.078	0.266
F-Test (no const)				0.5130			0.8247
F-Test (with const)				0.5322			0.8521
Nr Observations		1,945	1,888		1,954	1,897	
R-Square		0.0526	0.053		0.0379	0.0368	

Note: Default ethnic category is 'SC'. F-tests analyse whether coefficients are joint significantly different across samples; F-test p-values reported. Column of 'Differences' highlighted with (***), (**) and (*) indicate significance at one per cent, five per cent and ten per cent levels respectively.

Table 6c. *Peru: BGLW Tests, Determinants of child anthropometrics (younger cohort only)*

Variables		Determinants of HAZ			Determinants of WHZ		
		Full Sample	Non-Attriting Sample	Difference	Full Sample	Non-Attriting Sample	Difference
Male Child	Coef	-0.1774	-0.1807	-0.0034	-0.0746	-0.0678	0.0068
	P-Value	0.004	0.004	0.736	0.199	0.251	0.494
Measles Vaccination	Coef	-0.5291	-0.5160	0.0131	-0.2352	-0.2219	0.0133
	P-Value	0.000	0.000	0.242	0.000	0.000	0.231
BCG Vaccination	Coef	0.0633	0.0793	0.0161	-0.0476	-0.0701	-0.0226
	P-Value	0.745	0.693	0.360	0.728	0.604	0.605
Single Child	Coef	0.0372	0.0095	**-0.0277**	0.0705	0.0626	-0.0079
	P-Value	0.631	0.905	**0.0333** **	0.332	0.401	0.545
Primary Sch. - Carer	Coef	0.5461	0.5433	-0.0027	0.0073	0.0039	-0.0034
	P-Value	0.000	0.000	0.804	0.947	0.971	0.819
Primary Sch. - Partner	Coef	0.2206	0.2292	0.0086	0.0194	0.0218	0.0025
	P-Value	0.015	0.011	0.700	0.814	0.793	0.857
Wealth Index	Coef	1.0951	1.1480	0.0529	0.8109	0.8489	0.0380
	P-Value	0.000	0.000	0.172	0.000	0.000	0.388
HH owns Livestock?	Coef	-0.1202	-0.1315	-0.0113	-0.0344	-0.0142	**0.0202**
	P-Value	0.085	0.060	0.539	0.630	0.846	**0.0934** *
HH owns Land?	Coef	-0.2993	-0.2939	0.0055	-0.0829	-0.0769	0.0060
	P-Value	0.000	0.000	0.739	0.200	0.245	0.626
HH owns House?	Coef	0.0072	0.0161	0.0089	0.0328	0.0304	-0.0024
	P-Value	0.910	0.800	0.620	0.586	0.620	0.864
Constant	Coef	-3.5720	-3.6764	-0.1044	-0.6436	-0.6058	0.0378
	P-Value	0.000	0.000		0.213	0.250	
Nr Rooms	Coef	-0.0085	0.0006	**0.0091**	0.0154	0.0249	0.0095
	P-Value	0.665	0.976	**0.0601** *	0.436	0.192	0.205
House Quality Index	Coef	-0.1858	-0.2676	**-0.0818**	-0.1580	-0.1967	-0.0386
	P-Value	0.336	0.173	**0.0822** *	0.403	0.308	0.366
HH Head - Male	Coef	-0.0950	-0.1142	-0.0191	0.1763	0.1670	-0.0093
	P-Value	0.310	0.226	0.310	0.038	0.052	0.492
HH Head - Age	Coef	0.0364	0.0376	0.0012	0.0209	0.0168	-0.0041
	P-Value	0.007	0.005	0.784	0.147	0.246	0.227
HH Head - Age Squared	Coef	-0.0003	-0.0003	0.0000	-0.0002	-0.0002	0.0000
	P-Value	0.034	0.021	0.668	0.157	0.250	0.242
Age - Mother	Coef	0.0959	0.0991	0.0031	0.0416	0.0399	-0.0017
	P-Value	0.004	0.004	0.581	0.141	0.168	0.732
Age Squared - Mother	Coef	-0.0017	-0.0018	-0.0001	-0.0007	-0.0006	0.0001
	P-Value	0.002	0.002	0.430	0.144	0.189	0.515
HH Size	Coef	-0.1089	-0.1126	-0.0037	-0.0764	-0.0823	-0.0059
	P-Value	0.000	0.000	0.476	0.004	0.002	0.168
Nr HH Adults	Coef	0.1686	0.1737	0.0051	0.0912	0.0967	0.0054
	P-Value	0.000	0.000	0.553	0.008	0.005	0.392
Nr HH Females	Coef	0.0086	0.0095	0.0009	0.0499	0.0581	0.0083
	P-Value	0.803	0.785	0.890	0.110	0.063	0.205
Eth. Dummy - Mestizo	Coef	-0.0342	0.0282	0.0624	-0.0646	-0.0349	0.0297
	P-Value	0.771	0.797	0.253	0.580	0.771	0.241
Eth. Dummy - Amazon I	Coef	-0.2348	-0.1809	0.0539	-0.4124	-0.3870	0.0254
	P-Value	0.282	0.399	0.331	0.023	0.036	0.373
Eth. Dummy - Negro	Coef	-0.4614	-0.3818	0.0796	0.9903	1.0375	**0.0472**
	P-Value	0.375	0.459	0.179	0.020	0.016	**0.0751** *
Eth. Dummy - Asiatic	Coef	1.6187	2.6307	1.0121	0.3949	0.3459	-0.0490
	P-Value	0.016	0.000	0.128	0.012	0.036	0.695
F-Test (no const)				0.4162			0.6829
F-Test (with const)				0.4182			0.7333
Nr Observations		1,951	1,880		1,943	1,871	
R-Square		0.2069	0.2078		0.0637	0.0626	

Note: Default ethnic category is 'White'. F-tests analyse whether coefficients are joint significantly different across samples; F-test p-values reported. Column of 'Differences' highlighted with (***), (**) and (*) indicate significance at one per cent, five per cent and ten per cent levels respectively.

Table 6d. *Vietnam: BGLW Tests, Determinants of child anthropometrics (younger cohort only)*

Variables		Determinants of HAZ			Determinants of WHZ		
		Full Sample	Non-Attriting Sample	Difference	Full Sample	Non-Attriting Sample	Difference
Male Child	Coef	-0.1815	-0.1735	0.0080	0.0275	0.0269	-0.0006
	P-Value	0.007	0.010	0.396	0.661	0.669	0.884
Measles Vaccination	Coef	-0.3200	-0.3300	-0.0101	-0.2499	-0.2478	0.0021
	P-Value	0.000	0.000	0.122	0.000	0.000	0.649
BCG Vaccination	Coef	0.2301	0.2064	-0.0238	0.0894	0.0823	-0.0071
	P-Value	0.024	0.043	0.107	0.258	0.299	0.308
Single Child	Coef	0.0470	0.0214	**-0.0256**	0.1596	0.1452	**-0.0144**
	P-Value	0.563	0.792	**0.0968** *	0.035	0.058	**0.0564** *
Primary Sch. - Carer	Coef	-0.1329	-0.1364	-0.0035	0.0713	0.0709	-0.0005
	P-Value	0.086	0.078	0.605	0.312	0.316	0.872
Primary Sch. - Partner	Coef	-0.0441	-0.0569	-0.0127	0.0204	0.0239	0.0036
	P-Value	0.542	0.434	0.199	0.762	0.724	0.569
Wealth Index	Coef	2.1043	2.1091	0.0048	1.1614	1.1320	-0.0294
	P-Value	0.000	0.000	0.914	0.000	0.000	0.271
HH owns Livestock?	Coef	-0.1491	-0.1566	-0.0076	-0.0042	-0.0029	0.0013
	P-Value	0.034	0.026	0.174	0.951	0.967	0.663
HH owns Land?	Coef	0.0512	0.0509	-0.0003	-0.0647	-0.0637	0.0009
	P-Value	0.450	0.454	0.971	0.336	0.346	0.864
HH owns House?	Coef	0.0126	0.0117	-0.0009	0.0158	0.0189	0.0031
	P-Value	0.863	0.873	0.924	0.816	0.782	0.572
Constant	Coef	-2.3196	-2.2450	0.0745	-0.8573	-0.8405	0.0168
	P-Value	0.001	0.002		0.166	0.177	
Nr Rooms	Coef	0.0551	0.0550	-0.0001	0.0233	0.0232	-0.0001
	P-Value	0.061	0.061	0.965	0.373	0.376	0.959
House Quality Index	Coef	-1.0450	-1.0442	0.0007	-0.6358	-0.6228	0.0130
	P-Value	0.000	0.000	0.968	0.000	0.000	0.194
HH Head - Male	Coef	-0.0627	-0.0540	0.0087	-0.0783	-0.0829	-0.0046
	P-Value	0.466	0.531	0.221	0.324	0.299	0.342
HH Head - Age	Coef	0.0015	-0.0004	-0.0019	-0.0095	-0.0106	-0.0011
	P-Value	0.924	0.981	0.374	0.504	0.458	0.237
HH Head - Age Squared	Coef	0.0000	0.0000	0.0000	0.0001	0.0001	0.0000
	P-Value	0.810	0.924	0.409	0.724	0.657	0.280
Age - Mother	Coef	0.0687	0.0669	-0.0018	0.0179	0.0196	0.0017
	P-Value	0.122	0.131	0.673	0.641	0.613	0.395
Age Squared - Mother	Coef	-0.0010	-0.0010	0.0000	-0.0003	-0.0004	0.0000
	P-Value	0.178	0.191	0.653	0.600	0.579	0.508
HH Size	Coef	-0.0407	-0.0484	-0.0078	-0.0371	-0.0440	**-0.0069**
	P-Value	0.403	0.318	0.269	0.404	0.327	**0.0505** *
Nr HH Adults	Coef	0.0595	0.0689	0.0094	0.0419	0.0496	**0.0077**
	P-Value	0.259	0.189	0.332	0.378	0.302	**0.0263** **
Nr HH Females	Coef	0.0033	0.0065	0.0033	0.0504	0.0507	0.0003
	P-Value	0.941	0.881	0.514	0.206	0.206	0.903
Eth. Dummy - Kinh	Coef	0.3925	0.4233	0.0308	0.1210	0.1206	-0.0003
	P-Value	0.006	0.003	0.141	0.340	0.347	0.928
Eth. Dummy - H'Mong	Coef	-0.6698	-0.5902	**0.0796**	0.4791	0.5156	0.0365
	P-Value	0.001	0.003	**0.0876** *	0.002	0.001	0.154
Eth. Dummy - Ede	Coef	-2.0542	-2.0495	0.0047	0.7138	0.7088	-0.0050
	P-Value	0.000	0.000	0.836	0.000	0.000	0.451
Eth. Dummy - Ba Na	Coef	0.3937	0.4208	0.0271	-0.0143	-0.0063	0.0080
	P-Value	0.544	0.517	0.268	0.971	0.987	0.457
Eth. Dummy - Nung	Coef	0.2782	0.2999	0.0218	0.3206	0.3184	-0.0022
	P-Value	0.240	0.205	0.319	0.212	0.217	0.603
Eth. Dummy - Tay	Coef	-0.5338	-0.5049	0.0289	0.2765	0.2749	-0.0016
	P-Value	0.018	0.025	0.192	0.186	0.190	0.687
Eth. Dummy - Dao	Coef	-0.4407	-0.4167	0.0239	0.1803	0.1826	0.0023
	P-Value	0.091	0.109	0.289	0.351	0.348	0.592
F-Test (no const)				0.9874			0.9936
F-Test (with const)				0.9874			0.9936
Nr Observations		1,501	1,484		1,501	1,485	
R-Square		0.1905	0.1848		0.0443	0.0428	

Note: 'Other' ethnic group is default category. F-tests analyse whether coefficients are joint significantly different across samples; F-test p-values reported. Column of 'Differences' highlighted with (***), (**) and (*) indicate significance at one per cent, five per cent and ten per cent levels respectively.

Table 7a. *Ethiopia: BGLW Tests, Determinants of school enrolment (older cohort only)*

Variables	Full Sample		Non-Attriting Sample		Differences	
	Coef.	p-value	Coef.	p-value	Coef.	p-value
Male Child	-0.1726	0.112	-0.1668	0.126	0.0058	0.660
Single Child	-0.5444	0.050	-0.5047	0.076	0.0398	0.447
Sex HH Head	0.0095	0.956	0.0116	0.947	0.0021	0.935
Age HH Head	0.0132	0.739	0.0200	0.627	0.0068	0.377
Age Squared HH Head	-0.0001	0.733	-0.0002	0.630	-0.0001	0.377
Age Mother	0.0851	0.153	0.0830	0.172	-0.0021	0.790
Age Squared Mother	-0.0012	0.111	-0.0012	0.120	0.0000	0.912
Primary Sch. Carer	0.2911	0.117	0.2857	0.125	-0.0054	0.492
Primary Sch. Partner Carer	-0.0412	0.789	-0.0614	0.691	**-0.0202**	**0.050 ****
HH Size	-0.0800	0.100	-0.0814	0.096	-0.0013	0.757
Nr HH Females	0.0157	0.754	0.0149	0.767	-0.0008	0.805
Nr HH Adults	0.0295	0.642	0.0254	0.690	-0.0041	0.260
Wealth Index	4.9554	0.000	4.8005	0.000	-0.1549	0.208
Housing Quality Index	-0.0377	0.949	0.0466	0.937	0.0843	0.341
Own Livestock	-0.1720	0.198	-0.1721	0.201	-0.0001	0.993
Nr. Rooms	-0.0269	0.694	-0.0227	0.741	0.0043	0.473
Own House	-0.2436	0.081	-0.2384	0.090	0.0052	0.733
Own Land	0.0314	0.853	0.0184	0.915	-0.0130	0.569
Eth. Dummy - Other	0.5341	0.117	0.5184	0.129	-0.0157	0.203
Eth. Dummy - Amhara	0.4719	0.037	0.4570	0.045	-0.0149	0.464
Eth. Dummy – Gurage	0.9017	0.001	0.8720	0.001	-0.0297	0.152
Eth. Dummy - Hadiva	-0.3174	0.268	-0.3317	0.248	-0.0143	0.106
Eth. Dummy - Oromo	-0.0824	0.724	-0.0741	0.751	0.0082	0.349
Eth. Dummy - Tigrian	-0.0545	0.826	-0.0750	0.763	-0.0205	0.318
Eth. Dummy - Wolavta	-0.5885	0.046	-0.5901	0.047	-0.0015	0.949
_cons	-1.3120	0.194	-1.3794	0.175	-0.0675	
F-Test (no constant)						0.9887
F-Test (with constant)						0.9927
Nr Observations	878		864			
R-Square	0.2214		0.2184			

Note: F-tests analyse whether coefficients are joint significantly different across samples; F-test p-values reported. Column of 'Differences' highlighted with (***), (**) and (*) indicate significance at one per cent, five per cent and ten per cent levels respectively (older cohort only).

Table 7b. *India: BGLW Tests, Determinants of school enrolment (older cohort only)*

Variables	Full Sample		Non-Attriting Sample		Differences	
	Coef.	**p-value**	**Coef.**	**p-value**	**Coef.**	**p-value**
Male Child	0.0553	0.806	0.0896	0.693	0.0343	0.256
Single Child	0.3116	0.521	0.2704	0.574	-0.0412	0.303
Sex HH Head	-0.0336	0.936	-0.0133	0.974	0.0203	0.438
Age HH Head	-0.3667	0.004	-0.3353	0.008	0.0314	0.270
Age Squared HH Head	0.0037	0.008	0.0034	0.015	-0.0003	0.268
Age Mother	0.2264	0.086	0.1949	0.146	-0.0315	0.269
Age Squared Mother	-0.0026	0.161	-0.0022	0.239	0.0004	0.271
Primary Sch. Carer	0.2283	0.435	0.2308	0.431	0.0025	0.785
Primary Sch. Partner Carer	0.4088	0.118	0.3877	0.137	-0.0211	0.246
HH Size	0.0348	0.779	0.0382	0.761	0.0034	0.641
Nr HH Females	-0.0324	0.801	-0.0376	0.771	-0.0052	0.522
Nr HH Adults	0.1163	0.421	0.1083	0.452	-0.0079	0.446
Wealth Index	-0.6823	0.455	-0.8222	0.374	-0.1399	0.253
Housing Quality Index	0.2934	0.597	0.2953	0.597	0.0019	0.910
Own Livestock	-0.1117	0.658	-0.1349	0.595	-0.0232	0.350
Nr. Rooms	-0.0873	0.403	-0.0839	0.425	0.0035	0.398
Own House	-0.2403	0.468	-0.2130	0.521	0.0273	0.258
Own Land	0.0388	0.879	-0.0029	0.991	-0.0416	0.287
Eth. Dummy – ST	-0.7511	0.025	-0.6542	0.056	0.0969	0.265
Eth. Dummy – BC	-0.2697	0.358	-0.2528	0.388	0.0169	0.258
Eth. Dummy – OC	-0.3351	0.353	-0.2983	0.409	0.0368	0.209
_cons	6.1628	0.021	6.0877	0.023	-0.0751	
F-Test (no constant)						1.0000
F-Test (with constant)						1.0000
Nr Observations	982		969			
R-Square	0.1215		0.1084			

Note: F-tests analyse whether coefficients are joint significantly different across samples; F-test p-values reported. Column of 'Differences' highlighted with (***), (**) and (*) indicate significance at one per cent, five per cent and ten per cent levels respectively for the eight-year old cohort only.

Table 7c. *Vietnam – BGLW Tests, Determinants of school enrolment (older cohort only)*

Variables	Full Sample		Non-Attriting Sample		Differences	
	Coef.	**p-value**	**Coef.**	**p-value**	**Coef.**	**p-value**
Male Child	0.0815	0.836	0.0828	0.833	0.0013	0.440
Sex HH Head	0.4410	0.320	0.4401	0.321	-0.0008	0.384
Age HH Head	-0.0145	0.918	-0.0146	0.917	-0.0001	0.639
Age Squared HH Head	0.0001	0.959	0.0001	0.958	0.0000	0.600
Age Mother	0.1666	0.461	0.1662	0.462	-0.0004	0.478
Age Squared Mother	-0.0019	0.494	-0.0019	0.495	0.0000	0.487
HH Size	-0.1453	0.393	-0.1454	0.392	-0.0001	0.524
Nr HH Females	0.2856	0.157	0.2856	0.157	0.0000	0.820
Nr HH Adults	-0.1677	0.485	-0.1674	0.486	0.0004	0.373
Wealth Index	5.7870	0.015	5.7814	0.015	-0.0056	0.225
Housing Quality Index	-1.7512	0.197	-1.7477	0.197	0.0035	0.405
Own Livestock	0.6731	0.194	0.6723	0.194	-0.0008	0.459
Nr. Rooms	-0.0671	0.740	-0.0673	0.739	-0.0003	0.682
Own Land	0.1292	0.803	0.1285	0.804	-0.0007	0.354
Eth. Dummy – H'Mong	-1.6907	0.000	-1.6890	0.000	0.0017	0.417
_cons	-1.6933	0.595	-1.6844	0.597	0.0090	
F-Test (no constant)						0.9998
F-Test (with constant)						0.9999
Nr Observations	865		859			
R-Square	0.5091		0.5085			

Note: F-tests analyse whether coefficients are joint significantly different across samples; F-test p-values reported. Column of 'Differences' highlighted with (***), (**) and (*) indicate significance at one per cent, five per cent and ten per cent levels respectively (older cohort only).

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