FACTORS AFFECTING INFANT AND CHILD MORTALITY IN ONDO STATE, NIGERIA

BY

BABATUNDE A. AHONSI
POPULATION STUDIES
LONDON SCHOOL OF ECONOMICS
AND POLITICAL SCIENCE

THESIS SUBMITTED AS A REQUIREMENT FOR THE UNIVERSITY OF LONDON DEGREE OF PH.D (ECON.) IN POPULATION STUDIES.

SEPTEMBER 1992

ABSTRACT

Following the logic of the proximate determinants framework for child survival analysis, the study shows how the main socio-economic inequalities in neonatal, post-neonatal, and child mortality observed in 1981-86 Ondo State were produced. Unlike most previous studies of early childhood mortality factors in Nigeria, the study explicitly investigates the linking mechanisms between key socio-economic factors and child survival. Local area infrastructural development is shown to be the main socioeconomic factor in neonatal mortality while household disposable income status along with local area infrastructural development showed the strongest impacts upon post-neonatal mortality. Household disposable income status emerged as the main socioeconomic factor affecting mortality during ages 1-4, with maternal education showing no strong effects even in this age segment where its impact may be expected to be most strongly felt. The integrated analysis demonstrates that much of the observed infant mortality advantage of residence in more developed local areas is due to easier physical and real access to modern health services and that most of the child mortality benefits conveyed by high household income status derive primarily from better home sanitary conditions and secondarily from better quality of curative and home care for very ill children.

ACKNOWLEDGEMENTS

I am extremely grateful to Professor John Hobcraft for his excellent supervision and guidance of the data analysis and writing-up of this thesis. Dr. Chris Wilson's suggestions and advice especially during the early stages of the research were also quite helpful and I was fortunate to have had at different times, helpful advice from Tim Dyson, Mike Murphy, and Chris Langford. The Association of Commonwealth Universities (U.K.) financed my stay at the L.S.E. and for this, I will be ever grateful.

The moral support and practical help of many other people helped eased my preparation and completion of this study. I especially want to thank Dr. Hussai Abdullah-Olukoshi for her great acts of friendship and the following: Clement Deniran, Johnson Akintolu, Yvonne Shodeke, Fry Amadi, Adango Oko-Jaja, Chol Garkmar and his family, Dr. Pat Onyemunwa, Tunde Ayan, Nelson Onuoha, Dr. Orieji Chimere-Dan, Chris Okogwu, Felix Ogbera, Sikiru Baruwa and Barinem Vulasi - for putting up with me and remaining my friends during the last 3-4 years. From among my former teachers, I wish to acknowledge with thanks the encouragement given to me by Professor P. O. Olusanya, Dr. Tade Aina, and Mr. Oberu Aribiah. Finally, I thank my parents, Lola, Sumi, Tonia, Anna, Moji and Osaghe for their constant support and love.

B. A. Ahonsi.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

BACKGROUND TO THE STUDY

1.1: INTRODUCTION

An aspect of demographic phenomena in developing countries that continues to receive considerable attention from researchers is mortality among infants and children aged below five years. The rationale for this special focus is not far-fetched, for one in every three deaths in the world is the death of a child under five years of age, most of which occur in the developing world (Grant, 1988; 1991).

Despite the dramatic decline in overall developing world mortality level since 1945, an under-five mortality rate of over 100 per 1,000 live births was still recorded in 1990 in fifty developing countries. In other words, with just a few years to the end of the 20th century, the death of more than one child out of every ten born, prior to their fifth birthday is the norm in such a large number of countries. More than two-thirds (34) of these are located in sub-Saharan Africa (Grant, 1991).

For Nigeria, which stands out as a prominent member of this group by virtue of having about the 30th highest under-five mortality in the world (190), the indications from the limited relevant data available are that in general, the components of the health status of the population has witnessed little or no change. This is in the sense that throughout the last four decades, nearly 50 percent of all deaths occurred among children below five years of age (Adeokun, 1985; Ransome-Kuti, 1986)

Thus, given that deaths to infants and very young children form the bulk of deaths occurring in Nigeria, exploring and accounting for the factors behind the high level of early age mortality in a way that highlights strategies that could be used to lower it would seem to be an important research undertaking, if overall mortality levels in Nigeria are to be significantly lowered.

Moreover, based on the pattern of demographic change experienced by present-day low-mortality societies, the general tendency is that when under-five mortality rate drops below 100 per 1,000 live births, the pace of decline in fertility becomes even more rapid than the previous reduction in infant and child mortality (Ruzicka and Kane, 1988; Grant, 1991). A common underlying factor for this pattern seems to be that couples tend to have fewer children once they become convinced that their existing children will survive, although the relationship between lower early child mortality and fertility decline is quite a complex and synergistic one.

The need for child mortality research in Nigeria is even more pressing now, since having realised the difficulties that rapid population growth poses to further economic development, the Federal Government has embarked on a policy directed towards lowering fertility and child morbidity and mortality levels. The goal is to reduce the rate of population growth from 3.3 percent per annum in 1984/85 to 2.5 percent by 1995 and 2.0 percent by the year 2000. The target as regards mortality is to bring down the infant mortality rate from 90 per 1,000 live births to 50 by 1995 and to 30 by the year 2000 (Federal Ministry of Health, 1988). Yet, compared to Senegal or Kenya for example, not much is known about child survival determinants in Nigeria.

However, it is quite clear that in virtually all high-mortality countries, there are a few sub-groups that experience quite low early child mortality comparable to the overall levels in the more advanced societies while the majority of the population continues to experience frequent child losses; a situation which if it were to persist will keep overall life expectancy low.

Analysis of data from the World Fertility Survey (WFS) pertaining mainly to the 1970s showed the existence of such huge socioeconomic differences in infant and child mortality in many developing countries that the typical ratio between the groups with the highest and lowest neo-natal mortality ranged from two to four, for post-neonatal mortality, two to five and for child mortality, three to 30 (Hobcraft et al, 1984). Significantly, results from the ongoing Demographic and Health Surveys (DHS) programme largely comfirm the persistence of this phenomenom into the 1980s despite the achievement of lower child mortality levels (Hill, 1990; Cleland et al, 1991; Barbieri, 1991).

For Nigeria, estimates of infant (1q0) and overall child (5q0) mortality rates for 1970-79 and 1980-89, derived respectively from the Nigerian segment of the WFS and the DHS and shown in Table 1.1 below, point to remarkable north-south regional inequalities in child survival.

Table 1.1: Infant and Child mortality rates by Region, 1970-79 and 1980-89: Nigeria

Region	1q0		5q0	
	1970-79	1980-89	1970-79	1980-89
Southwest	68	85	116	167
Southeast	93	83	162	144
Northwest	96	110	187	244
Northeast	92	88	148	215
All Nigeria	91	91	162	191

Sources: (i) National Population Bureau (1986) Nigeria Fertility Survey: State Level Reports (Lagos: NPB): Table 31.
(ii) Federal Office of Statistics and DHS/IRD (1992) Nigeria Demographic and Health Survey 1990 (Columbia, Maryland: DHS/IRD Macro International Inc.): Table 7.2

These regional differentials probably mainly reflect differences in prevailing levels of household poverty, availability of public and social amenities and the educational composition of the populations in the regions, all of which are well documented (Barbour, 1982b; Ikporukpo, 1987). Ecological differences between the regions may not be too important since in general, there is no part of Nigeria that is unaffected by a localized tropical disease; meningitis being more widespread to the north and malaria to the south (Barbour, 1982a).

Indeed, the 1981/82 Nigeria Fertility Survey (NFS) data relating to the 1970s showed that rural residents, women with no schooling, and fathers with no schooling experience an infant mortality rate that is respectively, 1.32, 1.81, and 1.20 times that experienced by urban residents, mothers with at least seven years of schooling, and fathers with at least seven years of schooling. Regarding mortality between the first and fifth birthday, the equivalent ratios are by and large, even larger - 1.33, 2.03, and 1.51 (Cochcrane and Farid, 1988). Broadly similar patterns emerge from the DHS data referring to the 1980s (Federal Office of Statistics and DHS/IRD, 1992: 80).

Such disparities are almost certainly a reflection of the differential clustering by socioeconomic status of the biomedical factors that directly produce ill-health and death. Thus, a practical and most probably fruitful way of trying to understand the salient elements behind high child mortality levels in a country like Nigeria with inadequate sources of demographic data, is through the detailed analysis of demographic sample survey data for the important correlates of early child mortality and the interactions between them.

It has been argued that cross-national analyses provide the firmest basis for making conclusive statements about the key socioeconomic determinants of early child mortality given the atypicality of some study settings (Preston, 1985). Yet, it is widely recognized that the main lesson that such differentials can provide is that poverty, lack of adequate education and poor environmental sanitation account for high levels of infant and child mortality; a conclusion that may not be of much help to a policy-maker concerned with reducing early child mortality through choosing from various possible health-enhancing strategies (Ruzicka, 1989).

Indeed, Preston (1985:260) noted the need to go beyond the 'totally atheoretical, mechanistic dose-response relations put forward in most studies'. A potentially effective means of achieving this is to examine the interplay between socioeconomic status variables and the access to and use of health resources in producing the effects on the more biological determinants of infant and child mortality.

The last point comes down to searching for the linking mechanisms between socioeconomic factors and child mortality, a task that is considered extremely difficult without sufficient information on, and an adequate understanding of, the sociocultural context and the nature of the public health system of the areas studied (Hobcraft, 1985). It is arguable that such an aim is better achieved through detailed studies of specific societies than through crossnational studies which seem best-suited for deducing broad generalizations about a limited number of determinants.

Further strengthening the case for detailed area studies is the observation that the amount of maternal education for instance, that is required to achieve significant reduction in early childhood mortality varies from culture to culture (Ware, 1984), while its joint effects with widespread health services provision in producing 'rapid mortality decline at low costs' in certain developing areas (Caldwell, 1986), seems rather difficult to separate from the historically specific political and social changes in these areas.

The increased awareness of the need for research integrating the socioeconomic and the more proximate determinants of child health and survival has yielded significant efforts at developing conceptual frameworks to guide data analysis. The frameworks put forward by Mosley and Chen (1984) and Palloni (1985) seem to be very good examples in this regard. But only very recently have a few empirical analyses actually utilizing the insights provided by such frameworks been attempted (see for example, Bicego and Boerma, 1991); a situation that was due in part to the lack of data required for integrated analyses of child survival factors (M'Backe and van de Walle, 1987).

With regard to Nigeria for instance, most of the past studies on early child mortality factors utilized indirect estimates derived from responses to questions on women's total number of children ever born (CEB) and the total number surviving (CS). Such data in comparison to more detailed birth history data provide limited opportunities for going beyond the establishment of a few socioeconomic differentials (Hobcraft, 1984). The present study is thus cast within the overall growing attempt at conducting integrated research into child mortality determinants with the hope of providing policy-relevant and theoretically insightful results.

Another issue rekindling research interest in child survival determinants in developing countries seems to be the need to address the concern that the rate of reduction in mortality levels of many developing countries may have slowed down and in some cases been reversed, due to the deleterious effects of their declining economic performance (Gwatkin, 1980; United Nations Fund for Children, 1985). Although it had been shown that a few countries with limited economic resources continued to achieve disproportionately low mortality levels (Caldwell, 1986), only recently has it been documented in detail that the pace of mortality decline in the 1970s through to the second half of the 1980s in the developing world, has remained largely unchanged despite the general economic decline (Hill and Pebley, 1989; Cleland et al, 1991). Nevertheless, the sub-Saharan region, especially West Africa, seem not to be participating fully in the persisting decline in developing world childhood mortality levels (Sullivan, 1991).

Nigeria is a particularly interesting case in this context because up to 1987 her economy was of middle-income status; she had by 1980/81 achieved near-universal primary education and had achieved rates of secondary and tertiary education, in addition to medical personnel levels, well-above the sub-Saharan Africa average. But she was in terms of life expectancy and early childhood mortality worse than the average for the sub-continent (Green and Singer, 1984).

The problem may well be inequalities in the distribution of resources since relatively egalitarian income distribution and devotion of public resources to broad-based health services have been shown to produce notable mortality reductions in many parts of the developing world (Cochcrane, 1980; Flegg, 1982; Caldwell, 1986). In fact, comparison of the results from the 1981/82 Nigeria WFS and the 1990 Nigeria DHS suggests that the pace of childhood mortality decline slowed significantly during the second half of the 1980s as the economic situation of the mass of the people worsened drastically (Sullivan, 1991).

Even during the 1970-82 period when there was a tremendous increase in state resources for meeting basic needs and reducing mass poverty through earnings from the sale of crude oil, the evidence does not suggest that the majority of Nigerians were better-off in terms of their overall well-being (Toyo, 1986; Green and Singer, 1984). Gross inequities and uneven development typify the society, economy and landscape (Bangura, 1986; Idachaba, 1985). Rural poverty remains pervasive with rural social services being very limited in scope or non-existent and the proportion of urban households below the poverty line has increased with rapid urbanization (Green and Singer, 1984). Consequently, as with the resultant increase in the proportion of the national population in absolute poverty, the present economic crisis has merely exacerbated a long-term crisis of mass poverty and underdevelopment.

The main social progress that has been made so far is in the expansion of formal education especially in Southern Nigeria. The proportion of the national population in the primary age bracket (six to 11 years) attending primary schools and the equivalent proportion (that is among 11-18 year olds) attending secondary schools had by 1980 reached 90 and 30 percent respectively (Federal Office of Statistics, 1986: 46), while the adult literacy rate was by 1981, about 66 and 40 percent for males and females respectively (United Nations Fund for Children, 1985: 88). The figures for Ondo State our study setting, as with the rest of Southwest Nigeria where the history of some sort of free universal primary education dates back to 1955 (Nwafor, 1982: 50), are much higher than the national average as the sample survey data shown in Table 1.2 tend to suggest especially for the younger adult population.

Table 1.2: Percent Literate among Adults by Age and Sex, 1981

Area	15 - 29 years			30 years and above		
	Male	Female	Both	Male	Female	Both
Ondo State						
rural	76.6	30.3	55.3	18.4	10.7	14.6
urban	72.6	59.2	65.1	51.0	28.3	38.2
All Nigeria						
rural	46.6	25.5	32.7	25.5	10.2	15.8
urban	64.2	47.5	54.5	56.8	42.6	50.2

Source: Federal Office of Statistics (1983a) National Integrated Survey of Households: Report of General Household Survey, April 1981 - March 1982: 20 - 21.

Post-1980 Ondo State thus seems to be an ideal setting for re-assessing the relative roles of educational/attitudinal and material poverty factors, as determinants of child mortality risks. A sharp deterioration has occurred in general living conditions in Nigeria since 1981 as a result of a combination of increasing unemployment and underemployment, declining real wages, rapid increases in the retail prices of staple foods and deteriorating social services (Adedeji,1985). It may well be that young children in poor households and communities have suffered the most from these economic hardships, probably with some mortality consequences (UNICEF, 1985; Sullivan, 1991).

The remainder of this chapter presents the conceptual framework that guides our organization of the relevant literature review and within which the study data are to be analysed. This is followed by a review of the relevant literature on the determinants of early child mortality that focusses on studies based on Nigerian data using the findings and conclusions from studies on other parts of tropical Africa and from crossnational analyses as a background in demonstrating the basic themes around which this study is built. An outline of the objectives and plan of the thesis is then given in the final section.

1.2: CONCEPTUAL FRAMEWORK OF STUDY

The analysis of the data for this study is guided mainly by the insights provided by the Proximate Determinants Framework put forward by Mosley and Chen (1984) for the study of child survival in developing countries. This is because it allows in principle, for the careful tracing of the pathways through which socioeconomic and community factors impinge upon child survival. Its logic is similar to that of the largely successful proximate determinants frameworks for fertility analysis and hence it has an enormous potential for enhancing the theoretical value and policy relevance of child mortality research.

Briefly, the Mosley-Chen framework rests on the following premises:

(i) Under optimal conditions, less than five percent of new born infants will die during their first five years of life.

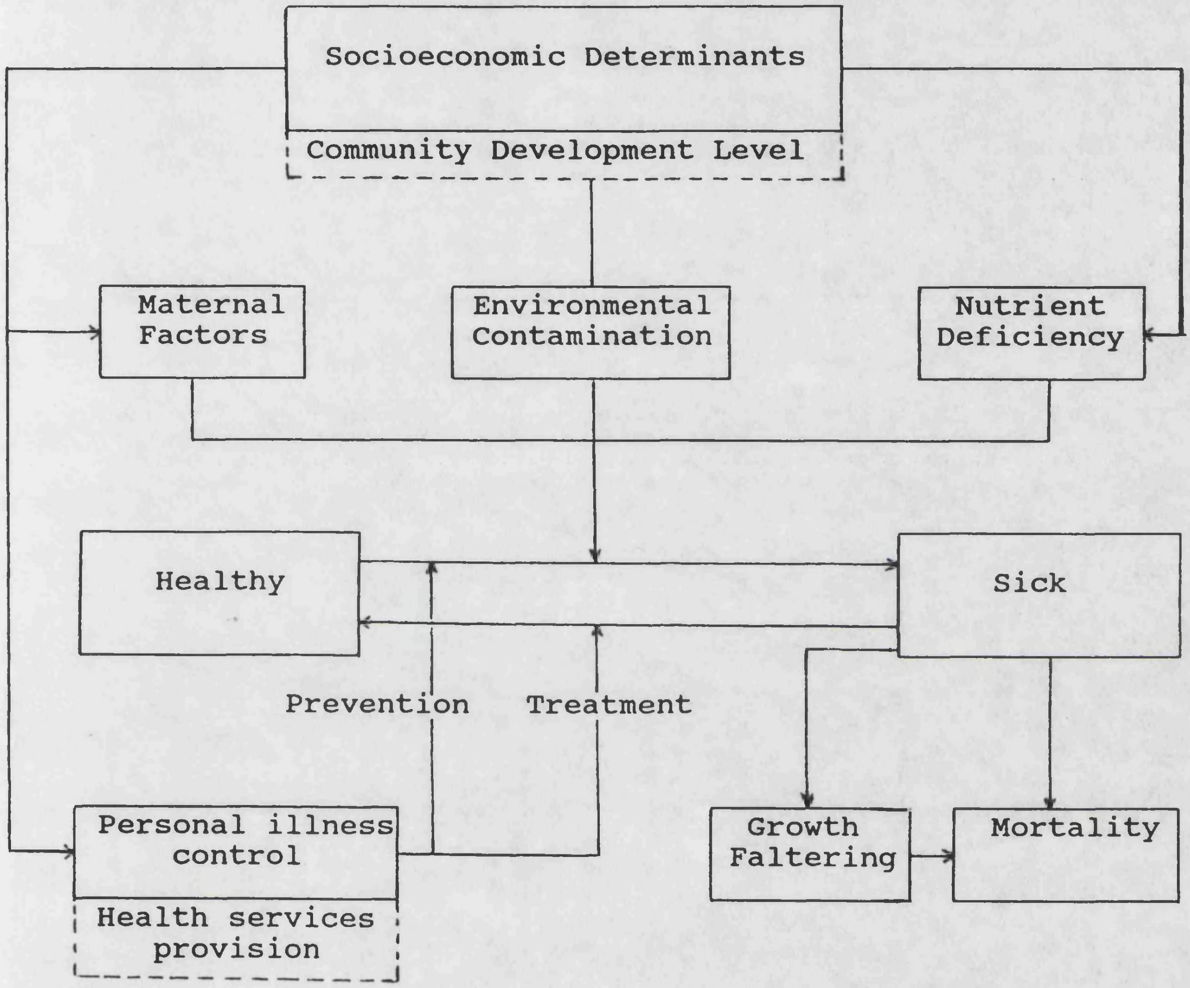
(ii) A higher death probability is due to the effects of social, economic, environmental and biological forces which necessarily operate through more basic determinants of the risk of disease and the outcome of disease processes - the proximate determinants.

(iii) A child's death (or growth faltering) is the cumulative consequence of multiple disease processes including their biosocial interactions.

The model identifies five groups of mechanisms through which socioeconomic factors act to influence the risk of mortality, namely maternal factors, environmental contamination, nutrient deficiency, personal illness control and injury.

The original model has been slightly modified by expanding the ultimate factors' block (socieconomic determinants) to include the probable effects of the infrastructural development of the community in which children are born and raised (level of community development). Also, the extent of health services provision is added as a possible filter on the personal illness control mechanism. The injury mechanism on which information is rarely gathered in demographic surveys has been omitted to reduce the sets of mechanisms to four. The framework as adapted is illustrated in Figure 1.1.:

Figure 1.1: An Adaptation of the Mosley-Chen Proximate Determinants Framework for Child Survival Analysis



It is thus indicated that maternal factors (age, parity, and birth interval), environmental contamination (air, food/water/fingers, skin and insect vectors) and nutrient deficiency influence a child's transition from a healthy to a sick state, while personal illness control (modified by accessibility of health services) affects the morbidity rate through prevention and the rate of recuperation through treatment. However, a sick child's condition could worsen so much as to result in growth faltering. Though originally presented as an outcome variable, growth faltering may also be viewed as a measure of **relative** risk of exposure to future mortality; hence the arrow linking 'growth faltering' and 'mortality'.

But as indicated by Mosley and Chen (1984:29), the fact that child death in the developing world is usually 'the ultimate consequence of a series of biological insults' (as opposed to being the outcome of a single biological event as with conception leading to a birth), makes it unlikely that the framework would be easily amenable to an explicit quantification of component contributions to mortality differentials as has been achieved for fertility differentials by Bongaarts (1978) and Hobcraft and Little (1984).

More importantly, for this study, some of the information available in the 1986 Ondo State DHS (ODHS) on indicators of nutrient deficiency (that is, anthropometric measurements) and personal illness control (that is, immunization uptake) relate to living children only. Hence, the direct linking of the identified key ultimate determinants through these mechanisms' indicators to child mortality is infeasible. But the framework provides the study an important basis for categorizing the various possible child survival determinants in a way that imposes some logical causal order on the analysis of observed socioeconomic differentials in child mortality.

There remains, however, a widespread consensus on the need to attempt some operationalization of this framework (Gray, 1989; Bicego and Boerma, 1991). Hence we shall attempt an examination of the relationships between the identified key socioeconomic factor(s) in child survival in Ondo State and the prevalence of child malnutrition, uptake of immunization and recent child morbidity, in the expectation that the results of such analysis can provide further insights on the pathways through which the ultimate determinants operate on child survival.

According to the framework, it can be said that child deaths result from two broad factors. The first consist of exposure variables namely, those conditions that govern exposure to disease and the chances of actually acquiring diseases. The second group comprises those factors that govern the course and outcome of the disease/ill-health process, that is, resource variables.

Thus, type of toilet facilities and extent of household crowding may be used to gauge exposure differences while the length of time a child was breastfed and type of medical care used, tap the course and outcome aspects of disease processes. By way of further illustration, maternal education can be thought of as influencing child health and survival through better care practices related to contraception, nutrition, hygiene and preventive/curative care such as allocation of more resources to child care or use of appropriate weaning foods, timely visits to prenatal clinics, optimal birth spacing and maintenance of proper home hygiene.

Similarly, with regard to household income or wealth, women from poorer households may have children that are more likely to be sick or die due to their own poor health associated with inadequate nutrition and rapid childbearing, poor sanitary conditions of their households and the possession of limited resources to provide adequate nutrients for their children and to exploit available medical services in the event of child illness.

However, an important lesson from previous studies (Hobcraft et al, 1984; 1985; Casterline et al, 1989; Boerma and Bicego, 1991; Bicego and Boerma, 1991) is that the relative importance of each set of proximate determinants tends to vary with age of the child. Thus, maternal factors such as teenage motherhood and short preceding birth intervals tend to have a greater impact on mortality during than after infancy while the reverse tends to be the case for factors of environmental contamination. Hence, the need to split the first four years of life into the neonatal, post-neonatal and early childhood periods in examining child survival determinants as done in this study.

The Mosley-Chen framework provides a useful guide for subsequent analysis by its categorization of various determinants of child health and survival in a way that allows for the integrative linking of environmental conditions, dietary status, health care, reproductive patterns and of disease states and outcomes, on the one hand and to socioeconomic factors on the other. Our general empirical approach will therefore be first, to establish the crucial socioeconomic variations in infant and child mortality in Ondo State, followed by an ordered control for various indicators of the relevant proximate factors (having established their discriminatory impact on child survival).

1.3: RELEVANT LITERATURE REVIEW AND THE MAIN ISSUES

In examining the findings from previous empirical studies, this section is organized around factors that are known to be significantly related to early child mortality in developing countries. These are classified following the logic of the proximate determinants framework into two groups: the ultimate determinants, mainly the socio-economic factors; and the proximate determinants, the intermediate biomedical mechanisms through which the former are presumed to act on child survival.

(a) The Ultimate Determinants -

(i) Parental Education: Broadly, there are two reasons for expecting the education of parents to affect the health and survival of their children. First, it enhances their income potential by raising their occupational status. Second, it provides them with knowledge and attitudes related to proper child care and the prevention and management of ill-health.

Caldwell's (1979) Ibadan study is considered to be one of the most influential analyses in the area of child mortality determinants in the developing world (Cleland and van Ginneken, 1989; Casterline et al, 1989). It is based mainly on data from a mid-1973 survey conducted in Ibadan City, southwest Nigeria which asked amongst others, CEB/CS questions of 6,606 women aged 15 - 59 years. Data from a second survey which covered 1,499 women residing in the broader region is used to supplement the main analysis. The child mortality index used is obtained by summing the proportions of children dead for each age group of respondents derived separately for younger (under 30 years) and older women.

The results show the index obtained for women with some primary schooling and for those with secondary schooling to be 68 and 40 percent respectively, of the index for women with no schooling in both the wider rural and urban segments. When the measures for environmentally poorer Old Ibadan are compared with those for New Ibadan, the educational differentials within each category are found to be much stronger than the areal differential.

More importantly, father's schooling though also producing a monotonic decline in the child mortality index as its level rises, yields smaller differentials than mother's schooling. Controlling for father's and mother's occupational status and type of residential environment, child mortality is still found to decline steeply with maternal education and the result is not altered even after incorporating the use of family planning and father's education. Net of these five factors, the children of women with secondary schooling average only 50 percent of the chance of dying for children of mothers with no schooling.

The study therefore concluded that the crucial role of maternal education in lowering child mortality is independent of the household's standard of living. Three main mechanisms through which mother's schooling acts to improve child survival were then suggested. First, education reduces women's fatalism about illness and hence raises their willingness to adopt modern child care practices. Second, it enhances a mother's ability to manipulate existing medical facilities through the better utilization of the services and the extraction of better treatment from health personnel for her children. Third, it raises a woman's status within the family in a way that increases her command over household resources and leads to the devotion of more resources to the welfare of her children irrespective of their sex.

In an earlier study also based on CEB/CS data collected in two socio-structurally identical Ekiti villages in present-day Ondo state, one - Ido with a well-staffed hospital and the other, Isinbode with no modern health facility within 40 kilometres, Orubuloye and Caldwell (1975) found that the differential in the average number of dead children according to mother's level of education (no education versus primary education or more) in the served village was twice as wide as in the unserved village.

It is worth noting however, that neither analyses attempted an empirical demonstration of how the suggested mechanisms of maternal education act on child survival. In examining this issue, Cleland and van Ginneken (1989), accept the primacy of maternal schooling as a determinant of child mortality in the developing world. But they argue for the relative unimportance as mechanisms, of health services utilization, superior health knowledge, and the devotion of more resources to child care associated with enhanced female status within the family. Instead, they suggested improved domestic care of children by way of better home and child hygiene and more intensive child supervision, as the crucial linking mechanisms.

Nevertheless, it may well be, as findings from an increasing number of studies in Africa (Ahmad et al, 1991; Casterline et al, 1989; M'Backe and van de Walle, 1987; Ware, 1984) indicate, that the beneficial effects of maternal schooling on early child mortality may have sometimes been exaggerated.

For instance, apart from doing the analysis separately for younger and older women, the 1979 Ibadan study did not control for the influence of such biodemographic factors as birth interval size and birth order which as will be shown later are also important determinants of child survival. This omission, perhaps due to the nature of the data, may partly account for the huge educational differentials presented although some studies suggest that this may not be the case (see Cleland and van Ginneken, 1989 for a review of such studies).

Nevertheless, Caldwell's dismissal of the notable effect of a mother being in a white-collar occupation as being dependent on her schooling should also be noted since it has been well established with southern Nigeria data that, high maternal occupational status has an independent lowering effect on child mortality (Sulaiman, 1987; United Nations, 1985). The control for use of modern health facilities (during the last birth) could be regarded as incomplete in the absence of information on physical access to such facilities. Equally important is the omission of income/wealth related factors and household environmental variables.

Later analyses of child mortality data from Nigeria have tried to account for some of the factors omitted in the earlier studies. The 1985 United Nations' comparative study of 15 developing countries is one of such studies. The dataset on Nigeria covered the southwest region and was collected in 1971 as part of the Nigeria Fertility, Family and Family Planning Survey. The analysis is based on CEB/CS responses from 2,957 women of childbearing age, using marital duration as the index of a child's exposure to mortality risks. The mortality index is obtained for each woman by relating the actual proportion of her children who have died to the proportion expected for an 'average' woman in the population of the same marital duration. Simultaneous consideration of all study variables was done using ordinary least squares (OLS) regression.

The analysis showed that with the exception of mothers with Koranic schooling, there is a decline in child mortality as mothers' years of schooling increases. Bivariate results also indicate that irrespective of level of father's education, increasing the level of maternal education leads to improvements in child mortality. The schooling effect also retains its strength across area of residence and household water supply categories. As for paternal education, the child mortality index also declines as its level rises. But the downward trend is broken at an intermediate level, a finding which the authors argue supports the view that maternal education has a greater impact on child mortality than paternal education.

When all other variables were controlled for, the coefficients for both mother's and father's schooling remain large and statistically significant with the estimates indicating the net effect of one year of maternal schooling in lowering child mortality to be 0.9 percent compared to 0.5 for father's schooling. The results also suggest that beyond six years of schooling, maternal education confers no additional net advantage. This latter finding is similar to Caldwell's observation in Ibadan of a stronger effect on child mortality of the transition from no schooling to primary schooling than from primary to secondary schooling. This pattern is however contrary to what has been observed in wider areas of the developing world in crossnational analyses (Caldwell and McDonald, 1981; Hobcraft et al, 1984; Cleland et al, 1991).

Also important is the finding by the United Nations study of an exaggerated effect of mother's education in the absence of control for her income. When the regression coefficients without and with income were compared with regard to mother's schooling, all but one notably decreased in size.

This finding is contradicted by an Ile-Ife (southwest Nigeria) study of the infant mortality experience of 2,111 mothers (interviewed between 1980 and 1981), which showed an increased effect of mother's education when other socio-economic variables including income and breastfeeding were held constant (Bankole, 1989). But it should be remembered that income and household environmental factors may not be as important for infant mortality (especially its neonatal component) as biodemgraphic and related endogenous factors (Boerma and Bicego, 1991).

In fact, other studies do reveal substantial weakening in the maternal education effects when some key variables are taken into account. The study by Onyemunwa (1988) in Benin City, midwest

Nigeria based on the most recent five-year birth histories of 3,688 women interviewed in 1984/85, presents results which show the expected association of maternal schooling with lower child mortality remaining statistically significant when parity, household toilet type, type of refuse disposal and timing of antenatal care variables were controlled for using logistic regression. But when the immunization status of the most recent births were incorporated in the controls, mother's schooling significance was reduced to marginality. This implies that some of the maternal education effect is achieved through increased access to and utilization of modern child health services.

Similarly, data from Ilorin, Kwara State collected from 913 currently married women aged 15 to 35 in 1983/84 and analysed using the same methods adopted by the 1985 U.N. study, showed the child mortality index to decline with higher levels of mother's schooling except between secondary and tertiary levels. Despite women with no schooling experiencing child mortality risks quadruple that of women educated up to secondary level, this disadvantage is hugely reduced and becomes statistically insignificant in the presence of controls for husband's occupation, parity, contraceptive use, area of residence and presence of indoor tap water and a refrigerator. Meanwhile, father's education continued to exert a significant though reduced net lowering effect on child mortality. These findings thus seem to highlight improved home hygiene and biodemographic profiles as some of the causal pathways through which parental education impacts upon child survival.

Also, Feyisetan and Adeokun (1989) in a study which mainly examined the relationship between variations in the perceptions of disease etiology, prevention and treatment and infant mortality in a wide area of southwest Nigeria during 1981-87, observed no significant impact of maternal education on child survival after controlling for the effects of maternal occupation, age and various child-health attitudes and service utilization factors.

There is therefore with respect to Nigeria some basis for the position that once some of the health disadvantages of being born into a lower class family are reduced through the provision of broad based and accessible health services and such health enhancing resources like modern toilet facilities, the direct influence of parental education (especially mother's) on child survival seems to wane considerably. One may interpret this pattern as indicative of some of the main pathways through which parental education conveys advantages in child survival.

But it is worth noting here that compared to Latin America and Asia, maternal education has weaker effects on child mortality in sub-Saharan Africa relative to paternal education and occupation (Hobcraft et al, 1984; United Nations, 1985). Hobcraft et al suggest that the particular role of paternal education reflects the small proportion of women with schooling in Africa. However, Southern Nigeria is above the sub-Saharan average with regard to female schooling and particular attention probably needs to be paid to factors of household and community poverty.

In the context of Nigeria, parental education effects on child survival may be less reflective of 'choices' or 'decisions' in matters of child care and health than means for overcoming economic constraints on such choices. Moreover, with an increasing majority of deaths to African under-fives occuring in the first year of life (Rutstein, 1984; Hill, 1990; Barbieri, 1991), during which the net effect of maternal education is often modest, much more thought needs to be given to the blanket recommendation of increased maternal schooling (Caldwell and Caldwell, 1985) as the **most** cost-effective means of lowering early child mortality in Africa.

In fact, comparative analysis of WFS data by Hobcraft et al (1984) presented 'best-fitting' models which omit maternal schooling in 15 out of 24 countries for the neonatal period, 14 out 24 for the post-neonatal, and 9 out of 28 countries for the early childhood period. An earlier review of the literature on the various ways maternal education affects child mortality reached the conclusion that to the extent that most studies do not satisfactorily separate the influence of maternal schooling from the overall economic circumstance of the household, it has been made to explain 'at once too much and too little' (Ware, 1984). Ware also suggested that its effect in more recent periods may be different from its effects in the past when very few women in many developing areas had been exposed to Western education.

Indeed, Bicego and Boerma (1991) in a multivariate analysis of DHS data for 17 developing countries for the 1987-90 period, present results that suggest for four West African countries - Ghana, Senegal, Togo and to a lesser degree, Mali - very weak maternal education effects on neonatal mortality, and for mortality during 1-23 months of life, a reduction to statistical insignificance upon the inclusion of controls for household economic status, biodemographic factors and health services utilization. Moreover, a joint analysis of WFS and DHS data for 12 developing countries (including Senegal and Sudan) indicated that the contribution to overall child mortality decline during 1965-85 of the increase in the proportion of female population exposed to formal schooling may have been modest (Cleland et al, 1991).

On the other hand, a principal components analysis of DHS data for the factors associated with variations in infant and child mortality for 44 sub-regions created out of Senegal, Mali, Togo, Ondo State, Ghana, Uganda, Burundi, Kenya, and Zimbabwe, reached the conclusion that social factors especially parental education are significantly more correlated with mortality differentials than residential and economic ones (Barbieri, 1991).

On the whole therefore, ample opportunities still exist for further assessments of the relative roles of educational and economic poverty factors as determinants of child mortality patterns and change in various parts of sub-Saharan Africa.

(ii) Household Income or Wealth and Parental Occupational/ Employment Status: These are variables that directly determine a household's economic position and therefore influence amongst other factors, the quality of its children's nutrient intake, their home living conditions and their use of modern medical services, all of which may be expected to affect their health and survival.

Caldwell's 1979 Ibadan study did find a comparable effect of mother's white-collar occupational status in producing lower child mortality as secondary schooling although it was simply discounted as having no independent effect because over 93 percent of such women had secondary education. On the other hand, a substantial impact of husband's white-collar occupational status was deduced in that for women married to men in white-collar occupations residing in New Ibadan, the observed child mortality index was 64 percent of the level for those with husbands in non-white-collar occupations.

Sulaiman (1987) presents a detailed analysis of the effects of this set of variables in Southern Nigeria. Using the same methods as the 1985 U.N. study but incorporating data from Southeast Nigeria and replacing marital duration with mother's age as the index of a child's exposure to mortality risks, it matched and analysed responses from 4,679 couples. It was therefore possible to estimate the influence of woman's income on child survival independent of her husband's income. The approach was justified on the ground that in Southern Nigeria where women have traditionally engaged in economic activities outside the home and where spouses maintain separate incomes, mother's income may be expected to have a greater impact on child mortality given the greater demand on the man's income from extended family commitments.

The analysis showed an inverse association between child mortality and both parents' income. But while it required an annual paternal income of about 600 U.S. dollars to notably lower child mortality, only 300 dollars was required of mother's income to have an even greater impact. The effect of mother's income was found to be greater in complex households while husband's income had a greater impact in nuclear households. The multivariate analysis showed that both income effects were independent of each other. But some of the initial effect of mother's income was shown to be due to its association with her education and husband's income while the effect of the man's income was mainly reduced by controlling for the availability of toilet and water facilities. There is thus some indications from this study of reduced physical exposure to pathogens and enhanced living standards (perhaps with regard to nutrition) as channels through which higher parental incomes lead to lower child mortality.

Likewise, Bankole (1989) found a linear lowering effect on infant mortality of husband's income in Ile-Ife, southwest Nigeria even after controlling four other socio-economic variables. Again, only births to women whose husbands' reported annual earnings was below about 600 U.S. dollars in the mid-1980s, showed a significant elevated risk of death in infancy. It is worth noting that parental or household income has also been shown to have a net lowering impact on child mortality in Greater Khartoum (Farah and Preston, 1982), urban Burkina-Faso (M'Backe and van de Walle, 1987), and Egypt (Casterline et al, 1989). In all three cases, income had a much greater effect than the parental education variables.

However, data from Benin City (Onyemunwa, 1988), Ilorin (Oni, 1988), Ile-Ife (Bankole, 1989) and the wider area of Southern Nigeria (Sulaiman, 1987) show that mother's work outside the home in a non-white collar occupation is associated with higher child mortality than economic inactivity. In particular, women in farming and the informal sectors of the urban economy have the highest child mortality and Sulaiman's study shows this to be due to the very low income they earn, their residence in complex households lacking modern toilets and in areas lacking modern health facilities. But the Ile-Ife study shows that mother's work exerts a lowering impact on infant mortality once the intensity of breastfeeding (an indicator of child care) is taken into account.

On the other hand, most of the Nigerian studies suggest that husband's white-collar occupational status conveys no major child survival advantage once variables like income and education are controlled for. This is somewhat at variance with findings from Caldwell's 1979 Ibadan study and from comparative analysis of WFS data (Hobcraft et al, 1984) which show for Senegal, Lesotho, Kenya and Sudan, paternal occupational status as an important child mortality determinant. However, this contrast may be partly due to the fact the latter did not incorporate factors of household income/wealth and health services availability.

(iii) Rural-urban Residence, Local area and Ethno-regional factors: The influence of type of area of residence on child mortality may be expected through the easier access to health services and perhaps other resources as a result of their greater concentration in urban areas in most of Africa (Mosley, 1985). Similar expectations may be used to underline the study of local area and regional variations in addition to cultural factors, as particular ethnic groups (with peculiar child care practices) tend to occupy particular geographical areas.

Caldwell (1979) found a higher child mortality level in Old Ibadan than in the newer areas although the differential was very much smaller than the educational differentials. But Oni (1988) found a statistically significant lowering effect on child mortality of residence in medium and high status areas of Ilorin relative to residence in the low class areas. By contrast, Onyemunwa (1988) found lower child mortality in Old Benin than in the newer areas.

More importantly, data pertaining to the whole of Southwest Nigeria showed a 20 percent mortality disadvantage of rural residence which was explained away with controls for some of the socioeconomic characteristics of respondents (United Nations, 1985). This is also the case for the other 14 countries considered, suggesting that it is the socioeconomic characteristics of the urban population rather than residence in the city that accounts for the lower child mortality of urban-based women. A similar conclusion was drawn in a review of WFS evidence by Preston (1985). The absence of significant rural-urban differentials in child survival in many developing areas also raises questions about the effectiveness of the predominantly urban-based curative health services in enhancing child survival.

Our search through the literature revealed no empirical study of sub-regional or local area variations in child mortality in Nigeria although both within and across tha states that make up Nigeria substantial unevenness in overall development and in living conditions are observable (Idachaba, 1985; Ikporukpo, 1987). It is not unreasonable to expect differentials in early child mortality that correspond to areal differences in the availability of infrastructures and economic opportunities. A key aim of this study therefore is the examination of the impact of local area development factors on child survival in Ondo State and how these interact with micro-level factors.

(iv) Marriage Factors and Religion: Polygyny, complex households and Islam have been shown to be associated with higher child mortality than monogamy, nuclear household structure and christianity respectively, across Africa (Gaisie, 1980).

Caldwell (1979) found in Ibadan that even after holding constant five other socio-economic factors including parental education and occupation, the probability of dying for children of monogamous marriages was 25 percent less than that for children of polygynous marriages. But in Ilorin, the child mortality disadvantage of polygynously married and moslem women disappeared when nine socio-economic and environmental factors were taken into account.

Results from two studies (United Nations, 1985; Sulaiman, 1987) indicate that in Southern Nigeria women in both types of marital unions who have been married more than once have higher child mortality than women in stable monogamous unions, even when other socioeconomic factors are held constant. This points to the disruptive influence of marital instability on child care. Relatedly, Sulaiman's study shows that at each level of parental income, child mortality is higher in complex households than in nuclear ones; a finding probably reflecting increased scarcity of resources for child care as the number of people sharing available resources increases.

(b) <u>The Proximate Determinants -</u>

Many post-1980 studies on child mortality differentials in developing areas have incorporated some of the biodemographic, environmental and health factors through which socio-economic factors impinge on child survival. However, causal modelling of the process linking the ultimate determinants through the proximate or intermediate factors to child mortality as a research area is only beginning to advance beyond the embryonic stage (Preston, 1985; M'Backe and van de Walle, 1987; Bicego and Boerma, 1991).

The studies reviewed below have mostly examined this group of variables without explicitly treating them as intermediate factors within an integrated framework. The variables of interest include inter-birth spacing, indicators of environmental exposure to disease and accessibility and utilization of health services.

(i) Micro-environmental Factors: Type of toilet facilities, source of household water supply, housing quality, crowding and method of refuse disposal are among the indicators generally thought of as determining the level of potential exposure to infectious diseases, the leading causes of child deaths in the developing world (Mosley and Chen, 1984).

WFS evidence indicate type of toilet facilities as showing up net child mortality impact more frequently than availability of piped water supply in the developing world (Hobcraft, 1985). Bivariate results from the Nigerian segment of the WFS also revealed a clearer association between early child mortality and type of toilet facilities than with source of drinking water in each of the four regions (National Population Bureau, 1986). The same pattern (net of controls for parity, maternal education, type of refuse disposal and antenatal attendance) was indicated with the Benin, Midwest Nigeria data analysed by Onyemunwa (1988).

However, the Ilorin study (Oni, 1988) which had specific information on the presence of **indoor** tap water showed a significant net beneficial impact on child mortality of residence in a household with indoor tap water. No two contexts would be expected to produce the same results since environmental effects may be situation-specific. But the relatively poor performance of piped-water supply in Nigeria may be reflecting the high proportion of households that get their drinking water from pumps outside their homes; with the process of fetching and storing the water providing additional opportunities for its contamination.

Also worth noting is the argument by Frank and Dakuyo (1985) that it is the age at which children are allowed to use household toilet facilities rather than the mere availability of these facilities that may be more crucial to children's risk of exposure to diarrheal morbidity and mortality. Using Burkinabe qualitative data, they reasoned that situations in which children are not allowed to use the same toilet/ sanitary facilities as adults, are highly conducive to their exposure to fecal matter regardless of the availability of modern toilets within the household.

Crowding, which Aaby (1987) has argued is an important determinant of child mortality (especially measles mortality) in West Africa but which turned out to be unimportant in urban Burkina Faso (M'Backe and van de Walle, 1987), is another variable that has received little or no mention in past studies of child mortality determinants in Nigeria.

(ii) Bio-demographic Factors: These include mother's age, birth order, sex of child and inter-birth spacing. Doyle et al (1978) using prospectively collected data on 537 sibling groups born between 1962 and 1969 in Imesi, Ondo State presented results of analysis of variance and regressions which revealed no strong effects of birth interval size variation on survival and weight-gain of the following child. The authors therefore concluded that where as in their study setting, an adequate level of nutrition and child health services exist, the adverse effects of short birth intervals can be prevented.

These findings are however, at odds with the results from national level single-round retrospective survey data for many developing countries (Hobcraft et al, 1983, 1985; Hobcraft, 1991). The results for Nigeria from Rutstein's (1984) cross-national analysis of WFS data showed quite clearly that very short birth intervals (less than 24 months) notably increase the mortality of the index child during infancy and to a lesser extent, in early childhood.

As regards maternal age, elevated mortality risks to children born to teenagers and women aged 35 years and above, relative to children born to 20-29 years old mothers were observed in Nigeria as in the other countries considered. A 'U-shaped' association especially in infancy was also shown between birth order and mortality of the index child. Similar patterns were observed when Rutstein's (1984) analysis were done separately for the four regions of Nigeria (National Population Bureau, 1986). Also, both studies showed for Nigeria, sex differentials in the mortality of infants, toddlers, and 2-4 year olds which conform to the expected patterns, that is, higher male mortality in infancy and more balanced sex ratios beyond infancy.

Multivariate analyses of WFS data sets (not including Nigeria) that controlled for mother's education, showed that both maternal age and birth order effects are almost completely explained away once birth spacing factors are controlled for (Hobcraft et al, 1983, 1985). Only births to teenagers and first births continue to experience higher infant mortality when the length of the retrospective and prospective intervals are held constant. The elevated risks for first births reflects their special status being largely born to teenagers who are more likely to be physiologically and socially less equipped to bear and raise children than older women. Short preceding birth intervals are especially associated with hugely elevated risk of child death especially during the first year of life in many developing countries regardless of other socioeconomic, nutritional and biodemographic factors (Boerma and Bicego, 1991).

The underlying mechanisms for the child spacing impact on child mortality has been a subject of considerable dissensus in the literature (see also Pebley and Millman, 1986; Potter, 1988); with maternal depletion, sibling competition for resources and care, and increased infectious diseases transmission having been frequently put forward as main candidates. But one cross-national study has presented results which seem to narrow these down to maternal depletion as regards the effects of short preceding birth intervals (Boerma and Bicego, 1991). In any case, these factors are so closely intertwined with the biological processes leading to child deaths that Mosley and Chen (1984) collectively treat them ('maternal factors') as one of the proximate determinants of child survival in developing areas.

(iii) Breastfeeding and Nutritional Factors: Many studies in Asia in particular, have shown that severely malnourished children are at much greater risk of dying than mildly malnourished and adequately nourished children and that such children usually come from poor households headed by uneducated or modestly educated parents (Martorell and Ho, 1984). Nutrient intake therefore qualifies as a key mechanism through which socio-economic factors may act to affect child survival since malnutrition makes children more susceptible to infections and weakens their capacity to recover from illness. In this regard, breastfeeding has been shown to have child health-enhancing effects especially during infancy when it constitutes a major component of nutrient intakes in most developing areas (Gray, 1981; Huffman and Lampere, 1984).

The Ile-Ife study by Bankole (1989) showed low intensity of breastfeeding (measured by the age at which artificial milk was first introduced to the child) as exerting a significant elevating impact on infant mortality especially when supplementation takes place in the first month of life. Onyemunwa's (1988) study found a child mortality risk of 1.44 in favour of Benin mothers who considered breastfeeding for longer than one year to be best for babies. But such a result is limited by the uncertainty about the extent to which perceptions tally with actual behaviour.

Relatedly, results from a nutritional and medical intervention programme in Imesi, Ondo State during the 1960s suggest that five years after its initiation, infant mortality rate in Imesi was 48 per 1,000 compared to 91 in a nearby village that had similar mortality conditions at the outset (Berg, 1981).

The limited number of studies based on Nigerian data that took account of the role of breastfeeding and other aspects of infant feeding in the examination of child mortality patterns underline the need to further investigate the role of these factors as determinants of child survival in Ondo State.

(iv) Child care practices, access to and use of health services: The steps taken by parents to prevent child illness and when ill to ensure a child's quick return to health are perhaps the most directly linked to child mortality risks. This is an area in which questions about the relative role of parental knowledge/attitudes and capacity to procure good health are raised.

Some authors like Ware (1984) have argued that decisions about such child care matters like food sharing within the family may depend greatly on the level of household economic resources in many developing areas just as innovative health behaviour such as use of pre- and post-natal health services entail financial and social costs that are more readily met by the educated mothers.

Others stress the importance of education and attitudes since some behaviours are founded on ignorance such as: withholding of food and liquid from a child suffering from diarrhoea; use of inappropriate weaning foods; and inattention to household/personal hygiene; all of which heighten child mortality risks (Black, 1984; Frank and Dakuyo, 1985). Relatedly, some of the reasons for the underutilization of rural health services in many developing areas may be non-economic (Mosley, 1985).

The significance of either set of factors may depend on the social environment. In the Southern Nigeria situation where there are few households without a moderately educated female adult and where the educated command great social influence within and across families (Berry, 1985:30-38), traditional attitudes about health and unwillingness to resort to the use of modern health services are likely to be less important than economic and locational factors, in limiting the poorer and less educated groups' access to and utilization of these services for ensuring their children's health.

Indeed, a 1975 rural Ekiti (Ondo State) study revealed no significant educational differentials in the use of a modern hospital where it was available (Orubuloye and Caldwell, 1975). In comparing the two populations studied, differences in the treatment of child illness were mainly due to the ready access of one to a modern health facility which were not easily available to the other rather than to any contrast in attitudes to the proper treatment of sickness. This difference in access produced a huge child mortality advantage (.234 to .344) in favour of the served village. The conclusion of that study was that mortality decline is not 'a matter of overcoming ignorance but of providing a sufficient density of health services of reasonable calibre' (Orubuloye and Caldwell, 1975:272).

However, in a later reinterpretation of the same data, Caldwell and Caldwell (1985) argued that the presence of health services alone lowered child mortality by far less than its joint effects with mother's education. This position is somewhat at odds with the expectation that easier access to health services would tend to weaken the role of education, income and other individual characteristics in influencing child mortality. Two wide-ranging reviews (United Nations, 1985:277; Cleland and van Ginneken, 1989:22) had noted that Caldwell's hypothesis needs to be empirically demonstrated in other settings.

In fact, at least four of the studies reviewed above do document the lowering impact of the provision of modern health services on child mortality net of parental attributes. The United Nations (1985) study showed that women in rural Southwest Nigeria living eight or more miles away from the nearest hospital or dispensary had a child mortality index that is 30 percent greater than that for mothers residing in a community with both a hospital and dispensary. A striking 38 percent net difference in child mortality was estimated between urban areas that have hospitals and those that have only dispensaries (United Nations, 1985). Sulaiman's (1987) replication of the U.N. study to cover the whole of Southern Nigeria also observed broadly similar patterns.

Furthermore, the Benin study (Onyemunwa, 1988) while presenting no significant educational differentials in the use of antenatal care services and take-up of the first dose of BCG vaccine, shows these two factors to be important determinants of child mortality, with the latter remaining significant in the presence of controls for several socio-economic and environmental factors. Similarly, the Oyo State study (Feyisetan and Adeokun, 1989) observed a significant net beneficial impact on infant mortality of delivery in hospitals and maternity centres, modern post-natal care, and of rational and adequate perceptions by mothers of the causes and treatment of measles and diarrhoea.

It is not being suggested that some ignorance of the links between personal/environmental hygiene or dietetic deficiences and ill-health and some culturally based superstitions about health do not persist in Nigeria. For example, many people including the moderately educated still ascribe certain ailments and even deaths to supernatural causes (Maclean, 1971; Uche, 1985). Relatedly, doubts have been raised about the extent to which the formal educational system in Nigeria provide students with adequate knowledge about health issues (Adeokun, 1985:190). But overall, the evidence from attitudinal surveys in Ibadan (Maclean, 1971), rural Midwest Nigeria (Mott, 1976) and rural Southeast Nigeria (Uche, 1985) indicate a high level of awareness and willingness to use modern health facilities provided they are locationally and financially accessible.

Indeed, studies in rural North-central Nigeria (Stock, 1983), in urban South-east (Freeman et al, 1983) and the Southwest (Egunjobi, 1983) all show distance and cost as main factors in the utilization of modern health services. In other words, if modern health interventions do significantly contribute to lower child mortality as seems to be the case in Southwest Nigeria, then extending these services or increasing their density would tend to reduce socioeconomic inequalities in child survival.

(c) <u>Overview: Education, Attitudes and Poverty as Factors in Early Child Mortality in Nigeria:</u>

One issue the foregoing review has tried to raise is whether to view material poverty and deprivation as the main factors behind nutrient inadequacy, inadequate provision/underutilization of health services and resources and lack of personal and home hygiene, all of which significantly account for the high child mortality among the majority of Nigeria's population. Or rather to mainly attribute the mortality situation to lack of education, ignorance and attitudinal factors.

Some scholars will see this dichotomy as a false one since for instance, it may be reasoned that an educated mother is better-placed to appreciate the effectiveness of modern therapies and the potential seriousness of a child's ailment as to ensure her timely visit to a hospital. But it is arguable that such timeliness would depend on the ease with which she can get to the facility which may be tied to the amount of economic resources available to her household. This is especially so where transportation costs are high or where getting to use available health services involves long absence from work and productive domestic activities. Similarly, the lack of basic services like clean water and safe sanitation may make it difficult to practise home hygiene in poor and underserved communities.

In accepting the mutually reinforcing interactions between attitudes and poverty as determinants of the probability of child deaths, many analysts have tended to overstress the importance of the former without allowing for the possibility that the relative significance of either factor may be dependent on the social structure of the area involved. For many poor households in Nigeria there may be no choices to be made as regards for example, the use of soap for hand-washing, consumption of protein-rich foods and use of modern child-health services since they are simply out of reach. Even prior to the recent huge increases in retail prices, a 1980/81 National Consumer Survey showed that almost 60 percent of all monthly earnings of Nigerian households headed by a self-employed man was spent on food alone irrespective of area of residence. For households headed by a wage earner, the equivalent figures for the rural and urban areas were 40 and 50 percent respectively (Federal Office of Statistics, 1983b: 11-18). Thus, after meeting the costs of basic food items, little is left of most households' incomes for meeting such health-related expenditures as accommodation, transportation and use of health services.

The efforts of the United Nations Fund for Children (UNICEF) and the World Health Organization (WHO) in promoting the education of mothers on such 'low-cost' health measures as birthspacing, breastfeeding, child immunization, safe weaning, proper feeding during and after a child's illness, oral rehydration therapy and domestic hygiene have a great potential for lowering child mortality levels in sub-Saharan Africa. But the extent to which this can be actualized at least in the Nigerian situation seems heavily dependent on the extent to which the actual living conditions of the people and the overall environment are improved. The failure of the first national attempt at universal child immunization during the early 1970s was for instance, largely due to infrastructural inadequacies (Ransome-Kuti, 1985:12-13).

In short, as the search for the linking mechanisms between socio-economic factors and child mortality gathers pace, there is need to focus on factors related to the material circumstances of households and communities alongside educational and attitudinal variables, whose significance we do not deny. The power of an informed parent to take control over the health of her or his children may be quite often limited by poverty and inaccessibility of public utilities which make for humane living conditions.

The implications of our argument are that while it is important to extend formal education to an increasing proportion of the female population and to promote 'low-cost' health interventions, both of which empower the individual to assume greater responsibility for child and family health, great efforts would have to be made to facilitate this process and guarantee the permanence of its salutary mortality effects through the provision of extensive health and community services and the creation of more economic opportunities for the bulk of the population.

1.4: OBJECTIVES AND PLAN OF STUDY

Deriving from the discussions so far, the specific objectives of this study are as follows:

(i) Determine the most important and visible socioeconomic inequalities in infant and child mortality in Ondo State during 1981-86.

(ii) Ascertain how individual, household and community factors interact in shaping the observed socioeconomic patterns in infant and child mortality.

(iii) Attempt to demonstrate the mechanisms through which the key socioeconomic factors impinge upon child survival.

(iv) In further pursuit of (iii), examine the effects of the key socio-economic factor(s) in child survival on the uptake of immunization and the prevalence of stunting/underweight and recent diarrheal morbidity among children aged five years and below.

(v) Following from (i) to (iv), reassess the relative roles of educational/social factors and poverty as determinants of child survival outcomes in present-day Nigeria.

The thesis is organized into eight chapters along the lines that reflect the study's analytical approach. This chapter is followed by the chapter that profiles Ondo State, the study setting. Chapter Three evaluates the quality of the data and discusses the mortality estimation procedures. Chapter Four considers socio-economic and local area variations in infant and child mortality, having discussed the adopted analytical and statistical approaches.

In Chapter Five, the role of bio-demographic, micro-environmental, infant feeding and child health services accessibility and utilization factors are examined. Chapter Six then presents the results of the integrated analysis of the main infant and child mortality factors identified in the preceding chapters. The integrated analysis is taken further in Chapter Seven with an examination of the effects of the key socioeconomic child survival factor(s) on the prevalence of malnutrition, recent diarrheal morbidity and immunization uptake among under-fives. The last chapter summarizes the main findings of the study and discusses the main issues these raise.

1.5: SUMMARY

In this chapter we have provided the background to this study. The priority of integrated research into child mortality determinants in developing areas was underlined. With the Nigerian context in mind, the review of previous empirical studies demonstrates the usefulness of reassessing the relative roles of educational factors and economic poverty as determinants of early childhood mortality.

A slightly modified version of the Mosley-Chen framework for child survival research in developing areas was adopted as a guide for the subsequent data analysis in pursuit of the stated objectives of study.

REFERENCES

Aaby, P. (1987) Overcrowding: a major determinant of variations in measles mortality in Africa. IUSSP Seminar on Mortality and Society in subSaharan Africa, Yaounde, Cameroun; (Liege: IUSSP)

Adedeji, A. (1985) Some reflections on Nigeria's economic performance since Independence and thoughts on future prospects (Addis Ababa: United Nations Economic Commission For Africa).

Adeokun, L. (1985) Problems of health intervention programmes: the case of Nigeria. In Vallin, J. and A. D. Lopez eds., Health Policy, Social Policy and Mortality Prospects, (Liege: I.U.S.S.P): 180-192.

Ahmad, O. B., I. Eberstein and D. F. Sly (1991) Proximate determinants of child mortality in Liberia. Journal of Biosocial Science 23, 313-326.

Bangura, Y. (1986) The Nigerian food crisis. In P. Lawrence ed., World Recession and the Food Crisis in Africa, (London: James Curry Limited): 40-58.

Bankole, A. (1989) Maternal employment and infant mortality: an examination of the role of breastfeeding as an intermediate factor. Biology and Society 6(1): 19-26.

Barbieri, M. (1991) The socioeconomic and cultural context of infant and child mortality in subSaharan Africa. Paper presented at the Demographic and Health Surveys World Conference August 5-7 (Washington, D.C).

Barbour, K. M. (1982a) Human diseases and health facilities. In Barbour, K. M., J. Oguntoyinbo, J. Onyemelukwe and J. Nwafor eds., Nigeria in Maps, (London: Hodder and Stoughton): 50-51.

______________ (1982b) Regional inequalities. In Ibid: 136-137.

Berg, A. (1981) Malnourished People: a Policy View, (Washington, D.C.: The World Bank):82.

Berry, S. (1985) Fathers Work for Their Sons: Accumulation, Mobility and Class Formation in an Extended Yoruba Community (Berkeley: University of California Press).

Bicego, G. and J. Boerma (1991) Maternal education and child survival: a comparative analysis of DHS data. Paper presented at the Demographic and Health Surveys World Conference, August 5-7 (Washington, D.C.).

Boerma, J. and G. Bicego (1991) Preceding birth intervals and child survival: Searching for pathways of influence. Paper presented at the Demographic and Health Surveys World Conference, August 5-7 (Washington, D.C.)

Bongaarts, J. (1978) A framework for analysing the proximate determinants of fertility. Population and Development Review 4(1): 105-132.

Caldwell, J. C. (1986) Routes to low mortality in poor countries. Population and Development Review 12(2): 171-220.

______________ (1979) Education as a factor in mortality decline: an examination of Nigerian data. Population Studies 33(3): 395-413.

Caldwell, J. C. and P. Caldwell (1985) Education and Literacy as factors in health. In Halstead, S., J. Walsh and K. S. Warren eds. Good Health at Low Cost (New York: Rockefeller Foundation).

Caldwell, J. C. and P. McDonald (1981) Influence of maternal education on infant and child mortality: levels and causes. International Population Conference, Manila, 2 (Liege: IUSSP) :79-96.

Casterline, J. B., E. Cooksey and A. Ismail (1989) Household income and child survival in Egypt. Demography 26(1): 15-35.

Cleland, J., G. Bicego and G. Fegan (1991) Socioeconomic inequalities in childhood mortality: the 1970s compared with the 1980s. Paper presented at the Demographic and Health Surveys World Conference, August 5-7, (Washington, D.C.).

Cleland, J. and J. van Ginneken (1989) Maternal schooling and childhood mortality. Journal of Biosocial Science, Supplement 10: 13-34.

Cochrane, S. H. (1980) The socioeconomic determinants of mortality: the cross-national evidence. The Effects of Education on Health (World Bank Staff Working Paper 405): 3-33.

Cochrane, S. H. and S. M. Farid (1989) Fertility in subSaharan Africa: Analysis and Explanation (World Bank Discussion Papers, 43): 63-69.

Doyle, A., D. Morley, M. Woodland and J. Cole (1978) Birth intervals, survival and growth in a Nigerian village. Journal of Biosocial Science 10: 81-94.

Egunjobi, L. (1983) Factors influencing choice of hospitals: a case study of the northern part of Oyo State, Nigeria. Social Science and Medicine 17(9): 585-589.

Farah, A. A and S. H. Preston (1982) Child mortality differentials in Sudan. Population and Development Review 6(4): 615-644.

Federal Ministry of Health, Nigeria (1988) National Policy on Population for Development, Unity, Progress and Self-reliance (Lagos: Federal Ministry of Health).

Federal Office of Statistics and Institute for Resource Development (1992) Nigeria Demographic and Health Survey 1990 (Columbia, Maryland: DHS/IRD Macro International Inc).

Federal Office of Statistics, Nigeria (1983a) National Integrated Survey of Households: Report of General Household Survey, April 1981 - March, 1982, Survey Report No. GHS/SR/83/1 (Lagos: F.O.S).

________________ (1983b) National Integrated Survey of Households : Report of National Consumer Survey, June 1980 - May 1981 (Lagos: F.O.S).

________________ (1986) Economic and Social Statistics Bulletin: 1985 (Lagos: F.O.S).

Feyisetan, B. and L. Adeokun (1989) The effects of medical care and the treatment of children. In Pison, G., E. van de Walle, and M. Sala-Diakanda eds. Mortalite et Societe en Afrique au Sud du Sahara (Paris: I.N.E.D): 85-98.

Flegg, A. T. (1982) Inequality of income, illiteracy and medical care as determinants of infant mortality in underdeveloped countries. Population Studies 36(3): 441-458.

Frank, O. and M. Dakuyo (1985) Child Survival in Sub-Saharan Africa: Structural Means and Individual Capacity - A Case Study in Burkina Faso. Center for Policy Studies Working Papers

No. 122 (New York: The Population Council).

Freeman, D. H., W. Gesler, B. Meras and M. Schymura (1983) A categorical data analysis of contacts with the Family Health Clinic in Calabar, Nigeria. Social Science and Medicine 17(9): 571-578.

Gaisie, S. K. (1980) Mortality, socioeconomic differentials and modernization in Africa. In United Nations Economic Commission for Africa ed. Population Dynamics: Fertility and Mortality in Africa (Addis Ababa: U.N.E.C.A): 441-463.

Grant, J. P. (1991) State of the World's Children, 1991 (Oxford: Oxford University Press).

____________ (1988) State of the World's Children, 1988 (Oxford: (Oxford University Press).

Gray, R. H. (1989) The integration of demographic and epidemiologic approaches to studies of health in developing countries. In Ruzicka, L., G. Wunsch and P. Kane eds. Differential Mortality: Methodological Issues and Biosocial Factors (Oxford: Claredon Press): 36-63.

____________ (1981) Birth intervals, postpartum sexual abstinence and child health. In Page, H. J. and R. Lesthaeghe eds. Childspacing in Tropical Africa: Traditions and Change (London: Academic Press): 93-107.

Green, R. H. and H. Singer (1984) SubSaharan Africa in depression: the impact on the welfare of children. World Development 12(3), (Special Issue on the impact of World Recession on Children): 283-295.

Gwatkin, D. R. (1980) Indications of change in developing country mortality trends: the end of an era? Population and Development Review 6(4): 615-644.

Hill, A. ed. (1990) Determinants of Health and Mortality in Africa DHS Further Analysis Series No. 10, (Columbia, Maryland: IRD/Macro Systems Inc. and The Population Council).

Hill, K. and A. Pebley (1989) Child mortality in the developing world. Population and Development Review 15(4): 657-687.

Hobcraft, J. N. (1991) Childspacing and child mortality. Paper presented at the Demographic and Health Surveys World Conference, August 5-7, (Washington, D.C.).

______________ (1985) The interplay of health and society: towards new surveys of mortality determinants. In Casterline, J. B. ed. The Collection and Analysis of Community Data (Voorburg, Netherlands: International Statistical Institute): 147-156.

______________ (1984) The use of special mortality questions in fertility surveys- the WFS experience. In United Nations ed. Data Bases for Mortality Measurement, ST/ESA/Series A/84 (New York: Department of International Economic and Social Affairs) : 94-96.

Hobcraft, J., J. McDonald and S. Rutstein (1985) Demographic determinants of infant and early child mortality: a comparative analysis. Population Studies 39(3): 363-385.

____ (1984) Socioeconomic Factors in infant and child mortality: a crossnational comparison. Population Studies 38(2): 193-223.

____ (1983) Childspacing effects on infant and early child mortality. Population Index 49(4): 585-618.

Hobcraft, J. and R. J. Little (1984) Fertility exposure analysis: a new method for assessing the contribution of proximate determinants to fertility differentials. Population Studies 38(1): 21-45.

Huffman, S. L. and B. Lampere (1984) Breastfeeding performance and child survival. Population and Development Review 10 (Supplement on Child Survival): 93-116.

Ikporukpo, C. O. (1987) An analysis of the accessibility of Public Facilities in Nigeria. Socio-economic Planning Sciences 21(1): 61-69.

Idachaba, F. S. (1985) Rural Infrastructures in Nigeria (Ibadan: Ibadan University Press).

Maclean, U. (1971) Magical Medicine: a Nigerian Case-study (London: Penguin Press).

Martorell, R. and T. J. Ho (1984) Malnutrition, morbidity and mortality. Population and Develoment Review 10 (Supplement on Child Survival): 49-68.

M'Backe, C. and E. van de Walle (1987) Socioeconomic Factors and access to health services as determinants of child mortality. IUSSP Seminar on Mortality and Society in subSaharan Africa, Yaounde, Cameroun, (Liege: IUSSP).

Mosley, W. and L. C. Chen (1984) An analytical framework for the study of child survival in developing countries. Population and

Development Review, 10 (Supplement on Child Survival): 25-45.

Mosley, W. (1984) Child survival: research and policy. Population and Development Review 10 (Supplement on Child Survival): 3-23.

__________ (1985) Will primary health care reduce infant and child mortality? : a critique of some current strategies with special reference to Africa and Asia. In Vallin, J. and A. D. Lopez eds. Op cit: 103-137.

Mott, F. L. (1976) Some aspects of health care in rural Nigeria. Studies in Family Planning, 7(4): 109-114.

National Population Bureau (1986) Nigeria Fertility Survey 1981/82 State Level Reports (Lagos: N.P.B).

Nwafor, J. C. (1982) Educational facilities I: primary and secondary. In Barbour, K. M. et al eds. Op cit .

Ondo State Ministry of Health and Institute for Resource Development (1989) Ondo State Demographic and Health Survey 1986 (Columbia, Maryland: IRD/Macro Systems, Inc.)

Oni, G. A. (1988) Child mortality in a Nigerian city: Its levels and Socioeconomic differentials. Social Science and Medicine 27(6): 607-614.

Onyemunwa, P. (1988) Health care practices and use of health services as factors affecting child survival in Benin City, Nigeria. Africa Population Conference, Dakar,2. (Liege: IUSSP) :3.1.41-55.

Orubuloye, I. O. and J. C. Caldwell (1975) The impact of public health services on mortality: a study of mortality differentials in a rural area of Nigeria. Population Studies 29(2): 259-272.

Palloni, A. (1985) Health conditions in Latin America and policies for mortality change. In Vallin, J. and A. D. Lopez eds. op cit :475-492.

Pebley, A. R. and S. Millman (1986) Birthspacing and child survival International Family Planning Perspectives 12(2): 71-79.

Potter, J. E. (1988) Birthspacing and child survival: a cautionary note regarding the evidence from the WFS. Population Studies 42 (3): 443-450.

Preston, S. H. (1985) Mortality in childhood: lessons from the WFS. In Cleland, J. and J. N. Hobcraft eds. Reproductive Change in Developing Countries (Oxford: Oxford University Press): 253-272.

Ransome-Kuti, O. (1986) That our children will not die Inaugural Lecture Series (Lagos: Lagos University Press).

Rutstein, S. O. (1984) Infant and child mortality: levels, trends and demographic differentials. WFS Comparative Studies 43 (revised edition).

Ruzicka, L. (1989) Problems and issues in the study of Mortality differentials. In Ruzicka, L. et al eds. op cit: 3-17.

Ruzicka, L. and P. Kane (1988) Infant and child mortality: the implications for fertility behaviour. Population Research Leads (Bangkok: United Nations Economic and Social Commission For Asia and the Pacific): 5-10.

Stock, R. (1983) Distance and utilization of health services in rural Nigeria. Social Science and Medicine 17(7): 563-570.

Sulaiman, I. L. (1987) Mother's income and child mortality in Southern Nigeria. African Demography Working Paper No. 15, (Population Studies Center, University of Pennsylvania).

Sullivan, J. M. (1991) The pace of decline in under-five mortality: evidence from the DHS surveys. Paper presented at the Demographic and Health Surveys World Conference August 5-7, (Washington, D.C.).

Toyo, E. (1986) Food and hunger in a petroleum neocolony: a study of the food crisis in Nigeria. In Lawrence, P. ed., Op Cit: 231-248.

Uche, C. (1985) The environment of infant and child mortality : a case-study of Nigerian villages. P.S.T.C Working Paper Series No.WP-85-06, (Providence: Brown University).

United Nations (1985) Socioeconomic Differentials in Child Mortality in Developing Countries (New York: Department of Social and Economic Affairs) - ST/ESA/SER.A/97.

United Nations Fund for Children (1985) Within Human Reach: a Future for Africa's Children (New York: UNICEF).

Ware, H. (1984) Effects of maternal education, women's roles and child care on child mortality. Population and Development Review 10 (Supplement on Child Survival): 191-210.

CHAPTER TWO

ONDO STATE: THE STUDY SETTING

2.1: INTRODUCTION

This chapter profiles Ondo State, the study setting starting with a description of its geography, culture, society, and economy. Demographic estimates and statistics on aspects of child health for Nigeria with special reference to the Southwest region and Ondo State are then presented; followed by a discussion of the state of Nigeria's health care system with a focus on maternal and child health care delivery.

2.2: THE GEOGRAPHY OF ONDO STATE

Ondo State is one of the 31 administrative areas (30 states and Abuja, the Federal Capital Territory) that make up Nigeria, which according to United Nations' estimates contains roughly one-half and one-fifth of the total population of West Africa and Africa respectively (UNECA, 1986). Carved out of the former Western State (that is, Southwest region), it came into formal existence on April 1, 1976.

The state lies entirely within the tropics being situated between longitude four and six degrees east of the Greenwich Meridian and latitudes five and nine degrees north of the Equator (Ondo State Government Supplement, 1989). Its population which inhabits a land area of nearly 20,600 square kilometres, was according to the 1963 national census 2.73 million and is estimated to have increased to

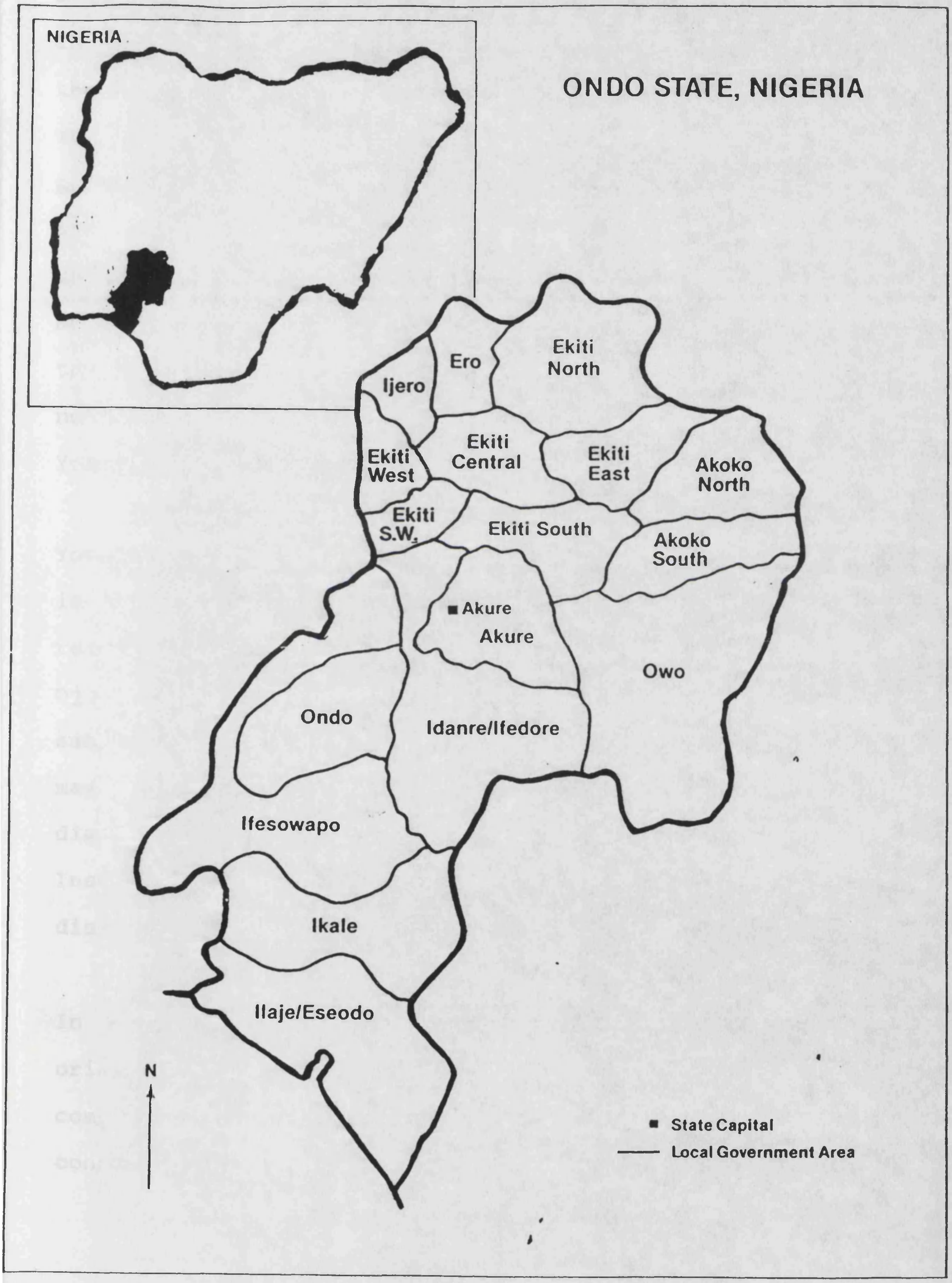
4.69 million by 1985 (National Population Bureau, 1986).

The topography of Ondo State is essentially one of lowlands, with numerous rugged hills and rivers. The land rises from the coastal part of Ilaje/Ese-Odo in the south to the hilly areas in the north. The climate of Ondo State as with the rest of the country is marked by two distinct seasons: the wet season, from April to October, and the dry season, November to March. Annual rainfall varies from 2,000 millimetres in the southern areas to 1,150 in the northern parts (Ondo State Government Supplement, 1989), so that inadequate rainfall for agricultural activities is not a problem in the state.

But climatic variation produces a north-south vegetational pattern, with the high rain-forest zone in the south and a predominantly savannah vegetation in the north. Mean daily maximum and minimum temperature ranges from 34.2 ^{0}C in February, to 27.5 in August and from 22.6 in April, to 19.5 in December, respectively (Federal Office of Statistics, 1982: 5-6).

Geopolitically, as at 1986/87 when the ODHS was conducted, the state was made up of 17 Local Government Areas as shown in Figure 2.1.

Figure 2.1: Ondo State and its 17 Local Government Areas as at 1986



2.3: SOCIETY AND CULTURE

The people of Ondo State are mostly Yoruba, made up of the Ekiti, the Akoko, the Owo, the Ondo, the Ikale, the Ilaje, and the Akure. The only non-Yoruba peoples inhabiting the state (less than 10 percent of the total population) are the Arogbo and the Apoi who are Ijaws. But generally almost all inhabitants speak and understand one of the varying dialects of the Yoruba language and share very similar traditions and customs. As can be gleaned from the map in Figure 2.1, the Ekiti and Akoko are concentrated in the northern areas, the Owo and the Ondo in the middle and the non-Yoruba groups in the southern-coastal area.

Yoruba societies are characterized by a pattern of settlements that is unique in tropical Africa and that has a long history, namely, residence in large, dense and compact communities (Little, 1974; Ojo, 1966). But as will be shown later, the people are mainly small-scale farmers and artisans so that relative population size may not be a very relevant criterion for sociologically distinguishing the rural ('traditional') areas from the urban. Instead, socioeconomic or infrastructural development may be better discriminants in the Ondo context.

In terms of cultural history, the Yoruba generally trace their origin to Ile-Ife and regard the culture hero **Oduduwa** as their common ancestor. Traditionally, marriage and reproduction are considered compulsory for every adult since these form the basis of lineage continuity and the foundation of household and family economy.

Marriage is considered a union between two families rather than two individuals. Hence, the principal parties almost always require the mutual consent of relatives, together with the payment of 'bride-price' before the marriage is considered legal. Arranged marriages have however become quite rare in modern Yoruba society (Fadipe, 1970: 73). Three types of kinship obtain in Yoruba society - blood kinship traced both patrilineally and matrilineally, kinship by marriage, and non-legal secondary kinship such as adoption of a deceased friend's children. The patrilineal form of social organization is however, dominant with post-marital residence being patrilocal and offsprings of a marriage considered as belonging to the man's extended family.

The Ondo areas are in particular, noted for well-established bilineal inheritance rules for titles and land. Here, chieftancy titles are not usually hereditary, but are more likely to be won by individuals of well known achievements and who enjoy the wide support of their kin groups (Krapf-Askari, 1969).

The Yoruba live in family compounds that is, a collection of apartments of individual families although unlike the general situation, the Ekiti (the major sub-ethnic group in Ondo State) generally build much smaller compounds (Ojo, 1966). Social relations within compounds are based on an order of seniority especially for wives, whose rankings usually depend more on duration of marriage than age. Also, unlike other areas of Yorubaland, the peoples of Ondo State are predominantly christians (Adeokun, 1983).

As regards female status, nearly all Yoruba women have and are expected to have some independent gainful employment (Krapf-Askari, 1969; Fadipe, 1970). A woman is free to pursue her own trade independent of the husband who is obliged to supply her with the means for doing this although her earnings are her own exclusive possessions. In farming households, there is usually a clear division of labour and proceeds between the man and his wife or wives; the men work the farms while the women market the farm produce and are paid commissions. Other forms of occupation that women in the area engage in are pottery, soap-making, and rudimentary food processing. With the wider spread of female education, an increasing proportion women are entering into modern sector occupations.

However, domestic work especially cooking and cleaning of the household is regarded as a woman's duty. In addition, she is usually expected to provide for some of her needs and those of her children which her husband is unable to provide for. In a 1977 study of the Ekiti and Ikale/Ijale women of Ondo State, Adeokun (1983) observed that the submissiveness of the wife to her husband especially among the uneducated groups, and her efforts towards the support of the family mainly determine her social esteem. But despite the overtly high level of maternal commitment to child welfare in both groups, the Ekiti woman was more likely to totally abstain from sex while breastfeeding her child, in the belief that semen can poison the breastmilk or pregnancy reduce its quality.

For the Ikale group, the same rule concerning sexual abstinence during lactation does not apply and the duration of postpartum sexual abstinence is notably shorter and unconnected with the taboo. Rather uncleanliness was reported as the main reason for abstaining postpartum. However, the Ikale did hold the belief that an early pregnancy (the foetus) can 'magically' threaten the life of the surviving infant. Thus, seemingly different attitudes to postpartum sexual activities does not produce a contrast in the concern for the welfare of the young child.

2.4: ECONOMIC ORGANIZATION, ECONOMY AND GENERAL DEVELOPMENT

In terms of economic organization, two main aspects of Yoruba society are land and urban residence. Traditionally, land is communally owned and the farming population resides in the town though keeping their farms at some distance from the town. In the past, rights of access to productive resources could be negotiated as well as inherited. But there has long been a growing movement towards individual ownership of land and its transfer by sale (Fadipe, 1970), which is perhaps now the norm. Generally, it is the expenditure of efforts on an object that confers ownership. Acquistive values are stressed and individual/family social status in modern Yoruba society is determined by wealth, generosity and possession of formal education (Berry, 1985).

The concentration of the population in dense, compact settlements has historically given rise to specialized occupations such as gold-smithing, carpentry, commercial farming, and food processing. But despite the occupational diversity, agriculture remains the main occupation of the people of Ondo State; with modern sector employment being mainly in the civil service due to the low level of industrialization in the state.

In fact, agriculture contributes about 70 percent of the state's Gross Domestic Product (Ondo State Government Supplement, 1989: 1379), with the main cash crops being cocoa, palm produce and timber. Cocoa is particularly important to the state's economy being the largest non-petroleum foreign exchange earner in the whole country, with the state accounting for over 50 percent of Nigeria's output of cocoa. The main food crops are yams, cassava, beans and rice.

Educationally, the state is by Nigerian standards quite advanced. As at the beginning of the 1986/87 school year, the state had 1,546 primary schools, 362 secondary schools, and six post-secondary institutions including two fully-fledged universities and one polytechnic. As at this time, education especially below tertiary level was heavily subsidizied, where not totally free (Ondo State Government Supplement, 1989: 1380). The pattern of registration was until very recently, one of an ever-increasing number of children attending primary schools. For example, in 1981/82 there were 674,128 primary school pupils in the state compared to 744,659 in 1984/85 (Federal Office of Statistics, 1985: 67); although the rise may be due more to school age population growth than rising participation rates.

It is noted here that evidence from a national census of infrastructures does not suggest the existence of wide areal disparities in the distribution of educational institutions in the state, contrary to the situation in other states in the country (Idachaba, 1985: 684). Accessibility of primary schools as at 1980 ranged from 1.6 kilometres' walking radius in Ero LGA to 2.8 in Idanre/Ifedore. The equivalent range for secondary schools' accessibility was 3.0 in Ero to 8.5 in Ifesowapo LGA.

However, other public services, infrastructures and institutions are poorly developed. Local government roads are noted for their seasonality and may become unmotorable during heavy rains. Hospital facilities are in short supply; four LGAs had no hospital as at 1980: Akoko-South, Ekiti-Southwest, Idanre/Ifedore, and Ilaje/Eseodo. But maternity centres are more widespread.

As with roads, water supply (pipe-borne), electricity, and banking services are grossly inadequate and highly skewed in spatial distribution. Thus, whereas Ondo and Ekiti-Southwest LGAs had over 800 metres of tarred roads per square kilometre, Ilaje/Eseodo and Ifesowapo had well below 200. Seven LGAs had no pipe-water supply schemes by 1980 while six had two or more (Idachaba, 1985: 662-716).

Overall, the less populated, riverine areas to the south especially Ilaje/Eseodo LGA are the least developed areas. This has been attributed to government neglect and their peripheral location (Adeokun, 1983). The general development situation is further illustrated in Table 2.1 which shows the spatial density per LGA of selected public utilities and institutions.

Table 2.1: Walking radius or per capita supply of public utilities and services in Ondo State by Local Government Area (LGA), 1980.

LGA	Walking radius (km) or per capita supply of:						
	Bank	Post	Road	Disp	Hosp	M.C.	Water
Akure	5.39	7.99	304	6.32	10.32	6.32	38.65
Ekiti-SW	6.13	6.13	836	4.01	---	4.01	---
Ekiti-Central	6.89	5.13	235	3.98	7.70	6.29	7.41
Akoko-North	8.34	6.81	384	3.40	16.68	4.31	8.20
Ero	9.40	3.32	375	2.83	13.29	4.01	0.26
Ekiti-South	9.46	7.33	167	7.33	16.39	7.33	---
Ondo	9.50	6.72	1008	7.18	13.43	7.18	---
Ekiti-West	9.54	5.10	428	6.03	13.49	6.03	3.45
Ijero	10.58	6.11	557	3.06	10.58	1.77	---
Owo	12.66	6.86	240	6.49	28.29	6.86	10.51
Ekiti-East	13.87	5.21	413	4.16	13.78	4.90	---
Akoko-South	16.17	6.11	588	4.67	---	4.88	---
Ifesowapo	17.04	13.20	170	7.38	29.51	9.84	2.71
Idanre/Ifedore	18.51	10.69	479	7.89	---	8.73	43.70
Ekiti-North	21.87	1.77	196	5.30	15.47	6.07	19.65
Ikale	22.60	5.19	512	5.48	22.60	9.23	14.95
Ilaje/Eseodo	26.05	10.63	148	6.96	---	18.42	---
Ondo State	11.54	6.78	357	5.42	18.06	6.64	8.57

Source: Idachaba, F. S. (1985) Rural Infrastructures in Nigeria (Ibadan: Ibadan University Press): 662-692.

Notes: Road=tarred roads per square kilometre; Disp=dispensary; Hosp=hospital; M.C.=maternity centre; Water=per capita pipe water supply (litres/day); SW=Southwest.

2.5: DEMOGRAPHIC AND CHILD HEALTH FEATURES

To provide a concise and accurate picture of the general demographic, mortality and health situation in Ondo State and Nigeria as a whole, is an exceedingly difficult task. This is because of the limited availability of reliable and up-to-date demographic data. Fourteen censuses have been conducted in the country, the most recent in 1991 being held almost two decades after the count in 1973 whose findings were cancelled by the government. The 1963 census data, whose accuracy is also considered questionable, has formed the basis of official government projections for planning purposes. Vital registration is in an even more dismal state. Despite its inception in 1863 and its reinforcements at different times subsequently including the institution of compulsory registration of births and deaths by law in 1979, it is thought that less than 10 percent and less than five percent of total estimated deaths and births respectively, are registered (National Population Bureau, 1984).

In deriving plausible demographic estimates therefore, reliance has had to be placed mainly on data from periodic sample surveys. These were sometimes based on different approaches and different coverage and interests, as conducted by individual researchers, research institutions and government units. Prior to Nigeria's participation in the WFS and DHS programmes, researchers have had to rely mainly on the data from the 1963 census and three sample surveys - the 1931 Medical Census, the 1965-66 Rural National Demographic Sample

Survey, and the 1971-73 National Fertility, Family and Family Planning Survey - in trying to obtain estimates that give a fairly approximate picture of the fertility and mortality situation in Nigeria (Farooq and Ekanem, 1977; Ayeni, 1979; Olusanya, 1980; Uche, 1981).

The three survey datasets have been extensively evaluated and given the numerous inadequacies highlighted, the estimates derived by the authors are to be regarded as at best providing a rough indication of the levels of vital rates at different periods in the past, despite the various refinements and adjustments made to the data. To these earlier sources could now be added results from the 1981/82 Nigeria Fertility Survey (NFS), the 1983/84 National Health and Nutritional Status Survey (HNSS), the 1986 Ondo State Demographic and Health Survey (ODHS), and the 1990 Nigeria Demographic and Health Survey (NDHS).

What follows is an attempt to build from the various available estimates, a relatively coordinated demographic and child health profile of Nigeria with special reference to Ondo State and the Southwest region.

(i) Population Distribution in Ondo State: Based on a projection of the state's population as recorded by the 1963 census which assumes an annual growth rate of 2.5 percent and no major intra-state migrations, the estimated distribution of the state's population summarized in Table 2.2, indicates that the Ekiti areas, all in the northwestern part (Figure 2.1), are the most densely populated. The estimated proportion of the total state population (4.2 million in 1980) residing in seven Ekiti LGAs which together constitute less than one-third of the state's land area is 46 percent.

Table 2.2: Estimated Population Density by Local Govt. Areas, 1980

Population per square kilometre	LGAs
315 - 615	Ero, Ijero, Ekiti-Central, Ekiti-Southwest, Ekiti-West, Ekiti-South, and Ekiti-East.
150 - 314	Akoko-North, Akoko-South, Ondo, Akure, Ekiti-North, and Ikale.
less than 150	Owo, Idanre/Ifedore, Ilaje/Eseodo, and Ifesowapo.

Source: Idachaba (1985: 663).

The geographical pattern that emerges from Table 2.2 (alongside Figure 2.1) is that of declining population density as we move from the northwest through the northeast and middle areas to the southern belt.

(ii) Fertility Levels and Trends:

Fertility estimates relating to various periods between 1965 and 1989 for Nigeria, the Southwest region, and Ondo State are presented in Table 2.3.

Table 2.3: Fertility Estimates (Total Fertility Rate-TFR) 1965-89

Period	All Nigeria	Southwest	Ondo State
1965 - 66(a)	5.6(R)	---	---
1967(b)	---	5.7(R)	---
1971-73(c)	6.2	6.0	---
1971-75(d)	6.6	7.1	---
1976-77(e)	---	---	7.0(R)
1976-80(f)	6.4	6.6	---
1981-86(g)	---	---	6.2
1986-89(h)	6.0	5.5	---

Note: R=rural
Sources: (a) Federal Office of Statistics (1968:21); (b) Olusanya (1969: 368); (c) Omideyi (1984: 54-57); (d) Chimere-Dan (1989: 68-72); (e) Adeokun (1983: 131); (f) National Population Bureau (1984: 76-93); (g) Ondo State Ministry of Health and Institute for Resource Development (1987: 11); (h) Federal Office of Statistics and Institute for Resource Development (1991: 6).

Though patchy, the picture that emerges from the various fertility estimates presented above is that as with the rest of the country, women in Ondo State and the Southwest region have on average, about six live births during their reproductive years. However, estimates from the 1990 Nigeria DHS data, for 1986-89 point to the beginnings of the transition to lower fertility levels in Southwest Nigeria. Indeed, in a rigorous analysis of WFS data for 20 developing countries on the effects of education on marital fertility, Cleland and Rodriguez (1988) had identified Southwest Nigeria as showing a clear sign of having entered a transitional phase; a similar conclusion was reached by Chimere-Dan (1989).

The inference about the imminence of fertility transition in the southwest, is supported by the fact that both the average female age at first marriage and at first birth (20 and 21.5 years respectively) in the region (including Ondo State) are about three years higher than the averages for Nigeria as a whole (same sources as in Table 2.3).

(iii) Mortality Levels and Trends: Tables 2.4a and 2.4b present estimates of infant and under-five mortality rates and their implied life expectancy at birth for Nigeria and the Southwest region for various periods between 1931 and 1989. These estimates have been extracted from various sources, all of which allude to the modest quality of the data from which they were derived. Some of the period fluctuations that can be observed are almost certainly linked with sampling variability and differences in methodologies.

For example, the large differences between the 1981/82 NFS-based rural estimates and the 1983/84 HNSS-based estimates (Table 2.4b) are implausible given that they were conducted only two years apart and may have a lot to do with differences in the adopted mortality estimation methods necessitated by the nature of the data. Whereas the NFS estimates were derived by direct methods from birth history data, the HNSS estimates come from CEB/CS data and were obtained using the Trussell variant of the Brass approach on the assumption of the age and trend pattern of the Coale-Demeny West model life table mortality regime. Preston (1985) has noted the superiority of direct estimates over indirect ones especially in the light of lack of direct information on either the age pattern or its trend in the population studied.

Table 2.4a: Mortality estimates, 1931 - 1989: Southwest/All Nigeria
(i) Infant mortality rate (per 1,000 live births)

	All Nigeria			Southwest Nigeria		
Years	Male	Female	Both	Male	Female	Both
1931(a)	---	---	215	---	---	229
1965-66(a)	---	---	178	---	---	124
1971-73(b)	---	---	---	91	92	91
1971-75(c)	92	81	91	---	---	---
1970-79(c)	---	---	---	71	65	68
1976-80(c)	98	78	82	---	---	---
1980-89(d)	94	89	91	---	---	85

(ii) Under-five mortality rate (5q0) per 1,000

1971-72(b)	---	---	---	166	167	166
1971-75(c)	158	146	153	---	---	---
1970-79(c)	---	---	---	113	120	116
1980-89(d)	200	182	191	---	---	167

(iii) Implied life expectancy at birth (e_0)+

1931(a)	---	---	32	---	---	31
1952-53(a)	---	---	35	---	---	---
1963(a)	---	---	40	---	---	40
1971-73(a)	---	---	42	---	---	44
1971-75	55	58	56	---	---	---
1970-79	---	---	---	60	62	61
1980-89	54	56	56	---	---	57

Sources: (a) Olusanya (1980: 418-420); (b) Ekanem and Farooq (1977: 126-128); (c) Morah (1985: 52-53) and National Population Bureau (1986: 47); (d) Federal Office of Statistics and DHS/IRD(1992:80-82).

Note: + Implied e_0 for the NFS-based estimates (1971-75 and 1970-79) are those corresponding to the derived 1q0 estimates in the General Pattern Model life tables of the U.N. system (United Nations, 1982).

Table 2.4b: 1981/82 NFS-based direct estimates and 1983/84 HNSS -based indirect estimates of infant (1q0) and child (5q0) mortality

All Nigeria	e_0		1q0		5q0	
Years	rural	urban	rural	urban	rural	urban
1975-79 (NFS)	56	62	89	64	151	116
1976	47	60	132	70	---	---
1978	48	64	127	55	---	---
1975-77	---	---	---	---	183	92

Sources: 1981/82 NFS-based direct estimates - Morah (1985)
1983/84 HNSS-based indirect estimates for 1976, 1978 and 1975-77 - Federal Office of Statistics (1985: 51).

However, there is general agreement between the HNSS- and NFS-based estimates for urban Nigeria and between these two and estimates from the other surveys. Thus, if we ignore the HNSS-based rural estimates and assume that estimates for 1931, 1965-66 and the 1970s are comparable, it can be deduced that between 1931 and the early 1970s, the level of infant mortality was more than halved in Nigeria as a whole. For the Southwest region (which includes Ondo State), the infant mortality level by early 1970s (about 90 per 1,000) was only 40 percent of the level in the early 1930s. The overall child mortality estimates and the implied life expectancy figures broadly tell the same story, that is, faster pace of mortality improvements in the Southwest compared to the whole country although it seems there was a general stagnation of childhood mortality levels during the 1980s. Nevertheless, a child born today in Ondo State may on average be expected to live for about 60 years.

(iv) Child health indicators: The indices shown in Table 2.5 are intended to obtain an impression of the level of exposure of children in Nigeria to modern health services.

Table 2.5: Child health care indicators - percentage of last births or births in the five years to survey for women aged 15-49; 1982-90

Indicator / Area	Survey year			
	1982	1984	1986	1990
(i) Ever-vaccinated				
Ondo State	64.7	---	98.8	---
Southwest	66.4	---	---	81.6
All Nigeria	43.2	---	---	60.6
(ii) Modern Prenatal care				
Ondo State	73.1	---	80.0	---
Southwest	78.3	---	---	86.5
All Nigeria	52.0	---	---	57.2
(iii) Professional Delivery Assistance				
Ondo State	52.1	---	58.8	---
Southwest	62.3	---	---	66.2
All Nigeria	34.7	35.4	---	31.9
(iv) Prevalence of child malnutrition				
Ondo State	---	13.8	6.8	---
Southwest	---	13.3	---	6.4
All Nigeria	---	20.5	---	10.9

Notes: 'Modern/professional' refers to care or assistance provided by a qualified doctor, nurse or midwife;
Malnutrition prevalence based on the proportion of children aged 6-36 months for 1986 and 6-60 months for 1984 and 1990, scoring weight-for-height z-scores of less than 2 standard deviations from the NCHS/WHO standard.

Sources: (i) Morah (1987) and National Population Bureau (1986) for indices relating to 1982 based on the 1981/82 NFS data;
(ii) Federal Office of Statistics (1985) for indices relating to 1984 based on the 1983/84 HNSS data;
(iii) Ondo State Ministry of Health and IRD/ Macro Systems, Inc. (1989) for 1986 indices based on the ODHS data;
(iv) Federal Office of Statistics and IRD/ Macro Systems, Inc. (1991; 1992) for 1990 indices based on the NDHS data.

Children in Southwest Nigeria (including Ondo State) seem to be more exposed to modern preventative and most probably curative health services than children in the rest of the country going by the proportion of women whose most recent live births were vaccinated against one or more of the common preventable childhood infections and whose prenatal care and delivery assistance were given by modern health workers.

The relatively high level of contacts with modern health services would imply better protection against frequent infections and quicker recovery from illness. This may partly account for the lower child malnutrition prevalence level in Ondo State and the Southwest compared to the whole country since anthropometric measures such as the weight-for-height scores shown in Table 2.5 reflect both nutrient intake and the general health status of the measured children (Martorell and Ho, 1984).

2.6: NIGERIA'S HEALTH CARE SYSTEM

The Nigerian state has always professed the belief that a healthy population is crucial to national development. It is therefore important to assess the extent to which this belief has been translated since 1975 into concrete achievements through the extension of preventive and curative health services and resources to broad sections of the population. This is especially so because an understanding of the ways a society's health system is organized, its biases, and functioning is an important precursor to a study of mortality determinants (Hobcraft, 1985). The year 1975 is taken as a starting point because it was then that an explicit national health policy was first adopted by the central government.

(i) Health Policy: The Basic Health Services Scheme was adopted and provided for in the 1975-1980 development plan and was subsequently upgraded into a broader Primary Health Care (PHC) programme during the 1981-86 plan period. The aim was the provision of a universally affordable, accessible and acceptable health care to the population through community participation and utilization of community resources (Adeokun, 1985; Egwu, 1988).

Since signing the Alma-Ata Declaration on PHC as the hub of health policy for developing countries in 1978, the achievement of the target of 'Health For All by the Year 2000' has been adopted by the Nigerian government as one of the fundamental objectives of state policy (World Health Organization Regional Office for Africa, 1987). Thus, the view that hospital-based services alone cannot meet the health needs of the majority of Nigeria's population has been officially accepted since the mid-1970s.

The initial strategy adopted for ensuring eventual total health coverage was the sub-division of Nigeria into 285 Basic Health Units (BHUs), each made up of a 60-bed comprehensive health centre (CHC) which acts as a referral point for a target population of 150,000. The CHC was then to depend on four primary health centres, each serving about 40,000 people and acting as reference point for a network of five health clinics which were supposed to be the first point of delivery of promotive, preventive and curative care within the whole system (Adeokun, 1985).

However, due to the worsening economic situation since the early 1980s, the whole programme was by 1984 scaled down. The Federal Ministry of Health remains the PHC implementation authority, coordinating the activities of the state-based units within each of the four health zones (Northeast, Northwest, Southeast and Southwest). But only 52 selected LGAs (out of 301 by 1986) were designated PHC model areas for the purpose of executing the programme and ultimately extending the models to cover the whole country by the year 2000 (Egwu, 1988).

(ii) Successes and Failures: A useful way of assessing the adequacy of Nigeria's health care system given its supposed PHC bias, is to ascertain the extent to which it has actualized the WHO's global strategy for 'Health For All by the Year 2000'. This entails the following:

(i) safe water in the home or within 15 minutes walking distance, and adequate sanitary facilities at home or immediate vicinity;

(ii) immunization against diphtheria, tetanus, whooping cough, measles, poliomyelitis and tuberculosis;

(iii) local health care including availability of at least 20 essential drugs and family planning service within one hour's walk or travel; and

(iv) trained personnel for attending pregnancy and child birth and caring for children up to at least one year of age (WHO, 1981: 75-76).

With regard to accessibility of safe water and sanitary facilities, evidence from the 1981/82 NFS suggests that only 20.4 percent of Nigerian households get their domestic water supply from pipes or pumps around the home, with the urban proportion (66.8) being almost four times the rural one. For Southwest zone, the overall proportion was 42 percent, with urban proportion (66.4) being about thrice the rural proportion. On the other hand, the proportion of households with direct access to flush or pit toilets was about 63.5, with a 10 percent urban advantage. For the Southwest, the overall proportion was a little below 50 percent but a much greater proportion (12 percent) than the national figure (3.9) had flush toilets in their homes (National Population Bureau, 1984; Morah, 1987).

For Ondo State by 1986, the ODHS results suggest that about 40 percent of households have access to pipe-borne drinking water, and 50 percent use flush or pit toilet facilities; with the urban proportions being about thrice the rural/riverine proportions. By 1990, the NDHS data indicated that for Nigeria as a whole, the proportion of households with access to pipe-borne water was 25 percent and 71 percent had flush or pit toilet facilities. The equivalent proportions for the Southwest were 44 and 77 percent respectively (Federal Office of Statistics and DHS/IRD, 1992: 16).

As regards the uptake of specific vaccines by Nigerian children, reliable data have only recently become available with the conduct of the two DHS surveys in 1986 (Ondo State) and 1990 (All Nigeria). The Federal Ministry of Health estimated that by 1985/86 only about 20 percent of children 0-24 months old, were covered by immunization and 35-40 percent of the whole population had access to essential health services (WHO Regional Office for Africa, 1987). For Ondo State by 1986, the ODHS estimates indicate that among children aged 12-59 months about 42 per cent were fully immunized. By 1990, the equivalent figures for the Southwest zone and the whole country, were 44 and 29 percent respectively (Federal Office of Statistics and IRD/Macro Systems, Inc., 1991: 15). Again, the urban proportions were about twice the rural ones.

But it is worth noting that the leading causes of deaths among infants and young children are according to the government sources cited above, diarrhoea, respiratory infections per se, or as complications of malaria (which is endemic) and severe malnutrition, for all of which immunization offers little direct protection. Nutrition improvement and control of communicable diseases are two health strategies that were attempted by government between 1981 and 1985 (United Nations, 1988: 20). But only the eradication of leprosy rather malaria control was actually vigorously pursued (Adeokun, 1985).

Moreover, the emphasis on preventive services including environmental sanitation only recently (1985/86) began to be pursued with some vigour. In Ondo State, the pilot project of the Expanded Programme on Immunization (EPI) was launched in the Owo LGA only in 1984 (the first in the country) and based on its acclaimed success was extended afterwards to the other LGAs in the state and the whole country. Also, the oral rehydration therapy (ORT) campaign in the state was only launched in September, 1986 (Ondo State Government Supplement, 1989).

Regarding the promotion of modern family planning as an enhancer of child and maternal health, this was only instituted as part of the national policy on population in 1988 against the background of low contraceptive prevalence levels alongside the gradual erosion of traditional long birth-spacing practices. By 1981/82, the proportion of women aged 15-49 that had ever used a modern method of contraception in the Southwest region and Nigeria as a whole was 6.5 and 2.5 percent respectively (National Population Bureau, 1984). By 1990, the proportion for the whole country was 9 percent, with current usage level estimated to be 3.8 percent. For Southwest Nigeria and Ondo State (1986), the current usage level was 10.5 and 10.8 percent respectively (Federal Office of Statistics and IRD /Macro Sytems, Inc., 1991; Ondo State Ministry of Health and IRD/ Macro Sytems, Inc., 1989).

On the question of the availability and utilization of basic health facilities, inequity in the distribution of these services and health manpower is notable and has long been recognized as a priority health problem in Nigeria (WHO Regional Office for Africa, 1987). Little success was achieved during the 1980s in, for instance, reallocating resources from the hospital-based curative units to community-based preventive and promotive services although there are a few states (including Ondo) where the distribution of such basic health services as maternity centres and dispensaries are far less skewed than in most parts of the country (Table 2.1; Idachaba, 1985). Even as recently as 1986, the Federal Government admitted that 70 percent of its total annual health expenditure was on personnel emoluments for mainly urban-based curative services (Abdulrahman, 1989).

In many states and especially Ondo as at 1986/87, government medical services (diagnosis, drugs and dressings) were supposed to be free for children below 18 years of age and students. Also, the immunization (EPI) and ORT programmes which are partly financed through foreign aid, provide essentially free services.

However, government health services are notorious for constantly lacking or being short of drugs, breakdown of vaccine storage equipment, and general inefficiency (Abdulrahman, 1989; Ransome-Kuti, 1986). This is in a situation in which for much of the 1980s, the annual health budget fell far short (fluctuating between 1.8 and 3.9 percent of the actual total budget outlay) of the 5 percent of the Gross Domestic Product recommended by the WHO, alongside persistent and rapid devaluation of the naira - the national currency (Abdulrahman, 1989; Achime, 1989).

Therefore, for most Nigerians who can afford them, private modern health services, and for the many who cannot, patent medicine dealers (legal and illegal), or traditional medical practitioners, are a first option in times of serious illness. In fact, a significant proportion of the modern health services in Nigeria is privately run and their services are usually much more expensive to procure than government ones. As at 1981/82, about 31 percent of all hospitals in Nigeria were owned and run by non-governmental organizations and private individuals (Federal Office of Statistics, 1986: 22-23). For Ondo State, which by 1986 had about 789 health institutions of various categories (Adekunle et al, 1990), the proportion of hospitals owned and run by private institutions was estimated to be about 35 percent (Federal Office of Statistics, 1986).

However, there seems to have been substantial progress in the area of health personnel development as illustrated by figures shown below in Table 2.6. Community health workers (an essential component of PHC) are increasingly widely available. But the problem of getting higher cadre personnel such as doctors and nurses to work in rural areas is yet to be successfully tackled (WHO Regional Office for Africa, 1987; Egwu, 1988), and we have no evidence of broad-based attempts at providing mobile health clinics.

Table 2.6: Some aspects of Health Manpower supply: Nigeria, 1976-86

Year	Nurses	Doctors	Community Health Workers
1976	42 047	4 876	----
1978	49 657	7 552	----
1980	60 865	8 037	2 541
1982	73 561	9 623	6 037
1984	89 794	12 412	15 402
1986	93 369	16 003	21 911

Source: Federal Republic of Nigeria (1988) Ministry of National Planning Economic and Statistical Review: 1988 (Lagos: Federal Ministry of National Planning): 47.

Nevertheless, the actual access of women to trained personnel during pregnancy, childbirth and postpartum seems appreciable as the data presented earlier in Table 2.5 suggest. For instance, during the first half of the 1980s, about 35 percent of mothers had their births delivered by trained personnel, with the figure for the Southwest zone being about 60 percent. But in both cases the the urban-based mothers were twice as likely as their rural equivalent to have done so. By 1990, the proportions for the Southwest and Nigeria as a whole were 66 and 32 percent respectively; suggesting no improvement in modern delivery care coverage during the 1980s. However, more notable improvements seem to have been made in extending immunization coverage to the under-five population.

(iii) Overview: Overall, the key problem with the prevailing health care system in Nigeria seems to be the continued dominance of urban-based curative services. The idea of community participation in health services delivery is yet to be successfully translated into reality. Public health education about the major health problems especially the prevention and control of malaria, and the promotion of adequate child nutrition has only recently begun to be seriously pursued. So also is the promotion of modern birth-spacing and family size limitation practices. Further compounding the poor health situation are such factors as weak physical infrastructures, poverty, and marginal living conditions which reduce individual responsiveness to health innovations (Egwu, 1988).

2.7: SUMMARY

This chapter profiled Ondo State, the setting for the study. The State was shown to be relatively socio-culturally homogeneous and educationally advanced by Nigerian standards but infrastructurally modestly developed. Demographic estimates for the State and the broader Southwest region indicated a high but somewhat declining level of fertility (late 1980s' TFR=5.5). Infant and child mortality levels during 1981-86 in the State were still quite high ($_5q_0$ of over 100 per 1000); hence the continuing need for research into child survival factors in Nigeria. Moreover, the discussion on the prevailing health delivery system highlighted its inadequacies as regards tackling the main causes of childhood deaths.

REFERENCES

Adeokun, L. A. (1983) Marital fertility and birth-spacing among the Yoruba. In Oppong, C. ed. Female and Male in West Africa (London: George Allen and Urwin): 127-137.

______________ (1985) Problems of Health intervention programmes: the case of Nigeria. In Vallin, J and A. D. Lopez eds. Health Policy, Social Policy and Mortality Prospects (Liege: IUSSP): 180-192.

Abdulrahman, D. A. (1989) Social policy goals and the distribution of health services in Nigeria and Tanzania. Scandinavian Journal of Development Alternatives 8(4): 159-174.

Achime, N. H. (1989) Health sector in a developing economy: an analysis of primary health care problems in Nigeria. Scandinavian Journal of Development Alternatives 8(4): 175-193.

Adekunle, C., V. Fillipi, W. Graham, P. Onyemunwa and E. Udjo (1990) Patterns of maternity care among women in Ondo State, Nigeria. In Hill, A. ed., Determinants of Health and Mortality in Africa DHS Further Analysis Series No. 10 (Columbia, Maryland: IRD and The Population Council, New York): 1-45.

Ayeni, O. (1979) A reassessment of the mortality data of the 1965-66 Nigerian Rural Demographic Inquiry: new refined estimates of mortality for Nigeria. Genus 35(3-4): 189-199.

Berry, S. (1985) Fathers Work for their Sons: Accumulation, Mobility and Class Formation in an Extended Yoruba Community (Berkeley: University of California Press).

Chimere-Dan, O. (1989) Patterns of Fertility in Nigeria. Ph.D

(Econ.) Thesis, University of London.

Cleland, J. and G. Rodriguez (1988) The effect of parental education on marital fertility in developing countries. Population Studies 42(3): 419-442.

Egwu, I. N. (1988) The concept of interactive primary health care and rural development in Nigeria. Community Development Journal 24(4): 247-255.

Ekanem, I. and G. M. Farooq (1977) The dynamics of population change in Southern Nigeria. Genus 3(1-2): 119-140.

Fadipe, N. A. (1970) The Sociology of the Yoruba Okediji, F. and O. Okediji eds. (Ibadan: Ibadan University Press).

Federal Office of Statistics and DHS/IRD (1992) Nigeria Demographic and Health Survey 1990 (Lagos: F.O.S and Columbia, Maryland: IRD/ Macro Systems Inc.).

____ (1991) Nigeria Demographic and Health Survey 1990: Preliminary Report (Lagos: F.O.S and Columbia, Maryland: IRD/Macro Systems Inc.).

Federal Office of Statistics (1985) The Health of Nigerians 1983/84 (Lagos: F.O.S).

____________________________ (1986) Annual Abstract of Statistics 1985 (Lagos: F.O.S): 67-68.

____________________________ (1982) Annual Abstract of Statistics 1982 (Lagos: F.O.S): 5-7.

____________________________ (1968) Nigeria Rural Demographic Sample Survey 1965/66 (Lagos: F.O.S).

Hobcraft, J. N. (1985) The Interplay of health and society. In

Casterline, J. B. ed. The Collection and Analysis of Community Data (Voorburg, Netherlands: International Statistical Institute) : 147-156.

Idachaba, F. S. (1985) Rural Infrastructures in Nigeria (Ibadan: Ibadan University Press).

Krapf-Askari, E. (1969) Yoruba Towns and Cities: An Inquiry into the Nature of Urban Social Phenomena (London: Oxford University Press).

Little, K. (1974) Urbanization as a Social Process: An essay on Movement and Change in Contemporary Africa (London: Routeledge and Kegan Paul).

Martorell, R. J. and T. Ho (1984) Malnutrition, Morbidity and Mortality. Population and Development Review (Supplement on Child Survival): 49-68.

Morah, B. C. (1987) Benchmark data on selected indicators of the coverage of primary health care services in Nigeria. Paper presented at the Sixth Annual Conference of the Population Association of Nigeria (Calabar, Nigeria).

____________ (1985) Evaluation of the Nigeria Fertility Survey 1981/82. WFS Scientific Reports No. 80 (Voorburg, Netherlands: International Statistical Institute).

National Population Bureau (1986a) Nigeria Fertility Survey 1981/82 :State-Level Report(s) (Lagos: N.P.B).

__________________________ (1986b) Federal Republic of Nigeria: Mid -Year Population Projections by States: 1963-2000 (Lagos: N.P.B).

__________________________ (1984) The Nigeria Fertility Survey 1981

/82: Principal Report I (Lagos: N.P.B).

Ojo, G. A. (1966) Yoruba Culture: A Geographical Analysis (London: University of London Press).

Olusanya, P. O. (1980) Evidence for the variation and decline in mortality in Nigeria. In U.N. Economic Commission for Africa ed. Population Dynamics: Fertility and Mortality in Africa (Addis Ababa: UNECA): 394-421.

______________ (1969) Rural-urban fertility differentials in Western Nigeria. Population Studies 23(3): 363-378.

Omideyi, A. K. (1984) A re-estimation of fertility rates in Nigeria : an application of the Gompertz relational model. Genus 40(3-4): 47-76.

Ondo State Government Supplement (1989) Ondo State. West Africa August (London): 1379-1384.

Ondo State Ministry of Health and Institute for Resource Development (1989) Ondo State, Nigeria Demographic and Health Survey: 1986 (Columbia, Maryland: IRD/Macro Systems Inc.).

Ransome-Kuti, O. (1986) That Our Children Will Not Die: Part II, Inaugural Lecture Series (Lagos: Lagos University Press).

Uche, C. (1981) The Contexts of mortality in Nigeria. Genus 37(1-2) : 123-136.

United Nations Economic Commission for Africa (1986) African Socio-economic Indicators 1985 (Addis Ababa: UNECA).

United Nations (1988) Case Studies in Population Policy: Nigeria (New York: U. N. - ST/ESA/SER.R/83).

______________ (1982) Model Life Tables for Developing Countries

Population Studies No. 77 (New York: Department of International Social and Economic Affairs).

World Health Organization (1981) Development of Indicators for Monitoring Progress Towards Health For All by the Year 2000 Geneva: WHO Health For All Series No.4).

World Health Organization Regional Office for Africa (1987) Evaluation of the Strategy for Health For All by the Year 2000 : Seventh Report on the World Health Situation:2 (Brazzaville, Congo: WHO).

CHAPTER THREE

NATURE AND QUALITY OF THE DATA

3.1: INTRODUCTION

This chapter outlines the nature and assesses the quality of the data collected in the 1986 Ondo State DHS with special reference to aspects of the birth history data relevant to the estimation of infant and child mortality rates and the examination of sub-group differences in such rates. Such data evaluation necessarily precedes the substantive analysis in order to indicate the analytical limitations imposed on the study by the data and more importantly, the level of confidence placeable on the conclusions drawn from the data.

3.2: THE DATA

General Features: The data analysed in this study were collected in the Ondo State Demographic and Health Survey (ODHS) during September 1986 to January 1987 by the State Ministry of Health with technical assistance from the Institute for Resource Development, Maryland, United States. Covering all the 17 Local Government Areas (LGAs) in the state as at 1986, the individual survey elicited data from a representative sample of 4,213 women aged 15-49 years, identified on a de facto basis in a preceding household enumeration survey; the sample being a two-stage, stratified, self-weighting probability type (Ondo State Ministry of Health and IRD/ Macro Systems, Inc., 1989).

Social, demographic and health information collected in the survey and contained in the individual standard recode file include:

(i) background characteristics of respondents;

(ii) marriage, breastfeeding, postpartum amenorrhoea and sexual abstinence;

(iii) birth history of women since January 1981;

(iv) contraceptive knowledge and use;

(v) fertility preferences; and

(vi) recent morbidity, immunization and anthropometric measures for children below five years of age.

The Collection of the Mortality Data: The analyses in this study pertain mainly to births born by respondents during the five years to survey due to the use of a truncated birth history approach (births since January 1981) in the collection of retrospective fertility and child mortality/health data. This introduces analytic limitations as regards the assessment of data quality through the examination of trends and the type of substantive issues that can be examined. Nevertheless, the truncated birth history data yielded about 3,800 live births and upon the exclusion of those born prior to September 1981 or in the month of interview, on whom important questions (for this study) on health, breastfeeding, and recent morbidity were not collected, we are left with 3,249 live births, of whom 263 had died by survey date.

Each respondent was asked for the date of birth of each of the live births she had in the last five years to interview and their survival status. If a child had died, information was collected on its age at death in days if in the first 28 days of life, in months for deaths at ages 1-23 months and in years for deaths at ages two years and above.

Mortality related information was also collected by asking each respondent about the total number of her living children residing at home with her, the total residing away, and the total number of her children that have died; all of which were differentiated by sex. But, as we shall show later, the time-located estimates of infant mortality (*q0*) and mortality below age two (*q2*) derived by indirect techniques from the CEB/CS data differ greatly from the direct estimates obtained from the 5-year birth history data. Also because of the limited opportunities the former provide for examining in details infant and child mortality patterns, the mortality measured in this study is only that experienced by the 3,249 births born between September 1981 and August 1986 as reported by respondents.

3.3: QUALITY OF THE DATA

(i) Introduction: It is well established that retrospective survey data from developing countries especially subSaharan Africa contain both sampling and non-sampling errors that can affect demographic estimates (Ewbank, 1981; Goldman et al, 1985; Institute for Resource Development, 1990). This section presents an assessment of various aspects of the ODHS individual survey data especially those of the birth history data relevant to the estimation of early child mortality rates.

The extent of sampling errors is taken into account by the computation of standard errors for the mortality rates presented in this and subsequent chapters. However, more attention is given here to non-sampling errors because they can more easily distort our examination of infant and child mortality differentials by being associated with some of the study's explanatory variables (see for example, Marckwardt, 1987).

The data quality assessments undertaken rely mainly on internal consistency and plausibility checks, supplemented where possible with comparisons of the data with estimates from the 1981/82 NFS. Two types of errors were particularly looked for. First, omission of live births especially those that may have died very early in life. Second, the misreporting of dates of births and ages at death. Both error types may be expected even for a five-year recall period because of the relatively low level of socio-economic modernization in Nigeria. This implies that for the many people who rarely interact with the modern sectors of the economy or the public bureaucracy, there is little incentive to remember exact dates of occurrence of vital events in their lives or to obtain documents which record such events.

It should be noted that although several of the possible checks on the data were carried out, conclusive inferences about the data quality cannot be made on the basis of the results of a few of the tests since for instance, omission of births is hard to detect except for gross underreporting. A final assessment has to be based on how well the data stands on all or most of the tests and the extent to which observed irregularities in the data might jeopardize an analysis of mortality differentials.

(ii) Coverage of Vital Events:

(a) Displacement of Birth dates: With the truncated birth history approach, misreported birth dates can transfer events across the reference boundary and as in the DHS surveys, some interviewers may deliberately move births across the boundary so as to minimize their work by avoiding asking the many questions (45 in the ODHS) on breastfeeding, recent morbidity and immunization for births born in the five years preceding survey (Goldman et al, 1988; Arnold, 1990; Sullivan et al, 1990). To reduce this possibility, the ODHS did ask a question on the occurrence of a birth prior to January 1981. Table 3.1 shows the distribution of all births recorded as occuring during 1981 to 1986.

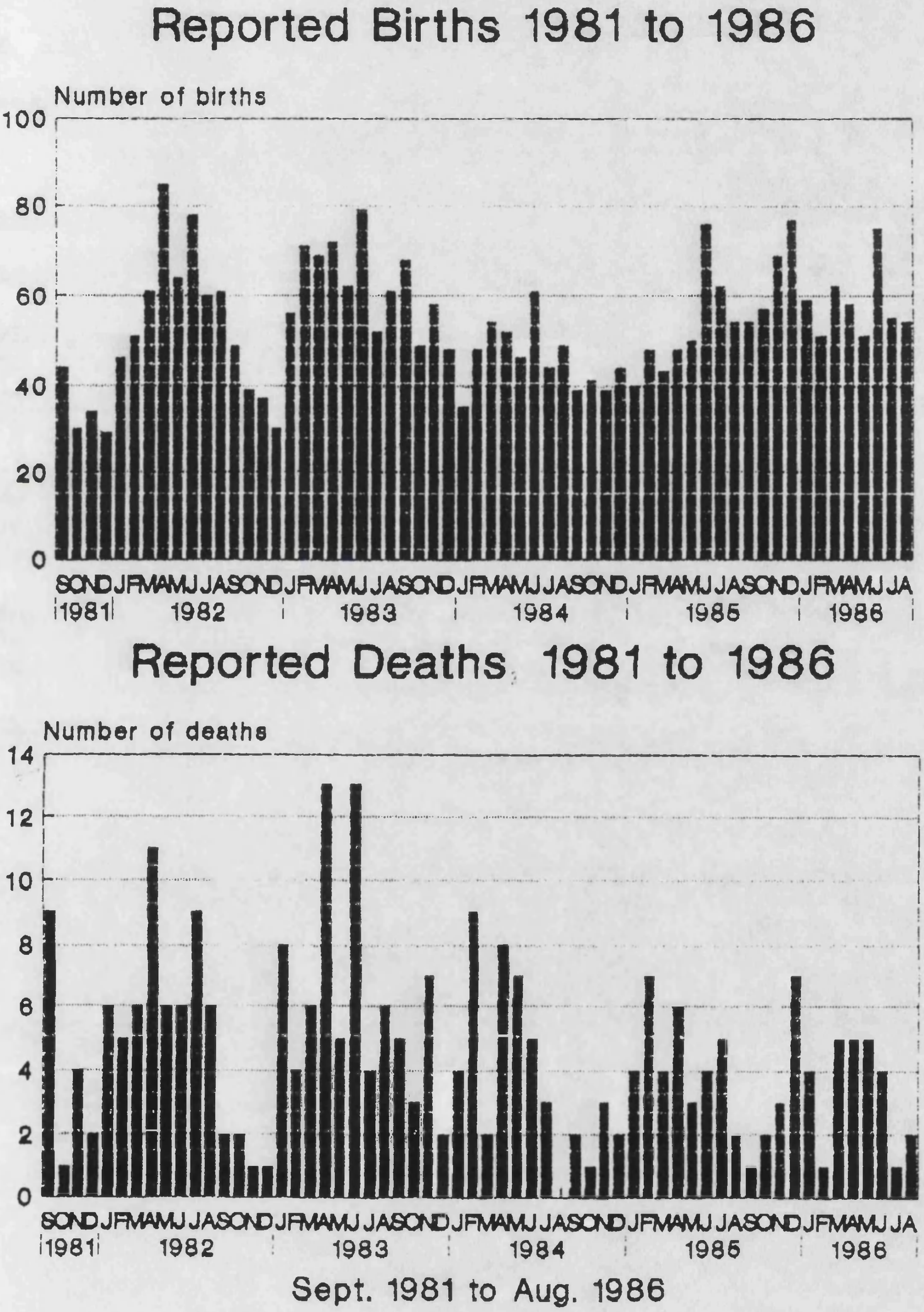
Table 3.1: Recorded live births by Year of occurrence, 1986 ODHS

Year(Y)	Number	Y / Y+1
1981	576	0.87
1982	661	0.89
1983	745	1.35
1984	552	0.82
1985	677	1.13
1986	600	--

The ratios of total births in one year to the next do not strongly suggest that the ODHS was seriously afflicted by the transfer of births across January 1981. But this assessment is incomplete since we have no way of knowing the total number of births in 1980. When we focus on the births had by months between September 1981 and August 1986 on which the 45 questions on health, immunization and breastfeeding were to have been asked, we notice from Figure 3.1, some indications of the reporting of fewer births (and to a lesser extent, deaths) as occurring in the last quarter of 1981 compared to the first quarter of 1982. Note however that the same pattern is true of 1982, 1983 and 1984; perhaps an indication of demographic seasonality in Ondo State.

Moreover, of the reported total number of children ever-born (13,963) by the surveyed women, 27.3 percent were reported as occurring during 1981-86, a figure that is within the range of 25-30 percent recorded in most of the WFS and DHS surveys in developing countries as the most recent five-year segment of the complete birth histories for all sampled women aged 15-49 (see Goldman et al, 1988; Arnold, 1990). Thus, whatever the defects in the ODHS truncated birth history data, the survey seems to have achieved sufficient coverage of births born by the sample in the five years preceding it.

Figure 3.1



(b) Sex ratios at birth: In a developing area like Ondo State, it may be expected that due to factors of traditionalism, female births are more likely to be omitted than male births by respondents in the event of non-reporting of some births especially those that died very early in life. Table 3.2 presents sex ratios of all reported births in the study sample according to some background characteristics.

Table 3.2: Sex Ratios at birth by some background characteristics

Characteristics	Ratios[1]	Number of births
Mother's schooling		
No schooling	99	1473
Some primary	111	1103
Complete primary	111	673
Paternal schooling		
No schooling	98	1092
Some primary	102	1080
Complete primary	116	1077
Residential milieu		
Rural/riverine	100	1890
Urban	113	1359
Maternal age		
< 20 years	124	238
20-34	110	2239
35+	87	772
Birth order		
First	118	505
2-5	110	1669
6+	93	1075
Total	105	3249

[1] Number of male births per 100 female births.

The sex ratio at birth of 105 for the overall sample of births is within the normal range for human populations. However, socio-economic differentials in the ratios indicate to varying degrees the incidence of sex-selective omission of births although it is possible that differential reporting of stillbirths as live births partly accounts for some of the unexpected patterns discussed next.

The ratios obtained for births to women with no schooling, women currently married to men with no schooling, and rural residents, do slightly indicate higher non-reporting of male births who may have died very early in life by women in these groups. On the other hand, possibly higher incidence of omission of female births or of mis-reporting of male still births as live births by educated parents is suggested by the somewhat above-normal sex ratios at birth (111 and 116). As for the very high sex ratio at birth (124) for births to teenagers, their small number makes it difficult to entirely attribute this unusual pattern to the greater omission of female births. But there is a fairly strong indication of higher levels of non-reporting of male births by older women and of female first births. Thus, overall, it is not very clear from the sex ratios shown in Table 3.2 that strongly systematic sex-selective birth omissions characterize the data.

(c) Completeness of deaths data: To further investigate the extent to which early infant deaths among the births born by respondents in the five years to survey were fully reported, we examine in Table 3.3 the ratios of deaths in the first six days of life to all deaths in the first 28 days, and the ratio of all neonatal deaths to all infant deaths. This is because such deaths may be more likely omitted or forgotten by respondents than deaths that occurred later in life as a result of not having lived long enough to have become 'a part of the family'.

Table 3.3: Ratio of deaths under 7 days to all neonatal deaths(A) and of neonatal to all infant deaths (B) by some characteristics

Characteristics	A	No. of deaths	B	No. of deaths
Mother's schooling				
No schooling	0.69	40	0.53	76
Some primary	0.68	25	0.42	59
Complete primary	0.76	17	0.38	45
Paternal schooling				
No schooling	0.63	24	0.51	47
Some primary	0.76	30	0.45	67
Complete primary	0.71	28	0.42	66
Residential milieu				
Rural/riverine	0.63	50	0.45	112
Urban	0.81	32	0.47	68
Maternal age				
< 20 years	0.80	10	0.45	22
20 - 34	0.68	47	0.41	115
35+	0.71	25	0.58	43
Birth order				
First	0.70	20	0.56	36
2 - 5	0.66	35	0.41	86
6+	0.77	27	0.47	58
Sex				
Male	0.72	52	0.51	101
Female	0.67	30	0.38	79
Total	0.70	82	0.46	180

The expectation for areas with moderate to high levels of neonatal and infant mortality (that is, 1q0 of about 55 - 65 per 1,000) is that about 70 percent of all neonatal deaths occur in the first six days of life (Sullivan et al, 1990); and around 50 percent of all infant deaths occur in the neonatal period going by WFS evidence (see Rutstein, 1984). We would also expect that the lower the mortality level, the greater the concentration of infant deaths in the first month of life and of neonatal deaths in the first week of life since typically the steepness of early childhood mortality decline with age is related to the level of mortality (Sullivan et al, 1990: 126).

Examining the ratios of deaths under seven days to all neonatal deaths, we observe a general closeness to the 'norm' of 0.70 across the categories of the six variables considered. However, the ratios of neonatal deaths to all infant deaths suggest possibly greater omission of neonatal female deaths, being (0.38) about 10 points lower than the expected proportion of all female infant deaths. Generally, whereas contrary to expectation there is no indication that the deaths that may have been omitted occurred mostly in the first week of life, it seems there was some omission or mis-reporting of other neonatal deaths although the small numbers involved in some cases makes it difficult to be definitive about this inference.

The parental educational differences in the ratios of reported neonatal deaths to all infant deaths partly reflect the odd pattern of increases in infant mortality as parental educational level rises. This partly explains the association of lower ratios with higher educational level (especially of the mother) although the possibly weak role of parental education as predictors of infant mortality in Ondo State should not be totally discounted. This is because as shown later, both parents' educational attainment show the expected inverse association with post-infancy mortality and more importantly, the odd educational differentials in infant mortality especially the post-neonatal segment imply implausibly huge omissions of infant deaths by the less educated respondents.

It is also noted that for both rural and urban-based respondents, the reported number of neonatal as proportions of all infant deaths are acceptably close to the expected fraction (0.50). However, even if we discount the ratio for the category with very small number of deaths (< 20 years), the ratios for the 20-34 maternal age group and for the birth order group 2-5 seem to be rather on the low side especially since these groups have comparatively lower infant mortality.

Thus, although it seems that neonatal deaths were omitted to varying degrees by women of different background characteristics, the clearest indication and part of the explanation for some of the other irregularities is the apparently significant greater omission of early female deaths. Indeed, overall comparison of the ODHS figures with estimates from the 1981/82 NFS data presented in Table

3.4, suggest that the ODHS may have suffered from an above-normal incidence of omission of female deaths.

Table 3.4: Comparison of sex-specific neonatal deaths as proportions of all infant deaths: 1986 ODHS versus 1981/82 NFS

Area	Period	Male	Female	Total
Ondo State	1981-86	0.51	0.38	0.46
Southwest	1970-79	0.52	0.62	0.57
All Nigeria	1976-80	0.52	0.51	0.52

Notes: Derived from National Population Bureau (1986): Table 31 and Rutstein (1984): 55.

(iii) Birth dates and age at death reporting: Respondents were asked to give the year and month of birth of each of the births had in the five years up to survey and, in addition to supply the current age of each living child. The date of birth along with the date of interview are basic to the computation of durations of exposure to the risk of death in the age segments considered in this study. It is therefore important to consider the quality of birth date reporting alongside that of the age at death reports.

(a) Completeness of date of birth reports: The ODHS data show that all respondents reported the month and year of occurrence of each of their births in the five-year reference period, so that no computer imputation of either information was necessary. However, given that in Southwest Nigeria in the 1981/82 NFS, almost 50 percent of respondents could not provide the month of occurrence of their most recent birth (Morah, 1985: 20-23) and some computer imputation was necessary for the DHS surveys in many of the more modernized Latin American and Asian countries (Sullivan et al, 1990), the complete reporting in the ODHS strongly indicates a high level of imputation in the field by interviewers. The extent of this practice can be gauged from the fact that in the national DHS survey conducted in 1990, the respondents could not provide complete birthdates for 8% and 22.9% of living and dead children respectively, born in the five years preceding the survey (F.O.S. and IRD/Macro Inc., 1990: 163).

On the other hand, the short period of recall demanded of respondents on their birth history, may have made it easier for most respondents to report the details of the date of their births especially since the majority of respondents had only one or two births to report on (Table 3.5).

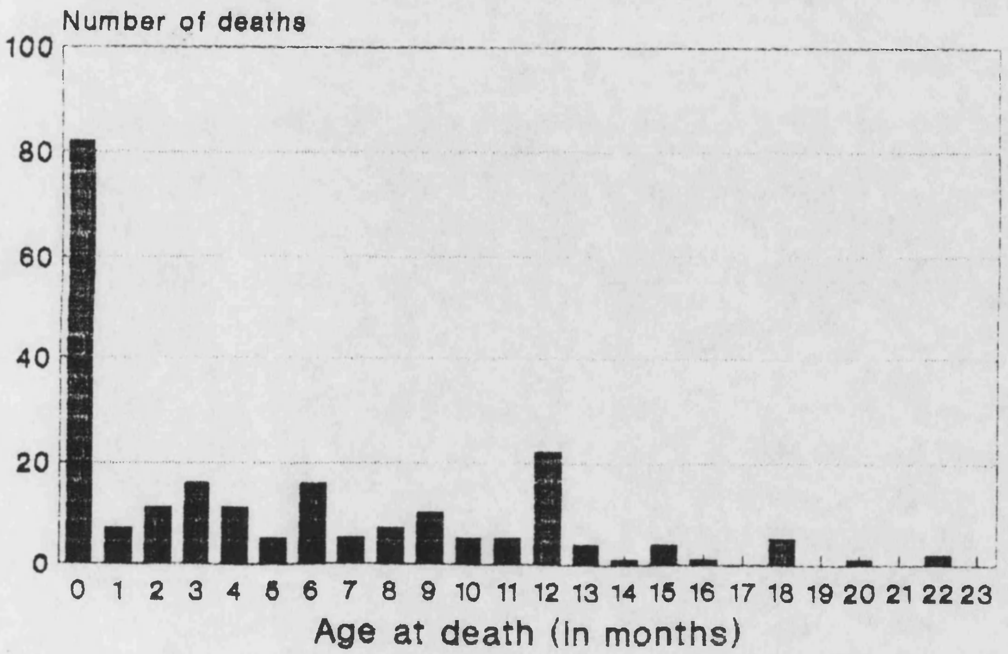
Table 3.5: Distribution of respondents according to the total number of births had between September 1981 and August 1986.

Number	Frequency	Percentage
1	1 140	35.1
2	1 760	54.2
3	322	9.9
4	27	0.8
Total	3 249	100.0

(b) Reporting of age at death: A common feature of retrospective birth history data from developing areas, is the heaping of reported age at death at 12 months and other months that are multiples of six (Goldman et al, 1985; Sullivan et al, 1990). Such misreporting of ages at death can bias age-specific mortality estimates if it produces a net transfer of deaths from one age interval to another. In particular, if heaping at 12 months is due to respondents rounding up the age of children who died shortly before their first birthday, infant mortality (1q0) rates will be underestimated and child mortality (4q1) will be overestimated. The reverse will occur if the rounding is downwards.

Figure 3.2 graphs the distribution of the reported ages at death for children who died before their second birthday. It shows a shortfall of deaths on both sides of age 12 months. However, there is some indication of some rounding up or down of infant deaths to age 6 and 9 months and the shortfall of deaths at ages immediately after 12 months is greater than before it.

Figure 3.2: Age at death for Children dying before 24 months



Thus, the rounding down of post-infancy deaths may have occurred to the same or greater extent as the rounding up of infant deaths, so that overall child mortality estimates may not be seriously biased upwards. However, the extent of heaping on age 12 months is serious enough to warrant caution in the detailed examination of patterns in post-neonatal (1-11 months) and child (12-59 months) mortality.

Table 3.6 presents indices of heaping of deaths at 12 months of age according to selected background characteristics, to ascertain the extent of the differential occurrence of this problem.

Table 3.6: Index of heaping[1] of deaths at month 12 of age by some background characteristics

Characteristics	Index of heaping
Mother's schooling	
No schooling	10.67
Some primary	5.00
Complete primary	4.00
Residential milieu	
Rural/riverine	11.33
Urban	2.22
Maternal age	
< 20 years	16.00[a]
20 - 34	4.00
35+	20.00[b]
Total	5.87

Notes: [1] The heaping index was calculated as:

$$\frac{(4*D12)}{(D10+D11+D13+D14)}$$

where D12 includes all deaths reported at 12 months or one year;

[a] four deaths reported at month 12 and one at only month 11;

[b] five deaths reported at month 12 and one at only month 14.

Since the heaping index was calculated as the number of deaths at month 12 divided by the average number of deaths at months 10, 11, 13, and 14, a value greater than 1.0 is indicative of heaping at 12 months assuming that the actual number of deaths changes linearly between 10 and 14 months. The indices indicate a high incidence of heaping especially among respondents residing in rural areas and those that have no schooling. As a precaution therefore, this study will initially also consider post-neonatal mortality as the probability of dying during months 1-15 as a check on the observed differentials based on the more conventional definition of months 1-11.

But it is worth noting that the overall index of 5.87 and most of the sub-group indices are much lower than the figures obtained for the most recent five-year period in nine national DHS-I surveys in sub-Saharan Africa which ranged from 9.2 to 39.1 (Sullivan et al, 1990: 123). Moreover, our examination of the detailed age at death distribution according to three social characteristics (mother's schooling, literacy and residential milieu) suggested that the greater part of the heaping is due more to the rounding down of ages at death occurring after age 12 months than to the rounding up of ages of infant deaths.

(iv) Plausibility of direct estimates of mortality:

(a) Method of estimation: Our focus in this study is mortality during the first five years of life, which could be sub-divided into the first month (neonatal), the rest of the first year (post-neonatal), and during months 12 - 59 (child mortality). Child mortality could be further broken down into mortality between the first and second birthday (toddler), and between the second and fifth birthday, if the data are sufficient for such detailed breakdown.

To measure mortality in these age intervals using retrospective birth history data, life table measures of probabilities of dying (nqx) are commonly adopted. The calculations are often done on a period basis, derived from all deaths in a particular year and on the number of person-years spent at the risk of death in that year (Rutstein, 1984). The data for each age group are thus derived from children belonging to different cohorts.

For this study, the sample consist of births between 1981 and 1986, all of whom reach interview at different ages below age five and so have only been partially exposed to the risk of deaths that occurred in the five years since September 1981. Out of the initial total of 3,249 births, 2,440 reach exact age 12 months (180 died in infancy), 1,810 reach age 24, 1,266 reach age 36, 611 reach age 48 and only 35 reach exact age 59 months.

We adopt the procedures outlined by Smith (1980) in the computation of the probabilities of dying between exact ages (nqx) treating the 3,249 births as a single pool born in September 1981, a number of whom die in the course of the next five years. The basic principle is to count a child as exposed to the risk of death either until the age at death or until their age at interview. All living children at interview are included in the denominator for all the mortality rates for all age intervals that they have survived and for half the age interval in which they were censored by interview. For precision, the nqx's were initially estimated on a monthly basis using the SPSS-X survival routine and were then combined to produce rates for broader intervals as nqx = 1 - (lx+n / lx).

(b) Overall sample mortality estimates: Estimates of various types of mortality rates for 1981-86 Ondo State that were initially examined are presented in Table 3.7.

Table 3.7: Mortality Estimates for Ondo State, 1981-86; ODHS

Interval of life (months)	Number of deaths	Rate (per 1000)	Standard error(SE)	Rate/SE
Neonatal (0)	82	25.3	2.75	9.16
Post-neonatal (1-11)	98	34.1	3.39	10.06
15/12q1/12 (1-15)	129	46.7	3.99	11.70
Infant (0-11)	180	58.4	4.23	13.81
1q1 (12-23)	40	17.5	2.74	6.39
3q1 (12-47)	81	42.4	4.41	9.61
3q2 (24-59)	43	28.6	4.18	6.84
4q1 (12-59)	83	45.7	4.58	9.98
5q0 (0-59)	263	101.4	4.83	20.99

A further consideration was on which age intervals to use in examining child survival determinants given the finding from previous studies covering wide areas of the developing world (Hobcraft et al, 1985; Bicego and Boerma, 1991; Barbieri, 1991) that the relative importance of various factors vary with the interval of life. We decided to base our study on the following types of mortality rates:

(i) **Neonatal mortality:** probability of dying during the first month of life;

(ii) **Post-neonatal mortality:** (a) probability of dying during months 1 to 11;
(b) Probability of dying during months 1-15 (as a variant of (a);

(iv) **Child mortality:** (a) probability of dying between exact ages 1 and 5 (4q1); and
(b) probability of dying between exact ages 1 and 4 (3q1) as a variant of (a).

This is because our detailed examination of the various rates (with their standard errors) according to five variables (mother's schooling, residential milieu, sex of child, birth order and length of the preceding birth interval) revealed 1q1 and 3q2 to be far more unstable for many subgroups than 4q1 and 3q1, due mainly to the small number of deaths involved as can also be gleaned from Table 3.7. To reduce biases in the multivariate analysis, 3q1 is adopted as the measure of child mortality because it reduces the extent of right-censoring while capturing most deaths in childhood (only two deaths were reported as occurring in the fifth year).

Despite adopting these broad age intervals, a heavily censored sample of 3,249 births is still a relatively insufficient one for establishing reliable measures of mortality for all subgroups. Note is thus made of all rates based on initial exposures of fewer than 300 children.

But a most recent five-year birth history data does have at least two advantages for this study. First, the quality of ages at death and dates of birth for births that occurred recently is usually better than for those that occurred further back in time (Sullivan et al, 1990; Arnold, 1990). Second, information collected about respondents and their households are as at time of survey and would better capture the situation around the time when the births studied were born.

(c) Some infant mortality (1q0) patterns: Bearing in mind the foregoing discussion, another check is now made on the quality of the ODHS child mortality data with an examination of infant mortality differentials according to some characteristics so as to ascertain their conformity to theoretically expected patterns.

Table 3.8: Infant mortality according to selected characteristics

Characteristics	Rate (per 1000)	Exposures	S.E	Relative risk
Mother's schooling				
No schooling	53.6	1417	5.9	74
Some primary	56.5	1044	7.1	78
Complete primary	72.9	617	10.4	100
Mother's literacy				
Cannot read	54.9	1583	5.7	88
Can read	62.2	1495	6.2	100
Paternal schooling				
No schooling	44.6	1052	6.4	68
Some primary	65.3	1025	7.7	99
Complete primary	65.9	1001	7.8	100
Paternal literacy				
Cannot read	47.7	942	6.9	76
Can read	63.1	2136	5.3	100
Residential milieu				
Rural/riverine	62.1	1802	5.7	117
Urban	53.3	1276	6.3	100
Birth order				
First	76.2	471	12.2	141
2-5	54.2	1584	5.7	100
6+	56.7	1023	7.2	105
Previous birth interval				
< 24 months	81.5	479	12.5	166
24+	49.2	2128	4.7	100
Sex of child				
Male	63.2	1598	6.1	118
Female	53.4	1480	5.9	100

The variations in infant mortality by the selected variables shown in Table 3.8 conform to the expected patterns except for the parental education/literacy differentials. The seemingly implausible educational patterns do not seem to be entirely attributable to differential omission of early infant deaths and the probably weak influence of parental schooling on infant mortality in Ondo State may be part of the explanation.

First, we observed earlier no inverse association between parental education and omission of deaths in the first week of life in which a higher incidence of such omissions may be expected than in the last three weeks of the first month of life. Also, as shown in the next chapter, the parental educational differentials in mortality beyond infancy are strongly in the expected direction.

Second, we note from past studies (Hobcraft et al, 1984; Cleland and van Ginneken, 1989) that maternal and paternal educational differentials in childhood mortality (4q1) are usually notably greater than equivalent differentials in infant mortality. From the ODHS data, the ratios of child mortality rates for women with no schooling and those with some primary schooling to the rate for women with at least complete primary education are 2.22 and 2.09 respectively. For paternal education, the equivalent ratios are 2.38 and 1.45.

But given that some childhood deaths may well have been omitted, these ratios may be taken to be indicative of the 'true' educational differentials in infant mortality in the absence of death omissions. A comparison with the rates and exposures shown in Table 3.8 would therefore broadly imply that women with no schooling and those with primary schooling omitted about 100 and 400 births respectively more than women with at least complete primary schooling, over 90 and 25 percent of whom were infant deaths. For the equivalent paternal education categories, the implied omissions are around 600 and 130 births out of which about a quarter and a third respectively were infant deaths.

In other words, about as many infant deaths were omitted as were reported by the less educated women which seem too high to be true. Indeed, it is likely that some omission of births not surviving infancy by women of higher socioeconomic status also occurred and the higher level of omissions by women of lower status would not have heavily distorted the expected educational patterns had the education effects upon infant mortality in 1981-86 Ondo State not been genuinely modest.

Further weakening an explanation of the odd parental educational differentials in infant mortality solely in terms of selective under-reporting of infant deaths is the observation from the rates shown in Table 3.9 that far greater omissions occurred in the post-neonatal than neonatal period although under-reporting seem more likely in the latter. We note also that data with defects from other parts of Africa less modernized than Ondo State do still show women with no schooling experiencing higher infant mortality than educated women so that the observed contradictory patterns are partly indicative of the weak lowering impact of parental education on infant mortality in our study setting.

ble 3.9: Neonatal and post-neonatal mortality rates (per 1000 live births) cording to parental education and household/local area socioeconomic status.

usehold/Local area tatus variables	Mother's schooling			Paternal schooling		
	None	Some primary	Complete	None	Some primary	Complete
Neonatal Mortality						
usehold disposable come status index						
Low	29.0	14.1	31.6	19.7	36.4	20.1
Medium	23.5	25.3	11.7	26.0	23.8	14.8
High	35.0	26.3	34.2	10.2	27.6	38.1
cal area composite velopment index						
Low	41.9	36.9	20.0	18.4	51.7	42.0
Medium	25.7	24.9	37.2	28.1	28.8	25.1
High	16.3	11.3	21.0	19.5	9.8	17.6
sidential Milieu						
Rural/riverine	27.6	21.6	35.9	20.5	31.2	29.9
Urban	27.0	24.2	19.0	25.6	22.8	23.0
Post-neonatal mortality						
usehold disposable come status index						
Low	37.6	38.1	83.0	28.6	59.1	49.1
Medium	21.1	41.9	64.4	18.0	33.8	63.0
High	15.9	12.8	25.1	21.0	20.5	17.0
cal area composite velopment index						
Low	40.1	44.4	38.3	36.5	47.1	40.9
Medium	23.6	45.2	77.5	21.4	43.5	64.2
High	17.6	17.3	34.1	12.9	24.8	26.1
sidential Milieu						
Rural/riverine	28.2	40.5	53.2	23.4	45.9	42.1
Urban	22.8	24.4	44.3	20.7	25.3	38.0

Note: See Chapter Four for details on the construction of indexes

Nevertheless, the data irregularities reflected in the rather implausible parental education differentials especially in post-neonatal mortality, suggest a disturbing degree of shoddiness in the conduct of survey interviews since further cross-tabulations of the rates as shown in Table 3.9 indicate implausible positive association of both maternal and paternal education with mortality in infancy across all categories of the household and local area economic status indexes. Many of the interviewers do not seem to have been particularly tactful in eliciting birth history information from women of low formal education status.

This study cannot therefore be very definitive in assessing the relative importance of parental education in the shaping of neonatal and post-neonatal mortality outcomes in 1981-86 Ondo State. But as some form of protection against the data defects, the multivariate analysis will incorporate the maternal education variable when the mortality effects associated with it turn out to be statistically significant so as to estimate as accurately as possible the net effects of other covariates.

Finally, in Table 3.10 we present results of our indirect estimation of mortality under age one (1q0) and under age two (2q0), alongside the direct estimates to illustrate the wide divergence between the two sets. The methods used to calculate the indirect estimates are described in United Nations (1983).

Table 3.10: Direct and Indirect (time-located) estimates of infant (1q0) and under-two (2q0) mortality

Rate	Direct	Indirect (circa 1984/85)			
		West(16.1)*	North(15.6)	East(17.7)	South(18.7)
1q0	58.4	88.8	86.8	89.2	84.3
2q0	74.9	107.6	108.1	102.1	100.5

* level of mortality implied in the Coale-Demeny model life table system.

The indirect estimates are much higher than the direct estimates of 1q0 and 2q0. For the North model regime which seems to best approximate Ondo State childhood mortality age pattern, the indirect estimates are almost 1.5 times the direct estimates. This implies either very massive omissions in the five-year birth history data or very recent rapid decline in childhood mortality in Ondo State which the indirect estimation procedures have not adequately simulated.

On the first count, it is worth reiterating that the volume of total children ever-born (13963) reported as having been born in the most recent five year period to survey fall within the expected range of 25-30 percent. On the second count, we observe from Table 3.11 that the proportion dead among children ever-born to women aged 15-19 is only 29 and 65 percent respectively of the equivalent proportions for women aged 45-49 and 20-24. Although the children of the older women have been exposed for longer to the risks of death and sampling fluctuations may be at play, the much lower proportion dead among children ever-born to 15-19 year olds may be indicative of substantial declines in childhood mortality in the recent years to survey especially given the usually elevated risks of deaths among births to teenage mothers. The Trussell variant of the Brass estimation procedures being based upon simulations of normal mortality change, seem not to have adequately captured this recent rapid decline; a feature that is not entirely uncommon with developing area retrospective survey data (Preston, 1985: 258; Hill, 1991: 372). Thus, coupled with the limitations of indirect estimates for detailed examination of child mortality differentials especially by biosocial variables, their wide divergence from the direct estimates precluded their use in this study.

Table 3.11: Reported proportion dead (PD) among children ever born to different age cohorts of women.

i	Age of women	PD	RPD(i/i+1)	RPD (i/7)	No. of women
1	15 - 19	.080	.645	.292	1109
2	20 - 24	.124	.961	.453	563
3	25 - 29	.129	.746	.471	560
4	30 - 34	.173	.940	.631	548
5	35 - 39	.184	.818	.672	478
6	40 - 44	.225	.821	.821	478
7	45 - 49	.274	---	1.000	477
Total		.205	---	---	4213

Notes: RPD - ratios of proportion dead

(v) The quality of other relevant aspects of the data:

Checks were also made on the data on reported recent illnesses among children below five years of age, their vaccination status, nutritional status and breastfeeding experience. Patterns in the data conform in general to expectations. For instance:-

(a) A strong positive association was observed between reports of fever illness and of cough/breathing difficult conditions experienced by last born children in the four weeks to interview;

(b) The age pattern and level of reported diarrhoea morbidity (last two weeks) among under-fives, broadly agrees with the data from the 1984 National Health and Nutritional Status Survey; that is an overall prevalence of about 5 to 7 percent, and a peak period of infection at 12 - 23 months which coincides with the period when most children are weaned in Nigeria.

Furthermore, immunization coverage (BCG, DPT1, POLIO1, and Measles) increases with the age of child up to 36 months; and the distributions of measured children (6-36 months old) on the anthropometric measures (height-for-age, weight-for-age, and weight-for-height) are all approximately normal in shape.

However, the breastfeeding data is marked by severe heaping of reported durations on months that are multiples of six. Almost 45 percent of the children were reported to have been breastfed for either 12, 18, or 24 months. Relatedly, a comparison of the age at first supplementation reports for currently breastfed children and for those already weaned, indicated a strong tendency to report higher ages for the latter group.

(vi) Overview: The various checks we have performed on the 1986 ODHS individual survey data revealed many of the irregularities associated with retrospectively collected demographic data in subSaharan Africa. The first focus was on the truncated birth history data and the first indications were that a relatively high level of coverage of births born during 1981-86 was achieved. But more detailed examinations revealed that more female births than males especially those who died very early in life may have been omitted. But this did not seem to have been associated with the educational background of respondents.

The age at death data was shown to be marked by much heaping on age 12 months and this seem to have been due less to rounding up of ages of infant deaths than to the rounding down of ages of post-infancy deaths, so that the child mortality estimates may not suffer much from an upward bias (and the post-neonatal mortality estimate from a downward bias). The patterns in infant mortality implied by the data are plausible except for the positive associations of infant mortality with parental education (especially mother's) which we argued are attributable both to selective non-reporting of infant deaths and the probably weak lowering impact of parental education on mortality in infancy in Ondo State.

Since other relevant aspects of the data also generally conform to expected patterns, it can be said that on the whole, the data quality is not so poor as to preclude a meaningful analysis of child mortality factors in Ondo State.

3.4: SUMMARY

This chapter assessed the quality of the data collected in the 1981-86 ODHS with special reference to infant and child mortality. It was shown that the survey achieved a reasonably high level of coverage of births and deaths during 1981-86. Reported age-at-death heaping on 12 months seem to have been due more to the rounding down of post-infancy deaths than the rounding up of infant deaths so that child mortality (4q1) estimates are relatively unbiased. Overall, the patterns in infant mortality implied by the data are plausible except for the differentials by maternal and paternal education which seem to be indicative of both selective underreporting of deaths and their weak covariation with infant mortality in the study area. Other aspects of the data were shown to be consistent so that overall, defects in the data were not considered to be so bad as to drastically distort an analysis of child survival determinants.

REFERENCES

Arnold, F. (1990) Assessment of the quality of birth history data in the Demographic and Health Surveys. In Institute for Resource Development, ed., An Assessment of DHS-I Data Quality, DHS Methodological Reports No. 1 (Columbia, Maryland: IRD/Macro Systems Inc.): 83-110.

Barbieri, M. (1991) The socioeconomic and cultural context of infant and child mortality in subSaharan Africa. Paper presented at the Demographic and Health Surveys World Conference, August 5-7 (Washington, D. C.).

Bicego, G. and J. Boerma (1991) Maternal education and child survival: a comparative analysis of DHS data. Paper presented at the Demographic and Health Surveys World Conference, August 5-7 (Washington, D. C.).

Ewbank, D. C. (1981) Age Misreporting and Age-selective Underenumeration: Sources, Patterns and Consequences for Demographic Analysis. Committee on Population and Demography, Report No.4 (Washington, D. C.: National Academy Press).

Federal Office of Statistics and IRD/Macro Systems Inc. (1991) Nigeria Demographic and Health Survey 1990: Preliminary Report (Lagos: F.O.S and Columbia, Maryland: IRD/Macro Systems Inc.).

____. (1992) Nigeria Demographic and Health Survey 1990 (Lagos: F.O.S. and Columbia, Maryland: IRD/Macro Systems, Inc.).

Federal Office of Statistics (1985) The Health of Nigerians 1983/84

(Lagos: F.O.S).

Goldman, N., C. F. Westoff and L. M. Navarro (1988) Full vs. Five-year birth history data for fertility and child mortality measures. Paper presented at the IUSSP Meeting, Santiago May.

Goldman, N., S. O. Rutstein and S. Singh (1985) Assessment of the quality of data in 41 WFS surveys: a comparative approach. WFS Comparative Studies No. 44 (Voorburg, Netherlands: International Statistical Institute).

Hill, K. (1991) Approaches to the measurement of childhood mortality: a comparative review. Population Index 57(3): 358-382.

Hobcraft, J., J. McDonald and S. Rutstein (1984) Socioeconomic factors in infant and child mortality: a crossnational comparison. Population Studies 38(2): 193-223.

Institute for Resource Development (1990) An Assessment of DHS-I Data Quality DHS Methodological Reports No.1 (Columbia, Maryland : IRD/Macro Systems Inc.).

Marckwardt, A. M. (1987) The individual interview. In Cleland, J. and C. Scott eds. The World Fertility Survey: An Assessment (Oxford: Oxford University Press): 434-473.

Morah, B. C. (1985) Evaluation of the Nigeria Fertility Survey 1981/82. WFS Scientific Reports No.80 (Voorburg, Netherlands: International Statistical Institute).

National Population Bureau (1986a) Nigeria Fertility Survey 1981/82 : State Level Reports (Lagos: N.P.B).

Ondo State Ministry of Health and Institute for Resource

Development (1989) Ondo State of Nigeria Demographic and Health Survey: 1986 (Columbia, Maryland: IRD/Macro Systems Inc.).

Preston, S. H. (1985) Mortality in childhood: lessons from the WFS In Cleland, J. and J. Hobcraft eds. Reproductive Change in Developing Countries (Oxford: Oxford University Press): 253-272.

Rutstein, S. O. (1984) Infant and child mortality: levels, trends and demographic differentials. WFS Comparative Studies No.43 (Revised edition). (Voorburg, Netherlands: International Statistical Institute).

Smith, D. (1980) Life table analysis. WFS Technical Bulletins No.6/ Tech. 1365 (Voorburg, Netherlands: International Statistical Institute).

Sullivan, J., G. Bicego and S. Rutstein (1990) Assessment of the quality of the data used for the direct estimation of infant and child mortality in the Demographic and Health Surveys. In Institute for Resource Development ed. Op cit.: 115-137.

United Nations (1983) Manual X: Indirect Techniques for Demographic Estimation Population Studies No.81 (New York: Department of International Social and Economic Affairs).

______________ (1982) Model Life Tables for Developing Countries Population Studies No.77 (New York: Department of International Social and Economic Affairs).

CHAPTER FOUR

SOCIO-ECONOMIC VARIATIONS IN INFANT AND CHILD MORTALITY

4.1: INTRODUCTION

This chapter examines the differences in neonatal, post-neonatal, and child mortality as shaped by each of several variables that, within the proximate determinants framework constitute the ultimate determinants of child survival. First, the plausibility and size of the differentials at the univariate level is assessed. Multivariate analysis using log-linear rate models to adjust for confounding associations is then undertaken to ascertain the key socioeconomic factors in childhood mortality in Ondo State during 1981-86.

4.2: GENERAL ANALYTICAL APPROACH

There are three stages to the analysis. In the first, mortality rates are calculated for births classified by socioeconomic variables (the focus of this chapter), and by biodemographic, household environmental, preventive child health services utilization, accessibility of health facilities and infant feeding variables (the focus of Chapter Five).

The second stage involves the selection of the most important of the variables that make up each of the two sets of factors. Thus, this chapter aims at identifying the most discriminating of the socioeconomic factors examined for evidence of strong co-variation with the mortality studied.

The initial selection is based on the sizes of the univariate differentials as indicated by their implied relative risks, their probable public health importance as implied by the population attributable risks, their conformity to theoretical expectations and the explanatory importance given to them in the research literature. One-factor log-linear models are then fitted to each of the selected variables to identify those whose implied relative risks are statistically significant. Following this, main effects models containing the reduced number of variables are fitted. All possible additions of single first-order interactions to the main effects models are also examined. The outcome of this stage in this chapter will be the identification of a few factors as the key ultimate socioeconomic determinants of neonatal, post-neonatal and child mortality in 1981-86 Ondo State.

Having also implemented stages one and two in Chapter Five for the proximate determinants, the third and final stage of the analysis (the focus of Chapters Six and Seven) involves first, the estimation of the net effects of the key ultimate determinants identified in this chapter. This is done by adjusting for their associations with the ascertained key biodemographic, household environmental, and child health and feeding variables. The search for the pathways through which the main socioeconomic factors influence infant and child mortality is taken further by a consideration of their effects on recent child morbidity prevalence, malnutrition and uptake of immunization.

4.3: SELECTION AND CONSTRUCTION OF SOCIO-ECONOMIC VARIABLES

15 variables that fall under this rubric were identified on the basis of findings from previous research and data availability and may be grouped as follows:

Individual-level factors: Mother's schooling, mother's literacy, current husband's schooling, current husband's literacy, discussion of family planning with husband in the 12 months prior to survey, acceptability of family planning media campaign, mother's current work status, current husband's occupation, marriage type, and number of times married.

Household level factors: Household disposable income status index and household non-disposable income status index.

Community level factors: Rural-urban residence, childhood place of residence, and local area non-health infrastructural development index.

(1a) Individual-level socioeconomic factors: For two reasons, the socio-economic characteristics of respondents are treated as individual level factors despite probably operating to some extent at the family level. First, variables such as marital stability, mother's schooling, and current work status would seem to impact upon child survival mainly through their influence on child care and health-seeking or enhancing behaviours which may depend strongly on the sex, order and age of the individual child. Second, the majority of respondents (90 percent) have had only one or two births in the period considered. The above-listed variables were constructed as outlined below.

Parental education/literacy variables: Mother's (and current husband's) schooling variable groups the births into three categories according to whether the women have no schooling, primary schooling (1-6 years of schooling) and at least completed primary schooling (7+ years). The literacy variable(s) groups the sample according to whether or not the women (current husband) can read or write. Literacy is not considered beyond the univariate level since there are no theoretical grounds for expecting it to capture most of the social, attitudinal and behavioural changes (discussed in Chapter One) through which education especially of the mother is thought to impact upon child survival.

Woman's status and modernity indicators: The variables on discussion of family planning with partner in the last year and acceptability of family planning media campaign are used to tap aspects of women's social status and exposure to modern influences. This seems reasonable for a largely non-contracepting, male-dominated society like Ondo State and these variables have in a similar sense been shown to be associated with child mortality in Nigeria and other parts of Africa (Caldwell, 1979; Barbieri, 1991). For the two variables, the births are grouped according to whether or not their mothers responded in the affirmative.

Mother's current work status and husband's occupation: In the ODHS questionnaire, the effect of mother's work status on child mortality among recent births seems to be best measured by the question on the current wage work status of the woman. The births are grouped according to whether or not their mothers are currently working for a wage outside the home. For the husband's occupation, three categories were created from the initial nine on the basis of their presumed socioeconomic status and the initial distribution. The first category consist of the few reported to be unemployed, and those engaged in agricultural activities; the second, those reported to be involved in trading, crafts, transport and other services; and the third ('white-collar'), comprises those reported to be clerks, office workers, teachers and other professionals.

Type and stability of marriage: Births were respectively grouped according to whether or not their mothers are in a polygynous union and whether they are still in their first marriage. Note that the sample is highly homogeneous in terms of religion (christians = 87 percent) and ethnicity (Yoruba = 86 percent); hence these variables are not considered in the mortality analysis due to the very small number of deaths (and exposures) in one of the contrasted groups.

(1b) <u>Distribution of the sample according to some individual level socioeconomic variables:</u> Table 4.1 shows the distribution of the births according to most of the individual level factors.

Table 4.1: Distribution of births according to some individual level socio-economic characteristics

Variable	Number	Percentage
Maternal education		
No schooling	1473	45.3
Some primary	1103	34.0
Complete primary	673	20.7
Paternal education		
No schooling	1092	33.6
Some primary	1080	33.3
Complete primary	1077	33.1
Discussed F.P. with partner last year (maternal autonomy index)		
No	2313	71.2
Yes	936	28.8
Maternal work status		
Not working	1081	33.3
Currently working	2168	66.7
Paternal occupation		
Farming/unemployed	1557	47.9
Sales/services	1158	35.6
'White-collar'	534	16.4
Marriage type		
Polygynous	1411	43.4
Monogamous	1838	56.6
Marital stability		
Once divorced	410	12.6
Never divorced	2839	87.4
Total	3249	100.0

Note: F.P. - family planning

(2a) Household level socio-economic factors: Two variables were created from responses to questions on the presence within a respondent's household of nine consumer items and durables as proxies for household income or economic status. The items are electricity, radio, television set, refrigerator, bicycle, motorcycle, car, tractor and an apartment or house. With the Nigerian context in mind, it was reasoned that the possession of a motorcycle, a car, tractor and an apartment or house would better reflect a household's non-disposable income since they would more likely have been acquired via savings, loans or inheritance than the other items. To the extent that savings imply non-availability of liquid cash for day-to-day child health enhancing expenditures, its impact on child survival may or may not be beneficial (United Nations, 1985). Consequently two indicators, one for household disposable income status, and the other for household non-disposable income status, were created as outlined below taking into account the initial distribution of the sample on each item.

Household disposable income status index: Five items - electricity, television, radio, refrigerator and bicycle - formed the basis of this variable. It has three levels: low, made up of births in households possessing one and the few with none of the five items; medium, refers to births in homes with two or three of the items; and high, births in households with four or five.

Household non-disposable income status index: This splits the sample into births in households with one or none of four assets (house, motorcycle, car, and tractor), that is, low, and those in households with more than one asset: medium-to-high.

(2b) Distribution of the sample according to household income status indicators: Table 4.2 shows how the sample is distributed according to the two household income status indicators.

Table 4.2: Distribution of births according to household income status indicators

Household income status index	Number	Percentage
Disposable income status		
Low	930	28.6
Medium	1531	47.1
High	788	24.3
Non-disposable income status		
Low	2451	75.4
Medium-to-high	798	24.6
Total	3249	100.0

(3a) Community level socio-economic factors:

Source of the data: The data on this group of variables come from a secondary source since the 1986 ODHS did not collect data on respondent's physical accessibility to health and other community services, or the presence of such services in the primary sampling units. However, during February 1979 to December 1980, the Federal Department of Rural Development attempted a complete enumeration of physical, social, and institutional infrastructures in Nigeria, with each of the 301 LGAs (as at 1980/81) as the basic unit of measurement (Idachaba, 1985). The data was questionnaire-elicited from officials in each LGA headquarters and cross-checked through visits to each LGA by a survey team.

The data used in this study therefore refer to the state of public utilities and services as revealed for Ondo State by the infrastructure census as at 1980/81 which also happens to precede the birth of the oldest of the children whose mortality is analysed in this study. The data on the date of completion of some of the utilities such as pipe water schemes (Idachaba, 1985: 677) indicate that less than a quarter were in place after 1975. Thus, possible child survival effects of some of these facilities could be expected since they have been in operation long enough to be of some consequence.

Nature and limitations of the data: In the ODHS standard recode file, codes for the 17 LGAs are provided and these can be identified with information in the main report (Ondo State Ministry of Health and IRD/Macro Systems Inc., 1989: 5). With this information respondents were categorized according to the spatial density in their LGAs of each of various utilities. One limitation of the infrastructure survey data is the insufficient information on the number and calibre of personnel that run the enumerated health facilities which makes their potential effectiveness difficult to ascertain. Secondly, the lack of up-to-date census data on the population of each LGA, meant that the average size of the relevant population served by specific utilities could not be reliably measured. This study thus relies on the spatial density of a utility per LGA as a measure of its residents' access to it.

Construction of the community level indicators of physical accessibility to public services and utilities: The main measure is the average walking distance in an LGA to a service or facility.

The services and institutions on which we have useful information are primary schools, secondary schools, banks, post offices, dispensaries, maternity centres, hospitals, pipe-water schemes, roads, and estimated female population aged 15-49 per trained midwife. Upon examining the measures for each LGA (see Table 2.1), it was clear that variability in the distribution of public utilities among the 17 LGAs in Ondo State especially for schools, post offices, dispensaries and to some extent maternity centres, was not so strong as to warrant more than two groupings of LGAs on most of the utilities for analytical purposes. The dividing line was placed close to the median value taking account of the range and the initial distribution.

Moreover, there seems not to be overall, sufficient variability in the data to attempt an examination of mortality rates computed for subgroups of births formed on the basis of their LGAs' performance on each of the spatial density measures. For this chapter therefore, one composite measure was created as follows:

Non-health infrastructural development index: Based on the initial accessibility measures for banks, post facilities, primary and secondary schools, this index groups births according to whether they reside in LGAs that scored low (below average) on at least two of the four indicators or otherwise (average and above).

(3b) Distribution of the sample according to community level socio-economic variables: The distribution in Table 4.3 also includes two variables relating to a respondent's current residential milieu and her childhood residence. Both have two levels - rural/riverine and urban.

Table 4.3: Distribution of sample according to community level socio-economic status variables

Variable	Number	Percentage
Non-health infrastructural development index		
Below average	1453	44.7
Average and above	1796	55.3
Residential milieu		
Rural/riverine	1890	58.2
Urban	1359	41.8
Mother's childhood place of residence		
Rural/riverine	1598	49.2
Urban	1651	50.8
Total	3249	100.0

(3c) Community-level effects on child survival: conceptual, measurement and interpretation issues: Previous studies on the impact of community factors on demographic outcomes show that analysis of such effects is not a straightforward and simple exercise. This is because of the many conceptual, measurement and interpretation complexities that such analyses entail (Casterline ed., 1985; Casterline, 1987; Pullum, 1991). Nevertheless, such efforts have yielded some empirical evidence for the view that higher density of health facilities can result in lower infant and child mortality; an indication of the desirability and feasibility of research encompassing individual, household and community factors. The basic hypothesis remains that of the responsiveness of demographic phenomena to the effects of the interactions between individual characteristics and community factors.

A working hypothesis for this study is that individual-level factors operate in conjuction with household factors and community level variables in impacting upon child survival. This implies that the effect of the spatial density of public utilities on infant and child mortality are expressed through individual and household factors.

The analytical approach involves including the characteristics of the LGA in which a child resides as contextual variables in an explanatory model that incorporates individual and household variables. This allows the three sets of variables to determine child survival outcomes, with the inclusion of individual and household factors helping to clarify some aspects of the relationship between community-level factors and child survival.

There is however, the problem of multicollinearity. The community-level factors are highly associated and in some cases, as with the residential milieu and non-health infrastructural development, may be measuring the same underlying concept (economic modernization in this instance). On the other hand, the adopted measures of physical accessibility of services - average walking distance to a facility in an LGA - were obtained independently of respondents' characteristics and subjective perceptions and are thus not subject to the same extent as measures created by aggregation of individual reports or characteristics to problems of proper choice of contextual unit, overlapping contexts, and the causal ordering of the individual and community variables (Blalock, 1985; Bilsborrow, 1985).

But given the average land area of LGAs in Ondo State (1,000 - 1,400 square kilometres) and an estimated population density of 202 per square kilometre, it is inevitable that composite spatial density measures will not adequately tap many respondents' physical proximity to public services since this depend greatly on their location and access to transportation. Thus, the measures are used in this study to only broadly indicate the general level of respondents' local area economic and health infrastructural development.

Moreover, there are other aspects to the accessibility of health and other public services apart from physical distance. With regard to health services, the adequacy of staffing and supplies, the varied perceptions of their utility, opening hours and cost of services are amongst other factors on which we have no information but which crucially determine their utilization, and without which they cannot possibly impact upon childhood mortality.

It is however not unreasonable given the many individual characteristics (including indicators of preventive child health services utilization) which are taken into account, to expect effects associated with spatial density of services to be real even without controlling for some of the key direct utilization channels.

Perhaps the main analytical difficulty for this study relates to the interpretation of the community effects that may be observed. Our approach of grouping individuals residing in communities with similar infrastructural development features may yield community effects net of the included individual and household variables. But they may be partly picking up effects that would have been accounted for by omitted or better measured individual and household variables.

However, the community factors as already noted will be examined along with many of the micro level factors known to be important determinants of child survival in developing areas. Thus, if the final statistical models for the integrated analysis of the observed patterns in infant and child mortality in Ondo State do show up community effects, these can reasonably be taken to be real net influences and not mere artefacts of the incompleteness of the individual and household components of the statistical models.

4.4: UNIVARIATE ANALYSIS

A necessary prerequisite to multivariate analysis is an understanding of the univariate differentials. We can thereby identify some of the socioeconomic variables that contribute little to an understanding of the observed infant and child mortality patterns.

(a) Neonatal mortality:

(i) Differentials according to individual level socio-economic characteristics: Neonatal mortality rates according to 10 socioeconomic characteristics are presented in Table 4.4a while Table 4.4b shows the person-time-units of exposure associated with the rates.

The first point that emerges from the figures is the weak or inconsistent patterns of association of many of the individual level socio-economic characteristics with neonatal mortality in Ondo State. This is a feature that is not uncommon in many populations in subSaharan Africa (Hobcraft et al, 1984; Bicego and Boerma, 1991). It may in part be reflecting the relatively stronger impact of biodemographic and such endogenous factors as obstetrical trauma and low birthweight on neonatal mortality. It may also be that higher levels of socioeconomic attainments are required to make a notable difference to neonatal mortality risks.

Table 4.4a: Neonatal Mortality rates (per 1000) by individual level socio-economic characteristics

Variable	Rate	S.E.	R.R.	P.A.R.
ernal education				
schooling	27.2	4.2	108	5.2
me primary	22.7	4.5	90	n.a.
mplete education	25.3	6.0	100	---
ernal literacy				
literate	27.3	4.0	118	8.4
terate	23.1	3.8	100	---
ernal education				
schooling	22.0	4.5	85	n.a.
me primary	27.8	5.0	107	3.4
mplete primary	26.0	4.8	100	---
ernal literacy				
literate	21.4	4.6	80	n.a.
terate	26.9	3.4	100	---
cussed F.P. with partner ternal autonomy index)				
No	25.5	3.3	104	2.8
Yes	24.6	5.1	100	---
her's attitude to F.P. ia campaign (modernity ex)				
Negative	33.9	8.3	142	5.9
Positive	23.8	2.9	100	---
ernal work status				
t working	25.9	4.8	104	1.3
rrently working	24.9	3.3	100	---
ernal occupation				
ming/unemployed	27.0	4.1	111	7.6
es/services	23.3	4.4	96	n.a.
ite-collar'	24.3	6.7	100	---
riage type				
lygynous	25.5	4.2	102	0.9
nogamous	25.0	3.6	100	---
ital stability				
ce divorced	31.7	8.6	130	3.8
ver divorced	24.3	2.9	100	---

s: S.E.-standard error; R.R.- relative risk; P.A.R.- population ttributable risk; n.a.- not applicable; F.P.- family planning; .A.R.=P(R.R.-1)/1+P(R.R.-1) provided R.R. ge 1, here P = proportion of the population 'exposed' to the risk factor.

e 4.4b: Person-time-units of exposure for the neonatal rates in Table 4.4a

able	Exposures	Variable	Exposures
rnal education		**Attitude to F.P. media**	
schooling	1437	Negative	1443
e primary	1080	Positive	1732
plete primary	658		
rnal literacy		**Maternal work status**	
iterate	1610	Not working	1056
erate	1565	Currently working	2119
rnal education		**Paternal occupation**	
schooling	1070	Farming/unemployed	1519
e primary	1053	Sales/services	1134
plete primary	1052	'White-collar'	522
rnal literacy		**Discussed F.P. with partner**	
iterate	960	No	919
erate	2215	Yes	2256
tal stability		**Marriage type**	
ce divorced	398	Polygynous	1379
ver divorced	2777	Monogamous	1797

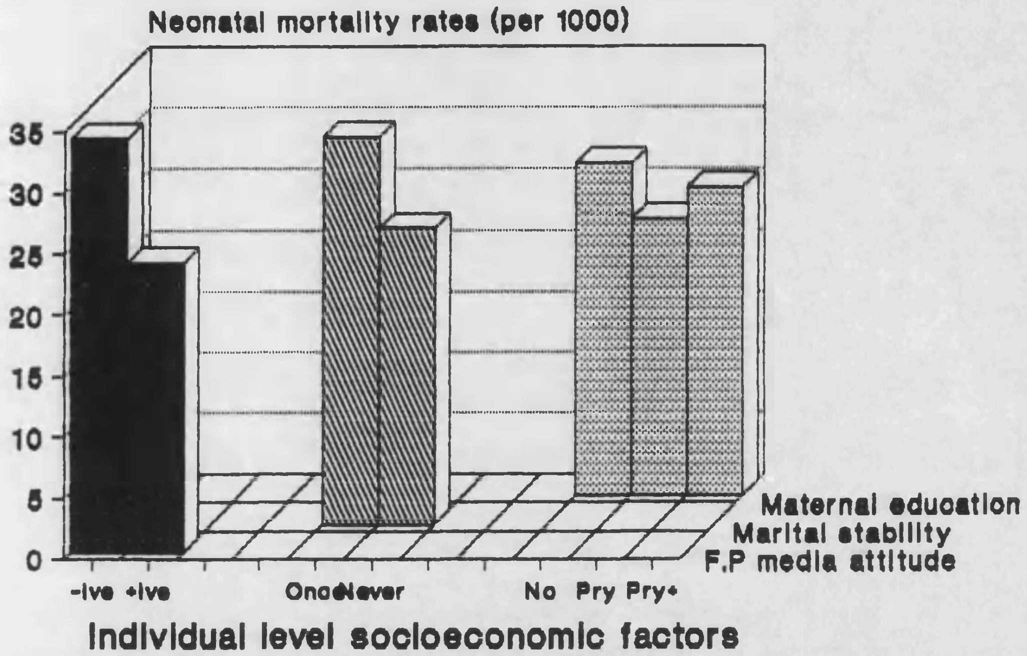
s: Each neonatal death is assumed to have contributed 0.4 unit of exposure given the concentration of these deaths in the first half of the month.

The parental education and literacy variables do not show a consistent negative association with neonatal mortality; hence the implied relative risks are either weak - less than 120 - or contrary to expectation - 80/90 -, and the associated hypothetical impact of such risks at the population level are weaker still, measuring less than 10 percent. But for variables indicative of female status and modernity, lower neonatal mortality risks are consistently associated with higher social status of mothers. In particular, women who are unfavourably disposed to family planning media campaigns show a neonatal mortality risk that is 42 percent more than that for women who are not.

Both woman's current work status and husband's occupation show weak associations with neonatal mortality. The pattern of lower neonatal mortality for the 'sales and services' group than for the 'white-collar' group may be indicative of weak income compositional differences. With the marriage factors, marital instabilty (R.R. of 130) rather polygyny (R.R. of 102), seems to be associated with higher risk of neonatal mortality in Ondo State.

Considering the relative risks (of at least 115-120), population attributable risks (about 10 percent or higher) and theoretical significance, few of the individual socioeconomic variables deserve further consideration as potentially important ultimate predictors of neonatal mortality in Ondo State. These are the variables on attitude towards family planning media campaign (individual modernity index), marital stability, mother's education and perhaps husband's occupation. Differentials according to the first three factors are illustrated in Figure 4.1.

Figure 4.1: Neonatal mortality rates by key individual level socioecon. factors



(ii) Household and community level socioeconomic differentials:
Table 4.5a presents neonatal mortality rates according to household and community level socioeconomic factors. Table 4.5b shows the distribution of the person-time-units of exposure associated with the rates.

Table 4.5a: Neonatal mortality rates (per 1000) by household and community level socioeconomic characteristics

iable	Rate	S.E.	R.R.	P.A.R.
ehold disposable income us index				
Low	24.7	5.1	78	n.a.
Medium	22.2	3.8	70	n.a.
High	31.7	6.2	100	---
ehold non-disposable ne status index				
Low	20.8	2.9	54	n.a.
Medium/high	38.8	6.8	100	---
l area non-health astructural development				
Below average	33.7	4.7	183	27.2
Average and above	18.4	3.1	100	---
ent residential milieu				
Rural/riverine	26.5	3.7	113	7.0
Urban	23.5	4.1	100	---
er's childhood milieu				
ural/riverine	26.9	4.0	114	6.4
rban	23.6	3.7	100	---

As with many of the individual level variables, the two household economic or income status indicators show implausible patterns of association with neonatal mortality. Part of the explanation lies in greater underreporting of neonatal deaths among lower status groups. But as argued earlier, the implied extent of such selective non-reporting seems to be too high to be entirely true given the internal consistency of most aspects of the dataset. It may be that in the study setting, the covariation of neonatal mortality risks with household economic status is weak. In other words, the pattern of lower mortality in households with fewer assets may at least be partly reflecting the probably weak role of household economic status as a determinant of mortality in the first month of life.

e 4.5b: Person-time-units of exposure for the neonatal rates in Table 4.5a

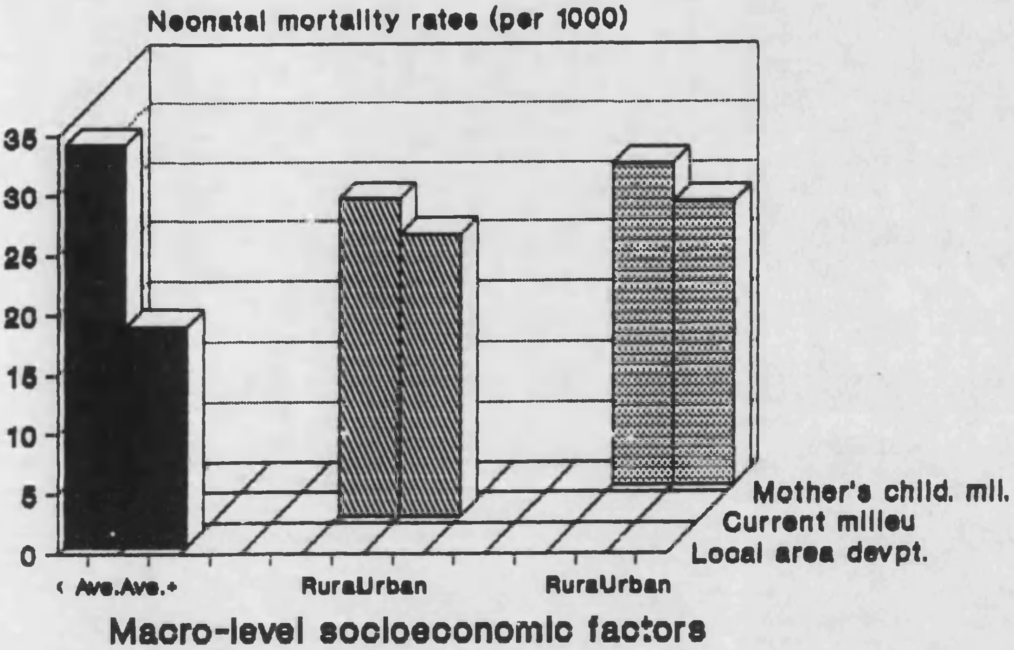
able	Exposures	Variable	Exposures
ehold disposable me status index		**Household non-disposable income status index**	
ow	909	Low	2394
edium	1501	Medium/high	781
igh	765		
ent residential milieu		**Non-health infrastructural development index**	
ral/riverine	1845	Below average	1409
ban	1330	Average and above	1766
er's childhood milieu			
ral/riverine	1565		
ban	1610		

s: As in Table 4.4b.

However, residence in urban areas and in economically more modernized local areas are associated with much lower mortality. But it is noteworthy that the strength of covariation of the local area infrastructural development index with neonatal mortality and the implied population attributable risks (27.2) is more than thrice those of the two residential milieu variables.

Going by the earlier stated criteria, the only macro level socio-economic factor worthy of further examination as a probably important ultimate predictor of neonatal mortality risks in Ondo State is the non-health infrastructural development index. But its strong association with the residential milieu variables means the latter also have to be considered. The neonatal mortality differentials according to these three variables are graphed in Figure 4.2.

Figure 4.2: Neonatal mortality rates by key macro-level socioeconomic factors



(b) Post-neonatal Mortality

(i) Individual level socioeconomic differentials: In Table 4.6a, mortality rates for the post-neonatal period of life defined as 1-11 months are presented to document individual socioeconomic differences. Rates for the post-neonatal period defined as 1-15 months are presented in Table 4.7a to check for the extent to which differential age misreporting occurred to distort the patterns that emerge from the conventionally defined rates. Tables 4.6b and 4.7b respectively show the person-time-units of exposure associated with the two sets of rates.

able 4.6a: Post-neonatal mortality (1-11 months) rates (per 1000) by individual level socioeconomic characteristics.

Variable	Rate	S.E.	R.R.	P.A.R.
ernal education				
schooling	27.1	4.4	56	n.a.
ne primary	34.6	5.8	71	n.a.
nplete primary	48.8	9.0	100	---
ernal literacy				
literate	28.4	4.3	65	n.a.
terate	44.0	5.8	100	---
ernal education				
schooling	23.1	4.8	56	n.a.
ne primary	38.6	6.2	94	n.a.
nplete primary	41.0	6.5	100	---
ernal literacy				
literate	26.9	5.4	72	n.a.
terate	37.2	4.2	100	---
cussed F.P. with partner ternal autonomy index)				
No	35.0	4.1	111	7.2
Yes	31.6	6.1	100	---
her's attitude to F.P. ia campaigns (modernity ex)				
egative	26.6	7.9	76	n.a.
ositive	35.2	3.7	100	---
ernal work status				
ot working	33.8	5.9	99	n.a.
urrently working	34.0	4.1	100	---
ernal occupation				
rming/unemployed	32.7	4.7	75	n.a.
les and services	31.6	5.4	73	n.a.
hite-collar'	43.4	9.5	100	---
riage type				
lygynous	38.4	5.3	125	10.1
nogamous	30.7	4.3	100	---
ital stability				
ce divorced	52.3	11.7	166	7.9
ver divorced	31.5	3.5	100	---

ble 4.6b: Person-time-units of exposure for the rates in Table 4.6a

riable	Exposures	Variable	Exposures
ternal education		**Mother's attitude to F.P. media**	
o schooling	1278	Negative	400
ome primary	950	Positive	2381
omplete primary	553		
		Paternal education	
ternal literacy		No schooling	959
lliterate	1495	Some primary	920
iterate	1286	Complete primary	902
ternal literacy		**Maternal work status**	
lliterate	861	Not working	899
iterate	1920	Currently working	1883
ternal occupation		**Discussed F.P. with partner**	
arming/unemployed	1339	No	1979
ales/services	987	Yes	802
White-collar'	455		
		Marriage type	
rital stability		Polygynous	1226
Once divorced	349	Monogamous	1555
Never divorced	2432		

te: The exposure of each child is defined as the number of months it lives in the interval divided by the length of the interval (11 months).

The four parental education/literacy variables as with neonatal mortality show a positive association with post-neonatal mortality (for the two variants of rates used). This contradiction of the expected pattern is in fact much stronger than was the case with neonatal mortality. While suggestive of major underreporting of post-neonatal deaths by lower status groups, the observations made earlier about other contributing factors to the neonatal mortality irregularities are also relevant here. It should be noted that one would expect more neonatal than post-neonatal deaths to be unreported which is not the case here. This indicates as noted in the last chapter, major flaws in the fieldwork especially in the eliciting of birth history information from lower status respondents. The odd post-neonatal patterns do not however, seem to be due to differential rounding up to age 12 months of infant deaths since both variants of the rate yield similar patterns.

Table 4.7a: Post-neonatal mortality (1-15 months) rates (per 1000) by individual level socioeconomic characteristics

riable	Rate	S.E.	R.R.	P.A.R.
ternal education				
o schooling	36.8	5.2	64	n.a.
ome primary	53.7	7.3	94	n.a.
omplete primary	57.2	9.7	100	---
ternal literacy				
Illiterate	42.4	5.3	83	n.a.
Literate	51.1	6.0	100	---
ternal education				
o schooling	37.0	6.1	72	n.a.
ome primary	52.1	7.3	102	1.0
omplete primary	51.1	7.3	100	---
ternal literacy				
Illiterate	43.6	6.9	91	n.a.
Literate	47.9	4.8	100	---
scussed F.P. with partner				
No	49.3	4.8	123	14.0
Yes	40.1	6.8	100	---
ther's attitude to F.P. dia campaigns				
Negative	32.2	8.7	66	n.a.
Positive	49.0	4.4	100	---
ternal work status				
Not working	45.6	6.9	97	n.a.
Currently working	47.1	4.9	100	---
ternal occupation				
arming/unemployed	46.0	5.7	82	n.a.
ales and services	43.4	6.5	78	n.a.
White-collar'	55.8	10.8	100	---
rriage type				
olygynous	55.6	6.5	141	15.6
onogamous	39.5	4.9	100	---
rital stability				
nce divorced	76.9	14.1	182	9.6
ever divorced	42.2	4.1	100	---

ble 4.7b: Person-time-units of exposure for the rates in Table 4.7a

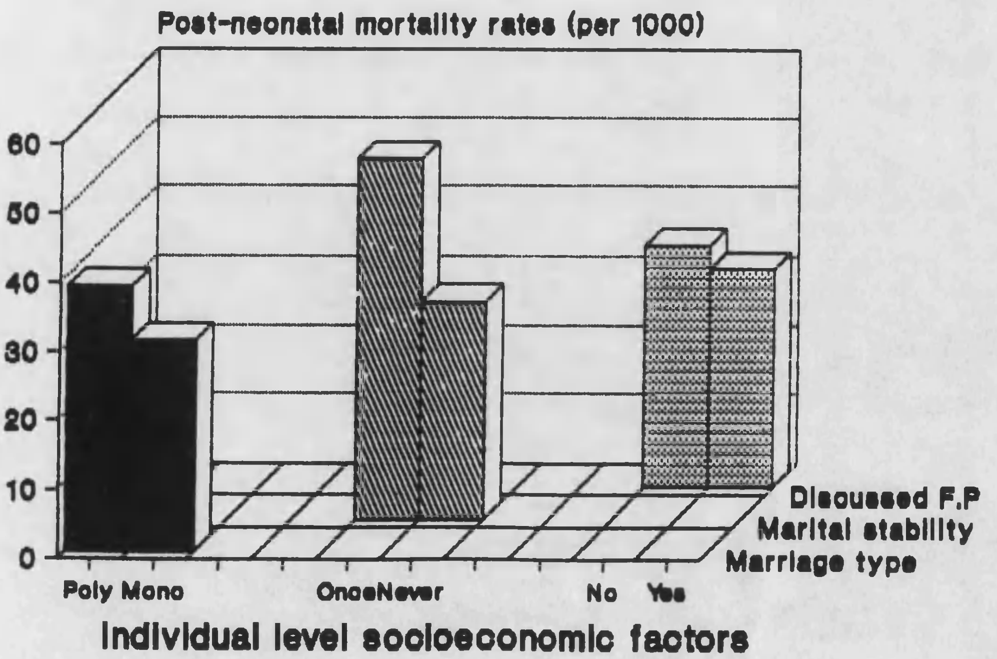
riable	Exposures	Variable	Exposures
ternal education		**Mother's attitude to F.P. media**	
o schooling	1163	Negative	364
ome primary	864	Positive	2167
omplete primary	504		
		Paternal education	
ternal literacy		No schooling	873
lliterate	1360	Some primary	837
iterate	1171	Complete primary	821
ternal literacy		**Maternal work status**	
lliterate	784	Not working	818
iterate	1747	Currently working	1713
ternal occupation		**Marriage type**	
arming/unemployed	1218	Polygynous	1116
ales and services	898	Monogamous	1415
White-collar'	415		
scussed F.P. with partner		**Marital stability**	
No	1800	Once divorced	318
Yes	731	Never divorced	2213

te: The exposure of each child is defined as the number of months it lives in the interval divided by the length of the interval (15 months).

Despite the data problems, one of the family planning variables used to indicate the social status and outlook of women, that is, discussion of family planning with partner in the last 12 months, shows a clear plausible association with post-neonatal mortality on both variants. But the parental occupational/work status variables show weak expected or theoretically implausible patterns of association. For the variables on stability and type of marriage, the indication is that births to women who have been married more than once or women in polygynous unions are more likely to die during the 1-11 (1-15) months of life than births to women in the contrasting groups. Note that including deaths reported as occurring during months 12-15, does not alter the picture of post-neonatal mortality differentials that emerge from the data. The general tendency is for the differentials to increase slightly.

Overall, three variables namely, those on discussion of family planning with partner, marriage type, and marital stability show sufficiently strong covariation with post-neonatal mortality at the univariate level to warrant further examination. Also, to provide some protection against data defects which seem best highlighted by the maternal education variable, this will be included along with the three identified factors in the multivariate analysis. Figure 4.3 graphs the differentials in post-neonatal mortality (1-11 months) according to these three factors.

Figure 4.3: Post-neonatal mortality rate by individual level socioecon. factors



(ii) Differentials according to household and community level socioeconomic factors: In Table 4.8a and Table 4.9a, post-neonatal mortality rates by household and community level socioeconomic factors are presented. The associated person-time-units of exposure are shown respectively in Tables 4.8b and 4.9b.

able 4.8a: Post-neonatal mortality (1-11 months) rates (per 1000) by household and community level socio-economic characteristics

Variable	Rate	S.E.	R.R.	P.A.R.
ousehold disposable income tatus index				
Low	43.3	7.1	227	41.4
Medium	36.2	5.1	190	37.6
High	19.1	5.3	100	---
ousehold non-disposable ncome status index				
Low	34.5	3.9	106	4.3
Medium-to-high	32.5	6.7	100	---
ocal area non-health nfrastructural development				
Below average	46.1	5.9	189	28.6
Average and above	24.4	3.8	100	---
urrent residential milieu				
Rural/riverine	36.6	4.6	120	10.6
Urban	30.5	4.9	100	---
other's childhood milieu				
Rural/riverine	30.7	4.6	83	n.a.
Urban	37.3	5.0	100	---

able 4.8b: Person-time-units of exposure for the rates in Table 4.8a

ariable	Exposures	Variable	Exposures
ousehold disposable income tatus index		**Household non-disposable income status index**	
Low	784	Low	2098
Medium	1314	Medium/high	683
High	683	**Current residential milieu**	
ocal area non-health nfrastructural development		Rural/riverine	1603
		Urban	1178
Below average	1214	**Mother's childhood milieu**	
Average and above	1567	Rural/riverine	1387
		Urban	1394

otes: As in Table 4.6b.

ble 4.9a: Post-neonatal mortality (1-15 months) rates (per 1000) by household and community level socio-economic characteristics

riable	Rate	S.E.	R.R.	P.A.R.
usehold disposable income atus index				
Low	62.0	8.5	238	43.4
Medium	48.1	5.8	185	36.3
High	26.0	6.2	100	---
usehold non-disposable come status index				
Low	47.6	4.6	108	5.7
Medium-to-high	43.9	7.8	100	---
cal area non-health frastructural development				
Below average	61.0	6.8	172	24.4
Average and above	35.4	4.7	100	---
rrent residential milieu				
Rural/riverine	49.7	5.3	117	9.1
Urban	42.4	6.0	100	---
ther's childhood milieu				
Rural/riverine	44.8	5.6	93	n.a.
Urban	48.4	5.7	100	---

ble 4.9b: Person-time-units of exposure for the rates in Table 4.9a

riable	Exposures	Variable	Exposures
usehold disposable income come status index		**Household non-disposable income status index**	
Low	713	Low	1909
Medium	1196	Medium-to-high	622
High	622		
		Local area non-health infrastructural development	
rrent residential milieu			
Rural/riverine	1459	Below average	1105
Urban	1072	Average and above	1426
ther's childhood milieu			
Rural/riverine	1262		
Urban	1269		

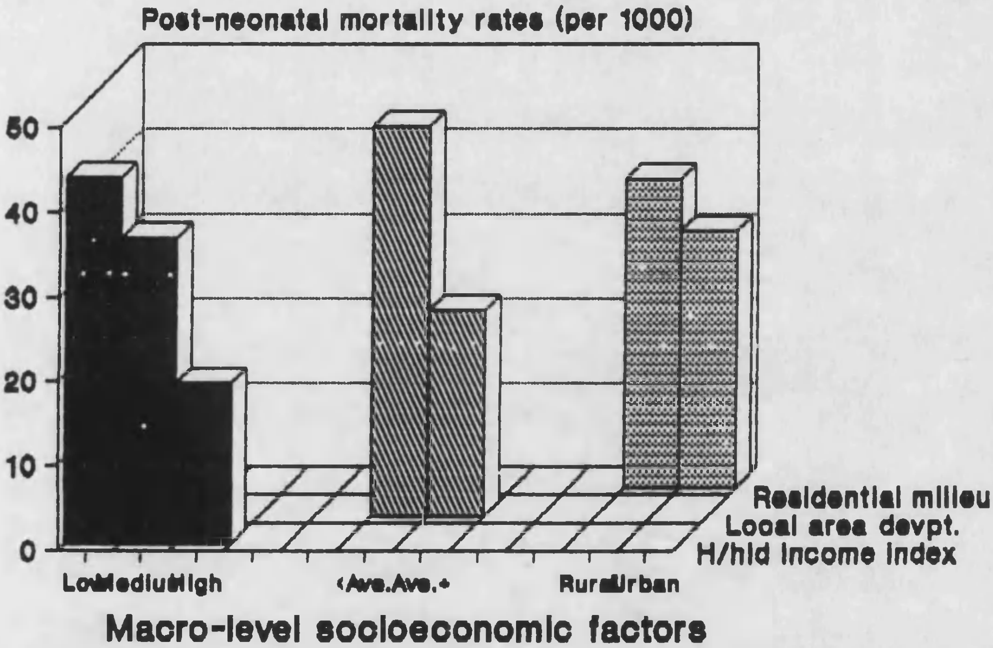
tes: The exposure of each child is defined as the number of months it lives in the interval divided by the length of the interval (15 months).

Apart from the mother's childhood milieu variable which shows little or no differentials, all the household and community level socio-economic variables show expected associations with post-neonatal mortality. For the first time, one of the socio-economic factors, household disposable income status, shows an implied relative risk of above 200. Births born to women belonging to low income status households experience a post-neonatal mortality rate (43.3) that is more than twice that for births to women from high economic status households. It is worth noting that the differentials according to the disposable income index are much stronger than that for the non-disposable income indicator.

Also, the composite local area development measure shows very strong covariation with post-neonatal mortality (implied R.R. of 172 and P.A.R. of 24.4) while the current residential milieu variable produces an expected but weaker differential. A point that emerges by comparing the results for post-neonatal mortality with those for neonatal mortality is that the socio-economic factors (at both the micro and macro levels), in comformity with findings from previous research in developing areas (see for example, Hobcraft et al, 1984; Bicego and Boerma, 1991), show stronger covariation with post-neonatal than neonatal mortality in Ondo State.

On the basis of implied relative risk of about 120 or higher and P.A.R. of at least 10 on both variants of the rate used, three of the macro level socioeconomic variables examined here will be considered further as probable key socioeconomic determinants of post-neonatal mortality in 1981-86 Ondo State. These are the household disposable income status index, local area non-health infrastructural development index, and current residential milieu. The post-neonatal mortality (1-11 months) differentials according to these three variables are illustrated in Figure 4.4.

Figure 4.4: Post-neonatal mortality rate by key macro-level socioecon. factors



(c) <u>Child mortality</u>

(i) Individual level socioeconomic differentials: Child mortality differences in Ondo State on the basis of individual level socioeconomic characteristics are illustrated by the rates presented in Table 4.10a and Table 4.11a. In the former, child mortality rate is defined as the probability of dying between exact ages 1 and 5 (4q1), and in the latter, between exact ages 1 and 4 years (3q1). Tables 4.10b and 4.11b present the relevant person-time-units of exposure associated with the two sets of rates. As indicated in the last chapter, only two deaths were reported as having occurred during the fifth year of life, which with the associated heavier right-censoring in the 4q1 exposure data makes the 3q1 the preferred option for multivariate analysis to engender the derivation of statistically valid results especially as both sets of rates imply virtually the same univariate patterns.

The results indicate that unlike in infancy, the parental educational variables show plausible and relatively strong covariation with child mortality. The exception is the lower rate for births to women with no schooling compared to those with primary schooling (1-6 years). One of the indicators of the modernity and status of women (discussion of family planning with partner) also reveals relatively strong association with child mortality, with births to women of lower status having an excess risk of death in childhood of about 50 percent.

Mother's current work status and husband's occupation show very weak covariation with child mortality. So too, does the marital stability variable. But being born and raised within a polygynous marriage seems to be associated with considerably elevated child mortality risks (R.R. = 171) and has a population attributable risk of about a quarter.

ble 4.10a: Child mortality (exact ages 1-5) rates (per 1000) by individual level socio-economic characteristics

riable	Rate	S.E.	R.R.	P.A.R.
ternal education				
o schooling	46.5	6.6	145	24.5
ome primary	51.3	8.1	160	28.1
omplete primary	32.0	9.0	100	---
ternal literacy				
Illiterate	50.2	6.5	124	11.3
Literate	40.4	6.3	100	---
ternal education				
o schooling	54.2	8.2	163	25.7
ome primary	47.3	7.9	142	18.5
omplete primary	33.2	7.3	100	---
ternal literacy				
Illiterate	58.6	8.9	149	13.6
Literate	39.3	5.2	100	---
scussed F.P. with partner				
aternal autonomy index)				
No	50.4	5.7	149	25.8
Yes	33.9	7.4	100	---
ther's attitude to F.P.				
dia campaign (modernity index)				
Negative	(51.7)	13.4	116	2.0
Positive	44.7	4.8	100	---
ternal work status				
Not working	44.2	7.9	96	n.a.
Currently working	46.1	5.6	100	---
ternal occupation				
Farming/unemployed	49.4	6.7	90	n.a.
Sales and services	35.8	6.7	65	n.a.
'White-collar'	(54.9)	13.1	100	---
rriage type				
Polygynous	59.0	7.6	171	23.8
Monogamous	34.5	5.3	100	---
rital stability				
Once divorced	(51.4)	12.8	115	2.1
Never divorced	44.8	4.9	100	---

(   ) based on less than 300 children.

Overall, mother's schooling, paternal schooling, discussion of family planning with partner, and marriage type, are the individual-level socioeconomic variables that stand out as worthy of further consideration as key ultimate child mortality factors in

Ondo State. Figure 4.5 illustrates the four differentials.

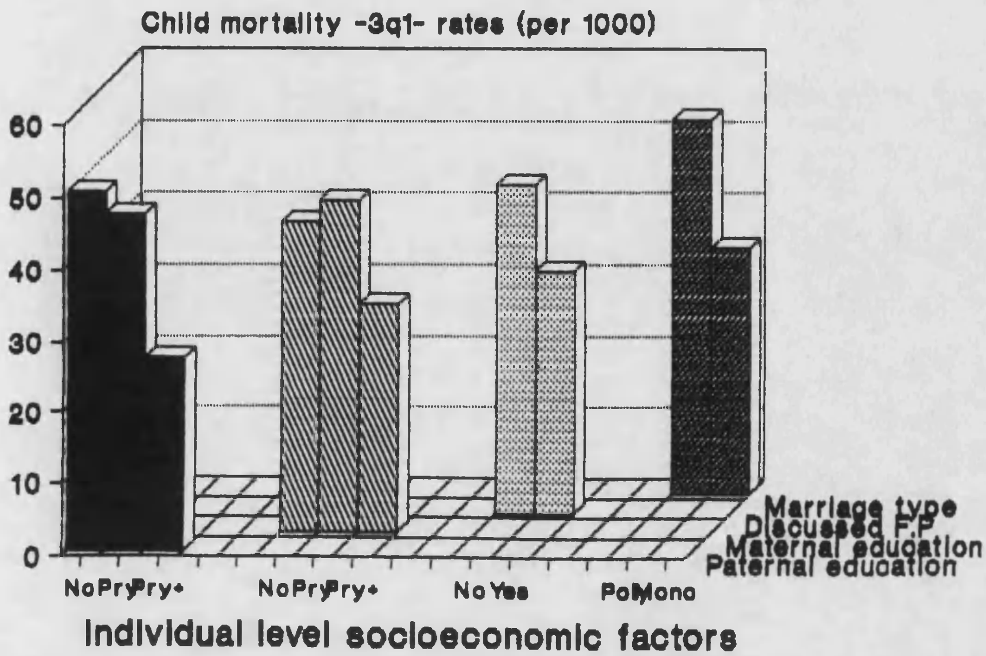
ɔle 4.10b: Person-time-units of exposure for the rates shown in Table 4.10a

:iable	Exposures
:ernal education	
ı schooling	587
ɔme primary	411
ɔmplete primary	212
:ernal education	
ı schooling	448
ɔme primary	396
ɔmplete primary	366
:ernal occupation	
ırming/unemployed	606
ıles/services	410
Vhite-collar'	194
:cussed F.P. with partner	
No	862
Yes	348
:her's attitude to F.P. media ıpaign	
Negative	163
Positive	1047

Variable	Exposures
Maternal literacy	
Illiterate	635
Literate	575
Paternal literacy	
Illiterate	384
Literate	826
Maternal work status	
Not working	361
Currently working	848
Marriage type	
Polygynous	542
Monogamous	668
Marital stability	
Once divorced	156
Never divorced	1054

:es: The exposure of each child is defined as the number of months it lives in the interval divided by the length of the interval (48 months).

Figure 4.5: Child mortality rates by key individual level socioecon. factors



ble 4.11a: Child mortality (exact ages 1-4) rates (per 1000) by individual level socio-economic characteristics

riable	Rate	S.E.	R.R.	P.A.R.
ternal education				
o schooling	43.3	6.5	135	20.4
ome primary	46.5	7.8	145	22.9
omplete primary	32.0	8.7	100	---
ternal literacy				
Illiterate	44.3	6.1	110	5.2
Literate	40.4	6.1	100	---
ternal education				
o schooling	50.2	7.9	184	30.8
ome primary	47.3	7.8	173	26.6
omplete primary	27.3	6.3	100	---
ternal literacy				
Illiterate	54.0	8.6	147	13.1
Literate	36.8	5.0	100	---
scussed F.P. with partner aternal autonomy index)				
No	45.9	5.4	135	20.1
Yes	33.9	7.2	100	---
ther's attitude to F.P. dia campaign (modernity index)				
Negative	(51.7)	13.3	126	3.0
Positive	41.1	4.6	100	---
ternal work status				
Not working	44.2	7.7	106	1.8
Currently working	41.6	5.3	100	---
ternal occupation				
arming/unemployed	46.2	6.5	103	2.3
ales and services	35.8	6.6	80	n.a.
White-collar'	(44.8)	11.6	100	---
rriage type				
Polygynous	52.2	7.2	151	19.0
Monogamous	34.5	5.2	100	---
rital stability				
Once divorced	(51.4)	12.7	125	3.2
Never divorced	41.0	4.7	100	---

ble 4.11b: Person-time-units of exposures for the rates shown in Table 4.11a

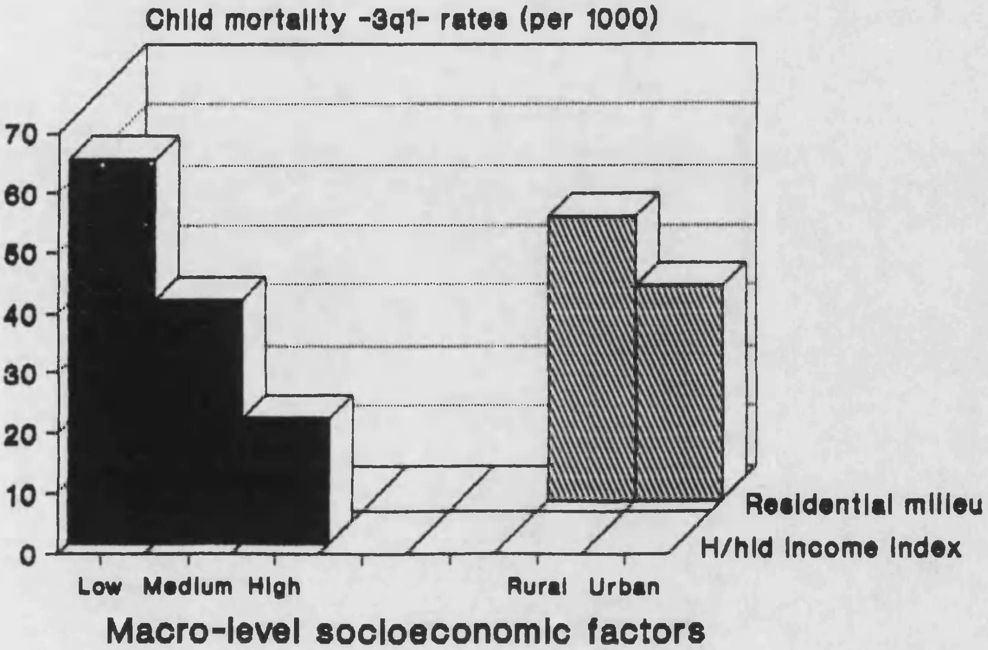
riable	Exposures	Variable	Exposures
ternal education		**Maternal literacy**	
o schooling	733	Illiterate	824
ome primary	514	Literate	689
omplete primary	266	**Paternal literacy**	
ternal education		Illiterate	483
o schooling	557	Literate	1030
ome primary	497	**Maternal work status**	
omplete primary	459	Not working	454
ternal occupation		Currently working	1059
arming/unemployed	756	**Discussed F.P. with partner**	
ales/services	516	No	1075
White-collar'	241	Yes	438
rriage type		**Mother's attitude to F.P. media**	
olygynous	676	Negative	206
onogamous	837	Positive	1307
rital stability			
nce divorced	191		
ever divorced	1322		

tes: The exposure of each child is defined as the number of months it lives in the interval divided by the length of the interval (36 months).

(ii) Differentials according to household and community level socioeconomic variables: Tables 4.12a and 4.13a show the two sets of child mortality rates according to household and community level socioeconomic factors. Tables 4.12b and 4.13b show the person-time-units of exposure associated with the rates. Relatively low mortality in childhood seems to be strongly associated with being born into and raised in a household with relatively high disposable income status. On the other hand, possession of assets such as cars and houses, shows no such association; with a weak child mortality elevating impact being indicated.

It is also noteworthy that the local area development indicator shows no strong covariation with childhood mortality in contrast to the earlier noted increased prominence of the individual level socioeconomic variables as covariates of mortality beyond infancy. But residence in urban areas (which probably reflects not only higher infrastructural development level but also exposure to modern social influences), shows a strong association with lower child mortality, with rural/riverine residence being associated with excess child mortality of about 50 percent. On the basis of our selection criteria, only two macro-level socioeconomic factors seem important enough to deserve further examination as possible key ultimate determinants of child mortality in Ondo State during 1981-86. These are the household disposable income status and current residential milieu. The child mortality (3q1) differentials according to these two factors are illustrated in Figure 4.6.

Figure 4.6: Child mortality rates by key macro-level socioecon. factors



ble 4.12a: Child mortality (exact ages 1-5) rates (per 1000) by household and community level socioeconomic characteristics

riable	Rate	S.E.	R.R.	P.A.R.
usehold disposable income atus index				
Low	75.4	10.9	366	57.1
Medium	40.5	6.0	197	39.0
High	20.6	6.3	100	---
usehold non-disposable income atus index				
Low	42.0	5.1	74	n.a.
Medium-to-high	56.7	9.9	100	---
cal area non-health ıfrastructural development				
Below average	44.7	6.8	96	n.a.
Average and above	46.5	6.2	100	---
ırrent residential milieu				
Rural/riverine	52.4	6.4	148	21.5
Urban	35.5	6.1	100	---
ther's childhood milieu				
Rural/riverine	42.2	6.1	86	n.a.
Urban	49.2	6.8	100	---

ıble 4.12b: Person-time-units of exposure for the rates shown in Table 4.12a

ıriable	Exposures	Variable	Exposures
usehold disposable ıcome status index		**Household non-disposable income status index**	
Low	337	Low	904
Medium	571	Medium-to-high	306
High	302		
		Current residential milieu	
cal area non-health ıfrastructural development		Rural/riverine	716
		Urban	494
Below average	527	**Mother's childhood milieu**	
Average and above	683	Rural/riverine	630
		Urban	580

tes: As in Table 4.10b.

ble 4.13a: Child mortality (exact ages 1-4) rates (per 1000) by household and community level socioeconomic characteristics

riable	Rate	S.E.	R.R.	P.A.R.
usehold disposable income atus index				
Low	63.9	10.1	310	52.7
Medium	40.5	5.9	197	39.0
High	20.6	6.2	100	---
usehold non-disposable come status index				
Low	37.7	4.8	66	n.a.
Medium-to-high	56.7	9.8	100	---
cal area non-health frastructural development				
Below average	40.9	6.5	93	n.a.
Average and above	43.8	6.0	100	---
rrent residential milieu				
Rural/riverine	47.0	6.1	132	15.7
Urban	35.5	5.9	100	---
ther's childhood milieu				
Rural/riverine	42.2	6.0	99	n.a.
Urban	42.6	6.3	100	---

ble 4.13b: Person-time-units of exposures for the rates shown in Table 4.13a

riable	Exposures	Variable	Exposures
usehold disposable income atus index		**Household non-disposable income status index**	
Low	423	Low	1149
Medium	714	Medium/high	364
High	376		
		Mother's childhood milieu	
rrent residential milieu		Rural/riverine	752
Rural/riverine	894	Urban	761
Urban	619	**Local area non-health infrastructural development**	
		Below average	660
		Average and above	853

tes: As in Table 4.11b.

(d) Overview of Infant and Child Mortality univariate socioeconomic differentials: The descriptive results presented thus far, show that the strength of covariation of socio-economic factors with child survival is much bigger after than before the first birthday. Partly as a result of defects, the data showed maternal and paternal schooling to be positively associated with mortality until the post-infancy period. But variables used to measure aspects of female status and exposure to modern social influences, show strong inverse associations with neonatal and post-neonatal mortality. Parental occupational/work status variables appear not to be consistently associated with mortality in infancy whereas marital instability and to some extent polygyny, seem to raise the risks of neonatal and post-neonatal deaths.

For child mortality, many of the individual level socio-economic variables that did not meaningfully discriminate mortality in infancy also did not do well with the notable exception of the two parental schooling variables. The female social status variables continued to show up as probably important ultimate determinants of child survival.

The household and community socioeconomic factors performed differently in infancy and childhood. While the household economic status variables especially the disposable income status indicator did not show a plausible and strong covariation with neonatal mortality, their association with post-neonatal and child mortality are much stronger than the factor of spatial density of non-health infrastructures which revealed the strongest and clearest differentials in neonatal mortality of all the socioeconomic variables examined.

The last point is the first indication that the community development index may be closely associated with the density of health services (considered later) which can be expected to impact upon mortality in infancy, a period in which the major immediate causes of death such as neonatal tetanus and respiratory pathologies require quick and easy access to hospitals and clinics to deal with. On the other hand, if the household disposable income status index is actually tapping income as presumed, then its seemingly greater influence in childhood than infancy is quite plausible. It is likely to be a major factor in the quality of children's nutrient intake and the home hygiene, which if very poor will tend to lead to conditions producing death more gradually than those that result in infant deaths.

Overall therefore, the factors that seem to deserve more attention as socioeconomic determinants of neonatal mortality in Ondo State are mother's exposure to modern influences (measured by attitude towards family planning campaigns) marital stability, and local area economic development level. For post-neonatal mortality, the highlighted factors are female social status (indicated by the variable on the discussion of family planning with partner), marital stability, marriage type, household disposable income status index, current residential milieu, and local area development level. Finally, for child mortality the socioeconomic factors to be considered are - mother's schooling, paternal schooling, discussion of family planning with partner, marriage type, household disposable income status, and residential milieu.

4.5: MULTIVARIATE ANALYSIS

(a) Introduction: The univariate results presented in the foregoing sections indicate that infant and child mortality in Ondo State vary according to certain individual, household and community socioeconomic characteristics. However as Table 4.14 showing the bivariate correlation coefficients for some of the variables selected for further consideration indicate, most of these variables are associated with each other to varying degrees, making it difficult to interpret the observed univariate socioeconomic differentials. Multivariate analysis is therefore necessary to estimate the independent effects of each of the variables net of the others. This is done using log-linear Poisson regression.

ble 4.14: Zero-order correlations between some selected individual-level, usehold-level and community-level socioeconomic characteristics: Births in the preceding five years to the 1986 ODHS

riable	MEDU	HEDU	DSCFP	HOCC	POLY	HINC	LOCAL	MILIE
EDU	1.00	.55**	.36**	.45**	.18**	.30**	.09**	.22**
EDU		1.00	.32**	.59**	.21**	.33**	.07	.23**
SCFP			1.00	.29**	.08*	.27**	.17**	.21**
OCC				1.00	.18**	.35**	.15**	.35**
OLY					1.00	.12*	.12*	.11*
INC						1.00	.20**	.45**
OCAL							1.00	.24**
ILIE								1.00

Notes: ** denotes P <.01; * denotes P <.05; MEDU-maternal education HEDU-paternal education; DSCFP-discussion of F.P. with partner; POLY-marriage type; HINC-household disposable income status; LOCAL-local area infrastructural development index; MILIE-current residential milieu. The variables were treated as continuous for purposes of calculating correlations.

(b) The Statistical Model: The unit of analysis is the individual child and the dependent variable is a dichotomy denoting whether or not the child survived through the age interval (month 0, months 1-11, or months 12-47) in question. We have adopted this approach in preference to the alternative of including all age intervals in the analysis with age treated as one of the independent variables. This is because one of our main substantive interests is to ascertain clearly the extent to which various determinants of child survival vary in their influence across segments of the first four years of life. And it seems this aim would be better accomplished by treating the neonatal, post-neonatal, and childhood periods separately, since in our view, some of the most informative findings on the age pattern to child survival determinants in developing areas have come from studies that adopted a similar approach (Hobcraft et al, 1984; 1985; Bicego and Boerma, 1991).

The model assumes log-linear effects of the independent variables on the probability of survival and a Poisson error distribution. In doing the actual fitting, counts of deaths rather than the mortality rates for each unique combination of the levels of all independent variables are modelled, taking the counts of exposures as known constants to be adjusted for in deriving expected number of deaths. More formally, the model including the variables examined in this chapter is as follows:

$$\ln E(D_{ijn}) = \ln N_{ijn} + GM + COMM_i + HOULD_j + INDV_n$$

where 'ln' refers to natural logarithm, $E(D_{ijn})$ denotes the mathematical expectation operator, $INDV_n$ denotes effects of n categories of individual level socioeconomic factors, $HOULD_j$ denotes effects of j categories of household level socioeconomic factors, $COMM_i$ denotes effects of i categories of community level socioeconomic factors; D_{ijn} are counts of deaths specific to community, household, and individual characteristics, N_{ijn} are counts of exposure for the same and GM is a grand mean rate. The D_{ijn} (counts of deaths) are assumed to follow a Poisson distribution.

Taking each independent variable's theoretically low-risk level as baseline, parameter estimates and their standard errors are found by maximum likelihood procedures and the exponentiated values of the parameter estimates are then interpreted as estimated relative risks (Statistical and Epidemiology Research Corporation, 1989). The deviance is used as an approximate measure of goodness-of-fit since it closely follows a chi-square distribution with the residual degrees of freedom. In effect, the difference between the deviances of two fitted models is the likelihood ratio statistic and is used to assess the significance of the most recent model extension under the null hypothesis that the coefficients for all parameters generated by the extension terms are simultaneously zero.

Where, as in this study, the sample is not a purely random one and the small number of exposures and deaths quickly results in a great deal of sparseness in multiway tables (of counts of deaths and exposures), the distribution of the deviance may not be well approximated by the chi-square distribution (Hobcraft et al, 1984). Hence, the statistical significance of the fit of various models need not be taken to be more than broadly indicative although it is more likely that in testing for the statistical significance of a model extension, the assumption of the chi-square distribution of the deviance is less strongly violated.

The last point is particularly pertinent to this study because our greater interest is in following the change in the coefficients for the key community and household level socioeconomic variables as the individual-level and the more proximate variables are added into the regression models than in the identification of the most parsimonous model that fits the data.

(c) Inclusion of variables in the models: A very large number of independent variables can be included in the multivariate analysis by creating multiway tables of exposures and deaths based on all variables of interest. Such attempts result very quickly in unstable estimates as a result of very small average exposures per cell. One-variable models for each of the selected variables were thus first fitted to identify those with statistically significant gross effects on the mortality considered. These were then included in the main effects models following the adopted causal order. Next, a systematic examination of all possible additions of single first-order interactions to this model was carried out.

The P-values of the chi-square (X^2) statistics upon which the selection of variables for inclusion in the reduced model is based are shown in Table 4.15. A low P-value indicates a stronger relationship. Using a P-value of .05 as a minimum criterion, it is clear that only one variable - the local area infrastructural development index - has statistically significant gross effects on neonatal mortality, with the individual modernity index (attitude to family planning campaigns) being of fairly notable significance.

Four variables (as highlighted in Table 4.15) have significant effects on post-neonatal mortality and two (marriage type and household disposable income status) on child mortality, so that the general picture that emerges from this screening process is one of very few real socioeconomic determinants of child survival in Ondo State during 1981-86.

However, because we are also interested in observing the impact of some of the theoretically important individual-level variables on one another and how the effects of local area factors change with the inclusion of household and individual factors, six-variable models were fitted with the relevant additions to the variables with statistically significant gross effects being based on the P-values.

ble 4.15: P-values of X^2 statistics for selected socio-economic variables in the one-variable models of neonatal, post-neonatal and child mortality

Variable	Neonatal	Post-neonatal	Child
scussion of family planning th partner	.722	.598	.107
ther's attitude to F.P. campaign	.106	.614	---
rital stability	.317	**.051**	.434
rriage type	---	.137	**.054**
ternal education	.561	**.053**	.346
ternal education	---	---	.101
ternal occupation	.623	---	---
usehold disposable income atus index	---	**.020**	**.007**
cal area non-health frastructural development	**.005**	**.008**	---
rrent residential milieu	.497	.191	.203
ther's childhood milieu	.518	---	---
and mean deviance	977.19	862.09	824.45

(d) Main effects on Neonatal mortality: This section examines the patterns of neonatal mortality according to the six socioeconomic variables included in the sequentially fitted main effects models. The results are presented in Table 4.16.

Table 4.16: Relative risks of neonatal mortality associated with socio-economic variables: results of Poisson regressions

riable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
cal area non-health frastructural devpt.						
elow average	1.85**	1.85**	1.86**	1.86**	1.86**	1.86**
rrent residential lieu						
ural/riverine		1.04	1.02	1.02	1.02	1.01
ther's attitude to P. media campaigns						
egative			1.47	1.46	1.43	1.46
rital stability						
nce divorced				1.28	1.30	1.29
ternal education						
ome primary					0.84	0.82
o schooling					0.99	0.96
ternal occupation						
ales/services						1.04
arming/unemployed						1.08
ange in model X^2	7.81	.053	2.62	.721	.613	.058
-value	.005	.816	.173	.381	.574	.876

Notes: * denotes P <.05; ** denotes P <.01 .

It is clear from the parameter estimates shown above that none of the individual socioeconomic status factors as measured in this study seems to constitute important channels through which the strong association of the local area infrastructural development index with neonatal mortality risks in 1981-86 Ondo State was produced. Mother's exposure to modern social influences (as indicated by her attitude towards family planning media campaigns) while not statistically significant, seems to be the only individual level socioeconomic factor independently measurably associated with neonatal mortality in the Ondo context. Broadly speaking, being born to a 'modern' woman appears to confer a 50 percent neonatal mortality advantage relative to being born to a 'traditional' mother, notwithstanding the local area or residential milieu.

It is worth noting that the inclusion of the maternal education variable does nothing to alter the inferences drawn here. The main conclusion at this juncture must be that children born in the more developed local areas of Ondo State enjoy on average, a notable survival advantage (about 90 percent) over children born to women in other areas irrespective of their residence in towns or villages and their household socioeconomic context.

(e) <u>Interaction effects on Neonatal mortality:</u> The results of the statistical testing for all the possible single first-order interactions term extensions of the six-variable main effects model on neonatal mortality are summarized in Table 4.17. We note here that for reasons of sample size, the variables with three levels were dichotomized. But as the P-values demonstrate, the extension of the main effects model by single first-order interaction terms turned out to be almost wholly unfruitful, underlining the problems of small sample size and few socioeconomic factors with strong effects on neonatal mortality in Ondo State. Moreover, our examination of the parameter estimates generated by the interaction terms revealed virtually no interpretable patterns.

ble 4.17: P-values of X^2 statistics for interaction term extensions to the six-variable (socio-economic) main effects model : neonatal mortality

teraction	P-value
cal area non-health frastructural devpt. with	
urrent residential milieu	.318
other's attitude to F.P. edia campaigns	.207
arital stability	.179
aternal education	.067
aternal occupation	.118
rrent residential milieu	
other's attitude to F.P. edia campaigns	.270
arital stability	.825
aternal education	.424
aternal occupation	.722

Interaction	P-value
Mother's attitude to F.P. media campaigns with	
Marital stability	.353
Maternal education	.102
Paternal occupation	.239
Marital stability with	
Maternal education	.314
Paternal occupation	.877
Maternal education with	
Paternal occupation	.411

Overview: Overall, it seems that in Ondo State during 1981-86, local area development and individual modernity were the two socioeconomic status factors most strongly associated with lower neonatal mortality risks. Our task later in this study is to show the main mechanisms through which these two factors acted to produced their estimated effects on neonatal survival.

(f) Main effects on Post-neonatal mortality: Table 4.18 shows the Poisson regression estimates of relative risks of post-neonatal mortality according to the six selected socio-economic variables sequentially entered into the main effects models.

Table 4.18: Relative risks of Post-neonatal mortality associated with socio-economic variables: results of Poisson regressions

riable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
cal area non-health frastructural devpt.						
elow average	1.91**	1.92**	1.82**	1.81**	1.76**	1.74**
rrent residential lieu						
ural/riverine		1.17	0.95	0.94	1.04	1.04
usehold disposable come status index						
edium			1.81*	1.76*	2.09**	2.07**
ow			2.23**	2.18**	2.74**	2.72**
rital stability						
nce divorced				1.58	1.51	1.55
ternal education						
ome primary					0.58**	0.57**
o schooling					0.53**	0.51**
rriage type						
olygynous						1.20
hange in model X^2	10.82	.642	5.86	2.92	9.98	.837
-value	.001	.464	.049	.143	.009	.496

otes: * denotes P <.05; ** denotes P <.01

Three socio-economic variables, one at each level (community, household, and individual) are shown to be significantly associated with post-neonatal mortality in Ondo State. These are the local area infrastructural development level, household disposable income status, and maternal education. The statistically significant but rather odd inverse association of maternal education with post-neonatal mortality risks is indicative of unusually high levels of underreporting of late infancy deaths by women of lower educational status. Therefore as some form of protection against these defects, the maternal education variable has to be included in the integrated modelling of observed post-neonatal mortality patterns.

It is nevertheless clear from the results that the huge elevating effect on post-neonatal mortality of residence in infrastructurally poorly developed local areas is only reduced by about 11 percent when account is taken of the greater concentration of relatively poor families in such areas. But the household income status index turns out to be more strongly predictive of post-neonatal mortality in Ondo State than the local development level index. Residence in the poorest households is shown to be associated with almost 300 percent excess mortality net of the effects associated with the five other socioeconomic status variables.

(g) Interaction effects on Post-neonatal mortality: The results of the statistical testing for the significance of all the single first-order interactions terms added to the six-variable (socio-economic) main effects model of post-neonatal mortality are summarized in Table 4.19.

Again, the extensions to the main effects socioeconmic model for post-neonatal mortality produced no statistically significant or clearly interpretable interaction effects. The only somewhat meaningful pattern is that of the elevated risk (R.R. = 1.96) for children born in low income status households and located in areas of below average infrastructural development level (P = .109).

ble 4.19: P-values of X^2 statistics for interaction term extensions to the six-variable (socioeconomic) main effects model: Post-neonatal mortality

teraction	P-value	Interaction	P-value
cal area non-health frastructural devpt. with		**Household disposable income status index with**	
urrent residential ilieu	.124	Marital stability	.964
ousehold disposable ncome status index	.109	Maternal education	.231
		Marriage type	.497
arital stability	.829	**Marital stability with**	
aternal education	.276	Maternal education	.738
arriage type	.354	Marriage type	.206
rrent residential milieu			
ousehold disposable ncome status index	.135		
arital stability	.889		
aternal education	.341		
arriage type	.931		

Overview: In sum, the multivariate results discussed in the foregoing section suggest that post-neonatal mortality patterns in 1981-86 Ondo State were in terms of socioeconomic factors mainly shaped by household income status and local area development level.

(g) Main effects on Child mortality: Table 4.20 shows the Poisson regression estimates of relative risks of child mortality (that is mortality between exact ages 1 and 4) according to the six socioeconomic factors sequentially included in main effects models.

ble 4.20: Relative risks of child mortality associated with socioeconomic variables : results of Poisson regressions

riable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
rrent residential milieu						
ural/riverine	1.29	0.95	0.88	0.87	0.86	0.87
usehold disposable come status index						
edium		2.09**	2.02**	1.98**	1.93*	2.01*
ow		3.15**	2.99**	2.90**	2.97**	3.06**
rriage type						
olygynous			1.44	1.42	1.42	1.44
scussion of F.P. with rtner						
No				1.20	1.24	1.25
ternal education						
ome primary					1.55	1.54
o schooling					1.46	1.45
ternal education						
ome primary						0.94
o schooling						0.79
hange in model X^2	1.01	9.93	2.65	.566	1.72	1.45
-value	.245	.007	.101	.435	.284	.381

Note: * denotes P < .05; ** denotes P <.01 .

The figures do not indicate any of the familial social status variables to be of very notable or statistically significant effects in co-varying with child mortality. However, in terms of the magnitude of their estimated effects, paternal education seems to be the strongest child mortality co-variate among the familial social variables, with children of less educated men experiencing mortality risks that are about 45-55 percent higher than that for children of men with at least complete primary education. Maternal education's gross effects on child mortality seem to be entirely due to its correlation with the other socioeconomic variables.

But the most notable pattern that emerges from Table 4.20 relates to the economic circumstances of the household within which children are raised. The clear indication is that children of women belonging to the lowest income status households are about thrice as likely to die between their first and fourth birthday as those residing in homes of high income status regardless of their mother's social outlook and current residential milieu.

ble 4.21: P-values of X^2 statistics for interaction term extensions to the six-variable (socioeconomic) main effects model: Child mortality

teraction	P-value	Interaction	P-value
rrent residential milieu with		**Marriage type with**	
ousehold disposable ncome status index	.118	Discussion of F.P. with partner	.265
arriage type	.503	Paternal education	.167
iscussion of F.P.	.213	Maternal education	.177
aternal education	.370	**Discussion of F.P. with partner with**	
aternal education	.299	Paternal education	.282
usehold disposable come status index with		Maternal education	.453
arriage type	.728		
iscussion of F.P.	.665	**Paternal education with**	
		Maternal education	.461
aternal education	.361		
aternal education	.454		

(h) <u>Interaction effects on child mortality:</u> Table 4.21 shows a summary of the results of the statistical testing for significance of all possible single first-order interaction terms added to the main effects model for child mortality. Since no significant effects emerged, the apparent indication is that the significant huge effects obtained for the household disposable income status factor do hold irrespective of its interactions with the other socioeconomic factors and the interactions between the latter.

Overview: The preceding analysis indicates that for child mortality, the key socioeconomic determinant is the household income or economic status, with paternal education appearing to be of some supplementary importance. The integrated analysis will seek to explain how both factors acted to shape child mortality outcomes in 1981-86 Ondo State. It is noted here that the analysis thus far, suggests that the 1986 ODHS truncated birth history data cannot be feasibly used to model child survival patterns that incorporate interactions between the predictor variables. The remainder of the study thus discusses only results from the main effects models.

4.6: SUMMARY

This chapter described the study's analytical approach and the socioeconomic variables examined for child survival effects. The data analysis revealed the existence of few notable socio-economic differentials confirming for neonatal mortality, woman's modernity and local area infrastructural development as the key socioeconomic determinants; for post-neonatal mortality, household income status and local area development; and for child mortality, household income status and paternal education.

REFERENCES

Barbieri, M. (1991) The socio-economic and cultural context of infant and child mortality in subSaharan Africa. Paper presented at the Demographic and Health Surveys World Conference, August 5-7, (Washington, D.C.).

Bicego, G. and J. Boerma (1991) Maternal education and child survival: a comparative analysis of DHS data. Paper presented at the Demographic and Health Surveys World Conference, August 5-7, (Washington, D.C).

Bilsborrow, R. E. (1985) Collecting community-level data for fertility analysis. In Casterline, J. B. ed., The Collection and Analysis of Community Data (Voorburg, Netherlands: International Statistical Institute): 255-268.

Blalock, H. M. (1985) Cross-level analyses. In Casterline, J. ed. op. cit. : 187-205.

Caldwell, J. C. (1979) Education as a factor in mortality decline: an examination of Nigerian data. Population Studies 33(3): 395-413.

Casterline, J. B. (1987) The collection and analysis of community data. In Cleland, J. and C. Scott eds., The World Fertility Survey: An Assessment (Oxford: Oxford University Press): 882-905.

________________ ed. (1985) The Collection and Analysis of Community Data (Voorburg, Netherlands: International Statistical Institute).

Hobcraft, J., J. W. McDonald and S. Rutstein (1984) Socioeconomic factors in infant and child mortality: a crossnational comparison. Population Studies 38(2): 193-223.

____ (1985) Demographic determinants of infant and child mortality: a comparative analysis. Population Studies 39(3): 363-385.

Idachaba, F. S. (1985) Rural Infrastructures in Nigeria (Ibadan: Ibadan University Press).

Ondo State Ministry of Health and IRD/Macro Systems, Inc. (1989) 1986 Ondo State Demographic and Health Survey (Akure: Ministry of Health and IRD/Macro Systems, Inc., Maryland).

Pullum, T. (1991) Community level data collection and analysis. Demographic and Health Surveys World Conference Proceedings Volume II (Columbia, Maryland: IRD/Macro Inc.): 807-826.

Statistical and Epidemiology Research Corporation (1989) EGRET Reference Manual (Seattle, Washington: SERC).

Sulaiman, I. L. (1987) Mother's income and child mortality in Southern Nigeria. African Demography Working Paper 15, (Population Studies Center, University of Pennsylvania).

United Nations (1985) Socioeconomic Differentials in Child Mortality in Developing Countries (New York: Department of Social and Economic Affairs- ST/ESA/SER.A/97).

CHAPTER FIVE

BIODEMOGRAPHIC, MICRO-ENVIRONMENTAL AND CHILD HEALTH SERVICES AND CARE DIFFERENTIALS IN INFANT AND CHILD MORTALITY

5.1: INTRODUCTION

This chapter examines variations in child survival in 1981-86 Ondo State according to three sets of proximate factors. First, mortality differences by sex of child, birth order, length of preceding and of subsequent birth interval, maternal age, birth type, number of other births in the last five years, and mother's average inter-birth interval length are analysed. Second, the co-variation of environmental factors (listed below), and third, of health services accessibility, preventive child care and infant feeding factors with child survival are examined. The overall aim here is to identify the key proximate factors whose effects would be taken into account in trying to show the pathways through which the main socio-economic factors impacted upon child survival.

5.2: THE VARIABLES

1a. **<u>Biodemographic factors:</u>** The construction of the relevant variables here is outlined below:

Sex of child: This naturally splits the sample into two with females as the reference group given that female children experience lower mortality than males especially in infancy.

Birth order: This variable groups the sample into three: first births, births of orders 2-5, and births of order six and above.

Length of the preceding birth interval: Due to the relatively long durations of breastfeeding and post-partum sexual abstinence among Ondo State women (averaging 18 and 23 months respectively) and the associated lengthening of birth intervals, three levels for this variable were created: first births, < 24 months, and 24+ months.

Length of the subsequent birth interval: This variable also has three levels:- < 24 months, 24+ months, and last births.

Average inter-birth interval: This is based on the information on the total number of children ever-born by the respondent prior to the index child, her age at first birth and at the birth of the child preceding the index child. It has three levels as in the preceding birth interval length variable.

Other births in the last five years: This variable splits the births according to whether or not their mothers had other birth(s) in the five years preceding the survey.

Maternal age: This has three levels:- < 20 years, 20-34, and 35+.

Birth type: This has two levels:- single versus multiple births. Despite the higher likelihood of death clustering within families, multiple births were retained in the analysis due to their very high mortality so as to enhance the number of deaths.

1b: Distribution of the sample by biodemographic variables: Table 5.1 shows how the births are distributed according to the variables listed above.

Table 5.1: Distribution of births by biodemographic variables

Variable	Number	Percentage
Sex of child		
Female	1582	48.7
Male	1667	51.3
Birth order		
First	505	15.5
2-5	1669	51.4
6+	1075	33.1
Length of preceding interval		
First births	516	15.9
< 24 months	488	15.0
24+	2245	69.1
Length of subsequent interval		
Last births	2147	66.1
< 24 months	282	8.7
24+	820	25.2
Average inter-birth interval		
First births	516	15.9
< 24 months	1625	50.0
24+	1108	34.1
Other births in last 5 years		
Yes	2108	64.9
No	1141	35.1
Maternal age		
< 20 years	238	7.3
20-34	2239	68.9
35+	772	23.8
Birth type		
Multiple	128	3.9
Single	3121	96.1
Total	3249	100.0

2a: Micro-environmental variables: Included here are the variables used to measure children's potential level of exposure to environmental contamination and the ease of disease transmission within the household. Their construction is outlined below.

Household toilet type: This may be used to indicate the risk of exposure to fecal contamination which is strongly related to the risk of potentially fatal diarrheal diseases (Mosley and Chen, 1984; Black, 1984). The births are classified into a low-risk group if belonging to households with flush or pit toilets and a high-risk group if residing in households without a latrine.

Age children use toilet: This groups the births according to whether or not children aged below five years in a household are reported as being able to use the same toilet facilities as older children and adults. This is because children in households with toilet facilities may be as exposed to fecal matter as those in households without such facilities if they have no access to them (Frank and Dakuyo, 1985).

Household drinking water source: This variable is used to indicate the relative risk of exposure to water-borne pathogens. The low-risk group ('pipe-borne' water) comprises births in households that get their drinking water from indoor or outdoor taps. The high-risk group consists of children in homes that get their drinking water from sources such as wells, ponds and rains.

Household non-drinking water source: This has two levels similar to those of the drinking water variable and may be related to the ease with which general personal and home hygiene can be practised.

Local area per capita pipe-water supply: This three-level variable was constructed on the premise that households in communities with more piped water supplies will find it easier to practice adequate personal/domestic hygiene than those in poorly served areas.

Soap in household: This dichotomous variable is used to indicate the likelihood of proper hand-washing and bathing and hence the level of potential exposure to intestinal and skin parasites.

Floor material of residence: This seeks to measure the level of children's exposure to skin and other infestations spread by soil. The low-risk group comprises children living in shelters with non-soil and non-plank surfaces.

Number of persons in household: Taking into account the initial distribution of persons per household and the fertility level in Ondo State, this variable was constructed to have two categories: one, comprising children in households with seven or fewer residents and the other, those in households with eight or more residents. It is intended to tap the risk of contact-acquired respiratory infections in the absence of information on number of persons per room which may be a better indicator.

2b: Distribution of the sample by micro-environmental variables:

Table 5.2 shows how the births studied are distributed according to the eight environmental characteristics discussed above.

Table 5.2: Sample distribution according to environmental variables

Variable	Number	Percentage
Household toilet type		
Others	1570	48.3
Flush/pit	1679	51.7
Age children use toilets		
No conventional toilets	1569	48.3
> 5 years	1232	37.9
< 5 years	448	13.8
Household's drinking water		
Non-pipe source	1723	53.0
Pipe-borne	1526	47.0
Household's non-drink water		
Non-pipe source	1790	55.1
Pipe-borne	1459	44.9
Local area per capita water supply		
Zero	1332	41.0
< 10 litre/day	695	21.4
10+ litre/day	1222	37.6
Soap on premises		
No	306	9.4
Yes	2943	90.6
Floor material of home		
Plank/soil	955	29.4
Cement/terrazo	2294	70.6
No. of persons in household		
8+	1368	42.1
Le 7	1881	57.9
Total	3249	100.0

3a: Health services accessibility, preventive child health care and infant feeding variables: The variables in this category examined in this study are outlined below:

Breastfeeding duration: The association of breastfeeding duration with child survival is only considered for mortality during ages 1-4 because of the relatively long average duration in the study population (18 months) such that virtually all the 180 children who died in the first year of life (92%) were breastfed for as long as they lived. The variable has two categories - one (the 'low risk group') consists of births breastfed for at least one year, and the other, births breastfed for less than a year - excluding children breastfed for as long as they lived.

Age at supplementation: This variable is also considered in relation to child mortality only and has three levels. The first consists mainly of children who first received solid or liquid foods at age two months and over (and the few cases recorded as never having received their first supplements as at survey day). The second group comprises those who first received supplements in the second month of life, and the third group, those who received theirs in the first month of life. All children were reported as having started to receive drinking water by the third week of life and by the fourth month almost all had started receiving solid foods in addition to breastmilk.

Tetanus toxoid vaccination: This variable splits the sample according to whether or not the respondent reported receiving a tetanus toxoid vaccination when pregnant with the index child.

Modern prenatal care: This groups the sample according to whether when pregnant with the index child prenatal care was received from a trained health worker (that is a doctor, midwife or nurse) or from an untrained person (that is traditional birth attendants - TBAs, friends or relatives). The inclusion of those who saw TBAs in the latter group may have led to an undercount of women who received modern prenatal care since some of the TBAs may have received some formal training as part of the primary health care programme in Nigeria (see Iyun, 1989 for an example).

Assistance at delivery: This has two categories: the 'low-risk' group consists of births whose delivery was assisted by a trained health worker, and the high-risk group consists of those whose delivery was assisted by an untrained person.

Knowledge of sugar-salt-solution: This variable is intended to measure the respondent's awareness of basic child illness management methods. It divides the sample according to whether or not their mothers reported knowing sugar-salt-solutions as a remedy for diarrhoea, a common life-threatening ailment that afflicts young children in the developing world.

Maternal health services spatial density: This composite measure is based on data from the rural infrastructures survey discussed in Chapter Four and relates to the average walking distance to a maternity centre (MC) and the estimated number of women aged 15-49 years per trained midwife. The index has three levels: <u>Below average</u>, comprises births in LGAs with an average distance to an MC of more than seven kilometres and an estimated number of women per trained midwife of more than 10,000; <u>average</u>, consists of births in LGAs with average distance to an MC of 4.5 to 7.0 kilometres and an estimated number of women per midwife of less than 10,000; and <u>above average</u>, groups births in LGAs with an average distance to an MC of less than 4.5 kilometres and an estimated number of women (15-49) per trained midwife of less than 7,000.

General health services spatial density index: This is based on the preceding variable and the preliminary measures of average distance to a dispensary (that is, whether > 6.5km, 4-6.5 or < 4) and to a hospital (that is, whether > 30km, 11-30 or < 11) per LGA. It has three categories: <u>Below average</u>, comprising births in LGAs that scored poor on two or all three indices; <u>average</u>, which includes all births in LGAs that scored average on two and poor on one of the three indices; and <u>above average</u>, which groups all births that scored at least average on the three indices. This composite measure seeks to tap the overall degree of physical access to health services by the study population in different local areas.

3b: <u>Distribution of the sample according to infant feeding and health care/services accessibility variables:</u> Table 5.3 shows how the study population is distributed by the variables outlined above.

Table 5.3: Distribution of births by feeding/health care variables

Variable	Number	Percentage
Breastfeeding duration[1]		
< 12 months	371	22.1
12+ months	1310	77.9
Age at supplementation[2]		
< 1 month	317	19.0
1 month	515	30.6
2 months and over	849	50.4
Tetanus toxoid vaccination		
No	935	28.8
Yes	2314	71.2
Modern prenatal care		
No	650	20.0
Yes	2599	80.0
Assistance at delivery		
untrained personnel	1343	41.3
trained	1906	58.7
Mother knows ORT (S.S.S.)		
No	2075	63.9
Yes	1174	36.1
Local area maternal health services spatial density		
Below average	1122	34.5
Average	732	22.5
Above average	1395	43.0
General health services spatial density		
Below average	1314	40.4
Average	899	27.7
Above average	1036	31.9
Total	3249	100.0

[1]includes only births that lived for at least 12 months, excluding those breastfed until death.
[2]age at which children received their first solid or liquid foods
Note: ORT (S.S.S.)- oral rehydration therapy (sugar-salt-solution).

Note from the figures above that once we exclude children for whom breastfeeding was terminated by their death, the majority of children over a year old were breastfed for at least 12 months. A fairly high level of utilization of modern maternal and child health services and broadly even sample distribution in terms of relative physical accessibility of health facilities is also indicated. But as regards remedies for diarrhoea, a common child ailment, only a third of the sample know of sugar-salt-solutions.

5.3: UNIVARIATE ANALYSIS

This section describes the differences in neonatal, post-neonatal and child mortality according to the three sets of proximate variables outlined above.

(a) Neonatal Mortality:

(i) Differentials according to biodemographic characteristics: Table 5.4a presents sub-group neonatal mortality rates by six biodemographic variables and Table 5.4b shows the person-time-units of exposure associated with the rates. The rates according to the length of the subsequent birth interval and by whether another birth was had in the five years prior to survey are not presented because they were observed to be extremely high for the theoretical high-risk groups ('< 24 months' and 'Yes', respectively) which are largely artefacts of the reverse association between the death of a previous child and the quick return of ovulation following the resultant discontinuation of breastfeeding. All the 82 neonatal deaths were coded as having been breastfed until death or for one month on the breastfeading duration variable. 95% of the post-neonatal deaths and 35% of post-infancy deaths were similarly coded. Hence post-neonatal mortality rates according to these two variables are also not presented.

ble 5.4a: Neonatal mortality rates (per 1000) by biodemographic variables

Variable	Rate	S.E.	R.R.	P.A.R.
ex of child				
Male	31.2	4.2	164	25.0
Female	19.0	3.4	100	---
irth order				
First	39.6	8.7	189	17.6
6+	25.1	4.8	120	7.2
2-5	21.0	3.5	100	---
ternal age (years)				
< 20	(42.0)	12.9	200	8.9
35+	32.4	6.4	154	12.3
20-34	21.0	3.0	100	---
irth type				
ultiple	(101.6)	26.8	460	13.1
ingle	22.1	2.6	100	---
ngth of preceding birth terval (months)				
irst births	40.6	8.5	208	17.0
24	34.8	8.3	178	12.3
4+	19.6	2.9	100	---
erage inter-birth terval (months)				
irst	40.6	8.5	146	12.8
24	18.5	3.3	66	n.a.
4+	28.0	4.9	100	---

ble 5.4b: Person-time-units of exposures for the neonatal rates in Table 5.4a

riable	Exposures	Variable	Exposures
x of child		**Birth type**	
ale	1620	Multiple	116
emale	1555	Single	3059
rth order		**Length of preceding birth interval**	
rst births	492	First births	497
+	1051	< 24 months	473
-5	1632	24+	2205
ternal age			
20	229	**Average inter-birth interval**	
5+	749	First births	497
0-34	2197	< 24 months	1590
		24+	1088

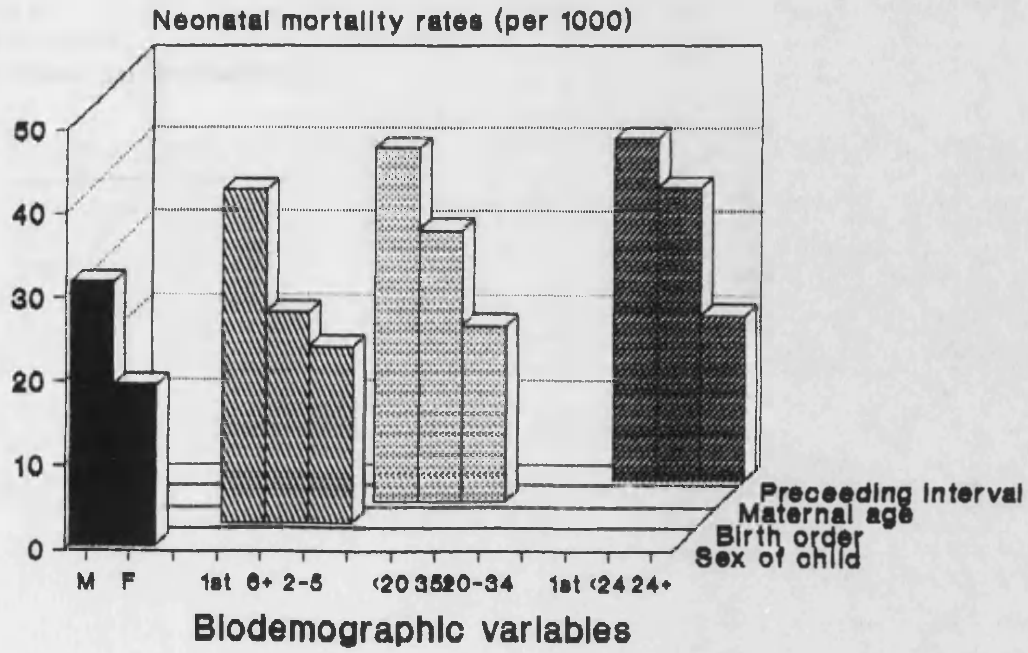
te: Each neonatal death is assumed to have contributed 0.4 unit of exposure given the concentration of these deaths in the first half of the month.

Examining the rates in Table 5.4a, we notice that compared to the socioeconomic variations observed in Chapter Four, all six biodemographic variables show strong and with one exception, plausible co-variation with neonatal mortality. Male births are 1.64 times more likely to die in the first month of life than female ones. First births and sixth and higher order births show a higher risk of neonatal death than births of orders 2-5. First births as have been observed in many other developing areas (Rutstein, 1984; Hobcraft et al, 1985; Hobcraft, 1991) have a clearly elevated risk of neonatal death in Ondo State (R.R. = 1.89), reflecting their special status of being born and raised by socially and often physically immature women. Indeed, the neonatal mortality experienced by births to teenage mothers is twice that of births to women aged 20-34. Also, the elevated risk of death for the very few multiple neonates is so high that it translates into a 13% elevation of the overall neonatal mortality above the level that would have obtained in the absence of multiple births. Hence our decision to take this factor into account in the multivariate consideration of the biodemographic differentials.

As regards the birth-spacing variables, it is noteworthy that first births show a much higher risk of death than births born less than 24 months after a previous birth. In fact, for the long-term retrospective spacing pattern variable, births whose mothers on average had previous births at less than 24 months apart, have a lower neonatal mortality rate (18.5) than births whose mothers on average had previous births at least 24 months apart (28.0). The slight discrepancy in the rates for first births on the birth order variable and the two birth-spacing variables reflects the fact that the multiple first births given a previous interval of zero month in the data file were recoded as first births.

On the basis of our initial selection criteria of implied relative risks of at least 115 and population attributable risks of at least 10%, five biodemographic variables - sex of child, maternal age, birth order, preceding birth interval and birth type - seem worthy of further examination as potentially important proximate neonatal mortality factors in 1981-86 Ondo State. Differentials according to these factors (except birth type) are graphed in Figure 5.1.

Figure 5.1: Neonatal Mortality Rates by Selected Biodemographic Variables



(ii) Differentials according to environmental characteristics:

Table 5.5a presents neonatal mortality rates according to seven household and one community environmental variables and Table 5.5b, the associated person-time-units of exposure.

ble 5.5a: Neonatal mortality rates by environmental characteristics

Variable	Rate	S.E.	R.R.	P.A.R.
ousehold toilet type				
Others	28.7	4.2	130	12.7
Flush/pit	22.0	3.6	100	---
e children use toilets				
conventional toilets	28.8	4.2	92	n.a.
> 5 years	18.6	3.8	59	n.a.
Le 5	31.3	8.3	100	---
usehold drinking water				
Non-pipe source	27.3	3.9	119	9.2
Pipe-borne source	22.9	3.8	100	---
n-drinking water source				
Non-pipe	25.7	3.7	104	2.2
Pipe-borne	24.7	4.1	100	---
cal area per capita ter supply				
Zero	28.5	4.5	116	7.7
< 10 litres/day	20.1	5.3	82	n.a.
10+	24.5	4.4	100	---
oap on premises				
No	39.2	11.1	165	5.8
Yes	23.8	2.8	100	---
oor material of household				
Plank/soil	26.2	5.0	106	1.7
Cement/terrazo	24.8	3.2	100	---
. of persons in household				
8+	21.9	3.9	79	n.a.
Le 7	27.6	3.8	100	---

ble 5.5b: Person-time-units of exposure for the neonatal rates in Table 5.5a

riable	Exposures	Variable	Exposures
usehold toilet type		**Floor material of home**	
Others	1532	Plank/soil	932
Flush/pit	1643	Cement/terrazo	2243
e children use toilet		**No. of persons in household**	
conventional toilet	1532	8+	1403
> 5 years	1208	Le 7	1772
Le 5	435		
usehold drinking water		**Household non-drinking water**	
on-pipe source	1681	Non-pipe source	1749
ipe-borne source	1494	Pipe-borne	1426
oap on premises		**Local area per capita water supply**	
No	295	Zero	1298
Yes	2880	< 10 litres/day	682
		10 litres+/day	1195

te: As in Table 5.4b.

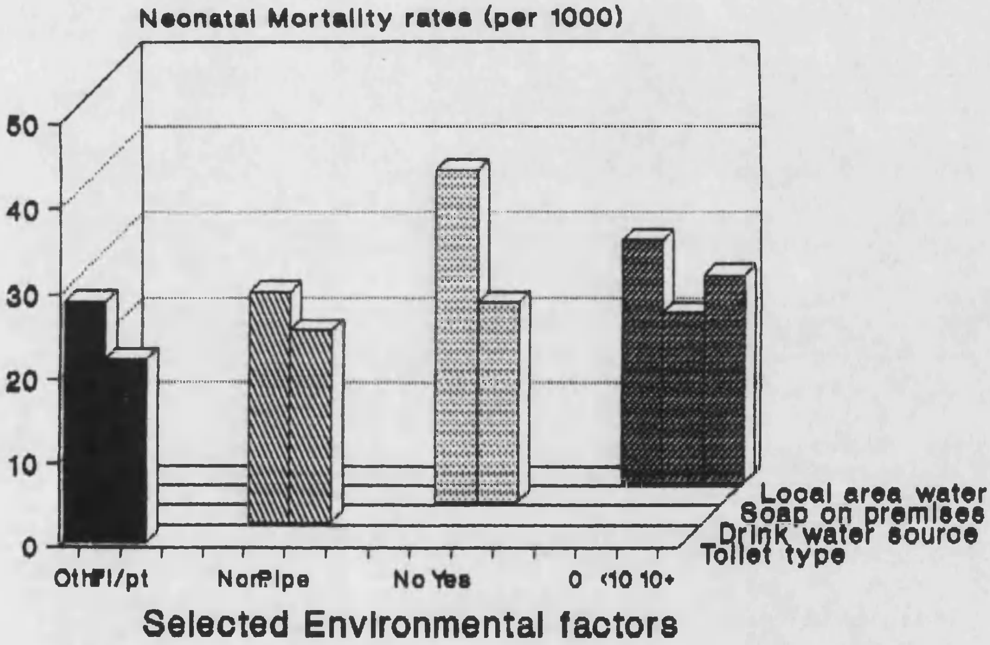
Being born into a household with conventional toilet facilities is shown to be associated with lower neonatal mortality, conveying a 30% advantage relative to children born into households with no toilet facilities. On the other hand, since neonates can hardly be expected to use the same toilet facilities as older children and adults, it is not surprising that no neonatal mortality advantage is observed for children born into homes where under-fives are reported as using the same facilities as adults.

Households that get their drinking water from non-pipe sources show a neonatal mortality rate that is only 1.19 times that for households that drink pipe-borne water. As for use of pipe-borne water for non-drinking purposes, no notable neonatal mortality benefits seem to be conveyed. Relatedly, there is no clear negative association between local area per capita water supply and neonatal mortality level.

However, having a soap on the premises apparently yields a notable neonatal mortality advantage (R.R. = 1.65) although only very few households reported not having a cake of soap on their premises on survey day; hence the relatively low potential population level impact of this factor (P.A.R. = 5.8). Also, the type of floor material of the homes children are born into seems to make no difference to the risk of death in the first month of life. Furthermore, the proxy for household crowding is not shown to be positively associated with neonatal mortality risks. Since any crowding effect may be expected to operate mainly through increased transmission of contact-acquired infections (Aaby, 1987), neonates would not really be exposed to such infections with their immunologic defences still being largely reinforced through breastfeeding.

Overall, only two factors - household toilet type and drinking water quality - on the basis of our selection criteria (R.R. = 115+ and P.A.R. = 10+) strictly deserve further consideration as probably important micro-environmental factors in the shaping of neonatal mortality outcomes in Ondo State. But given their implied relative risks and their close association with the first two variables, the variables on the presence of soap in households and local area water supply were also selected for further analysis. The neonatal mortality differentials according to these four factors are illustrated in Figure 5.2.

Figure 5.2: Neonatal Mortality rates by Selected Environmental Variables



(iii) Differentials according to health care and services factors:

Table 5.6a presents neonatal mortality rates according to six health care and services variables and Table 5.6b, the associated person-time-units of exposure.

ble 5.6a: Neonatal mortality rates (per 1000) by health care variables

Variable	Rate	S.E.	R.R.	P.A.R.
etanus toxoid vaccination				
No	28.9	5.5	121	5.7
Yes	23.8	3.2	100	---
Modern prenatal care				
No	26.2	6.3	105	1.0
Yes	25.0	3.0	100	---
ofessional assistance at delivery				
No	29.0	4.6	128	10.3
Yes	22.6	3.4	100	---
other knows ORT (S.S.S.)				
No	24.1	3.4	88	n.a.
Yes	27.3	4.8	100	---
aternal health services spatial density				
Below average	30.3	5.1	156	20.1
Average	28.7	6.2	148	14.4
Above average	19.4	3.6	100	---
eneral health services spatial density				
Below average	32.7	4.9	169	27.9
Average	21.1	4.8	109	4.2
Above average	19.3	4.3	100	---

ble 5.6b: Person-time-units of exposure for the rates in Table 5.6a

riable	Exposures	Variable	Exposures
tanus vaccination		**Maternal health services spatial density**	
No	911	Below average	1091
Yes	2264	Average	713
		Above average	1371
dern prenatal care			
No	634	**General health services spatial density**	
Yes	2541		
		Below average	1275
ofessional assistance at livery		Average	882
		Above average	1018
No	1308		
Yes	1867	**Mother knows ORT (S.S.S.)**	
		No	2030
		Yes	1145

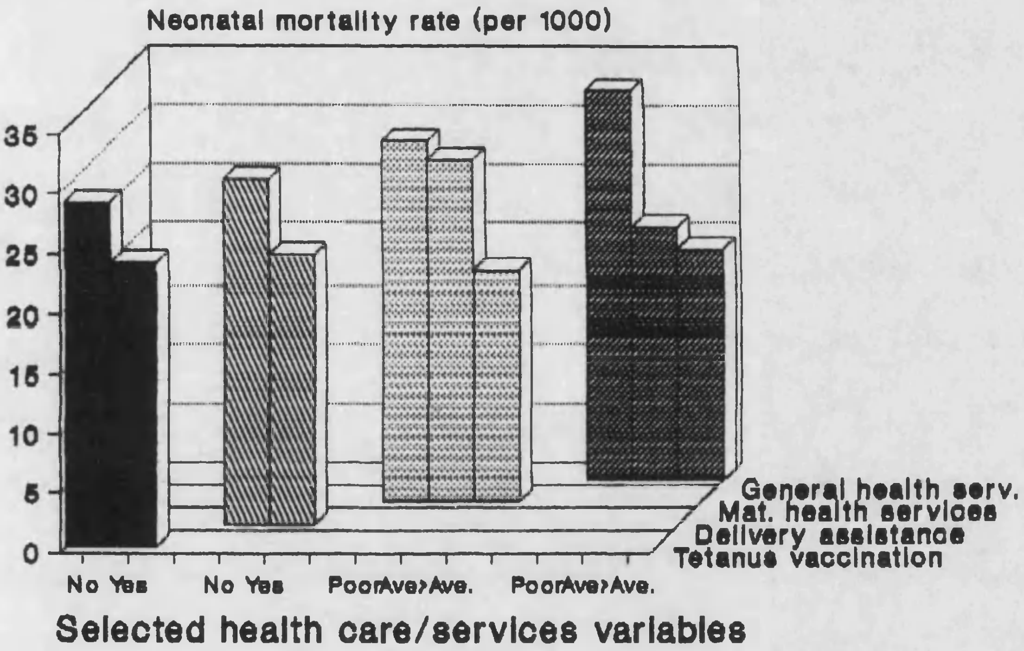
te: As in Table 5.4b.

The three maternity care variables show the expected pattern of association with neonatal mortality. But whereas uptake of the tetanus vaccination and being assisted at delivery by trained health personnel seems to confer more than 20% neonatal survival advantage, modern prenatal care only seems to be slightly beneficial (R.R. = 1.05). Knowledge of a home-made therapy for diarrhoea is not associated with lower neonatal mortality, probably an indication of the fact that diarrhoea is an ailment that tends to afflict older infants as they begin to take other foods to supplement breastmilk (Black, 1984).

The two measures of physical accessibility of modern health services show strong plausible co-variation with neonatal mortality. Children born in areas with relatively few maternity centres, dispensaries and hospitals are more likely to die in the first month of life than those in areas with higher spatial density of health facilities.

On the basis of a minimum implied relative risk of 1.15 and population attributable risk of 10%, the variables on type of assistance at delivery, maternal health services accessibility and general access to health facilities seem worthy of further consideration as important proximate factors in neonatal mortality during 1981-86 in Ondo State. The uptake of tetanus toxoid vaccination may also be considered given the implied relative risks. The neonatal mortality differentials according to these four variables are graphed in Figure 5.3 below.

Figure 5.3: Neonatal mortality rates by selected health care/services variables



(b) Post-neonatal mortality:

(i) Differentials according to biodemographic characteristics: In Table 5.7a, post-neonatal mortality rates that show individual biodemographic differences are presented. Table 5.7b shows the person-time-units of exposure associated with the rates.

ıble 5.7a: Post-neonatal mortality rates by biodemographic characteristics

Variable	Rate	S.E.	R.R.	P.A.R.
Sex of child				
Male	33.0	4.6	94	n.a.
Female	35.1	4.9	100	---
Birth order				
First	38.1	9.4	112	2.6
6+	32.4	5.7	96	n.a.
2-5	33.9	4.7	100	---
ıternal age (years)				
< 20	(57.1)	16.0	167	6.1
35+	26.3	6.1	77	n.a.
20-34	34.2	4.1	100	---
irth type				
Multiple	(45.4)	19.9	136	1.4
Single	33.5	3.4	100	---
ngth of preceding birth ıterval (months)				
First births	37.4	9.2	124	4.1
< 24	48.4	10.1	160	10.2
24+	30.2	3.8	100	---
erage inter-birth interval the index child				
First births	37.4	9.2	130	8.5
< 24	36.6	4.9	128	14.4
24+	28.7	5.4	100	---

ıble 5.7b: Person-time-units of exposure for the rates in Table 5.7a

ıriable	Exposures	Variable	Exposures
x of child		**Birth type**	
ale	1419	Multiple	100
emale	1362	Single	2681
irth order		**Length of preceding interval**	
irst	415	First births	420
5+	923	< 24	433
-5	1443	24+	1928
ıternal age		**Average inter-birth interval**	
20 years	199	First births	420
5+	657	< 24	1418
0-34	1925	24+	943

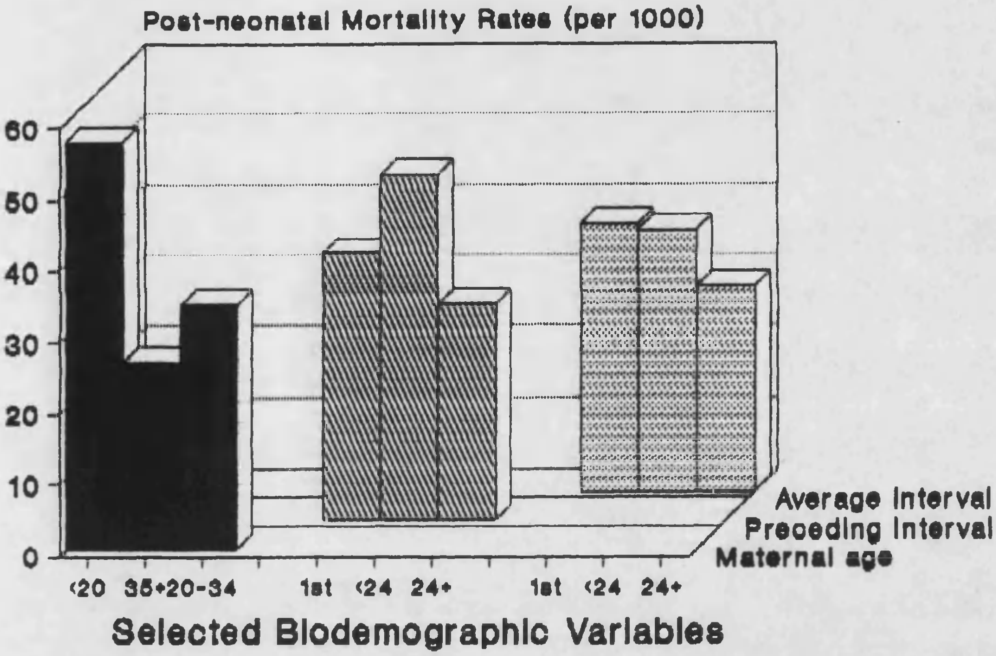
ote: The exposure of each child is defined as the number of months it lives in the interval divided by the length of the interval (11 months).

Male births and first births which were shown to have notably elevated risk of death in the first month of life do not seem to suffer such disadvantages in the rest of the first year of life. In fact, there is no perceptible sex differential in post-neonatal mortality. Also, first births show much reduced post-neonatal mortality disadvantage relative to births of orders 2-5.

However, births to teenage mothers in contrast to those to older women (35+), display elevated post-neonatal mortality disadvantage relative to those of women aged 20-34 years (R.R. = 1.67). Multiple births still show a mortality disadvantage during the post-neonatal period, but this is much reduced compared to the neonatal situation. Children born shortly after a previous birth (< 24 months) and those of women whose overall birth-spacing is relatively short are observed to be at a risk of post-neonatal mortality that is at least a third higher than that of births in contrasting categories.

On the basis of our selection criteria, only the two retrospective birth-spacing variables and perhaps, the maternal age variable seem to deserve further consideration as key intermediate factors in the socio-economic shaping of post-neonatal mortality patterns in Ondo State. The post-neonatal mortality differentials according to these three variables are graphed in Figure 5.4.

Figure 5.4: Post-neonatal Mortality Rates by Biodemographic Variables



(ii) Differentials according to household and community environmental characteristics: Table 5.8a documents post-neonatal mortality differences in 1981-86 Ondo State according to eight environmental factors while Table 5.8b shows the associated person-time-units of exposure.

ble 5.8a: Post-neonatal mortality rates by environmental characteristics

Variable	Rate	S.E.	R.R.	P.A.R.
usehold toilet type				
Others	44.2	5.4	180	28.2
Flush/pit	24.5	4.0	100	---
e children use toilet				
o conventional toilet	44.5	5.5	219	48.1
> 5 years	25.9	4.8	128	17.0
Le 5	20.3	7.1	100	---
usehold drinking water				
on-pipe sources	41.1	5.1	158	23.4
ipe-borne	26.0	4.3	100	---
n-drinking water source				
on-pipe	39.6	4.9	146	20.3
ipe-borne	27.1	4.5	100	---
cal area per capita ter supply				
Zero	43.5	6.0	144	18.6
< 10 litres/day	22.7	6.0	75	n.a.
10+ litres+/day	30.3	5.2	100	---
oap on premises				
No	(52.4)	13.6	163	5.6
Yes	32.2	3.4	100	---
oor material of home				
lank/soil	35.2	6.3	105	1.5
ement/terrazo	33.5	4.0	100	---
. of persons in household				
8+	25.2	4.6	62	n.a.
Le 7	40.5	4.8	100	---

ble 5.8b: Person-time-units of exposure for the rates in Table 5.8a

riable	Exposures	Variable	Exposures
usehold toilet type		**Floor material of household**	
Others	1332	Plank/soil	807
Flush/pit	1449	Cement/terrazo	1974
e children use toilet		**No. of persons in household**	
conventional toilet	1332	8+	1232
> 5 years	1065	Le 7	1549
Le 5	384	**Non-drinking water source**	
usehold drinking water		Non-pipe	1535
Non-pipe	1453	Pipe-borne	1246
Pipe-borne	1328		
		Local area per capita	
Soap on premises		**water supply**	
No	253	Zero	1128
Yes	2528	< 10 litres/day	600
		10 litres+/day	1053

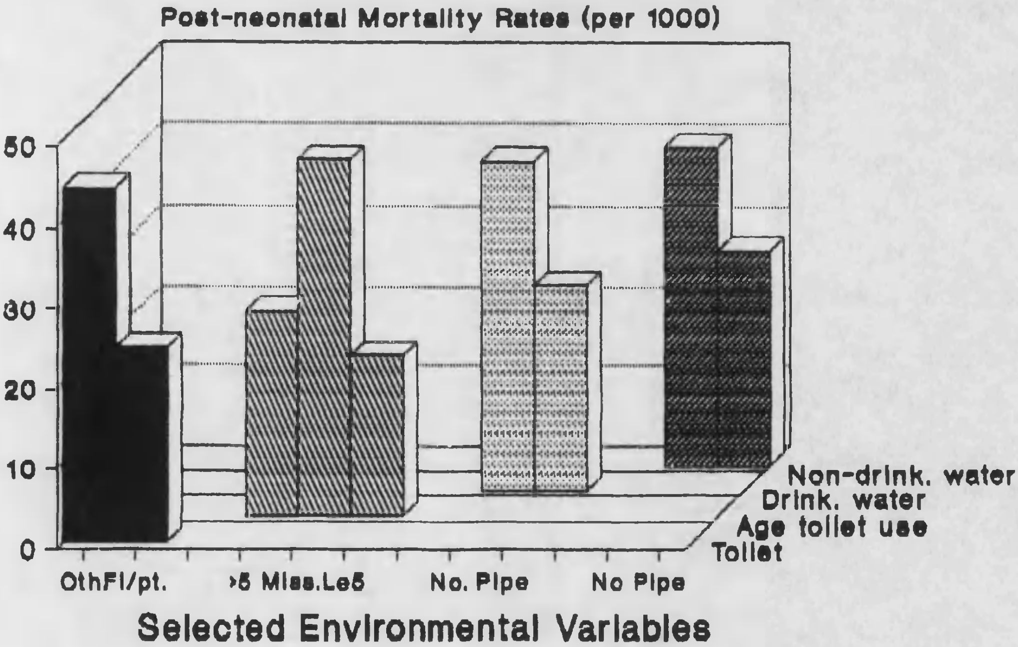
te: As in Table 5.7b.

As with neonatal mortality but to a greater extent, the presence of some sort of toilet facilities in a household seems to confer a post-neonatal mortality advantage. Children in households without toilets experience a mortality risk that is 1.80 times that of those in households with such facilities. Interestingly, households in which under-fives are reported as using the same toilet facilities as adults experience much lower post-neonatal mortality than households in which they do not. Access to pipe-borne water for drinking and non-drinking purposes seems to result in a much greater mortality advantage in the post-neonatal period than was observed in the first month of life as one would expect with gradually increasing exposure of older infants to environmental contamination. Also, households in local areas unserved by public water schemes experience a post-neonatal mortality rate that is at least 1.44 times that of those in served areas.

Presence of soap in a household continues to be associated with lower mortality in the post-neonatal period. Similarly, the type of floor material still makes little difference to the risk of death and the indicator of household crowding shows higher household density to be more strongly associated with lower mortality. The latter pattern may again be reflecting the non-specificity of the measures and the fact that in Yoruba society wealthy individuals usually take up more extended family obligations including child-fostering and support of younger co-siblings than poorer persons (Berry, 1985). In fact, we obtained a small but statistically significant positive correlation (r = 0.28) between the household disposable income index and the household density variable.

Overall therefore, the variables on household toilet type, age children use toilet, household drinking/non-drinking water source, local area per capita water supply, household density and perhaps, presence of soap on premises qualify for further examination as micro-environmental factors in the production of post-neonatal mortality outcomes in 1981-86 Ondo State. The post-neonatal mortality differentials according to the first four variables are illustrated in Figure 5.5 below.

Figure 5.5: Post-neonatal Mortality Rate by Selected Environmental Variables



(iii) Differentials according to health care/services variables:

Table 5.9a shows the post-neonatal mortality rates according to health care and services accessibility factors and Table 5.9b shows the person-time-units of exposure associated with these rates.

ble 5.9a: Post-neonatal mortality rates by six health-related variables

Variable	Rate	S.E.	R.R.	P.A.R.
'etanus toxoid vaccination				
No	41.5	6.9	134	9.0
Yes	31.0	3.8	100	---
odern prenatal care				
No	42.0	8.4	131	5.8
Yes	32.1	3.7	100	---
'ofessional assistance at delivery				
No	38.2	5.6	122	8.3
Yes	31.2	4.2	100	---
other knows ORT (S.S.S.)				
No	36.8	4.4	127	14.7
Yes	29.0	5.2	100	---
ternal health services density				
Below average	34.6	5.8	116	6.6
Average	41.4	7.8	139	12.0
Above average	29.7	4.8	100	---
neral health services density				
Below average	39.8	5.7	203	36.6
Average	42.4	7.1	216	35.3
Above average	19.6	4.6	100	---

The maternal/child care variables continue to show the expected patterns of association with mortality into the post-neonatal period of life. Births whose delivery were assisted by trained health workers show a risk that is 22% less than that for those assisted by traditional or untrained personnel. Tetanus vaccination is shown to be associated with a post-neonatal mortality advantage of more than 30%. However, these patterns can only be taken to be broadly indicative of the link between general exposure to child health services and child survival and not the impact of each specific service. Relatedly, a mother's awareness of sugar-salt-solutions as a remedy for diarrhoea is associated with lower risks of death during the post-neonatal segment of infancy when children become increasingly susceptible to such infections.

le 5.9b: Person-time-units of exposure for the rates in Table 5.9a

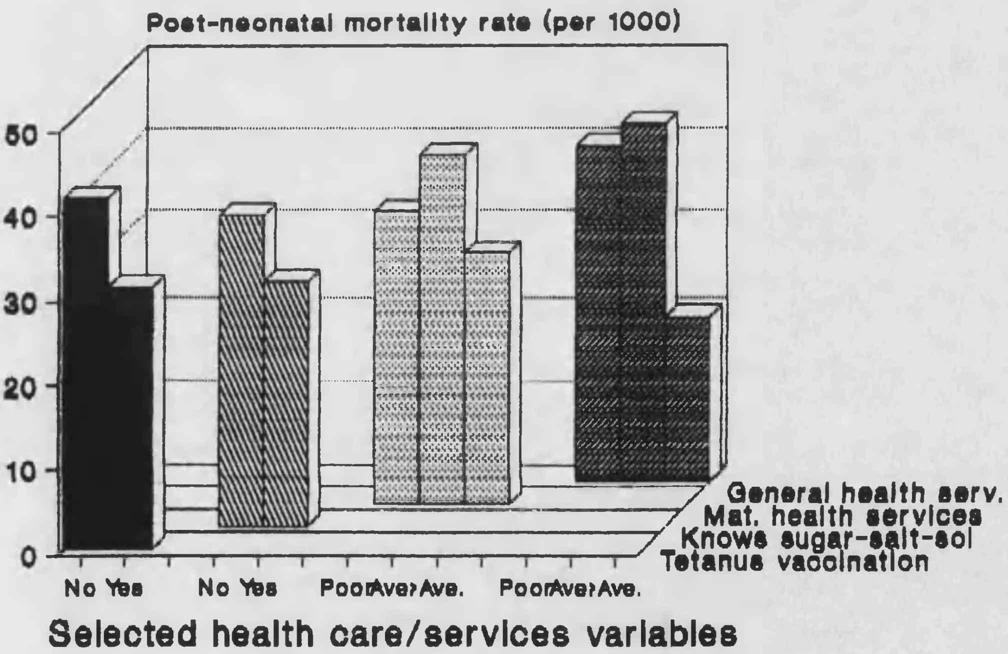
iable	Exposures	Variable	Exposures
anus vaccination		**Maternal health services spatial density**	
No	790	Below average	951
Yes	1991	Average	632
ern prenatal care		Above average	1198
No	552	**General health services**	
Yes	2229	**spatial density**	
fessional assistance		Below average	1116
delivery		Average	764
No	1134	Above average	901
Yes	1647	**Mother knows ORT (S.S.S.)**	
		No	1785
		Yes	996

e: As in Table 5.7b.

As regards physical proximity to health services, the differentials according to the two indicators examined indicate that children living in the poorest served areas are at much higher risks of post-neonatal mortality than those in the better served areas. It is worth pointing out though, that during this segment of life when it may be expected that curative as opposed to preventive measures convey more child-survival benefits, the maternal health services index shows a relatively weaker association with mortality than the general health services accessibility variable.

Overall, uptake of tetanus toxoid vaccination, knowledge of sugar-salt-solutions, physical accessibility of maternal health services, and accessibility of general health services are the variables that seem on the basis of our minimal analytical requirements to deserve further consideration as probable pathways through which socio-economic factors impinged upon post-neonatal mortality in Ondo State. The differentials according to these four variables are graphically illustrated in Figure 5.6.

Figure 5.6: Post-neonatal mortality rates by selected health variables



(c) Child Mortality:

(i) Differentials according to biodemographic factors: In Table 5.10a, child mortality rates (3q1) according to individual biodemographic characteristics are presented. Table 5.10b presents the associated distribution of person-time-units of exposure.

ıble 5.10a: Child mortality rates according to biodemographic variables

Variable	Rate	S.E.	R.R.	P.A.R.
ex of child				
Male	44.2	6.4	109	4.3
Female	40.7	6.1	100	---
irth order				
First	(47.3)	11.4	129	6.3
6+	49.4	8.2	135	12.0
2-5	36.6	5.8	100	---
ternal age (years)				
< 20	(48.0)	16.1	112	1.2
35+	39.2	8.7	92	n.a.
20-34	42.7	5.4	100	---
irth type				
ultiple	(80.0)	29.8	194	3.1
ingle	41.3	4.4	100	---
ngth of preceding interval				
First births	46.5	10.9	104	0.8
< 24	30.2	9.2	68	n.a.
24+	44.5	5.5	100	---
ngth of subsequent interval				
Last births	37.7	5.6	75	n.a.
< 24	(31.7)	11.5	63	n.a.
24+	50.4	7.6	100	---
erage inter-birth interval index birth				
irst births	46.7	11.0	113	4.0
24	41.7	6.1	101	0.6
4+	41.2	7.2	100	---
other birth in last 5 years				
Yes	43.7	5.7	109	5.2
No	40.1	6.6	100	---

ble 5.10b: Person-time-units of exposure for the rates shown in Table 5.10a

riable	Exposures	Variable	Exposures
x of child		**Length of preceding interval**	
Male	758	First births	205
Female	755	< 24 months	269
		24+	1039
rth order			
irst	202	**Length of subsequent interval**	
+	501	Last births	654
-5	810	< 24 months	168
		24+	691
ternal age			
20 years	89	**Average inter-birth interval**	
35+	380	First births	205
20-34	1044	< 24	290
		24+	1018
rth type			
Multiple	48	**Another birth in last 5 years**	
Single	1465	Yes	922
		No	591

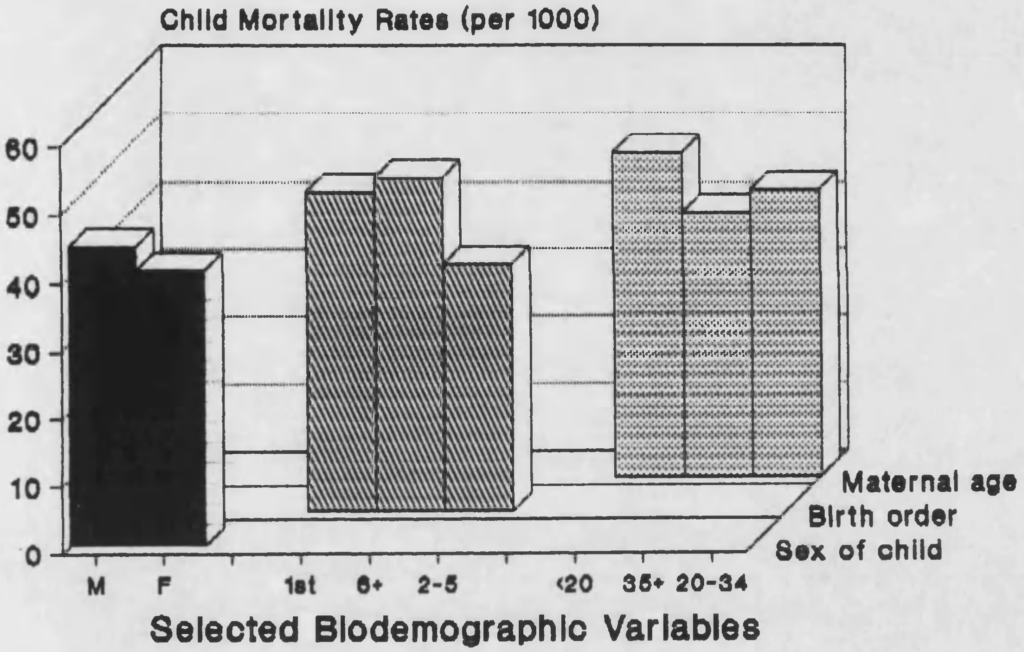
te: The exposure of each child is defined as the number of months it lives in the interval divided by the length of the interval (36 months).

Male births display only slightly higher mortality in childhood than female births when compared with the sex differential in neonatal mortality. But first births and sixth or higher order births seem to continue to experience elevated mortality risks relative to other births with the high order (6+) births' mortality disadvantage being particularly heightened in childhood. The latter may be a reflection of increased co-sibling competition for household resources and maternal care and possibly increased ease of infection transmissions. The few twins remaining in the sample also continue to experience elevated risks of death.

However, none of the birth-spacing variables show a negative co-variation with the risks of death in childhood in contrast to the patterns observed in infancy. Though somewhat surprising, this pattern may be indicative of the concentration of the birth-spacing effects in infancy in Ondo State. Previous studies covering many areas of the developing world do indicate much higher birth-spacing mortality effects in infancy (especially the first month of life) than beyond (Hobcraft et al, 1985; Boerma and Bicego, 1991).

Thus, in terms of the strength and plausibility of associations, only the birth order variable seems worthy of further consideration as an important intermediate factor in the determination of child mortality patterns in Ondo State. But it would be interesting to first see whether it retains its strength of co-variation with child mortality risks in the presence of controls for the effects of the other biodemographic factors (maternal age and sex of child) that also show plausible though weaker co-variation with child mortality. Figure 5.7 below illustrates the child mortality differentials according to these three variables.

Figure 5.7: Child Mortality Rates by Selected Biodemographic Variables



(ii) Differentials according to household/community environmental characteristics: Table 5.11a shows child mortality rates (3q1) according to a number of environmental factors. The distribution of the person-time-units of exposure associated with these rates are are shown in Table 5.11b.

ble 5.11a: Child mortality rates according to environmental variables

Variable	Rate	S.E.	R.R.	P.A.R.
usehold toilet type				
Others	60.7	7.5	238	39.1
Flush/pit	25.5	4.7	100	---
e children use toilet				
o conventional toilet	61.0	7.5	656	80.5
> 5 years	31.1	6.0	334	62.4
Le 5	9.3	5.0	100	---
usehold drinking water				
on-pipe sources	45.1	6.3	116	7.5
ipe-borne	39.0	5.8	100	---
n-drinking water source				
on-pipe	43.4	6.1	105	2.6
ipe-borne	41.2	6.2	100	---
cal area per capita				
ter supply				
Zero	37.1	6.1	92	n.a.
< 10 litres/day	54.6	10.5	135	11.5
10 litres+/day	40.4	6.7	100	---
oap on premises				
No	(53.0)	15.8	128	2.5
Yes	41.3	4.6	100	---
oor material of home				
Plank/soil	47.5	8.7	118	5.0
Cement/terrazo	40.2	5.1	100	---
. of persons in household				
8+	41.3	6.7	96	n.a.
Le 7	43.2	5.9	100	---

ble 5.11b: Person-time-units of exposure for the rates shown in Table 5.11a

riable	Exposures	Variable	Exposures
usehold toilet type		**Floor material of household**	
Others	719	Plank/soil	448
Flush/pit	794	Cement/terrazo	1065
e children use toilet		**No. of persons in household**	
conventional toilet	719	8+	651
> 5 years	585	Le 7	862
Le 5	210	**Non-drinking water source**	
usehold drinking water		Non-pipe	802
Non-pipe source	807	Pipe-borne	711
Pipe-borne	706	**Local area per capita**	
oap on premises		**water supply**	
No	137	Zero	606
Yes	1376	< 10 litres/day	340
		10 litres+/day	567

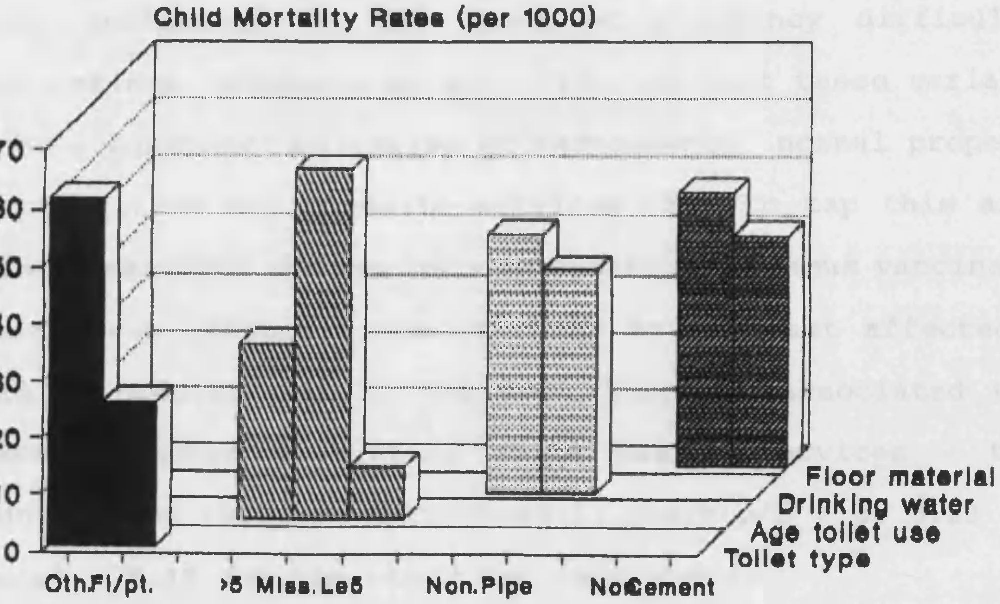
ote: As in Table 5.10b.

The indications are that the presence of some sort of toilet within the household is associated with very much reduced child mortality risks than was the case with neonatal and post-neonatal mortality. This is to be expected because at older ages most of the children become weaned thereby losing the anti-infective and protective properties of breastmilk while becoming more fully exposed to the effects of feeding inadequacies and poor hygienic conditions within the household. Interestingly, beyond infancy when young children may begin to use the same toilets as older children, lack of access to toilets by under-fives within a household is associated with hugely elevated risk of death (R.R. = 3.34). Access to pipe-borne water for drinking purposes remains more of an advantage for child survival than access to such sources for non-drinking uses. However, local areas with no pipe-borne water supply services are apparently at no child mortality disadvantage; a probable indication of the failure of our measure to tap adequately households' actual access to pipe-borne water which the mere presence of a scheme does not guarantee.

But the figures show that the few households that reported not having a cake of soap on the premises on survey day were at a child mortality disadvantage compared to those that reported having one. A cemented floor surface is indicated to be associated with much lower mortality in childhood than was the case in infancy. However, the household density indicator remains undiscriminating of child mortality in the expected direction.

In accordance with our initial selection criteria, the two variables on presence of and age at which children use toilets clearly deserve further consideration as potentially important intermediate factors in child mortality in Ondo State during 1981-86. As a preliminary check for their relative representativeness as environmental risk factors in child mortality, their effects are first assessed in the presence of controls for the effects of the variables on household drinking water source and floor material type. The differentials in child mortality by these four variables are graphed below in Figure 5.8.

Figure 5.8: Child Mortality Rates by Selected Environmental Variables



(iii) **Differentials according to infant feeding and health care/ services accessibility factors:** In Table 5.12a, child mortality rates according to infant feeding and health care/services variables are presented. The associated distribution of person-time-units of exposure are shown in Table 5.12b.

It is worth noting here that the uptake of tetanus toxoid vaccination, type of assistance at delivery, and spatial density of maternal health services are not really causally relevant as determinants of mortality outcomes beyond infancy since their direct health benefits would seem to relate to the period shortly before and after delivery. Moreover, there is some evidence from the data that the use of modern prenatal care services and to a smaller extent, assistance at delivery by trained personnel, are partly influenced by the onset of pregnancy difficulties or complications (Adekunle et al, 1990), so that these variables may not be adequately indicative of respondents' normal propensity to use preventive child health services. But to tap this aspect of women's behaviour the variable on uptake of tetanus vaccination was nevertheless adopted since it seems to be least affected by the validity problem and is the most strongly associated with the uptake of other preventive child health services - that is, immunizations (BCG and DPT1/POLIO1); Pearson's r of 0.23 compared to r of < 0.15 for the other two indicators.

ble 5.12a: Child mortality rates by feeding and health care/services factors

Variable	Rate	S.E.	R.R.	P.A.R.
eastfeeding duration				
< 12 months	40.4	9.4	160	11.7
12 months+	25.2	4.2	100	---
e at first supplements				
< 1 month	31.2	5.2	61	n.a.
1 month	55.1	6.6	107	4.2
2 months+	51.5	9.7	100	---
tanus toxoid vaccination				
No	60.8	9.6	172	15.8
Yes	35.4	4.7	100	---
ther knows ORT (S.S.S.)				
No	46.3	5.6	130	16.8
Yes	35.5	7.2	100	---
neral health services atial density				
Below average	43.6	7.1	117	8.6
Average	46.3	8.6	124	10.1
Above average	37.3	7.1	100	---

ble 5.12b: Person-time-units of exposure for the rates shown in Table 5.12a

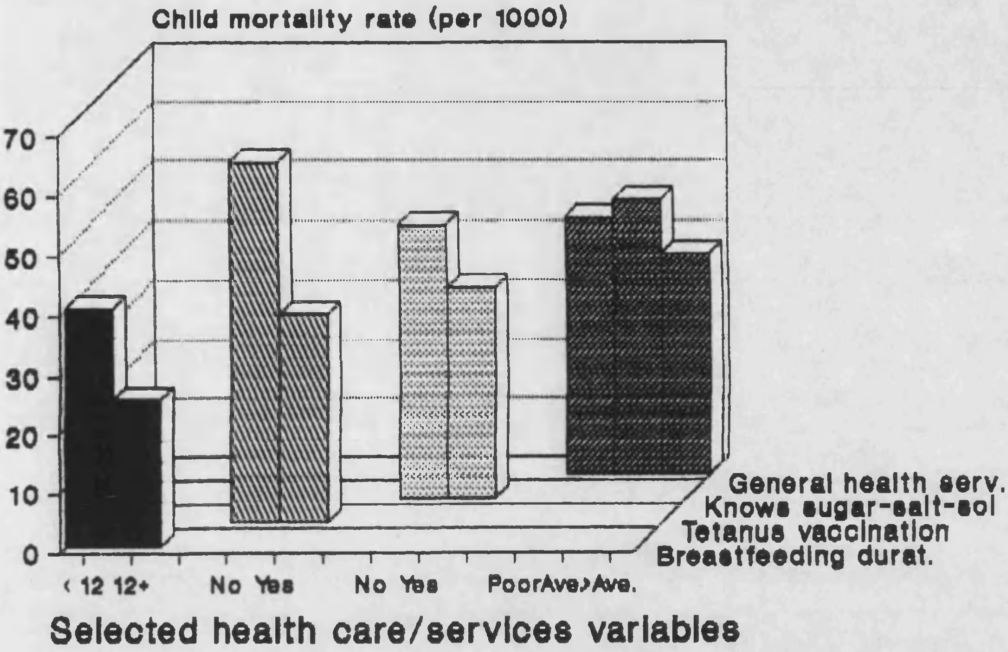
riable	Exposure	Variable	Exposure
eastfeeding duration		**Mother knows ORT (S.S.S.)**	
< 12 months	287	No	990
12 months+	1184	Yes	523
e at first supplements		**Tetanus toxoid vaccination**	
< 1 month	734	No	418
1 month	456	Yes	1095
2 months+	281	**General health services spatial density**	
		Below average	612
		Average	412
		Above average	489

te: As in Table 5.10b.

The child mortality differentials shown in Table 5.12a indicate that breastfeeding a child for less than one year is associated with elevated risk of mortality of about 60%. But a later age at the introduction of the first solid or semi-solid foods to a child apparently confers no survival advantage reflecting in part, the fact that very few births in the sample were breastfed exclusively beyond the first week of life. Prior to being given their first foods, infants are given drinking water which may not always be free from contamination. However, women's adoption of modern preventive child health measures (as indicated by the uptake of tetanus vaccination) and knowledge of proper child illness treatment (as indicated by their awareness of ORT as an effective remedy for diarrhoea), are associated with higher childhood survivorship. Residence in a local area with a relatively high density of health services also seems to confer some child mortality advantages.

Going by the implied relative and population attributable risks, the variables on breastfeeding duration, tetanus toxoid vaccination, knowledge of home-made sugar-salt-solution as a remedy for diarrhoea, and general health services physical accessibility seem to deserve further consideration as proximate factors in the shaping of child mortality outcomes in Ondo State during 1981-86. The child mortality differentials according to these four variables are graphed in Figure 5.9.

Figure 5.9: Child mortality rates by selected health care/services factors



(d) Overview of infant and child mortality univariate differentials according to proximate variables: Two general points emerge from the descriptive results presented in the foregoing sections. First, is the difference in the relative strength of co-variation of the biodemographic and environmental factors with mortality in infancy and childhood. The biodemographic factors show particularly strong patterns of association with infant mortality and very weak associations with child mortality. On the other hand, the household environmental variables increase in their strength of co-variation with mortality as the age of child increases; producing the largest mortality differentials in childhood. This broad pattern is as expected since more endogenous factors especially related to the circumstances around delivery to which the biodemographic variables tend to be strongly related would play a much greater role as determinants of mortality in infancy than factors of environmental contamination. The latter would be more prominent beyond infancy as children become more exposed to their environment as result of becoming more active with age and being weaned and hence also losing the anti-infective benefits of breastfeeding.

The male mortality disadvantage was for instance, found to be much concentrated in the neonatal period and similarly, the elevated mortality risks for first births is more pronounced in the neonatal period than in later months of life. The same point is true of the patterns by maternal age, birth type and the birth-spacing variables. In fact, the association of short retrospective birth intervals with higher mortality seems to have been limited to the first year of life during 1981-86 in Ondo State.

On the other hand, the lack of some sort of toilet facilities within the household more than doubles the risk of death in childhood compared to the implied relative risks of 1.30 and 1.80 in the first month and next eleven months of life respectively. Also noteworthy is the particularly heightened risk of childhood death (which is absent in infancy) for children in households where under-fives are reported as not using the same toilets as older children and adults compared to those in households in which they do. Similarly, whereas the type of floor material of residence makes little difference to the risk of death in infancy, children in homes with uncemented floors showed a child mortality rate that is one-fifth higher than that of those in homes with cemented floors. However, as regards the indicator of household crowding, larger households which in the Ondo society also tend to be relatively wealthy showed lower childhood mortality than smaller ones especially in infancy. Thus, it seems that in general, the advantages of being part of a large home outweighs the health hazards that may be associated with crowding.

Second, it is noteworthy that compared to the socio-economic and household environmental / biodemographic differentials especially the former, the relative risks of neonatal, post-neonatal, and child mortality implied by the breastfeeding, child health care and services accessibility variables are much more consistently in the theoretically expected direction. For neonatal mortality, the relatively weak association of modern prenatal care with lower risks of neonatal death most probably derives from the tendency for such services to attract many problem-prone pregnancies.

For the rest of infancy, it was found that knowledge of home-made diarrhoeal morbidity remedy seems to clearly favour lower mortality as opposed to the neonatal situation in which the main threat to survival would be tetanus rather than diarrhoea. Also, access to hospitals and dispensaries (main components of the general health services accessibility index) seems to yield a greater survival advantage beyond the first month of life than access to maternity services as might be expected.

In childhood, the somewhat weakened negative association of local area spatial density of health services with mortality may be reflective of the increased prominence in childhood of causes of death that operate cumulatively and gradually rather than sudden fatal bouts of illnesses that may be more likely in infancy and for which easy access to modern curative health services might make a critical difference.

5.4: MULTIVARIATE ANALYSIS

(a) Preamble: The descriptive results presented in Section 5.3 showed that infant and child mortality in Ondo State during 1981-86 varied according to a number of proximate determinants. But as the bivariate correlation coefficients shown in Table 5.13 for some of the selected variables within each of the three sets of proximate factors indicate, multivariate analysis is necessary to estimate the independent effects of each selected variable within each set of factors so as to identify the main ones whose effects need to be taken into account in explaining the documented socioeconomic inequalities in child survival.

ble 5.13: Zero-order correlations between some selected biodemographic (A), cro-environmental (B), and child health care/services (C) variables : births during the five years to the 1986 ODHS

riables (A)	SEX	AGEBORN	BTORDER	PREVINT	ALLSPAC
EX	1.00	-.02	-.04	.03	.05
EBORN		1.00	.27**	.03	-.19**
ORDER			1.00	-.10*	-.09*
EVINT				1.00	.21**
LSPAC					1.00

riables (B)	TOILET	DRINK	NONDRINK	FLOOR	PIPSPLY
OILET	1.00	.43**	.39**	.44**	.29**
RINK		1.00	.90**	.43**	.32**
ONDRINK			1.00	.41**	.27**
LOOR				1.00	.25**
IPSPLY					1.00

riables (C)	PRENAT	TETA	DELIV	KNOWSSS	GENHIND	MATHIND
RENAT	1.00	.69**	.54**	.26**	.21**	.25**
ETA		1.00	.46**	.25**	.15*	.23**
ELIV			1.00	.27**	.14*	.19**
NOWSSS				1.00	.15*	.18**
ENHIND					1.00	.68**
ATHIND						1.00

tes: * denotes P < .05; ** denotes P < .01; SEX = sex of child; AGEBORN = maternal age; BTORDER = order of birth; PREVINT = length of preceding birth interval; ALLSPAC = average length of birth intervals to index birth; TOILET = household toilet type; DRINK = household drinking water; NONDRINK = source of non-drinking water; FLOOR = floor material type; PIPSPLY = local area per capita water supply; PRENAT = type of prenatal care; TETA = tetanus toxoid vaccination; DELIV = assistance at delivery; KNOWSSS = knowledge of ORT; GENHIND = general health services spatial density; MATHIND = maternal health services spatial density.
The variables were treated as continuous for purposes of calculating the correlation coefficients.

(b) Inclusion of variables in the models: One-variable models were again first fitted for each of the variables to identify those with statistically significant gross effects on the mortality considered and hence, determine the order of inclusion of the variables (for each set of proximate factors) in the overall main effects models taking into account their theoretical relevance and the temporal order implied by the Mosley-Chen child survival framework. The P-values of the chi-square statistics upon which the actual inclusion sequence are based are shown in Table 5.14.

ble 5.14: P-values of X^2 statistics for key demographic/environmental/health riables in one-variable models of neonatal, post-neonatal and child mortality

riable	Neonatal	Post-neonatal	Child Mortality
x of child	**.026**	---	.748
rth order	.063	.792	.240
ternal age	**.049**	.095	.508
rth type	**.001**	.214	.117
ngth of preceding int.	**.007**	.135	---
erage length of eceding birth intervals	---	.537	.542
other birth in last ve years	---	---	.905
usehold toilet type	.228	**.002**	**.001**
e children use toilet	---	**.008**	**.001**
usehold drink. water	.430	**.017**	.861
usehold non-drink water	---	.112	---
ap on premises	.097	.104	.916
oor material type	---	---	.569
usehold size	.456	**.054**	.764
cal area water supply	.510	**.048**	.427
tanus vaccination	.399	.088	**.043**
pe of prenatal care	.868	.269	---
sistance at delivery	.245	---	---
owledge of ORT	---	.248	**.055**
ternal health services	**.047**	---	---
neral health services	**.052**	**.004**	.306
eastfeeding duration	---	---	.102
rand mean deviance	977.19	862.09	824.45

Using a P-value of .05 as a minimum criterion, it is quite apparent that the gross effects on neonatal mortality of four of the selected biodemographic variables - sex of child, maternal age, length of the retrospective birth interval and birth type - are statistically significant. But only one of the short-listed variables related to household hygiene (presence of soap on premises) shows an effect that may not be entirely due to chance though falling below the minimum significance level (P = .097).

Also, among the health care/services variables, only the two on the local area spatial density of health services show gross effects that are statistically significant, with the effects of the three preventive child health care factors being possibly due to chance. It is noted here that the relatively strong correlation (r= 0.68) between the two health services variables rendered infeasible their joint inclusion in the main effects models for neonatal mortality. This reflects the fact that areas which are well-served by one type of service also tend to be well-served by other types so that either composite indicator could be used to broadly represent the spatial density of health services as a whole. We therefore fitted the main effects models twice to include separately each indicator. Results presented below relate to the maternal health services access indicator whose inclusion in the previous model produced the bigger reduction in the deviance.

For post-neonatal mortality, all the selected biodemographic variables except perhaps, maternal age (P = .095) have effects that are statistically insignificant. In contrast, the observed effects of four of the environmental variables - household toilet type, age children use toilet, drinking water source, and local area water supply - are statistically significant. But among the health care/services factors, the only highlighted variable is the general health services spatial density index although the gross effects associated with the tetanus vaccination variable (an index of mothers' propensity to use modern preventive child health services) seem to be weakly significant.

Regarding child mortality, none of the observed biodemographic differentials are statistically significant whereas the two factors related to household toilet type and use by children have gross effects that are statistically significant as do the tetanus vaccination, knowledge of ORT, and to a limited extent, breastfeeding duration variables.

(c) Main effects on Neonatal Mortality: In this section, we examine the patterns in neonatal mortality according to the selected bio-demographic, micro-environmental, and preventive health care, services accessibility and infant feeding variables included in the sequentially fitted main effects models. The aim is to identify the key proximate factors to incorporate in the integrated analysis of neonatal mortality outcomes in 1981-86 Ondo State. The results are summarized in Tables 5.15a, 5.15b and 5.15c.

ble 5.15a: Relative risks of neonatal mortality associated with bio-demographic variables: results of Poisson regressions

riable	Model 1	Model 2	Model 3	Model 4
eceding birth interval				
irth order				
24 months and order 6+	1.08	0.79	0.72	0.73
24 months/order 1	2.03**	1.99**	2.07**	2.06**
ternal age (years)				
35+		1.43	1.46	1.43
20		2.04**	2.19**	2.21**
irth type				
ultiple			5.63**	5.57**
x of child				
ale				1.64*
ange in Model X^2	9.12	6.66	21.83	4.91
-value	.009	.033	.000	.029

** denotes P <.01; * denotes P <.05

Since the first order category constitutes a level within two of the selected demographic variables (birth order and preceding birth interval length), both were combined into one variable with three progressively 'risky' levels - > 24 months and orders 2-5, > 24 months and orders 6+, and < 24 months/order 1. Although the elevated risks of mortality associated with being a first birth is usually lower than that associated with being born less than 24 months after a previous birth (Hobcraft et al, 1985; Boerma and Bicego, 1991), and the former is less amenable to policy interventions, both are grouped together in this analysis due to the particularly high mortality of first births in early infancy in Ondo State. Also, despite the gross neonatal mortality effects associated with the birth type and sex of child variables being statistically more significant than the other highlighted biodemographic variables, they were introduced last into the models because they are not readily amenable to policy interventions and therefore have much reduced substantive significance.

It is clear however, that even after controlling for the effects of these two factors, both the preceding birth interval/order and maternal age variables' effects on neonatal mortality remain statistically significant. In particular, a short preceding birth interval or being a first birth and teenage motherhood continue to be associated with a doubling of neonatal mortality risks.

ble 5.15b: Relative risks of neonatal mortality associated with micro-environmental variables: results of Poisson regressions

'ariable	Model 1	Model 2	Model 3
oap on premises			
No	1.66	1.57	1.56
usehold toilet type			
Others		1.24	1.21
usehold drinking ter source			
Non-pipe			1.06
hange in Model X^2	2.56	1.02	.062
P-value	.098	.307	.811

Regarding the environmental variables, we showed earlier than none implied relative risks that were statistically significant at P < .05 level. The Poisson regression results in Table 5.15b only serve to confirm the variable on presence of soap in a home as the factor most strongly capturing the micro-environmental context of neonatal mortality risks in 1981-86 Ondo State since its gross effects are not much reduced with controls for the effects of the other two environmental variables that showed somewhat strong covariation with neonatal mortality.

able 5.15c: Relative risks of neonatal mortality associated with preventive ild health care/services proximity variables: results of Poisson regressions

riable	Model 1	Model 2	Model 3	Model 4
ternal health services atial density				
Average	1.46	1.15	1.38	1.41
Below average	1.57*	1.80	2.17*	2.19*
tanus vaccination				
No		1.10	1.12	1.12
ofessional assistance delivery				
No			1.04	1.01
dern prenatal care				
No				0.69
hange in Model X^2	6.32	1.05	1.26	.059
P-value	.048	.298	.263	.658

* denotes P < .05

Relative to the gross effects, the parameter estimates shown in Table 5.15c indicate that the neonatal mortality advantage of above average physical proximity to modern maternal health facilities apparently increases when account is taken of the utilization of tetanus vaccination, delivery assistance and prenatal care services. It is also noteworthy that the association of lower neonatal mortality with uptake of tetanus toxoid vaccination hardly changes with controls for the effects of the other preventive child health factors and although of relatively weak statistical significance may along with the spatial density of maternal health services be included as a proximate factor in the integrated consideration of the neonatal mortality patterns.

(d) Main effects on Post-neonatal Mortality: The next three tables show the Poisson regression estimates of relative risks of post-neonatal mortality according to each of the three sets of proximate factors considered in this study.

ble 5.16a: Relative risks of Post-neonatal mortality associated with selectec biodemographic variables: results of Poisson regressions

riable	Model 1	Model 2	Model 3	Model 4
ternal age				
35+	0.78	0.85	0.86	0.86
20	1.70	1.52	1.51	1.52
eceding birth interval				
irth order				
24 months and order 6+		0.90	0.88	0.88
24 months / order 1		1.21	1.23	1.23
rth type				
ultiple			1.50	1.50
x of child				
ale				0.94
ange in Model X^2	4.14	1.19	.686	.101
value	.101	.550	.407	.851

It can be seen from the estimates above that teenage motherhood is the biodemographic factor most strongly associated with elevated risks of post-neonatal mortality in 1981-86 Ondo State; resulting in a 50 percent excess risks even after controlling for its correlation with retrospective birth interval/order, birth type, and sex of child. Along with the birth type variable, only the maternal age factor on the basis of the magnitude of the associated relative risks seem deserving of inclusion in the integrated analysis of post-neonatal mortality patterns as a control for the role of biodemographic factors.

ble 5.16b: Relative risks of Post-neonatal mortality associated with selectec usehold and community environmental variables: results of Poisson regressions

riable	Model 1	Model 2	Model 3	Model 4	Model 5
cal area per capita ter supply					
10 litres/day	0.75	0.62	0.58	0.57	0.58
Zero	1.44*	1.18	1.13	1.11	1.12
usehold toilet type/ e at use by children					
5 years		1.21	1.26	1.19	1.21
conventional toilet		1.87**	1.69*	1.60	1.58
usehold drinking ter source					
on-pipe			1.43	1.35	1.30
mber of persons household					
8+				0.74	0.75
ap on premises					
No					1.37
ange in Model X^2	6.15	8.13	1.59	2.22	1.20
value	.047	.007	.183	.121	.264

* denotes P <.01; * denotes P <.05

Regarding the household and local area environmental factors, it is apparent from Table 5.16b that the variables that best capture the effects of this group of factors on post-neonatal mortality in 1981-86 Ondo State relate mainly to the type and age at use by children of toilet facilities within a household, and to a smaller extent, quality of household drinking water whose inclusion in the models reduces the magnitude (by about 21 percent) as well as the statistical significance of the effects associated with the former. Specifically, it seems that irrespective of other aspects of the household and local area environmental hygiene, the absence of conventional toilets within the average Ondo household was associated with about a 60 percent elevation of post-neonatal mortality risks during 1981-86.

ble 5.16c: Relative risks of Post-neonatal mortality associated with key alth care and services proximity variables: results of Poisson regressions

riable	Model 1	Model 2	Model 3
cal area general health rvices spatial density			
verage	2.15**	2.10**	1.98**
elow average	2.07**	1.95**	1.83**
tanus toxoid vaccination			
No		1.16	1.15
ther knows ORT (S.S.S.)			
No			1.11
ange in Model X^2	11.21	1.68	1.35
value	.004	.162	.209

Notes: ** denotes P <.01; * denotes P <.05

On the health care and services proximity context, the suggestion is that as with the multivariate results for neonatal mortality, the estimated relative risks of post-neonatal death associated with the variable on the local area spatial density of health services are the strongest among the examined health care and services factors. It appears that children residing in areas poorly served by modern health facilities are nearly twice as likely to die during the post-neonatal segment of infancy as those in the best served areas even with the uptake of preventive child health services and mother's knowledge of ORT as a diarrhea therapy taken into account. However, tetanus vaccination uptake as an index of preventive child health seeking behaviour of mothers, also seems to be worthy of retention in the integrated analysis given that its gross effects are not drastically reduced with the other two health factors accounted for.

(e) Main effects on Child Mortality (3q1): Tables 5.17a, 5.17b, and 5.17c present the Poisson regression estimates of relative risks of child mortality associated with the selected variables within each of the three sets of proximate determinants examined in this study.

ble 5.17a: Relative risks of child mortality (3q1) associated with selected biodemographic variables: results of Poisson regressions

riable	Model 1	Model 2	Model 3	Model 4
erage inter-birth interval birth order				
24 months and order 6+	1.09	1.19	1.18	1.19
24 months / order 1	1.19	1.14	1.11	1.11
ternal age				
35+		0.83	0.83	0.83
20		1.40	1.45	1.44
rth type				
ultiple			1.49	1.49
x of child				
ale				1.07
ange in Model X^2	.531	1.16	1.83	.084
value	.702	.561	.176	.792

As would be expected from the X^2 statistics presented earlier, the results in Table 5.17a indicate that none of the biodemographic factors was significantly associated with child mortality in 1981-86 Ondo State. However, the combined average inter-birth interval/birth order variable being composite in nature is retained for the integrated analysis of child mortality patterns to capture possible maternal/biodemographic influences.

ble 5.17b: Relative risks of child mortality associated with key household and community environmental variables: results of Poisson regressions

riable	Model 1	Model 2	Model 3	Model 4
cal area per capita				
ter supply				
10 litres/day	1.33	1.04	1.08	1.08
Zero	0.94	0.73	0.75	0.76
usehold toilet type/				
e at use by children				
5 years		2.98*	2.99*	2.99*
conventional toilets		3.84**	3.90**	3.91**
usehold drinking water				
urce				
Non-pipe			0.72	0.74
oor material of home				
lank/soil				0.91
ange in Model X^2	1.62	9.63	1.75	.131
value	.429	.031	.179	.718

** denotes P <.01; * denotes P <.05

As regards household environmental and hygienic circumstances, the most striking point that emerges from the parameter estimates above is that the composite variable on toilet type and age at use by children is potentially the most important factor pertaining to environmental risks in the shaping of child mortality patterns in Ondo State during 1981-86. It retains its huge mortality effects (about a tripling of the risks of death for children in the poorer categories) and statistical significance after controlling for the effects associated with the other selected environmental variables.

ble 5.17c: Relative risks of child mortality associated with selected infant eding and health care/services access factors: results of Poisson regressions

riable	Model 1	Model 2	Model 3	Model 4
neral health services				
atial density				
verage	1.31	1.29	1.29	1.25
elow average	1.15	1.06	1.05	1.03
tanus vaccination				
No		1.55*	1.54*	1.45
eastfeeding duration				
12 months			0.99	1.02
ther knows ORT (S.S.S.)				
No				1.36
ange in Model X^2	.950	3.10	.093	1.56
value	.564	.054	.866	.127

* denotes P < .05

It is clear from the estimates presented in Table 5.17c that preventive child health care (as indicated by uptake of tetanus vaccination) and mothers' knowledge of home-made therapies for common childhood ailments (as indexed by knowledge of sugar-salt-solutions as a therapy for diarrhoea) favour lower child mortality in Ondo State even after taking account of the physical proximity of modern health facilities and maternal breastfeeding behaviour. Though the results are of somewhat weak statistical significance, the slight reduction (by about 16%) in the magnitude of the estimated relative risks implied by the tetanus vaccination variable upon the inclusion of the knowledge of ORT variable, suggests that in present-day Ondo State, mothers' awareness and utilization of preventive and curative child health measures both have some child mortality lowering impact, but with 'prevention being better than cure'.

It is notable that once other health-related factors are taken into account, whether a child was breastfed for at least a year or not makes virtually no difference to its survival chances. This result reflects the fact that most Ondo women breastfeed their children who live long enough, well beyond their first birthday but begin to feed them drinking water and other liquids and semi-solid foods very early in infancy. Thus, once we exclude children breastfed for as long as they lived to avoid the problem of reverse causation, the child survival impact of breastfeeding may be quite small in areas with infant feeding patterns similar to those observed in Ondo State. This point of course, casts no doubt on the well-established fact of the child health enhancing benefits of breastfeeding at the individual level.

(f) <u>Overview of Multivariate results</u>: We set out through the analysis in this section to identify the key factors from each of the three sets of proximate determinants - biodemographic, micro-environmental, and child health care/services proximity - selected on the basis of the descriptive analysis as possibly being of some consequence for child survival in Ondo State during 1981-86. The results enabled the identification of the variables that were sufficiently strongly associated with mortality as to be usefully indicative or representative of 'maternal/biodemographic', 'environmental contamination', 'personal illness control', and 'nutrient intake' mechanisms through which the key socioeconomic factors may have impacted upon neonatal, post-neonatal, and child mortality.

The results suggest that for neonatal mortality, the key proximate factors to be accounted for in the integrated analysis are birth order and preceding interval size, birth type, sex of child, maternal age, presence of soap in a home, spatial density of maternal health services, and tetanus vaccination. For post-neonatal mortality the indicated key proximate factors relate to maternal age, household toilet type and age at use by childern, household drinking water quality, spatial density of general health services and uptake of tetanus vaccination as a proxy for use of preventive child health services. Finally, for mortality at ages 1-4, average retrospective birth interval size, household toilet type and age at use by children, uptake of preventive health services, and mother's knowledge of ORT as a treatment for diarrhea stood out as potentially important proximate factors.

5.5: SUMMARY

This chapter examined the covariation of proximate factors with child survival in Ondo State with a view to identifying those to be incorporated into the integrated analysis of neonatal, post-neonatal and child mortality patterns. Biodemographic and health services proximity factors turned out to have relatively very strong effects on survival in infancy while factors related to environmental contamination were more prominent in childhood.

REFERENCES

Aaby, P. (1987) Overcrowding: a major determinant of variations in measles mortality in Africa. IUSSP Seminar on Mortality and Society in subSaharan Africa, Yaounde, Cameroun; (Liege: IUSSP).

Adekunle C., V. Fillipi, W. Graham, P. Onyemunwa and E. Udjo (1990) Patterns of maternity care among women in Ondo State, Nigeria. In Allan H., ed., Determinants of Health and Mortality in Africa DHS Further Analysis Series No. 10 (Columbia, Maryland: IRD and The Population Council): 1-45.

Berry, S. (1985) Fathers Work for Their Sons: Accumulation, Mobility and Class Formation in an Extended Yoruba Community (Berkeley: University of California Press).

Black, R. E. (1984) Diarrheal Diseases and Child Mortality Population and Development Review 10 (Supplement on Child Survival): 141-161.

Boerma, J. T. and G. T. Bicego (1991) Preceding birth interval and child survival: Searching for pathways of influence. Paper presented at the Demographic and Health Surveys World Conference August 5-7 (Washington, D.C).

Frank, O. and M. Dakuyo (1985) Child Survival in subSaharan Africa: Structural Means and Individual Capacity - A Case Study in Burkina Faso. Center for Policy Studies Working Papers No. 122 (New York: The Population Council).

Hobcraft, J. N. (1991) Childspacing and child mortality. Paper presented at the Demographic and Health Surveys World Conference August 5-7, (Washington, D.C.).

Hobcraft, J., J. McDonald and S. Rutstein (1985) Demographic Determinants of Infant and Early Child Mortality: a comparative analysis. Population Studies 39(3): 363-385.

Iyun F. (1989) An assessment of a rural health programme on child and maternal care: the Ogbomoso Community Health Care Programme (CHCP), Oyo State, Nigeria Social Science and Medicine 29, 935-940.

Mosley, W. and L. C. Chen (1984) An analytical framework for the study of child survival in developing countries. Population and Development Review, 10 (Supplement on Child Survival): 25-45.

Rutstein, S. O. (1984) Infant and Child Mortality: Levels, Trends and Demographic Differentials. WFS Comparative Studies 43 (revised edition).

CHAPTER SIX

DETERMINANTS OF SOCIO-ECONOMIC VARIATIONS IN INFANT AND CHILD MORTALITY

6.1: INTRODUCTION

Our purpose in this chapter is to integrate the findings from the last two chapters in order to demonstrate how and to what extent the socio-economic factors highlighted as having significantly shaped infant and child mortality risks in 1981-86 Ondo State operated through the key proximate factors.

The analysis presented in Chapter Four indicated that the most significant and visible socio-economic inequalities in neonatal mortality were associated with local area economic development level (as indicated by the spatial density of non-health infrastructures and services) and mothers' exposure to modern influences (as proxied by women's attitude to family planning media campaign). For the proximate factors, Chapter Five showed those with notable impacts to be birth order-preceding interval size, maternal age, sex of child, birth type, presence of soap in household, spatial density of maternal health services and tetanus vaccination.

As regards survival beyond the first month of infancy, the most notable socio-economic variations were by local area infrastructural development level and household disposable income status, with mother's schooling being included for further analysis to provide some form of control for data defects given its statistically significant but seemingly implausible inverse association with post-neonatal mortality. The general spatial density of modern health services, tetanus vaccination, type and age of use by children of toilet facilities, household drinking water source, maternal age, and birth type were the proximate factors shown to best capture post-neonatal mortality risks in 1981-86 Ondo State.

For child mortality, the most significant socio-economic variations were related to household disposable income status and paternal educational status while the proximate factors so highlighted were those of household toilet type and age at use by children, mother's knowledge of simple child health therapies (as indicated by knowledge of sugar-salt-solutions as a remedy for diarrhoea), tetanus vaccination (as a proxy for mother's propensity to seek modern preventive child health care), and birth order-average retrospective spacing pattern.

As noted in Chapter Four, extensive exploratory analysis indicated the problems of fitting Poisson regression models containing terms for more than six independent variables with our data. To incorporate all the selected socio-economic and proximate factors therefore, a few of the variables with more than two categories were collapsed into two.

6.2: MODEL ESTIMATION AND INFERENCE

Given that our main interest is in the estimation of the effects of introducing the proximate variables on the relationships between the key socio-economic factors and child survival within each of the three segments of life considered in this study, we make no attempt at identifying the 'best-fitting' models for the data. Instead, by following the changes in the coefficients for the key socio-economic factors related to the inclusion of each of the key proximate variables, we draw inferences on the pathways of influence on child survival. The importance of each included variable is assessed by the change in the model X^2 value associated with the addition of that variable. The model estimation process is the causal ordering of factors implied by our adopted version of the Mosley-Chen child survival framework as outlined in Chapter One taking into account the level of the variable (that is community, household, and individual, in that order).

Thus, for neonatal mortality for example, we first include in the baseline model the local area development variable and extend it by including the maternal health services accessibility variable (also a community factor) given that the most obvious and direct reason for the former's strong co-variation with neonatal mortality is most likely its strong correlation with spatial density of maternal health services. Familial/household attributes are then included (in this instance, mother's exposure to modern influences and presence of soap in the home) and followed by attributes related to the individual child (birth order-preceding interval size, maternal age, sex, birth type, and tetanus vaccination). Similar sequences of inclusion of the key factors in the models for post-neonatal and child mortality are as shown in the relevant tables below.

6.3: NEONATAL MORTALITY PATTERNS

The results concerning the determinants of the key socio-economic variations in neonatal mortality risks in 1981-86 Ondo State are presented in Table 6.1.

Table 6.1: Relative risks of neonatal mortality associated with key socioeconomic and proximate factors: results of Poisson regressions

riable	Models: One	Two	Three	Four	Five	Six	Seven	Eight	Nine
n-health frastructural devpt.									
Below average	1.86**	1.75*	1.76*	1.73*	1.71*	1.70*	1.71*	1.64*	1.63*
ternal health services atial density									
Average		1.33	1.33	1.35	1.38	1.37	1.35	1.43	1.43
Below average		1.42	1.40	1.42	1.45	1.38	1.36	1.37	1.35
ther's attitude to mily planning campaign									
Negative			1.43	1.40	1.44	1.44	1.42	1.46	1.44
ap in household									
No				1.59	1.61	1.54	1.55	1.46	1.45
eceding interval/birth order									
24 months and order 6+					1.05	0.85	0.86	0.79	0.78
24 months / order 1					2.06**	1.90*	1.88*	1.94*	1.94*
ternal age									
20/35+ years						1.68*	1.69*	1.75*	1.75*
x of child									
Male							1.64*	1.61*	1.61*
rth type									
ultiple								5.29**	5.35**
tanus vaccination									
one									1.07
ange in Model X^2	7.81	2.01	1.55	2.02	9.69	4.66	4.76	20.41	.101
-value	.005	.273	.211	.159	.008	.031	.029	.001	.780

The huge neonatal mortality advantage that residence in relatively more developed local areas seems to confer on children in Ondo State is shown to be only very slightly due to the higher spatial density of modern maternal health services in such areas. Less than one-eight (13 percent) of the effects associated with the local area infrastructural development indicator is accounted for with the inclusion of the maternal health services accessibility index although this reduces its level of statistical significance.

Similarly, exposure to modern social influences (as indicated by women's attitude to family planning media campaign) seems to contribute virtually nothing to explaining the much lower neonatal mortality risks in the more developed local districts, neither does household hygienic circumstance (proxied by presence of cake of soap in the home).

Addition of the more proximate variables related to the bio-demographic profiles of births and preventive health services utilization also do not significantly erase the neonatal mortality effects associated with residence in relatively more developed local areas. When taken into account, the biodemographic and family formation variables erase only 12 percent of the effects associated with local area development level, with much of this being due to the higher mortality risks for multiple births.

However, unlike the tetanus vaccination factor, the biodemographic factors do on their own, show strong effects on neonatal mortality risks. First births and those born less than 24 months after a previous birth are about twice as likely to die in the first month of life as births of orders 2-5 or those born at least 24 months after a preceeding birth. Births to teenagers and women over 34 years old, male births, and multiple births all show notable elevated risks of neonatal death.

Taken together, the modest impact of the maternal health services accessibility factor and the negligible estimated effects of tetanus vaccination, on the association between local area development level and neonatal survival provide little support for our a priori expectation that access to and utilization of modern maternal and child health services would mediate such an association. More importantly, this key socio-economic inequality in neonatal mortality documented for 1981-86 Ondo State is only modestly (about 25 percent) accounted for by all the proximate factors shown to have significantly co-varied with neonatal mortality risks. Thus, much of the main socioeconomic differentials in neonatal mortality remains unexplained.

One main inference can however be made at this point; that is, irrespective of the socioeconomic context or milieu into which children are born in contemporary southwest Nigeria, bearing them further apart and later, having fewer of them, and paying special attention to male and multiple neonates can do much to improve their survival chances.

Although the results suggest the existence of some unobserved risk conditions, it is worth pointing out that the observed pattern of socioeconomic factors' impact on neonatal survival not having been directly effected through differential family building patterns has also been documented for many parts of the developing world including subSaharan Africa (Cleland and van Ginneken, 1989; Bicego and Boerma, 1991).

6.4: POST-NEONATAL MORTALITY PATTERNS

In Table 6.2, the Poisson regression estimates regarding the determinants of post-neonatal mortality risks in Ondo State during 1981-86 are presented. These show that the differentials in post-neonatal survival according to local area infrastructural development level is slightly larger than that observed for neonatal mortality. But unlike the latter, the mortality advantage related to residence in more developed areas seems to have been effected to a greater extent through higher spatial density of modern health services in such areas. Four-tenths (41.3 percent) of the elevated risks of post-neonatal mortality (1.92) associated with residence in less developed areas is accounted for with the inclusion of the health services physical accessibility index which also reduces the statistical significance of the remaining effect.

Table 6.2: Relative risks of post-neonatal mortality associated with key socioeconomic and proximate variables: results of Poisson regressions

riable Models:	One	Two	Three	Four	Five	Six	Seven	Eight
n-health infrastructural velopment level								
elow average	1.92**	1.54*	1.56*	1.56*	1.54*	1.57*	1.58*	1.56*
neral health services atial density								
verage		1.67	1.45	1.41	1.34	1.30	1.30	1.31
elow average		1.62	1.36	1.35	1.33	1.27	1.26	1.26
usehold disposable come status								
Medium			1.68	1.84*	1.63	1.54	1.54	1.55
Low			2.01*	2.07**	1.92*	1.76	1.77	1.75
ther's schooling								
None				0.63*	0.62*	0.60*	0.59*	0.58*
e of use by children d type of toilet facilities								
Above 5 years					1.22	1.23	1.23	1.24
o conventional toilets					1.65	1.56	1.55	1.53
usehold drinking water urce								
Non-pipe						1.30	1.30	1.28
ternal age								
20/35+ years							0.98	0.97
tanus vaccination								
None								1.21
hange in Model X^2	10.82	2.88	4.81	6.29	2.93	1.19	.084	.719
-value	.001	.213	.089	.014	.145	.182	.813	.314

** denotes P <.01; * denotes P <.05

However, controlling for the household disposable income status does nothing to reduce the effects associated with infrastructural development level although as a factor it does show a significant impact on post-neonatal survival with children in the poorest households being about twice as likely to die as those in the richest homes and its inclusion in the models does reduce by about 33-40 percent the effects associated with the spatial density of health services.

Interestingly, the addition of the maternal educational status variable (both to capture some of the defects within the data and to indicate its likely significance had the quality of death reporting not varied by socio-economic status), increases somewhat the magnitude of the estimated relative risks associated with household disposable income status. None of the included proxies for household environmental conditions, family building pattern, and uptake of preventive child health services helps much to explain the inequalities in post-neonatal mortality associated with local area and household economic status.

On the whole, the two key socioeconomic determinants of post-neonatal survival seem to be to a great extent independent of one another once the physical availability of health services is taken into account. Effects associated with both are also only partially explained by the key proximate factors included in the analysis.

The clearest pattern that emerges from the results is that the post-neonatal mortality advantage of being born and raised in a relatively developed area of Ondo State derives to some extent from greater physical proximity to modern health services and to a greater extent (60 percent) from a host of other health risk-modifying factors and influences not captured by the data.

It is to be noted though that we find some supporting evidence for the view that being part of a relatively rich household does partially compensate for some of the child survival disadvantages of residence in an area poorly served by modern health facilities.

6.5: CHILD MORTALITY PATTERNS

Table 6.3 gives the Poisson regression results for relative risks of death in early childhood (ages 1-4) associated with key socio-economic and proximate variables in 1981-86 Ondo State. These show that the very large differentials in child mortality by the household disposable income status indicator is only to a small extent (13 percent) associated with the educational status of the household head. But it is apparent that a major channel through which richer households achieve lower child mortality than others is their provision of superior sanitory facilities and their children's usage of such facilities.

The inclusion within the models of the variable on type of household toilet facilities and whether under-fives within the household reportedly use these facilities accounts for more than 43 percent of the estimated effects associated with household income status even with paternal educational status taken into account, and its remaining effect becomes statistically insignificant.

able 6.3: Relative risks of child mortality (3q1) associated with key socio-economic and proximate variables: results of Poisson regressions

riable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
usehold disposable come status index						
Medium	1.98*	1.86	1.50	1.49	1.48	1.47
Low	3.09**	2.82**	1.93	1.93	1.89	1.87
ternal educational atus						
Primary		1.39	1.37	1.44	1.40	1.40
None		1.30	1.25	1.23	1.19	1.18
e at use/toilet type						
> 5 years			2.82*	2.86*	2.88*	2.88*
o toilet facilities			4.17**	4.19**	4.09**	4.08*
erage preceeding intervals ze/birth order						
24 months and order 6+				1.00	0.98	0.98
24 months / order 1				1.27	1.26	1.27
tanus vaccination						
None					1.28	1.27
owledge of sugar-salt olution						
No						1.06
ange in Model X^2	10.48	1.34	8.73	1.03	1.10	.083
value	.005	.483	.013	.593	.302	.808

** denotes P <.01; * denotes P <.05

Especially noteworthy also however, is the significant independent effects estimated to be associated with the household sanitary conditions indicator. Children in Ondo State residing in homes with no modern toilets or latrines seem to suffer mortality risks at ages 1-4 that are more than quadruple that for children in homes with such facilities which they reportedly use.

The results also provide some support for the argument by Frank and Dakuyo (1985) that in homes with sanitary facilities where children do not or are not expected to share such facilities with adults, children may be more exposed to water-borne enteropathogenic agents than in homes where children use the same facilities with adults with consequent health hazards. The estimated relative risks indicate that Ondo under-fives in homes with toilet facilities which they do not use are almost thrice as likely to die in early childhood as children in homes where they do so. This underlines the importance of discouraging the practice of keeping separate young children's sanitory requirements and provisions from those of adults which seems to result in less than adequate sanitory care for them.

Given the relatively weak independent effects of the average retrospective birth spacing/order variable and other proxies for family formation patterns on child mortality observed in Chapter Five, it is not surprising that the former's inclusion in the models erases none of the remaining effects associated with household disposable income status. Also, the indicators of use and knowledge of child health care measures both explain less than 5 percent of the estimated impact on child mortality of the household disposable income status factor.

In sum, unlike the situation in infancy, the main socio-economic factor in early child mortality in 1981-86 Ondo State - household income status - seems to have mainly operated, even with differences in the educational status of household heads accounted for, through differential quality of home sanitary conditions and hence most probably, differential exposure of children to infectious diseases, especially water-borne ones. Only a very small portion of its remaining estimated effects seem traceable to factors of child health care and services utilization.

It appears then, that socio-economically conditioned behaviours that help to lower mortality risks beyond the first year of life for young Nigerian children may be largely preventative in nature. Creating home environments and living conditions in which children are exposed to low risks of diarrheal and other water-borne infections is indicated as a probably very effective way of lowering child mortality levels in present-day Nigeria.

6.6: OVERVIEW

Taken with the findings presented in Chapters Four and Five, the results discussed in this chapter lead us to a number of general points. First, infant mortality risks seem to be notably less sensitive to key socio-economic factors than child mortality risks. This pattern is similar to that described by Hobcraft et al (1984) and Bicego and Boerma (1991) for many culturally and epidemiologically diverse areas of the developing world. It is thought of as indicative of the greater extent to which individual and household assets shape risk-modifying behaviours and conditions as the child ages and is increasingly susceptible and exposed to diseases.

Secondly, on the basis of the estimated relative risks obtained for the neonatal, post-neonatal, and years 1-4 segments of early childhood, the key proximate determinants of child survival measured in this study (especially those related to household sanitary conditions) explain to a far greater extent the main socio-economic differentials in mortality beyond than during infancy.

Nevertheless, for all three segments of early childhood, especially the first two, substantial portions of the key socioeconomic differentials in survival chances remain unexplained. Thus, it appears that there exist various unmeasured behaviours and conditions related to higher household and community socio-economic status that significantly elevate the chances of child survival.

Thirdly, it seems that irrespective of familial socioeconomics, a significant number of deaths in the first month of life in 1981-86 Ondo State could have been avoided given more favourable family building patterns in the form of longer birth intervals, delayed childbearing and family size limitation. However, the bio-demographic variables most strongly associated with neonatal mortality - sex of child and birth type - in the study area are not easily amenable to behavioural changes except in terms of paying particular attention to male and multiple births from the moment they are born right through early infancy.

Fourthly, it is noteworthy that the significant estimated impacts of household and local area socioeconomic status on child survival beyond the neonatal period of life is not reduced by controlling for parental educational and social status factors. Being born into a poor household and area seems to confer such huge child survival disadvantages that dealing with poverty especially through improved provision of sanitary facilities and better housing has to be taken as a child health priority in Nigeria; a task now made even more difficult by the drastically worsening economic situation.

Fifthly, to the limited extent to which we have been able to capture the intermediate mechanisms through which the key socio-economic factors impacted upon child survival in 1981-86 Ondo State, it seems that preventative and indirect child health interventions related specifically to promoting family planning behaviour and improving household sanitary environments constitute potentially very effective options in the short-to-medium term for reducing the risks of child deaths in poor households and areas.

Finally, the failure of the analysis to capture some of the behaviours and conditions through which the main socio-economic inequalities in child survival were produced necessitates an analysis of the impact of these socio-economic factors on other child health outcomes namely, child nutritional, immunization, and recent diarrhoeal morbidity status. By comparing the results from such analysis with those from the mortality analysis, it might be possible to draw inferences on the nature of some of the unobserved influences and the extent to which they relate to curative rather than preventive health behaviours. This is the task taken up in the next chapter.

6.7: SUMMARY

This chapter sought to demonstrate the pathways through which the key socioeconomic factors in child survival operated to produce their effects. But the results only partially achieved this aim. Much of the main socioeconomic differentials in survival in infancy remained unexplained, with neonatal survival being shown to be most significantly determined by the speed of reproduction and bio-demographic attributes of births. Beyond infancy however, socio-economic inequalities in child survival seem to be largely due to differential quality of household sanitary conditions.

REFERENCES

Bicego, G. T. and J. T. Boerma (1991) Maternal Education and Childhood Mortality: A Comparative Analysis of DHS Data. IRD/Macro International Inc., Demographic and Health Surveys World Conference Proceedings Volume I (IRD, Columbia, Maryland) : 177-204.

Cleland, J. and J. van Ginneken (1989) Maternal Schooling and Childhood Mortality. Journal of Biosocial Science Supplement 10 : 13-34.

Frank, O. and M. Dakuyo (1985) Child Survival in subSaharan Africa : Structural Means and Individual Capacity - A Case Study of Burkina Faso. Center for Policy Studies Working Papers No. 122 (New York: The Population Council).

Hobcraft, J., J. W. McDonald, and S. Rutstein (1984) Socioeconomic Factors in Infant and Child Mortality: A Crossnational Comparison. Population Studies 38(2): 193-223.

CHAPTER SEVEN

DETERMINANTS OF SOCIOECONOMIC VARIATIONS IN CHILD NUTRITIONAL, RECENT DIARRHEAL MORBIDITY AND IMMUNIZATION STATUS

7.1: INTRODUCTION

To further clarify how the key socioeconomic child survival factors produced their effects, this chapter examines their impact upon three child health outcomes: nutritional status (stunting/underweight), recent diarrheal morbidity, and uptake of immunizations. Previous analysis indicated the existence of significant unmeasured influences through which relatively higher local development and household economic status afforded children better survival chances. In an area like Ondo State, a majority of early childhood deaths (beyond the first four weeks of life) are due to the high frequency of contracting infections and worsening nutritional status (Mosley, 1985). Indicators of these conditions thus need to be considered in an examination of child survival determinants. This is done separately from the mortality analysis because the available data only relate to children alive at survey. But by comparing the results presented here with those in the earlier chapters, a clearer picture should emerge on the pathways of influence on child mortality of the key socio-economic factors.

7.2: THE VARIABLES AND STATISTICAL PROCEDURES

Indicators of the three child health outcomes considered here were obtained and constructed as follows:

Stunting and underweight status: Height and weight were measured in the 1986 ODHS for children aged 6-36 months. A child is regarded as stunted if the recumbent length-for-age is more than two standard deviations below the NCHS/WHO reference median and may be viewed as manifesting chronic undernutrition as a result of the cumulative effects of poor nutrient consumption and/or repeated bouts with infections. A child is viewed as underweight if its weight-for-age is more than two standard deviations below the reference median. Underweight is considered more reflective of more recent deficits in nutritional intake and illness than stunting (Townbridge, 1985; Gorstein and Akre, 1988).

Wasting (low weight-for-height) is not considered because the cases (90) were too few for meaningful analysis; undernourished children are often both lighter and shorter than they should be for a given age. Also, the analysis excludes children whose height or weight were not recorded and whose measurements were implausible that is below -5.0 or above 4.0 standard deviations from the reference median. Due to the problems that may be caused by selection bias, we also present results from a multivariate analysis that includes all dead children as being stunted and underweight had they survived to survey date to see how different these are from the results of the original analysis.

Recent diarrheal morbidity status: Information was collected for all children aged below five years on the prevalence of diarrhoea in the two weeks preceding the interview and on the prevalence of fever and cough/breathing difficulties in the four weeks to survey. They are respectively thought to signal gastro-intestinal infection, malaria (in the study setting), and pneumonia, all of which can be fatal if left untreated appropriately. The problem with the morbidity data is that they are based on the subjective assessment and accuracy of recall of the mother concerning the child's health condition in the recent past and are far more sensitive to language ambiguities than death reporting.

We analyse here only the diarrhoea morbidity prevalence differentials because on an initial examination of sub-group differences in the reported prevalence of the three illnesses, far fewer meaningful and clear patterns emerged from the fever and respiratory ailment than from the diarrhoea data. This may be indicative of a greater tendency to confuse the symptoms of different illnesses the longer the period of recall.

First immunizations status: Mothers were asked if their (living) children under five years of age had a health card and if a mother was able to present the card, the interviewer recorded the dates of specific vaccinations. If she could not produce the card, she was asked whether the child had ever been vaccinated. Since cards were produced for only 24 percent of the children most of whom were very young and of educated and urban-based mothers, results from such an unrepresentative sample would be extremely difficult to interpret. The analysis reported here is based on the sample of all children aged 12-59 months and addresses the issue of whether a child had received the first (BCG, DPT1, POLIO1) of the five sets of immunizations which the WHO recommends should be completed by the 12th month of life

(UNICEF/WHO/UNESCO, 1989). For children without cards whose mothers reported that they had once been vaccinated, we assume that the vaccines received were BCG or DPT1/POLIO1.

Methods of analysis: The descriptive analysis is based on proportion of the different groups with the relevant outcome characteristic. The plausibility and size of the differentials are assessed by the implied relative risks and their conformity to theoretical expectations while their probable public health importance are implied by the population attributable risks. The strength of the associations are further indicated by the correlation coefficients (Pearson's R) and the extent of sampling errors indicated by the standard errors of the proportions.

The multivariate analysis is undertaken with logistic regression. The dichotomous outcomes examined here were analysed using the following model:

$$\text{logit } q_i = b_o + b_i X_i ,$$

where q_i is the probability of the outcome given the array of independent measures, X_i, and where b_o is a constant and b_i represents a series of unknown coefficients to be estimated through maximum-likelihood techniques.

With the theoretically low-risk group taken as reference, the maximum estimate of b is interpreted as the difference in the predicted log odds of the outcome between those with a particular higher-risk characteristic and those with the reference characteristic. To facilitate comparison with the results of the mortality analysis and since the relative odds will overstate the relative risks to varying degrees when the prevalence of the outcome is high (as with stunting/underweight and immunization status) and varies widely across the contrasted groups, relative odds were converted to relative risks thus:

$$RR = RO \;/\; \{(1-P_{ref}) + (RO*P_{ref})\}$$

where RR is the relative risks, RO, the relative odds, and P_{ref}, the prevalence of the outcome in the reference (Bicego and Boerma, 1991).

The process of model estimation again follows the causal/temporal ordering of factors implied by the proximate determinants framework for child survival analysis taking account of the level of the factor (that is, whether community, household, or individual). Given the strong age pattern to child nutritional status, the stunting and underweight models include controls for the current age of child (entered as categorical dummies).

7.3: CHILD STUNTING AND UNDERWEIGHT STATUS PREVALENCE PATTERNS

(a) Socioeconomic differentials in Stunting prevalence among children aged 6-36 months: Table 7.1a shows differences in child stunting prevalence by three community/household socioeconomic characteristics.

ble 7.1a: Stunting prevalence by household/community socioeconomic factors

riable	Proportion(%)	S.E.	R.R.	P.A.R.	Pearson's R.
cal area non-health frastructural devpt.					
Below average	29.5	1.90	85	n.a.	-0.05
Average and above	34.6	1.75	100	---	---
sidential milieu					
ural/riverine	37.2	1.79	141	18.7	0.13**
Urban	26.3	1.83	100	---	---
usehold disposable come status index					
Low	37.1	2.56	173	16.5	0.14**
Medium	35.6	1.92	166	23.7	---
High	21.4	2.24	100	---	---
Total	32.3	1.29	---	---	---

tes: ** denotes P < .01; * denotes P < .05; S.E. = standard error; R.R. = relative risks; P.A.R. = population attributable risks; R = correlation coefficient; n.a. = not applicable.

Unlike the neonatal but very much like the child mortality patterns, we find that whereas residence in infrastructurally more developed areas confers no advantage (indeed, a disadvantage) in child stunting, urban residence is associated with notably lower (by 40 percent) stunting prevalence than rural/riverine residence. Also, stunting prevalence is strongly inversely correlated with household income status, with children in the poorest households being about 1.70 times more likely to be stunted than those in the high income status homes, with implied population attributable risks of about 20 percent.

Table 7.1b documents the differentials in childhood stunting according to parental socioeconomic status attributes.

le 7.1b: Child stunting prevalence by parental socioeconomic characteristics

iable	Proportion(%)	S.E.	R.R.	P.A.R.	Pearson's R.
ernal educational tus					
schooling	34.3	1.76	123	11.5	0.06*
me primary	34.9	2.30	125	7.7	---
mplete primary	28.0	2.11	100	---	---
ernal educational tus					
schooling	34.0	1.97	125	9.9	0.05*
me primary	33.6	2.25	124	7.6	---
mplete primary	27.2	2.61	100	---	---
ernal occupational tus					
rming/unemployed	34.7	1.92	130	12.3	0.06*
les/services	31.9	2.13	120	6.9	---
hite-collar'	26.6	3.02	100	---	---
ernal work status					
t working	29.2	2.12	86	n.a.	-0.04
rrently working	34.0	1.62	100	---	---
cussed F.P. with partner ternal autonomy index)					
o	33.3	1.55	111	7.4	0.03
es	30.0	2.32	100	---	---
her's attitude to F.P. ia campaign (modernity ex)					
gative	33.0	3.29	102	0.3	0.01
sitive	32.0	1.40	100	---	---
riage type					
lygynous	33.6	1.97	107	2.9	0.02
nogamous	31.3	1.72	100	---	---
ital stability					
ce divorced	35.1	3.92	110	1.1	0.02
ver divorced	32.0	1.37	100	---	---

ote: F.P. = family planning

Sticking to our criteria of implied relative risks of at least 115 and population attributable risks of at least 10 percent, it is clear that as with the mortality patterns, many of the parental socioeconomic attributes do not strongly co-vary with child stunting prevalence. Moreover, among those that meet the specified criteria, it is notable that compared to the observed differentials in child mortality (3q1), the co-variation of stunting levels with the parental education variables is clearly not as strong as the variations by the income status index and residential milieu. Nevertheless, children of women with no schooling, of those currently working and of farming/trading fathers are at least 1.15 times more likely to be stunted than those in contrasting categories.

(b) <u>Differentials in Stunting prevalence among children aged 6-36 months according to proximate variables</u> In Table 7.2a estimates of stunting prevalence by biodemographic factors are presented.

<u>Table 7.2a: Child Stunting prevalence by biodemographic variables</u>

iable	Proportion(%)	S.E.	R.R.	P.A.R.	Pearson's R
rent age of child					
months+	48.1	2.40	441	53.1	0.30**
- 23	32.5	1.99	298	45.4	---
12	10.9	1.74	100	---	---
ernal age (years)					
20	38.0	4.67	122	2.0	0.05
+	33.7	2.76	108	2.0	---
- 34	31.2	1.53	100	---	---
ceding birth interval					
rst births	34.6	3.30	109	1.4	0.02
24 months	32.3	3.68	102	0.2	---
months+	31.8	1.52	100	---	---
th order					
rst	34.6	3.30	110	1.5	0.02
	32.3	2.21	102	0.7	---
- 5	31.6	1.82	100	---	---
of child					
le	32.7	1.79	103	2.0	0.01
nale	31.9	1.87	100	---	---
th type					
ltiple	54.0	6.28	173	3.8	0.11**
ngle	31.2	1.31	100	---	---

It seems that apart from current age and birth type, the biodemographic status of children does not make much difference to their likelihood of being short for their age in sharp contrast to their likelihood of dying documented in Chapter Five. Thus, it seems that factors such as sex of child, age of mother, order of birth, and inter-birth interval while not being very critical to children's nutrient intake or exposure to infections, may be quite important in influencing the quality of care that they receive once they become seriously ill. However, the considerable increase in stunting with age is consistent with progressive independence of children from breastfeeding and greater exposure to prevailing weaning/dietary norms and the environment as they become more mobile and active. The particular vulnerability of twins is again highlighted by the stunting prevalence data.

Table 7.2b presents the estimated prevalence of stunting among Ondo under-threes according to micro-environmental and health services accessibility/care factors. The figures suggest that apart from the differentials by household size which, like the child mortality ones, shows seemingly unexpected negative co-variation with stunting prevalence, all the examined differentials are in the theoretically expected directions.

However, while the size of the differentials according to local area availability and household access to pipe-borne water supplies roughly parallel equivalent child mortality (3q1) differentials, the differentials by household toilet type/age of children at use, local area spatial density of modern health services, mother's knowledge of ORT, tetanus vaccination, and breastfeeding duration are all smaller.

ble 7.2b: Child stunting prevalence by micro-environmental and health care/ services accessibility variables

riable	Proportion(%)	S.E.	R.R.	P.A.R.	Pearson's R
cal area per capita ter supply					
ero	35.7	2.06	129	10.7	0.08*
10 litres/day	34.2	2.91	123	4.4	---
0 litres+/day	27.7	2.00	100	---	---
usehold drinking ter source					
on-pipe	35.0	1.85	118	8.4	0.06*
ipe-borne	29.6	1.80	100	---	---
usehold toilet type/ e at use by children					
o toilets	35.5	1.92	135	14.5	0.09**
ush/latrines at >5 years	30.7	2.07	117	5.7	---
ush/latrines at <5 years	26.2	3.18	100	---	---
usehold size					
+	31.6	1.73	95	n.a.	-0.02
e 7	33.3	1.94	100	---	---
neral health services atial density					
elow average	35.6	2.09	120	7.4	0.06*
verage	30.8	2.44	104	1.0	---
bove average	29.6	2.21	100	---	---
ther knows ORT (S.S.S.)					
No	34.7	1.67	121	11.5	0.07*
Yes	28.6	2.02	100	---	---
tanus vaccination					
No	35.4	2.46	114	3.8	0.04
Yes	31.1	1.52	100	---	---
eastfeeding duration					
topped/ < 12 months	33.4	2.42	108	2.0	0.02
till / 12 months+	31.0	1.52	100	---	---

ote: ORT (S.S.S.) - oral rehydration therapy [sugar-salt-solutions]

Nevertheless, the relative and population attributable risks associated with household toilet type/child use, density of health services, mother's knowledge of ORT and piped water access factors are large enough to be included in the multivariate analysis whose results are summarized in Tables 7.3a and 7.3b.

ble 7.3a: Relative risks of stunting among 6-36 month olds associated with y socioeconomic and proximate variables : results of logistic regressions^

riable /Models:	One	Two	Three	Four	Five	Six	Seven	Eight	Nine
usehold disposable									
come status index									
edium	1.69**	1.53**	1.53**	1.56**	1.52**	1.56**	1.58**	1.60**	1.59**
ow	1.92**	1.67**	1.67**	1.71**	1.68**	1.76**	1.76**	1.78**	1.76**
sidential milieu									
ural/riverine		1.29**	1.28*	1.28*	1.27*	1.40**	1.42**	1.43**	1.42**
ternal education									
ome primary			1.09	1.12	1.11	1.11	1.20	1.20	1.19
o schooling			1.03	1.04	1.03	1.04	1.13	1.13	1.12
ternal occupation									
ales/services			1.04	1.05	1.05	1.04	1.07	1.06	1.06
arming/unemployed			1.13	1.15	1.15	1.14	1.17	1.17	1.16
ternal education									
ome primary				1.02	1.02	1.01	1.05	1.06	1.02
o schooling				0.95	0.94	0.96	1.00	1.00	0.96
ternal work status									
ot working				0.88	0.88	0.89	0.87	0.87	0.85
cal area water supply									
10 litres/day					1.08	1.09	1.09	1.06	1.06
Zero					1.09	1.11	1.09	1.08	1.07
usehold toilet type									
ge at use									
ush/latrines at >5 years						1.18*	1.16	1.17	1.18
o toilets						1.12	1.08	1.11	1.09
usehold drinking water									
on-pipe						0.84	0.86	0.86	0.85
eceding interval/birth order									
e 24 months and order 6+							0.96	0.97	0.97
24 months/order 1							1.21*	1.20*	1.21*
rth type									
ultiple							1.96**	1.96**	2.00**
neral health services									
atial density									
verage								0.90	0.90
elow average								0.96	0.94
ther knows ORT (S.S.S.)									
No									1.01
tanus vaccination									
No									1.12
ange in Model X^2	30.44	6.73	.878	2.91	.599	3.12	19.94	.710	1.58
-value	.000	.009	.645	.112	.741	.111	.000	.701	.198

tes: ** denotes P <.01; * denotes P <.05; Ge = greater than or equal to; ORT (S.S.S.) oral rehydration therapy (sugar-salt-solutions); ^ models control for current age of child.

ble 7.3b: Relative risks of stunting (including all dead children as stunted) sociated with key explanatory variables: results of logistic regressions^

riable /Models:	One	Two	Three	Four	Five	Six	Seven	Eight	Nine
usehold disposable come status index									
Medium	1.72**	1.61**	1.61**	1.63**	1.61**	1.62**	1.64**	1.65**	1.65**
Low	2.11**	1.74**	1.78**	1.81**	1.79**	1.83**	1.83**	1.82**	1.81**
sidential milieu									
ural/riverine		1.21	1.21	1.20	1.19	1.30*	1.31*	1.29*	1.28*
ternal education									
ome primary			1.13	1.12	1.13	1.13	1.24	1.24	1.23
o schooling			1.04	1.04	1.06	1.06	1.16	1.14	1.13
ternal occupation									
ales/services			1.06	1.07	1.08	1.10	1.16	1.15	1.15
arming/unemployed			1.17	1.19	1.20	1.19	1.22	1.21	1.21
ternal education									
ome primary				0.99	0.98	0.99	1.00	1.02	1.01
o schooling				0.92	0.89	0.89	0.92	0.96	0.93
ternal work status									
ot working				0.87	0.91	0.87	0.85	0.86	0.86
cal area per capita ter supply									
10 litres/day					1.09	1.08	1.09	1.09	1.09
Zero					1.07	1.08	1.07	1.05	1.06
usehold toilet type/ e at use									
ush/latrines at >5 years						1.26*	1.25*	1.26*	1.26*
o toilets						1.28*	1.25*	1.24*	1.24*
usehold drinking water									
on-pipe						0.86	0.88	0.88	0.87
eceding interval/birth order									
24 months and order 6+							0.97	0.96	0.95
24 months/order 1							1.26*	1.24*	1.24*
rth type									
ultiple							1.92**	1.94**	1.92**
neral health services atial density									
verage								0.98	0.96
elow average								1.01	1.00
ther knows ORT (S.S.S.)									
No									1.11
tanus vaccination									
No									1.02
ange in model X^2	33.17	4.98	1.24	4.86	.527	3.94	22.53	.298	2.85
-value	.000	.056	.439	.081	.788	.099	.000	.860	.096

otes: ** denotes P <.01; * denotes P <.05; Ge - greater than or equal to; ORT (S.S.S.) - oral rehydration therapy (sugar-salt-solutions);
^ models control for current age of child.

The estimated effects on the risks of child stunting associated with the household disposable income status indicator roughly parallels in magnitude the effects on post-neonatal mortality but is slightly smaller than the effects on child mortality. Children in the poorest homes are about twice as likely to be stunted as children in the most well-off homes. Controlling for residential milieu (most probably tapping broad aspects of modernization), reduces by about 25 percent the gross effects of the income status index while the introduction of four factors of parental socioeconomic status does not erase any of the remaining effects.

More importantly, as with the post-neonatal mortality patterns but, very much unlike the child mortality situation, the results do suggest that the impact of the household income status on stunting is not mediated by local area and household sanitary conditions. Neither is it mediated by family formation patterns, maternal child health therapy knowledge and contact with modern preventive child health services. However, being a multiple birth, a first birth or born shortly after a previous child is each independently associated with notably increased risks of stunting.

It is noted here that the possibility that omission of dead children from the analysis may have introduced a selection bias is not borne out by the figures in Table 7.3b showing the results of the stunting models for all children (including dead children) based on the extreme assumption that all of the dead children would have been stunted at the time of survey had they survived.

The household income status effects appear to be only slightly larger than in the models based on data for living children.

(c) Socioeconomic variations in underweight status prevalence among children aged 6-36 months : In Table 7.4a, estimates of underweight prevalence among young children in 1981-86 Ondo State according to community and household-level socioeconomic status indicators are presented.

ble 7.4a: Child underweight prevalence by community/household status factors

riable	Proportion(%)	S.E.	R.R.	P.A.R.	Pearson's R
cal area non-health frastructural devpt.					
elow average	28.1	1.88	98	n.a.	-0.00
verage and above	28.8	1.67	100	---	---
sidential milieu					
ural/riverine	33.3	1.75	148	21.3	0.12**
rban	22.5	1.74	100	---	---
usehold disposable come status index					
ow	37.1	2.56	204	21.9	0.16**
edium	29.2	1.83	160	21.9	---
igh	18.2	2.10	100	---	---
otal	28.5	1.25	---	---	---

tes: S.E.-standard error; n.a.-not applicable; R.R.-relative risks; P.A.R.-population attributable risk; P.A.R. = P(R.R.-1)/1+P(R.R.-1), provided R.R. ge 1; where P- proportion of the population 'exposed' to the risk factor; ge-greater than or equal to;

As with the stunting and child mortality differentials but in contrast to the post-neonatal mortality patterns, the level of infrastructural development of children's local area appears to be irrelevant to their chances of being underweight for their ages although those residing in a rural milieu and in poor households are much more likely to be of low weight-for-age than children in urban settings and especially economically well-off homes. Underweight prevalence differences according to parental socioeconomic status variables are shown in Table 7.4b.

ɔle 7.4b: Underweight prevalence by parental socioeconomic status factors

riable	Proportion(%)	S.E.	R.R.	P.A.R.	Pearson's R
ternal educational atus					
ɔ schooling	32.5	2.26	139	11.5	0.08**
ɔme primary	30.0	2.22	128	8.3	---
ɔmplete primary	23.4	1.99	100	---	---
ternal educational atus					
ɔ schooling	31.4	1.93	140	14.1	0.08**
ɔme primary	28.8	2.15	129	9.1	---
ɔmplete primary	22.4	2.45	100	---	---
ternal occupational atus					
arming/unemployed	32.7	1.89	170	24.8	0.11**
ales/services	27.3	2.03	142	13.8	---
White-collar'	19.2	2.69	100	---	---
ternal work status					
urrently working	28.6	1.55	101	0.7	0.00
ot working	28.3	2.10	100	---	---
scussed F.P. with partner aternal autonomy index)					
No	30.0	1.51	120	12.3	0.06*
Yes	25.1	2.19	100	---	---
ther's attitude to F.P. dia campaign (modernity dex)					
egative	31.0	3.25	110	1.6	0.02
ositive	28.1	1.35	100	---	---
rriage type					
olygynous	30.7	1.92	115	6.5	0.03
onogamous	26.8	1.64	100	---	---
rital stability					
nce divorced	31.8	3.82	113	1.4	0.03
ever divorced	28.1	1.32	100	---	---

tes: As in Table 7.4a.

The size of the relative and population attributable risks associated with paternal education, mother's schooling, paternal occupational status and the maternal autonomy/spousal communication index highlight these factors as aspects of familial socioeconomics strongly correlated with the risks of poor weight-gain by young children in 1981-86 Ondo State. But these parental attributes do not co-vary with underweight prevalence as strongly as the household income status index. Interestingly, paternal occupational status turns out to be more strongly inversely associated with underweight prevalence than the parental education variables.

(d) <u>Differentials in low weight-for-age prevalence among 6-36 months old children according to proximate variables.</u>

Table 7.5a presents low weight-for-age prevalence according to the biodemographic attributes of the children.

ble 7.5a: Child underweight status prevalence by biodemographic variables

riables	Proportion(%)	S.E.	R.R.	P.A.R.	Pearson's R
rrent age of child					
4 months+	36.8	2.32	215	27.5	0.17**
2 - 23	28.7	1.92	168	22.5	---
12	17.1	2.09	100	---	---
ternal age (years)					
20	35.2	4.59	134	2.9	0.08**
35+	33.3	2.75	127	5.7	---
0 - 34	26.2	1.46	100	---	---
eceding birth interval					
irst births	33.7	3.28	124	3.8	0.05*
24 months	29.8	3.60	110	1.2	---
4 months	27.2	1.45	100	---	---
rth order					
irst	33.7	3.28	130	4.6	0.07**
+	30.3	2.18	117	5.7	---
- 5	25.8	1.71	100	---	---
x of child					
ale	28.3	1.72	99	n.a.	-0.00
emale	28.7	1.82	100	---	---
rth type					
ultiple	61.9	6.11	231	6.5	0.17**
ingle	26.8	1.26	100	---	---

tes: As in Table 7.4a

Again, it seems that apart from the current age of child and birth type, the biodemographic attributes of a child do not greatly enhance or diminish its likelihood of being thin for its age. Nevertheless, it appears that biodemographic factors (except sex of child) are somewhat more strongly correlated with low weight-for-age than low height-for-age which is more reflective of longer term nutritional status. An indication of the impact of other proximate factors is given in Table 7.5b which documents variations in underweight prevalence by micro-environmental and health care/services-related indicators.

ble 7.5b: Underweight prevalence by environmental and health-related factors

riable	Proportion(%)	S.E.	R.R.	P.A.R.	Pearson's R
cal area water supply					
Zero	33.9	2.03	157	19.4	0.13**
<10 litres/day	30.5	2.82	141	7.6	---
10 litres+/day	21.6	1.84	100	---	---
usehold drinking water					
on-pipe	30.3	1.78	113	6.5	0.04
ipe-borne	26.7	1.74	100	---	---
usehold toilet type/ e at use					
No toilets	33.4	1.89	142	16.7	0.10**
ush/latrines at >5 years	24.2	1.92	103	1.0	---
ush/latrines at <5 years	23.7	3.07	100	---	---
usehold size					
8+	28.5	1.69	100	0.0	0.00
Le 7	28.5	1.85	100	---	---
neral health services atial density					
elow average	32.0	2.03	135	12.3	0.08**
verage	29.1	2.40	123	5.7	---
bove average	23.7	2.06	100	---	---
ther knows ORT (S.S.S.)					
No	31.6	1.63	134	17.4	0.09**
Yes	23.6	1.89	100	---	---
tanus vaccination					
No	34.1	2.44	130	8.3	0.08**
Yes	26.2	1.44	100	---	---
eastfeeding duration					
opped/< 12 months	32.5	2.40	105	2.0	0.04
ill/ > 12 months	30.9	1.52	100	---	---

tes: As in Table 7.4a.

Except for the differentials by breastfeeding duration and household size, the variations in underweight prevalence according to the examined environmental sanitation and health care/services factors are relatively strong and in the expected directions. In particular, children belonging to the 'highest-risk' categories of the variables on local area per capita water supply and spatial density of modern health services, household toilet type/age at use by children and mother's knowledge of ORT are more likely by at least 34 percent to be underweight than children in the lowest risk categories. In Tables 7.6a and 7.6b, we examine the extent to which these proximate factors mediate the strong association shown to exist between household economic status and young children's weight-for-age in Ondo State. The results are summarized in terms of the logistic regression estimates of relative risks of low weight-for-age associated with all the key explanatory variables.

The estimated household income status effects on the risks of low weight-for-age are slightly larger than those observed for the risks of stunting although like the latter, the models including all dead children as underweight if they had survived to survey (Table 7.6b) convey similar patterns to those provided by the models based on data for living under-threes only. But in contrast to the results from the stunting models, the estimated relative risks of low weight-for-age associated with household income status lie between those observed for post-neonatal and child mortality and the pattern of mediation of these effects via factors of residential area and sanitation also differ.

le 7.6a: Relative risks of low weight-for-age among 6-36 months olds
sociated with key explanatory variables: results of logistic regressions^

iable / Models:	One	Two	Three	Four	Five	Six	Seven	Eight	Nine
isehold disposable									
come status index									
edium	1.61**	1.46**	1.44*	1.43*	1.32	1.30	1.34	1.32	1.30
ow	2.14**	1.90**	1.86**	1.84**	1.74**	1.71**	1.74**	1.73**	1.68**
idential milieu									
ural/riverine		1.26*	1.24*	1.24*	1.21	1.20	1.27*	1.24	1.22
ernal education									
ome primary			1.00	1.01	1.00	1.00	1.15	1.15	1.15
schooling			1.02	1.03	1.03	1.03	1.14	1.13	1.13
ernal occupation									
les/services			1.47*	1.49*	1.50*	1.50*	1.48*	1.48*	1.44*
rming/unemployed			1.41*	1.43*	1.44*	1.42*	1.43*	1.42*	1.40*
ernal education									
ome primary				0.97	0.97	0.97	1.02	1.02	1.00
schooling				0.96	0.96	0.96	1.02	1.02	0.99
scussed F.P. with partner									
aternal autonomy index)									
No				1.07	1.06	1.06	1.11	1.11	1.09
al area water supply									
10 litres/day					1.21	1.20	1.22	1.25	1.24
None					1.33**	1.32**	1.27*	1.27*	1.24
isehold toilet type/									
e at use									
ush/latrines at >5 years						1.04	1.03	1.03	1.05
toilets						1.08	1.02	1.02	1.02
isehold drinking water									
on-pipe						1.02	1.02	0.99	0.97
ternal age (years)									
5+							1.10	1.10	1.07
eceding interval/									
rth order									
24 months and order 6+							0.96	0.96	0.96
24 months / order 1							1.41**	1.41**	1.41**
rth type									
ultiple							2.59**	2.59**	2.61**
neral health services									
atial density									
verage								1.05	1.06
elow average								1.09	1.07
ther knows ORT (S.S.S.)									
No									1.09
tanus vaccination									
No									1.19
ange in Model X^2	35.42	4.55	6.67	.429	6.46	.191	51.04	.214	2.29
value	.000	.033	.039	.521	.040	.909	.000	.899	.128

otes: ** denotes P <.01; * denotes P <.05; ORT (S.S.S.) - oral rehydration therapy (sugar-salt-solutions); Ge - greater than or equal to; ^ models control for current age of child.

)le 7.6b: Relative risks of low weight-for-age among 6-36 months olds ıcluding all dead children as underweight) associated with key explanatory :iables: results of logistic regressions^

:iable / Models:	One	Two	Three	Four	Five	Six	Seven	Eight	Nine
ısehold disposable									
:ome status index									
ədium	1.65**	1.57**	1.54**	1.52**	1.46**	1.42**	1.47**	1.44**	1.40*
)w	2.15**	2.00**	1.98**	1.95**	1.88**	1.86**	1.90**	1.86**	1.77**
ıidential milieu									
ıral/riverine		1.21	1.14	1.13	1.10	1.11	1.15	1.11	1.09
:ernal education									
)me primary			1.06	1.09	1.08	1.09	1.12	1.10	1.06
) schooling			1.04	1.07	1.07	1.07	1.09	1.06	1.04
:ernal occupation									
ıles/services			1.46*	1.47*	1.43*	1.44*	1.46*	1.43*	1.40*
ırming/unemployed			1.43*	1.45*	1.41*	1.41*	1.43*	1.41*	1.39*
:ernal education									
)me primary				0.96	0.95	0.95	1.03	1.06	1.01
) schooling				0.90	0.90	0.89	1.01	1.02	0.99
ıcussed F.P with partner									
ıternal autonomy index)									
ɪo				1.12	1.13	1.12	1.16	1.13	1.10
:al area water supply									
10 litres/day					1.19	1.15	1.18	1.17	1.16
ɪone					1.27*	1.25*	1.24*	1.20	1.18
ısehold toilet type/									
ə at use									
ısh/latrines at >5 years						1.16	1.13	1.11	1.09
) toilets						1.25	1.22	1.21	1.19
ısehold drinking water									
)n-pipe						1.06	1.07	1.04	1.02
:ernal age (years)									
5+							1.12	1.10	1.10
20							1.19*	1.18*	1.18*
əceding interval/									
:th order									
24 months and order 6+							0.99	0.98	1.00
?4 months / order 1							1.41**	1.41**	1.42**
:th type									
ıltiple							2.57**	2.56**	2.56**
ıeral health services									
ıtial density									
/erage								1.12	1.13
əlow average								1.16	1.14
:her knows ORT (S.S.S.)									
ɪo									1.13
:anus vaccination									
ɪo									1.20
ınge in Model X^2	38.48	2.64	2.43	.618	5.31	2.79	46.42	.604	1.96
-value	.000	.163	.298	.448	.070	.256	.000	.740	.158

)tes: ** denotes P <.01; * denotes P <.05; ORT (S.S.S.) - oral rehydration therapy (sugar-salt-solution); Ge - greater than or equal to; ^ models control for current age of child.

With current age of child held constant, children in low income-status households are more than twice as likely to be underweight as those in high income status homes while children in medium status homes are about 60 percent more likely. Controlling for rural-urban residence erases about a fifth of these initial effects. But the inclusion of the four parental socio-economic status variables erases virtually none of the remaining effects.

However, unlike the stunting results, the inclusion of the environmental sanitation factors especially local area access to pipe-borne water explains away about another 20 percent of the estimated household economic status effects. Other proximate factors - maternal age, preceding interval/birth order, birth type, and child health care knowledge, services accessibility and utilization - erase less than 10 percent of the remaining effects despite the statistically significant independent effects of the three biodemographic factors.

7.4: PATTERNS IN RECENT DIARRHEAL MORBIDITY

The next four tables present figures showing the differentials in reported prevalence of diarrheal morbidity among Ondo under-fives in the last two weeks to survey according to the examined socioeconomic and proximate variables.

le 7.7a: Reported prevalence of diarrheal morbidity (last two weeks) among er-fives according to community and household socioeconomic status factors

iable	Proportion(%)	S.E.	R.R.	P.A.R.	Pearson's R
al area non-health rastructural devpt.					
low average	8.6	0.77	101	0.4	0.00
erage and above	8.5	0.68	100	---	---
idential milieu					
ral/riverine	8.8	0.68	107	3.8	0.01
oan	8.2	0.78	100	---	---
sehold disposable ome status index					
V	7.3	0.90	79	n.a.	-0.03
dium	8.8	0.75	95	n.a.	---
gh	9.3	1.06	100	---	---
tal	8.5	0.51	---	---	---

tes: As in Table 7.4a.

Given that diarrheal diseases are thought to be the leading cause of infant and child mortality in developing countries (UNICEF/ WHO/UNESCO, 1989) and this study has documented some notable socioeconomic differentials in childhood mortality in 1981-86 Ondo State especially according to local area development level and household economic status, we might expect similar socio-economic variations in the reported prevalence of recent diarrheal morbidity. But the figures in Tables 7.7a and 7.7b suggest that few of the socioeconomic differentials are even large enough as to warrant targetted diarrheal control measures.

ble 7.7b: Reported prevalence of diarrheal morbidity (last two weeks) among under-fives according to parental socioeconmic status characteristics

riable	Proportion(%)	S.E.	R.R.	P.A.R.	Pearson's R
ternal educational atus					
o schooling	7.5	0.83	80	n.a.	-0.03
ome primary	8.6	0.89	91	n.a.	---
omplete primary	9.4	0.93	100	---	---
ternal educational atus					
o schooling	6.9	0.69	72	n.a.	-0.02
ome primary	10.1	0.95	105	2.0	---
omplete primary	9.6	1.18	100	---	---
ternal occupational atus					
arming/unemployed	7.9	0.71	113	5.7	-0.01
ales/services	10.0	0.91	143	13.0	---
White-collar'	7.0	1.14	100	---	---
ternal work status					
urrently working	9.0	0.64	120	11.8	0.04
ot working	7.5	0.83	100	---	---
scussed F.P. with partner aternal autonomy index)					
No	8.9	0.62	119	11.5	0.03
Yes	7.5	0.89	100	---	---
ther's attitude to F.P. dia campaign (modernity dex)					
egative	10.2	1.45	124	3.8	0.02
ositive	8.2	0.54	100	---	---
rriage type					
olygynous	9.1	0.80	114	5.7	0.02
onogamous	8.0	0.66	100	---	---
rital stability					
nce divorced	15.3	1.86	201	10.8	0.10**
ever divorced	7.6	0.52	100	---	---

tes: As in Table 7.4a.

ble 7.7c: Reported prevalence of diarrheal morbidity (last two weeks) among under-fives according to biodemographic variables

riable	Proportion(%)	S.E.	R.R.	P.A.R.	Pearson's R
rrent age of child					
months+	9.1	0.68	130	15.0	0.05*
- 23	8.5	1.14	121	4.0	---
12	7.0	1.01	100	---	---
ernal age (years)					
20	13.9	2.38	160	4.0	0.02
5+	6.5	0.93	75	n.a.	---
- 34	8.7	0.62	100	---	---
ceding birth interval					
rst births	12.5	1.53	158	8.3	0.05*
24 months	7.1	1.22	90	n.a.	---
+	7.9	0.59	100	---	---
rth order					
rst	12.5	1.53	142	6.5	0.02
	6.3	0.78	93	n.a.	---
- 5	8.8	0.72	100	---	---
of child					
le	9.0	0.73	113	6.6	0.02
male	8.0	0.71	100	---	---
rth type					
ltiple	6.7	2.42	78	n.a.	-0.01
ngle	8.6	0.52	100	---	---

es: As in Table 7.4a.

ble 7.7d: Reported prevalence of recent diarrheal morbidity (last two weeks) nong under-fives by micro-environmental and health care/services variables

riable	Proportion(%)	S.E.	R.R.	P.A.R.	Pearson's R
cal area per capita					
ter supply					
ero	8.2	0.79	94	n.a.	-0.01
10 litres/day	8.9	1.12	102	0.4	---
0 litres+/day	8.7	0.84	100	---	---
usehold drinking water					
on-pipe	8.6	0.71	102	1.0	0.00
ipe-borne	8.4	0.74	100	---	---
usehold toilet type/					
e at use by children					
o toilets	10.4	0.81	153	20.0	0.07**
ush/latrines at >5 years	6.7	0.73	99	n.a.	---
ush/latrines at <5 years	6.8	1.22	100	---	---
usehold size					
8+	9.1	0.70	124	11.5	0.03
Le 7	7.8	0.74	100	---	---
neral health services					
atial density					
elow average	7.6	0.77	77	n.a.	-0.03
verage	8.0	0.95	81	n.a.	---
bove average	9.9	0.96	100	---	---
ther knows ORT (S.S.S.)					
No	6.9	0.58	61	n.a.	-0.07*
Yes	11.3	0.96	100	---	---
tanus vaccination					
No	7.8	0.92	89	n.a.	-0.02
Yes	8.8	0.61	100	---	---
eastfeeding duration					
topped/ < 12 months	8.9	0.85	102	0.7	0.01
till / 12 months+	8.7	0.65	100	---	---

tes: As in Table 7.4a.

Local area development level apparently makes no difference to diarrhea prevalence levels and the household income status index and the parental education variables surprisingly show a positive co-variation with reported diarrheal morbidity prevalence while the rural-urban differential is very small (7 percent). Indeed, it is the socioeconomic factors which were found to be of modest or no independent impact on child survival that emerge as strongly and plausibly co-varying with diarrheal morbidity prevalence. In particular, children of women who have been divorced at least once are about twice as likely to be suffering from diarrhoea than other children although they are a small group (12 percent of the sample).

The differentials according to the proximate variables (tables 7.7c and 7.7d) are somewhat more consistent than the socioeconomic ones especially those by current age of child, household toilet facilities and household size. Since most children in Ondo State are weaned after their second birthday and thus become more exposed to diets of less than adequate nutrient and hygienic quality, it is not surprising that the highest diarrhoea prevalence rate is reported for children aged 24 months and over. The likelihood of greater exposure to fecal matter by children in homes lacking conventional toilets may explain the more than 50 percent increase in the risks of diarrhoea infections among children in such homes compared to others. But it is somewhat odd that children in local areas served by pipe-borne water and with health facilities and of women that have had previous contacts with preventive health facilities are reported as having suffered more from recent diarrhoea illnesses than children in contrasting situations. It is interesting though, that women who reported knowing about ORT also reported a higher occurrence of recent diarrhoea illnesses among their children than women who did not; suggesting that the health campaigns in Nigeria to promote the use of home-made oral rehydration solutions to combat childhood diarrhoea may have made their mark in Ondo State.

Some of the seemingly implausible differentials described above are however not very dissimilar to those recently documented for wide areas of the developing world including sub-Saharan Africa. Boerma et al (1991) report the existence of no difference or a positive correlation of maternal education (especially up to primary level) with recent diarrhoea morbidity among young children in the DHS data for 18 out of 23 developing countries. In particular, primary education had no effect on the prevalence of diarrhoea in the 11 subSaharan Africa countries considered in the study. They also reported very small or inconsistent differentials by demographic characteristics.

The modest size of the plausible socioeconomic differentials in diarrhoea prevalence in Ondo State and the relative preponderance of seemingly implausible ones given the mortality differentials precluded the need for multivariate analysis. The modest outcome of the diarrheal morbidity analysis derives partly from differential reporting. Nevertheless, the consistent picture that parts of the data paint as regards for example, the age and household size patterns in diarrhoea prevalence, does suggest that the existence of very few major and consistent socioeconomic variations in the prevalence of diarrhoea illnesses among young children in 1981-86 Ondo State may be genuine.

7.5: CHILDHOOD IMMUNIZATIONS DIFFERENTIALS

Tables 7.8a to 7.8c document the differentials in the non-uptake of the recommended first set of childhood immunizations

(BCG/DPT1/POLIO1) by Ondo children aged 12-59 months according to relevant socioeconomic and proximate factors.

ble 7.8a: Non-uptake of first childhood immunizations by community and household level socioeconomic status indicators

riable	Proportion(%)	S.E.	R.R.	P.A.R.	Pearson's R
cal area non-health frastructural devpt.					
elow average	43.2	1.75	144	16.0	0.14**
verage and above	30.1	1.42	100	---	---
sidential milieu					
ural/riverine	43.0	1.48	174	31.0	0.19**
rban	24.7	1.60	100	---	---
usehold disposable come status index					
ow	44.4	2.10	216	25.9	0.17**
edium	37.3	1.63	181	28.1	---
igh	20.6	2.01	100	---	---
otal	35.8	1.12	---	---	---

tes: As in Table 7.4a.

ɔle 7.8b: Non-uptake of first childhood immunizations according to parental socioeconomic status characteristics

ciable	Proportion(%)	S.E.	R.R.	P.A.R.	Pearson's R
ternal educational atus					
ɔ schooling	44.4	1.92	196	26.5	0.18**
ɔme primary	38.1	1.96	169	18.7	---
ɔmplete primary	22.6	1.79	100	---	---
ternal educational atus					
ɔ schooling	44.5	1.64	285	48.2	0.22**
ɔme primary	33.1	1.91	212	27.0	---
ɔmplete primary	15.6	2.04	100	---	---
ternal occupational atus					
arming/unemployed	43.5	1.62	206	35.1	0.18**
ales/services	30.8	1.85	146	13.8	---
White-collar'	21.1	2.44	100	---	---
ternal work status					
urrently working	31.0	1.31	67	n.a.	-0.15**
ot working	46.1	2.06	100	---	---
scussed F.P. with partner aternal autonomy index)					
No	41.4	1.34	205	43.5	0.20**
Yes	20.2	1.82	100	---	---
ther's attitude to F.P. dia campaign odernity index)					
Negative	51.6	2.98	157	8.3	0.14**
Positive	32.9	1.19	100	---	---
rriage type					
olygynous	42.4	1.72	139	15.3	0.13**
onogamous	30.4	1.45	100	---	---
rital stability					
nce divorced	38.6	3.22	109	1.0	0.02
ever divorced	35.4	1.19	100	---	---

tes: As in Table 7.4a.

ble 7.8c: Non-uptake of first childhood immunizations according to bio-demographic and health care / services variables

riable	Proportion(%)	S.E.	R.R.	P.A.R.	Pearson's R
rrent age of child					
2 - 23 months	42.2	2.56	123	4.8	0.07*
4+	34.2	1.24	100	---	---
usehold size					
8+	36.3	1.51	103	2.0	0.01
Le 7	35.2	1.06	100	---	---
ternal age (years)					
20	39.4	4.17	113	1.0	0.03
35+	36.8	2.25	105	2.0	---
0 - 34	35.0	1.35	100	---	---
eceding birth interval					
irst births	29.0	2.73	76	n.a.	-0.08*
24 months	31.8	2.70	83	n.a.	---
4 months+	38.2	1.37	100	---	---
rth order					
irst	29.0	2.73	85	n.a.	0.01
+	41.2	1.99	121	6.5	---
- 5	34.1	1.54	100	---	---
x of child					
ale	35.6	1.56	99	n.a.	-0.00
emale	36.0	1.61	100	---	---
rth type					
ultiple	23.7	5.53	65	n.a.	-0.05
ingle	36.2	1.14	100	---	---
neral health services atial density					
elow average	49.0	1.79	202	30.6	0.23**
verage	27.8	2.02	114	3.8	---
bove average	24.3	1.81	100	---	---
ther knows ORT (S.S.S.)					
No	43.3	1.40	219	44.8	0.24**
Yes	19.8	1.65	100	---	---
tanus vaccination					
No	76.0	1.78	432	50.7	0.56**
Yes	17.6	1.07	100	---	---

tes: As in Table 7.4a.

The largest socioeconomic differentials in non-uptake of the first set of childhood immunizations are by household disposable income status, maternal education, spousal communication/maternal autonomy index, paternal education, and paternal occupational status. It is of note that these differentials are more consistent and broadly larger than equivalent childhood mortality differentials except for the household income status index.

As regards variations according to relevant proximate factors (Table 7.8c), it appears that in general, the biodemographic characteristics of children make no big difference to their chances of being immunized against common childhood diseases during their first year of life. Indeed, it is children with the 'less favourable' characteristics that were more likely to have received first childhood immunizations. It is quite clear though, that children of women who are relatively more knowledgeable about child health therapies, who received the tetanus toxoid vaccine while pregnant, and of those residing in areas relatively well-served by modern health facilities, are far less likely not to have received first childhood immunizations than other children.

We now examine how the significant proximate factors mediate the relationships between the key socioeconomic variables and non-uptake of first childhood immunizations especially the impact of the household income status indicator. The relevant results are summarized in Table 7.9.

ɔle 7.9: Relative risks of non-uptake of first childhood immunizations among ɔhildren aged 12-59 months associated with key socioeconomic and proximate variables: results of logistic regressions

iable	Models: One	Two	Three	Four	Five	Six	Seven
al area non-health frastructural devpt.							
elow average	1.40**	1.38**	1.41**	1.37**	1.30*	1.26*	1.13
idential milieu							
ural/riverine	1.69**	1.49**	1.43**	1.44**	1.39**	1.19	1.10
isehold disposable ɔome status index							
edium		1.50**	1.29*	1.18	1.17	1.11	1.07
ɔw		1.70**	1.46**	1.30*	1.26	1.14	1.08
ternal education							
ɔme primary			1.49**	1.26	1.22	1.17	1.02
ɔ schooling			1.62**	1.28	1.21	1.19	0.97
ternal occupation							
ales/services			1.20	1.01	0.99	0.96	0.91
arming/unemployed			1.22	0.99	0.96	0.92	0.88
ternal education							
ɔme primary				1.55**	1.57**	1.56**	1.39
ɔ schooling				1.81**	1.85**	1.79**	1.46*
ternal work status							
urrently working				0.58**	0.58**	0.67**	0.79**
scussed F.P. with partner							
No				1.60**	1.44**	1.45**	1.32*
rriage type							
ɔlygynous				1.20*	1.19*	1.18*	1.14
rrent age of child							
2 - 23 months					1.24*	1.18*	1.12
ternal age (years)							
20 / 35+					1.06	1.04	0.99
neral health services atial density							
verage						0.81	0.78
elow average						1.43**	1.40*
ther knows ORT (S.S.S.)							
No							1.52**
tanus vaccination							
No							3.34**
ange in Model X^2	76.98	20.54	23.87	47.35	7.25	38.57	159.83
-value	.000	.000	.000	.000	.019	.000	.000

otes: ** denotes P <.01; * denotes P <.05; F.P - family planning; ORT (S.S.S.) - oral rehydration therapy (sugar-salt-solution)

Unlike the child health outcomes considered so far, factors of maternal socioeconomic status emerge as the socioeconomic factors with the strongest net impact upon non-uptake of first childhood immunizations. The inclusion of the 'block' of maternal socioeconomic status variables reduces by about 35 percent and over 50 percent respectively, the initial impacts of the household income status factor and the two paternal socioeconomic status factors; rendering the remaining effects associated with the latter statistically insignificant while themselves retaining statistical significance even after controlling for the effects associated with the included proximate factors.

The strength of the association of lower levels of non-uptake of first childhood immunizations with residence in relatively more infrastructurally developed local areas is reduced by about 19 percent upon controlling for differential demographic characteristics (current age of child and maternal age), by slightly less than 15 percent with controls for differential spatial density of health services, and most importantly, by over 50 percent when differential uptake of tetanus vaccination is taken into account.

It is particularly noteworthy that of all the explanatory variables in the models, previous contact with preventive health services (that is uptake of tetanus vaccination) is the factor most strongly associated with uptake of childhood immunizations. Children whose mothers did not receive tetanus vaccinations while pregnant with them are more than thrice as likely not to receive the first childhood immunizations as children of women who did.

It is also worth pointing out that while the gross effects on the non-uptake of immunizations estimated to be associated with the household income status indicator roughly parallel in magnitude the effects on post-neonatal and child mortality, the latter were not significantly reduced after controlling for the effects associated with the parental socioeconomic status factors and health services accessibility and utilization indicators as obtained in the immunization models. This seems to suggest that higher parental educational and occupational status especially the former may favour the uptake of relatively cheap and accessible health services like immunization services, but do not guarantee the utilization of the relatively more expensive curative services required to deal with life-threatening situations when children become seriously ill.

7.6: IMPLICATIONS FOR CHILD SURVIVAL OUTCOMES

The findings of the analysis presented in this and the previous chapter indicate that in Ondo State, children in relatively more developed local areas and higher economic status households are at a notable health and survival advantage. But whereas residence in more developed areas seem to confer no nutritional status advantage on children during their first three years of life, being part of a relatively rich home does convey nutritional advantage in a manner comparable to their post-neonatal mortality advantage.

However, none of the effects on childhood stunting estimated to be associated with the household disposable income status index were erased after controlling for household sanitation. This was also the case with the post-neonatal mortality patterns, but not for low weight-for-age which is more indicative of relatively recent or acute rather than chronic nutritional deterioration. But, as with the mortality differentials, the household economic status effects on both the risk of stunting and low weight-for-age seem to be almost totally unrelated to differential biodemographic profiles.

The relatively few clear patterns observed in the recent diarrheal morbidity data reflect in the main, reporting problems. But it may also be a pointer to the possibility that children from relatively better-off socioeconomic backgrounds and areas do not particularly fare better than those from lower status backgrounds in being ill with diarrheal diseases. However, the observed childhood immunization differentials suggest quite clearly that children in the relatively more developed areas are notably less likely not to have received first childhood immunizations than those in infrastructurally less developed areas and more importantly, that household economic status seems to be less important than maternal educational and social status as a determinant of first childhood immunization. Lower levels of non-uptake of immunizations among children of parents of higher socioeconomic status seem to be partly due to their mothers' previous contacts with preventive child health services.

Results of the mortality analysis did not however indicate maternal educational and social status and contacts with preventive child health services (proxied by uptake of tetanus vaccinations) as key child survival factors. Instead, local area development level mediated in part by spatial density of health services and household income status, mediated by household sanitary conditions were observed to have the strongest impacts.

It is not possible to draw very firm conclusions from the study data about the links between the key socioeconomic factors, disease prevention, morbidity, curative care, growth faltering and childhood mortality in 1981-86 Ondo State. Nevertheless, when viewed together, the findings just summarized enable informed speculation on these links.

There seems to be more similarity in the size and pattern of the mediation of the household income status effects on the indicator of acute malnutrition (low weight-for-age) and the effects on post-neonatal and child mortality than between the latter and the effects on stunting (thought to be more indicative of chronic malnutrition). It can therefore be argued that since low weight-for-age may be more indicative of increased susceptibility to disease and death than low height-for-age in subSaharan Africa (Serdula, 1987), the remainder of the estimated impact of the household income status on post-neonatal and child mortality in Ondo State unexplained after controlling for measured key proximate factors may relate to the quality of curative and home care that seriously ill children receive. This is especially in terms of the timely procurement of appropriate medical advice, treatment and other health enhancing resources.

The apparent lack of economic status differences in the prevalence of childhood diarrheal morbidity provides further support for the hypothesis that in 1981-86 Ondo State, actions taken to diminish case-fatality from infectious diseases which may be largely dependent on availability of financial resources contributed significantly to the gulf in child survival chances between poor and relatively well-off homes. This argument is reinforced by the observation that household income status was not particularly important in the uptake of first immunizations, services provided cheaply via heavily subsidized mass programmes.

As regards neonatal mortality, it is also not unreasonable given the likely importance of endogenous factors like intra-uterine growth retardation and prematurity, to expect that real access to modern curative services not well captured by the spatial density of health services index may be the key to the unresolved part of puzzle about the much higher neonatal survival chances of children in the more developed local districts of Ondo State.

7.7: SUMMARY

This chapter examined differentials in child nutritional, recent diarrheal morbidity, and immunization status with a view to shedding more light on the pathways of influence on child survival of local development level and household income status. The patterns described led to the inference that much of the unmeasured influences through which these two factors impacted upon child survival related to real access to modern curative care especially when infants become seriously ill.

REFERENCES

Bicego, G. T. and J. T. Boerma (1991) Maternal education and child mortality: a comparative analysis of DHS data. IRD/Macro International Inc., Demographic and Health Surveys World Conference Proceedings Volume I (Columbia, Maryland: IRD) : 177-204.

Boerma, J. T., E. Sommerfelt, and S. Rutstein (1991) Childhood Morbidity and Treatment Patterns DHS Comparative Studies, No. 4 (Columbia, Maryland: Institute for Resource Development).

Gorstein, J. and J. Akre (1988) The use of anthropometry to assess nutritional status. World Health Statistics Quarterly 41: 48-57.

Mosley, W. (1985) Will primary health care reduce infant and child mortality?: a critique of some current strategies with special reference to Africa and Asia. In Vallin, J. and A. D. Lopez eds. Health Policy, Social Policy and Mortality Prospects (Liege: I.U.S.S.P): 103-137.

Serdula, M. (1987) Diet, Malnutrition and Mortality in sub-Saharan Africa. Paper presented at the IUSSP Seminar on Mortality and Society in subSaharan Africa (Yaounde, Cameroun)

Townbridge, F. (1985) Wasting and stunting as risks factors for morbidity and mortality. Proceedings of the XIII International Congress of Nutrition: 93-95.

United Nations Children Fund, World Health Organization and U.N. Educational, Scientific and Cultural Organization (1989) Facts for Life: A Communication Challenge (Oxford: P & LA).

CHAPTER EIGHT

SUMMARY AND CONCLUSION

8.1: INTRODUCTION

This study set out to achieve an integrated analysis of the determinants of neonatal, post-neonatal, and child mortality in 1981-86 Ondo State with a view to reaching theoretically insightful and policy-relevant conclusions. Cast within the Mosley-Chen proximate determinants framework, the analysis first established which of the examined socioeconomic factors had significant effects in the shaping of child survival outcomes and secondly, which of the examined proximate variables had significant discriminatory impacts. Next, an attempt was made to demonstrate how and the extent to which the identified key socio-economic factors acted through the main proximate variables to impinge upon child survival. Finally, to further clarify their pathways of influence, the study examined the impact of the key socioeconomic child survival factors on the uptake of first immunizations, child nutritional status, and recent diarrheal morbidity prevalence.

8.2: SUMMARY OF MAIN FINDINGS

On the socioeconomic shaping of child survival outcomes, the study found that in 1981-86 Ondo State, few individual and household socioeconomic characteristics were strongly associated with the risks of neonatal death. The indicators of local area economic development and individual modernity (attitude to modern family planning media campaign) emerged from among the 13 examined socioeconomic factors with the strongest net influences upon neonatal survival, with children born into local areas of below average infrastructural development and to women opposed to family planning promotion being respectively, almost 90 and 50 percent more likely to die in their first month of life than other children.

As regards post-neonatal mortality, more of the individual and household socioeconomic status variables emerged with strong covariations with survival, with the local area development factor and urban residence still being of relatively notable influence. The analysis specifically indicated that even with other aspects of familial socioeconomic status accounted for, children belonging to households of low economic or income status were almost thrice as likely to die during the post-neonatal segment of infancy as those in high income status homes, and children residing in relatively poorly developed local areas were about 75 percent more likely to die than those residing in the more developed areas.

For mortality at ages 1-4, the greatest number of the individual -level socioeconomic factors (including for the first time the parental education variables) along with the household disposable income status factor showed strong covariation with survivorship whereas the composite local area development index showed virtually no co-variation. Specifically, the results indicated that after controlling for the influences of other aspects of familial socioeconomic status, children born and raised in homes of medium and low disposable income status were respectively more than twice and thrice as likely to die at ages 1-4 as children in high income status households. Among the other socioeconomic status variables, it was observed that paternal education covaried more strongly with child mortality than maternal education in contrast to findings from many other developing areas (see Cleland and van Ginneken, 1989; for a review of such studies). However, this finding conforms to the pattern of relatively strong role of paternal socioeconomic status as a determinant of child survival in subSaharan Africa compared to other developing regions that was observed in a crossnational analysis of WFS evidence by Hobcraft et al (1984).

Another interesting finding from our study relates to the absence of any real interactions between community level and household/individual level socioeconomic status factors in the shaping of child survival outcomes. The significant beneficial infant mortality impact of local area infrastructural development appears to be independent of familial socioeconomic status and the significant mortality advantage at ages 1-4 of residence in high income status households while somewhat slightly related to paternal educational status, did not appear to depend greatly on local area development level.

The broad socioeconomic pattern in child survival outcomes that emerges from this study in the overall context of few real socioeconomic determinants, is one of increasing prominence of individual and household socioeconomic status factors and decreasing prominence of community development level as the age of child increases.

As regards the proximate determinants, far more of them showed strong and plausible co-variation with mortality in infancy than during ages 1-4 in contrast to the socioeconomic patterns. For the neonatal period, the indicators of 'maternal factors' that were most strongly discriminatory of survival were those of preceding birth interval/order, maternal age, birth type, and sex of child. Presence of soap on household premises emerged from among the indicators of 'environmental contamination', and from among the indicators of 'personal illness control' emerged local area spatial density of maternal health services and tetanus vaccination.

For post-neonatal mortality, the proximate determinants that stood out as prominent were maternal age, birth type, toilet type and age at use by children, household drinking water quality, spatial density of general health services, and tetanus vaccination. Regarding mortality between the first and fourth year of life, the proximate factors that emerged as key determinants were average size of preceding inter-birth intervals, toilet type and age at use by children, uptake of tetanus vaccination (as an index of use of preventive child health services), and knowledge of ORT. An interesting finding here was the much lower risks of death observed among under-fives that use the same available household toilet facilities as older children than for children that do not, with the latter enjoying only a relatively small advantage over children in homes without conventional toilets.

The overall pattern that characterized the child survival differentials according to proximate variables is one of a difference in the relative strength of covariation of the biodemographic/health services factors and the environmental contamination indicators, with survival in infancy and beyond. The former had particularly predominating patterns of association with survival in infancy and relative weak ones with post-infancy survivorship; whereas for the latter the patterns were reversed.

The integrated analysis demonstrated that about 13 percent (with a 95% confidence interval - C.I. - of 8.84-19.63) of the local area differentials in neonatal mortality was attributable to differential availability of modern maternal health services; a further 12 percent (95% C.I. = 8.28-18.88) was due to maternal/biodemographic factors and the remaining 75 percent seem to be due to other risks conditions not captured by the mortality data. On the other hand, 40 percent (95% C.I. = 28.4-59.2) of the post-neonatal mortality differentials by local area infrastructural development level was directly traced to differences in the spatial density of modern health services, with the remaining 60 percent being due to unobserved risk conditions. For mortality at ages 1-4 however, it was shown that even after controlling for paternal educational status effects (which erases about 13 percent), 44 percent (95% C.I. = 25.1-77.48) of the huge effects estimated to be associated with the household disposable income index was attributable to household toilet and sanitary conditions leaving about 40 percent of the effects unaccounted for.

Further examination of the key child survival factors in terms of their association with child nutritional, recent diarrheal morbidity and first immunization status, indicated that much of the unmeasured pathways of influence of household economic status on post-neonatal and child mortality appear to be related to the quality of curative and home care that seriously ill children receive. For neonatal mortality, it seemed from the further analysis that much of the unmeasured causal influences of the local area development factor relate to real access to modern curative care services which seem not to have been well-captured by the spatial density of health services index.

8.3: THEORETICAL AND POLICY IMPLICATIONS

Our findings on the predominance of household economic status as a socioeconomic determinant of post-neonatal survival over other familial socioeconomic factors adds to the growing body of evidence from Africa (Casterline et al, 1989; M'Backe and van de Walle, 1987; Ahmed et al, 1991) that casts doubts on the primacy of maternal education as a child survival factor. While data problems may partly account for its weak or inconsistent effects observed in infancy with the 1986 ODHS data, the same cannot be said to be true of its weak net influence on survival at ages 1-4 where it would normally be more prominent. Although this finding is not consistent with those from many other developing world settings (Cleland and van Ginneken, 1989), it nevertheless emphasizes the need for caution in generally recommending increasing female schooling as the most cost-effective social investment for bringing about improved child health and survival.

Indeed, the prominent role of local area development factors documented in this study as determinants of infant mortality and that of household income status for survival beyond infancy, indicates that in contemporary Nigeria household and community poverty will have to be dealt with if significant reductions in the very high early child mortality levels are to be achieved. Lack of access to economic resources for procuring adequate home care, creating disease-free home environments, and for utilizing modern curative services when children become very ill appears to explain the situation of frequent child losses in the majority of poor households in Nigeria.

Our findings on the hierarchy of the socioeconomic influences on child survival therefore supports the view that while education of a parent enables him or her to better appreciate the effectiveness of modern therapies, the potential seriousness of a child's ailment and the importance of home hygiene, the limited availability of resources can be so constraining that the parent is unable to translate such knowledge and willingness into life-saving actions. For instance, meeting transport costs may prevent a timely visit to the nearest hospital, just as the lack of basic sanitary facilities and clean water may be a barrier to the practice of home hygiene in poorly served communities. As indicated in Chapter One, for the majority of households in present-day Nigeria, once the costs of basic food items have been met, little is left of the household incomes to meet other child health-related expenditures.

The main implications of our argument is that ultimately, to lower early childhood mortality levels in Nigeria, increasing female schooling and extending the provision of 'low-cost' health interventions would be important but not sufficient without major improvements in the living standards of the bulk of the population and extended provision of broad-based health and social utilities. However, the study findings do indicate that in the short-to-medium term, significant progress can be made towards achieving the national population policy target of lowering the infant mortality rate from about 90 in 1990 to 50 in 1995 and 30 by the year 2000 (Federal Ministry of Health, 1988), through facilitating the wider adoption of birth-spacing and family size limitation practices, improving the immunization coverage of the under-two population, and increasing the home use of oral rehydration solutions for combatting childhood diarrhoea. Health promotion campaigns discouraging the practice of keeping young children's toilet facilities separate from those of older children and adults might also achieve some useful results.

8.4: AGENDA FOR FURTHER RESEARCH

The findings from this study raise a number specific issues and questions for further research. First, the study has confirmed the utility of integrated research into infant and child mortality determinants. The proximate determinants framework for child survival analysis thus needs to be applied to data covering the whole of Nigeria and to more African datasets than has been done so far if a better understanding of the sources of socioeconomic inequalities in child survival in the region is to be achieved.

With regard to the proximate determinants of child survival in developing areas, the study demonstrated the existence of a crucial difference in the risks of early childhood death between children residing in homes with conventional toilets to which they have similar access as older children and those in homes in which they do not. Thus, whenever the data is of sufficient size and variability, future investigations should adopt household sanitary facilities indicators that distinguish between availability and utilization by under-fives.

On the socioeconomic determinants of child survival, it is clearly the case that Nigeria and other countries in Africa, have economies and landscapes characterized by substantial unevenness and given the significant local area development level effects on infant mortality documented in this study, future studies should endeavour to incorporate community data into their analysis even if the relevant information comes from secondary sources. Equally important is the need to address the issue of the relative importance of maternal education and household economic status as the key socioeconomic child survival determinant. While Caldwell's famous 1979 Ibadan study makes a persuasive case for the primacy of maternal education, our finding about the predominance of household income status in 1981-86 Ondo State suggests that country- or area-specific studies need to pay particular attention to both variables since their relative impacts may vary from place to place.

Finally, the data irregularities that our analysis encountered reduced the study's scope for making more definite inferences on the infant mortality socioeconomic determinants. The analytical and planning utility of any demographic dataset depends so greatly on its quality that more care, efforts and resources need to be devoted to the actual data collection process in future surveys in Nigeria than seem to have been done in the 1986 ODHS.

REFERENCES

Ahmad, O. B., I. Eberstein and D. Sly (1991) Proximate determinants of child mortality in Liberia. Journal of Biosocial Science 23, 313-326.

Caldwell, J. C. (1979) Education as a factor in mortality decline : an examination of Nigerian data. Population Studies 33(3): 395-413.

Casterline, J., E. Cooksey and A. Ismail (1989) Household income and child survival in Egypt. Demography 26(1): 15-35.

Cleland, J. and J. van Ginneken (1989) Maternal schooling and childhood mortality. Journal of Biosocial Science, Supplement 10: 13-34

Federal Ministry of Health, Nigeria (1988) National Policy on Population for Development, Unity, Progress and Self-Reliance (Lagos: Federal Ministry of Health).

Hobcraft, J., J. McDonald and S. Rutstein (1984) Socioeconomic Factors in Infant and Child mortality: a crossnational comparison. Population Studies 38(2): 193-223.

M'Backe, C., and E. van de Walle (1987) Socioeconomic factors and access to health services as determinants of child mortality. IUSSP Seminar on Mortality and Society in subSaharan Africa, Yaounde, Cameroun (Liege: IUSSP).