GENDER AND GROWTH ASSESSMENT: MICROECONOMIC STUDY

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The in-depth micro-economics analysis that forms this report has largely been conducted by Richard Palmer-Jones (micro)[1], with some support from the rest of the team. While the key insights from this analysis have been presented in the National Overview, this report is potentially an invaluable resource, methodologically and in terms of the detail of analysis, for both policy-makers and research analysts interested in the theme of gender and growth in Nigeria.

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Abbreviations

APAEE	Average Per Adult Equivalent Expenditure
AVBS	Average Budget Share
CBN	Cost of basic needs
COG	Cost of goods
COL	Cost of living
CPI	Consumer Price Index
CWIQ	Core Welfare Indicators Questionnaire 2006
FCT	Federal Capital Territory
FEI	Food energy intake
FOS	Federal Office of Statistics (now NBS)
FPL	food poverty line
GHS	General Household Survey
HCR	Head count poverty (the proportion of the population living in households whose expenditure is below the relevant poverty line)
hhh	Household head
HI	High intensity UPE
ISCO	International Standard Classification of Occupations
LFS	Labour Force Survey
LI	Low intensity UPE
APCE	Monthly Per Capita Expenditure
N	Naira, the Nigerian unit of currency
NADA	National Data Bank
NBS	National Bureau of Statistics
NLSS	National Living Standards Measurement Survey
NDHS	Nigerian Demographic and Health Survey
NPL	National poverty line
MICS	Multiple Indicators Cluster Survey
MT	Mother tongue
NDHS	Nigerian Demographic and Heath Survey
NPL	national CBN poverty line
PAE	Per Adult Equivalent
PG	Poverty Gap
PG2	Poverty Gap Squared
PPP	Purchasing Power Parity
UPE	Universal Primary Education programme

Executive Summary

This micro-economics report explores nationally-representative survey data relevant to understanding the pathways between gender inequality and economic growth and development in Nigeria. Gender inequalities in human capital (education and health) may be both a cause and a consequence of patterns of economic growth; low female human capital (relative to male levels) may lead to slow growth of incomes and well-being and, conversely, the pattern of economic growth may not benefit males and females fairly. We particularly explore spatial and gendered patterns of poverty using new poverty lines: associations between female education and child well-being, and a variety of household characteristics and contextual variables. Key findings are that poverty is not concentrated among females and that the gender-growth pathways are conditioned strongly by ethnicity rather than religious affiliation, although these two characteristics are associated. Education of males and particularly females is much lower in the northern regions characterised by Hausa, Fulani, Kanuri and other ethnicities and Islamic religious affiliation; public investments in education such as the UPE do not appear to have brought as many benefits as might have been expected from earlier studies.

The data sets considered include the National Living Standards Measurement Survey 2003/4 (NLSS); General Household Survey (GHS 2007, 2005 & 1999); Nigerian Demographic and Health Surveys 1-3 (NDHS, 1990, 1999, & 2004); Core Welfare Indicators Questionnaire 2006 (CWIQ); the Multiple Indicators Cluster Surveys of 1995, 1999 & 2006 (MICS1, 2 & 3 respectively); the Nigerian Demographic and Heath Surveys of 1990, 1999 & 2004 (NDHS1 -2, & -3)); and the Labour Force Survey (LFS) of 2005. All the surveys mentioned above were conducted by the Federal Office of Statistics (FOS, now National Bureau of Statistics (NBS)) except the LFS, which was conducted by the National Manpower Board. The database has been analysed by only a few authors and there are multiple problems of access and data quality with all of these surveys. Unconstrained access is now available for NLSS, NDHS, CWIQ and MICS3, although data of NLSS, CWIQ and MICS3 were not initially available to this study. We rely mainly on NLSS, NDHS and MICS3, making only limited use of the other surveys mainly because of design and/or data quality issues. Several components of NLSS apparently cannot be analysed due to data problems.

The report attempts to address some of the problems with these data sets; there are significant issues in the design of questionnaires and the quality of their execution and with their data processing and analysis. The near monopoly of relevant nationally-representative surveys by NBS, while it should ensure consistency and comparability, may be unfortunate if it leads to poor total quality control. Because of initial difficulties of access and the many problems with the data that we encountered, our analysis has been somewhat more limited than we had hoped. Greater use of these data for evidence-based policy analysis and advocacy by a wider range of scholars and civil society agents is to be encouraged, and should lead to the identification of problems and ways of dealing with them and, hopefully, pressure for their rectification.

We explored relationships between gender inequalities and growth, especially the reciprocal relationships among education, health and well-being and employment.

Poverty is a key indicator of well-being. We suggest that the methods of poverty calculation used in the NLSS leave something to be desired, and we recalculate poverty lines and poverty aggregates for the rural and urban sectors of each state using the data available. We compute a national poverty line based on normative calorie requirements and urban and rural poverty lines using a new data-consistent method; we find that there are major data problems in NLSS in some states. These poverty lines are broadly consistent with those produced by other authors (NBS, 2005, Appleton et al., 2008: all further citations to Appleton et al. in this document refer to this text); however, it is clear that further improvements in the database are required, particularly the development of consistent units with which to measure consumption use and spatially and socially relevant prices of basic commodities consumed by the poor.

There is less poverty in the southern zones and in urban areas; however, poverty as a measure of well-being is flawed in not reflecting the natural and infrastructural environment which condition the translation of consumption into well-being. As with other analysts, we find that female-headed households are less likely to be poor than male-headed one and that there are fewer females than males among the poor; these findings may be statistical artefacts because poverty calculations may be confounded by inadequacies of the adjustments for household size and composition. Our analysis suggests that social capital variables are unreliable, but Koranic education and northern ethnicities (Hausa, Fulani, Kanuri) are strongly associated with the probability of being poor, low per capita consumption, probability of children not being vaccinated and child malnutrition. These variables are also associated with higher fertility for all ages upto fertility completion (around 50), but fertility has remained surprisingly high even among groups which have experienced higher levels of female literacy and education.

Women generally have less education than men, particularly among some social groups and mainly in the northern regions – specifically among non-Christians and among Afro-Asiatic and Afro-Shaharan (AA and AS) language-speaking groups (Hausa among the AA and Kanuri among the AS; the Fulani have poor human capital figures among the Niger-Congo linguistic group). The education of husbands and wives is highly correlated, with husbands generally, although not always, having rather more education than their wives. This makes separating the associations of fathers' and mothers' education with growth and well-being relevant variables difficult, but it is nonetheless important given the widespread assumption that female education is the main driver of development. We argue that male education and the education of other members of households than the mother are also important correlates of child human capital (nutrition, health and education), but underlying cultural and historical factors have affected the spatial and social distribution of education. We also find that improved household infrastructure (improved water supplies and sanitation, electricity, modern cooking fuels), are associated with improved child nutrition independently of household wealth and the mother's and father's education. Unfortunately, the lack of village infrastructure data (due in the case of NLSS to failures of execution), prohibits further exploration of the role of infrastructure in relationships between (gendered) human capital, employment and well-being.

In conclusion, we find that gender inequalities, especially the significantly lower educational levels of females in many parts of Nigeria and particularly among some

ethnic groups, are associated with development disadvantages, but the positive association between partners' educational levels and the independent contributions of fathers' education to human development outcomes and the importance of ethnic and contextual variables (household infrastructure) point to a more complex situation than one of simple female disadvantage. It must be recognised that investment in the education of females may not have the expected direct and indirect development benefits unless the context in terms of culture and economic, social and political opportunities is also favourable to the expression of female and male agency. Removing these contextual constraints can also be a focus of development interventions, but the design of these interventions may require more intensive analysis of existing data, the encouragement of production of better-quality data and use of ethnographic and mixed methods to understand the deep-seated constraints to taking advantage of Nigeria's development opportunities provided by relatively abundant resource rents.

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1 Microeconomic evidence on gender inequality and growth in Nigeria

This annex conducts some analyses of the nationally-representative survey data relevant to relations between gender inequality and growth. More specifically, it explores the interrelations between female human capital and poverty, fertility and child welfare, employment, earnings and wages.

In this first section it describes in a general way the surveys that are of potential use in analyzing the links between gender inequality and growth in Nigeria and some of the issues involved in accessing and using this national database.

1.1 Introduction

The connections between micro- and macro-gender inequalities and growth are not well developed. In principle a computable general equilibrium model (CGE) should be produced; however, gender sensitive CGE models have not been developed (but see Fontana and Wood, Lofgren et al., 2008), face many problems (Fontana, personal communication, 2008) and are beyond the scope of this report. Instead, this section addresses three gender gaps that are thought to affect both the prospects for growth and conversely the impacts of growth on gender inequalities.

These gaps are in human capital, particularly education and health, in employment and productive activities and in wages. The orthodox view in gender and growth studies is that inequalities in these three areas, generally characterised by female disadvantage, reflect not only unjust disparities but also inefficiencies in the use of resources on the one hand, and inequalities in the outcomes of growth processes which may be expected to reduce future growth process through the inefficiencies identified on the other. These arguments are the essence of cases made for the focus on female education prominent in much recent development policy (see Schultz, 2002 for a review of the underlying arguments). This approach is now perhaps the dominant view on how to improve human well-being; for example, the WHO Commission on Social Determinants of Health is a very recent adherent to this view; their first recommendation is to 'improve the well-being of girls and women and the circumstances in which their children are born' (WHO, 2008:2).

A typical argument is that lower educational levels in females compared to males means that, assuming no underlying difference in educational or work potential, the talent pool is inefficiently provided with complementary human capital, which then reduces the average level of human resources in productive employment (Klasen, 2002). A further argument is that female education generates greater externalities than male education in the form of more and better education of children, improved child survival and health and better, generally lower, choice of fertility levels which will reduce population growth and thereby boost growth per capita and improved well-being (Schultz, 2002).

A number of potential contradictions within these arguments have been noted. One that we bear in mind is the possibility that the female education-employment-productivity route to enhanced growth may be partially inconsistent with that from female education to improved child quality insofar as this arises because of improved quality of the time mothers spend at home (home time involves time spent at home in caring and domestic tasks). A common argument is that increased female employment (and wages) translates

into greater female bargaining power over household allocation of resources, which results in more child-friendly expenditure as well as better decision making and more efficient home time. However, insofar as waged work may be at the expense of home work, as suggested by the 'time famine' line of argument (Perlow, 1999), female employment outside the home may be partially at the expense of the quantity and quality of home work to the detriment of child quality[2], especially if it is in employment which has low returns. Access to infrastructure and utilities such as piped water, modern sanitation, electricity and household durable goods may mitigate these trade-offs.

A related contradiction lies in assuming that as more women are drawn into education, and at higher levels, the female talent pool at each level of educational attainment will remain the same. Assuming that generally more talented females are educated when female education is limited,[3] the average talent of educated females will fall and the marginal returns to female education at each level of education will also fall.

Another problem with the existing literature is a common bias in the treatment of links between parental education and child well-being. This is manifest in at least two relevant areas of research; first, the common neglect of male education in empirical work relating parental education to child well-being,[4] despite male education at household (and community) level being highly correlated with female education (father's with mother's). Thus, the early work identifying the close link between maternal education and well-being outcomes (when the focus was on fertility behaviour and health behaviour towards children), recognised that male education was also closely connected with desirable outcomes, although less closely than that of females (see for example, Trussel and Preston, 1982,[5] United Nations, 1985).

The second lies in the area of education externalities: while the direct implications of mother's education for her children's welfare is one such externality, another recently-expounded externality is that of 'effective literacy' (Basu and Foster, 1998) of household members whereby the literacy of some household members has effects on employment and wages of household illiterates (Basu et al., 2002). Both these sets of authors suggest particular advantages of females as both transmitters and beneficiaries of literacy externalities. This view not only entails logical contradictions (illiterate females are more likely to be beneficiaries of externalities transmitted by literate males in their household) but also suffers various empirical failings (Iversen and Palmer-Jones, 2008; Lindelow, 2008). Thus using an assumption of assortative mating[6] (or at least selection of females into households), it may be characteristics of households that determine both females'

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[2] This refers to a child's health, nutritional status, cognitive and motor capabilities: "quality is measured by various proxies for the well-being of children" (Becker, 1981:8).

[3] Of course class and other factors including ethnicity, religion and so on will affect the probability of being educated. But even if the better-off are more likely to send their girls to school, it is likely that the more talented become educated.

[4] and indeed the absence of indicators of male (father's/partner's) well-being such as male height, weight and BMI in most demographic and health surveys (DHS).

[5] From work on Sri Lanka and South Korea, these authors conclude that 'the education of the father has a significant and pronounced effect on childhood mortality even when the mother's education is controlled' (p. 1).

[6] Mating of individuals with more traits in common than is likely in random mating.
Source: wordnetweb.princeton.edu/perl/webwn [accessed October 1 2009]

education and their externalities. An upshot of this work is that not only does male education also play a role in processes affecting the growth and well-being of children, but there may also be underlying features of conjugal contexts that contribute both to gendered education investments and their interconnections with growth and well-being.

Hence, in exploring the links between gender inequalities, growth and well-being we bear in mind the need to explore these more complex frameworks for understanding gender-growth-well-being interrelationships.

2 The Micro-economic database

The following nationally-representative micro-economic data sets could be used to address micro-economic aspects of gender-growth relationships: the National Living Standards Measurement Survey 2003/4 (NLSS); General Household Survey (GHS) 2007, 2005 & 1999; Nigerian Demographic and Health Surveys 1-3 (NDHS, 1990, 1999, & 2004); Core Welfare Indicators Questionnaire 2006 (CWIQ); Multiple Indicators Cluster Surveys of 1995, 1999 & 2006 (MICS1, 2 & 3 respectively); Nigerian Demographic and Heath Surveys of 1990, 1999 & 2004 (NDHS1, 2 & 3) and the Labour Force Survey (LFS) of 2005.[7] All of these surveys were conducted by the Federal Office of Statistics (FOS, now National Bureau of Statistics (NBS)) except the LFS, which was conducted by the National Manpower Board.[8]

This Nigerian micro-economic database has been little used other than for production of official publications, which mainly consist of descriptive statistics and offer limited analysis. The nationally-representative social surveys have until very recently[9] not been readily available to independent researchers. Partly as a result of this a disproportionately large amount of time was devoted in this study to accessing relevant data sets, exploring and where possible cleaning them, leading to relatively limited analysis. Table 2-1 provides some basic information about these surveys.

2.1 National Living Standards Survey, 2003/4

This survey is a stratified clustered survey with a sample size that allows representative statistics at state level; although the design sample size was somewhat larger, there are usable data on 19,158 households in the NLSS data set we have. It includes standard household demographic, education, health and employment schedules and modules on migration, housing, social capital and community participation (but not a usable

[7] Earlier LFS were not nationally representative.

[8] Further details of many of these surveys can now be found at the Nigerian national Bureau of Statistics Data Archive at:: http://www.nigerianstat.gov.ng/nada/index.php (accessed October, 2009). Note that versions of the datasets available through the NBS Data Archive may not give the same results as those we derive because the versions available through this site may not be, and in some cases definitely are not, the same as those used here. We believe that the versions that we used were the best available at the time.

[9] While Part A of the NLSS 2003/4 (see below) was available online at the commencement of this study, the complete data set became available online only in July 2008. Even this data set does not include crucial data for exploring well-being such as the commodity prices required to compute poverty (see below).

community module[10]), income from agriculture, expenditure, non-farm enterprise, assets and savings.

Relatively little use has been made of this survey and the data are in need of further cleaning. While the household income modules do not seem to have been used, two groups have published material calculating poverty and poverty profiles based on the expenditure (and demographic, etc.) modules (NBS, 2005, Appleton et al.). The NBS report on poverty makes use of consumption, health, education, household amenities, employment (occupational group), land and livestock ownership and some crop input and output data. One group has made use of the employment data (Appleton et al.), but these authors comment that they have not been able to extract usable income data from this survey.

Both NBS and Appleton et al. use the expenditure data to compute an expenditure aggregate and utilise this to compute poverty measures. Both groups seem to have used similar poverty lines which are anchored in normative calorie requirements; however they use slightly different welfare aggregates, as explained below, and so produce slightly different poverty statistics. Using a national food basket, regional price indexes are computed with prices obtained from the official retail price[11] for each state and sector (rural/urban) collected by the Ministry of Agriculture. We use the same data with a different and arguably more appropriate methodology to compute poverty lines, poverty and poverty profiles.

2.2 General Household Survey

The main survey of economic and social affairs in Nigeria is the GHS; Collier and Gunning (1999a) report surveys being conducted at fairly regular intervals from 1980. The GHS is a fairly brief survey of households in which (according to the 2007 GHS survey instrument) general household data, demographic, educational and employment data on each household member, absent members, contraceptive use, births, immunisation, child nutrition, deaths, health, household enterprises and household expenditure are reported. Initially we were only able to access data on Part B of the 2005 GHS and Parts B and K[12] of the 2007 GHS. Later we obtained the 1999 GHS, but the definition of many variables is not clear; later we obtained the complete data for 2005 and 2007 GHS. While the latter two surveys are very similar, a survey instrument for the 2005 survey has not been available.

The GHS 2007 is potentially a useful source of information on a wide range of welfare and gender relevant variables, but its use encounters a major problem; it is difficult to merge the different data files because the identification variables are not consistent across files. For example, of a total sample size of 18,826 households (in the household characteristics file, Part A), 2,993 could not be matched to the consumption expenditure

[10] A community prices module was reported to have been found unreliable.
[11] These prices were, we believe, the same as those used in NBS, provided to the author by Geoffrey Greenwell.
[12] Part B refers to individual household member characteristics (age, sex, educational attainment, literacy, employment and so on); Part K reports household expenditure. Pasrt A includes household characteristics such as sources of drinking water, quality of house building materials, etc..

file (Part K) and 1263 records in the expenditure file could not be matched to a household in Part A. While part of the problem appears to be missing observations in the expenditure file, quite a number of problems seem to be errors in the household identification coding (e.g. I instead of 1, O instead of 0 and so on. Table 2-2 gives further details of the problems of matching. Around 7-9 per cent of each file cannot be matched with the household characteristics, making any analysis problematic, especially since the distribution of missing matches is not evenly distributed across states and is not readily rectified This data source has not been used. However, it is notable that Aromolaran, 2008 (see also 2004), in his analysis of female labour force participation, reports using a large database from the GHS of 1996-1998; these data were not available to us.

2.3 Multiple Indicator Cluster Surveys (MICS)

Three of these surveys have been conducted; MICS1 (1995) MICS2 (1999) and MICS3 (2006). Data for MICS2 and 3 were provided by NBS, but we have only explored those from MICS3 due to time constraints. MICS1 data do not seem to be available.

2.3.1 MICS3, 2006

This survey (MICS3) was conducted by NBS with funding and support from UNICEF as part of the MICS programme. It is a stratified cluster survey with a large design sample size that is nationally-representative, using sample weights. The data set provided has data from 28,603 households and 27,093 women interviewed; there are anthropometric measurements on 17,093 children. Given the wide range of variables in the questionnaires this is a potentially useful source of information on child welfare and mothers' education, health practices and so on. A wealth index can be computed.

These surveys cover background material on households including demographic, identity (religion, mother tongue and ethnic group) and education variables of all household members, household assets and issues of maternal and child health and nutrition. It has sections on child labour, maternal mortality and salt iodisation. It lacks a community characteristics module.[13] The large sample size and inclusion of ethnicity variables makes the survey highly suitable for exploring contextual analysis of gender and growth issues. However, the data are newly released and in need of cleaning, especially with regard to the ethnicity and language variables. MICS has very limited information on partners of carers, unfortunately; no doubt this reflects the unfortunate neglect of the roles of men in child welfare circles.

2.4 Nigerian Demographic and Health Surveys

Nigeria has NDHS conducted by NBS in 1990, 1999 and 2003, and a further one is underway. They are stratified clustered surveys that provide estimates representative at

[13] This can be partly compensated by using information derived from the households in each cluster (MICS uses a stratified cluster sample design in which a group of households in the same neighbourhood form a cluster, and so will share characteristics such as access to electricity, piped water, and such variables which are reported for each household) to produce indexes of, for example, access to education, electricity, water and sanitation. However, the reliability of such variables is conditional on the households included in the sample and must be considered very noisy. Similarly, use of households in a cluster to determine the mother tongue or ethnic group of households which do not report these variables will not be very precise.

zonal level. No state variable is provided. Data from three of these surveys can be downloaded from the www.measuredhs.com site on completion and acceptance of a brief research proposal. Relatively little use seems to have been made of the surveys apart from the official reports and papers by Ukwuani and Suchindran (2003) and Osili (2008). There are at least some identifiable data errors remaining in the data, so their processing and use must be undertaken with caution; for example, NDHS2 has some unacceptably extreme child anthropometric measures.

2.4.1 Welfare indicators

All NDHS report nutritional status of children (height for age (haz), weight for age (waz) and weight for height (whz) derived from height, weight and age variables) and NDHS2 and 3 provide maternal nutritional status (height and BMI). NDHS1 does not report maternal nutritional status, and none of the reports provide information on paternal anthropometric status. However, NDHS do provide significant information on health practices and some information on characteristics of the mother and father/partner, and a wealth index can be calculated. Unfortunately the information on partners and males in households is less reliable than that on women due to the small sample size (there are only 2,346 records on males compared to 7,620 on females), and it may be biased in that the sample of men interviewed may not be representative of the same population as the women (for example there are slightly fewer men in the southern zones per household than in the north).

2.5 Core Welfare Indicators Questionnaire Survey, 2006

This survey is 'designed for monitoring poverty and the effects of development policies, programmes and projects on the welfare situations [sic] in the country' (NBS, 2006). CWIQ surveys have been widely implemented in Sub-Saharan Africa and are supported by the World Bank (Klugman, 2002 Vol 1:424-5[14]) There are many limitations to the CWIQ survey that render it of little value in making comparisons with poverty estimates from other sources; it is also limited as a source from which to construct poverty profiles. Generally CWIQ surveys attempt to record inputs into processes[15] which determine welfare rather than indicators of welfare outcomes.

It is claimed that comparability with more conventional welfare indicators (e.g. consumption) can be established by recording correlates of their indicators and then 'predicting' these welfare outcomes from the values recorded in the CWIQ.[16] This methodology requires a number of assumptions, particularly (1) that the parameters of the model do not change between the surveys being compared and (2) that the variables recorded in the two surveys are sufficiently similar to warrant their use in the same model. Neither assumption seems warranted. Firstly, during periods of economic, social and political change the context within which households make decisions about resource

[14] See also http://www4.worldbank.org/safr/stats/cwiq.cfm

[15] 'access, use and [subjective] satisfaction indicators' (Klugman, 2002)

[16] 'predictor variables were identified and selection of poverty predictors which are proxy indicators, [sic] easy to measure and is reasonably accurate. These are consumption correlates usually derived through rigorous regression analysis using Household Budget Survey and similar other survey data.' (Ajayi, 2006:197).

allocation changes and hence any ceteris paribus assumptions in the base regression model are unwarranted (e.g. if public goods are not included in the model regression model – or more generally if there are any missing variables which affect the transformation of the indicators into well-being – and access to them changes over time, the parameters would be expected to change as well). Secondly, answers to questions are known to be sensitive to the context in which they are delivered (question wording, sequencing and so on) and hence answers will often differ. This is especially likely if the model is estimated from an intensive, say multi-visit, survey while the CWIQ is a short single-visit survey. Other factors can affect the distribution of values such as sampling, etc. and these need to be comparable.

The report of the 2006 Nigerian CWIQ does not attempt any such modelling and there are no other CWIQ surveys for Nigeria with which comparisons can be made.

2.6 Ethnicity

Many statistics in Nigeria manifest strong regional or zonal variations often summarised as 'north-south' differences, although it is recognised that there are significant within-region variations. It is common to attribute the north-south differences to differences in religious affiliation, with the north predominantly Muslim and the south predominantly Christian. However there is a strong probability that religious differences are confounded by ethnic and other variables (for example pre-colonial, colonial and post-colonial histories are more similar within than between regions, which makes any attribution of causality difficult to sustain). The north is not only predominantly Muslim in religious affiliation but also ethnically Hausa; and among the southern Christians there are two major groups, the Igbo and Yoruba ethnicities, and many other less numerous ethnic groups. There is as substantial Yoruba Islamic as well as Christian population. It is unfortunate that these surveys focus on the whole on the major ethnicities (Hausa, Igbo and Yoruba) and their religious affiliations, as this may oversimplify the relationships and result in erroneous causal attributions. The tendency to take a simplistic view is represented by this focus in the major surveys which report four or five categories of ethnicity (Hausa, Yoruba, Igbo and other), although some of the surveys (NDHS2 & 3, and MICS 2 & 3) provide information that allows further disaggregation of ethnic groups. I use the more extensive categorisation of ethnicity in MICS3 to expore relationships between ethnicity, religion and child outcomes below (see section 4.1.3); nevertheless, it would be very useful to be able to use a more disaggregated classification of ethnicity within each of the major regions was available in, for example, NLSS, to test further the simple associations made in policy circles in Nigeria between either religion or the major ethnicities and growth or welfare variables.

The content of the national sample surveys in terms of variables is fairly standardised, perhaps reflecting the dominance of a single organisation in their execution. However, there are variations in practices with regard to ethnicity from round to round and between surveys. Ethnicity in NLSS is not directly reported at all, but can be inferred for some households based on the Nigerian language in which they are literate (able to read and/or write). The answers to questions on the Nigerian language in which a household member is literate are reported as the three major Nigerian languages, English and 'other'. There is also a question on English literacy; in both the Nigerian and English questions there are

separate responses for reading and writing. A few households report reading in one Nigerian language and writing in another. Quite a number of iondividuals are reported to be literate in both English and a Nigerian Languages. Classification of households which report no literacy in a Nigerian language can be based on the predominant language in the state of residence, or other literates in the same cluster. Nearly two-thirds of households have to be classified in these ways.

Ethnicity is not reported in the GHS, CWIQ, or LFS.

In NDHS1, 2 & 3 and in MICS3 there are one or more variables reporting a greater number of ethnic categories. NDHS1 reports language of interview and language of respondent, the most extensive classification in *slang*r which reports 96 categories. Other variables (*slangr*, *slangi snlangi*) report nine languages – pidgin, Hausa, Yoruba, Igbo, Efik, Kanuri, Tiv, English and Other).

Variables s119 and s118 report ethnicity variables in the 1999 NDHS and the 2003 NDHS respectively, and in the latter ethnicity can also be identified by the language of the respondent and interview (person record file – *shlangin* and *shnlang;* individual record – *slangint* and *snlang*), but only the three main languages, English and Other are given as categories. *Slang*r in NDHS1, s118 in Ndhs2 and s119 in NDHS3 use similar but not identical classifications of ethnicity by language (NDHS2 and 3 use the same coding scheme).

MICS3 has two variables, mother tongue and ethnicity; the answers to both questions are generally identical. However, there are more than 1000 categories; even the most optimistic count suggests only some 511 live languages in Nigeria and it is evident on inspection that many of these reflect either errors in writing down answers of comprehension (e.g. Hausawa for Hausa), in writing (1gbo for example) or in data entry.

2.7 Summary

Nigeria has a fairly extensive selection of nationally-representative sample surveys which contain much information of relevance to gender-growth relations. Most of these surveys have been produced by NBS, often in collaboration with (and funding from) international aid donors. Aid donors have also funded support for NBS, including the availability of data, the analysis and production of reports and their availability in electronic form.

However, many of these surveys are currently only available through personal application, generally involving formal or informal relations with NBS or its staff. At the time of writing only the data from the Nigerian Living Standards Measurement Survey of 2002/3 were publicly available through NADA.[17] Furthermore, to some extent as a consequence of constrained availability, relatively little use has been made of this extensive database other than to produce the official reports. These, understandably, have limited analytical content.

We have attempted use of NLSS 2002/3, NDHS1, 2 and 3, MICS3, GHS 2005 and 2007 and LFS. Some sections of NLSS can be used, with qualifications, to compute

[17] This was true up to the time that this document was produced in draft form. At the time of editing data from several other surveys have become available (see http://www.nigerianstat.gov.ng/nada/index.php, accessxed 13/10/2009).

demographic, education and health behaviour characteristics of households and an expenditure welfare aggregate. Some of our difficulties with these sections are described in the relevant sections of this annex. We comment on problems we encountered using different surveys in varying detail because of the differing extent to which we make use of each.

However, the employment and income data have proved difficult or impossible to use because of problems in computing the aggregates, some of which can be traced back to the design of the survey.

In our experience the data are difficult and time-consuming to use; the data user experiences problems merging multi-file databases and inconsistent or out-of-range codes. Sometimes it may be that different coding schemes reflect the preferences of collaborators, but one of the advantages of NBS being the usual executors of surveys should be that the coding schemes are appropriate to the Nigerian contexts and largely consistent across surveys. Using the data and reviewing the survey instruments reveals a number of conceptual and design problems in the questionnaires. These are less extensive in the case of surveys with international collaborators (the NDHS and MICS surveys) where the instruments generally follow internationally standardised designs, than in locally specific surveys (GHS and NLSS). However, we understand that differences between NBS and UNICEF led to the non-availability of MICS2 data.

There are also inadequacies in coding schemes, inconsistencies between surveys and problems in the linking and skipping within questionnaires (e.g. for education and occupations); this is most obvious in the case of NLSS, where we find difficulties in linking occupations and computing an income aggregate.

Low utilisation, personalised access and difficulties in utilising those data that are accessed probably contribute to lack of pressure and slow progress in improving total quality control of NBS surveys. India, which used to allow only restricted access to national socio-economic surveys, has experienced increased use and high-quality public policy analysis following liberalising access to the unit record data (see for example Deaton and Kozel, 2005). In turn, wider use seems to generate increased valuation of these surveys and the organisations responsible for them.

2.8 Database tables

Table 2-1: Data Sources: summary of relevant characteristics

	Cond-ucted by:	Source of data	Availability	Uses	Comments
Socio-economic surveys					
NLSS 2002/3	NBS	NBS www site direct & NADA	Complete public availability since July 2008; by personal application previously[18]	Household demography, welfare and poverty measurement; education, waged employment and wages	Serious coding and data error problems; usable demographic, health, education and expenditure data Household production and income data unusable at this stage Inadequate classification of sectors of employment, and employment Apparently poor data collection and cleaning in some sections NBS should clean for merging. Not clear whether investing more effort to make work, production and income data usable is worthwhile.
GHS					
2007	NBS	NBS	From July 2008 on application Incomplete and partial	Household demography	Data files only partially link due to household and person identification problems Of 18826 households, 2267 do not match with the household roster file; similar problems with other sections Not useful in the short run. NBS should clean and ensure cross-section merging.
2005			Incomplete data files	Lacks questionnaire	Unusable
1999			Complete data file	Questionnaire hard to interpret	Unusable
CWIQ 2006	NBS	NBS	Complete available from July 2008 on application to NBS; Online availability indicated but not 'live'	Household demography, education, employment	Education and employment codes differ from other sources Due to differences in the questionnaire the CWIQ data are generally not comparable with other data sources and are of limited analytical value other than for monitoring specific variables A recent review of Core Welfare Indicators Questionnaire
LFS Various years	Labour Bureau	Labour Bureau, Ibadan	Limited, on personal application. Only 2005 formal establishments survey obtained	Employment in formal sector organisations; education and wages.	Limited to formal sector only, lacking in-depth household information Education codes partially inconsistent with other sources.

[18] http://www.nigerianstat.gov.ng/nlss/2006/index.html. This link is reached through http://www.nigerianstat.gov.ng/, which also indicates a link to the CWIQ which is broken. Links to individual level and household expenditure data only became live in June or July 2008. Household level data were available earlier. There data are organised differently to those that can be obtained through the National Data Bank (NADA – see left hand pane on http://www.nigerianstat.gov.ng/). These data sources have not been checked for differences in values and variables. We have generally used the data from the direct link which was obtained earlier.

Health surveys					
MICS (Multiple Indicators Cluster Survey UNICEF					
1- 1995	NBS	NBS	Not known	Not known	Not known
2- 1999	NBS	NBS	Discretionary from NBS	As MICS3	Not known
3- 2006	NBS	NBS	On application to NBS	Household demography, child nutritional status, fertility and child health practices; education and occupation of mother/carer and father/partner; wealth index, ethnicity	Large sample Employment and education codes inconsistent with other sources 1868 out of 131136 interviews not completed Approximate methods used for child and maternal mortality (Brass and sisterhood methods respectively). The sample size is limited for thie methodology for estimating maternal mortality Estimations below national level; suggestions that data on sisters are not robust.
NDHS					
1- 1990	NBS	Macroint	Complete and free online	Fertility, child mortality and nutritional status	Four zones
2- 1999	NBS	Macroint	Complete and free online	Fertility, child (and adult) mortality and nutritional status and maternal mortality by sister method Information on partners	Six zones Errors in anthropometric measurements and in fertility and mortality data (accepted that child mortality figures are under-estimates) Bias in partner sample; i.e. more missing partners among females with more education Used by Osili and Long, 2008, and by Osili, 2008 Adult and maternal mortality figures (by sibling method) seem unreliable Sample size small.
3- 2004	NBS		Complete and free online	Household demography, child nutritional status, fertility and child health practices; education and occupation of mother/carer and father/partner; wealth index, ethnicity	Limited sample size Significant data error problems seemingly unusual in this data source (e.g. HAZ in NDHS2) Lack of income and expenditure data, and limited value of wealth index Lack of state level variable hence only analysable at zonal level – zonal aggregation Bias in partner sample (more partners of more educated females missing).

Table 2-2: Files matching in GHS 2007

'parta' (18826 records) (identification) merges with: -	Unmatched records from:		Matched records	% households not matched	
	Part A	Merge file		Part A	Matched file
b – roster	2267	6550	77150	12.01	7.83
c – usually absent	17574	156	1827	93.12*	7.87
d – contraceptive	3348	1857	22778	17.74	7.54
e – births	17599	137	1291	93.25	9.59
f – immunisation	17383	146	1567	92.11	8.52
g – breastfeeding	17784	91	1090	94.23	7.71
h – deaths	18375	45	488	97.37	8.44
i – health	10447	1536	20794	55.36	6.88
j – enterprises	4090	1355	18401	21.67	6.86
k – expenditure	2993	1263	15833	15.86	7.39

Note: * many households do not have relevant data.

Table 2-3 Database Statistics

: NLSS Questionnaires (this table is incomplete and may be inaccurate in parts)			
	Section	.do files used in this study	Comments
Household demographics	1		FAO and adapted Ghana Adult Equivalents
Food purchases	10B		
Food consumption from own production	9H		
Frequently purchased non-food purchases	10a2		Label values overlap with have same values as infrequent non-food items – codes shifted + 150 and values labels altered
Tobacco	10b	Tobacco.do NonFoodExpenditure.do	
Infrequently purchased non-food items (Section 10a1)	10a1		Durables not included
Imputed house rent	7	RentRegression	Rent also in 10a1 (304)
Consumption from own employment non-farm enterprises	11A&D	Nfdtotpr.do	Activities reported in 11A do not match those in 11D s11dq5 value of consumption in last 2 weeks; some activities not coded (given 128) s11dq10 value of cons but not operating in last 2 weeks
Durables	10a1 & 12b	asset_imputation.do DurablesWorldBank.do	User values computed as owner cost and depreciation
Expenditure on utilities	7	utilities.do	Light, refuse, & water Water also included in 10a2
Expenditure on education	2	education.do	
Expenditure on health	3 10a2	Health1.do Health2.do	Computes much higher health expenditure value Used in Consumer Price Index (CPI) calculation
Employers' provision of transport	4	NonFoodExpenditure.do (Employ_Transport.dta)	
CPI	10a1, 10a2, 10b		Compute weights and democratic budget shares of items in price file and in expenditure/consumption files Not same pattern in either food or non-food items Many non-food items not in price file

Table 2-4 Summary of NLSS questionnaire

Summary of NLSS Questionnaire Section 4A Employment and Time Use Form 1						
Person id	1. During the past 12 months have you done work for which you have received a wage or any other payments? Yes….1 (>>5) No… 2	2. During the past 12 months have you been paid money including payment in kind through self-employment (for example trading)? Yes…1 (>>5)	3. During the past 12 months have you worked on a farm, field or herding livestock? Yes…1 (>>5) No…2	4. During the past 12 months have you worked unpaid for an enterprise belonging to a member of your family? Yes…..1 No…2	5. [Main activity code]	6. Which other activities did you do? [up to 4 choices] Other 3 Occupations apart from Q. 5
Source: NLSS Questionnaire.						

3 Poverty, inequality and gender in Nigeria

Poverty has increasingly come to the fore as a development indicator,and poverty is widely held to be gendered (UNDP, 1995). Growth is supposed to reduce poverty, but may impact differently by gender (Chant, 2003), . Hence assessing spatial, social and temporal patterns of poverty is an important component of gender and growth assessment.

The NLSS 2003/4 is the most comprehensive recent survey that can be used to compute poverty. NBS 2005 is the official report on this survey and produces poverty calculations (see FOS 1999, for an earlier review of the statistics of poverty). Appleton et al. provide a wide-ranging review of Nigeria's poverty statistics and their evolution over time.[19] It is clear that there are problems in making temporal comparisons of poverty, perhaps especially in Nigeria, because of changing methodologies and questions about the comparability in terms of welfare of the poverty lines used at different times. Nevertheless, there are some broadly agreed patterns: between 1980 and 1985 head count poverty is reported to have increased sharply from 28.1 per cent to 46.3 per cent and subsequently fluctuated widely between a reported minimum of 42.5 per cent and a maximum of 65.6 per cent. The official poverty count for 2003/4 varies with definitions, but by the most common measure (see below) is put at 54.7 per cent (NBS, 2005:xv). Appleton et al. (p334-5) identify a number of problems in the NBS estimate of poverty and provide a preferred figure for the same year of 57.8 per cent.[20] The regional distribution of poverty in both studies corresponds closely. Both studies report less poverty in female than in male-headed households.

Other methods of assessing well-being in Nigeria lack spatial completeness and temporal range. The GHS of 2007 provides consumption information as well as some household characteristics, but the data are not comparable with NLSS consumption data because of major differences in the survey instruments. Data from the earlier rounds of the GHS have not been made available to us in usable form, although as discussed above, Aromolaran (2004, 2008) reports a large combined database of GHS from 1996, 1997 and 1998. The CWIC survey likewise does not provide adequate information with which to compute money-metric poverty comparable with NLSS information, and has been conducted only once. This limits its use in spatial and temporal comparisons. Some information on welfare can be derived from the three NDHS (1990, 1999 and 2003), especially direct indicators of well-being such as child nutritional status and mortality; however, because of limitations of sample size and the wealth index[21] and the changing

[19] This document became available to us only in mid 2008. Earlier studies include Canagarajah, Ngwafon and Thomas, 1997; Bevan, Collier and Gunning, 1999; FOS, 1999, 2005; Canagarajah and Thomas, 2001; Anyanwu, 2005. Bevan et al (1999:100) report: 'The data base from which to construct long-term trends in the level and distribution of living standards is unusually inadequate for Nigeria. Although there are a large number of village studies, the first national survey from which a distribution can be calculated is for 1992. As a result, many pertinent questions are unanswerable and the inferences we draw are little more than speculation.'

[20] This is the figure provided in Table 14.2. However, the text shows a preference for a figure of 63.6% (p337).

[21] The wealth index in particular, although increasingly used, is problematic mainly because as an asset index based only on ownership of assets and crude indicators of housing and utilities, it provides no

scope of the questionnaires over time there are qualifications to the usefulness of these surveys. Firstly they do not record income or consumption; a wealth index is the nearest to an economic welfare aggregate that can be produced, and even these indexes have limited value since they are based only on the ownership of an asset rather than its value. MICS3 also provides information on child nutrition and mortality and maternal mortality, but like the NDHS only has an asset index as a material goods-based welfare indicator.

Since definitions and details of calculations, including the official poverty calculations, vary, any conclusions about trends in well-being drawn from published sources should be treated with caution. As we (along with other researchers outside NBS[22]) did not have access to previous data sets with which to implement a consistent series of poverty calculations,[23] we focus our poverty calculations on clarifying the methods of and results from a specific, transparent, repeatable way of computing poverty using the NLSS of 2003/4 data set now publicly available online from NBS. Our objective is to assess the incidence and gender aspects of poverty.

The details of calculations of poverty from household surveys depend mainly on the computation of a welfare aggregate (value of consumption in our case) and poverty lines in this metric, which then identify the households which are considered poor; the method of aggregating these households into a poverty index provide other, arguably less significant issues. Poverty lines are important in that they identify the households which are considered poor, and it is the characteristics of these households that generate the poverty profile – their location, occupations, gender composition and so on. There are obvious flaws in the poverty lines used in the NBS poverty assessment from NLSS 2003/4, which are also used by Appleton et al., which we try to clarify next.

3.1 Poverty lines

Problems in computing a poverty profile in Nigeria stem in part from the lack of published poverty lines. A poverty line is broadly thought to be the expenditure (or income) below which a household falls below an acceptable level of welfare. To compute a poverty line one needs a welfare aggregate for the household (usually expenditure, or value of consumption[24] for households that are at least partly self-provisioning, per

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indicator of changing qualities (and hence value) of assets. See Filmer and Pritchett (2001) for discussion of DHS wealth indexes.

[22] E.g. Appleton et al. (2008) and Bevan and Collier (1999). Canagarajah, Ngwafon and Thomas (1997) are an exception.

[23] Although Aromolaran (2008) uses data from the GHS 1996/7-1998/9 to analyse relationships between female schooling and labour force participation.

[24] Many poverty profiles use an income concept. Economists generally argue that income is a less appropriate concept than consumption for a number of reasons (Deaton, 1980; Deaton and Grosh, 2000; Deaton,and Zaidi, 2002): firstly it is often harder to record because of both its inherent complexity and the incentives and ability of households to disguise their incomes. Secondly, income is more subject to short term fluctuations than expenditure; following some sort of 'permanent income', or consumption smoothing hypothesis (value of) consumption is a better reflection of a household's real standard of living. However, there are many problems in using (value of) consumption as a welfare aggregate, including the neglect of intra-household allocations of consumption, the appropriate way to compute the value of durable goods, the valuation of home-produced goods, the appropriate deflators to use for household size and age/sex) composition, the value of public goods, the environment, and commons. A coherent concept for consumption based poverty takes account of all factors that affect the transformation of commodities

person, or per adult equivalent) and a value of this aggregate that identifies the critical value below which households are considered poor. This level will vary between 'domains': household size and composition are two variables affecting the appropriate expenditure level, but so are spatial location (state/region of the country and rural or urban location are other important variables[25]). In this text we use household expenditure and consumption to signify 'computed value of consumption' unless otherwise indicated. We use expenditure and consumption interchangeably, unless otherwise stated, to refer to this concept.

A set of poverty lines for different domains (geographical area – rural/urban/state – at a specified time) is supposed to represent the cost of attaining a common fixed standard of living. It is generally agreed that the cost of living (the cost of attaining a common standard of living) differs substantially between rural and urban sectors; it also varies between states in Nigeria (and other countries).

3.2 National poverty line

Appleton et al. provide insight into the way that national poverty lines have evolved over time and correctly identify confusion in the explanation given by NBS of their (NBS) method of computing poverty lines. Because, as Appleton et al. show, there is no uncontroversial anchor for the recently-used national poverty lines we attempt to derive a national poverty line using normative food requirements and then apply state/sector Consumer Price Indexes (CPI)s to obtain state/sector poverty lines.[26]

3.2.1.1 State/sector CPIs

We turn firstly to the spatial CPIs used to derive local (state/sector) poverty lines from a national poverty line. NBS, 2005, publishes an outline of the method used to compute state/sector CPIs which are used to adjust expenditure to the national poverty line. This is equivalent to multiplying the national poverty line by the domain CPI relative to the national price level to obtain state/sector poverty lines. With the information on expenditures on items in NLSS and some retail prices made available by NBS,[27] we can compute spatial indexes (Deaton, 1988) for each state and sector. The Tornqvist index is preferred to the more commonly used Laspeyres index in that it is a superlative index using information on expenditure patterns in both domains. Since patterns of consumption vary greatly in Nigeria between regions (and between urban and rural

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(purchased or home-produced) into well-being. Actual implementations are necessarily unsatisfactory reflections of such ideal concepts; nevertheless, the details of poverty line and welfare aggregate construction are crucially important for interpretation.

[25] While it is common to use a simple dichotomy between rural and urban areas, Dubey and Palmer-Jones (2005*a, b and c)* show that towns of different size also differ significantly in prices and consumption patterns in India, with smaller rural towns having costs of living close to their surrounding rural area rather than to major cities or metropolises of the same state.

[26] NBS apply their CPIs to domain consumption and then compare the adjusted consumption expenditure to the national poverty line. The procedures are equivalent.

[27] This file is based on the retail prices published by NBS (NBS, 2007*:* unfortunately these published data are incomplete, having missing data for several states for one or both rural and urban sectors.)

areas), the Laspeyers and other non-superlative indexes may be quite misleading as to relative costs of living.[28] The formula for this index is:

3.2.1.2 The Törnqvist index formula

The Törnqvist spatial index formula for location *j* relative to location *o* in period *t* ($T^t_{j,o}$) is:

$$T^t_{j,o} = \prod_i \left(\frac{p_{ij,t}}{p_{io,t}} \right)^{\sigma^{s_i}} \text{ where } \sigma^{s_i} \text{ is } \frac{S_{ij,t} + S_{io,t}}{2} \text{ and } S_{ij,t} = \frac{p_{ij,t} p_{ij,t}}{\sum_i p_{ij,t} q_{ij,t}}$$
$$= \exp\left(\sum_{i=1,..,n} \frac{w_{ij,t} + w_{io,t}}{2} . \ln\left(\frac{p_{ij,t}}{p_{io,t}} \right) \right) \text{ Törnqvist index} \quad (1.1)$$

Where $p_{ij,t}$ is the price of good *i* in location *j* (at a given time); $w_{ij,t}$ is the expenditure share of good *i* in location *j* (at the same time); $p_{oj,t}$ and $w_{oj,t}$ are the prices and expenditure shares of the base location at time *t*. The base location may be a national average. Where expenditure patterns differ greatly between locations (as they do between regions in Nigeria), it may be preferable to use a multilateral index number formula such as the Eltetö-Köves-Szulc (EKS) or Geary-Khamis (GK) methods (Deaton and Heston, 2008), but these are not considered here due to limitations of time.

The expenditure shares and prices should be relevant to the 'poor' population since both the prices that the poor pay and the share of different items in their consumption bundles may be quite different to those of the average population. As with NBS we use expenditure shares of the lower two pentiles. However, we note that in some cases the expenditure patterns suggest consumption of a very narrow range of commodities compared to the domain as a whole, and in the case of two states (Kogi and Kwara) there seem to be serious issues with the range and categorisation of consumption items reported.[29]

In our case, we compute total expenditure by each household, largely following the method used by NBS (Murgai, 2008), and the expenditure on each item for which we have unit prices from NBS to derive the shares of total expenditure of these items. Applying the index number formula using both food and non-food items provides the appropriate state/sector deflator.[30] We use democratic average expenditure shares of the

[28] As is well-known that the use of Lasperyers (or base period/location-weighted) indexes can significantly overestimate cost differences as they do not allow for households' ability to adjust consumption to different relative prices. Nor do they take into account differences (or changes) in tastes.

[29] The major item consumed in these two states is reported to be millet flour in the data sets we have, but this is not a widely-consumed item in these areas (or anywhere in Nigeria). We assume that the NBS poverty line calculations for these states is similarly limited by these lacunae in the price database.

[30] There are various alternatives; we can either base all indexes in a single national commodity bundle and set of prices, or we can compute separate urban and rural national commodity/price bundles and compute the state rural index in relation to the national rural bundle, and similarly for the urban sectors. This may be appropriate in that urban and rural consumption bundles are very different. The national urban CPI relative

lower 40 per cent of expenditure distribution (as noted above) in each state/sector to compute poverty-relevant CPIs for each state and sector. There are some problems in matching the items reported in the NLSS consumption schedule and those in the price file which are not discussed further here, but which suggest that careful development of the NLSS schedule and the items for which retail prices are recorded is desirable.

The main problems with this method are (a) the CPI calculations and (b) the level of the national poverty line.

3.3 CPI calculations

The problems with the NBS poverty line calculations from NLSS 2003/4 are (1) the food commodity bundle used to estimate the cost of meeting minimal nutritional requirements; (2) the food commodity bundle used in the state/sector CPI calculations; (3) the use of the Laspeyres index number formula to calculate domain (state and sector) specific indexes; and (4) the calculation of the non-food component of the poverty line. This fourth problem relates partly to the data used to calculate the (non-food) welfare aggregate and partly to the concept used to define the appropriate non-food share.

In general NBS (2005) and Appleton et al. use the same procedures to compute poverty. Thus NBS, and Appleton et al. in following NBS, use the same state/sector deflators (points (1) to (3) above and 'the [inverse] proportion of consumption expenditure dedicated to non-food items for those households whose standard of living measure corresponds to the food poverty line' to compute the non-food share.[31] As Appleton et al. correctly note, this approach roughly corresponds to the 'lower' poverty line in the World Bank's Cost of Basic Needs (CBN) method (Ravallion, 1994, 1998, World Bank, 2002).[32] Figure 3-1 provides a description of the lower and upper poverty lines of this

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to the national rural bundle of consumption can give a relevant deflator for the urban relative to the rural sector. These can then be used to compute state/sector poverty lines by chaining the state urban vs. national CPI and the national urban vs. rural CPI. These chained indexes can then be applied to a single national poverty line. Or, separate national urban and rural poverty lines can be determined and the state/rural and state/urban poverty lines derived by the relevant state vs. national CPIs. The relevance of these alternatives may lie in large differences in consumption patterns and needs between rural and urban households that make a unified system an implausible way of deriving comparative standards of living. Here we adopt a unified approach, although we feel that this needs to be explored in more detail in due course.

[31] The national poverty line may be derived using a non-food share, since the cost of basic needs (CBN) method of computing poverty lines generally entails this; but it is not clear why one would use a non-food share to compute deflators when an index can be computed from non-food items in the expenditure schedule for which there are retail prices. While the share of expenditure on non-food items for which there are retail prices is relatively small (small share of expenditure on all non-food items) it may be better to use these non-food item prices in the deflator rather than using only food items combined with non-food shares estimates.

[32] The upper poverty line adds to the food component the non-food expenditure of households whose food consumption corresponds to the food poverty line. Consequently it is usually significantly higher. Logically the upper poverty line appears to correspond better to the underlying rationale of these poverty lines in that they are based on the idea of the expenditure required to meet basic food and non food needs. Since the food component corresponds to the expenditure required to meet food requirements, it seems reasonable to argue that the non-food expenditure of households whose food expenditure just meets their food needs is the expenditure required to meet their non-food needs. This non-food expenditure exceeds that required for their basic needs if at the point where food basic needs are met the income elasticity of demand for food falls to zero. This is unlikely; hence a lower expenditure on non-food items as implied by the lower poverty

method; in general the so-called upper poverty line is more consistent with the underlying theory of consumer behaviour, and the lower CBN PL is justified in case some part of the non-food expenditure at the UPL is discretionary (Ravallion, 1998). The CBN method uses limited information on food items to compute food poverty lines (FPLs) and the inverse Engel share calculation of the non-food component uses no information on prices of non-food items.

In contrast to this practice I use two methods. My preferred method combines using information on budget shares of both food and non-food items computed from NLSS together with state/sector retail prices of as many items in these categories for which one has prices, to compute Tornqvist indexes covering all groups of items of consumption (food and non-food) relative to the all-Nigeria budget shares and population-weighted national average prices. The second method partially follows the World Bank CBN approach in computing FPLs for each state and sector and upper and lower poverty lines using the relevant non-food shares. Thus these methods differ in both the food and non-food components of the poverty line calculation from that used by NBS. While the use of both food and non-food price information is theoretically more appropriate, the limited availability of price information with which to compute the non-food CPIs required by the first method (we have prices for only a small share of non-food items), would warrant use of the CBN method(s) to triangulate with the first, imperfectly implementable, CPI method. Within the resources available to us we have not yet calculated the state/sector poverty lines by the CBN method.

3.3.1.1 Food bundles used to compute poverty lines in Nigeria

A second problem with NBS CPI calculations is the use of a single national food bundle; not only is this inappropriate when food consumption patterns differ greatly (Tarp et al., 2002), but the bundle actually used does not correspond well to any pattern actually observed in Nigeria. We do not use a fixed food bundle for all states and sectors since food consumption patterns vary greatly by region;[33] instead we use local food bundles (partially following the procedure of Tarp et al. (2002) but using as much food information as available). We also use democratic[34] budget shares for both food items and non-food shares of the bottom two quartiles.

Thus our preferred CPI for adjusting a national food poverty line to different state/sector domains uses the Tornqvist index number formula relative to the all-Nigeria food bundle and a non-food component based either on local (state/sector) shares of expenditure on non-food items of households whose food expenditure corresponds to the estimated food

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line calculation entails foregoing some basic food needs. The World Bank authors suggest computing both upper and lower poverty lines and poverty aggregates based on them. It is not clear why NBS does not use both concepts, but it can be noted that the upper poverty lines give rise to very high poverty estimates.

[33] The food bundle apparently used by NBS does not correspond to the consumption pattern of any state/sector domain, as shown below.

[34] Democratic budget shares are the average population-weighted household budget shares. Often, computed budget shares are plutocratic in that they are expenditure-weighted; these are calculated by summing expenditure on each item over all households and dividing by the total expenditure-weighted expenditure.

poverty line, or a non-food CPI using what non-food prices and expenditure patterns are available.

3.3.1.2 The welfare aggregate

Welfare can be assessed in different ways, including use of a money-metric concept of welfare. Money-metric welfare is a quantitative indicator of welfare that is expressed in monetary terms; the most common are income and expenditure (or consumption). There have not been many analyses of money-metric welfare in Nigeria apart from those produced by the NBS and its predecessor the FOS. Appleton et al. have produced a recent review of these measures (see also Bevan Collier and Gunning, 1999) and their own poverty profile[35] using the NLSS (2003/4). We focus on the NBS report of NLSS (2003/4) and Appleton et al's poverty profile. Some aspects of our welfare aggregate (value of consumption) are described in more detail in the Appendix.

The welfare aggregate used by NBS is based on computed household expenditure and is normalised on the number of adult equivalents, or on household size; these aggregates are then compared using deflators which reflect estimated differences in the COG.[36]

Given the unreliability of any calorie-based poverty line(s), we use our own calculation of a national CBN poverty line (NPL) of N27,036 per adult equivalent per year, rather than the national poverty line suggested by Appleton et al. of N28,084 per adult equivalent (FAO scale) per year.[37] We apply our domain deflators to our NPL to obtain poverty lines for each domain (state/sector/month) and compute poverty using our expenditure aggregate. Since neither NBS nor Appleton give sufficient details on the construction of their expenditure aggregates, we have used methods described in Mungai (2008), which we believe is broadly similar to that used by both NBS and Appleton et al. (see p17 of their Supplementary Materials), to guide our construction, specifically with regard to use values of durables and lumpy items purchased and imputed rent of housing. However, following Appleton et al. we have used the Section 10 estimates of health expenditures rather than those suggested by the World Bank,[38] although not for all the same reasons as Appleton, et al.. Our reasons are that Section 10 estimates are likely to

[35] A poverty profile is a statistical description of the characteristics of households characterised as poor.
[36] This is different to a COL deflator in that the latter reflects the cost of attaining an equivalent standard of living or level of welfare broadly understood, whereas the former reflects the cost of purchasing a given bundle of goods.
[37] Appleton et al. p 334 quote this as the per month expenditure poverty line, but this is a mistake (Appleton, personal communication, July 2008). NBS do not give the time units for their consumption aggregate or poverty line.
[38] The World Bank used Section 3 on health expenditures rather than the expenditures reported in Sections 10A1 & 10A2; the former results in significantly higher reported health expenditures than those reported in Section 10A1 & 2. It is not clear whether the extent to which the former suffer 'telescoping' effects is more of a misestimate than the extent to which the latter may suffer from 'memory lapse' (or lack of knowledge by the respondent) effects.

be more comparable with those given in other surveys such as the GHS (reason 4[39]) (see Appendix, p16).

Appleton et al. seem to compute an NPL using the 'lower CBN' method described by Ravallion (1998). In this method a national food poverty line is computed using the cost of a bundle of commonly consumed food items and non-food expenditure is estimated from the non-food expenditure level[40] of households whose total expenditure corresponds to the food poverty line. The food bundle is presumably that used by both sources in the food component of their COL deflators since quantities and calorie consumption can be computed for only these food items.

3.4 Problems with the official poverty lines

Valid welfare comparisons, including those using a poverty concept, and the assessment of gender dimensions of well-being require welfare concepts and poverty lines that lead to the identification of a household as poor to be consistent in different domains (state, sector, month), so that the characteristics of the domain and household that are at least in part to be used to explain its characterisation as poor can be assessed by the same yardstick. In this section we explore the welfare aggregates and poverty lines used to compute poverty profiles that can throw light on gender and poverty relationships. Appleton et al. have pointed to inconsistencies in the terminology of NBS poverty line construction. Here we explore further the ways in which NBS constructed its poverty lines and provide further criticism of both the NBS and the Appleton et al. poverty lines.

3.4.1 NBS poverty lines

NBS starts with what it terms an 'objective' poverty line which it also terms a 'food energy intake' method. The NBS method is not the same as that usually associated with this term, but is closer to the CBN approach promulgated by Ravallion and associates at the World Bank (e.g. Ravallion, 1998). Figure 3-1 provides a description of the CBN method. This involves computing household calorie consumption, the value of household food consumption and the value of total household consumption and then computing the total expenditure at which households meet their normative calorie requirements, which NBS put at 2900 calories per adult equivalent.

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[39] http://www.csae.ox.ac.uk/books/epopn/Appendixsupplementarymaterial.pdf. We find some of the reasons given in this document implausible: 1) annualising expenditures reported for a short reference period in which infrequently purchased items are reported, is as likely to underestimate as to overestimate expenditures, depending on the balance between errors of telescoping and memory lapse; 2) section 3 in the NLSS questionnaire seems to ask for health expenditures by the person apart from expenditures made by others. 3) the questionnaire does not specifically mention transport to medical facilities or for treatment, etc., this is as likely to have resulted in an under rather than an over count of these expenses, as the general transport questions do not attempt to itemise the purposes for which transport was purchased; 4) & 5) seem plausible enough unless one considers that if the methods used in other the surveys referred to are those used in Section 10 of NLSS they provide no independent corroboration that Section 3 of NLSS provides an over-estimate relative to the methods of Section 10.

[40] I cannot reconcile a discrepancy between the food poverty line given by NBS of N16,922 (the context implies per adult equivalent) in their appendix, N21,743 per adult equivalent in the text (p15) and N21,018 given by Appleton et al. No doubt the latter two estimates differ because of the different consumption aggregate calculated by the two sources, while the former two probably differ because they refer to per person and per adult equivalent respectively.

However, NBS takes a different route; it calculates the cost of a bundle of food items supposedly corresponding to the expenditure patterns of households in the lower quintiles of the household expenditure distribution. It adds to this cost the estimated non-food expenditure of households whose total expenditure per adult equivalent is 'around the core poverty line'; using the mean of expenditures of households whose expenditure is within the range N100 per adult equivalent above and below the total expenditure per adult equivalent which corresponds to the computed food expenditure required to provide 2900 calories per adult equivalent. This is what makes the definition similar to the lower CBN poverty line of the World Bank authors referred to above. The World Bank's upper poverty line adds the non-food expenditure of households whose food expenditure is equivalent to the food expenditure required to meet these normative calorie requirements (NBS does not use an upper poverty line).

It is nowhere reported what this food bundle is, but a data file provided by NBS to us contains such a bundle (Table 3-3). There are various other components of the calculation that are unclear to us which we do not detail here.

There are several reasons why such a calculation is problematic; these can be appreciated in part through the following attempted reconstruction of the NBS method. Basically, the NLSS lacks information on the *quantities* of foods purchased which can then be used to calculate calories consumed using calorie conversion tables for the foods consumed. Instead, these quantities seem to have been computed using local (state/sector) retail prices to divide the value of consumption on food items, giving the implied quantities. NBS does not publish the food conversion tables either. We attempted to replicate the NBS calculation by using the steps implied by the NBS method, and do indeed find a poverty line figure similar to that reported by NBS. We use the following steps:

1) Compute household food and non-food expenditures on all items of consumption identified in NLSS;
2) construct the state/sector/month deflators from the food and non-food deflators provided by NBS (note that these are not the same as those we constructed ourselves). We use food and non-food shares of households whose expenditure is within +/- N100 (per adult equivalent) of the undeflated expenditure of the 40th percentile household as weights;
3) deflate household expenditure by these state/sector/month specific CPI deflators;
4) merge household expenditure on individual food items with the prices from the CPI prices file (provided by NBS) by state, sector and month, with a file of food calorie contents (not provided by NBS, but constructed by ourselves);
5) compute the quantities purchased by dividing the expenditure on each item by the relevant price, and multiply this quantity by the relevant calorie content;
6) aggregate these estimates of calorie consumption to obtain calorie consumption for each household and divide by the number of adult equivalents to give calorie consumption per adult equivalent per day;
7) calculate the mean calorie consumption (per adult equivalent) and total expenditure on all food items, and scale this food expenditure to provide 2900 calories per adult equivalent per day. This is the food poverty line, which in our

case came to N20,532 per adult equivalent per household per year (NBS reports this as N21,743; these figures are quite sensitive to the household weighting procedure used).

8) calculate the mean non-food expenditure of households (+/- N100 pae) whose total expenditure corresponds to the food poverty line (N20,532 pae per year) household. In our case this came to N8712 per adult equivalent per year. Note that the upper poverty line using this calculation (e.g. adding the non-food expenditure of households whose food expenditure corresponds to the food poverty line (N20,640 per adult equivalent per year) would be 41,172 pae per year. This of course gives rise to even higher levels of (CBN) poverty

3.4.2 Consumer price indexes

We compute Tornqvist indexes using democratic average budget shares and retail commodity prices for each state/sector relative to the national level. That is, we compute:

$$T^t = \prod_i \left(\frac{p_{i,t}}{p_{0,t}} \right)^{\sigma^{s_i}} \text{ where } \sigma^{s_i} \text{ is } \frac{S_{i,t} + S_{i,0}}{2} \text{ and } S_{i,t} = \frac{p_{i,t} p_{i,t}}{\sum_i p_{i,t} q_{i,t}}$$

$$= \exp\left(\sum_{i=1,,n} \frac{w_{t,i} + w_{0,i}}{2} . \ln\left(\frac{p_{t,i}}{p_{0,i}} \right) \right)$$

where p_{ij} is the price of good i in location j at time t (t is each month from September 2003 to August 2004); w_{ij} is the expenditure share of good i in location j (at time t); p_{oj} and w_{oj} are the prices and expenditure shares of the base location. The base location *0* is the national average and location i is the state/region. Weights of items are democratic (the average of budget shares of each household computed with population weights); many CPI expenditure shares are plutocratic computed as the aggregate of household expenditure on each item divided by the aggregate of total household expenditure; i.e. the plutocratic share is:

$$W_i^P = \frac{1}{X} \sum\nolimits_n x^n s_i^n$$

Where X is the total of all household expenditures of households n; x^n is household n's total expenditure on good i and $s_n{}^i$ is household n's expenditure share on good i ($x_i{}^n/x^n$). The summation expression simplifies to $x_i{}^n$.

The democratic share is:

$$W_i^D = \frac{1}{N} \sum\nolimits_n \left(s_i^n \right)$$

Where N is the number of households (n) and $s_i{}^n$ is as above.

NBS uses a Laspeyres index, with common weights in all states and sectors; hence, in the NBS CPIs only the state/sector prices vary. This is likely to produce significant errors in the CPI calculations.

Furthermore, the indexes are computed for each month of the year because there was significant price inflation over the year. Hence households interviewed towards the end of the survey period experienced significantly higher prices than those at the beginning (see Figure 3-2).

3.4.3 Budget shares and retail prices

Table 3-2 gives the national budget shares of items in NLSS expenditure schedules and prices of items that can be matched between the NLSS and the NBS retail prices (Appendix Table 3-4 provides information on the individual items). The total shares of food and non-food items by sector show that while in the rural sector 64 per cent of all expenditure is constituted of items with national retail prices, only 52 per cent of expenditure in the urban sector has prices. Data for individual states shows considerable variation.

As Table 3-3 shows, the shares of items contained in the NBS bundle are quite different to those in our national bundle; in particular, the share of major cereals such as guinea corn, millet, maize, rice and yam in our calculations have a much smaller share of average national expenditure than in the NBS food bundle, while gari, white bean, vegetable oils and many other items have larger shares. We are not clear how NBS arrived at their budget shares, since they do not correspond to either democratic or plutocratic shares. There are similar discrepancies when we compute rural and urban national average expenditures.

It is also the case that the shares of expenditure on non-food items for which there are prices is much lower especially in urban areas than for food items.

Our national bundle is clearly a mix of the consumption patterns of northern and southern regions and does not correspond to actual expenditure patterns of either. When we compute budget shares for each zone we still do not obtain expenditure patterns which correspond to those of NBS. As **Table 3-5**shows, cereals are a significantly greater share of expenditure, especially in northern zones, but none come close to the shares involved in the NBS food bundles. Even when we compute expenditure shares by state some northern states show higher levels of expenditure shares on cereals, but again in none of the approaches to these calculations that I tried does the share of expenditure on guinea corn approximate the 22 per cent used by NBS in its poverty line calculation (details available from the author).

While expenditures on individual items in our calculations differ significantly from those used by NBS, our expenditure shares for food groups (cereals, staple roots, meat, etc.) are somewhat closer, although the rural and urban patterns still show significant differences; if individual items within these groups have differing seasonal price trends, the use of a single cereal to stand for all cereals would lead to errors, and similarly for other individual items representing other expenditure groups.

Table 3-6 compares our state/sector deflators for January 2004 with those reported by NBS; our deflators are less variable between states, as one would expect for a superlative index which allows for differing consumption expenditure patterns between domains. A feature that emerged from detailed inspection of the results is peculiarities in the consumption patterns of Kogi and Kwara states. In these states a very low share of

overall expenditure can be used in the CPI calculations. This is because for the lower pentiles in these states the major part of expenditure is on an item classified as millet flour; this is an item for which we do not have prices and hence is excluded from our calculations.

Map 1 compares our poverty deflators with those derived by NBS; note that the scales are all different, so comparisons should be made within each map rather than across them.

3.5 National poverty line

The national poverty line should be anchored in a welfare-relevant way; it should reflect the level of expenditure that corresponds to the minimum socially-acceptable standard of living. In many places this is derived from estimates of minimum food requirements calculated using nutritional norms for the population such as those proposed in FAO/WHO (1985). It is debatable whether this is a coherent approach or relevant to societies which in large part are not nutritionally constrained. However, it can be a starting point because, despite its problems, it commands considerable agreement. Further, both NBS and Appleton et al. use a lower CBN poverty line as the basis for their poverty lines. Both these sources use a common (national) FPL, which Appleton et al. draw from NBS; to this FPL an allowance for non-food expenditure is added. In calculating their non-food component NBS and Appleton differ in that the latter uses a lower estimate of health expenditure.[41] Since the basis of the NBS FPL is not explicit and because it is only made at a national level, we have made our own calculations of both a national FPL and zonal FPLs. Our FPLs are described next.

3.5.1 Food poverty lines

FPLs are computed by converting household food consumption into calories using a table of calories per food item and dividing by the computed number of adult equivalents in the household (using the FAO adult equivalents ratios), to give an estimate of calories per adult equivalent (per day) for each household. NBS does not provide a table of food item to calories conversion factors, so we used data from FAO (1968).[42] Nor does NBS provide a list of the quantities of different foods that it uses in computing its food poverty line. Nor does it indicate which food items are used and the proportion of each in their calculations. In principle we should use the patterns of food consumption reported in surveys such as NLSS. Since NLSS consumption data do not allow estimates of quantities of food items consumed we compute food quantities by dividing expenditure by retail prices; this limits us to the food items for which there are retail prices, which as noted above cover a variable proportion of food expenditure in different domains.

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[41] NBS uses the health expenditure from Schedule 3 (Health) while Appleton et al. use expenditures reported in Schedule 10A2. According to these authors the former give health expenditures significantly higher than those reported in similar surveys in other African countries, while the latter give significantly lower estimates of health expenditure (op cit. 333 and Appendixsupplementarymaterial.pdf available at http://www.csae.ox.ac.uk/books/epopn/default.htm. It is not clear from this evidence of course which is the more accurate estimate, but, a share of health expenditure of around 14% given by using Section 3 data does seem high, although no evidence is given to suggest why the 1.5% given by the Section 10A data might be considered appropriate.

[42] Food Composition Table for use in Africa:
http://www.fao.org/docrep/003/X6877E/X6877E00.htm#TOC

Having computed calorie consumption we estimate the food expenditure at which households just attain their normative calorie requirements (2900 cals per adult equivalent); this corresponds to point Z_fZ_f in Figure 3-1). We estimate (using a double log regression of food expenditure on calorie consumption) the per capita FPL as N19,061 per adult equivalent per year.[43] The NBS estimate is N21,743 per adult equivalent. After sorting households by their food expenditure per capita we identify the 100 households above and below the household whose food expenditure is closest to this FPL and estimate the median nonfood expenditure as N8,306 per capita per year (the mean was 15,375).[44] This gives our food energy intake (FEI) poverty line by this method of N27,367 per capita per year, compared to the NBS estimate of 30,128 (see Table 3-7) and the N28,087 per adult equivalent per year used by Appleton et al.

Adjusting this national poverty line by the state/sector deflators is one way to arrive at disaggregated poverty lines (or equivalently, using these deflators to adjust state/sector expenditures to account for regional cost of goods differences). Another way to compute poverty lines is to compute them directly for each domain. We do not proceed to this stage, partly because of doubts about the food consumption data for some states, though it may be worth pursuing as part of an exploration of the robustness of these types of poverty calculations.

Our deflators differ from those of NBS because of the different index number formula and different weights used. Map 1 depicts our and NBS' deflators.

3.5.2 Poverty

We calculate head count poverty (HCR) – the proportion of the population living in households whose expenditure is below the relevant poverty line. Because the welfare aggregate we have calculated differs from that used by NBS and Appleton et al.[45] and because we use different deflators to arrive at poverty lines and a different national poverty anchor, it is inevitable that the poverty counts for different domains computed by different authors will differ. Table 3-8 reports our calculations of HCR poverty by zone; our estimates are somewhat higher in the northern and South West zones than the others; this arises because our deflators reflect local patterns of consumption, in particular allowing the budget shares of common foodstuffs in the north to adjust to the food consumption patterns in each zone rather than using a common food basket. Table 3-9 and Table 3-10: Poverty and Inequality by Sector and Zone show the distributional statistics at national, sectoral and zonal levels; as one would expect, HCR poverty is lower in urban

[43] About 5% of households have unacceptably low food expenditures. It appears that it is a coincidence that the inclusion of extreme values in the regression of (log of) food expenditure on (log of) calorie consumption gives a 'reasonable' value; estimating the food energy intake (FEI) equation directly (i.e. log of total household expenditure on calorie consumption) gives a much higher value of the FEI poverty line..

[44] The data have some extreme values of both food and non-food expenditure. Just over 5 per cent of households are estimated to have expenditure per adult equivalent of less than N200 and about the same number have less than N500 per capita; these are unrealistically low. Appleton et al. impute food expenditure for 285 households with no reported food expenditure (without giving details of the imputation); we do not follow this procedure and prefer to use robust statistics such as the median in this case.

[45] We have followed Appleton et al. in using the health expenditure from Section 10A. This lowers total expenditure, but in poverty calculations it is offset by a corresponding reduction in poverty lines.

areas and both the proportion of the population that is poor and the total number of poor are much higher in rural areas in all zones. Also, not only are the headcount levels of poverty somewhat smaller in the southern zones, but inequality among the poor as measured by the poverty gap (PG) or poverty gap squared (PG2) is also much less than in northern zones. This inequality is only partially reflected in the Gini coefficients for the population as a whole.

Figure 3-3 displays cumulative distribution below poverty lines.

3.5.3 Gender and poverty

Female-headed households manifest rather lower levels of poverty in all zones except North Central; also, there are rather fewer females among the poor and a lower proportion of females are poor in all zones except the South East, where a slightly larger number of females are among the poor (Table 3-11 & Table 11).

However, this may partly be a consequence of the smaller average size of female-headed households and the difficulties of taking account of household composition and household economies of scale. A now commonly-used alternative approach to adult equivalence scales, following Barten (1964), is to adjust simultaneously for household composition and size using an approximation such as:

$$ye = \left(N_a + N_c \right)^{\phi}$$

Where *ye* is equivalence of a nominal person, N_a and N_c are the numbers of adults and children respectively and □ and □ are parameters, using 0.74 for □ and 0.8 for □ (arbitrary but not uncommon values) to calculate equivalent consumption did not produce a significant change in the conclusion that female-headed household were less poor and less represented among the poor on the whole than male-headed households.

Doubts about this evidence that female-headed households are less poor is found by Appleton et al., who suggest there are 'subtle relations between welfare and gender' (p51); unfortunately, although using the same data set (NLSS, 2003/4) we find that the results of these authors are not very robust to alternative specifications. We turn to their approach using human capital regressions in the next section.

3.6 Poverty profile

A poverty profile (correlates of poverty) provides some insight into the likely relationships between gender and growth. NBS (2005) and Appleton et al. have provided poverty profiles given their estimates of consumption.

Given our different welfare estimator (although we follow the same procedure we do not come to exactly the same average figures) and different deflators to adjust for cost of living differences, it is likely that our results will differ slightly from those of these other sources. However, the differences in methods of calculation are unlikely to be so large as to lead to large differences in poverty profiles or determinants of welfare. Rather, we warn that these types of estimate are not robust even with quite small differences in calculations and specifications; this warns against drawing strong conclusions without corroborating evidence. A piece of evidence in support of this caution lies in our re-estimation of the poverty profiles reported in Appleton et al. One issue concerns the

social capital variables computed as the average of values of scales of other households in the same survey cluster. Since the NLSS is a stratified clustered survey, significance levels should take account of the clustering of households (which often entails similarity of values within clusters and requires adjustments to the standard errors of coefficient estimates). It is not clear whether Appleton et al use these adjustments in reporting the significance levels of their estimates. We report our approximation to these estimates in Table 3-14, which compares regression with and without taking account of clustering. Looking at the social capital variables, we see firstly that rather few appear statistically significant apart from the community program, conflict and crime variables. Of the other variables, we note also that there is no clear pattern to the few that are significant, and closer inspection of Appleton et al. supports this view. If there were to be a significant relationship between a social capital variable and welfare, one would expect (a) that several of the levels of each variable would be significant, and (b) that the coefficients would manifest a gradation so that clusters reporting more of a variable would have a larger (or smaller) coefficient. It is possible that there is a non-linear relationship (as suggested by Appleton et al. for the 'trust' variable (p353), but this is seems unlikely and we note that the interpretation of the coefficients reported there (p347) seems rather stretched. We drop the Likert scale variables in further analysis.

Moreover, we can note that when clustering is allowed from (columns 2, 4 & 6) significance levels of community participation, conflict and crime fall, and some become statistically insignificant. The reason for this is that the values of these variables (the likelihood of engaging in a community programme, experiencing conflict or crime) are correlated within the cluster. Two other variables that can be used in social capital regressions, membership of associations and churches, can be computed from NLSS. A household reporting no membership of any association has a significant negative effect on household welfare, an effect which is nearly significant ($p = 0.069$) when the regression is cluster-adjusted.

In Table 3-16 & Table 16 we see in model 1 the standard regressions of welfare on household education variables; as expected the coefficients household head's education are positive and increasing with levels of education. Even when we add the education of the household head's spouse[46] the education of the household head remains of the same order of size and statistical significance (model 2). Similarly, the education of the household head remains significant in the Tobit regression with truncation at the (local) poverty line, as also in the Logit regression (model 4). Models with spouse's education have a similar effect to the comparison of models 1 & 2. Koranic education of the household head or spouse does not appear as a significant determinant of wealth or poverty.

Table 3-17 shows the relative sizes of the coefficients of education levels of the household head and spouse. For male household heads the relative size of their and their spouses' education coefficients are broadly similar, but for female-headed households the

[46] For household heads with more than one wife we take the maximum level of education among the wives. A significant number of household heads are reported as having no spouse living in the household; it is assumed that in these households the spouse has no education. If any wife receives Koranic education the household head is reported as having a spouse with Koranic education.

coefficients of secondary and higher education are rather larger than for their male counterparts. The coefficients of the (male) spouses of female-headed households are rather ambiguous – however, the education details of most spouses of female-headed households (88 per cent) are missing in the data (replaced with a presumptive zero).

3.7 Poverty tables

Table 3-1: Estimated Annual Zonal Deflator Inflation Rates

Zone	Rural	Urban
SS	9.5	8.5
SE	10.9	6.9
SW	13.5	16.2
NC	14.4	14.7
NE	18.8	14.9
NW	14.1	10.0
FCT	7.3	6.1

Source: author's calculations explained in the text.

Table 3-2: National Total Budget Expenditure Shares

	All items		Items with prices	
	Rural	Urban	Rural	Urban
Food	58.05	50.05	43.93	37.22
Non-food	41.95	49.95	20.55	15.66
Total	100	100	64.48	52.88

Source: Author's calculations explained in the text
Note: Democratic budget shares of the lowest two pentiles of the expenditure distribution of NLSS, 2003/4

Table 3-3: Item National Food Shares (NBS)

	Food Share			Food share	
Item	NBS	This study	item	NBS	This Study
Guinea corn	22.531	3.01	Chicken	0.739	0.24
Millet	15.077	2.59	Guinea fowl	0.004	0.03
Maize (white)	9.490	2.13	Agric eggs	0.086	0.35
Maize (yellow)	1.116	0.35	Fresh milk	0.259	1.47
Rice (local)	4.129	2.81	Milk powder	0.246	0.75
Rice (agric)	0.243	1.07	Baby milk	0.012	0.07
Rice (imported)	1.092	1.61	Smoked fish	0.277	0.42
Bread	0.628	3.72	Fish fresh	0.895	1.49
Buns	0.241	3.67	Fish frozen	1.038	2.03
Biscuits	0.025	2.09	Dried fish	0.979	3.11
Yam flour	0.400	0.25	Fried fish	0.195	0.70
Cassava flour	1.385	0.48	Beef (fresh)	1.404	2.79
Cassava	2.550	1.41	Fresh mutton	0.103	0.55
Cocoyam	1.184	0.79	Other meat	0.425	1.35
Plantain	0.732	0.94	Garden egg	0.163	0.43
Yam	9.712	4.36	Okro fresh	2.604	3.34
Sweet potato	0.393	0.10	Okro dry	0.064	1.45
Gari (white)	1.504	5.28	Onion/shallot	0.553	5.24
Gari (yellow)	1.239	1.18	Pepper	1.044	0.54
Brown bean	0.085	0.60	Tomato	0.821	4.28
White bean	0.529	3.16	Other veg/not can	1.947	2.87
Kola nut	0.057	1.66	Coffee	0.007	0.12
Groundnut oil	0.423	2.88	Tea	0.076	0.98
Red palm oil	1.233	5.62	Honey	0.057	1.23
Vegetable oil	0.036	0.31	Malt drinks	0.166	0.35
Banana	0.201	0.71	Minerals	0.089	0.73
Orange	0.124	1.03	Beer (local & imp)	0.424	0.25
Fruit juice	0.015	0.02			

Source: Author's calculations from NLSS
Notes: % items for which there are retail prices
Some minor items omitted so sums do not come to 100%

Table 3-4: National Average Budget Shares and Prices

	national								
	urban		rural			urban		rural	
Item (food)	Avbs*	Price (N)	Avbs*	Price (N)	Item (non-food)	Avbs*	Price (N)	Avbs*	Price (N)
Guinea corn	0.572	27.91	1.809	32.27	Cotton	0.201	147.81	0.269	174.76
Millet	0.602	34.53	1.469	35.5	Silk	0.026	118.51	0.063	98.08
Maize (white)	0.802	35.22	0.968	32.29	Handloom (*aso_oke*)	0.039	.	0.017	.
Maize (yellow)	0.095	35.03	0.189	32.24	Ankara	0.652	864.51	0.883	785.29
Rice (local)	0.782	63.61	1.492	63.73	Polyester material	0.169	168.46	0.252	184.94
Rice (agric)	0.484	76.14	0.424	70.93	Wool	0.019	322.91	0.040	266.45
Rice (imported)	0.724	92.5	0.640	91.48	Other clothing material	0.405	.	0.522	.
Maize flour	0.278	.	0.168	.	Men's tailoring	0.627	407.35	0.865	448.39
Bread	1.379	64.54	1.703	63.73	Women's tailoring	0.754	288.14	1.005	229.76
Buns	2.425	81.87	0.844	89.36	Boys' tailoring	0.502	227.99	0.663	236.16
Biscuits	1.312	89.59	0.533	87.09	Girls' tailoring	0.427	191.97	0.518	172.53
Yam Flour	0.148	47.49	0.073	63.2	Suits	0.016	3011.01	0.009	4248.38
Cassava flour	0.175	47.49	0.225	63.2	Other ready-made clothing	0.130	.	0.178	.
Plantain flour	0.009	.	0.018	.	Hand-woven cloth	0.006	.	0.027	.
Wheat flour	0.051	.	0.038	.	Blouses, shirts	0.234	571.94	0.296	626.36
Corn flour	0.091	.	0.109	.	Frocks (women)	0.042	1442.29	0.030	1713.17
Cassava	0.228	38.24	0.877	34.94	Boys' dress	0.292	311.8	0.332	292.45
Cocoyam	0.204	48.27	0.430	45.85	Mens' dress	0.135	1239.7	0.169	1295.67
Plantain	0.346	86.1	0.434	86.2	Girls' dress	0.266	1151.16	0.284	1365.77
Yam	2.058	53.78	1.650	45.94	Umbrella	0.170	395.68	0.212	405.76
Other root/tubers	0.902	34.55	0.332	34.77	Men's raincoat	0.004	.	0.014	.
Fufu	0.253	.	0.177	.	Women'sraincoat	0.003	.	0.005	.
Gari (white)	3.115	43.86	1.509	41.08	Boys' raincoat	0.000	.	0.002	.
Gari (yellow)	0.385	49.32	0.585	47.69	Girls' raincoat	0.035	.	0.037	.
Cassava (*akpu*)	0.068	.	0.119	.	Other clothing	0.013	.	0.024	.
Other starchy products	0.228	.	0.188	.	Shoes leather	0.476	1659.67	0.440	1801.54
Brown bean	0.342	59.19	0.182	63.38	Sandals leather	0.322	1339.75	0.332	1511.95
White bean	1.143	53.02	1.470	51.88	Shoes canvas	0.120	775.74	0.112	679.93
Suya bean	0.065	.	0.066	.	Sandals rubber	0.475	183.58	0.665	173.76
Moimoi	0.570	.	0.560	.	Other footwear	0.490	.	0.799	.
Akara	1.464	.	1.561	.	Mortgage charges	0.003	.	0.001	.
Groundnut	0.375	.	0.509	.	Other housing charges	0.107	.	0.035	.
Other pulses	0.141	.	0.197	.	Refuse collection	0.104	.	0.002	.
Kulikuli	0.394	.	0.822	.	Glass/tableware	0.031	.	0.028	.
Dawadawa	1.161	.	2.076	.	Cutlery & others	0.015	.	0.027	.
Kola nut	0.436	54.49	0.904	56.57	Pots, pans, pestle & mortar	0.095	.	0.169	.
Palm nut	0.079	.	0.131	.	Other household utensils	0.050	.	0.063	.
Cashew nut	0.023	.	0.057	.	Domestic staff wages	0.001	.	0.002	.
Other oil seeds and nuts	0.253	.	0.400	.	Therapeutic equipment	0.003	.	0.006	.
Animal fats	0.061	.	0.093	.	Doctor, consultant fees	0.226	183.57	0.163	250.96
Coconut oil	0.032	.	0.060	.	Dentist fees	0.007	.	0.004	.
Groundnut oil	1.057	201.15	1.328	197.43	Nurses, midwives	0.022	.	0.041	.
Palm kernel oil	0.131	.	0.149	.	Native doctors	0.061	.	0.117	.

Table 3-4: National Average Budget Shares and Prices

	national								
	urban		rural			urban		rural	
Item (food)	Avbs*	Price (N)	Avbs*	Price (N)	Item (non-food)	Avbs*	Price (N)	Avbs*	Price (N)
Red palm oil	1.786	162.99	2.806	162.96	Other practitioners	0.022	.	0.018	.
Shea butter	0.024	.	0.042	.	Hospital fees	0.028	150.93	0.054	170.92
Margarine	0.048	.	0.051	.	Other medical services	0.244	.	0.289	.
Vegetable oil	0.139	201.15	0.126	197.43	Tyres	0.040	.	0.100	.
Avocado pear	0.042	.	0.042	.	Battery	0.126	.	0.276	.
Banana	0.251	71.23	0.338	87.09	Radio, wireless	0.187	.	0.222	.
Mango	0.150	.	0.178	.	TV set, video	0.040	.	0.004	.
Pineapple	0.130	.	0.073	.	Other (phonogram)	0.000	.	0.003	.
Pineapple juice	0.017	.	0.011	.	Camera & others	0.000	.	0.002	.
Orange	0.438	45.39	0.431	42.26	Sports equipment	0.002	.	0.009	.
Orange juice	0.019	.	0.015	.	Batteries (small radio)	0.224	.	0.294	.
Other fruit (not canned)	0.089	.	0.101	.	Musical instrument	0.002	.	0.004	.
Fruit canned	0.023	.	0.012	.	Jewellery, rings	0.110	.	0.096	.
Fruit juice	0.016	144.94	0.005	156.88	Other sporting goods	0.000	.	0.010	.
Chicken	0.077	365.61	0.118	397.5	Water rates	0.386	.	0.126	.
Duck	0.005	.	0.006	.	Gas for cooking	0.010	.	0.027	.
Guinea fowl	0.006	388.52	0.018	426.23	Kerosene	2.032	71.1	3.323	61.92
Other poultry	0.013	.	0.008	.	Charcoal	0.024	21.18	0.020	18.2
Agric eggs	0.197	17.04	0.111	16.9	Firewood	1.033	12.11	1.199	15.3
Local eggs	0.041	.	0.049	.	Repairs to clothes	0.135	.	0.214	.
Other eggs (not chicken)	0.003	.	0.002	.	Repairs to footwear	0.183	216.47	0.199	244.11
Fresh milk	0.359	65.3	0.819	80.8	Repairs to furniture	0.004	.	0.011	.
Milk powder	0.369	307.84	0.272	299.44	Repairs to fittings	0.022	.	0.017	.
Baby milk	0.036	438.79	0.025	458.91	Washing powder	1.906	65.6	3.144	63.69
Milk tinned	0.252	.	0.201	.	Insecticides	0.179	189.26	0.097	193.58
Other milk products	0.068	.	0.116	.	Matches	1.602	3.9	2.459	3.93
Smoked fish	0.168	339.03	0.185	424.5	Toilet paper	0.198	30.27	0.163	30.13
Crabs/lobsters	0.247	.	0.413	.	Light globe/bulbs	0.153	37.89	0.088	36.97
Fish fresh	0.528	202.24	0.703	196	Candles	0.238	68.02	0.239	60
Fish frozen	0.779	166.36	0.909	182.21	Non-durable goods	0.233	.	0.287	.
Dried fish	0.832	339.03	1.678	424.5	Household services	0.209	.	0.287	.
Fried fish	0.252	339.03	0.328	424.5	Painkillers	0.306	.	0.483	.
Snails	0.037	.	0.071	.	Antibiotics	0.063	71.83	0.095	56.97
Beef (fresh)	1.129	283.84	1.202	321.79	Anti-malaria medicines	0.163	.	0.298	.
Fresh mutton	0.139	223.02	0.302	308.36	Other med & pharmaceutical	0.115	.	0.159	.
Pork	0.037	.	0.059	.	Medical services	0.052	.	0.074	.
Corned beef	0.021	.	0.020	.	Spares & tools	0.006	.	0.018	.
Bush meat	0.080	.	0.183	.	Petrol	0.051	38.91	0.033	34
Other meat	0.351	251.8	0.738	287.26	Oil, grease, etc	0.038	266.23	0.037	226.72
Cocoyam leaf	0.096	.	0.119	.	Interstate bus	0.124	272.4	0.178	275.18
Garden eggs	0.142	53.04	0.212	55.2	City bus fares	0.637	33.54	0.406	24.47
Okro fresh	1.199	68.05	1.558	72.64	Other (rail, air)	0.019	.	0.026	.
Okro dry	0.497	88.09	0.692	122.6	Postal charges	0.006	20.02	0.015	20

Table 3-4: National Average Budget Shares and Prices

	national								
	urban		rural			urban		rural	
Item (food)	Avbs*	Price (N)	Avbs*	Price (N)	Item (non-food)	Avbs*	Price (N)	Avbs*	Price (N)
Onions/shallot	1.714	59.68	2.583	63.78	Telegrams, telephone, fax	0.029	48.41	0.016	41.35
Pepper green	1.829	181.93	2.472	141.02	Recreational goods	0.017	.	0.018	.
Tomato	1.686	73.49	1.884	83.03	Cinema, video house	0.004	36.71	0.007	89.2
Other vegetables (not canned)	1.015	100.14	1.349	139.59	Video cassette hire	0.012	.	0.009	.
Tomato puree	0.261	.	0.340	.	Gambling, lotto	0.002	.	0.005	.
Other canned vegetables	0.099	.	0.163	.	Others including concerts	0.007	.	0.015	.
Coffee	0.058	140.28	0.047	137.74	Newspapers	0.034	59.59	0.021	60.72
Chocolate drinks	0.115	.	0.093	.	Books, magazines, etc	0.159	147.66	0.200	142.86
Tea	0.413	66.23	0.414	64.98	Educational cost	0.127	.	0.081	.
Other foods (not beverage)	0.198	.	0.249	.	Tuition & board	0.037	3665.11	0.030	6960.64
Cooked rice/stew	0.294	.	0.189	.	Licenses	0.003	1017.04	0.014	1111.69
Fufu and soup	0.081	.	0.057	.	Insurance	0.002	.	0.010	.
Tuwo and soup	0.151	.	0.212	.	Services of barber/beauty shops	0.216	35.55	0.185	37.99
Amala and soup	0.097	.	0.017	.	Personal care goods	0.394	129.98	0.475	166.76
Garri and soup	0.087	.	0.050	.	Writing & drawing	0.059	16.11	0.088	15.66
Pound yam/soup	0.048	.	0.013	.	Expenditure in hotels	0.011	1192.47	0.012	1319.86
Other hotel/restaurant meals	0.072	.	0.076	.	Financial services	0.118	.	0.095	.
Jams	0.032	.	0.051	.	Other services	0.314	.	0.233	.
Honey	0.406	338.83	0.604	377.02	Not known	0.017	.	0.013	.
Confectionery	0.049	.	0.048	.	Light	0.025	.	0.041	.
Ice cream/lolly	0.030	.	0.026	.	Refuse	0.014	.	0.032	.
Other food items	0.641	.	1.058	.	Water	4.590	.	0.843	.
Malt drinks	0.142	59.15	0.152	53.78	Employer's payment for transport	0.072	.	0.036	.
Minerals	0.321	30.65	0.299	30.33	Tobacco	0.063	135.68	0.157	126.98
Beer (local/imported)	0.084	99.27	0.119	102.28	Other	0.078	.	0.055	.
Stout (local/imported)	0.028	156.42	0.024	154.39	Education tuition	2.650	.	1.255	.
Palm wine	0.057	58.63	0.168	58.19	Education books	2.866	.	1.582	.
Pitto	0.022	.	0.081	.	Education uniforms	2.681	.	1.511	.
Apeteshi/spirit	0.022	123.2	0.086	137.48	Education extra-curricular	1.450	.	0.592	.
Gin	0.032	268.3	0.058	290.94	Education food & boarding	0.973	.	0.201	.
Other wine (local/imported)	0.008	322.66	0.026	282.55	Education transport	1.203	.	0.282	.
Other alcoholic beverage	0.013	.	0.022	.	Education other	1.988	.	1.152	.
Sorghum	0.003	.	0.016	.	Imputed rent	9.174	.	6.043	.
Millet flour	2.902	.	1.126	.	Use value of large investments	1.579	.	1.760	.
Other grains	0.014	.	0.046	.	Non-electric small appliances	0.000	.	0.002	.
Other flour	0.000	.	0.009	.	Electric small appliances	0.047	.	0.054	.
Sweet potato	0.002	.	0.074	.					
Bambara bean	0.024	.	0.108	.					
Cow pea	0.326	.	0.142	.					
Coconut	0.004	.	0.033	.					
Other nuts	0.001	.	0.045	.					
Water melon	0.008	.	0.055	.					
Pawpaw	0.027	.	0.070	.					

Table 3-4: National Average Budget Shares and Prices

	national								
	urban		rural			urban		rural	
Item (food)	Avbs*	Price (N)	Avbs*	Price (N)	Item (non-food)	Avbs*	Price (N)	Avbs*	Price (N)
Pepper	0.052	.	0.361	.					
Cabbage or lettuce	0.002	.	0.014	.					
Game birds	0.000	.	0.000	.					
Goat	0.012	.	0.004	.					
140 (no description given)	0.001	.	0.001	.					
Total	50.05		58.05			49.95		41.95	
Share with price	37.22		43.93			15.66		20.55	

Source: Author's calculation from NLSS 2003/4
Note: * Democratic average budget share of total expenditure

Table 3-5: Share of Expenditure on Food Items for which there are Retail Prices

	South South		South East		South West		North Central		North East		North West	
item	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Guinea corn	0.03	0.03	0.08	0.06	0.05	0.08	0.08	3.13	0.80	5.55	1.81	7.58
Millet	0.11	0.12	0.27	0.14	0.13	0.13	0.03	1.35	0.19	3.97	3.16	7.01
Maize (white)	0.69	0.73	0.38	1.15	0.40	1.81	0.55	2.29	0.75	2.83	2.20	2.24
Maize (yellow)	0.13	0.14	0.27	0.56	0.36	0.20	0.09	0.53	0.19	0.30	0.11	0.37
Rice (local)	1.72	1.82	0.53	2.34	1.54	0.75	0.32	2.64	0.33	2.86	3.17	4.38
Rice (agric)	1.72	1.81	1.23	0.69	0.63	3.20	0.92	0.20	0.03	0.45	1.20	0.23
Rice (imported)	2.14	2.25	2.50	2.08	1.70	3.95	1.19	0.39	0.62	0.44	0.63	0.29
Bread	3.69	3.89	4.13	3.72	3.34	5.24	2.08	2.19	0.91	3.33	2.74	2.56
Buns	0.29	0.30	0.21	0.67	0.61	1.70	9.02	9.51	10.67	0.30	0.23	0.29
Biscuits	0.87	0.91	0.94	0.74	1.18	1.07	4.89	3.82	3.71	0.44	0.34	0.32
Yam flour	0.06	0.06	0.04	0.02	0.14	1.47	0.59	0.26	0.02	0.05	0.09	0.01
Cassava flour	0.24	0.25	0.06	0.57	0.25	1.93	0.56	0.65	0.09	0.22	0.38	0.17
Cassava	1.89	1.99	0.74	2.69	0.53	0.75	0.12	0.89	0.16	1.37	0.62	1.53
Cocoyam	1.11	1.17	0.54	2.14	1.25	0.79	0.24	0.26	0.04	0.52	0.52	0.19
Plantain	2.53	2.66	2.48	1.33	1.71	1.02	0.37	0.04	0.01	0.05	0.04	0.02
Yam	3.80	4.01	3.73	4.13	3.17	5.69	5.32	6.82	4.96	1.45	1.88	0.69
Sweet potato	0.06	0.07	0.00	0.28	0.03	0.00	0.00	0.31	0.00	0.10	0.00	0.06
Gari (white)	2.07	2.18	1.40	2.65	2.04	8.30	11.42	8.92	10.70	0.46	0.26	1.14
Gari (yellow)	2.92	3.07	2.63	1.82	1.79	0.38	0.16	0.11	0.31	0.30	0.19	0.42
Brown bean	0.26	0.28	0.31	0.54	0.76	2.20	0.98	0.08	0.06	0.24	1.41	0.10
White bean	4.51	4.74	3.42	4.25	2.95	5.37	1.38	1.38	0.34	1.27	2.18	1.63
Kola nut	0.62	0.65	0.42	0.80	0.21	0.33	0.13	0.84	0.26	3.35	2.63	2.83
Groundnut oil	2.07	2.18	2.40	1.32	1.98	0.31	0.17	0.90	0.40	3.97	4.09	3.98
Red Palm oil	5.07	5.34	4.15	4.02	3.16	6.91	2.49	4.54	0.96	5.19	2.87	6.41
Vegetable oil	0.28	0.30	0.29	0.28	0.33	0.23	0.21	0.15	0.03	0.27	0.62	0.21
Banana	1.06	1.12	0.87	1.05	1.26	0.37	0.27	0.38	0.09	0.62	0.83	0.24
Orange	0.41	0.43	0.36	0.78	1.50	0.32	0.42	1.28	1.09	1.20	1.87	0.79

Table 3-5: Share of Expenditure on Food Items for which there are Retail Prices

	South South		South East		South West		North Central		North East		North West	
item	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Fruit juice	0.02	0.02	0.01	0.02	0.15	0.00	0.01	0.00	0.00	0.01	0.03	0.00
Chicken	0.13	0.14	0.18	0.30	0.38	0.07	0.05	0.21	0.02	0.30	0.30	0.22
Guinea fowl	0.01	0.01	0.00	0.00	0.02	0.01	0.02	0.20	0.00	0.01	0.02	0.01
Agric eggs	0.63	0.66	1.04	0.24	0.87	0.49	0.27	0.03	0.03	0.01	0.10	0.04
Fresh milk	0.45	0.48	0.26	0.33	0.33	0.10	0.06	0.74	0.76	1.11	1.08	4.12
Milk powder	0.83	0.88	0.79	1.32	2.13	0.53	0.31	0.31	0.25	0.07	0.86	0.12
Baby milk	0.03	0.03	0.13	0.16	0.12	0.07	0.07	0.01	0.00	0.02	0.13	0.02
Smoked fish	0.57	0.60	0.32	0.68	0.93	0.81	0.30	0.19	0.30	0.12	0.38	0.09
Fish fresh	2.07	2.18	1.64	1.11	0.71	2.68	0.86	0.79	0.10	1.08	1.18	1.06
Fish frozen	2.82	2.97	2.14	3.79	2.83	4.79	1.96	0.66	0.23	0.35	0.15	0.27
Dried fish	3.08	3.25	2.44	3.84	2.75	2.35	0.64	4.04	0.85	4.82	3.33	1.57
Fried fish	0.38	0.40	0.41	0.75	0.39	0.59	0.31	0.53	0.08	0.58	0.80	0.78
Beef (fresh cattle)	2.35	2.47	2.27	2.18	2.22	2.33	1.01	1.95	0.87	3.53	4.06	1.66
Fresh mutton	0.07	0.07	0.07	0.19	0.21	0.13	0.07	0.25	0.04	1.07	0.44	1.14
Other meat	0.91	0.96	0.70	0.94	0.79	2.17	0.67	0.76	0.10	1.32	0.68	2.25
Garden eggs=	0.31	0.33	0.55	0.91	0.64	0.49	0.14	0.30	0.07	0.46	0.48	0.12
Okro fresh	3.50	3.69	2.82	3.03	2.48	3.72	1.52	3.04	0.91	3.15	2.68	2.13
Okro dry	0.48	0.51	0.57	0.68	0.52	0.73	0.24	1.13	0.37	1.89	2.57	2.18
Onion/Shallot	5.04	5.31	3.53	4.30	3.40	6.37	2.14	4.08	0.81	6.15	4.53	4.52
Pepper	0.59	0.62	0.24	1.23	0.21	0.55	0.04	1.34	0.05	0.23	0.04	0.31
Tomato	2.77	2.91	2.57	3.97	3.13	6.31	2.27	1.75	0.50	3.82	4.05	4.04
Other vegetables (not canned)	2.47	2.60	2.05	2.87	2.75	3.42	1.50	2.52	0.58	2.93	3.17	2.08
Coffee	0.12	0.12	0.23	0.18	0.34	0.26	0.08	0.04	0.02	0.04	0.06	0.02
Tea	1.04	1.10	1.05	1.76	2.15	0.64	0.42	0.35	0.06	0.62	1.19	0.27
Honey	0.55	0.58	0.80	0.92	0.75	0.42	0.35	1.56	0.48	1.73	1.86	1.32
Malt drinks	0.59	0.62	0.93	0.81	1.06	0.14	0.07	0.07	0.00	0.02	0.15	0.01
Minerals	1.30	1.37	1.66	1.18	1.36	0.70	0.51	0.19	0.08	0.11	0.19	0.02
Beer (local/imported)	0.32	0.34	0.43	0.43	0.42	0.13	0.07	0.39	0.04	0.18	0.28	0.00
Total	73.798	77.701	64.216	78.912	67.033	95.523	59.970	81.299	45.295	76.789	70.870	76.074

Source: author's calculations explained int eh text.

Table 3-6: Poverty Line Deflators by Index, Sector and State

	Rural			Urban		
state	avbs	Tornqvist	NBS	avbs	Tornqvist	NBS
Abia	0.66	0.95	1.18	0.58	1.03	1.17
Adamawa	0.59	0.87	1.21	0.52	0.93	1.11
Akwa Ibom	0.54	1.09	1.15	0.42	1.00	1.12
Anambra	0.57	1.05	1.16	0.55	1.03	1.24
Bauchi	0.55	0.82	1.10	0.55	0.95	1.06
Bayelsa	0.61	1.20	1.37	0.59	1.10	1.27
Benue	0.57	0.88	0.94	0.55	0.89	0.83
Borno	0.54	0.87	0.99	0.58	0.88	1.09
Cross-rivers	0.57	1.09	1.10	0.56	1.04	1.07
Delta	0.55	1.12	1.42	0.57	1.05	1.26
Ebonyi	0.57	0.95	1.10	0.57	0.91	0.97
Edo	0.54	0.99	1.10	0.56	0.98	1.27
Ekiti	0.59	0.99	0.84	0.55	0.98	0.92
Enugu	0.59	0.91	1.23	0.56	1.01	0.99
FCT	0.57	1.02	1.68	0.62	1.09	1.75
Gombe	0.55	0.87	0.89	0.43	0.89	1.11
Imo	0.55	1.06	1.16	0.53	1.15	1.04
Jigawa	0.54	0.77	0.89	0.44	0.79	0.84
Kaduna	0.6	0.88	1.03	0.56	0.93	0.91
Kano	0.56	0.76	1.06	0.55	0.81	0.95
Katsina	0.53	0.89	0.99	0.47	0.87	0.96
Kebbi	0.59	0.78	1.14	0.61	0.88	1.09
Kogi	0.22	0.85	1.72	0.19	1.01	0.88
Kwara	0.2	0.98	0.82	0.25	0.73	0.82
Lagos	0.24	0.80	1.08	0.27	0.98	1.31
Nassarawa	0.58	0.95	0.94	0.6	0.85	1.05
Niger	0.59	0.94	1.03	0.55	0.84	0.97
Ogun	0.63	1.01	0.89	0.58	0.92	1.02
Ondo	0.64	0.94	1.00	0.62	0.90	0.78
Osun	0.56	0.91	0.91	0.53	0.86	0.84
Oyo	0.56	0.97	0.94	0.54	0.87	1.01
Plateau	0.55	0.81	1.06	0.54	0.95	0.92
Rivers	0.57	1.09	1.68	0.54	1.13	1.19
Sokoto	0.56	0.80	0.94	0.54	0.91	0.99
Taraba	0.52	0.79	1.13	0.57	0.88	0.95
Yobe	0.55	0.80	1.14	0.57	0.93	1.18
Zanfara	0.52	0.94	1.03	0.54	0.89	0.97
Total	0.54	0.93	1.11	0.52	0.94	1.05
min	0.2	0.76	0.82	0.19	0.73	0.78
max	0.66	1.2	1.72	0.62	1.15	1.75

Source: author's calculations explained in the text

Table 3-7: National Food Energy Intake Poverty Lines

	NBS	Authors
Food poverty line	21743	19061
Non-food component	8385	8306*
Total (FEI Poverty Line)	30128	27367

Source: author's calcualtions

Note: * Median value

Table 3-8: Numbers and Proportions of Poor in Nigeria by Zone

	This study					NBS (HCR)			Appleton et al.
Zone	Number of poor	Proportion (HCR)	se	95% ci		CBN	$1 per day ppp	23,733 N apaee	CBN
South South	6838074	0.410	0.016	0.379	0.441	0.511	0.476	0.351	0.350
South East	4258411	0.284	0.014	0.257	0.312	0.342	0.312	0.267	0.267
South West	11405558	0.424	0.016	0.393	0.455	0.43	0.402	0.43	0.430
North Central	12197326	0.660	0.015	0.630	0.690	0.633	0.586	0.67	0.682
North East	12237011	0.666	0.016	0.634	0.698	0.673	0.648	0.722	0.722
North West	22258966	0.621	0.015	0.592	0.649	0.639	0.612	0.71	0.712
FCT	330364	0.431	0.053	0.328	0.535				0.433
Total	69,521,125	0.520	0.006	0.507	0.533	0.547	0.516	0.567	0.544

Source: Author's calculations from NLSS
Note: Based on population weighted undeflated household expenditure per adult equivalent

Table 3-9: Poverty and Inequality of Consumption (per adult equivalent)

	Nigeria			
Zone	hcr	pg	pg2	gini
South South	0.410	0.138	0.065	0.392
South East	0.284	0.085	0.039	0.356
South West	0.424	0.196	0.121	0.431
North Central	0.660	0.331	0.212	0.445
North East	0.666	0.276	0.145	0.394
North West	0.621	0.251	0.131	0.420
FCT	0.431	0.145004	0.070	0.468
National	0.520	0.217	0.121	0.435

Source: Author's calculations from NLSS
Note: Based on population weighted household expenditure per adult equivalent deflated by our domain CPIs

Table 3-10: Poverty and Inequality by Sector and Zone

		hcr	pg	pg2	gini
National	Rural	0.489	0.172	0.083	0.398
	Urban	0.165	0.049	0.023	0.591
Rural	South South	0.489	0.172	0.083	0.367
	South East	0.324	0.098	0.044	0.341
	South West	0.399	0.146	0.077	0.353
	North Central	0.704	0.338	0.209	0.394
	North East	0.762	0.329	0.176	0.339
	North West	0.768	0.328	0.176	0.367
	FCT	0.645	0.233	0.118	0.343
Urban	South South	0.268	0.078	0.032	0.388
	South East	0.165	0.049	0.023	0.360
	South West	0.429	0.206	0.130	0.445
	North Central	0.579	0.318	0.218	0.499
	North East	0.481	0.175	0.086	0.399
	North West	0.383	0.126	0.058	0.385
	FCT	0.222	0.059	0.024	0.411

Source: author's calculations

Table 3-11: Poverty among Female-headed Households

	National	Female-headed household		
Zone	hcr	hcr	pg	pg2
South South	0.410	0.371	0.122	0.056
South East	0.284	0.248	0.075	0.034
South West	0.424	0.362	0.150	0.083
North Central	0.660	0.715	0.462	0.337
North East	0.666	0.515	0.192	0.100
North West	0.621	0.321	0.109	0.050
FCT	0.431	0.100	0.040	0.016
National	0.520			

Source: author's calculations

Table 3-12: Numbers and Proportions of Poor by Sex

	Number		Proportion	
Zone	Females	Males	Females	Males
South South	3,799,882	3,950,897	0.404	0.415
South East	2,190,979	2,146,114	0.269	0.301
South West	5,022,357	5,444,246	0.406	0.442
North Central	5,471,948	5,913,649	0.661	0.659
North East	5,350,363	5,878,938	0.664	0.667
North West	9,446,273	10,671,222	0.612	0.629
FCT	163,342	221,385	0.428	0.434
Total	31,445,144	34,226,451	0.507	0.533

Source: author's calculations

Table 3-13: Household size, adult equivalents equivalent sizes and expenditure

	Number of persons		FAO adult equivalents		Equivalent* household size		Equivalent* expenditure	
Zone/sex of hhh[$]	m	f	m	f	m	f	m	f
South South	6.26	4.92	5.43	4.12	3.747	2.698	4785.38	4823.36
South East	6.15	4.58	5.32	3.78	4.152	2.727	4448.58	4481.93
South West	5.29	3.98	4.6	3.3	3.241	2.15	4038.06	3881.39
North Central	6.69	4.32	5.83	3.59	4.131	2.527	2370.62	1843.73
North East	7.8	4.98	6.78	4.28	4.45	2.497	2425.23	3039.01
North West	7.75	4.6	6.75	3.9	4.791	2.657	2419.39	4002.72
FCT	6.7	8.41	5.91	7.25	4.004	2.693	5095.26	8519.7
Total	6.78	4.47	5.89	3.72	4.165	2.522	3244.94	3951.7

Source: author's calculations

Note: * Using a Barten-type adjustment for household size and composition

$ hhh: household head

Table 3-14: Regression Models of Welfare and Poverty, Nigeria 2003/4

	OLS	SVY OLS	Tobit	SVY Tobit	Logit	SVY Logit
Dependent variable	lnmpaee	lnmpaee	lnmpaee	lnmpaee	poor	poor
column	1	2	3	4	5	6
Primary_ave	0.025***	0.038***	0.025***	0.028	-0.028	-0.062
	(0.005)	(0.010)	(0.008)	(0.015)	(0.025)	(0.046)
secondary_ave	0.076***	0.118***	0.076***	0.124***	-0.131***	-0.254***
	(0.006)	(0.010)	(0.009)	(0.018)	(0.029)	(0.058)
teachertraining_ave	0.199***	0.429***	0.211**	0.453**	-0.684*	-1.171
	(0.045)	(0.091)	(0.072)	(0.169)	(0.292)	(0.643)
polytechnic_ave	0.264***	0.427***	0.287***	0.506***	-0.655***	-1.261***
	(0.018)	(0.040)	(0.037)	(0.108)	(0.149)	(0.364)
koranic_ave	0.008	0.018	0.030	0.010	-0.076	0.005
	(0.015)	(0.024)	(0.017)	(0.027)	(0.056)	(0.086)
university_ave	0.425***	0.759***	0.375***	0.971***	-1.777***	-3.697***
	(0.023)	(0.072)	(0.059)	(0.208)	(0.361)	(0.779)
agehhh	0.010***	0.009**	0.005*	0.008*	-0.013	-0.027*
	(0.002)	(0.003)	(0.002)	(0.004)	(0.008)	(0.012)
agehhhsq	-0.000***	-0.000**	-0.000**	-0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnlandpae	-0.002	-0.007**	0.006***	-0.006*	0.012*	0.039***
	(0.001)	(0.002)	(0.001)	(0.003)	(0.005)	(0.008)
lnassets12pae	0.032***	0.030***	0.029***	0.032***	-0.071***	-0.076***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.004)
lnae	-0.414***	-0.377***	-0.433***	-0.415***	1.274***	1.123***
	(0.012)	(0.020)	(0.014)	(0.022)	(0.047)	(0.074)
propt_0	-0.180***	-0.138***	-0.144***	-0.113**	0.466***	0.525***
	(0.022)	(0.033)	(0.025)	(0.036)	(0.080)	(0.112)
propt_5	-0.084***	-0.039	-0.075***	-0.030	0.244***	0.271**
	(0.018)	(0.026)	(0.020)	(0.029)	(0.064)	(0.087)
propt_f_15_65	0.033	0.129***	0.090***	0.095**	-0.234***	-0.088
	(0.017)	(0.028)	(0.020)	(0.033)	(0.065)	(0.096)
propt_65	-0.011	0.050	0.025	0.084	-0.183	-0.377**
	(0.025)	(0.036)	(0.029)	(0.043)	(0.093)	(0.131)
fhh	-0.253***	-0.178***	-0.143***	-0.109***	0.134*	0.086
	(0.015)	(0.024)	(0.018)	(0.029)	(0.059)	(0.083)
urban	0.295***	0.333***	0.275***	0.339***	-0.727***	-0.901***
	(0.012)	(0.025)	(0.015)	(0.029)	(0.050)	(0.080)
			Reference fgt			
nw	-0.636***	-0.598***	-0.644***	-0.542***	0.481**	0.098
	(0.062)	(0.087)	(0.054)	(0.082)	(0.167)	(0.236)
ne	-0.689***	-0.644***	-0.708***	-0.587***	0.686***	0.390
	(0.062)	(0.088)	(0.055)	(0.082)	(0.167)	(0.241)
nc	-0.827***	-0.752***	-0.808***	-0.701***	0.758***	0.427
	(0.062)	(0.089)	(0.054)	(0.083)	(0.167)	(0.239)
ss	0.023	0.027	0.125*	0.137	-0.448**	-0.500*
	(0.062)	(0.088)	(0.056)	(0.083)	(0.168)	(0.239)
sw	-0.590***	-0.589***	-0.406***	-0.541***	-0.015	0.191
	(0.061)	(0.088)	(0.055)	(0.083)	(0.169)	(0.234)
se	-0.012	0.017	0.058	0.163	-0.863***	-1.119***
	(0.062)	(0.087)	(0.056)	(0.083)	(0.170)	(0.241)
Community program	0.057***	0.039*	0.064***	0.052**	-0.122***	-0.072
	(0.010)	(0.017)	(0.011)	(0.019)	(0.036)	(0.057)
conflict	-0.120***	-0.122**	-0.124***	-0.107*	0.342***	0.309*
	(0.028)	(0.041)	(0.029)	(0.043)	(0.093)	(0.138)
crime	-0.180***	-0.140**	-0.132***	-0.099	0.308**	0.107
	(0.033)	(0.054)	(0.036)	(0.054)	(0.117)	(0.178)
			Reference definitely not			
loan1_	0.243	-0.058	0.436*	0.029	0.496	1.997*
	(0.163)	(0.322)	(0.172)	(0.356)	(0.560)	(0.985)

loan2_	0.460**	0.217	0.578**	0.377	0.541	1.711
	(0.167)	(0.334)	(0.176)	(0.364)	(0.571)	(1.002)
loan3_	0.319	0.053	0.528**	0.241	0.220	1.250
	(0.194)	(0.390)	(0.204)	(0.428)	(0.657)	(1.164)
loan4_	0.225	0.021	0.496	0.280	-0.253	0.640
	(0.257)	(0.515)	(0.274)	(0.578)	(0.895)	(1.580)
			Reference strongly disagree			
trust1_	0.407	0.076	0.230	0.144	-0.921	0.068
	(0.224)	(0.449)	(0.238)	(0.500)	(0.777)	(1.426)
trust2_	0.232	0.083	0.351	0.192	-0.716	0.585
	(0.226)	(0.445)	(0.238)	(0.495)	(0.775)	(1.420)
trust3_	0.414	0.166	0.162	0.247	-0.405	0.246
	(0.240)	(0.476)	(0.251)	(0.528)	(0.823)	(1.533)
trust4_	0.588*	0.327	0.239	0.581	-0.775	-0.991
	(0.250)	(0.498)	(0.261)	(0.556)	(0.850)	(1.579)
			Reference very unlikely			
coop21_	-0.305	-0.014	-0.240	-0.064	1.306	0.690
	(0.242)	(0.490)	(0.274)	(0.560)	(0.881)	(1.534)
coop22_	-0.755**	-0.545	-0.409	-0.525	2.218*	2.208
	(0.268)	(0.543)	(0.298)	(0.613)	(0.961)	(1.668)
coop23_	-0.514	-0.340	-0.208	-0.340	2.501*	2.718
	(0.273)	(0.531)	(0.306)	(0.617)	(0.988)	(1.704)
coop24_	-0.277	-0.161	0.659	0.093	1.749	1.671
	(0.376)	(0.764)	(0.411)	(0.842)	(1.330)	(2.344)
			Reference disagree strongly			
help1_	0.071	0.146	0.050	-0.003	-2.287**	-2.770
	(0.255)	(0.462)	(0.228)	(0.497)	(0.824)	(1.673)
help2_	0.123	0.155	0.096	-0.083	-1.506	-1.905
	(0.260)	(0.479)	(0.236)	(0.518)	(0.848)	(1.703)
help3_	-0.313	-0.113	-0.106	-0.344	-1.539	-1.058
	(0.257)	(0.465)	(0.238)	(0.510)	(0.839)	(1.604)
help4_	0.374	0.407	0.210	0.228	-1.740	-1.809
	(0.318)	(0.572)	(0.324)	(0.703)	(1.068)	(2.056)
_cons	10.887***	10.724***	8.348***	8.301***	-2.170	-2.119
	(0.362)	(0.724)	(0.377)	(0.802)	(1.250)	(2.300)
sigma			0.657***	0.663***		
			(0.004)	(0.009)		
r2	0.469***	0.426***				
N	19158	19158	19158	19158	19158	19158

Source: Author's calculations from NLSS

Table 3-15: Membership of Associations and Church/Mosque and Welfare and Poverty, Nigeria 2003/4

	Survey tobit	Survey logit
	b (se)	b (se)
no_assoc	-0.068*	0.358***
	(0.028)	(0.086)
christian_church	0.012	0.030
	(0.023)	(0.074)
islamic_church	-0.094***	0.202*
	(0.026)	(0.078)
_cons	9.227***	-3.319
	(0.555)	(1.722)
sigma	0.662***	
_cons		
r2	(0.006)	
N	19158	19158

Source: Author's calculations from NLSS. Variables and controls not listed include all those in Table 16 & age, agesq, urban, zone, logs of landowned and other assets, demographics, and clustering

Table 3-16: Regression Models of Welfare and Poverty, Nigeria 2003/4

Method	OLS	OLS	Tobit	Logit	OLS
Model	1	2e	3	4	5
Dependent variable	lnitemexppae	lnitemexppae	lnitemexppae_ defl	poor1	Female hd. hhold. only
Incomplete primary hhh	0.096*	0.106**	0.109*	-0.454***	0.085
	(0.042)	(0.039)	(0.053)	(0.132)	(0.076)
primary_hhh	0.128***	0.124***	0.136***	-0.372***	0.113
	(0.021)	(0.023)	(0.025)	(0.072)	(0.058)
incompletesecondary_hhh	0.134***	0.109**	0.136**	-0.439***	0.141
	(0.039)	(0.040)	(0.048)	(0.122)	(0.089)
secondary_hhh	0.231***	0.173***	0.239***	-0.627***	0.355***
	(0.027)	(0.029)	(0.032)	(0.086)	(0.078)
teachertraining_hhh	0.289***	0.237***	0.297***	-0.663***	0.377**
	(0.048)	(0.051)	(0.061)	(0.162)	(0.136)
polytechnic_hhh	0.441***	0.334***	0.420***	-1.117***	0.654***
	(0.042)	(0.043)	(0.052)	(0.129)	(0.124)
koranic_hhh	0.056	0.036	0.051	-0.158	0.058
	(0.031)	(0.046)	(0.033)	(0.113)	(0.153)
university_hhh	0.793***	0.594***	0.762***	-1.843***	0.921***
	(0.051)	(0.056)	(0.073)	(0.198)	(0.179)
fhh	0.172***	0.211***	0.190***	-0.554***	0.000
	(0.031)	(0.033)	(0.039)	(0.101)	.
incompleteprimary_spouse		-0.047			0.273
		(0.040)			(0.184)
primary_spouse		0.007			0.782*
		(0.024)			(0.375)
incompletesecondary_spouse		0.052			-0.189*
		(0.035)			(0.076)
secondary_spouse		0.166***			-0.053
		(0.034)			(0.139)
teachertraining_spouse		0.288***			0.000
		(0.064)			.
koranic_spouse		0.023			0.000
		(0.047)			.
polytechnic_spouse		0.226***			0.000
		(0.062)			.
university_spouse		0.447***			0.358*
		(0.090)			(0.148)
constant	9.090***	9.150***	9.209***	-3.096***	9.189***
	(0.116)	(0.115)	(0.146)	(0.389)	(0.302)
sigma			0.683***		
_cons			(0.009)		
r2	0.377***	0.383***			0.426
N	19158	19158	19158	19158	2771

Source: Author's calculations from NLSS.

Note: Controls not listed include age, agesq, urban, zone, logs of landowned and other assets, demographics, and clustering.

Table 3-17: Coefficients of HHH and Spouse' Education on Welfare

Dependent variable = ln (monthly adult equivalent expenditure)	male hhh			female hhh	
	without spouse	with spouse		with spouse	
	hhh	hhh	Spouse	hhh	spouse
Incomplete primary	0.096*	0.106**	-0.047	0.085	0.273
Primary	0.128***	0.124***	0.007	0.113	0.782*
Incomplete secondary	0.134***	0.109**	0.052	0.141	-0.189*
Secondary	0.231***	0.173***	0.166***	0.355***	-0.053
Teacher training	0.289***	0.237***	0.288***	0.377**	0.000
Polytechnic	0.441***	0.334***	0.023	0.654***	0.000
Koranic	0.056	0.036	0.226***	0.058	0.000
University	0.793***	0.594***	0.447***	0.921***	0.358*

Source: author's calculations
Note: See Table 3-16 for further details

3.8 Poverty figures

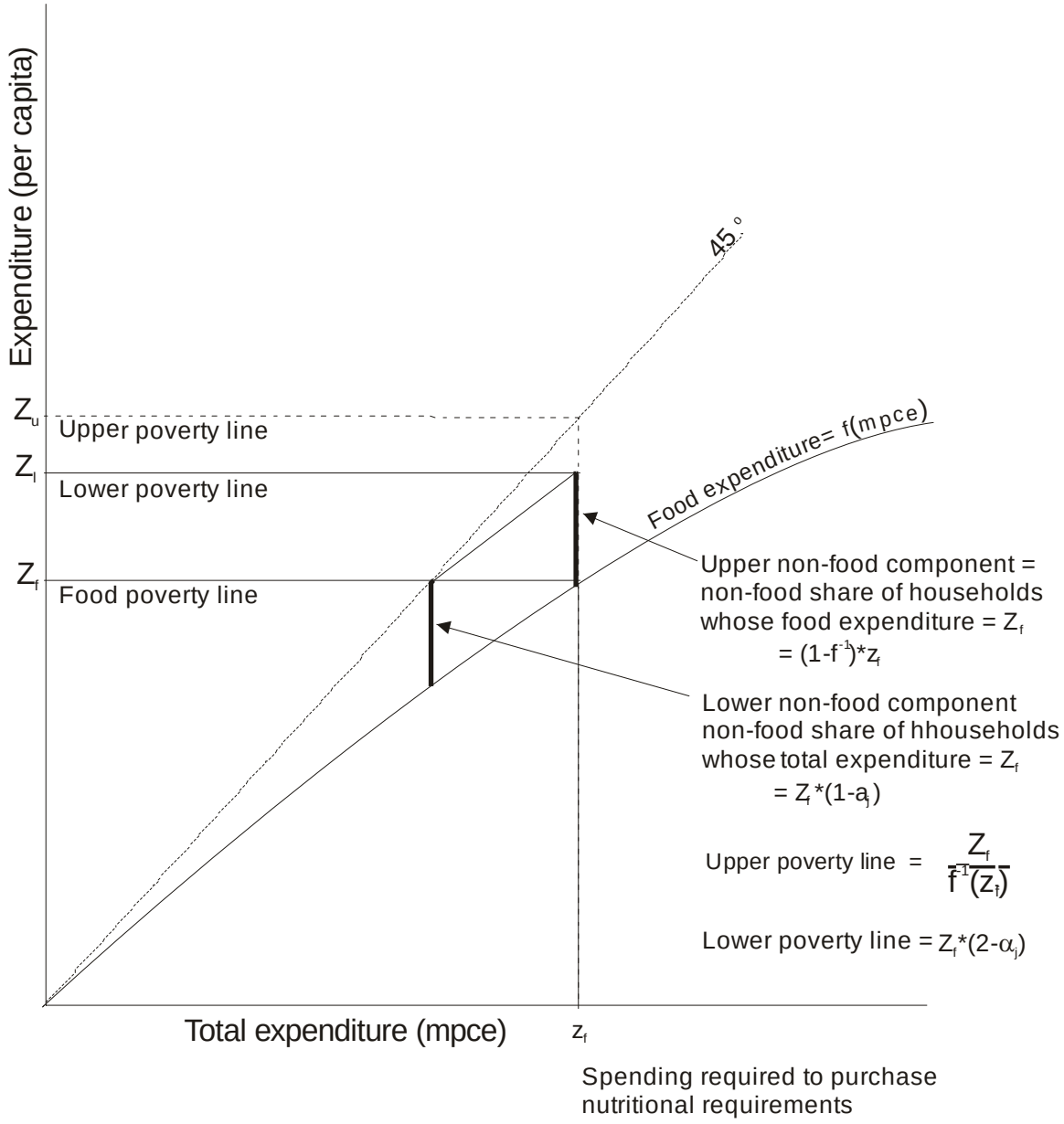


Figure 3-1: Cost of Basic Needs Poverty Lines

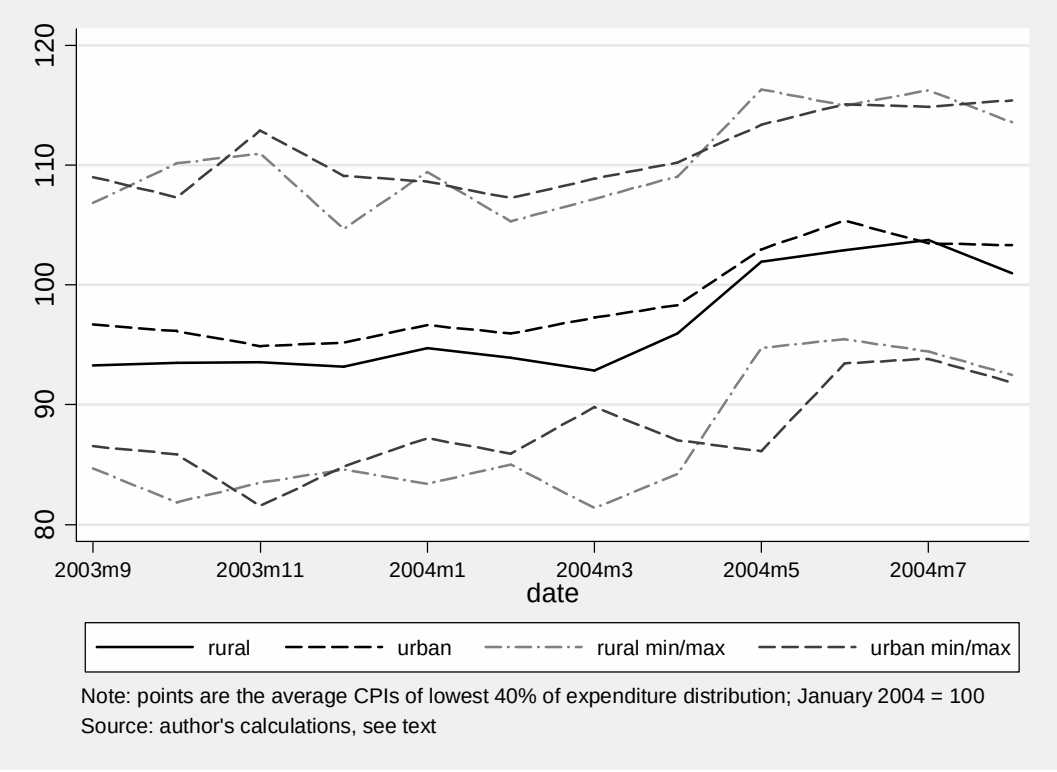


Figure 3-2: Seasonal price variation (average CPIs) September 2003–August 2004

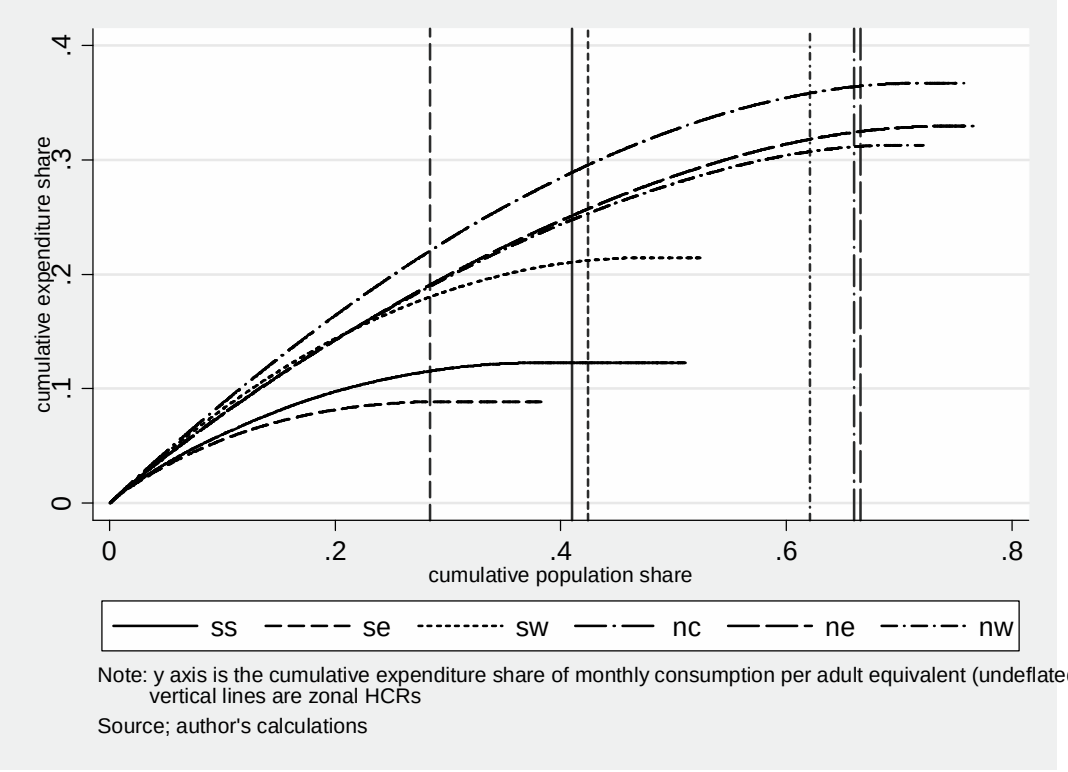
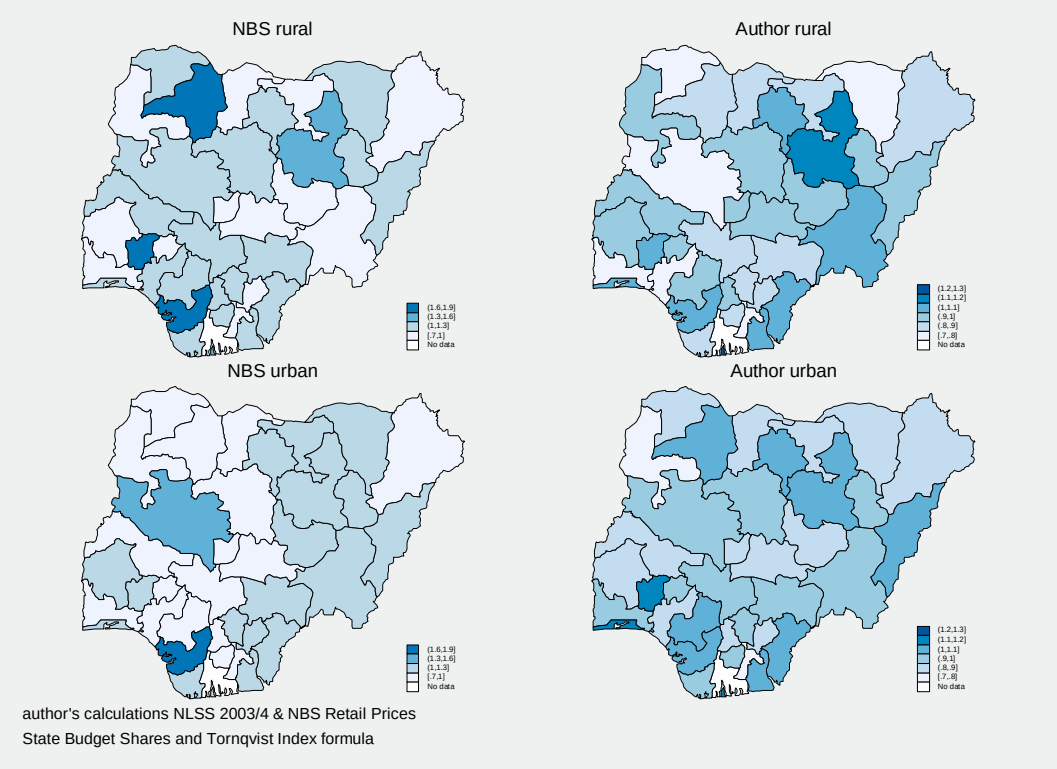


Figure 3-3: Incidence, Intensity and Inequality of Poverty (the Three "Is" of Poverty - TIP) curves of monthly per adult equivalent expenditure by zone

3.9 Poverty maps



Map 3-1: State and Sector CPI deflators by author

4 Gender Differences in Human Capital

This section explores gender differences in education; the exploration was limited by time constraints, but raises important points and suggests need for further work on these data.

Gender inequalities in survival, health and education are significant in Nigeria. While juvenile survival differences are small, female mortality rates in the reproductive years due to maternal mortality are some the worst in the world. Excess female mortality is not only an expression of profound capability inequality but also, from an economic point of view, a source of inefficiency in terms of lost labour, human capital and child quality. As noted in the discussion of data availability, it is not possible to analyse maternal mortality using the available national sample surveys.

4.1 Education

In Nigeria women are less likely to be educated than men. While, as noted above, different sources provide different definitions of education, recent surveys provide a broadly similar picture (Table 4-1, Figure 4-1). There are significant gender differences in educational attainments in total and in both rural and urban areas (Table 4-1 for NLSS data) and by zone of the country (Figure 4-2 for MICS3 data).

While we do not have equivalent data from earlier surveys, the distribution of educational attainment by age shows the rise in educational attainment over time; these figures may exaggerate the levels of education attained in earlier generations in that longevity is likely to be associated with educational attainment and hence a greater proportion of the uneducated old will have died, raising the proportion of old survivors (Figure 4-3); this is most likely to have distorted the picture at the higher levels of education (lower right panel of Figure 4-3). Zonal differences in the distribution of educational attainment and age are depicted in Figure 4-1.

One of the methodological problems in identifying the effects of education on well-being outcomes, and by inference, growth, is that the educational levels of parents are strongly associated. This can give rise both to estimation problems due to collinearity and to interpretive problems. As Alakka Basu (1999) points out, in a context where females are less educated than males and mating is assortative, the association of female education with fertility reduction may be due to the types of male (or their households) that accept educated females as marriage partners. Iversen and Palmer-Jones (2008) extend this idea in suggesting that benefits in terms of the higher wages of illiterate females employed in non-farm sectors and living in a household with at least one literate may be partly due to the types of illiterate females that households with (usually male) literates prefer as marriage partners. Lindelow (2008) further suggests that there may be educational externalities associated with each level of education of any member of a household, extending to any other member regardless of their educational level[47]. Moreover, these

[47] i.e. education externalities may be multilateral and occur between each level of education of transmitter and receiver of the externality.

externalities may depend on the identities, especially, perhaps, gender of both transmitters and receivers.

Another set of variables interrelated with gender and well-being variables are religion and ethnicity. Here too, correlation between levels of and gender differences in educational attainment make for difficulties in interpretation of correlations between, for example, mother's education and well-being of other household members, including growth-related outcomes such as child nutritional status and educational attainments.

4.1.1 Assortative mating and correlation of parental education

Table 4-2 shows that there is a strong association of the educational level of carers of children for whom there are anthropometric measurements in MICS3 and that of their partners; Figure 4-7 depicts the same data. The association of carer's and partner's education makes difficulties in establishing causal relations between maternal education and welfare outcomes such as child survival and nutritional status. These difficulties are illustrated below using a simple model of child nutritional status.

Further work is required to explore the implications of assortative mating in estimating the effect of education of mothers and fathers separately (Breierova and Duflo, 2004) . The UPE, which was implemented with different intensity in different states between 1974 and 1981, provides a possible 'natural experiment' to assess these issues (Osili and Long, 2008; Osili, 2008)_

4.1.2 Proximate illiteracy

It is clear that it is not only the mother's education that is associated with welfare outcomes; recent work has shown that the literacy or education of a household member can have an association with welfare outcomes. Basu and Foster (1998), Basu, Narayan and Ravallion (2002) and Iversen and Palmer-Jones (2008) are concerned with the effective literacy of illiterate household members (i.e. variables associated with an illiterate person who lives in a household with at least one literate. Lindelow (2008) suggests a scheme of generalised education externalities for other household members, which may be generated by any educated household member and accrue to any household member according to their identities (gender, relative age, level of education).[48] In MICS3, education of household members is not given except for children and youths between 5 and 24; however mother's and father's education is given. In this survey we can use indicators of mother's education relative to father's as an additional indicator of the type of education externality and of the education levels of siblings. Thus we can compute variables for the proportion of household members who are educated, the maximum education levels of children up to 24 and mother's and father's education.

[48] In his empirical work Lindelow focuses on whether anyone in the household has a higher level of education than the woman/mother whose behaviour is the dependant variable; whether the mother/woman's spouse has a higher level of education than her; and the education of the first, second and third highest level of education of household members other than the person with the highest level of education in the household,

4.1.3 Religion, ethnicity and education

Religion, ethnicity and education are highly associated amongst themselves and have strong associations with other variables such as religion, as well as with well-being outcomes. Table 4-3 shows the classification scheme adopted and Table 4-4 gives the cross-tabulation by religion of the household head.

NLSS only provides data on the religion of persons, although it also provides answers to questions about literacy in Nigerian languages (Hausa, Yoruba, Igbo and Other). More than half the people in households surveyed were not able to read or write any Nigerian language, so these variables cannot be used to identify ethnicity. GHS (2007) and LFS (2005) do not provide language or ethnicity information. The MICS3 and NDHS surveys, on the other hand, ask a question about ethnicity, and about mother tongue (MT). In MICS3 in the vast majority of cases ethnicity and MT have the same response. This classification provides a better opportunity to distinguish between effects of religion and ethnicity on other variables than the simple Hausa, Yoruba, Igbo and Other classification.

MICS3 has more than 1000 categories of MT/ethnicity, among which there is a fair proportion of data errors.[49] We have classified the responses to the MT question using the typology of Nigerian languages available from www.ethnologue.com. This source classifies Nigerian languages into three major groups: Niger-Congo (NC); Afro-Asiatic (AA) and Afro-Saharan (AS). The vast majority fall into the former two categories (Yoruba and Igbo are NC languages and Hausa is AA). A more nuanced classification which divides the population into significant subsets is used: Table 4-4 gives the classification and estimated populations together with the languages common in each classification. As is well-known, the Hausa are predominantly Muslim and the Igbo are Christian, but the Yoruba are split between Christian and Muslim.

Both religion and ethnicity are associated with many important correlates of growth and well-being. For example, the educational level of carers (predominantly mothers) is strongly associated with their religious affiliation (Table 4-5; Figure 4-5). The educational level of children is similarly associated with both the ethnicity and the religion of their carers (and their carers' partners). However, among language groups that include both Christians and Muslims, levels of education of Christian carers are higher than those of Muslims of the same language group, but levels of education of the Muslims tend to be higher than among Muslims belonging to language groups with few Christians (Table 4-6). As Table 4-7 shows, both religion and ethnicity are significant regressors of the probability of carers being literate, but interaction terms for ethnic groups that are split between Christians and Muslims are not statistically significant.

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[49] NDHS1 has 96 categories of language (snlangr) but also has variables with fewer categories; slangr, alangi have codes for Hausa, Yoruba, Igbo, Efik, Kanuri, Tiv, English and Other; variable s119 in NDHS2 has has 113 categories, but no data for 'ethnicity' (v131); NDHS3 has variable s118 for languages, with 97 cateories. The codes for these variables differ between NDHS1 and NDHS2, but the latter apparently has the same codes as NDHS3. In no case is it clear how these language questions were asked. It seems that the NDHS1 had pre-coded questions for the language of the interview, but it is not clear how the questions that resulted in the variable snlangr (language of respondent) were solicited. MICS3 has no instructions about how the questions 'MT of Head' and 'Ethnic Group of Head' were to be filled in. The range of answers suggests it was not pre-coded and relied on the respondent's answer, which was simply transcribed (with error).

Other variables such as child anthropometric status are also associated with both these variables. Table 4-8 shows the simple OLS regressions of child height-for-age on religious affiliation, carers' and partners' education, and ethnic group dummy variables (the wealth index is included in the last regression in this table). Columns 2 and 3 show that adding secondary education for carers and partners separately to religious affiliation is statistically significant for both carers and partners, and partner's higher education is also significant; Muslim is significantly negative. However, when added together only carer's secondary education is significant because of the collinearity between carer's and partner's education.

4.1.4 Effects of UPE

There are significant zonal differences in both the levels, gender differences and trajectories of educational attainments (Figure 4-4); the northern zones lag well behind the southern, with the partial exception of North Central. There were significant increases particularly in primary education in the late 1970s associated with the UPE; this programme was implemented with greater intensity outside the South West, as noted by Osili (2008) (see also Osili and Long, 2008). South Western states developed widespread primary education in the 1950s and 1960s, while other states to some extent caught up during UPE, which focussed expenditure on areas lagging behind in modern education. The states of Ogun, Oshun, Oyo and Lagos can be grouped as a low-intensity UPE (LI) group and the remainder as high intensity UPE (HI) states; Figure 4-6 shows the extent of catch-up by low-intensity states in the late 1970s.

UPE provides a 'natural experiment' that has been exploited by Osili and Long (2004, 2008) (hereafter O&L) and Osili (2008) to assess the impact of UPE investment in education on schooling outcome and female labour force participation, delayed marriage, reduced fertility by the age of 25 and lower infant mortality. O&L use NDHS2 data to estimate the effects of this natural experiment; however, NDHS2 data are thought to be unreliable, at least with regard to child mortalities (National Population Council, 1999, 2003; see also below). NDHS3 data may be more unreliable in respect of migration data (O&L), which can affect which states people were actually brought up in. But it is also likely, at least for some statistics, that 1999 was too early to assess the impact of UPE since many of those who were exposed to it were in the early stages of their reproductive careers; thus the effect of UPE on total fertility may be less than that on early fertility, though O&L find similar reductions in early fertility in a brief exploration of NDHS3.[50] The strong conclusion that UPE has reduced fertility is based on a significant correlation of early with lifetime fertility (O&L:72).

[50] 'To study the impact of the UPE programme, we rely mainly on the 1999 Nigerian Demographic and Health Survey (NDHS)' (p381). 'Finally, because the cohorts born after the initiation of the UPE programme (1976-1981) were just reaching their mid-twenties by 1999, we cannot fully exploit them to study the impact of education on socio-economic outcomes' (p382); 'We should note that early fertility may be less indicative of final fertility outcomes for women. To examine this outcome, we examine the 2003 NDHS which allows us to examine fertility outcomes nearly four years later for the UPE cohort and find the number of births before age 30 is still significantly lower for the UPE cohort compared to unaffected cohorts' (p391). However, it is not clear to which table(s) this last statement refers; thus the data in Table 15.5 are clearly from NDHS 2. In any case, a simple comparison of children born by age 30 is not the appropriate method to assess how total (lifetime) fertility has been affected.

The effects of UPE on fertility can be further explored using the more recent NDHS3 and MICS3 surveys, since NDHS2 may have been too early to assess effects on infant and child mortality. The analysis was extended to the 2003 NDHS by O&L, who found a similar reduction in fertility. However, by 2003 the older females who experienced UPE would still not have reached lifetime fertility as they would only be between 33 and 28 years old. Further use of NDHS3 is rejected because of 'disadvantages due to higher migration' (ibid.), but this is not explained[51]; since women who migrated to their current residence after the age of six can be identified and either excluded or controlled for, it is not clear why this is a problem insuperable in further analysis.

While it is impossible to say whether lifetime fertility of UPE-affected women will be lower than non-affected cohorts based on assumptions of continuation of age-specific fertility patterns from earlier cohorts, even if we rework the NDHS estimations reported by O&L to clarify some questionable specifications and use MICS3 data (which refer to March and April 2007), it might be possible to examine other well-being-related variables (child survival or nutritional status) as beneficial health-seeking behaviour.

In this section we report only our findings of the effect of UPE on educational attainments and fertility, taking up the effects of UPE on child survival, anthropometric status and health-seeking behaviour below. We provide results from all three data sets: NDHS2, NDHS3 & MICS3. It is desirable to do this because the NDHS of 1999 may have been too early to assess some of the impacts of UPE as mothers were in their childbearing years. The oldest cohort that might have benefitted from UPE would have been only 29 in 1999, and the youngest only 24. UPE may have delayed rather than reduced fertility. There are also significant methodological problems in implementing the test methodology, which are discussed in due course.[52] Even in 2007 (MICS3), many who had access to UPE schools were in the middle of their reproductive years. A further problem with the interpretations offered by O&L is that they ignore the confounding of mother's with father's education and do not address this issue; it is difficult to address it because the primary focus of NDHS, as with other DHS surveys, is ever married women[53]. Even for MICS3 the focus is mothers. While data on fathers are produced in DHS, the sample of men interviewed is substantially smaller than that of females, and the information on partners obtained in the interviews with women have many missing observations and may lack the accuracy of data obtained from women about their own characteristics.

There is no doubt that the number of primary schools in HI states increased following UPE; however the rate of increase of gross enrolment is the more appropriate figure, since the total population of HI states is much larger than that of LI states, and number of

[51] Osili, personal communication, suggests that NDHS3 may be affected by migration so that state of residence of females may not correspond well to state in which educated. No figures are given to support this assertion.

[52] In the draft version of this report we only had access to O&L's widely distributed original paper of 2004; in this version of our report we mainly refer to the version published in a peer review journal (O&L, 2008). I am very grateful to Una Osili for considerable clarification of their methods, some data with which to replicate their results and discussion about the issues involved. We may continue to disagree about a number of issues raised here.

[53] "ever married" means currently or formerly married (divorced or widowed) women.

schools do not necessarily equate with successful schooling achievement. The quality of schooling attainment in the HI states beyond number of years of education, completion of primary education and other variables such as age at first marriage, first birth and other welfare-relevant variable are matters taken up below.

As we will see below, the effects on these and other welfare-related variables in NDHS3 and MICS3 (numbers of children born or died – both by mother's age of 33 – child nutritional status, waged employment and other variables) do not appear to improve more in HI states than in LI states, and this leads us to re-examine the results published by O&L for NDHS2; we find significant points of disagreement with their paper which we are currently exploring (see further below). In fact, in many of the welfare-relevant variables we find less improvement for the UPE cohorts in HI than in LI states, results which are the opposite of those found by O&L.

4.1.4.1 Evaluation of UPE: Research design

Education is thought to be a crucial variable affecting growth and well-being, and female education in particular is crucial both because of the generally lower levels of female education and because education of females is thought to be particularly effective in enhancing growth and well-being (Blackden et al., 2006, Verschoor et al, 2006). The UPE programme in Nigeria (1976-1981) provides a natural experiment to assess the impact of primary school investment in that it was implemented with varying intensity in different states. One route by which female education may enhance well-being is by reducing fertility. O&L (2008) find that additional expenditure on education significantly increased years of education completed, and that a one-year increase in female education reduced fertility by 0.26 births by the age of 25. In this section we address what may be considered some limitations of this work; in later sections we build on this to explore whether there are other favourable outcomes such as reduced infant mortality, child nutritional status and greater health-seeking behaviour. Our main problem with the O&L work is the inclusion of variables to address the issue of mean reversion[54].

As pointed out above, states can be grouped as experiencing low- and high-intensity UPE and the difference in dependent variables (education and well-being) within these groups between cohorts who passed primary education age before and during UPE can be compared between these groups. Since UPE was implemented between 1976 and 1981 and the usual age for starting primary education in Nigeria is six, the first cohort exposed to UPE would have been that born in 1970 and the last that born in 1975; and UPE was implemented with high intensity in all states other than those of the former South-Western region. Table 4-9 sets out the potential natural experiment design.

This experiment can be tested using the following econometric model.

$$S_{ijk} = \beta_0 + \beta_1 X_{ijk} + \beta_2 \left(I_k * C_{70-75} \right) + \beta_3 I_k + \beta_4 * C_{70-75} + \varepsilon_{ijk} \quad \textbf{(1)}$$

Where S_{ijk} is the welfare variable of household *i* of cohort *j* in state *k* (years of schooling, number of births and so on); X_{ijk} is a set of controls (religion, ethnicity, year of birth); I_k

[54] The phenomenon that variables measured at one time which deviate from their mean value for random reasons revert to the mean in later measurements.

is an indicator for HI state (taking the value 1 for non-Western region states and 0 for Western region states); and $C_{70\text{-}75}$ is an indicator for the UPE cohort taking the value 1 for individuals born between 1970 and 1975. The model is estimated using a control group of individuals born between 1956 and 1961 who cannot have benefitted from education in the HI programme. An alternative specification substitutes 'federal capital funds allocated for primary school construction in 1976' (O&L:61). Thus I_k becomes E_k, where E is the per capita expenditure on UPE of federal funds in state *k*.

In order to be clear, the specification entails that, while β_2 corresponds to the additional growth of schooling in the HI states compared to the LI states,[55] β_3 should pick up the difference in years of schooling between HI and LI states and β_4 should correspond to the growth of enrolment in the LI states between cohorts.

Mean reversion in this context occurs when units are assigned to treatments on the basis of estimates of previous low performance which are measured with error or otherwise subject to random fluctuations; when estimates of low performance (e.g. estimated years of education completed by a given cohort) include transitory elements due to random fluctuations it is inevitable that the mean years of education in subsequent cohorts in the same units will revert to the mean. Thus in her seminal paper Duflo (2001:798-9) argues: '[T]he pattern of increase in education could vary systematically across regions. In particular, there could be mean reversion'. More generally, there could have been a greater increase in education even if UPE had not been implemented with greater intensity in the HI states. It is not possible to test this counterfactual; Duflo conducts a test of a false treatment to show that there was no difference in the increase in education between HI and LI regions for two different age groups, neither of which went through the programme. O&L conduct a similar false treatment test and find no mean reversion. We find that depending on which cohorts are included, there were not surprisingly differences in the increase in years of schooling between the HI and LI states. Thus, using NDHS2 data, when we compare the 1949-1955 with the 1956-1961 age group we find that Western states increased years of education faster than non-Western states, but comparing the 1956-61 group with the 1962-67 age group the non-Western states increased years of education slightly faster. Thus, while it is possible that years of education would have increased faster in non-Western states during the UPE period anyway, we need some estimator of the likely counterfactual increases. O&L write:

> Because one might expect more growth in educational attainment in areas where fewer students were in school, we also control for the female share of total primary school enrolment [sic] in the state in 1970 to deal with the possibility of mean reversion. We also recognize that there may have been other programs in place to encourage women to become educated or enter the labor force. During this period in Nigeria, public-sector employment as well as the wages of civil servants

[55] 'The parameter α2 is the reduced-form estimate of the effect of UPE. We expect that the change in schooling outcomes should be larger in the high-intensity states for the 'UPE Cohort,' and therefore, α2 is expected to be positive. In particular, it measures whether individuals in high-intensity states, who experienced large changes due to the UPE program, also experienced more rapid growth in schooling in comparison to individuals in the low-program intensity states, who did not experience much change due to UPE' (O&L, 2008:64). Our model uses βs while O&L use αs

> significantly expanded. This expansion in the federal civil-service labor force may be correlated with the timing of the UPE program and so to account for this factor, the baseline model also controls the time-varying share of female civil service employment in the state of residence.' (p.65)

Since the share of females in total primary enrolment is more likely to be an indicator of gender discrimination rather than overall increase in enrolment (even of females), a better predictor of the likely increase in educational enrolment might be the proportion of each cohort enrolled, together perhaps with an indicator of gender bias. In any case, since we find little difference in increase in enrolment rates due to UPE our conclusion that UPE made little evident difference would be reinforced if there would anyway have been some increase in years of education in non-Western states in the absence of UPE.

Thus, our results[56] for these regressions are unfortunately somewhat different to those reported by O&L. Table 4-10 gives the descriptive statistics that are in some cases different from those in O&L: in particular, we find more children on average born to women at the time of the survey than the number born before the age of 25, while O&L find the reverse. Since it is impossible for fewer children to be (ever) born to women in the survey than before the age of 25 to these same women, it is not clear what the figures in O&L refer to.[57]

Table 4-11 reports the mean differences in years of education and (early) births between UPE-exposed control cohorts by intensity of UPE. Years of education increased between cohorts in both UPE categories, but the differences between HI and LI states are relatively small in NDHS2, while in NDHS3 & MICS3 they are negative, implying that years of education in HI states increased less than in LI states. For early fertility again we get results which contrast with those reported by Osili and Long, with a small but slightly greater reduction in early births in HI states in NDHS2, but a rather larger reduction in early births between cohorts in LI states in NDHS3 (and a small difference in MICS3).

Table 4-12 gives our estimates of the relevant Difference in Difference regression coefficients for NDHS2 (replicating O&L (2008) Table 5, which is reproduced here in Table 4-13 below). Consider the coefficients of $C_{70\text{-}75}$; these are supposed to represent the difference in the dependent variable between the cohorts in the control (LI) states (β_4). We can expect that even in LI states, years of education increased between the two cohorts (a simple tabulation shows that there was a difference in years of schooling of about 2.3 years in the LI states between the control (born 1956-61) and UPE (born 1970-75) cohorts. The difference in the HI states was 2.92 years of schooling, implying a difference coincident with UPE of 0.62 years (Table 4-11). Hence this coefficient should be positive, significant and have a value around 2 to 3, as we find. However, O&L find a negative coefficient that is statistically insignificant (Table 4-13).

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[56] Our regressions do not include a control for the share of females in primary school enrolment in year individual was 6 due to lack of data , nor do we include the proportion of civil servants who were female in 1970 in the 12 states at this stage, also due to lack of access to these data. It seems unlikely that including these variables would substantially alter our results. This assertion has been corroborated with more recent work not reported here.

[57] We find this even when we restrict the sample to women aged 25 and over (2.37 children ever born and 1.34 children born before the age of 25, in both cases for women of 25 or older; 4.14 and 2.33 for those women of 25 and older who have ever had children).

Turning to Panel B, we find some positive effects of HI when this is proxied by the expenditure on classrooms per capita.

Similarly, when the dependent variable is the number of children born by mother's age 25, the difference between cohorts in the control states, which is captured by the coefficient of $C_{70\text{-}75}$, is likely to be negative since fertility is probably declining in these states, which is what we find. O&L, on the other hand find a significant positive coefficient, suggesting that 3.67 more children were born to mothers under the age of 35 in the LI states (Table 4-13).

These differences between our findings and those of O&L reflect differences in specifications of the models; specifically, if we include their variables which are introduced to control for mean reversion (MR) we find results that are similar to theirs (Table 4-14);[58] we also find high collinearity between their MR variables and the variables involved in the Difference in Difference estimation (variable inflation figures are given in Table 4-15). As we can see, the size and statistical significance of the UPE impact variable (young_high or UPE Cohort * HI state) changes between specifications, especially when the 'UPE Cohort * Female Share of Primary Enrolment 1975' variable is introduced. As Table 4-15 indicates, this variable is unacceptably collinear with the UPE Cohort dummy variable. Since multi-collinearity means that the regression coefficients are estimated with imprecision and also liable to large fluctuations, and because the coefficients O&L (and we) find on $C_{70\text{-}75}$ and I_k are highly implausible, we conclude that at this stage it is better not to attempt to control for mean reversion in this way.

4.1.4.2 MICS3

MICS3 provides more recent data on education and well-being than NDHS2 or 3. Because of differences in survey and questionnaire design we cannot exactly replicate the analysis of NDHS above; however, re-estimating models with different data sets can provide useful checks on the conclusions of work based on a single survey or several surveys with a common design. Because in this case the survey organisation is common (NBS), there may be less dissimilarity between MICS and NDHS surveys than between surveys conducted by different organisations.

Simple difference in difference cross-tabulations of years of education of females, the proportion that completed seven years of education and average numbers of children ever born and died are shown in Table 4-16. In this data set the increase in numbers of years of education and proportion of females completing seven years of education is not greater in HI than in LI states, but there are slightly faster reductions in number of children ever born and number of child deaths. However, the women exposed to UPE in this sample have not completed their fertile years.

Further support for the argument that UPE increased years of education and Primary 7 completion is not found when using the expenditure on UPE (Table 4-17), but there is

[58] Due to shortage of time these results do not completely mimic those found in O&L. We do not include controls for state and year of birth, and our variable for % female share of civil servants refers to 1975 (19 states) only, as does our variable for female share of primary enrolment. These differences are unlikely to change the substantive points made here that the collinear variables are likely to introduce large fluctuations into coefficient estimates, making their interpretation unreliable.

some evidence that the number of children ever born and number of child deaths did decrease faster, although both births and deaths are still significantly higher in HI than in LI states.

4.1.4.3 Conclusion

The UPE programme provides an opportunity for using difference in difference estimation of the effects of higher expenditure on primary education. I am sceptical that O&L use an appropriate methodology, especially with regard to variables that might reflect mean reversion, and prefer to exclude these variables in the specification used at this stage.

Years of education of females increased in the HI states during the UPE years, but, using NDHS2 data, at an insignificantly greater rate than in LI states. Expenditure per capita on UPE did have significant effects on years of education and the proportion of females completing seven years of education. We found small negative effects on children born to women under the age of 25 in the UPE cohorts. Using the later MICS3 data we also show some increase in years of education and reduction in numbers of children born and child deaths in the UPE cohort in the HI states. However, the effects are small and both births and child deaths remain significantly more frequent in these non-Western states which experienced UPE with high intensity; and, as discussed further below, notwithstanding increases in years of female education, fertility and child deaths remain unfortunately high in all regions of Nigeria, especially in the north. These issues are taken up again below.

4.2 Human capital tables

Table 4-1: Educational Attainments by Sex, Nigeria 2003/4 (%)

	Total		Urban		Rural	
educlass	male	female	male	female	male	female
None	13.35	16.09	11.41	14.27	15.85	18.52
FSLC	6.97	7.95	5.19	6.33	9.27	10.12
MSLC	0.42	0.26	0.21	0.09	0.69	0.50
Vocational	0.09	0.11	0.02	0.06	0.18	0.17
JSS	20.43	20.81	19.66	19.15	21.44	23.03
O Level	32.97	31.13	36.83	35.92	27.98	24.75
A Level	3.34	2.19	3.71	2.48	2.88	1.80
Nursing	4.08	3.89	4.92	4.98	2.99	2.44
BA/BSC/HND	5.67	3.73	8.08	5.35	2.56	1.56
Certificate	2.76	1.75	3.47	2.26	1.84	1.07
Masters	0.06	0.03	0.08	0.04	0.04	0.02
Doctorate	0.06	0.07	0.05	0.07	0.07	0.07
other	9.80	11.99	6.38	9.01	14.22	15.95
Total	100.00	100.00	100.00	100.00	100.00	100.00

Source: Author's calculations from NLSS 2003/4

Table 4-2: Educational Attainment of Carers of Children and their Partners*

Carer	Partner					
	none	primary	secondary	higher	non-standard	Total
None	6,857	717	584	133	204	8,495
Primary	369	2,236	838	185	35	3,663
Secondary	160	509	2,252	394	16	3,331
Higher	10	31	112	588	2	743
Non-standard	24	19	20	13	385	461
Total	7,420	3,512	3,806	1,313	642	16,693

Source: Author's calculation from MICS3

* number of cases

Table 4-3: Classification scheme for Nigerian Languages

Main Classification							Common Language
Niger-Congo	Atlantic-Congo	Northern Ijoid					Fulani Izon; Ijaw
		Volta-Congo	Benue-Congo	Bantoid	North	…	
					South	Ekoid	
						Jarawan	
						Tivoid	Tiv
				Cross Rivers	…		
					Delta	…	
						Central Delta	Obobolo
						Ogoni	Ogoni
				Yoruboid	Edekiri	Yoruba	Yoruba
				Edoid			Edo Esan
				Igboid			Igbo
				Jukunoid			Jukun
				Kainji			Bassa
				Nupoid			Nupe
				Plateau			Berom; Izare; Idoma
Afro-Asiatic	Chadic	Biu-Mandara	…				
			West	Hausa			Hausa
		Semitic					
Nilo-Saharan	Saharan						Kanuri
	Songhai						Zabarma/Zabarchi

Notes: 1. All others put 'Other' category

2. NDHS1 uses a different set of major classification (Adamawa, Ebira, Ekoid, Jarawan, Mambiloid, Tivoid, Biu-Mandara, Cross River, Ede-Yoruba, Edo, Fulfulde, Idoma, Igbo, Ijaw, Junkenoid, Nupe, Plateau, Sahara, Semitic, West Chadic). NDHS2 & 3 use lists of 224 languages

Table 4-4: Mother Tongue and Religion of Carers

Language group*		Religion of head (%)			%	
		Christian	Islam	Other	%	
Niger-Congo	Not known	75.93	22.36	1.71	100	11.99
	Atlantic	0.41	99.59	0	100	6.01
	Ijoid	93.11	0.08	6.81	100	1.85
Benue-Congo	Bantoid	70.41	26.44	3.15	100	3.59
	Cross-Rivers	98.1	0	1.9	100	2.61
	Yoruboid	51.2	47.87	0.93	100	22.63
	Igboid	91.77	3.11	5.12	100	14.22
	Kainji	39.04	47.26	13.7	100	0.57
Afro-Asiatic	Hausa	2.89	97.0	0.11	100	30.2
Nilo-Saharan	Kanuri	0.27	99.73	0	100	2.72
	Other	86.18	12.4	1.42	100	3.61
Total		44.79	53.61	1.59	100	100

Source: MICS3

* Not known	Agbo, Ananaju, Beriberi, Esan, Gwari, Ibibio, Ibolo, Isoko, Jarawa, Jukun, Kamue, Kilba, Lubgudu, Mada, Marwa, Ogbia, Okun, Sayawa, Taroh, Waja, Zarmanchi
1 NC Atlantic	Fulani
2 NC Ijoid	Ijaaw, Izon, Nembe, Okrika
3 Bantoid	Chamba, Jaranhi, Mambila, Tiv
4 Cross-Rivers	Abua, Anang, Efik, Ogoni, Oron, etc..
5 Yoruboid	Alago, Bini, Ebira, Ekiti, Epie, Etsako, Gbagyi, Nupe, Uhrobo, Yoruba, etc.
6 Igboid	Ekeye, Iroma, Igala, Igbo, Igede, Ikwere, etc.
7 Kainji	Amoh, Bassa, Dakarchi, Kambari, Kamuku
8 Chadic	Babur, Bogghom, Bura, Geranci, Gude, Hausa, Karekare, Marghi, Pia, Shuwa, Tangale, Wutkum, etc.
9. Kanuri	Kanuti, Manga, etc.
10. Other	Adara, Berom, Eggon, Jaba, Koro, Migilli, Mumuye, Rindre, Wanno, etc.

Table 4-5: Educational Level, Religion and Ethnicity

Religion of head		Highest level of school attended					Total
		none	primary	secondary	higher	non-standard	
Christian		18.98	33.56	38.23	9.12	0.12	100.00
Islam		69.19	14.35	10.79	2.50	3.17	100.00
Other		43.90	38.02	16.43	0.74	0.91	100.00
Total		46.34	23.32	23.14	5.43	1.77	100.00
MT of Carer*							
Not known		32.83	30.67	29.98	5.57	0.95	100.00
NC	NC Atlantic	87.58	6.28	3.12	0.59	2.42	100.00
	NC Ijoid	25.04	32.11	39.95	2.90	0.00	100.00
	Bantoid	58.40	24.07	15.80	1.73	0.00	100.00
NC - BC	Cross-Rivers..	17.14	45.93	32.16	4.77	0.00	100.00
	Yoruboid	18.15	31.64	37.87	12.16	0.18	100.00
	Igboid	14.82	33.97	42.28	8.80	0.13	100.00
	Kainji	74.37	22.95	2.31	0.00	0.37	100.00
AA	Hausa.	77.77	11.29	5.32	1.17	4.45	100.00
NS	Kanuri.	87.82	3.38	4.25	1.37	3.18	100.00
Other		41.64	28.35	26.63	3.08	0.30	100.00
	Total	46.34	23.32	23.14	5.43	1.77	100.00

Source: Author's calculations from MICS3

* For common languages in each classification see note to the preceding table

Table 4-6: Level of Carers' Schooling by Language, Group and Religion

Language of Carer	Religion of head	Highest level of school attended					
		none	primary	secondary	higher	non-standard	Total
Not known	Christian	20.13	35.84	37.00	6.80	0.22	100
	Islam	75.56	12.60	6.51	1.85	3.48	100
	Other	34.77	38.74	26.49	0.00	0.00	100
NC Atlantic	Christian	62.43	16.33	17.69	3.55	0.00	100
	Islam	87.68	6.24	3.06	0.58	2.43	100
	Other						
NC Ijoid	Christian	23.99	31.85	41.04	3.12	0.00	100
	Islam	0.00	100.00	0.00	0.00	0.00	100
	Other	39.36	36.01	24.63	0.00	0.00	100
Bantoid	Christian	43.97	32.15	21.42	2.46	0.00	100
	Islam	94.00	3.97	2.02	0.00	0.00	100
	Other	80.80	12.80	6.40	0.00	0.00	100
Cross-Rivers	Christian	16.95	45.66	32.79	4.60	0.00	100
	Islam						
	Other	26.68	59.98	13.34	0.00	0.00	100
Yoruboid	Christian	10.50	32.57	40.69	16.07	0.17	100
	Islam	25.94	30.80	34.90	8.18	0.19	100
	Other	41.58	23.89	34.53	0.00	0.00	100
Igboid	Christian	12.55	33.06	44.89	9.49	0.00	100
	Islam	52.40	31.15	13.58	1.94	0.93	100
	Other	32.33	51.66	13.30	0.71	1.99	100
Kainji	Christian	54.08	39.02	5.95	0.95	0.00	100
	Islam	83.52	16.48	0.00	0.00	0.00	100
	Other	100.00	0.00	0.00	0.00	0.00	100
Hausa	Chistian	61.26	16.77	19.81	2.17	0.00	100
	Islam	78.24	11.14	4.90	1.14	4.59	100
	Other	100.00	0.00	0.00	0.00	0.00	100
Kanuri	Christian	100.00	0.00	0.00	0.00	0.00	100
	Islam	87.79	3.38	4.27	1.38	3.19	100
Other	Christian	37.46	29.47	29.17	3.55	0.35	100
	Islam	66.48	21.35	11.97	0.19	0.00	100
	Other	78.85	21.15	0.00	0.00	0.00	100

Source: MICS3

Table 4-7: Carers' Education, Mother Tongue and Religion

Dependent variable: carers' education*	_1	_2	_3	_4
Muslim	-1.542***		-0.968***	-1.112***
	-0.02		-0.033	-0.046
Other	-0.699***		-0.732***	-0.729***
	-0.07		-0.077	-0.083
Fulani		-1.517***	-0.990***	-0.887***
		-0.06	-0.066	-0.07
Izon		0.589***	0.199**	0.160*
		-0.063	-0.065	-0.066
Tiv		-0.505***	-0.683***	-0.641
		-0.057	-0.06	-0.34
Yoruba		0.768***	0.388***	0.348***
		-0.077	-0.08	-0.08
Igbo		0.481***	0.582***	0.274
		-0.036	-0.041	-0.266
Bassa		0.802***	0.490***	0.458***
		-0.039	-0.042	-0.043
Hausa		-0.965***	-0.860***	-0.843***
		-0.112	-0.119	-0.12
Kanuri		-1.155***	-0.668***	-0.570***
		-0.034	-0.043	-0.048
Other		-1.506***	-0.974***	-0.869***
		-0.082	-0.087	-0.09
mt3_11		0.006	-0.258***	-0.277***
		-0.053	-0.056	-0.056
bantoid_christ				-0.017
				-0.344
bantoid_muslim				-0.21
				-0.365
yoruba_christ				0.136
				-0.268
yoruba_muslim				0.521
				-0.27
_cons	0.740***	0.132***	0.566***	0.605***
	-0.02	-0.026	-0.031	-0.032
r2_p	0.234***	0.268***	0.318***	0.320***
N	17093	17382	17093	17093

Source: MICS3

* Probit regression with dependent variable = 21 if carer has primary or above education. Base levels are 'Christian' for religion and 'Not known' for language groups. We have used the best-known language of the language group as labels.

Table 4-8: Child HAZ, Parental Education, Religion and Ethnicity

Dependent variable					
WHO HAZ	1	2	3	4	5
Muslim	-0.693***	-0.538***	-0.617***	-0.225***	-0.257***
	-0.034	-0.04	-0.04	-0.054	-0.054
Other	-0.264*	-0.139	-0.146	-0.165	-0.113
	-0.134	-0.134	-0.135	-0.135	-0.135
Careers' primary		0.065		0.055	0.008
		-0.047		-0.06	-0.061
Carers' secondary		0.429***		0.339***	0.186**
		-0.046		-0.065	-0.068
Partners' primary			0.016	-0.123*	-0.158**
			-0.049	-0.06	-0.06
Partners' secondary			0.218***	-0.077	-0.162**
			-0.047	-0.062	-0.062
Partners' higher			0.418***	0.107	-0.092
			-0.066	-0.08	-0.083
Fulani				-0.640***	-0.600***
				-0.096	-0.095
Izon				-0.163	-0.198
				-0.134	-0.134
Tiv				0.307**	0.399***
				-0.099	-0.099
Yoruba				-0.331**	-0.364**
				-0.114	-0.114
Igbo				-0.121*	-0.223***
				-0.059	-0.06
Bassa				0.044	-0.011
				-0.063	-0.063
Hausa				-0.358	-0.339
				-0.228	-0.227
Kanuri				-0.658***	-0.660***
				-0.068	-0.068
Other				0.389**	0.407***
				-0.121	-0.121
wlthscor					0.184***
					-0.023
Constant	-0.953***	-1.176***	-1.094***	-1.032***	-0.908***
	-0.025	-0.04	-0.042	-0.056	-0.058
r2_a	0.027***	0.034***	0.032***	0.050***	0.054***
N	14483	14483	14143	14143	14143

Source: Author's calculations from MICS3

Note: Base variables are Christian, carers and partners with no education, and 'not known' for ethnic group

4.2.1 UPE tables

Table 4-9: Difference in Difference Design			
	Cohort exposure		
States by UPE intensity	Not exposed (born before 1970)	Exposed (born 1970-1975)	Treatment effects
Low (South-western)	X00	X01	X01-X00
High (other)	X10	X11	X11-X10
Double difference effect			(X11-X10)/ (X10-X00)
False treatment	$X0^{1}0$ 1950-55 (21-26 in 1976)	X00 1956-61 (15-20 in 1976)	X00-$X0^{1}0$

Table 4-10: Summary Statistics of Variables used in DD regressions				
	author		Osili & Long	
	mean	sd	mean	sd
children born at time of survey	2.38	2.85	2.16	2.78
children born before 25 years	1.34	1.68	2.35	1.81
children born before16 years	0.11	0.39	0.14	
children born before 18 years	0.27	0.64	0.25	
years of education	4.98	4.80	5.00	4.71
completed seven years education or more	0.34	0.47	0.34	0.47
old	0.10	0.29		
young	0.18	0.38		
highintensity	0.82	0.38	0.82	
muslim	0.44	0.50	0.44	
christian	0.54	0.50	0.54	
other_religion	0.02	0.14	0.02	
hausa	0.19	0.39	0.24	
yoruba	0.20	0.40	0.22	
igbo	0.16	0.37	0.14	
All other ethnicities	0.45	0.50	0.40	
fulani	0.04	0.20		
crossriver	0.07	0.26		
kanuri	0.01	0.08		
tiv	0.02	0.13		
edo	0.02	0.15		

Source: Author's calculations from NDHS2 (1999).

Table 4-11: Mean differences in years of education and (early) births between test (HI) and control (LO) cohorts

	years of education			Births before 25		
UPE	cohort			cohort		
NDHS2	1956-61	1970-75	Diff.	1956-61	1970-75	Diff.
LI	6.12 (.413)	8.41 (.234)	2.29 (.44)	1.83	1.49	-0.34
HI	2.58 (.156)	5.59 (.125)	3.01 (0.22)	2.48	2.08	-0.40
Difference in difference[1]	3.53 (.37)	2.81 (.323)	0.72			-0.06
False experiment (NDHS2)	1949-55	1956-61	Diff.	1949-55	1956-61	Diff.
LI	4.07	6.12	2.05	1.89	1.83	-0.06
HI	2.13	2.59	0.46	2.40	2.48	0.08
Difference in difference	1.94	3.53	-1.59	-0.51	-0.65	0.14
NDHS2	1956-61	1962-67	Diff.	1949-55	1956-61	Diff.
LI	6.12	7.77	1.65			
HI	2.59	4.46	1.88			
Difference in difference	3.53	3.31	0.23			
NDHS3				Births before 30		
LI	5.23	8.35	3.12	3.50	2.32	1.19
HI	2.79	5.02	2.22	4.26	3.70	0.56
Difference in difference			-0.90			0.63
	MICS3			Children ever born[2]		
LI	6.79	8.50	1.71	5.43	3.63	-1.80
HI	3.96	4.60	0.64	6.07	4.30	-1.77
Difference in difference			-1.07			0.03

Source: author's calculations from NDHS2

Notes: 1. The difference in difference figure reports the difference between the UPE cohort in HI states and that in LI states compared to the pre-UPE cohort. For years of education the difference should be positive if UPE increased years of education more in HI states than in LI states and negative for births if HI UPE exposure reduces fertility more than in LI states.

2. Obviously, the UPE cohort will not have completed their reproductive years by 2007 since the oldest will be 37 and the youngest 31 years old. MICS does not allow calculation of births by age, but only of children ever born. Nevertheless, the age-specific fertility of women in NDHS3 for all of Nigeria less than 34 years old was 3.13 and that for women of 34 and above was 1.49, suggesting that the younger women who experienced UPE will not have completed their reproductive lives.

Table 4-12: Difference in Difference UPE with High Intensity Dummy Variable (NDHS2)

Panel A	yearsedn			childrenbornlt25		
		Add state Fixed Effects	Add state a & year of birth Fixed Effects		Add state Fixed Effects	Add state a & year of birth Fixed Effects
I_k*$C_{70\text{-}75}$	0.818	0.797	0.770	-0.098	-0.078	-0.087
	(1.884)	(1.885)	(1.824)	(-0.569)	(-0.457)	(-0.512)
$C_{70\text{-}75}$	2.015***	2.062***	2.698***	-0.286	-0.301	-0.809**
	(5.178)	(5.439)	(4.312)	(-1.861)	(-1.955)	(-3.276)
I_k	-1.491***	1.644*	1.725*	0.309	0.000	0.000
	(-3.597)	(2.051)	(2.158)	(1.891)	(.)	(.)
r2	0.357	0.399	0.409	0.078	0.090	0.110
Number of obs	2603	2603	2603	2608	2608	2608
Difference in Difference UPE with UPE Expenditure Variable						
Panel B	yearsedn			childrenbornlt25		
I_k = Fed. Gov't UPE FUnds		Add state dummies	Add state & yob		Add state dummies	Add state & yob
I_k*$C_{70\text{-}75}$	0.006*	0.006*	0.007*	-0.002	-0.002	-0.002
	(2.027)	(2.244)	(2.482)	(-1.562)	(-1.651)	(-1.695)
$C_{70\text{-}75}$	2.128***	2.126***	2.625***	-0.201	-0.192	-0.692**
	(6.738)	(6.922)	(4.373)	(-1.614)	(-1.539)	(-2.958)
I_k	-0.001	-0.011**	-0.012**	0.001	0.004*	0.004*
	(-0.418)	(-2.734)	(-2.905)	(1.018)	(2.259)	(2.455)
r2	0.356	0.400	0.410	0.077	0.091	0.111
Number of obs	2603	2603	2603	2608	2608	2608

Source: Author's calculations from NDHS2

* p<0.05, ** p<0.01, *** p<0.001; 't' values in brackets

Controls do not include proportion of females in total enrolment in 1970, nor proportion of civil servants who are female when the individual was 6, as used by O&L, due to lack of access to the data. However, we doubt that this causes the difference in results, as discussed below.

We include coefficients for $C_{70\text{-}57}$ & I_k in specification 2, 3, 4 & 5 and 3 & 6 respectively, despite the change in interpretation due to inclusion of state and yob fixed effects.

Table 4-13: Difference in Difference UPE with High Intensity Dummy Variable (O&L Table 3)

	yearsedn			childrenbornlt25		
		Add state dummies	Add state a& yob		Add state dummies	Add state a& yob
I_k*$C_{70\text{-}75}$	1.632* (1.77)	1.573* (1.76)	1.537* (2.22)	-0.098 (-0.569)	-0.078 (-0.457)	-0.087 (-0.512)
$C_{70\text{-}75}$	-0.297 (0.14)	-1.188 (0.61)		-0.286 (-1.861)	-0.301 (-1.955)	-0.809** (-3.276)
I_k	-1.491*** (-3.597)	1.644* (2.051)		0.309 (1.891)	0.000 (.)	0.000 (.)
r2 Number of obs	0.357 2603	0.399 2603	0.409 2603	0.078 2608	0.090 2608	0.110 2608
Difference in Difference UPE with UPE Expenditure Variable						
	yearsedn			childrenbornlt25		
I_k = Fed. Gov't UPE Funds		Add state dummies	Add state a& yob		Add state dummies	Add state a& yob
I_k*$C_{70\text{-}75}$	0.007 (1.61)	0.007* (1.72)	0.008* (2.43)	-0.003** (2.00)	-0.003** 2.24)	-0.003*** (2.91)
$C_{70\text{-}75}$	1.903 (1.41)	1.144 (0.90)		1.874*** (2.80)	1.922*** (2.78)	
I_k	-0.001 (-0.24)	-0.012** (-2.30)	-0.012** (-2.40)	0.002 (1.18)	0.001 (0.56)	0.001 (0.125)
r2 Number of obs	0.383 2646	0.395 2646	0.407 2646	0.096 2646	0.104 2646	0.125 2646

Source: O&L Table 3

* p<0.05, ** p<0.01, *** p<0.001; 't' values in brackets

Controls do not include proportion of females in total enrolment in 1970, nor proportion of civil servants who are female when the individual was 6, as used by O&L, due to lack of access to the data. However, we doubt that this causes the difference in results as discussed below.

Table 4-14: Effects of Collinear Control Variables on Estimates of UPE on Years of Education					
	yearsedn				
	1[a]	2	3	4	5[b]
UPE cohort * highintensity	0.721 (1.269)	1.941** (3.236)	1.500* (2.452)	0.638 (1.157)	1.605* (2.272)
UPE cohort	2.083*** (3.962)	-5.298*** (-3.617)	-2.755* (-2.002)	2.191*** (4.322)	-2.727 (-1.795)
High Intensity UPE State	-1.493 (-1.798)	-1.238 (-1.609)	-0.829 (-1.055)	-0.268 (-0.346)	-0.911 (-1.330)
muslim	-0.112 (-0.185)	0.558 (1.051)	0.660 (1.239)	0.645 (1.190)	0.599 (1.232)
christian	3.874*** (6.263)	3.886*** (7.017)	3.860*** (6.961)	3.860*** (6.819)	3.951*** (8.526)
hausa	-1.432*** (-4.685)	-0.894** (-3.250)	-0.716* (-2.529)	-0.718* (-2.527)	-0.843** (-2.821)
yoruba	1.927** (3.122)	1.936*** (3.477)	1.857** (3.315)	1.863** (3.307)	1.880*** (5.243)
igbo	1.365*** (3.514)	0.805* (2.060)	0.745 (1.920)	0.754 (1.944)	0.693* (2.201)
young_f_shareprimary education_1975		16.136*** (5.414)	10.655*** (3.927)		10.439*** (3.464)
f_share_civilservants19_75		9.182 (1.924)	6.766 (1.381)	6.613 (1.352)	6.544 (1.708)
f_share_primaryenrolment_1975			7.483* (2.520)	14.411*** (4.757)	6.174* (2.135)
r2 Number of obs	0.354 2603	0.379 2603	0.381 2603	0.378 2603	0.381 2603

Source: Author's calculations from NDHS2. 't' values in brackets.
p<0.05, ** p<0.01, *** p<0.001
Notes: no additional controls included – i.e. controls for state and year of birth not included.

a. estimate with Stata svy: regress command with states as strata and v001 as cluster and v005 as weights
b. With robust standard errors clustered on year of birth * state (ass in O&L)

Table 4-15: Variable Inflation Factors, Column (5) Table 4-14

Variable	VIF[$]	1/VIF
UPE Cohort	60.44	0.017
UPE Cohort * Female Share of Primary Enrolment 1975	43.83	0.023
Muslim	12.09	0.083
Christian	11.36	0.088
UPE Cohort * HI state	8.76	0.114
Female Share of Primary Enrolment 1975	5.01	0.199
Female Share of Primary Enrolment 1975	4.8	0.209
yoruba	2.37	0.423
Female Share of Civil Service Employment 1975	1.74	0.574
hausa	1.68	0.594
igbo	1.32	0.759
Mean VIF	13.95	

Source: author's calculations
Note: $. Variable Inflation Factor

Table 4-16: MICS3: Mean differences in Years of Education and Children Ever Born by Exposure to UPE

	years education			Children ever born5		
UPE exposure	cohort			cohort		
MICS3	1956-61	1970-75	Diff.	1956-61	1970-75	Diff.
LI	6.79	8.50	1.71	5.43	3.63	1.80
HI	3.96	4.60	0.64	6.07	4.30	1.77
Difference in difference[1]	2.83	3.90	-1.07	-0.64	-0.67	0.03
	Proportion completed 7 years primary education			Children died		
LI	0.36	0.50	0.13	0.69	0.36	0.33
HI	0.18	0.26	0.07	1.07	0.66	0.41
Difference in difference[1]	0.18	0.24	-0.06	-0.38	-0.30	-0.08

Source: Author's calculation from MICS3

Table 4-17: Difference in Difference UPE with UPE Expenditure per Capita						
	Years of education			Children ever born		
	1	2	3	4	5	6
young_high	-0.542 (-0.775)	0.200 (0.305)	0.232 (0.363)	-0.310 (-1.127)	-0.466 (-1.680)	-0.503 (-1.855)
exposed to UPE	2.102** (3.187)	1.493* (2.427)	1.488 (1.888)	-1.656*** (-7.177)	-1.536*** (-6.534)	-0.604 (-1.775)
high intensity UPE state	-2.291* (-2.330)	-1.734 (-1.672)	-1.592 (-1.558)	1.016*** (3.335)	0.760 (1.894)	0.820* (2.065)
r2 Number of obs	0.325 4622	0.392 4622	0.401 4622	0.109 4730	0.168 4730	0.184 4730
UPE expenditure per capita	Years of education			Children ever born		
young_funds	-0.004 (-0.986)	0.001 (0.263)	0.000 (0.137)	-0.003 (-1.938)	-0.004* (-2.195)	-0.004* (-2.138)
exposed to UPE	2.134*** (4.588)	1.556*** (3.578)	0.000 (.)	-1.609*** (-7.311)	-1.548*** (-7.119)	0.000 (.)
capita1	-0.001 (-0.342)	0.006 (1.184)	0.006 (1.226)	0.006*** (3.367)	0.005* (2.514)	0.005* (2.537)
r2 Number of obs	0.306 4622	0.392 4622	0.401 4622	0.106 4730	0.169 4730	0.184 4730
Source: Author's calculations from MICS3 * p<0.05, ** p<0.01, *** p<0.001						

4.3 Human capital figures

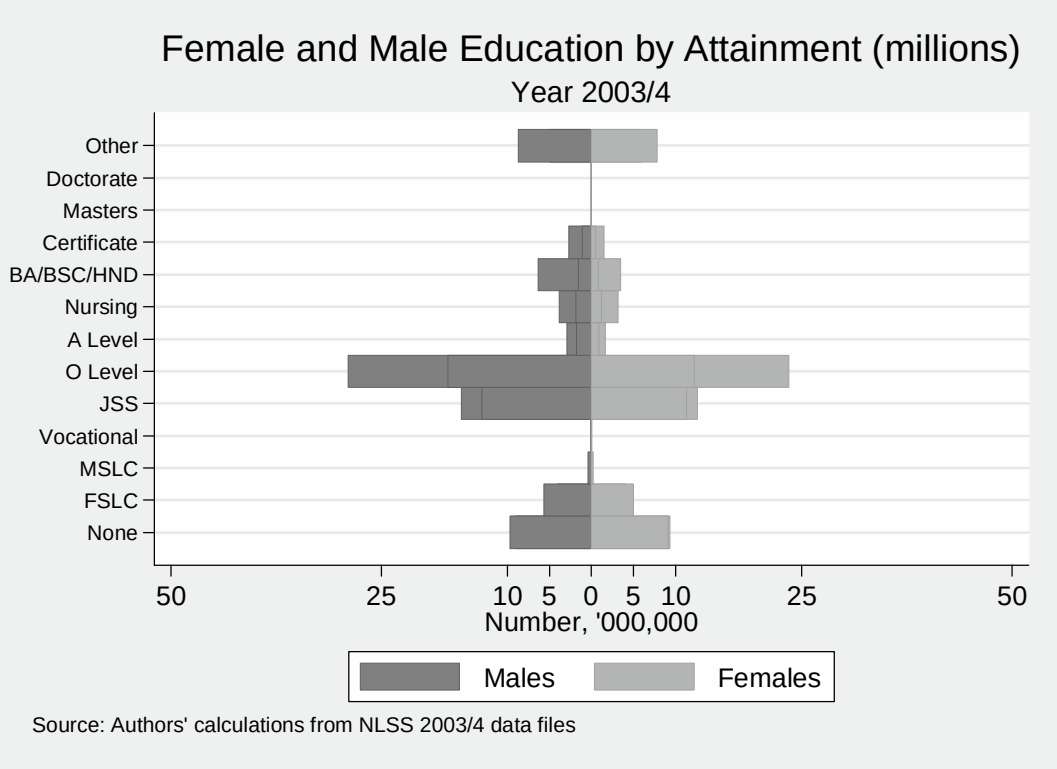


Figure 4-1: Male and Female Educational Attainments, Nigeria 2003/4

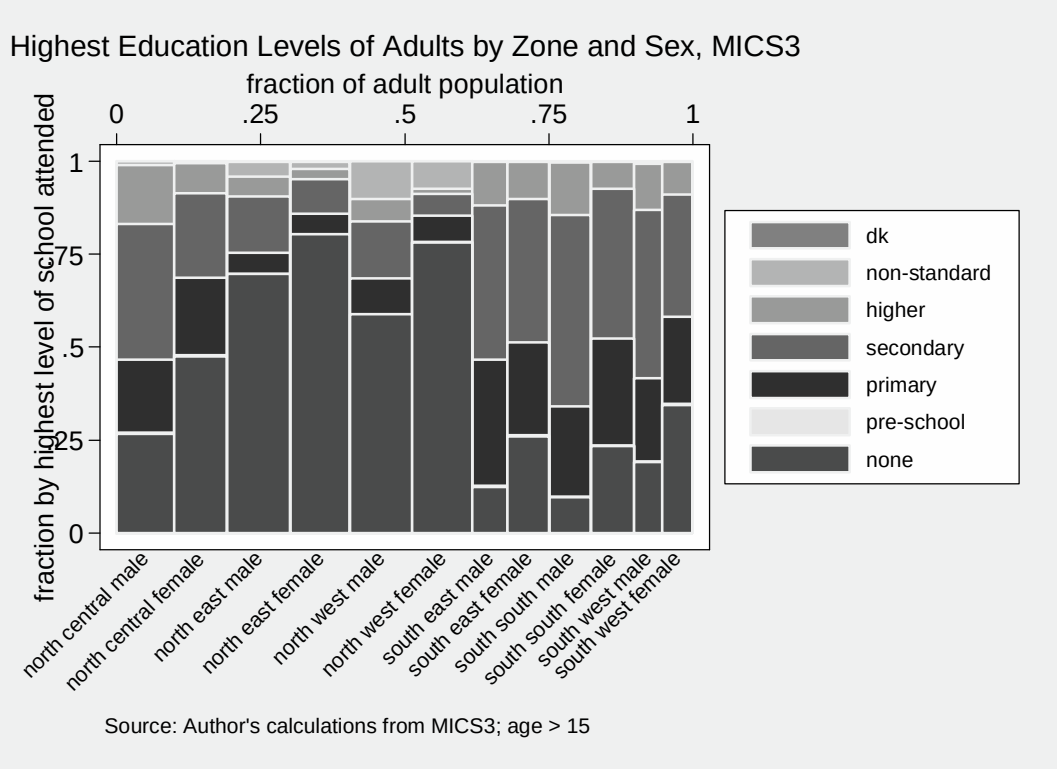
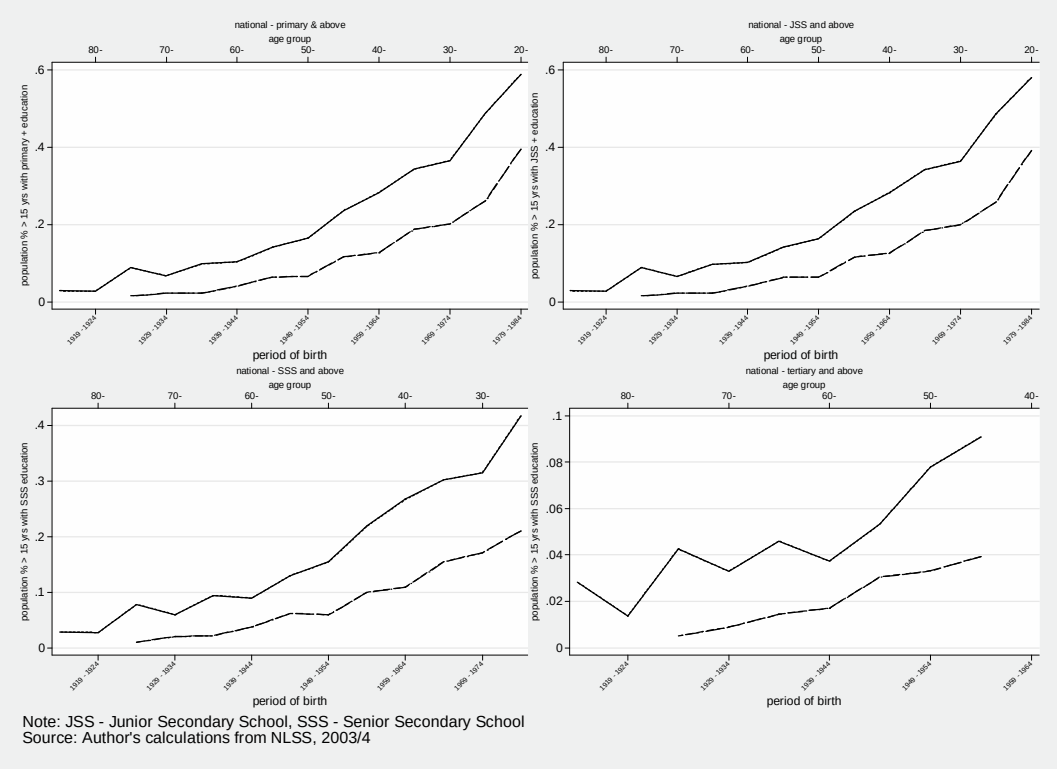


Figure 4-2: Levels of Education by Gender and Zone, Nigeria, 2006



Note: JSS - Junior Secondary School, SSS - Senior Secondary School
Source: Author's calculations from NLSS, 2003/4

Figure 4-3: Levels of Educational Attainments by Age and Level of Education, Nigeria 2003/4

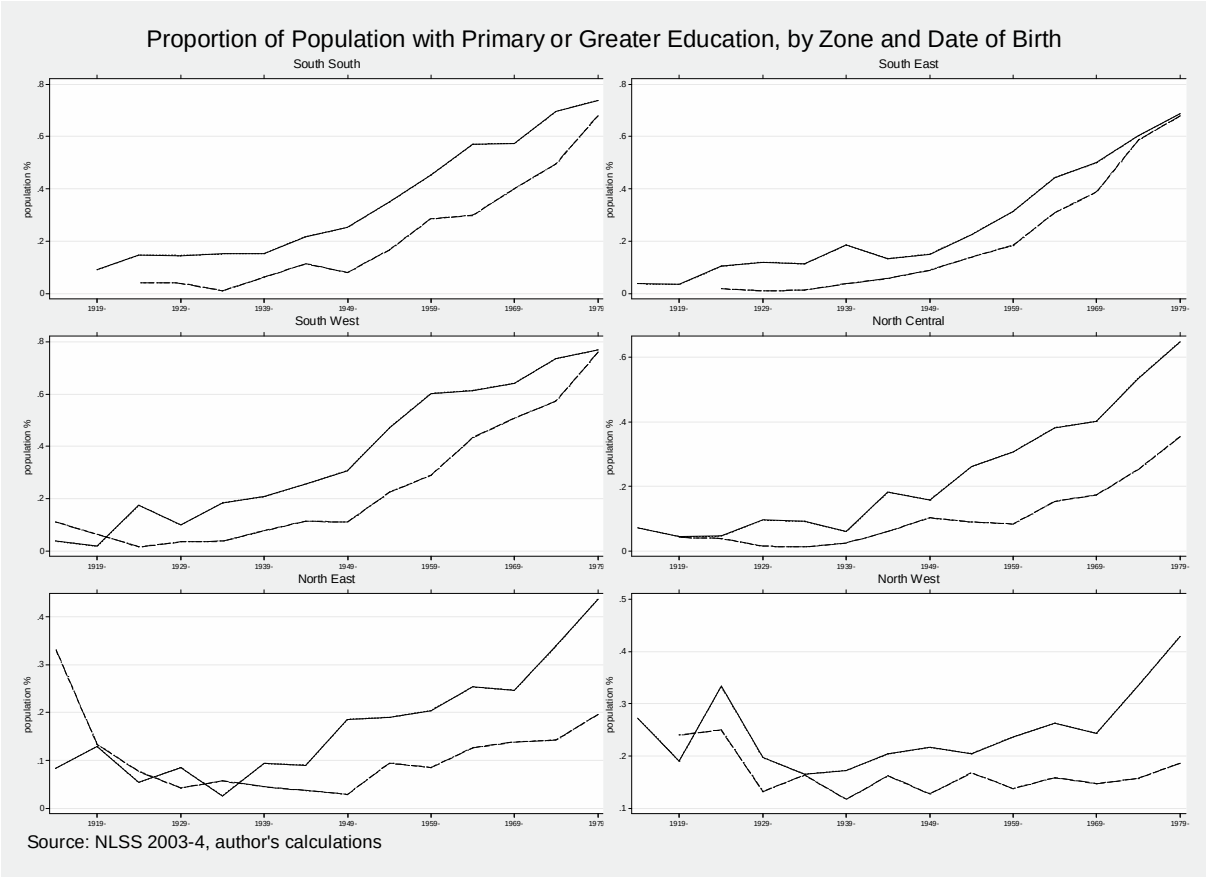


Figure 4-4 Zonal Levels of Education by Gender and Age, Nigeria 2003/4

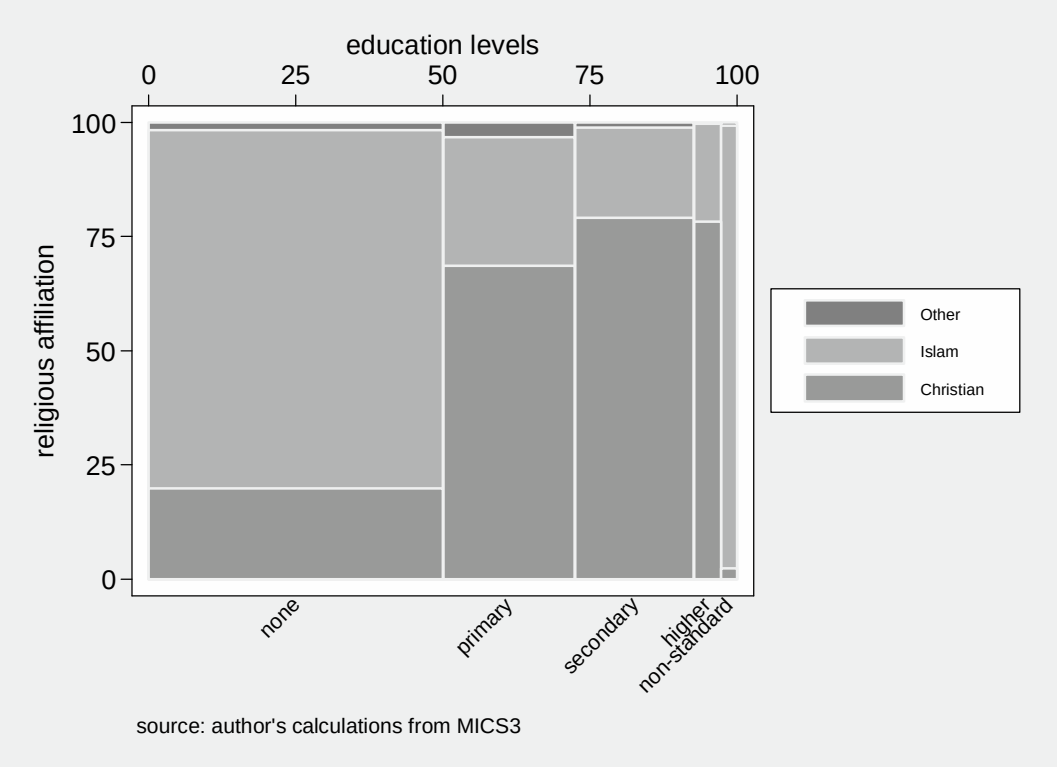


Figure 4-5: Educational Levels of Carers by Religious Affiliation

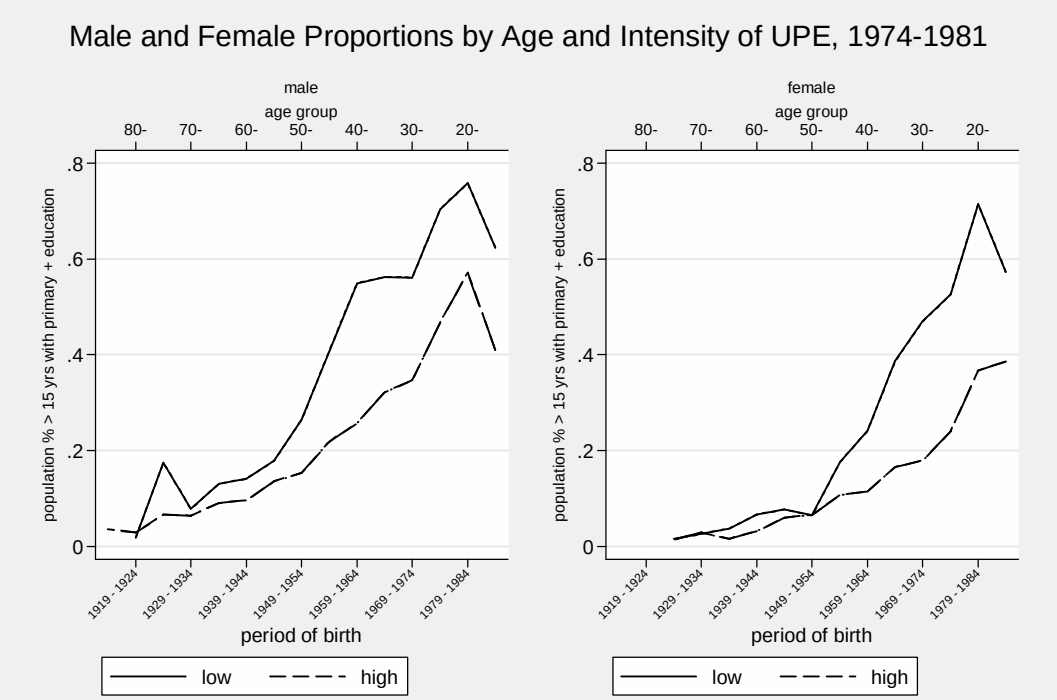


Figure 4-6: Impact of UPE by Intensity of UPE

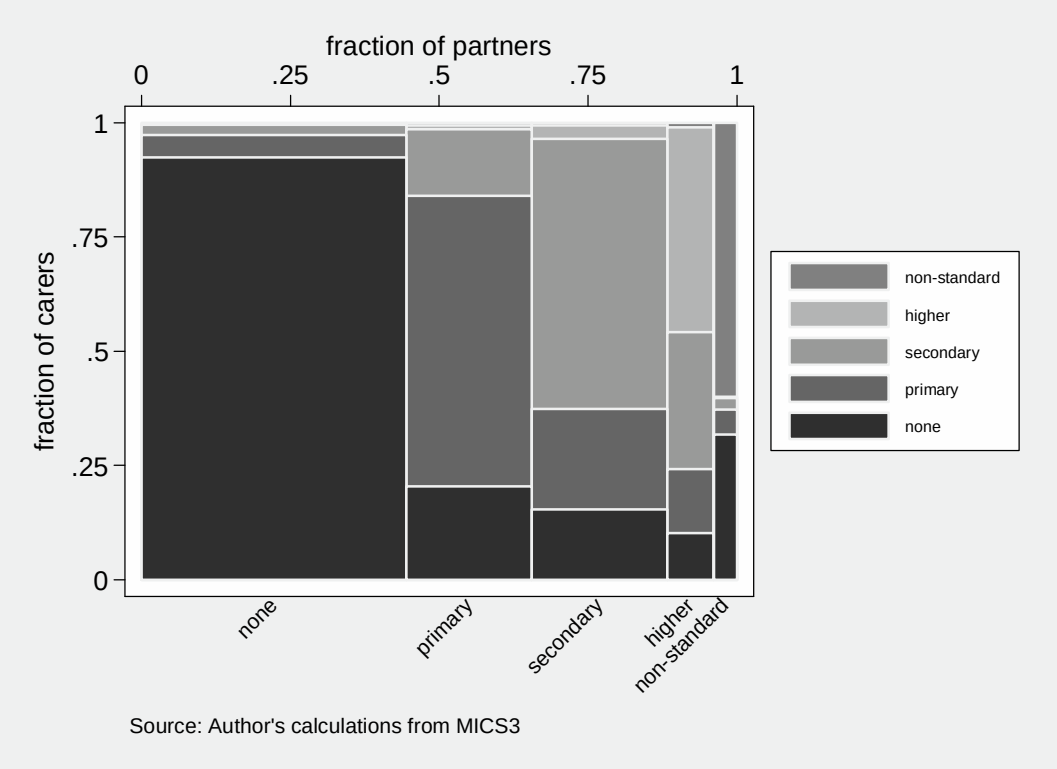


Figure 4-7: Association of Educational Attainments of Carers and Partners

5 Child mortality, fertility and education

Information on mortality in Nigeria was the basis of one of the most widely-quoted and almost certainly foundational texts on the association of maternal education with child mortality (Caldwell, 1979). Caldwell reported on a child mortality index computed for a sample of Yoruba speaking residents of Ibadan[59] and for a broader sample of residents of Western Nigeria and argued for 'the primacy of mother's education as a factor in depressing mortality' (p400). He claimed that ''[T]he preceding analysis has shown that maternal education is the single most significant determinant of these marked differences in child mortality' (p408). The single most telling evidence seemed to be the much lower estimated child mortalities of mothers whose education level was greater than that of the father: '[T]he most striking differences occur in the relatively small proportion of marriages where the wife is better educated that the husband' (p405). Subsequent literature has focussed on the links between maternal education and child mortality and other indicators of well-being, largely ignoring links with partner's education (for example, Schultz, 2002), even when it has been noted that father's education is also strongly associated with child well-being outcomes (see, among others, Trussell and Preston, 1982, UN, 1985). Below, we outline reasons why it may be a mistake to draw such conclusions from these types of evidence.

Child mortality and fertility are still very high in Nigeria, notwithstanding the large increases in mothers' and fathers' education since Caldwell's survey conducted in 1973, (Caldwell, 1979), and are strongly correlated with region, sector (rural or urban), ethnicity, religion, education and wealth; intervening variables such as health practices and hygiene assets are also aligned with these variables. As shown above, region, ethnicity and religion are highly correlated and it is unwise to settle on any one of these as determinants of fertility. The NDHS can be used to assess fertility and child mortality, although NDHS2 is deemed unreliable, even in its own report (National Population Commission, 2000). Figure 5-1 shows substantially lower estimated mortalities in NDHS2 than either the preceding or following surveys. Furthermore NDHS3 shows higher mortalities for equivalent periods than NDHS1, which raises questions about the reliability of these surveys, although, unlike NDHS2, doubts have not been raised in their official reports (FOS, 1992, National Population Commission, 2004). We use NDHS3 and NDHS1, but note the need for caution in interpreting results. MICS produce mortality and fertility statistics but these are not comparable because of methodological differences with the NDHS surveys.

5.1 Child mortality

Child mortality is still around 200 per 1000 live births (Figure 5-1) and has fallen by only about 1/5th since the 1970s from around 250 (Figure 5-2), notwithstanding the significant increases in maternal education achieved in this period. This compares unfavourably with neighbouring countries (Figure 5-3).

[59] In this survey we are told that there is no information on father's education (399), for which Caldwell has to rely on the smaller survey.

Child mortalities can be calculated from the NDHS; Figure 5-4 shows the hazard functions (chance of survival) calculated from NDHS3. Mortality rates are significantly higher in the north than in other zones (survival chances are lower) and for males relative to females especially in North Central and South East zones (Figure 5-4).

There is a strong association of parental education with child mortality (Table 5-2; Figure 5-5 and Figure 5-6). However, while the reduction in infant and child mortality is somewhat steeper for mother's compared to father's education a number of considerations mitigate against concluding that educating mothers is more effective in reducing mortalities than educating fathers. Firstly, we have already noted assortative mating, which means that the education of parents is correlated. Secondly, information on partners is biased with relatively more information missing on the partners of more educated mothers (Table 5-3). Since information on partners' education is supposed to be obtained by interviewing those partners (rather than indirectly from mothers) it is likely that the underrepresentation of partners of more educated women arises because of difficulties in locating and interviewing these people.

Thirdly, education is strongly related to economic status, which we can assess in the NDHS data only by using wealth indexes computed from indicators of household asset ownership. Table 5-4 below shows the association of parental education with wealth.

Another source of confounding in the Nigerian data is the variation in infant and child mortality between regions, religious affiliation and ethnic groups. As noted previously there are strong regional patterns of religion, ethnicity and education which make unpacking their individual contributions to mortality and fertility difficult. Figure 5-4 reports patterns of child survival by region and sex of child. Survival chances are higher in the south than the north and survival is particularly poor in the North East and North West.[60]

It is not easy to assert whether the poor mortality figures of the north are due to religion or ethnicity; Table 5-5 shows that the Hausa-speaking groups, together with other large largely northern groups (Kanuri and Fulani speakers) all have poor mortality statistics. Similarly, Islamic households (and adherents of tradition religion) have much worse mortality than Christian groups, but those of the Yoruba-speaking Islamic households are somewhat better than their Christian counterparts.

Table 5-6 shows the problems of separating the effects of maternal and paternal education on child mortality; columns 1-9 report the results of various simple hazard ratio estimates using Cox regression of infant and child mortality on parental education; the hazard ratio of the probability of a child dying by its fifth birthday. Columns 1 & 2, 3 & 4, 5 & 6 and 7 & 8 compare mothers' and partner's education for various specifications. There is no obvious difference in the pseudo R-square statistics between each pair of models, and coefficients of mother's education at each level of education are larger (have a larger impact on the hazard ratio), especially for the few mothers who have higher education. This may be readily accounted for by confounding factors, including assortative mating (educated women have educated partners), the predominance of mothers with higher education from the southern (Christian) areas and unobserved ability

[60] NDHS do not provide information on Nigerian states.

differences between men and women at each level of education. Father's education remains significant when mother's education is included in the model (column 7) and also when the wealth index is added (column 8). There is no obviously greater effect of mother's education than partner's education on girls' survival chances, and the addition of a wealth index affects the coefficients of both mothers' and fathers' education in similar ways. In both cases the coefficients on levels of education are reduced, especially for those with higher education.

5.2 Fertility

Fertility is also high in Nigeria, especially in the north. However, Table 5-7 shows that the difference in total fertility rate (TFR) between regions is not as large as might be expected. Generally, fertility is lower in the southern and North Central zones than in the North East and North West. However, within each region fertility declines with education of the mother, and to a lesser extent with education of the partner: this effect is similar in all zones. However, we need to note that the educational level of over a quarter of partners is missing: surprisingly more partners' education is missing for more educated females. Wealth is significant, but the effect seems larger in urban than rural sectors.

5.2.1 Maternal education, infant mortality and fertility revisited

To what extent has Caldwell's analysis of the crucial role of maternal education in mortality and fertility decline been vindicated? Very crudely, maternal years education for the fertile groups (aged 20-40) have increased significantly between the early 1970s, when Caldwell's survey (Caldwell, 1979) was conducted in Ibadan and Western Nigeria, and the first years of the 21st century. As Table 5-11 shows, average years of education of females have increased from around 1-4 to 5-6 years. However, fertility is still high, even in the southern regions where female school enrolment has been relatively high since the 1970s (Table 5-12 and Figure 5-7). Figure 5-8 shows that even in the South West, where primary education of the fertile group was already relatively high but has still increased since the time of Caldwell's survey, the total fertility rate has fallen little since the mid-1970s and remains at around 4.

While this evidence is based on broadly descriptive statistics, it does not seem to strongly support the arguments of O&L (2004) and Osili (2008) that the UPE has had a significant effect on fertility. Using data from NHS2 these authors use the 'natural experiment' estimate provided the spatially uneven implementation of UPE between 1974 and 1981 to estimate the effects of UPE on school enrolment and years of schooling and on fertility. Primary education enrolment was quite high in the Western Region prior to UPE and expenditures and physical investments under UPE were concentrated in non-Western Region states. Comparing those who went through the primary schooling system before UPE and those born just before UPE across LI and HI states (i.e. Western and non-Western regions) allows a difference-in-difference estimation of the impact of UPE. These papers argue that UPE increased female schooling and reduced fertility (number of births to women before their 25th year). One criticism of these papers is their use of the 1999 NDHS2, which was undertaken 20-25 years after UPE with the resultant restriction of fertility effects to up to 25 years of age; this means that the full effects of UPE are only partly observed. Thus UPE may have increased enrolment and reduced fertility up to 25

years of age but may have had little or no effect on total fertility if the main effect was to delay marriage and childbirth.

In any case, we can only partly replicate the results of these papers and our results suggest that the models used may not be robust to different specifications and have unacceptable levels of collinearity: without further work we prefer to drop this line of investigation.[61]

5.2.2 Education and health-seeking behaviour and outcomes

Education, especially of females, is thought to promote growth and improvements in well-being such as health and nutrition outcomes, both of which have intrinsic and instrumental values in the interrelationships with gender inequalities. However, health and nutrition will be the result of health endowments, environments and practices. If either health endowments or environment are unfavourable and perhaps unresponsive to short-term interventions, health practices may be a partial indicator of the longer-term contribution of education to growth and development. As we have seen above, neither years of completed education nor fertility have been particularly responsive to educational interventions, for example as shown in the analysis of UPE. In this section we explore whether health and nutrition practices and nutrition outcomes can be shown to be affected by development interventions and to what extent they are affected by contextual factors including culture and religious affiliation and gender relations. In particular we further explore relations between religious affiliation, ethnicity and health practices and outcomes.

Recently Antai and Antai (2008), Antai, (2009) and Antai et al. (2008) have addressed various of these issues, in particular the role of religious affiliation in Nigeria. Antai's (2008) focus on religious affiliation includes both assessment of the socio-economic and theological characteristics ('characteristics hypothesis' and 'particularised theology hypothesis' respectively) of the difference religious groups and raises the problem of separating ethnic from religious dimensions of the association of religion with variables of interest such as immunisation.

Variables such as ante- and post-natal care, medical attendance at birth, breastfeeding, the immunisation of children, their nutrition and nutritional status, incidence of illnesses and their treatment and so on can indicate short-term changes in health behaviour and responses to health-relevant interventions, including education. Explorations of these issues can also lead to greater understanding of inter-relationships between education, ethnicity and religion, and their effects on health behaviour and outcomes.

[61] There are a number of troubling features of these papers: in particular, not publishing details of the first-stage regressions and failure to test alternative specifications. There are significant differences between the specifications in the two papers which are not explained. It is not clear whether the estimations have taken account of the clustering of the sample, which will raise the standard errors and reduce significance levels. Robust estimators appear not to have been used – these also will raise standard errors. Our estimate using Stata survey commands suggests that the positive coefficient on 'young*high' in the regression on primary completion is no longer statistically significant.

Antai does not use ethnic characteristics in exploring the interrelationships among health behaviour and religious affiliation; nor do Antai et al. use the father's (partner's) educational status. However, these works do explore variables relating to female empowerment such as reported scope of decision making with respect to purchases, mobility outside the household, cooking, and use of media (newspapers, radio and television). The data source (NDHS3) also contains information on the perceived legitimacy of wife-beating under different circumstances.

We partially replicate these analyses using NDHS3 and, as in other parts of this work, explore the effects of introducing partners' education and ethnicity in order to clarify the legitimacy of claiming causal relations between female human capital and child well-being. Due to shortage of time we have not been able to conduct a similar analysis using the more recent MICS3, which could include the effects of Islamic religious leaders' resistance to the immunisation programme in 2003 & 2004.

5.2.2.1 Results

As noted above, this analysis has been truncated by shortage of time. However, it is clear from Table 5-13 that health-seeking behaviour in the form of full immunisation is associated with the variables reflecting religious affiliation and ethnicity and, in Table 5-14, mother's and partner's education, occupation and wealth. Further, we see that these variables are interrelated in that coefficients (odds-ratios) are strongly affected by the co-variates. For example, in columns 1, 2 & 3 we see that the odds-ratio on Muslim religious affiliation when only religious affiliation variables are present indicates a significantly lower propensity for a child to have a full set of vaccinations (0.18 relative to 'Christian = 1'), but when ethnic variables are included, the odds ratio is 0.53 and not statistically significantly different ($p<=0.05$) from the coefficient on Christian religious affiliation. The main ethnic variables remain significant; an interesting feature is the massive effect of including an interaction between Yoruba ethnicity and Muslim religious affiliation (columns 6 & 7), which indicates that the odds of complete vaccination for non-Yoruba Muslims is very low indeed.

Table 5-14 shows similar interrelationships of religious affiliation, ethnicity, parental education, occupation and wealth (using the DHS wealth index provided with NDHS3 data). In this table we see that both mother's and father's education have positive associations with the odds of full vaccination, even when religious affiliation and ethnicity are included, but when both mother's and father's education are included the father's education remains as significant as the mother's, if not more so. A similar interpretation applies to the logit regressions with mother's and father's occupations, although in these regressions we have not included religious affiliation. Inclusion of the wealth index renders father's occupational status insignificant, but the odds of full vaccination remain positively associated with mother's engagement in unskilled work. In a regression not reported here, inclusion of the wealth index in the regression in column 13 (adding it to both mother's and father's education), renders all the education coefficients insignificant.

We have further results of a similar nature where the dependent variable is partial immunisation, which is somewhat more common in Nigeria. Based on the time-limited exploration of these further regressions, and we do not add to the conclusion already

reached that there are complex relationships amongst religious affiliation, ethnicity, parental education, occupation and wealth that are jointly related to each other and to health-seeking behaviour, as indeed they are to health and nutrition outcomes. Our analysis does not contradict Antai's argument (2008) that both education and ethnic characteristics of households of particular religious affiliation are important, but shows little support for the 'particularised theology hypothesis'. Our analysis suggests that underlying ethnic and other locational characteristics (living in rural areas) play a large role in determining the way that religious affiliation is associated with health-seeking and health-achieving behaviour. Thus it is clear that Islamic affiliation among the Yoruba, and to an extent among those of Tiv, Cross Rivers and Edo ethnicity, is not characterised by low propensity to immunisation.[62]

[62] We have quite similar results when 'partial immunisation' is the dependent variable (i.e. a dichotomous variable with value 1 for those with any vaccination and 0 for those without any immunisation and excluding the fully immunised).

5.3 Education and health tables

Table 5-1: Infant and Child Mortality in Selected Areas

Country	0q1	0q5
Benin	89.0	150.0
Cameroon	87.0	149.0
Ghana	68.0	112.0
Niger	150.0	256.0
Nigeria	100.0	194.0
Sub-Saharan Africa	96.3	162.6
South Asia	62.0	82.9
World	51.4	74.9

Source: WDI, 2007, estimates for 2005

Table 5-2: Child Mortality Rates by Parental Education

Parent	Highest education	Neonatal	Peri-neonatal	Infant	Child	Under 5
Mother	None	52.6	58.8	108.3	135.2	228.9
	Primary	47.2	61.3	105.6	77.4	174.8
	Secondary	34.8	30.2	63.9	43.1	104.2
	Higher	56.3	15	70.4	24.4	93.1
Father	None	31.4	28.9	59.4	41.1	98
	Primary	55.8	61.4	113.7	146.5	243.5
	Secondary	53.9	60.6	111.3	84.7	186.6
	Higher	53.2	10.1	62.8	160.3	213
	don't know	53.2	10.1	62.8	160.3	213
Mothers'	Fathers'					
None	None	54.2	59.6	110.6	150.7	244.6
	Primary	53.1	68.6	118	114.9	219.4
	Secondary	47.4	50.1	95.1	107	191.9
	Higher	42	16	57.3	7	63.9
	don't know	104	0	104	410.2	471.6
Primary	None	54.8	70	121	135.4	240
	Primary	49.3	59.4	105.8	69.1	167.6
	Secondary	49.5	58	104.6	52.4	151.5
	Higher	10.6	68.6	78.5	56.9	130.9
	don't know	42.5	17.9	59.6	117.7	170.3
Secondary	None	117.1	69.7	178.6	54.1	223.1
	Primary	64.9	43.9	105.9	45.9	146.9
	Secondary	26.4	23.3	49.1	35	82.4
	Higher	19	26.1	44.7	50.4	92.8
	don't know					
Higher	None					
	Primary	81.7	0	81.7	0	81.7
	Secondary	0	39.5	39.5	24.7	63.2
	Higher	66.6	9.4	75.4	29	102.2
	don't know					

Source: Author's calculation from NDHS3

Table 5-3: Association of Partner's Education Levels and Missing Partner Information

Mother's highest educational level	Partner's highest education level None	Primary	Secondary	Higher	Don't know	Missing	Total
No education	1,927	548	279	86	13	152	3,005
Primary	256	511	377	98	16	408	1,666
Secondary	60	214	550	277	8	1,353	2,462
Higher	1	22	47	209	2	206	487
Total	2,244	1,295	1,253	670	39	2,119	7,620

Source: NDHS3

Table 5-4: Wealth Index by Parental Education

Carers' highest educational level	Partner's education level None	Primary	Secondary	Higher	Don't know	Total
NDHS1						
No education	-0.62	-0.32	-0.03	0.70	-0.24	-0.53
Primary	-0.33	0.12	0.34	0.59	0.18	0.10
Secondary	0.23	0.50	0.77	1.12	1.12	0.75
Higher		1.39	1.24	1.65	1.60	1.53
Total	-0.60	-0.07	0.37	1.00	-0.03	-0.30
NDHS3						
No education	-1.15	-0.80	-0.61	0.45	-1.15	-1.00
Primary	-0.99	0.13	0.11	0.26	0.31	-0.12
Secondary	-0.91	0.78	1.33	1.43	0.87	1.09
Higher	-1.74	1.04	1.16	2.15	2.79	1.96
Total	-1.13	-0.16	0.41	1.27	0.03	-0.36

Source: Author's calculations from NDHS1 & NDHS3

Table 5-5: Mortality by Language, Ethnicity and Religion of Respondent

	Neonatal	PNN	Infant	Child	Under-5
Language					
Hausa	50.2	49.1	96.9	134.3	218.2
Yoruba	23.4	32.2	54.9	33.8	86.8
Igbo	48.9	30.4	77.9	27.2	103
English	46	0	46	26.3	71
Other	49.8	62.3	109	98.4	196.7
Language*					
Hausa	48.4	51.2	97.1	135.7	219.7
Yoruba	32.3	35.3	66.5	37.8	101.8
Igbo	48.9	30.4	77.9	27.2	103
English	46	0	46	26.3	71
Fulani	55.2	54	106.2	146.1	236.7
Kanuri	46	49	92.7	186.7	262.1
Bantoid	62.6	79.1	136.7	29.2	162
Other/don't know	48	62.5	107.6	79.3	178.4
Religion					
Catholic	27.8	65.3	91.2	38.9	126.5
Protestant	52.7	46.9	97.1	52.2	144.2
Other Christian	44.9	39.2	82.3	52.8	130.8
Islam	47.1	52.9	97.5	131.7	216.3
Traditional	206.8	112.4	296	63.3	340.6
Islam North	46.8	55	99.2	132.3	218.4
Islam - Yoruba	24	23.5	47	47	91.7
Christian - Yoruba	40.1	45.2	83.5	29.9	110.9
Islam Fulani & Kanuri	50.6	52.8	100.7	159.8	244.4
Traditional	206.8	112.4	296	63.3	340.6

Source: NDHS3

Table 5-6 Child Mortality and Parental Education

	Model							
	1	2	3	4	5	6	7	8
mother_primary	-0.368***		-0.368***		-0.202***		-0.166***	-0.082***
	(0.0000)		(0.0000)		(0.0000)		(0.0000)	(0.0000)
mother_secondary	-0.716***		-0.713***		-0.379***		-0.371***	-0.185***
	(0.0001)		(0.0001)		(0.0001)		(0.0001)	(0.0001)
mother_higher	-1.411***		-1.413***		-0.862***		-1.237***	-0.931***
	(0.0003)		(0.0003)		(0.0003)		(0.0003)	(0.0003)
father_primary		-0.334***		-0.334***		-0.211***	-0.254***	-0.181***
		(0.0000)		(0.0000)		(0.0000)	(0.0000)	(0.0000)
father_secondary		-0.687***		-0.685***		-0.460***	-0.523***	-0.394***
		(0.0001)		(0.0001)		(0.0001)	(0.0001)	(0.0001)
father_higher		-0.821***		-0.819***		-0.439***	-0.482***	-0.268***
		(0.0001)		(0.0001)		(0.0001)	(0.0001)	(0.0001)
female*			-0.089***	-0.087***				
			(0.0000)	(0.0000)				
wealth index					-0.272***	-0.248***		-0.230***
					(0.0000)	(0.0000)		(0.0000)
r2_p	0.001***	0.001***	0.001***	0.001***	0.002***	0.002***	0.001***	0.002***
N	28123	27791	28123	27791	28123	27791	27791	27791

Source: Author's calculations from NDHS1

* child is female

Table 5-7: Total Fertility Rates by Educational Status of Parents and Zone

Mothers' educational attainment	Region North Central	North East	North West	South East	South South	South West	Total
No education	7.05	7.60	7.37	6.35	5.73	5.55	6.61
Incomplete primary	6.64	8.52	5.87	6.21	5.81	4.42	6.28
Complete primary	5.52	7.06	6.72	5.04	6.06	4.78	5.85
Incomplete secondary	5.41	5.14	5.04	3.91	5.57	4.10	4.84
Complete secondary	4.10	3.55	8.95	4.67	2.50	2.79	4.60
Higher	3.25	3.49	4.13	3.05	3.09	3.39	3.40
Total	6.54	6.61	6.51	5.17	5.59	4.96	5.89
Partner's educational attainment							
No education	7.08	7.81	7.43	6.32	7.09	5.93	6.94
Incomplete primary	6.58	7.70	6.80	6.09	8.35	7.15	7.11
Complete primary	7.23	8.30	7.20	5.97	5.48	5.21	6.55
Incomplete secondary	6.55	6.11	6.90	4.75	6.33	4.50	5.84
Complete secondary	5.42	5.59	7.94	5.18	4.72	4.06	5.45
Higher	5.75	5.97	6.36	5.27	5.04	5.17	5.59
Don't know	6.11	4.94	2.99	3.46	2.53	2.55	3.75

Source: Author's calculation from NDHS3

Table 5-8: Fertility Rates by Selected Covariates

Region	Variable	Value 1	2	3	4	5
North Central	Wealth group (all)	7.32	6.33	5.59	6.53	4.02
	Wealth group (rural)	7.08	5.69	7.08	5.56	7.79
	Wealth group (urban)	5.87	4.63	5.55	4.09	4.05
	Language	6.99	4.89	6.93	6.14	5.99
	Religion	5.97	6.34	4.86	6.87	8.56
North East	Wealth group (all)	7.57	7.81	6.7	6.45	5.13
	Wealth group (rural)	7.18	8.24	8.24	6.47	6.73
	Wealth group (urban)	7.68	6.84	5.81	4.95	3.29
	Language	7.44	1.88	0	5.52	6.53
	Religion	6.17	6.62	5.44	7.61	5.36
North West	Wealth group (all)	7.53	7.26	6.53	7.03	5.06
	Wealth group (rural)	7.58	7.48	6.94	7.2	8.61
	Wealth group (urban)	6.81	5.8	6.62	4.62	5.47
	Language	7.3	3.74	4.53	4.09	0
	Religion	5.51	5.61	4.84	7.25	7.98
South East	Wealth group (all)	6.87	4.62	4.18	3.45	3.82
	Wealth group (rural)	9.02	4.1	4.27	3.74	3.24
	Wealth group (urban)	5.91	5.28	2.7	4.13	4.22
	Language	0	0	4.63	3.56	0
	Religion	4.27	4.82	4.43	0	6.51
	Partner's education	7.09	6.32	5.86	5.04	2.53
South South	Wealth group (all)	7.19	5.86	6.15	3.93	3.36
	Wealth group (rural)	7.14	5.53	5.64	5.59	4.28
	Wealth group (urban)	6.79	6.28	4.1	2.53	4.16
	Language	0	2.77	4.1	5.36	5.68
	Religion	5.82	4.52	5.45	5.26	4.86
South West	Wealth group (all)	3.68	5.74	5.18	4.31	3.73
	Wealth group (rural)	3.68	2.97	6.12	3.92	4.91
	Wealth group (urban)	7.76	4.54	4.02	4.11	3.41
	Language	3.59	4.48	3.75	3.51	1.17
	Religion	4.45	4.41	4.17	4.7	5.33

Source: Author's calculations from NDHS3

Notes: Values of codes:

Mother's and partner's education: 1 none, 2 primary, 3 secondary, 4 higher, 5 other

Wealth Groups: 1-5 are wealth quintiles calculated over the groups indicated

Language: 1 Hausa, 2 Yoruba, 3 Igbo, 4 English, 5 Other; variable ***snlang*** was used, with language of interview ***slangint*** if substituted for Other.

Table 5-9: Total Fertility Rates by Language of Carer and Period before Survey

			NDHS1		
Language of interview	1987-89	1984-8	1981-3	1987-80	1975-7
Hausa	4.78	4.87	6.30	5.43	5.03
Yoruba	4.65	5.29	6.65	6.16	5.44
Igbo	4.72	5.60	6.57	6.64	5.84
English	3.98	4.97	6.24	6.28	5.78
Other	4.60	5.39	5.67	6.30	4.93
			NDHS3		
Language of respondent	2000-3	1997-9	1994-6	1991-3	1988-90
Hausa	6.29	6.53	6.66	6.88	7.22
Yoruba	3.57	3.66	3.65	3.61	3.59
Igbo	4.42	4.35	4.13	4.27	4.16
English	2.58	2.67	2.69	3.07	3.61
Other	5.38	5.38	5.44	5.44	5.53

Source: NDHS1 & NDHS3

Table 5-10: Distribution of Partners' Education by Level of Educational Attainment

	Partner's education level						
Educational attainment	None	Primary	Secondary	Higher	Don't know	Missing	Total
No education	65.02	17.89	9.17	3.11	0.45	4.36	100.00
Incomplete primary	19.17	30.26	17.06	5.22	0.47	27.82	100.00
Complete primary	14.10	29.83	27.37	7.41	1.67	19.63	100.00
Incomplete secondary	3.15	9.98	22.36	9.08	0.63	54.81	100.00
Complete secondary	1.30	6.83	24.58	17.81	0.19	49.28	100.00
Higher	0.10	3.79	8.38	44.48	0.24	43.02	100.00
Total	31.25	16.81	16.52	9.19	0.60	25.62	100.00

Source: Author's calculations from NDHS3

Table 5-11: Average Years of Education of Fertile Females

	Ndhs1		Ndhs2		Ndhs3	
Born	m	f	m	f	m	f
1935/1939	3.67	1.15				
1940/1944	4.08	1.42				
1945/1949	4.82	1.94				
1950/1954	5.68	3.09				
1955/1959	6.25	4.24				
1960/1964			7.50	3.98		
1965/1969			7.55	4.75	8.37	5.47
1970/1974			8.11	5.53	8.54	5.96
1975/1979			7.72	6.15	8.67	6.67
1980/1984			6.66	5.58	8.16	6.94
1985/1989					6.26	5.59

Source: Author's calculations from NDHS1, 2 & 3

Table 5-12: Total Fertility Rate by Region

		Period				
	region	1987-89	1984-86	1981-3	1978-80	1975-7
NDHS1	South East	4.61	5.48	6.14	6.66	5.12
	South West	4.48	5.26	6.58	6.58	5.80
	North West	4.91	5.24	6.39	5.26	5.39
	North East	4.55	4.44	6.29	5.24	4.90
	Region	2000-3	1997-9	1994-6	1991-3	1988-90
NDHS3	North Central	5.65	5.64	6.21	6.23	6.71
	North East	7.05	7.61	7.91	6.29	6.40
	North West	6.65	6.78	7.58	6.45	6.52
	South East	4.12	3.76	4.78	4.66	5.40
	South South	4.61	4.72	5.39	5.37	5.71
	South West	4.11	3.97	4.62	3.86	4.54

Source: Author's calculations from NDHS1 & 3

5.3.1 Health-seeking behaviour tables

Table 5-13: Logit Regressions for Full Immunisation with Religious Affiliation and Ethnicity (Odds Ratios)

	1	2	3	4	5	6	7	8
muslim	0.183***		0.531	0.140***	0.410	0.062***	0.072***	0.504
	(0.042)		(0.204)	(0.045)	(0.197)	(0.023)	(0.022)	(0.210)
other_relig	0.648		0.758	0.602	0.757	0.602	0.711	0.902
	(0.363)		(0.409)	(0.359)	(0.409)	(0.359)	(0.411)	(0.472)
hausa		0.081***	0.105***		0.129**			0.129**
		(0.049)	(0.066)		(0.088)			(0.089)
yoruba		4.465***	5.136***		4.278***			3.447***
		(1.262)	(1.483)		(1.456)			(1.075)
igbo		5.193***	4.165***		3.904***			4.216***
		(1.300)	(1.233)		(1.148)			(1.040)
fulani		0.239*	0.310		0.380			0.381
		(0.156)	(0.207)		(0.276)			(0.279)
crossriver		0.656	0.626		0.619			
		(0.342)	(0.317)		(0.325)			
kanuri		0.206*	0.266		0.324			0.324
		(0.162)	(0.214)		(0.275)			(0.277)
tiv		1.388	1.071		1.030			
		(0.606)	(0.492)		(0.474)			
edo		3.405	3.144		3.019			
		(2.217)	(2.103)		(1.976)			
protestant			0.909	0.728	0.921	0.728		
			(0.391)	(0.259)	(0.396)	(0.259)		
other_christian			0.590	0.559	0.619	0.559	0.659	
			(0.217)	(0.167)	(0.229)	(0.167)	(0.159)	
yoruba_muslim					1.647	20.348***	20.816***	2.095
					(0.811)	(7.478)	(7.740)	(1.038)
crs_muslim						0.396	0.396	0.396
						(0.320)	(0.320)	(0.320)
tiv_muslim							4.627	1.606
							(4.998)	(1.792)
Constant	0.069***	0.030***	0.044***	0.107***	0.046***	0.107***	0.091***	0.037***
	(0.009)	(0.006)	(0.015)	(0.026)	(0.016)	(0.026)	(0.014)	(0.007)
ll	-8.1e+10	-7.0e+10	-6.9e+10	-7.8e+10	-6.9e+10	-7.3e+10	-7.3e+10	-7.0e+10
chi2	54	113	130	55	127	89	88	118

Source: Author's calculations from NDHS3
* p<0.05, ** p<0.01, *** p<0.001
Note: Figures in brackets are robust standard errors computed with clustering and survey weights
Control variables include zones and urban residence.

Table 5-14: Logit Regressions of Full Immunisation on Religious Affiliation, Parental Education, Occupations and Wealth

	1	2	3	4	5	6	7	8	0
muslim	0.504	0.745	0.584	0.748					
	(0.210)	(0.316)	(0.242)	(0.313)					
other_relig	0.902	1.668	1.230	1.777					
	(0.472)	(0.968)	(0.615)	(0.994)					
hausa	0.129**	0.150**	0.152**	0.158**					
	(0.089)	(0.105)	(0.105)	(0.109)					
yoruba	3.447***	3.127***	3.306***	3.175***					
	(1.075)	(1.012)	(1.052)	(1.044)					
fulani	0.381	0.482	0.482	0.527					
	(0.279)	(0.361)	(0.341)	(0.383)					
kanuri	0.324	0.343	0.381	0.370					
	(0.277)	(0.287)	(0.322)	(0.308)					
igbo	4.216***	3.649***	4.301***	3.892***					
	(1.040)	(0.879)	(1.074)	(0.933)					
yoruba_muslim	2.095	1.442	1.863	1.452					
	(1.038)	(0.721)	(0.902)	(0.714)					
crs_muslim	0.396	0.472	0.393	0.399					
	(0.320)	(0.380)	(0.319)	(0.337)					
tiv_muslim	1.606	2.300	1.691	2.195					
	(1.792)	(2.630)	(1.976)	(2.583)					
mothers_primary		2.009		1.714					
		(0.742)		(0.638)					
mothers_secondary		3.181**		2.387*					
		(1.237)		(0.972)					
mothers_higher		3.381*		1.921					
		(1.848)		(1.166)					
fathers_primary			1.841*	1.644					
			(0.527)	(0.466)					
fathers_secondary			2.193*	1.664					
			(0.670)	(0.527)					
fathers_higher			3.401***	2.557**					
			(1.081)	(0.825)					
mothers_prof					4.045***		3.292**	1.659	1.659
					(1.659)		(1.387)	(0.635)	(0.635)
mothers_white					1.587		1.497	1.373	1.373
					(0.413)		(0.390)	(0.331)	(0.331)
mothers_unskilled					2.048*		2.587**	3.841***	3.841***
					(0.592)		(0.777)	(1.277)	(1.277)
fathers_prof						3.502***	3.257***	1.237	1.237
						(1.157)	(1.148)	(0.519)	(0.519)
fathers_white						3.204***	3.477***	1.624	1.624
						(0.914)	(1.019)	(0.521)	(0.521)
wealth index factor score								2.733***	2.733***
								(0.277)	(0.277)
Constant	0.037***	0.016***	0.018***	0.012***	0.025***	0.016***	0.010***	0.013***	0.013***
	(0.007)	(0.007)	(0.006)	(0.005)	(0.006)	(0.004)	(0.003)	(0.004)	(0.004)
ll	-7.0e+06	-6.8e+06	-6.8e+06	-6.8e+06	-8.2e+06	-8.1e+06	-8.0e+06	-7.1e+06	-7.1e+06
chi2	118	136	158	153	14	19	32	118	118
Number of obs	53451910	53451910	53451910	53451910	53451910	53451910	53451910	53451910	53451910

Source: Author's calculations from NDHS3
Note: standard errors are robust using survey weights and clustering
* p<0.05, ** p<0.01, *** p<0.001

5.4 Education and health figures

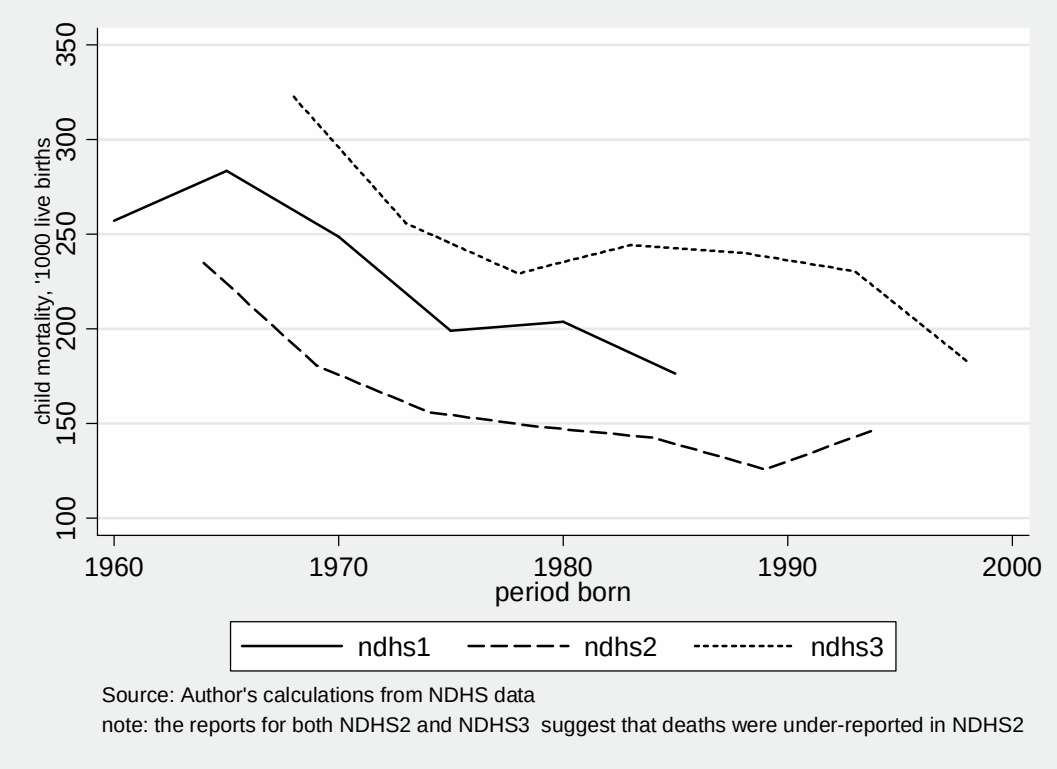


Figure 5-1: Changes in estimated child mortality by period born and NDHS

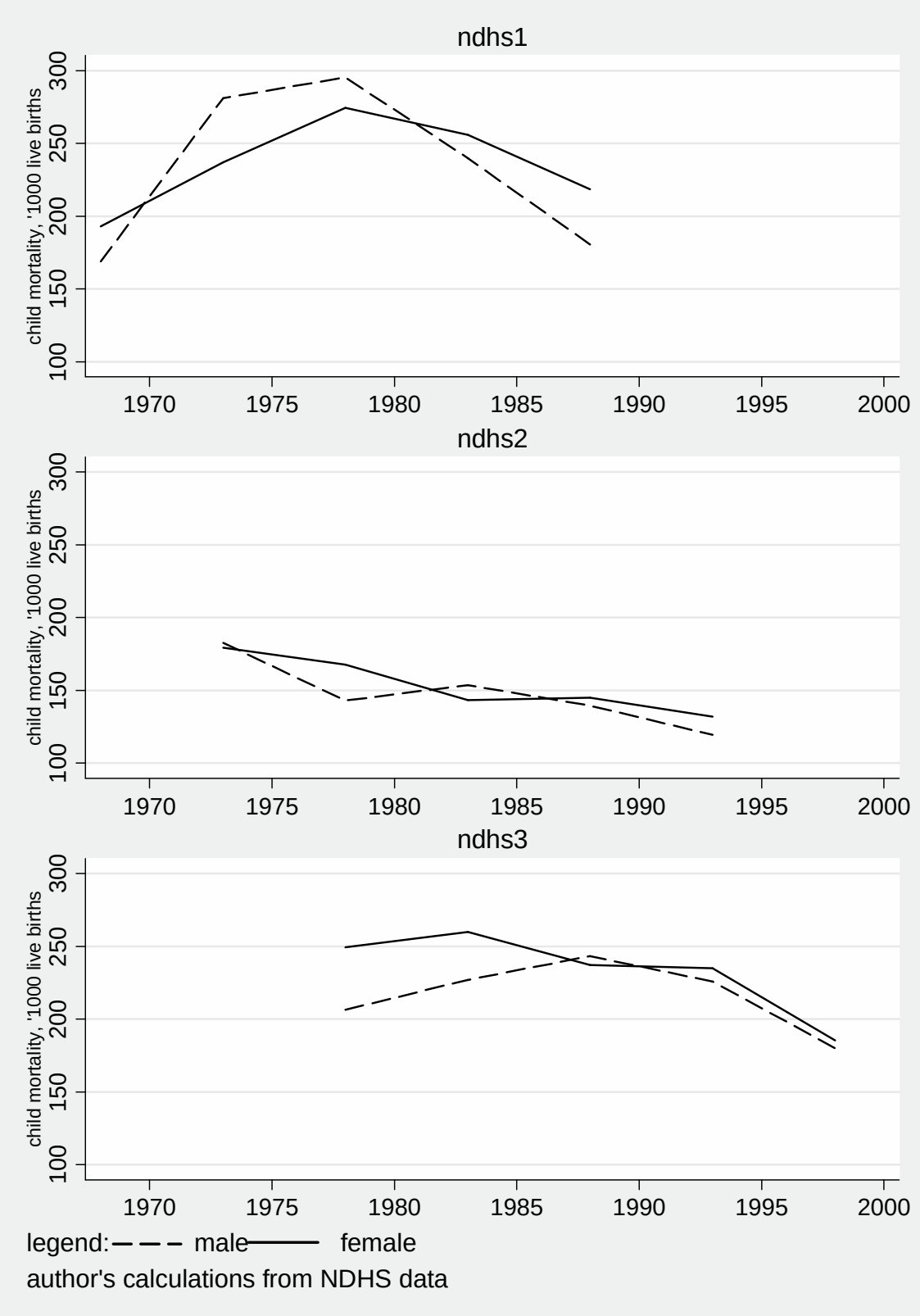


Figure 5-2: Child Mortality by Sex, Period and NDHS

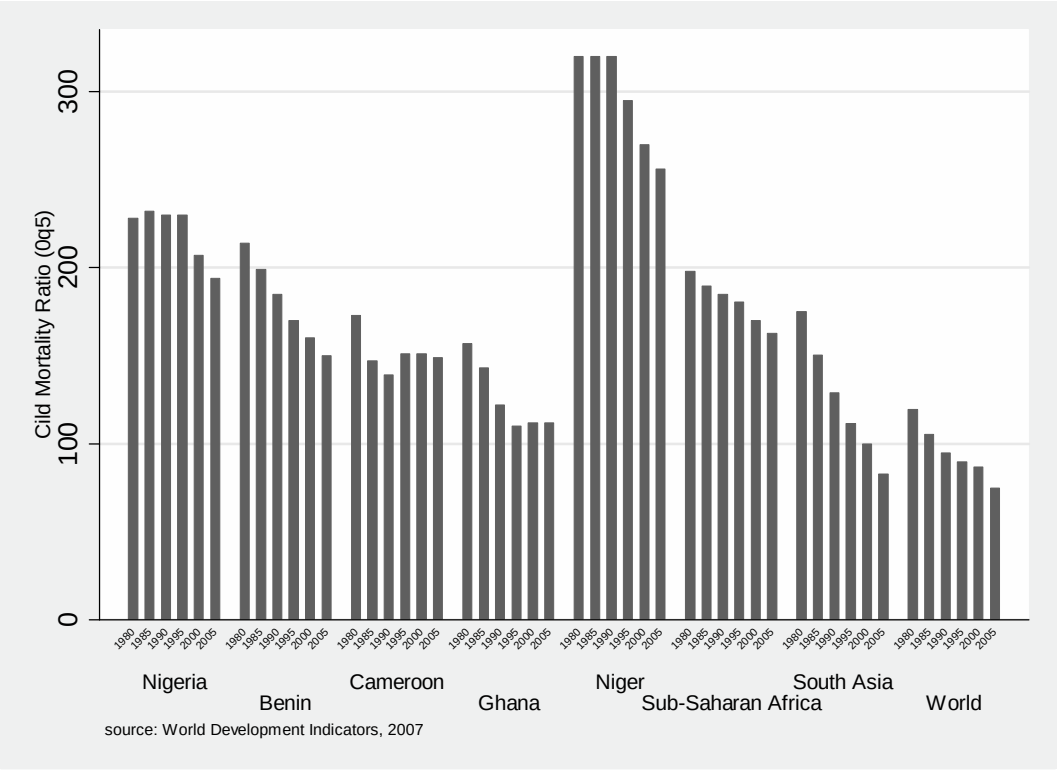


Figure 5-3: Child Mortality Rates in Nigeria and Neighbouring Countries.

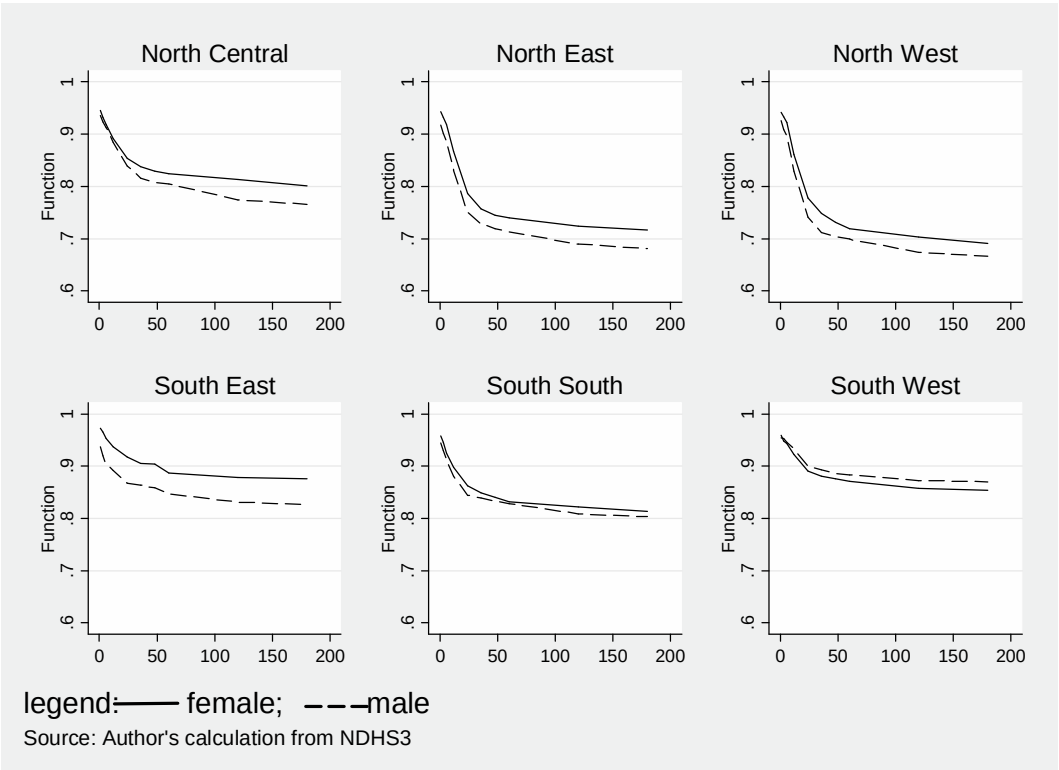


Figure 5-4: Child Survival Hazard Functions by Zone and Sex

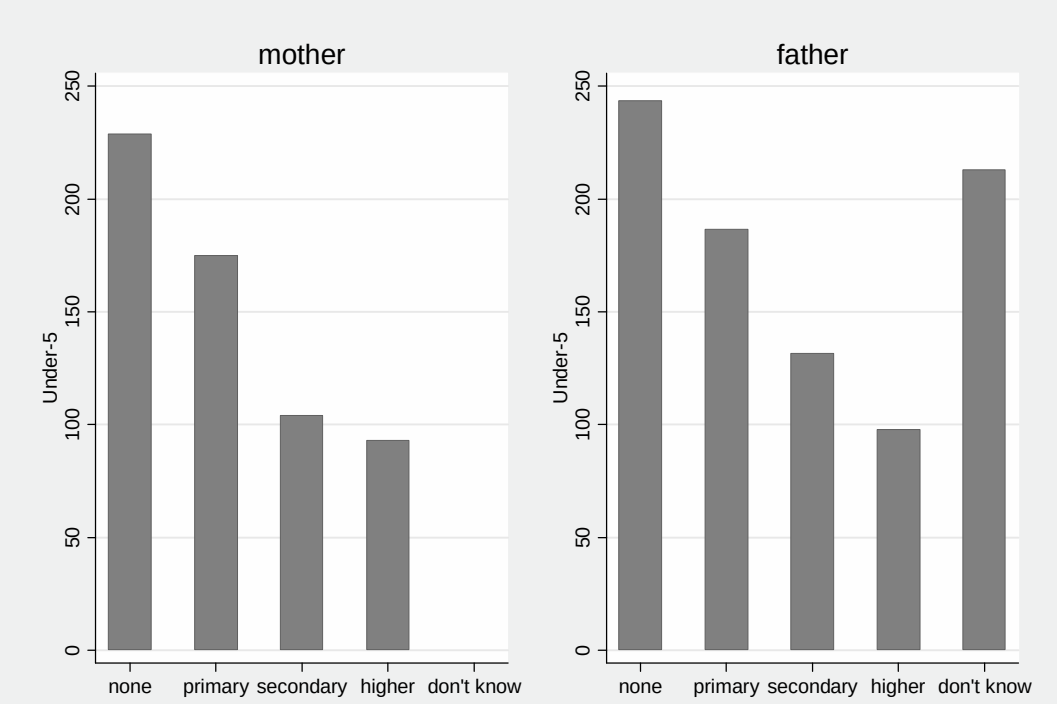


Figure 5-5: Under-5 Mortalities by Parental Education

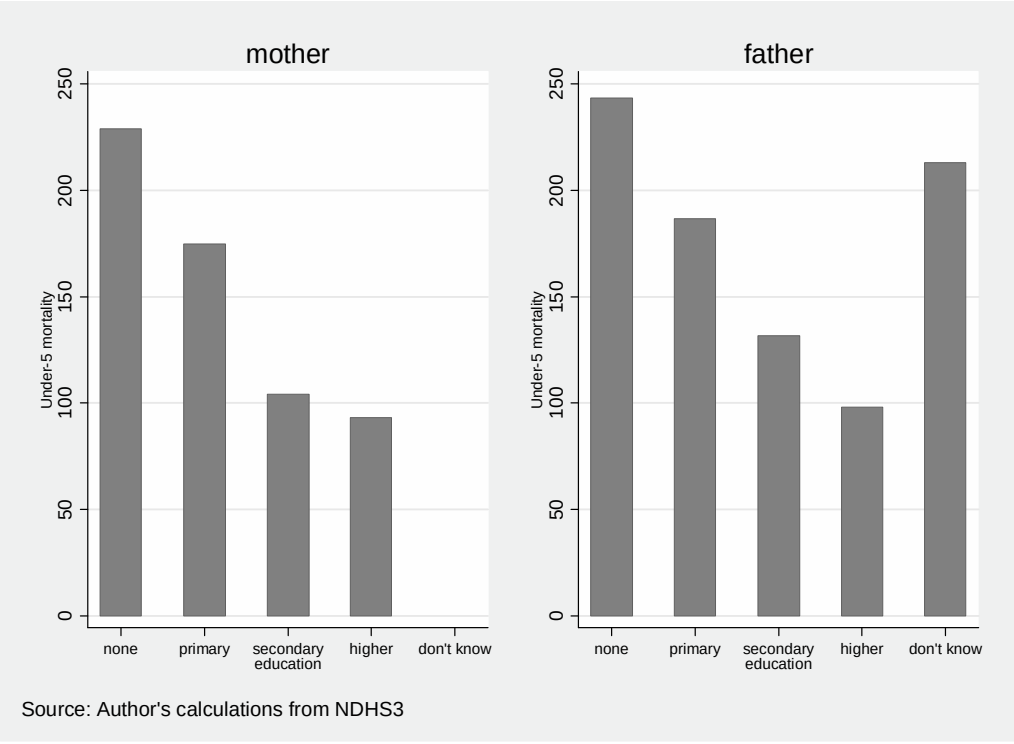


Figure 5-6: Under-5 Mortalities by Mother's and Father's Education

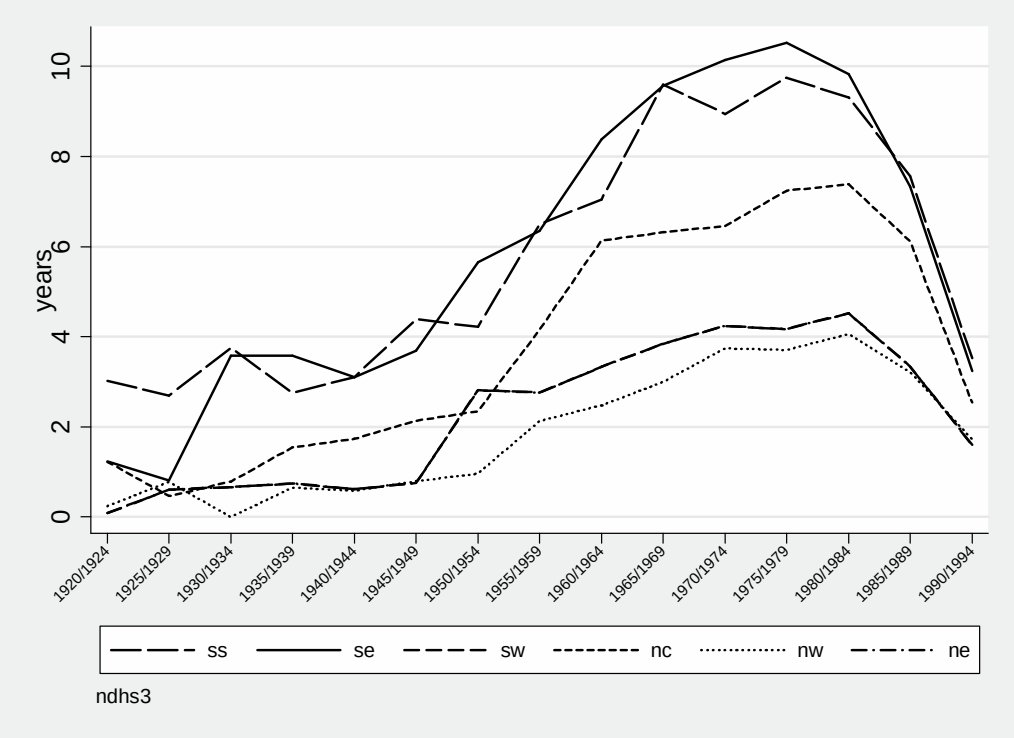


Figure 5-7: Average Years of Female Schooling by Date of Birth

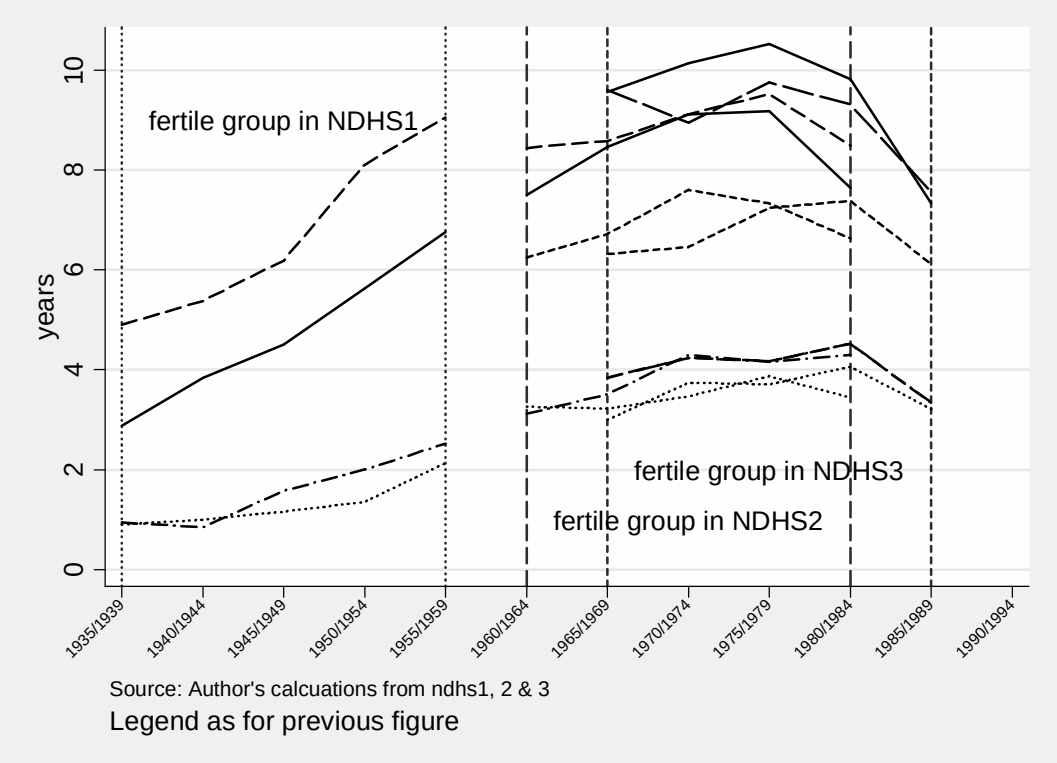


Figure 5-8: Years of Schooling for Fertile Females (20-39), by Period Born

6 Employment and wages

There are significant problems with the nationally-representative survey employment data in terms of the design of the questionnaires, their canvassing and probably the data entry and processing.

6.1 Employment data in NLSS

This survey reports the employment of household members on several forms; the responses on different forms are not always consistent and the answers seem incomplete. The questions are not always clear and activities are not treated symmetrically. There is also some duplication, which could lead to double counting; for example Section 4 on employment asks for income from all employment (Section 4a) and for each of four occupations (s4b, s4c, s4d, s4e). Also, Section 4 asks for earnings from self-employment (not agriculture) and Section 11 seeks information on household enterprises; these could be the same, or possibly different. Work in agriculture as a farmer is reported in Section 4 (s4aq5, s4bq9 s4cq12 s4dq12 s4eq12) and for people who also cultivate land (Section 9A); it is not clear whether production on own land is included in Section 4. On the other hand there are many respondents who do not have a main occupation (more than 50%), or do have a main occupation (s4aq5) but not an activity (s4bq4, s4bq8, or s4bq9) and so do not have any earnings (about 50% of those who report a main occupation (s4aq5).

Section 1 provides basic demographic information, including whether a person has been absent from the household; Section 2 provides education data including whether currently attending school; and Section 4 provides employment status data. Variable s4aq5 should provide the basic activity code for all persons older than 5 years and includes a code (00) for whether the person is 'economically inactive' (e.g. a student or retired). This means that there are a significant number of persons who might be expected to be economically active for whom no activity code is reported (Table 6-1).

Thus in NLSS 25 per cent of males and 41 per cent of females have no occupational code (when household weights are used, these proportions are 27 and 42 per cent respectively); many of those without an occupational code and not having attended school in the last year (who were over 5 and under 61 years old) are reported as engaged in housework[63] in the previous 7 days (65 per cent males and 82 per cent females, with mean totals of 19 and 42 hours in the previous 7 days respectively). Hence most of those for whom an occupation was not reported were involved in housework, which in the case of females amounted to more than six hours per day and in that of males, three hours per day.

Nevertheless, it is not clear whether this gives an accurate picture of employment since a significant number of persons who are eligible for work (did not attend school and aged

[63] Fetching firewood, water, ironing clothes, taking care of children, washing motor vehicles, sweeping for the household, disposing of garbage, preparing meals, marketing or shopping, running errands, washing dishes, doing other housekeeping activities, or caring for the old (section 4i).

more than 5 and less than 61) have no accounted activity (nearly 3000 out approximately of 13,000 who have no occupational code).

Most who were reported as engaged in family farming or housekeeping as their occupation (s4aq5 codes 52, 60, 61 & 63) were reported in their secondary occupation (s4bq9) to be engaged in family agriculture, unpaid family enterprises or self employed, and most had no reported earnings (17,000 out of 25,000 termed 'nowhere persons'); the remainder (7,780) who did report earnings from employment obtained them from family agriculture. Information on seeking work in Section 4F and migration in Section 1 (questions 18 & 19) does not seem to resolve the problem of nowhere persons[64] since very few people are reported as either seeking work or being absent from the household. The 17,000 odd nowhere people for whom there is an occupation code but no earnings are not in school: most report doing housework.

Perhaps the most significant problem lies in the apparent miscoding of the main occupation of household members (s4bq9); this code is supposed to correspond to s4aq5. Nearly 30 per cent of persons for whom occupations are listed have different codes in these two variables. This problem occurs in all four versions of the NLSS data that we have downloaded (from NADA, from the NBS website, from the World Bank and directly from NBS[65]). Many of the activity codes linked to earnings from main occupation (s4bq9) seem wrong; for example there are some 5000 accountants reported in s4bq9 but only 71 in s4aq5.[66] The same problem also occurs with secondary occupations, in that in 1008 out of 4251 cases for which a secondary activity is given the activity codes in s4cq1 do not match those in s4aq6a. However, in this case the information in s4cq1 does not seem implausible in terms of occupational pattern.

It seems that the best that can be done for the primary activity is to substitute the code s4aq5 into s4bq4 in order to classify occupations.

6.2 Employment and poverty

In this section we assess the relationship between employment and poverty in the NLSS especially to explore whether female employment has a different effect on welfare to male employment. We regress welfare (log of monthly per adult equivalent expenditure, deflated) on employment and control variables. The employment variables are the proportion of workers (persons aged 15-65 not in full time education) who are employed in the government, private or self-employed sectors. Table 6-4 shows the results; column 1 shows the basic model (the controls are not reported) showing that employment in government and self employment are positively related to welfare, as is the number of workers and having a female head to the household. Columns 2-4 report the results with workers' sector of employment separated by males and females (the variables are the proportions of all workers of a given sex in each sector). For males the results are as before, but for females only government employment seems to contribute significantly to

[64] Persons who appear to have no occupation,and not to be in school.
[65] See section 2.1
[66] Earnings linked to s4aq5 are total earnings from different sources, not earnings by occupation, and so seem unreliable as measures of earnings from occupations.

welfare; the coefficient on employment of females in both the private and self-employment sectors are not significant. The remaining columns give the results of quantile regressions which can suggest whether the relationship between employment and different levels of welfare differs. We see that the size of coefficients (and their significance in the case of private sector employment), increases at the higher (better off) quantiles.

These results, especially the size of the coefficient on government employment, draw attention to the significant (and large) association of public sector employment with levels of consumption and avoiding poverty. However, entry into government employment is strongly associated with educational qualifications and we see a much lower size of coefficient.

Since choice of employment sector is likely to be endogenous we can attempt an instrumental variables estimation; while education may affect earnings directly, it is probably determined prior to choice of employment, so we use the education variables as instruments (these are the proportions of all workers of a given sex at each level of education). Table 6-5 shows that coefficients on the government sector become much larger and those on females become significant and negative in the case of females in the private sector, but positive for females in self employment.

We pursue the issue of the relation between education and earnings in the next section, using not household welfare, as in this section, but estimates of monthly earnings.

6.3 Income from employment

Part A consists of three forms; the first form of Part 4A has some screening questions identifying whether the person (addressed as 'you') has a main work activity and up to 4 other occupations and 'any other work'; this form applies to all household members who work. The next form in part 4A requests total 'moneys received' from any source, whether employment or not (ten categories), and money spent by the household during the past twelve months (six categories). There are rows for household members, but it is not clear whether the response is supposed to be a grand summary of individual incomes and expenditures, reported at the first interview visit. This section seems to violate good practice in economic surveys which is to record items in the most disaggregated form feasible, not to require feats of memory and mental arithmetic and so on. The whole section of NLSS on employment is deeply flawed.

The filter questions are inconsistent, as shown in Table 2.4**Error! Reference source not found.**. For example, in Q1 the phrase 'any other payments' covers Q2, but the layout implies that a Yes (Y) results in skipping to Q5. Question 2 could only be answered Y if Q1 is also Y and is hence redundant. Q3 can only be answered Y when Questions s1 and 2 have been answered N for unpaid farm or livestock work, which is likely to be for family members and hence implies Q4. Q6 requests further activities; these are likely to be some of those that could be referred to by Q3. The third form of Section 4A refers to a secondary job and availability for extra work. It is not clear what the justification for these questions are since the category 'extra work' is unclear. The instructions on the form to skip to Q5 at the first Y to Qs1-5 is inconsistent with the instructions in the

enumerator's manual, which imply that each Q1-4 should be answered with a 1 or 2; the data file implies that the first Y induces a skip to Q5.

Answers to s4aq5 have further problems in that the responses given do not coincide with those given to s4bq4, which is also the occupation code of the most important activity; also, 826 out of 19,158 household heads report no answer to s4aq5: 3,706 household heads do not report any value for s4bq4 largely because their main activity is self-employed farming; however as noted below there are household heads who report earnings from their main activity even when this is classified as 'working on own or family agricultural activity, i.e. farming, fishing and animal rearing/poultry/ hunting' and a skip to their secondary occupation is indicated on the questionnaire.

There is also a further question on secondary activities in Section 4A (s4aq10); the codes for this question are not all the same as the first of the other occupations reported in variable s4aq6a.[67]

It would seem that the intention of the first form of Section 4a is to identify the economic activities of household members; in this case an exclusive list of types of activities should be listed in the filter questions which should have no skips (i.e. '1. Did you work for wages? (mention sectors but tick if obtained wages in any sector)'; '2. Did you gain income from, produce for sale or exchange in kind for household consumption on your own account in any sector?'; '3' Did you work unremunerated on household crops, horticulture, livestock, forestry, fish enterprises?'. The most 'important' activities could then be coded and listed, with two codes, sector and activity type.

6.4 Participation in and earnings from work

One of the core gender and growth arguments is that women are inefficiently discriminated against in terms of access to paid employment and wages from employment. This is usually explored through participation and wage models. The latter are known as Mincerian wage models (after Mincer, 1962) and are generally estimated using Heckman procedures (Heckman, 1979) to take account of selectivity bias (that only some people are in wage employment). As noted above, the questionnaire and the answers in the employment section do not give confidence that the responses are restricted to waged employment and earnings. Nevertheless we attempt to estimate Mincerian wages in this section.

6.4.1 Participation in employment

Women are less likely to be in waged employment than men, especially in the higher-earning government and private sectors. However, there are strong regional variations; women in southern zones often have employment earnings while those in the northern zones are less likely to have reported these earnings. This result is not consistent with general findings from qualitative and small-scale inquiries which tend to show that women in the north are very likely to have earnings from self-employment. This is shown by the high share of self-employment earnings among those women in the north who do report employment earnings. Nevertheless, it is likely that NLSS under-reports female

[67] Another inconsistency is that this question asks for 'Other 3 occupations apart from Q5', but lists four columns.

earnings from self-employment in the north,[68] making this survey unsatisfactory for exploring gender disaggregated economic activities. It seems likely that both the LFS and the GHS also under-record female household-based non-farm enterprises, which are important in the north. This makes for serious difficulties in exploring gender gaps in earnings and incomes, and consequently earnings functions.

Women are, however, more likely to be self-employed if reporting any waged income (overall the proportions of self-employed females and males are about the same).

The lack of precision in the questions and layout of the form generates many problems in using these data. Section 4B refers to the main activity, covering payment and time unit, type of work and amounts and forms of payment including taxes, bonuses, in-kind and benefits (accommodation and travel expenses – benefits in the forms of clothing, footwear and food are not mentioned). There are further questions about some characteristics of the work. Sections 4C, 4D and 4E are about second, third and fourth activities; the fifth activity implied in s4aq6d is dropped.

While the questions about remuneration for the main activity are quite intensive, several categories of remuneration do not appear for second and subsequent activities. This results in changed question numbers; in particular s4bq8[69] is dropped, as are questions about payment in rent, transport and other forms.

From these questions it is not clear whether incomes from own (household) farm, forest, fish, or livestock activities are to be recorded under employment; if they are, there appears to be duplication in subsequent sections which ask about these activities in considerable detail. However, it appears that income (or in-kind equivalent) from own-farm production activities is not included in Section 4 on employment. This is legitimate, since household members may be paid wages or their equivalent to work on the family farm (household heads' farm enterprises); however, the absence of convincing own-farm income in Section 9 limits the overall value of the income data.

There are further problems in the categorisation of activities; Question s4bq4 asks the enumerator to 'write name of industry code' and refers to the manual. In the data file variable s4bq4 lists codes that confound type of occupation with industry and, as noted elsewhere in this report, do not use the same industry/occupation categories as the GHS. The codes in NLSS s4bq4 roughly correspond to an ISCO coding system which aims to classify work by skill levels.[70] While having international sanction this coding system does not seem very suitable for use in this type of economy. Question s4bq8 asks whether the person in this activity is 'Employer; Paid Employee, Self-Employed, Paid Family Worker, Unpaid Family Worker, or Other'. Again there are inconsistencies; and employer is also generally self-employed. Only if a self-employed person does not employ anyone can they be Category 3 but not Category 1 (also, a manager of an

[68] Section 11 (household non-farm enterprises) does not report many northern females being responsible for non-farm household enterprises.

[69] (In this connection are you: Employer...1, Paid, Employee..2, Self, Employed..3, Paid family, Worker…..4, Unpaid family, Worker…5, Other……6 (SPECIFY)

[70] See http://www.ilo.org/public/english/bureau/stat/class/icse.htm, http://www.ilo.org/global/What_we_do/Statistics/topics/Statusinemployment/guidelines/lang--en/index.htm and http://www2.warwick.ac.uk/fac/soc/ier/research/isco88

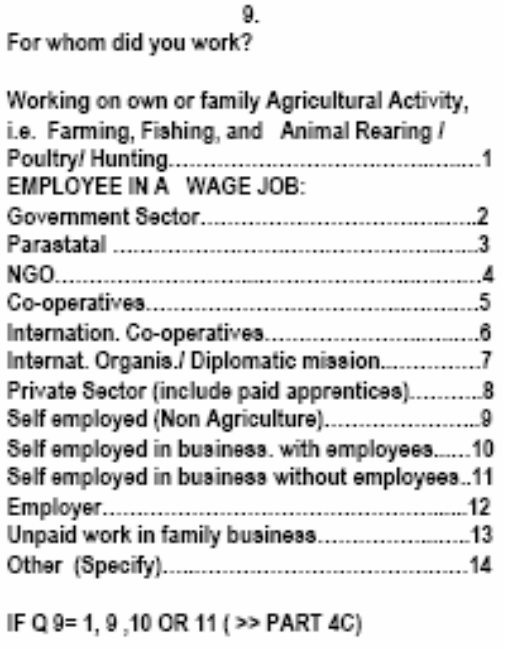
enterprise can be an employer and an employee at the same time). Cross tabulation of these three variables reveals confusions, as shown in Table 6-3. For example, it is not clear what 'other' workers in 'family agricultural activity' could be; how any worker could be other than a paid employee of the government sector; what sort of employer someone working for a cooperative could be; how an unpaid family worker could be anything other than an unpaid worker in a family enterprise, and so on.

Furthermore, there are obvious inconsistencies in the earnings for different employers; for the main occupation s4bq9 classifies work by employers and code 1 is set out as follows:

"Working on own or family Agricultural Activity, i.e. Farming, Fishing, and Animal Rearing/Poultry/Hunting……
……..…..…1

EMPLOYEE IN A WAGE JOB
2….
…

IF Q 9= 1, 9 ,10 OR 11 (>> PART 4C)
"


9.
For whom did you work?

Working on own or family Agricultural Activity, i.e. Farming, Fishing, and Animal Rearing / Poultry/ Hunting.....1
EMPLOYEE IN A WAGE JOB:
Government Sector.....2
Parastatal 3
NGO.....4
Co-operatives.....5
Internation. Co-operatives.....6
Internat. Organis./ Diplomatic mission.....7
Private Sector (include paid apprentices).....8
Self employed (Non Agriculture).....9
Self employed in business. with employees.....10
Self employed in business without employees..11
Employer.....12
Unpaid work in family business.....13
Other (Specify).....14

IF Q 9= 1, 9 ,10 OR 11 (>> PART 4C)

This implies that activities classified as Category 1 should not report earnings in the remainder of Section 4b. However, 7520 persons (out of 16688 persons reporting a main activity out of 19,158 households) are classified as Code 1, are reported as having earnings from this activity. We assume that these are wage earnings such as, perhaps, persons report wage earning on farm plots owned by other members of their own family (which the ethnographic record suggests is not impossible).

Despite these shortcomings, we use NLSS employment information to explore gender differences in employment and earnings.

Cross tabulations of industry (s4bq4) with status (s4bq8) or with employer (s4bq9) are similarly inconsistent. Thus 5,475 persons (out of 28,144 – 19.2 per cent) of persons are classified as accountants, 4685 of whom are working for family farms. Clearly, there are significant classification errors in these variables. We used the first occupation given in Section 4A to reclassify accountants.

6.5 Objectives for employment analysis

The objectives of our analysis of these employment data are to explore gender employment and wage gaps by sector of activity, educational levels and other variables (ethnicity and so on). We are particularly concerned to explore the hypotheses in the

gender and growth literature that women face discrimination in the labour market in terms of the sectors in which they are employed and the wages they earn.

The data problems make this problematic, as it is difficult to classify the reported activities into any sectoral classification that is commonly used. Appleton et al. classify the activities of household heads into agriculture, government, private wage, non-farm self-employment and non-working. These seem to correspond to reclassification of the codes for s4bq9, s4cq12, s4dq12 and s4eq12, with unpaid family workers (code 13) being classified as employed in agriculture if they are reported as having codes 61 & 62 for s4aq5 (farmers and agriculture in the occupation classification), otherwise as self-employed non-agriculture. We use this classification of employer. As noted above, the occupation codes are also problematic, but we substitute the main occupation listed in Section 4A for that in Section 4B where these differ. We then recode the occupations into ISCO categories as best we can.

On the basis of this reclassification we can organise the data into all the employment occupations for which income is reported with the understanding that this seems to leave out all own-farm production income.

6.6 Results

Mincerian wage equations are usually formulated in terms of work experience and educational attainments, since these are held to be important determinants of productivity. Since we have earnings but not wages, our functions may reflect the amount of time spent in waged work rather than in productivity. Nevertheless it is instructive to explore these relationships.

Column 1 of Table 6-6 shows a simple model of education and earnings; we take the log of earnings reported in the main activity and regress it (adjusting for clustering) on levels of education, with controls for length of work experience[71] and zone. As expected, education has a strong positive effect on earnings, with earnings steadily rising with level of education. Earnings are higher in the government and private sectors compared to self employment (compared to agriculture). Adding terms for female education in column 2, we see that some coefficients are negative, implying that females obtain lower earnings for equivalent educational attainments except for those with teacher training and university education (here the coefficients are small and not statistically significant). However, this effect is largely confined to the self-employment sector, as shown by the large negative coefficient for females in this sector; in column 3 the negative coefficients on female education have all become non-significant (although still negative).

Thus the lower earnings of women and their lower coefficients on education are a product of their low earnings in the self-employed sector. We should note that because the dependent variable is earnings rather than wages they may vary because of variations in the amount of time spent in this form of employment.

Not only are earnings apparently lower in the self-employed sector, but women are particularly likely to be employed in this sector given their levels of employment. This is

[71] Computed as age less estimated number of years of education completed; this is computed from the highest level of educational attainment and does not allow for repetition.

shown in columns 4-7, which report Probit regressions of the probability of employment by sector. The large positive coefficient on being female in column 6 compared to the negative coefficients in columns 4, 5 and 7 indicate the greater likelihood of female self employment compared to employment in the government sector (though here the coefficient is small and only marginally significant).

Table 6-7 reports the results of Heckman regressions which aim to take account of selection bias. This table supports the argument that for earnings in the government sector education at all levels is a strong determinant of selection into government employment, but subsequently has little influence on earnings. In the private sector, education is influential in both section and earnings determination, although the selection component coefficient sizes are smaller. For self employment, education has a negative influence on participation although it retains a significant influence on earnings.

6.7 Employment, time poverty and infrastructure

The segregation of women into self-employment and their relatively low earnings more or less regardless of their educational credentials are likely to reflect the gender division of domestic labour which constrains their opportunities for full-time employment. These constraints are likely to be greater for households which lack basic infrastructure such as piped water, sanitary latrines, electricity and so on and if access to public infrastructure such as markets, schools and health facilities is limited.

Poor people in the third world undoubtedly spend much time and energy on domestic chores, which constrain their ability to participate in employment outside the household as also to combine their time with other goods to provide household consumption and services such as caring for children and the sick and support for child education. Women are undoubtedly more constrained by poor quality and low amounts of household and community infrastructure in their home production, caring, farming, self-employment and labour market employment (Blackden and Wodon, 2006, Budlender, 2007, Razavi, 2007).

Nigeria lacks studies of time use (although a study was conducted in 1998 (Federal Office of Statistics, 1999)[72] and of the role of infrastructure in well-being and growth. Also unfortunately, the village infrastructure data file from NLSS is not available. We can however look at relations between household level infrastructure and health and nutrition outcomes using the national-scale NDHS and the MICS. Household investment in improved water and sanitation, time spent collecting water and access to electricity have potential for time saving; however these variables will also reflect household assets and the local availability of public goods.

Underlying this exploration is a household production model of a Beckerian type in which time of household members is combined with purchased and produced goods to produce consumption goods and services which lead to well-being outcomes for household members. Specifically, we can think of household infrastructure such as piped water, flush toilets, modern cooking fuels, improved flooring (cement, tiles, etc.), leading

[72] There does not appear to be an extensive report of this survey and there are no useful tables appended to it; nor do there appear to be any raw data. There appear to be several small scale studies, e.g. Usman, nd; Okpala, 1989.

to savings in time and effort (and environmental health improvements) which can be allocated to caring activities and employment; caring will improve health and nutritional outcomes and employment may increase income but reduce caring activities, or result in substitution by paid or unpaid servants and/or relatives who may be less productive. In any case, we can explore to what extent child nutritional outcomes, which are important indicators of the quality of parenting and of future performance in terms of economic growth and improvements in well-being, are associated with not only the human capital of parents and others in the household such as we have discussed above, but also the availability of household assets.

Table 6-8 gives some basic initial results of regressions of child height-for-age z-score (haz) with co-variates using NDHS3; column 1 reports the well-established relationships between mother's and father's years of education and being female, all of which have positive associations with haz (controls for mother's and female's years of education, female child, ethnic, zonal and rural residence variables are not reported).

Each set of household infrastructure dummy variables have significant positive effects on child well-being assessed as height-for-age (base categories left out are the lowest quality of the relevant infrastructure). Not all the coefficients have the level of statistical significance one might expect (e.g. piped water dummy) but the signs are as expected and there is considerable heterogeneity within these categories.[73] Thus improved water sources, sanitation, electricity and sources of cooking fuel, which can be expected not only to improve the health environment but also to reduce the burdens of domestic labour, especially for females, all have positive effects on variables that can be expected to reflect time poverty. Furthermore, improved household infrastructure is positively associated with the probability of the mother working outside the household and with measures of female autonomy (measured as reported taking of major decisions independently of partner and other household members – NDHS variables v743a-e).

A significant problem with this analysis is the significant degree of multi-collinearity among household infrastructure and other relevant variables (Table 6-9) and directions of causality. Thus households tend to have positive associations among education levels, occupational status, wealth and improved characteristics of household infrastructure that are associated with improved health environments and reduced time burdens. In further work it would be desirable to undertake some data reduction such as factor analysis to identify latent variables which might provide greater insight into the characteristics of households with better human capital and well-being outcomes.

[73] Full details of dummy variable construction are excluded in the interests of brevity, but are available on request.

Employment tables

Table 6-1: People Who Did Not Attend School in the Last Year And Are Without An Occupation Code			
	Sex		
	Male	Female	Total
No occupation Code	6,455	11,268	17,723
% of sex	25.34	41.15	
Has Occupation code**	Housework		
	None	Some	Total
No	4267	13456	17723
Yes	5134	30006	35140
Total	9401	43462	52863

Source: Author's calculations from NLSS.

Notes: *of those persons who did not attend school in the last year and are more than 5 and less than 61 years old

** s4aq5; more than 7000 persons who reported an occupation did not report main or secondary employment (s4ba4, or s4bq9)

(s4aq5 == . & s2aq4 ~= 1 & s1q5y > 5 & s1q5y <= 60)

(tab occ_code housework if s2aq4 ~= 1 & s1q5y > 5 & s1q5y <= 60)

Table 6-2: Proportions of Persons reporting Employment Earnings[$]

		zone							
		South South	South East	South West	North Central	North East	North West	FCT	Total
Sex	Occupations	% all eligible persons who have employment earnings							
Male	All occupations	50.98	39.64	56.76	38.74	28.21	22.98	28.38	34.98
Female	All occupations	37.33	31.06	50.73	18.74	9.98	5.25	13.98	20.20
% have employment earnings									
Male	Agriculture	43.21	41.48	27.55	50.80	64.98	57.64	39.23	48.41
	Government	16.77	15.25	15.06	18.09	16.07	10.69	34.62	15.54
	Private	8.32	7.18	11.62	4.55	3.65	3.64	6.15	6.31
	Self employed	31.69	35.99	45.77	26.56	15.30	28.03	20.00	29.74
	Total	100.00	99.90	100.00	100.00	100.00	100.00	100.00	99.99
Female	Agriculture	49.92	54.91	20.49	20.37	54.87	24.06	30.77	37.21
	Government	9.61	11.98	8.61	11.93	12.92	3.26	30.77	10.20
	Private	3.50	3.63	4.92	1.99	1.24	2.26	11.54	3.44
	Self employed	36.97	29.37	65.98	65.71	30.80	68.67	26.92	49.00
	Total	100.00	99.90	100.00	100.00	99.82	98.25	100.00	99.84

Source: Author's calculations from NLSS

Notes: $ Of persons older than 5 and less than 61 who did not attend school in 2002/3.

Table 6-3: Employer and Category of Employment

S4bq9 Worked for …	s4bq6 Employer	Paid employee	Self employed	Family enterprise Paid	Unpaid	Other
Family agricultural activity	445	1,107	10,486	279	5,965	5,802
Government sector	256	1,874	53	9	15	27
Parastatal	12	119	12	4	3	9
NGO	8	104	17	0	3	13
Co-operatives	2	12	10	1	3	2
International Co-operative	1	2	5	0	0	4
International Organisation	1	20	4	0	0	3
Private sector	48	400	49	4	7	7
Self employed (other)	57	198	2,070	14	170	26
Self employed (w/o employees)	40	81	270	15	27	12
Self employed (with employees)	121	365	3,527	21	371	80
Employer	17	47	21	1	6	2
Unpaid family worker	24	57	91	46	1,470	20
Other	24	102	61	10	165	105

Source: Author's calculations from NLSS

Table 6-4: Regression Models of Welfare and Poverty, Nigeria 2003/4

Dependent variable	Ln (monthly expenditure per adult equivalent (deflated))			Poor	Quantile regression Ln (monthly expenditure per adult equivalent (deflated))		
	OLS		Tobit	Logit	0.25	0.5	0.75
	b/se	b/se	b/se	b/se	b/se	b/se	b/se
	1	2	3	4	5	6	7
Government	0.051***				0.042***	0.048***	0.060***
	(0.005)				(0.004)	(0.003)	(0.004)
Private	0.007				0.005	0.013**	0.017***
	(0.007)				(0.006)	(0.005)	(0.005)
Self employment	0.009**				0.010***	0.008***	0.015***
	(0.003)				(0.003)	(0.002)	(0.002)
Female hhh	0.057	0.092**	0.113**	-0.343**	0.027	0.048	0.092***
	(0.033)	(0.034)	(0.042)	(0.109)	(0.029)	(0.024)	(0.025)
Number of workers	0.246***	0.229***	0.232***	-0.722***	0.250***	0.273***	0.308***
	(0.035)	(0.033)	(0.040)	(0.113)	(0.030)	(0.025)	(0.026)
Proportion of male workers in:							
Government		0.048***	0.052***	-0.152***			
		(0.005)	(0.007)	(0.017)			
Private sector		0.011	0.013	-0.050*			
		(0.007)	(0.009)	(0.022)			
Self employed		0.025***	0.026***	-0.082***			
		(0.004)	(0.004)	(0.012)			
Proportion of female workers in:							
Government		0.057***	0.049***	-0.119***			
		(0.009)	(0.011)	(0.026)			
Private sector		0.014	-0.009	0.001			
		(0.013)	(0.015)	(0.034)			
Self employed		-0.004	-0.005	0.009			
		(0.004)	(0.004)	(0.011)			
_cons	9.389***	9.889***	9.766***	-4.767***	8.987***	9.297***	9.791***
	(0.155)	(0.191)	(0.236)	(0.587)	(0.124)	(0.103)	(0.107)
sigma			0.685***				
			(0.009)				
r2	0.394***	0.401***			0.253	0.272	0.290
N	19158	19158	19158	19158	19158	19158	19158

Source: Author's calculations from NLSS.

Note: Controls not listed include age of hhh, agesq, urban, zone, logs of landowned and other assets and demographics

Table 6-5: Models of Welfare, Education and Poverty, Nigeria 2003/4

Dependent variable	Ln (monthly per adult equivalent expenditure (deflated))	
	OLS	IV regression
Ln proportion of household members) in:	b/se	b/se
Males	1	2
government	0.050***	0.189***
	(0.003)	(0.031)
Private	0.012**	0.022
	(0.005)	(0.234)
Self-employment	0.026***	0.059
	(0.002)	(0.048)
Females		
Government	0.050***	0.334***
	(0.005)	(0.072)
Private	0.001	-0.931*
	(0.008)	(0.389)
Self-employment	-0.003	0.168**
	(0.002)	(0.057)
Female-headed household (dummy)	0.082***	0.075
	(0.022)	(0.088)
Number of workers	0.239***	0.347***
	(0.021)	(0.049)
Constant	9.747***	7.980**
	(0.110)	(2.699)
r2	0.448***	P > Chi =.000***
N	19158	19158

Source: Author's calculations from NLSS.

Notes: Controls not listed include age, agesq, urban, zone, logs of landowned and other assets and demographics

The instruments are average years of education of adult males and females

Table 6-6: Education, Gender and Wage Earnings

	OLS			Probit			
	Log of total monthly earnings in main occupation			Govern-ment	Private	Self employment	Agric-ulture
	1	2	3	4	5	6	7
Incomplete primary	0.301**	0.418**	0.232	0.327*	0.263*	0.214**	-0.419***
	(0.105)	(0.149)	(0.156)	(0.136)	(0.119)	(0.069)	(0.068)
Primary	0.446***	0.550***	0.323***	0.669***	0.271**	0.410***	-0.651***
	(0.073)	(0.076)	(0.086)	(0.091)	(0.083)	(0.046)	(0.046)
Incomplete secondary	0.517***	0.749***	0.504***	0.843***	0.494***	0.419***	-0.941***
	(0.129)	(0.131)	(0.136)	(0.134)	(0.124)	(0.073)	(0.075)
Secondary	0.992***	1.118***	0.844***	1.332***	0.444***	0.577***	-1.327***
	(0.095)	(0.095)	(0.104)	(0.096)	(0.094)	(0.058)	(0.062)
Teacher training	0.929***	0.914***	0.727***	2.269***	0.569***	-0.442***	-1.313***
	(0.123)	(0.144)	(0.152)	(0.133)	(0.149)	(0.131)	(0.115)
Koranic	-0.118	0.316	0.143	0.092	0.115	0.271**	-0.330***
	(0.219)	(0.218)	(0.218)	(0.173)	(0.148)	(0.090)	(0.089)
Polytechnic	1.329***	1.441***	1.230***	2.358***	0.770***	-0.315**	-1.754***
	(0.144)	(0.150)	(0.158)	(0.119)	(0.126)	(0.102)	(0.110)
University	2.078***	2.016***	1.832***	2.521***	0.725***	-0.462***	-2.438***
	(0.147)	(0.141)	(0.147)	(0.137)	(0.141)	(0.109)	(0.178)
Female				-0.096*	-0.464***	0.536***	-0.463***
				(0.047)	(0.055)	(0.030)	(0.030)
Female * education							
Incomplete primary		-0.331	0.004				
		(0.174)	(0.187)				
Primary		-0.423***	0.000				
		(0.083)	(0.105)				
Incomplete secondary		-0.743***	-0.314				
		(0.194)	(0.211)				
Secondary		-0.620***	-0.145				
		(0.091)	(0.121)				
Teacher training		-0.175	-0.022				
		(0.176)	(0.209)				
Koranic		-2.369***	-1.957***				
		(0.435)	(0.448)				
Polytechnic		-0.536*	-0.339				
		(0.254)	(0.311)				
University		-0.053	0.086				
		(0.224)	(0.244)				
Sector							
Government	1.249***	1.255***	1.31***				
	(0.079)	(0.081)	(0.088)				
Private	1.217***	1.163***	1.247***				
	(0.091)	(0.092)	(0.099)				
Self-employed	0.775***	0.829***	1.179***				
	(0.067)	(0.067)	(0.084)				
Female * sector							
Government			0.025				
			(0.160)				
Private			-0.043				
			(0.177)				
Self-employed			-0.745***				
			(0.094)				
r2	0.105	0.115	0.121				
N	14487	14487	14487	14487	14487	14487	14487

Source: Author's calculations from NLSS 2003-4
Note: Controls are excluded from the reported results

Table 6-7: Education, Gender and Wage Earnings (Heckman)

	Earnings from			
Dependent variable	Government	Private	Self-employment	Self-employment
Incomplete primary	0.262	-0.836*	0.410**	0.383*
	(0.382)	(0.351)	(0.141)	(0.165)
Primary	0.077	-0.243	0.393***	0.429***
	(0.302)	(0.236)	(0.105)	(0.100)
Incomplete secondary	0.256	-0.759*	0.503**	0.543***
	(0.407)	(0.337)	(0.182)	(0.163)
Secondary	0.113	-0.517	0.982***	1.029***
	(0.466)	(0.272)	(0.143)	(0.126)
Teacher training	0.382	-0.958*	0.652**	0.793*
	(0.682)	(0.431)	(0.215)	(0.360)
Koranic	0.022	0.563	0.335	0.211
	(0.392)	(0.503)	(0.216)	(0.180)
Polytechnic	0.678	-0.899**	1.243***	1.233***
	(0.701)	(0.348)	(0.302)	(0.255)
University	1.066	0.823*	1.689***	1.579***
	(0.730)	(0.391)	(0.231)	(0.338)
Female	-0.048	0.503**	-0.829***	-0.861***
	(0.102)	(0.180)	(0.077)	(0.086)
Selection equation				
Incomplete primary	0.537***	0.351***		0.163**
	(0.114)	(0.099)		(0.055)
Primary	0.816***	0.292***		0.368***
	(0.067)	(0.064)		(0.033)
Incomplete secondary	1.030***	0.471***		0.372***
	(0.104)	(0.094)		(0.058)
Secondary	1.577***	0.476***		0.595***
	(0.074)	(0.073)		(0.042)
Teacher training	2.568***	0.569***		-0.467***
	(0.102)	(0.125)		(0.099)
Koranic	0.242*	0.100		0.153*
	(0.124)	(0.130)		(0.060)
Polytechnic	2.691***	0.871***		-0.317***
	(0.090)	(0.095)		(0.075)
University	2.844***	0.759***		-0.295**
	(0.103)	(0.115)		(0.096)
Female	-0.082	-0.430***		0.599***
	(0.043)	(0.047)		(0.024)
r2			0.103	
N	14487	14487	5361	14487

Source: Author's calculations from NLSS 2003-4
Note: Controls excluded from earnings and selection results

Table 6-8: Regressions of Household Infrastructure on Child Height for Age (WHO).

	Length/height-for-age z-score					
	1	2	3	4	5	6
Domestic water (base value is open water source)						
piped_water		1.350				
		(0.415)				
improved_water		1.555*				
		(0.276)				
protected_water		1.135				
		(0.180)				
open_well		1.269				
		(0.179)				
purchased_water		1.883*				
		(0.553)				
Domestic toilet (base value is none)						
flush_toilet			1.627**			
			(0.299)			
improved_toilet			1.605			
			(0.475)			
trad_toilet			1.274*			
			(0.154)			
Electricity (base variable is none)						
electricity				1.470***		
				(0.148)		
Cooking fuel (base value is biomass)						
modern_cooking					2.187	1.985
					(1.168)	(1.075)
improved_cooking					1.583**	1.268
					(0.229)	(0.225)
wealth index factor score						1.230*
						(0.101)
Constant	0.217***	0.177***	0.183***	0.178***	0.207***	0.221***
	(0.045)	(0.035)	(0.037)	(0.038)	(0.042)	(0.044)
r_square	0.091	0.094	0.093	0.094	0.094	0.095
Number of obs	4164	4164	4164	4164	4164	4164

Source: Author's calculations from NDHS3; controls for mother's and father's education, female child, ethnicity, zone and rural residence included in all regressions Ie.g. in column (1)
Note: standard errors are robust using survey weights and clustering
* p<0.05, ** p<0.01, *** p<0.001

Table 6-9: Correlation Coefficients among Household Infrastructure Variables

		years of education		occupation						
		Mother	Father	Mother	Father	Water	Toilet	Cooking fuel	Floor	Wealth index
Years education	Mother	1								
	Father	0.627	1							
	Mother	0.043	0.018	1						
Occupation	Father	-0.342	-0.431	0.112	1					
	Water	-0.135	-0.108	0.098	0.140	1				
	Toilet	-0.341	-0.307	0.137	0.321	0.283	1			
	Cooking fuel	-0.503	-0.407	0.046	0.285	0.268	0.493	1		
	Floor	-0.424	-0.420	0.072	0.347	0.227	0.446	0.449	1	
	Wealth index	0.584	0.541	-0.112	-0.454	-0.362	-0.676	-0.752	-0.675	1

Source: Author's calculation fromNDHS3
Note: Variables are ordered in ascending or descending order of 'modernity'

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Notes: User Define 2: English
User Define 3: $5.00

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7 Appendixes

7.1 The welfare aggregate

There are several steps in computing household expenditure in NLSS; broadly we follow the assumptions in World Bank, 2008, noting apparent differences with NBS, 2006 and Appleton et al., 2008. These steps are:

I. Compute household demographic characteristics (size, adult equivalents)

II. Compute food consumption:

  a. purchases from Section 10B (exclude tobacco)

  b. add food consumed from own production (Section 9H)

III. Compute non-food consumption:

  a. frequently consumed items (Section 10A2)

  b. infrequently consumed items (Section 10A1)

    i. smaller items

    ii. larger items converted to annualised values (see also user values of owned durables)

  c. Add consumption of non-food items from own production (Section 11D)

  d. Compute user values of owned durables (depreciation an owner cost)

IV. Compute expenditure on utilities (Section 7). Add median values for items with missing values

V. Compute poverty lines:

  a. money-metric poverty lines

    i. establish a national poverty line

    ii. compute spatial/sectoral COG deflators

      1. use democratic average budget shares

      2. use the set of retail prices for a subset of items available from NBS[74]

    iii. apply deflators to obtain state/sector/month[75] (domain) poverty lines

  b. calorie-based poverty lines based on calorie norms

[74] It is noteworthy that our budget shares are very different to those used by NBS to compute its CPI deflators. Also, NBS uses the Laspeyres index number formula while we use the Tornqvist formula. Laspeyres indexes tend to exaggerate price level differences. Our deflators are less variable than those used by NBS (and Appleton et al., 2008).

[75] Average inflation in the survey period was about 15%, so that a household surveyed in August 2004 would face a cost of goods 15% above that of a household in the same domain surveyed in September 2003. However, the deflator inflation rates varied significantly by domain (zone and sector) (Table 3-1).

i. establish calorie norms

ii. compute calories consumed in foods

1. develop a table of calorie (and other nutrient) contents of foods consumed by households – usually calories per kg or 100 gm, litre or piece (egg, cup of tea, mineral, etc.)

2. compute quantities of foods consumed

- NLSS 2003/4 does not contain variables that allow calculation of quantities directly (total quantity and units in which quantities measured)
- quantities can be estimated by dividing total expenditure (or value of consumption from home production) by local (state/sector) prices. However:
  - The publication on retail prices in Nigeria provides tables of retail prices of a significant number of items by month for each state and sector for the years 1997-2006; unfortunately it has many missing tables.
  - Prices are available in an Excel file from NBS apparently containing the calculation of the state/sector/month deflators used in NBS, 2005 and by Appleton et al., 2008. This file contains complete price information for September 2003 to August 2004 for a number of common items for all states and in both rural and urban sectors. The items cover between 57 and 94 per cent of the value of food consumption of state/sector domains (national average 84 per cent). The file also apparently gives the weighting used by these authors for their monthly state/sector CPI deflators. We show that while constrained by the items defined in the NLSS expenditure data, the item weightings do not appear to correspond well to a consumption pattern that is representative of any domain, including the national average. We compute new democratic weights for the bottom two quintiles of the undeflated expenditure distribution to compute four indexes for each state/sector/month domain. These deflators differ considerably from those used by NBS and Appleton et al.
  - While quantities of food items consumed can be calculated by this method (dividing expenditure by retail prices) even at national level, calorie consumption from a considerable share of food expenditure cannot be calculated and thus any calorie consumption estimate will be incomplete. This suggests that even a national FEI poverty line cannot reliably be estimated for Nigeria using the NLSS 2003-4 because the calorie contribution of a significant share of food expenditure cannot be calculated.

– However, a CBN[76] calorie-based set of poverty lines could be calculated provided one is prepared to give some credence to the idea that this method provides a comparable set of poverty lines. Notwithstanding its authoritative provenance, we do not believe that (any variant of) this method can be relied on for this purpose, though through default it may be the best available at this time with the data available.[77]

iii. (zf) and estimated non-food expenditure for households which spend zf of food items. = e.g. implement the CBN method for all domains.

[76] FEI poverty lines are the expenditure at which households on average consume the household normative calorie 'requirement'; it is usually calculated from a regression of estimated calorie consumption on household total expenditure. CBN poverty lines are calculated from the cost of a food bundle that provides the normative household calorie 'requirement' (zf) to which the estimated non-food expenditure of households which spend zf. This is usually estimated by some version of the inverse food Engel curve method. See Ravallion, 1992, 1994, 1996, 1998 and Tarp et al., 2002 for further detail.

[77] Palmer-Jones provides an extensive critique of CBN methods of PL calculation. There are several different variants of the CBN method.