DHS WORKING PAPERS

Demographic and Health Surveys

Rural-to-Urban Migration in Bolivia and Peru:
Association with Child Mortality,
Breastfeeding Cessation, Maternal Care,
and Contraception

Luis Tam

MACRO INTERNATIONAL INC.

DHS Working Papers
Number 8

Rural-to-Urban Migration in Bolivia and Peru: Association with Child Mortality, Breastfeeding Cessation, Maternal Care, and Contraception

Luis Tam

Macro International Inc.
Calverton, Maryland, USA

March 1994

Luis Tam is a medical doctor and a Doctor of Public Health who is currently the Child Survival Project Coordinator at PLAN International, an international nongovernmental organization based in the U.S. with affiliates in 27 developing countries.

The Demographic and Health Surveys (DHS) Program is designed to collect data on fertility, family planning, and maternal and child health. DHS is funded by the U. S. Agency for International Development. DHS Working Papers are intended to disseminate early findings of in-depth analysis of DHS data. Comments about this working paper or requests for information about the DHS Program should be sent to: DHS, Macro International Inc., 11785 Beltsville Drive, Suite 300, Calverton, MD 20705-3119, USA (Telephone 301-572-0200; Fax 301-572-0999).

Acknowledgments

I would like to thank Dr. Frank Andrews for his assistance in the preparation of the proposal, Pilar Garcia for her secretarial and administrative support, and Ronald Gutierrez, Gustavo Tapia, and Felix Alcantara for their assistance in the collection of information.

This study was funded by the Andrew W. Mellon Foundation through the Demographic and Health Surveys Small Grants Program.

Introduction

Latin America is the most urbanized of the developing country regions. In 1985, 68.8% of its population were urban dwellers and 22% lived in cities with more than 4 million population (Oberai, 1987).

Since 1950, migration is responsible for 38% of the growth rate in Latin American cities. Natural increases contribute 48% and the reclassification of rural localities 14% (PAHO, 1990). Urban growth rates in Latin America tend to increase with the size of the city, contrary to relations that generally prevail elsewhere (Preston, 1979).

The shift of people from rural to urban areas in Latin America mainly reflects the process of industrialization and the changes it brings in the demand for labor. People move to towns and cities for higher incomes and better living conditions (Mazumdar, 1987; Carafa, 1983; Oberai, 1987). These conditions contribute to the urban/rural differentials in infant and child mortality (Palloni, 1981; INE, 1991/1992). The mortality differentials in some Latin American countries can be compared in Table 1.

Table 1. Urban/rural differentials in infant mortality in selected Latin American countries

	IMR	Rural IMR	Urban IMR	Rural/Urban IMR
MEXICO (1987)	47.0	73.0	12.0	6.1
COLOMBIA (1986)	33.0	33.5	32.7	1.0
DOMINICAN REPUBLIC (1986)	67.7	65.8	69.2	1.0
ECUADOR (1987)	58.3	63.7	52.5	1.2
EL SALVADOR (1985)	67.5	80.9	47.8	1.7
GUATEMALA (1987)	73.4	84.5	49.3	1.7
BOLIVIA (1989)	96.0	112.0	79.0	1.4
PERU (1986)	76.0	101.0	54.0	1.9

IMR = Infant mortality rate (per 1000 live births)
Sources of data: DHS Final Reports of Mexico, Colombia, Dominican Republic, Ecuador, El Salvador, Guatemala, Bolivia and Peru.

Along with the rapid spread of urbanization has come the prolific growth of huge slums or shantytowns. Today, slum settlements represent over one-third of the urban population in Latin America, and in some cases (e.g., Bogota and Lima) they account for more than 60% of the urban total (Todaro, 1989). These urban communities develop in an atmosphere of limited shared cultural understanding, few neighborhood organizations, and a complete lack of infrastructure. The migrants' task is one of forging the social ties that enable the establishment of health, education, provisioning, recreation, and other services. Neighborhood committees, charged with carrying out local development projects, are typical of newly-formed urban communities. In Peru and Bolivia they build on Andean

communal traditions, although the proliferation of organizations beyond a single male hierarchy of traditional authority is a product of the last decade (Anderson, 1989).

Among the urban poor, three groups of factors are detrimental to health. The first includes low income, limited education, insufficient diet, overcrowding and under-protection. The second relates to man-made conditions of the urban environment, e.g., industrialization, pollution, traffic, stress, and alienation. The third is the result of social and psychological instability and insecurity (Harpham, 1986).

The excessive vulnerability of the urban poor and their exposure to pathogenic agents means that infectious diseases and malnutrition are severe health problems in slums and shantytowns. Often an imported reservoir of infection is continually replenished by rural-urban migration, which in turn reinforces local transmission, e.g., malaria and dengue (Mott, 1990).

Despite the unsatisfactory situation among the urban poor, the change from rural to urban residence may enhance the survival chances of the children of migrant mothers, as compared with the situation in rural areas. Despite its relevance, this topic has not been extensively studied by demographers.

Given the importance of rural-to-urban migration in Latin America and its potential implications for child health programs, the goals of the present study were to:

- Ascertain whether the children of rural-to-urban migrant mothers have 0-23 month mortality rates similar to those of the offspring of urban and rural natives in Bolivia and Peru

- Assess the association of the mother's migration status with her use of contraception, prenatal and modern birth delivery care, and the cessation of breastfeeding during the first 24 months of her child's life.

Bolivia and Peru were selected because of their high infant and child mortality rates, which show significant differentials between rural and urban areas. Moreover, both countries are highly urbanized and share similar socioeconomic conditions (Table 2).

Literature Review

Urbanization and Migratory Trends in Peru

DeSoto (1987) summarized the reasons of the rural-to-urban migration in Peru during the last 40-50 years. First, the building of roads and the development of communications allowed for easier transportation from the countryside

Table 2. Basic data: Peru and Bolivia

INDICATOR	PERU	BOLIVIA
Total population (millions, 1989)	21.1	7.1
Population growth rate (%, 1980-89)	2.2	2.7
% Total population urban (1980-89)	70	51
Urban population growth rate (%, 1980-89)	3.1	4.2
Urban/rural total fertility rate (1986-89)	3.1/6.3	4.0/6.4
Gross domestic product per capita (US $, 1988)	975	570
Adult literacy rate (%, men/women, 1985)	90/75	81/65
% Urban/rural population with access to health services (1985-88)	95/30	90/36
% Urban/rural population with access to potable water (1985-88)	73/17	75/13

Source of data: UNICEF 1991, 1986 Peru DHS, 1989 Bolivia DHS.

to the city and increased the awareness of the advantages of urban life among the rural population. Second, due to the agrarian crisis of the 1940s, massive lay-offs of workers in the large landholdings took place. These workers didn't own land, so they moved to the cities. Droughts during the 1980s maintained this expulsion process. Third, better health conditions and wages were a powerful attraction to migrants. Fourth, the cities (and especially Lima) have always been the centers of political and economic decisionmaking. And finally, since 1980, violence due to the guerrilla war has been an important cause of migration, especially in the southeastern mountain regions.

Urban migrants tend to be young men and women between the ages of 15 and 24, whose educational attainment is higher than the non-migrants (Oberai, 1987). Women now constitute the majority of the migration stream in Peru (and Latin America), largely as a result of its relatively advanced state of urbanization in comparison with other developing continents (Todaro, 1989). According to the 1991 Peru DHS (INE and IRD, 1992), the women/men ratio is 1.04 and 1.00 in the urban and rural areas of Peru, respectively. Moreover, women of reproductive age account for 27% of the urban population and 53% of the female urban population (national averages are 25% and 49%, respectively. These results confirm the major role of women in the migration flow, a characteristic to be taken into account when designing intervention programs.

The city of Lima is a striking example of the urbanization process in this country. From 1940 to 1988, the percent of Peru's population living in Lima increased from 8.6% to 28.8%. During 1976-81, this city was the final destination of 35% of all internal immigrants, especially those from its impoverished mountain areas. Two thirds of Lima's 1981 population were migrants or the sons of migrants (DeSoto, 1987; INE, 1990).

This massive migration has saturated the resources of Lima and other cities, resulting in a deterioration in living conditions, urban services, and economic opportunities. One consequence of this saturation is the percent of Lima's

population living in shantytowns, an increase of 40% to 65% during 1970-85 (Zschock, 1988; Harpham, 1986; Pan American Health Organization, 1990).

Due to migration, Lima's age structure is older than that of the rest of Peru. The median age of the population is 22.3 years, compared to a national figure of 20.4. The proportion of persons over age 65 is only 3.6%, lower than the national average of 4.1%, due to the tendency of in-migration to concentrate people of intermediate ages in the cities (Hakkert, 1986).

Because of the lack of employment opportunities in the urban formal sector and the lengthy and burdensome legal procedures to open new businesses (DeSoto, 1987), recently arrived migrants usually begin to work in the informal sector. Suarez-Berenguela (1988) found that in Lima migrants accounted for 72% and 67% of the labor force in the informal and formal sectors, respectively. He concluded that the informal sector was an entry point to urban labor markets. Income and labor conditions in the former sector usually are more deficient than in comparable formal sector jobs.

Urbanization and Migratory Trends in Bolivia

The reasons for rural-to-urban migration in Bolivia and Peru are similar (Pabon, 1988; UNITAS, 1988): the building of roads and the development of communications; droughts and the failure of the agrarian reform to enhance (or at least maintain) rural living standards; the decline of the mining industry; the mechanization of the large agricultural landholdings (e.g., sugar cane); and the development of public services and industries in the cities.

The cities of Santa Cruz and La Paz are the major destinations for rural-to-urban migrants in Bolivia. During 1976-80 the growth rates of Santa Cruz and La Paz were 7.4% and 4.4%, respectively. By 1980, 46.5% of the La Paz population and 50.8% of the Santa Cruz dwellers were immigrants.

Rural-to-urban migrants usually are young couples with small families. In La Paz, 70% of the recent rural-to-urban migrants can find employment only within the informal sector (family business 30%, home industries 20%, and domestic services 20%). Only 22% of rural migrants find jobs in the formal sector, usually in the construction industry. Wages in construction and in the informal sector are usually lower than in the rest of the formal economy (Secretariado Nacional de Pastoral Social, 1991; Organizacion Internacional del Trabajo, 1988).

Rural-to-urban Migrants and Child Mortality

Brockerhoff (1990) has authored one of the most recent studies on the relationship of rural-to-urban migration and child mortality. Using the data of the 1986 Senegal DHS, he found that mothers improved their children's survival chances by migrating from the countryside to the city. Nevertheless, children of urban migrants, continued to

experience a much higher risk of mortality before the age of five than children of urban non-migrants, even after the mother has lived in the city for several years.

Given that rural-to-urban migrants are often more educated, the proportion of more occupationally skilled and wealthier young adults is greater in the urban population than in the rural population. This *migrant selection* per se may partly account for infant and child mortality differentials between urban migrants and urban non-migrants, without considering the effect of living in an urban environment. Rosenzweig and Wolpin (1984) found in Colombia that a local health subsidy program provoked a selective migration to the program's area. This selective migration accounted for a significant portion of the program success.

Another variable to be included in the mortality analysis is *migrant adaptation* (Brockerhoff, 1990; Oberai, 1987), i.e., the contact with the urban environment will eventually lead to a change in the attitudes, motivations, and life style of migrants ("acculturation") and their partial or complete occupational and residential integration into the host society ("structural assimilation"). The adaptations of greatest importance to child survival are those associated with maternal child-care behavior, quality of household facilities, and fertility.

Even in the absence of positive migrant selection and adaptation, migration can also promote child survival if it involves relocating to a more favorable epidemiological environment or if certain health-related benefits of the urban place, such as climate and topography, extend to all residents. They will be classified as *environmental exposure* factors.

Figure 1 illustrates these pathways to child mortality among rural-to-urban migrants in Bolivia and Peru.

Hypotheses

HYPOTHESIS #1:

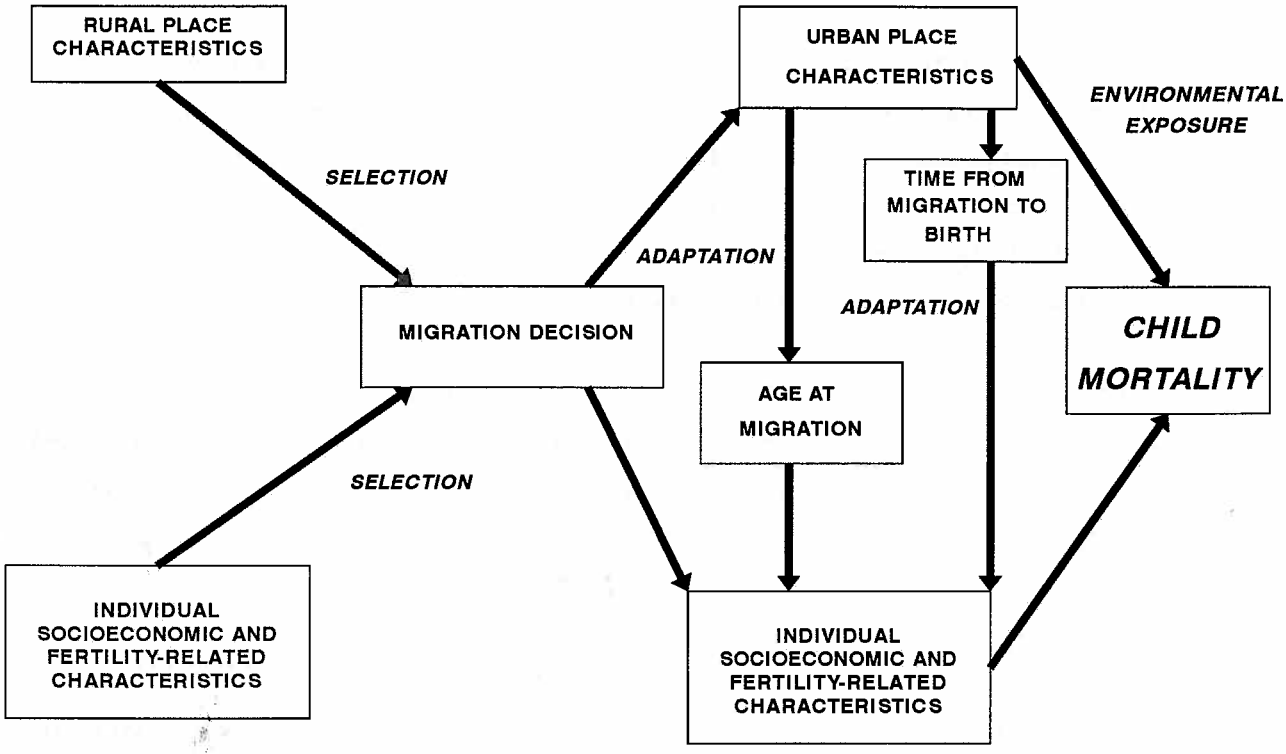
The 0-23 month mortality rate for children in Bolivia and Peru is significantly associated with their mothers' migration status. Two possible intermediate variables for these results are:

- The use of modern health services (Mosley and Chen, 1984), proxied in this study by the use of prenatal and modern birth delivery services and by the use of contraception
- The use of exclusive and total breastfeeding, proxied in this study by the cessation of breastfeeding.

HYPOTHESIS #2:

The use of prenatal care for the index child (delivered by medical doctor, nurse or midwife) is significantly associated with the mother's migratory status after controlling for socioeconomic and maternal-related variables.

Figure 1. Conceptual framework for the child mortality relationships



ADAPTED FROM BROCKERHOFF (1990)

HYPOTHESIS #3:

The use of modern birth delivery services for the index child (delivered by medical doctor, nurse or midwife) is significantly associated with the mother's migratory status after controlling for socioeconomic and maternal-related variables.

HYPOTHESIS #4:

The use of traditional and modern contraceptive methods (in the intergestational period prior to the index child) is significantly associated with the mother's migratory status after controlling for socioeconomic and maternal-related variables.

HYPOTHESIS #5:

The cessation of breastfeeding during the first 24 months of life is significantly associated with the mother's migratory status after controlling for socioeconomic and maternal-related variables.

Methods

Source of Data

The sources of the data were the Demographic and Health Surveys (DHS) of Peru (1986) and Bolivia (1989). Using the standard DHS questionnaire in both countries allowed for comparisons between them. The surveys' data files (recoded) were provided by the DHS Archive, Institute for Resource Development, Calverton, Maryland, USA.

The units of analysis were the children born during the 60 months prior to the survey. Their mothers were classified into four categories according to their migration status:

- Urban native: Mother born and currently living in an urban area
- Rural native: Mother born and currently living in a rural area
- Recent migrant: Mother born in a rural area but currently living in an urban area for less than 7 years
- Long-term (or old) migrant: Mother born in a rural area but currently living in an urban area for 7 years or more.

Data Processing and Analysis

SPSS-PC+ (version 4.0) and SYSTAT (version 5) were used for the data processing and analysis. The former was useful for descriptive statistics, creation of scale indexes (using factor and cluster analysis), cross tabulations and analysis of variance. SYSTAT was used for survival analysis and logistic regression (binomial and multinomial).

Survival analysis, i.e., Cox proportional hazards models and life tables (Allison, 1982, 1984; Cox, 1972), was used to test the mortality and breastfeeding hypotheses (#1 and #5) given that the data sets included the dates of the events of interest (birth, death, age at cessation of breastfeeding, age at migration, time from migration to birth) and identified the censored cases for these events.

The cumulative probabilities of mortality and breastfeeding cessation were estimated for the first 24 months of life using life table methods. For the multivariate analysis of the cessation of the breastfeeding hypothesis (#5), the Cox proportional hazards model was used with hierarchical addition of the migration variables. The dependent variable was the hazard rate of breast-feeding cessation at age "x" (months). The test of this hypothesis included a "health services" index variable (compounded by the use of modern prenatal care, use of modern birth delivery, and use of contraception). Controls for family formation patterns (i.e., birth order and duration of the preceding birth interval), mother's age at migration, maternal education, mother's marital status, possession of household goods, child's place of birth, and multiple birth were included in the analysis. Maternal age (at birth of the index child)

was not included in the multivariate analysis because it had a strong and significant correlation with the birth order. The variables used in this study are listed in Appendix A.

For testing hypotheses #2 and #3 (use of prenatal care and of modern birth delivery), the analytical method was binomial logistic regression with hierarchical addition of the migration variables. The dependent variable was the likelihood that the mother used these services during the pregnancy or birth of the index child.

For testing hypothesis #4 (use of traditional or modern methods of contraception in the intergestational period prior to the index child) the analytical method was multinomial logistic regression with hierarchical addition of the migration variables. The use of traditional and modern contraception were the dependent variables; their reference category was the non-use of contraception.

Results

A frequency distribution of several variables according to the migration categories is presented in Table 3. Rural natives endure the least satisfactory conditions in both countries: the lowest maternal education, the highest percent of children born in inadequate family formation patterns (and the lowest percent born in adequate patterns) and the highest percent of children with the poorest household conditions (and the lowest percent with the wealthiest households). The situation of urban natives is just the opposite: they are the most educated and the wealthiest and have the best family formation patterns. The condition of migrants, both recent and long-term, is intermediate between these two groups.

Mortality in Children Age 0-23 Months

Figure 2 shows that the mortality risk during the first 24 months of life in Peruvian children varies with the migration status of the mother. The mortality risks at 24 months of age are 0.065 in urban natives, 0.075 in long-term migrants, 0.093 in recent migrants, and 0.147 in rural natives. These differences are statistically significant (LRank test=39.60, df=3, $p<0.05$).

Figure 3 depicts similar results for Bolivia. At 24 months the mortality probabilities are 0.080, 0.084, 0.139, and 0.120 for urban natives, long-term migrants, recent migrants, and rural natives, respectively (LRank test=23.44, df=3, $p<0.05$).

Table 3. Frequency Distribution of Selected Variables

BOLIVIA

Variable	Recent Migrant	L-L Migrant	Rural Native	Urban Native	P
Number of children	435	703	2376	1722	5236
Maternal age (yrs)	26.5	29.3	28.3	26.5	0.00
Maternal education (yrs)	4.9	4.7	2.6	8.2	0.00
% children with B.O. 5+ and P.B.I <24 months	12.7	15.8	18.2	11.0	0.00
% children with B.O 2-4 and P.B.I. 24+ months	18.9	21.4	17.3	26.0	0.00
% children with a mother in union	90.5	92.3	91.1	88.7	0.02
% children with the highest wealth index	49.8	55.8	12.7	62.8	0.00
% children with the lowest wealth index	7.7	2.8	38.6	2.3	0.00

B.O.=birth order P.B.I.=preceding birth interval L-L=long lasting

PERU

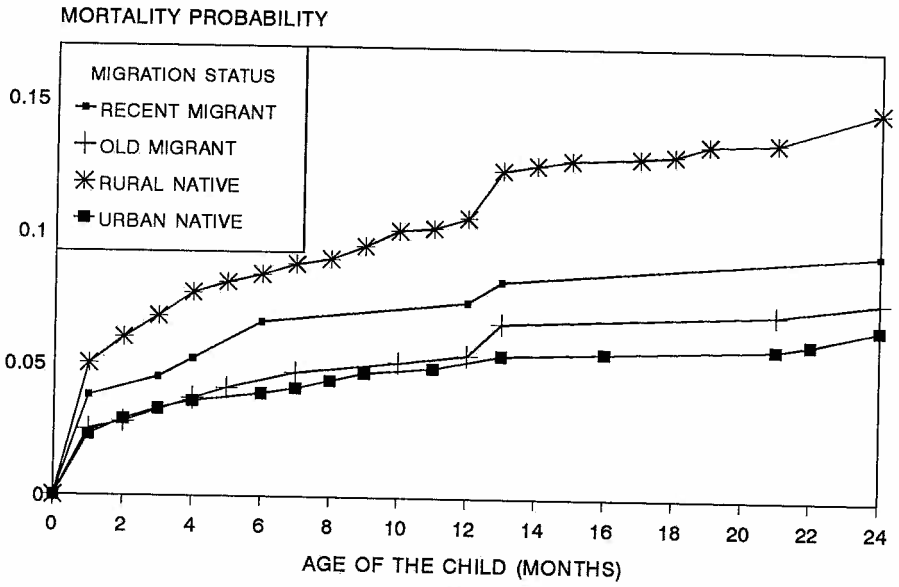
Variable	Recent Migrant	L-L Migrant	Rural Native	Urban Native	P
Number of children	157	314	1333	974	2778
Maternal age (yrs)	24.9	29.2	28.6	26.4	0.00
Maternal education (yrs)	5.2	5.7	2.5	8.7	0.00
% children with B.O. 5+ and P.B.I <24 months	15.3	13.3	22.5	9.1	0.00
% children with B.O. 2-4 and P.B.I. 24+ months	17.8	23.8	13.9	23.1	0.00
% children with a mother in union	86.0	92.6	92.1	90.3	0.02
% children with the highest wealth index	35.7	32.5	1.2	53.1	0.00
% children with the lowest wealth index	6.4	3.4	27.1	3.5	0.00

B.O.=birth order P.B.I.=preceding birth interval L-L=long lasting

Use of Prenatal Care

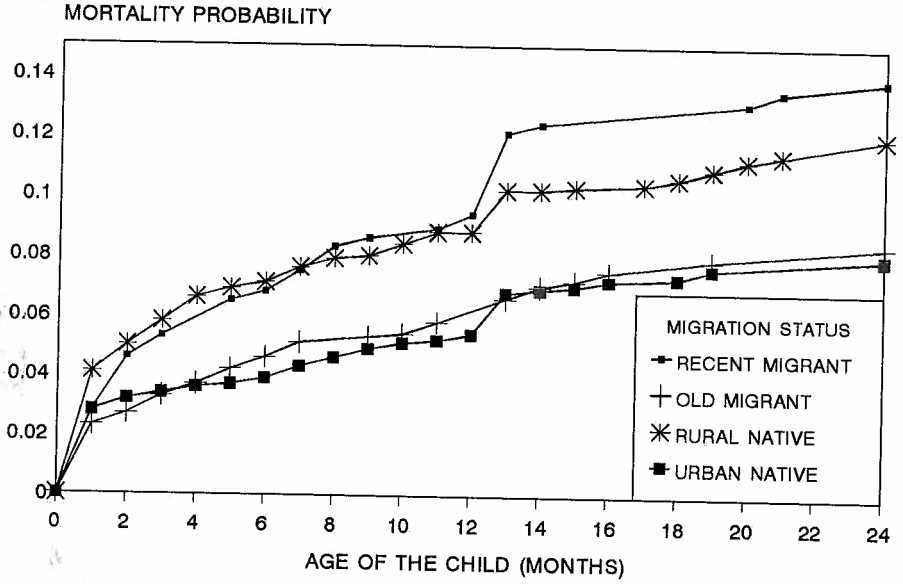
Results of the bivariate analysis: Figure 4 shows that the use of prenatal care (PNC) is significantly associated with the migration status. In both countries, the urban natives are the most likely users, followed by the long-term and recent migrants, and, finally, the rural natives (Chisquare=590 in Peru and 880 in Bolivia, df=3, $p<0.01$).

Figure 2. Cumulative probability of mortality by migration status, Peru, 1981-1986



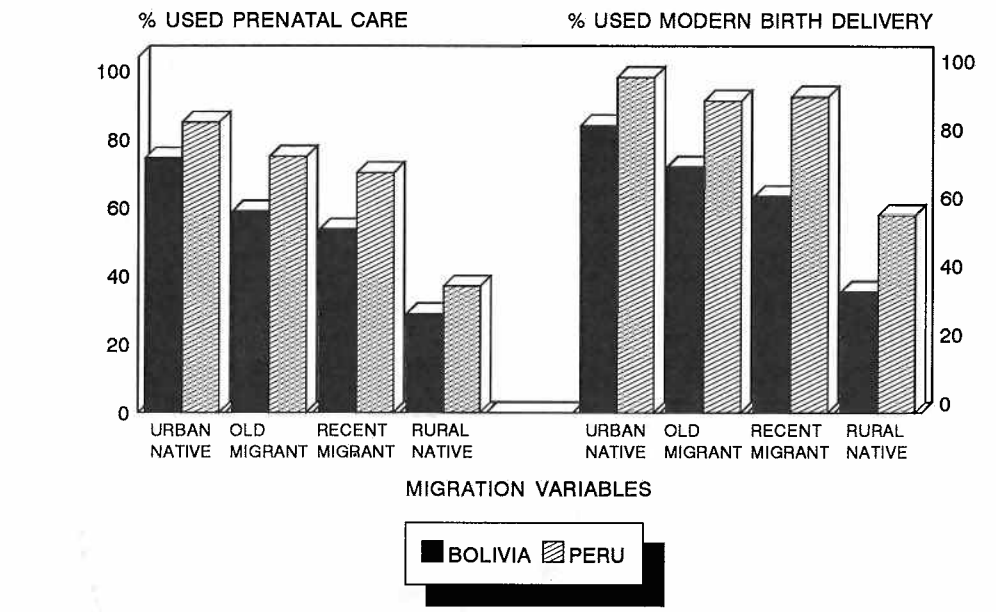
METHOD: LIFE-TABLES. N=2839.

Figure 3. Cumulative probability of mortality by migration status, Bolivia, 1984-1989



METHOD: LIFE TABLES. N=5236.

Figure 4. Association of the migration variables with prenatal and modern birth delivery care, Peru and Bolivia (bivariate analysis)



METHOD: CROSS-TABULATIONS

Results of the multivariate analysis: Equation (1) in Tables 4 and 5 shows the association of the non-migration variables with PNC in Bolivia and Peru. Equation (2) include the migration variables and are the fully specified models.

The -2Loglikelihoods of Equations (1) and (2) are 179.1 ($df=4$, $p<0.05$) in Bolivia and 79.5 ($df=4$, $p<0.05$) in Peru. Thus, the addition of the migration variables significantly enhances the fitness of the model, i.e., migration is significantly associated with the use of PNC.

Equation (2) depicts these significant associations after controlling for the other variables in the model (Figure 5). The pattern found in the bivariate analysis is confirmed: the use of PNC increases progressively from rural to urban natives. Recent migrants are less likely to use PNC than term migrants.

Remarkable changes in the magnitude of the odds ratios (ORs) in the "family formation patterns," the "place of birth," and the "marital status" variables occur between Equations (1) and (2) in both countries. These changes suggest that the effects of these variables on PNC are mediated (totally or partially) by the migration variables.

However, the ORs of the "wealth," "use of contraception," and "maternal education" variables don't change between Equations (1) and (2), suggesting that they affect the use of PNC without the mediation of the migration variables.

Table 4. Bolivia: Use of prenatal care

VARIABLES	EQUATION (1)		EQUATION (2)	
	Odds ratio	Signif	Odds ratio	Signif
(Ref cat: urban native)				
Long-lasting migrant			0.855	0.181
Recent migrant			0.510	0.000
Rural native			0.192	0.000
Age at migration			1.004	0.220
Maternal education	1.213	0.000	1.231	0.000
Marital status	0.356	0.000	0.950	0.641
Place of birth	2.052	0.000	0.503	0.000
(Ref: B.O. 2-4 and B.I>24m)				
B.O. 1	0.634	0.000	1.113	0.313
B.O. 2-4 and B.I.<24m	0.554	0.000	0.826	0.113
B.O. 5+ and B.I.<24m	0.557	0.000	0.839	0.110
B.O. 5+ and B.I.>24m	0.596	0.000	0.928	0.423
Wealth index	1.041	0.230	1.108	0.003
Use of contraception	1.737	0.000	1.759	0.000

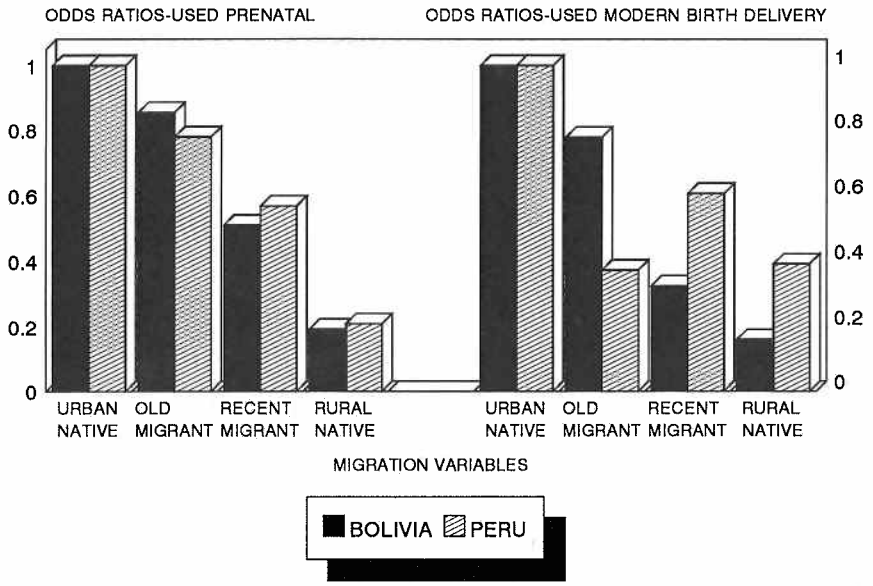
B.O. = Birth order B.I. = Birth interval (months)
Method: binomial logistic regression

Table 5. Peru: Use of prenatal care

VARIABLES	EQUATION (1)		EQUATION (2)	
	Odds ratio	Signif	Odds ratio	Signif
(Ref cat: urban native)				
Long-lasting migrant			0.780	0.163
Recent migrant			0.568	0.011
Rural native			0.209	0.000
Age at migration			1.006	0.203
Maternal education	1.140	0.000	1.154	0.000
Marital status	0.604	0.000	1.511	0.008
Place of birth	2.898	0.000	0.728	0.153
(Ref:B.O.2-4 and B.I>24m)				
B.O.1	0.700	0.010	1.230	0.180
B.O.2-4 and B.I.<24m	0.590	0.001	0.946	0.735
B.O.5+ and B.I.<24m	0.633	0.001	1.059	0.714
B.O.5+ and B.I.>24m	0.622	0.000	1.030	0.825
Wealth index	1.071	0.117	1.117	0.014
Use of contraception	1.313	0.001	1.349	0.000

B.O. = Birth order B.I. = birth interval (months)
Method: binomial logistic regression

Figure 5. Association of the migration variables with prenatal and modern birth delivery care, Peru and Bolivia (multivariate analysis)



FROM FULLY SPECIFIED MODELS: EQUATION (2) IN TABLES 4 TO 7
METHOD: BINOMIAL LOGISTIC REGRESSION

Use of Modern Birth Delivery Care

Results of the bivariate analysis: Figure 4 shows that use of modern birth delivery care (MBDC) is closely related to the mother's migration status. In Bolivia and Peru, the least frequent users are the rural natives, followed by the recent and the long-lasting migrants. Urban natives are the most frequent users of MBDC (Chisquare=596 in Peru and 1052 in Bolivia, df=3, $p<0.01$).

Results of the multivariate analysis: Equation (1) in Tables 6 and 7 shows the association of the non-migration variables with the use of MBDC in Bolivia and Peru. Equation (2) is the fully specified model.

The -2Loglikelihoods of Equations (1) and (2) are 185.3 (df=4, $p<0.05$) in Bolivia and 28.3 (df=4, $p<0.05$) in Peru, suggesting that migration plays an important role in the use of MBDC.

In Bolivia [Equation (2) in Table 6; Figure 5], the likelihood of use of MBDC varies with the migration status: urban natives are the most likely users, followed by the long-term migrants, recent migrants and finally rural natives. However, the results are different in Peru [Equation (2) in Table 7; Figure 5]: both the long-term migrants and the rural natives have the lowest likelihoods of using MBDC, while its use by recent migrants is intermediate between them and the urban natives.

Table 6. Bolivia: Use of modern birth delivery care

VARIABLES	EQUATION (1)		EQUATION (2)	
	Odds ratio	Signif	Odds ratio	Signif
(Ref cat: urban native)				
Long-lasting migrant			0.779	0.071
Recent migrant			0.325	0.000
Rural native			0.160	0.000
Age at migration			1.018	0.000
Maternal education	1.162	0.000	1.188	0.000
Marital status	0.244	0.000	0.701	0.004
Place of birth	1.887	0.000	0.411	0.000
(Ref: B.O. 2-4 and B.I>24m)				
B.O. 1	0.604	0.000	1.153	0.251
B.O. 2-4 and B.I.<24m	0.607	0.000	0.941	0.658
B.O. 5+ and B.I.<24m	0.609	0.000	0.921	0.503
B.O. 5+ and B.I.>24m	0.592	0.000	0.921	0.434
Wealth index	1.259	0.000	1.309	0.000
Use of prenatal care	6.253	0.000	6.527	0.000

B.O. = Birth order B.I. = Birth interval (months)
Method: binomial logistic regression

Table 7. Peru: Use of modern birth delivery care

VARIABLES	EQUATION (1)		EQUATION (2)	
	Odds ratio	Signif	Odds ratio	Signif
(Ref cat: urban native)				
Long-lasting migrant			0.373	0.001
Recent migrant			0.607	0.188
Rural native			0.392	0.000
Age at migration			1.007	0.191
Maternal education	1.132	0.000	1.142	0.000
Marital status	0.710	0.015	1.241	0.264
Place of birth	5.387	0.000	3.274	0.000
(Ref:B.O.2-4 and B.I>24m)				
B.O.1	1.467	0.038	2.063	0.000
B.O.2-4 and B.I.<24m	1.088	0.673	1.430	0.087
B.O.5+ and B.I.<24m	0.814	0.210	1.088	0.638
B.O.5+ and B.I.>24m	0.804	0.141	1.088	0.606
Wealth index	1.201	0.001	1.232	0.000
Use of contraception	2.143	0.000	2.192	0.000

B.O. = Birth order B.I. = birth interval (months)
Method: binomial logistic regression

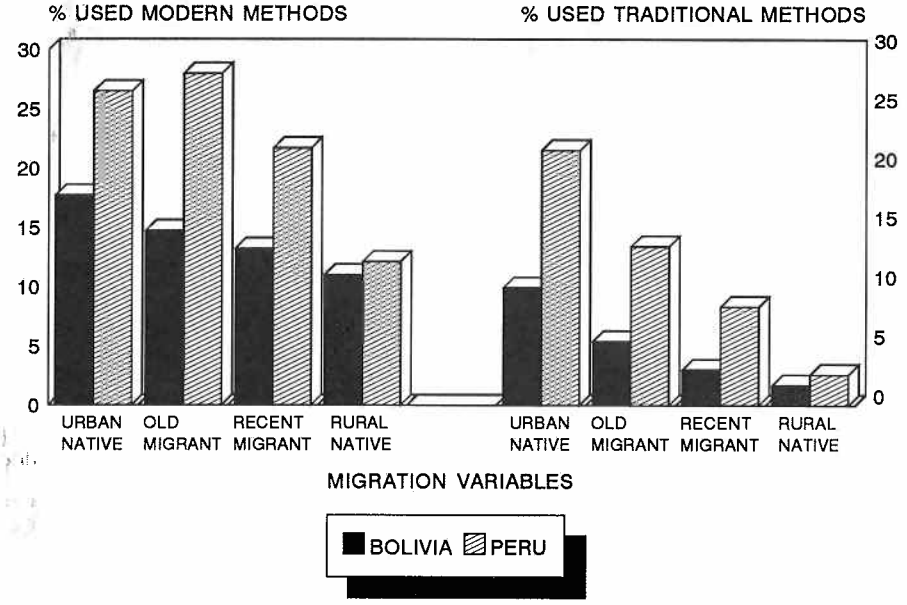
As in the case of PNC, the important changes in the magnitude of the ORs in the "family formation patterns," the "place of birth," and the "marital status" variables between Equations (1) and (2) suggest that their effects on the use of MBDC are mediated by the migration variables.

However, the ORs of the "wealth," "use of PNC" and "maternal education" variables don't change between both equations, suggesting that they affect the use of MBDC without the mediation of the migration variables.

Use of Traditional and Modern Contraceptive Methods

Results of the bivariate analysis: Figure 6 shows that the use of traditional and modern methods of contraception are significantly associated with the mother's migration status. For both types of methods, urban natives are the most frequent users, followed by the long-term migrants, the recent migrants, and, finally, the rural natives (Chisquare=365.0 in Peru and 201.0 in Bolivia, df=3, $p<0.01$).

Figure 6. Association of the migration variables with the use of traditional and modern contraception, Peru and Bolivia (bivariate analysis)



METHOD: CROSS-TABULATIONS

Results of the multivariate analysis: Equations (1) and (2) of Tables 8 and 9 estimate the ORs of the use of modern methods vis-a-vis the use of no methods (traditional or modern). Similarly, Equations (3) and (4) in the same tables calculate the ORs of the use of traditional methods. Equations (1) and (3) include only the non-migration variables. Equations (2) and (4) are the fully specified models.

Table 8. Bolivia: Use of contraception (modern and traditional)

VARIABLES	EQUATION (1)		EQUATION (2)		EQUATION (3)		EQUATION (4)	
	Odds ratio	Signif	Odds ratio	Signif	Odds ratio	Signif	Odds ratio	Signif
(Ref cat: urban native)								
Long-lasting migrant			0.565	0.009			0.881	0.383
Recent migrant			0.078	0.000			0.358	0.000
Rural native			0.018	0.000			0.096	0.000
Age at migration			1.012	0.110			1.004	0.325
Maternal education	1.130	0.000	1.149	0.000	1.134	0.000	1.153	0.000
Marital status	0.102	0.000	0.634	0.023	0.261	0.000	1.092	0.544
Place of birth	1.191	0.275	0.049	0.000	0.794	0.023	0.104	0.000
(Ref: B.O. 2-4 and B.I>24m)								
B.O. 1	0.057	0.000	0.176	0.000	0.135	0.000	0.279	0.000
B.O. 2-4 and B.I.<24m	0.193	0.000	0.373	0.000	0.344	0.000	0.543	0.000
B.O. 5+ and B.I.<24m	0.132	0.000	0.304	0.000	0.289	0.005	0.484	0.000
B.O. 5+ and B.I.>24m	0.308	0.000	0.764	0.111	0.956	0.000	1.120	0.296
Wealth index	0.910	0.145	1.425	0.000	0.904	0.015	1.016	0.720

B.O. = Birth order B.I. = Birth interval (months)
Method: multinomial logistic regression
Reference category for dependent variable: no use of contraception

Table 9. Peru: Use of contraception (modern and traditional)

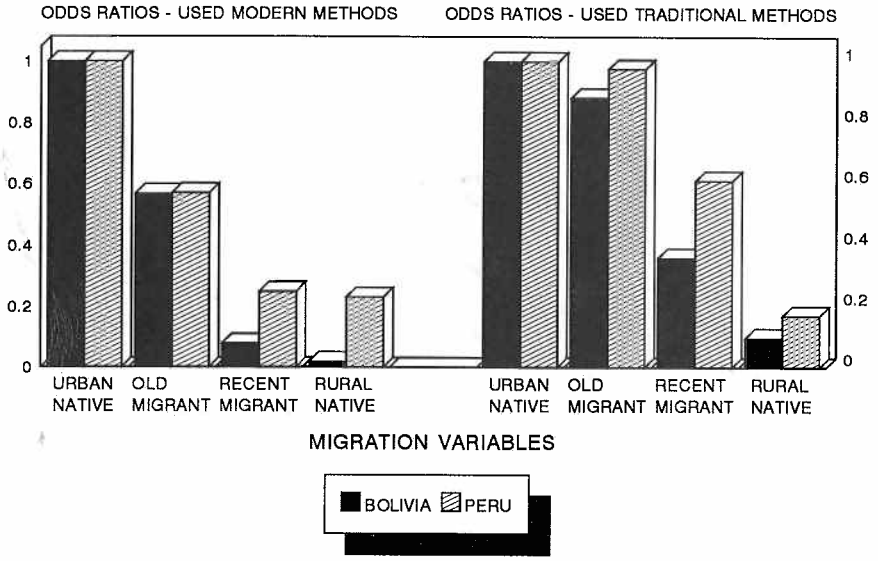
VARIABLES	EQUATION (1)		EQUATION (2)		EQUATION (3)		EQUATION (4)	
	Odds ratio	Signif	Odds ratio	Signif	Odds ratio	Signif	Odds ratio	Signif
(Ref cat: urban native)								
Long-lasting migrant			0.569	0.010			0.975	0.883
Recent migrant			0.248	0.000			0.610	0.044
Rural native			0.023	0.000			0.169	0.000
Age at migration			1.002	0.800			1.009	0.122
Maternal education	1.117	0.000	1.131	0.000	1.121	0.000	1.132	0.000
Marital status	0.126	0.000	1.059	0.827	0.275	0.000	0.806	0.215
Place of birth	2.433	0.000	0.125	0.000	1.759	0.000	0.336	0.000
(Ref:B.O.2-4 and B.I>24m)								
B.O.1	0.032	0.000	0.074	0.000	0.140	0.000	0.241	0.000
B.O.2-4 and B.I.<24m	0.159	0.000	0.297	0.000	0.264	0.000	0.418	0.000
B.O.5+ and B.I.<24m	0.153	0.000	0.379	0.000	0.276	0.000	0.461	0.000
B.O.5+ and B.I.>24m	0.355	0.000	0.947	0.771	0.513	0.000	0.879	0.382
Wealth index	1.195	0.006	1.408	0.000	1.035	0.504	1.087	0.103

B.O. = Birth order B.I. = birth interval (months)
Method: multinomial logistic
Ref. cat. for dependent variable: no use of contraception

The -2Loglikelihoods of these equations are 449.3 (df=4, $p<0.05$) in Bolivia and 231.8 (df=4, $p<0.05$) in Peru. These results suggest that migration is significantly related to the use of contraception (modern and traditional) in both countries.

Equation (2) shows that the use of modern contraception is most likely among urban natives, followed by the long-term and recent migrants (Figure 7). Rural natives are the least likely to use it. Equation (4) depicts similar results for the use of traditional methods (Figure 7).

Figure 7. Association of the migration variables with the use of traditional and modern contraception, Peru and Bolivia (multivariate analysis)



REFERENCE CATEGORY FOR THE DEPENDENT VARIABLE: NO USE OF CONTRACEPTIVE METHODS
FROM FULLY SPECIFIED MODELS: EQUATIONS (2) AND (4), TABLES 8 AND 9
METHOD: MULTINOMIAL LOGISTIC REGRESSION

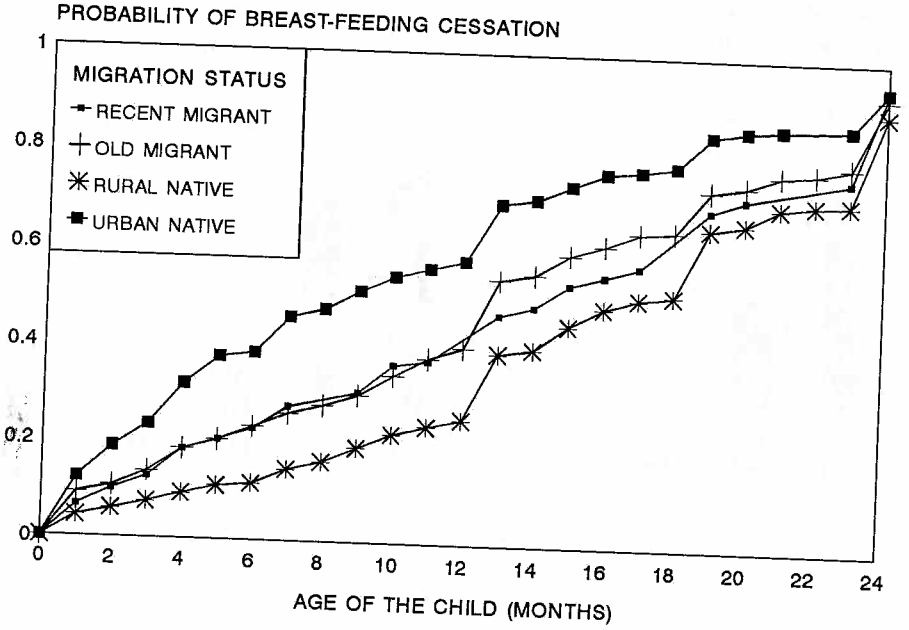
As in the case of PNC and MBDC, noticeable changes in the magnitude of the ORs in the "family formation patterns," the "place of birth," and the "marital status" variables occur between Equations (1) and (2) and between Equations (3) and (4). These results suggest that their effects on the use of contraception are mediated (totally or partially) by the migration variables.

However, the ORs of the "maternal education" and "wealth" variables don't change between these equations, suggesting that their effects on the use of contraception are not mediated by the migration variables.

Cessation of Breastfeeding in Children Younger than 24 Months

According to Figure 8, the probability of breastfeeding cessation during the first 2 years of life in Peruvian children varies with the mother's migration status. At 12 months, the cessation probabilities are 0.577 in urban natives, 0.400 in long-term migrants, 0.420 in recent migrants, and 0.254 in rural natives. These differences are statistically significant (LRank test=213.2, df=3, $p<0.05$).

Figure 8. Peru: Cumulative probability of breastfeeding cessation, by migration status



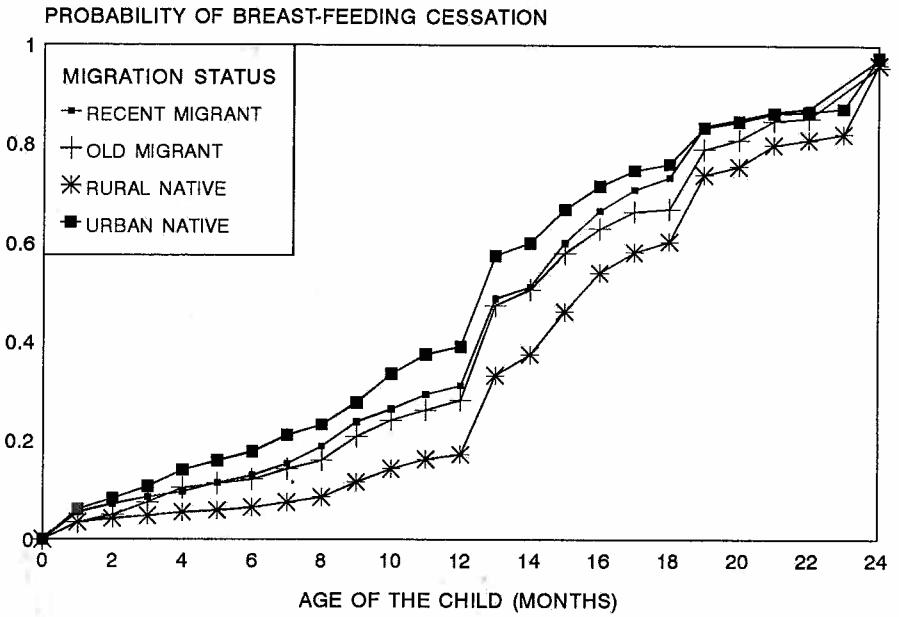
METHOD: LIFE TABLES. N=2735.

Figure 9 depicts similar results for Bolivia: 0.390, 0.282, 0.311 and 0.172 are the breast-feeding cessation probabilities at 12 months for urban natives, long-term migrants, recent migrants and rural natives, respectively (LRank test=153.5, df=3, $p<0.05$).

Results of the multivariate analysis: Equation (1) in Tables 10 and 11 shows the association of the non-migration variables with the cessation of breastfeeding. Equation (2) is the fully specified model.

In Bolivia [Equation (2), Table 10; Figure 10], the cessation of breastfeeding among migrants is less likely than among urban natives but is more likely than among rural natives. Results in Peru are similar and significant [Equation (2), Table 11].

Figure 9. Bolivia: Cumulative probability of breastfeeding cessation, by migration status



METHOD: LIFE TABLES. N=5226.

Table 10. Bolivia: Cessation of breastfeeding before 24 months of age

VARIABLES	EQUATION (1) Odds ratio	EQUATION (1) T value	EQUATION (2) Odds ratio	EQUATION (2) T value
(Ref cat: urban native)				
Recent migrant			0.862	2.668
Long-lasting migrant			0.898	3.282
Rural native			0.713	0.539
Age at migration			1.006	1.725
Multiple birth	1.826	3.047	1.879	1.680
Maternal education	1.041	7.921	1.040	4.792
Marital status	1.119	1.883	1.107	0.675
Place of birth	0.981	0.445	0.754	0.835
(Ref: B.O. 2-4 and B.I>24m)				
B.O. 1	1.209	3.648	1.214	2.610
B.O. 2-4 and B.I.<24m	1.196	2.924	1.201	2.465
B.O. 5+ and B.I.<24m	1.041	0.717	1.039	2.064
B.O. 5+ and B.I.>24m	0.900	2.132	0.894	1.647
Use of health serv. index	1.074	4.468	1.070	1.563
Wealth index	1.074	3.680	1.061	1.439

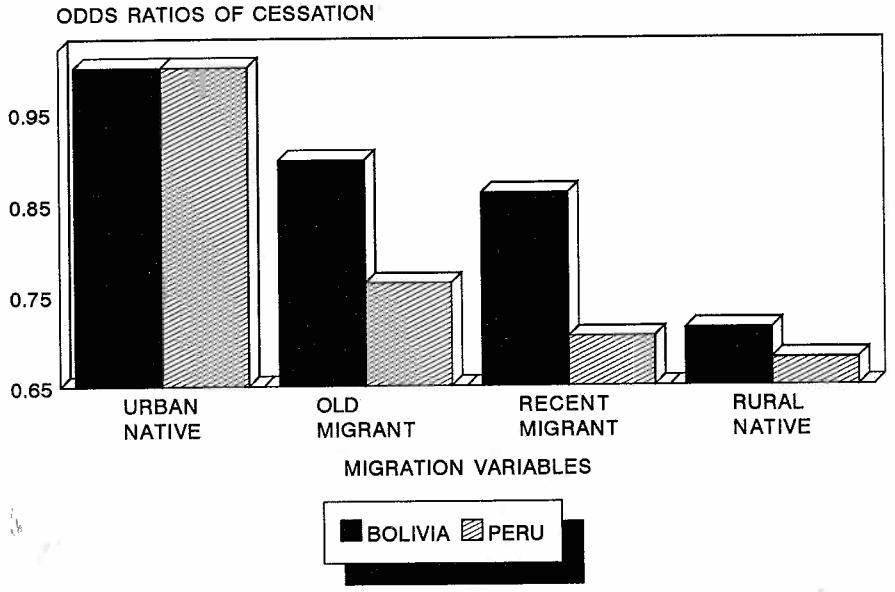
B.O. = Birth order B.I. = Birth interval (months)
Method: Cox proportional hazards model

Table 11. Peru: Cessation of breastfeeding before 24 months of age

VARIABLES	EQUATION (1)		EQUATION (2)	
	Odds ratio	T value	Odds ratio	T value
(Ref cat: urban native)				
Recent migrant			0.704	2.668
Long-lasting migrant			0.763	3.282
Rural native			0.680	2.539
Age at migration			1.004	1.725
Multiple birth	1.600	1.860	1.531	1.680
Maternal education	1.043	5.826	1.037	4.792
Marital status	1.052	0.630	1.057	0.675
Place of birth	1.235	3.205	1.207	0.835
(Ref:B.O.2-4 and B.I>24m)				
B.O.1	1.212	2.600	1.214	2.610
B.O.2-4 and B.I.<24m	1.218	2.469	1.218	2.465
B.O.5+ and B.I.<24m	1.192	2.162	1.183	2.064
B.O.5+ and B.I.>24m	0.899	1.484	0.888	1.647
Use of health serv index	1.040	1.686	1.037	1.563
Wealth index	1.034	1.432	1.035	1.439

B.O. = Birth order B.I. = birth interval (months)
Method: Cox proportional hazards model

Figure 10. Association of the migration variables with the cessation of breastfeeding in children 0-23 months old, Peru and Bolivia (multivariate analysis)



METHOD: COX PROPORTIONAL HAZARDS MODEL
FROM FULLY SPECIFIED MODELS: EQUATION (2), TABLES 10 AND 11

No changes in the magnitude of the ORs of the non-migration variables occur between Equations (1) and (2), suggesting that their effects on breast-feeding cessation are not mediated by the migration variables.

Discussion

An important association of rural-to-urban migration with mortality risk during the first two years of life in Peru and Bolivia has been found in this study. Children of migrant mothers have a mortality risk that falls between rural and urban natives. However, children of long-term migrant mothers have lower mortality rates than children of recent migrants. These results are compatible with those of the 1984 Peru Health and Nutrition Survey (INE, 1986) which found that the prevalence of malnutrition in the 6- to 23-month age group varied according to the place of residence, i.e., it was highest in the rural areas, intermediate in the urban slums, and lowest in the urban non-slum areas.

Additionally, a consistent pattern across migration categories has been found for the use of maternal care and contraception: the lowest use is among rural natives. Migrants (recent and long-term) attain intermediate use rates, whereas urban natives are the most frequent users. For example, whereas 35.3% of births among rural natives used MBDC in Bolivia, its use among recent migrants, long-term migrants, and rural natives was 63.2%, 71.9%, and 83.9%, respectively (Figure 4). The only discrepancy in this generalized pattern is the use of MBDC in Peru (Figure 5): long-term migrants have low use likelihoods, similar to the rural natives. The fact that long-term-migrant mothers are older than recent-migrant ones (Table 2) is a possible explanation for this finding, i.e., age-associated factors (e.g., culture, traditions) have a role in the use of maternal care services (Tam, 1991). However, the absence of similar trends in this study also suggests the presence of undetermined explanatory variables.

Results on breastfeeding cessation are just the opposite: rural natives have the lowest cessation rates, followed by migrants and urban natives. An example is the breastfeeding pattern in Peru (Figure 8). The probability of breast-feeding cessation at 12 months is highest among urban natives, intermediate among migrants, and lowest among rural natives. These results are similar to the 1984 Health and Nutrition Survey: the mean duration of breast-feeding was 15.5 months in the rural areas, 10 months in Lima's slums and 7.4 months among Lima's urban population (excluding the slum areas).

Figure 11 summarizes the association of key variables with the use of prenatal and modern birth delivery care and contraception. Household wealth and maternal education encourage the use of these services, independent of the mother's migration status. But migration status has a direct effect on the use of these services and also mediates the effect of the "family formation pattern" variables. The family formation variables only have a direct association with the use of contraception.

Figure 11. Associations with maternal care and contraception

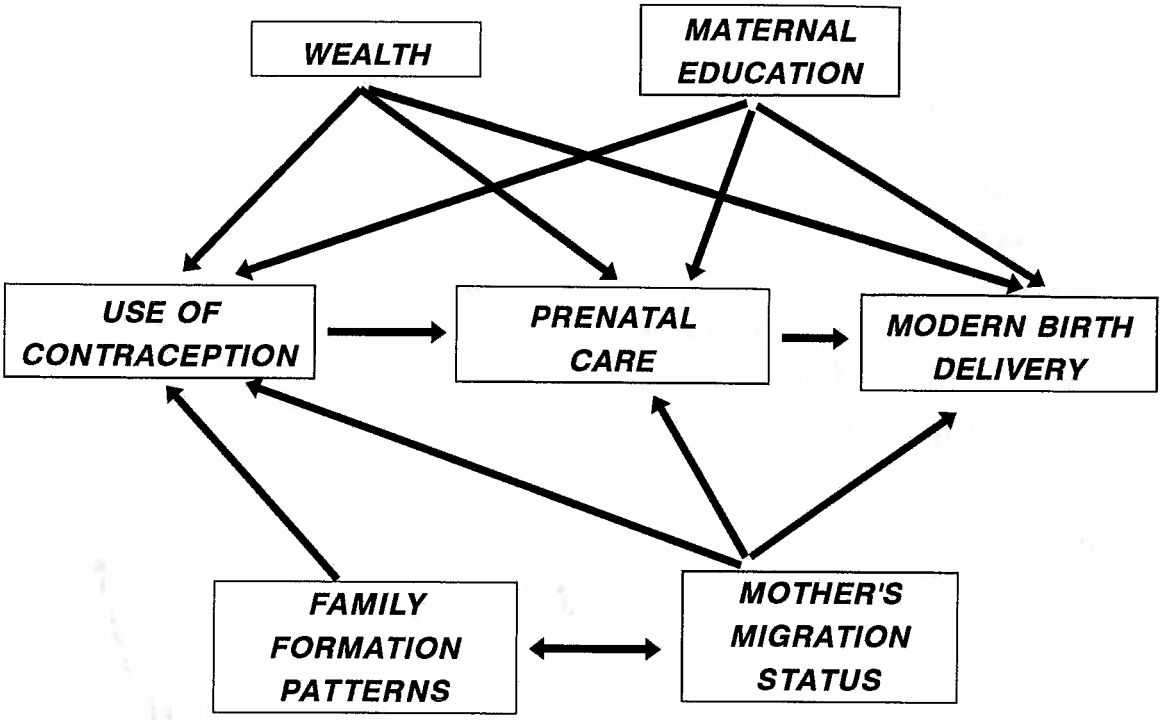
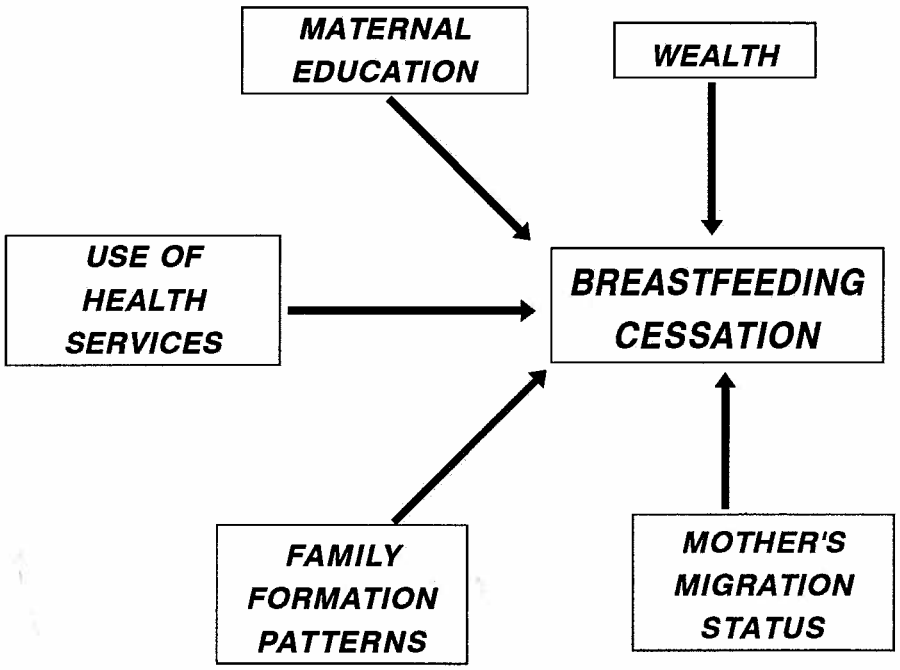


Figure 12 shows key relationships with the cessation of breastfeeding. Migration has a direct effect on breast-feeding cessation and doesn't mediate the association of other significant variables with this event, i.e., use of health services, family formation patterns, household wealth, and maternal education.

These findings confirm the hypothesis of this study: the mother's migration status is an important factor for the mortality and breastfeeding cessation risks in children and for her use of maternal care and contraception.

What are possible explanations for these migration effects? *Migrant selection*, suggested by the maternal education differentials between migrants and rural natives (Table 3), can be an explanation. Literate mothers usually assign a different economic value to their offspring than illiterate mothers and, therefore, have different health and fertility behaviors (Oberai, 1987; Brockerhoff, 1990). However, it is difficult to identify pure indicators of migrant selection, since most of the data pertaining to current status also reflect *environmental exposure* and *migrant adaptation* (e.g., household wealth).

Figure 12. Associations with breastfeeding cessation



The *environmental exposure* factors, proxied by the possession of household goods and the use of health services, influence the mortality risk of children (Figures 11 and 12). For example, migrants increase their use of potable water and health services partly because of their better availability in the cities. But migrants never replicate the use patterns of urban natives (Figures 4 through 7), maybe because of a) the relative scarcity of these services in the areas where migrants reside (generally slums or shantytowns), and/or b) the persistence of traditional and social attitudes and traditions among migrants.

The earlier cessation of breastfeeding and the increased use of maternal care and contraception among migrants (as compared with rural natives) strongly suggest *migrant adaptation*, i.e., "acculturation" and "structural adaptation." Additionally, the significant associations of the migration variables with maternal care, contraception, and cessation of breastfeeding persist after controlling for potential *migrant selection* and *environmental exposure* variables, i.e., maternal education, place of child's birth and family formation patterns, use of maternal care and contraception, and household wealth. These results also suggest *migrant adaptation*.

In a migrant squatter settlement ("barriada") in the city of Trujillo, Davison (1983) found that both the length of exposure to an urban environment and the age of enculturation were determinants of the health-seeking behaviors. Richman (1987) found that the second generation migrants in Lima were more highly acculturated, in relation to

language use, customs, sociability, perceived discrimination and ethnic identity, than first generation migrants. He also found that the first generation varied in acculturative level according to their age at the time of migration.

As explained for the *environmental exposure* factors, migrants never adopt the breastfeeding and use of health service patterns of urban natives (Figures 8 through 10), which suggests the persistence of social and cultural constraints. The use of contraception is an example of these constraints. Income-earning activities in the informal sector (e.g., street vendors) are usually the migrant's entry point to the urban labor market (DeSoto, 1987; Suarez-Berenguela, 1988). Because these activities make greater use of children as workers, they increase the economic value of children and tend to encourage fertility (Oberai, 1987). Another example is infantile diarrhea. Escobar (1983) found that in Lima slums, traditional beliefs regarding its etiology and treatment (including the use of traditional healers) were very common and different from the Western concepts. Folk medicine has survived in urban areas not only because a large number of people have faith in it, but also because as a system of medical care it has not remained rigid. It has adapted itself to the new urban scene.

Participation of the migrants in community development activities has been advocated as a way to transfer essential knowledge and skills for child care (Harpham, 1986). However, Anderson (1989), writing about a Lima slum, found that local community participation is not enough to ensure access to the information and adequate services women need in order to promote the well-being of their children in the setting of a large and heterogeneous city. She found that the most powerful predictor of the children's development was the access their parents had to abilities and practices associated with the dominant national culture: literacy, Spanish language, a history of travel in Peru, higher levels of formal education, and urban sophistication. These knowledge and skills are not always available within the boundaries of the slum. No amount of activism within these boundaries will give the women the range of experiences they need to gain a greater measure of control over that outside world.

Conclusions

The mortality risk of children of migrant mothers falls between that of rural and urban natives in Bolivia and Peru. Additionally, a consistent pattern across migration categories is found for the use of maternal care and contraception: the lowest use is among rural natives, whereas migrants attain intermediate results. Urban native mothers are the most frequent users of these services. Results of breastfeeding cessation are quite the opposite: rural natives have the lowest cessation rates, followed by migrants and urban natives.

This study also suggests that migrant selection, environmental exposure, and migrant adaptation are equally important contributors to these differentials. However, migrants never adopt the patterns of urban natives in breast-feeding and use of health service, suggesting the persistence of traditional social and cultural barriers.

These findings are useful for the design and implementation of maternal and child health programs in the urban slums and shantytowns of Peru and Bolivia.

Bibliography

Allison, P. 1982. Discrete Time Methods for the Analysis of Event Histories. In *Sociological Methodology*, ed. S. Leihart. USA: Jossey-Bass.

Allison, P. 1984. *Event History Analysis: Regression for Longitudinal Event Data.* USA: Sage.

Anderson, J. 1989. Women's Community Services and Child Welfare in Urban Peru. In *Women, Work, and Child Welfare in the Third World*, ed. J. Leslie. Boulder, Colorado: Westview Press.

Brockerhoff, M. 1990. Rural-to-urban Migration and Child Survival in Senegal. *Demography* 27:601-615.

Carafa, C.R. 1983. Bolivia: Marco Referencial sobre Políticas de Población. En *Luz y Sombra de la Vida: Mortalidad y Fecundidad en Bolivia.* La Paz: Proyecto Politicas de Población.

Cox, D.R. 1972. Regression Methods and Life Tables. *Journal of the Royal Statistics Society*, Series B34:187-202.

Davison, J. 1983. The Survival of Traditional Medicine in a Peruvian Barriada. *Social Science and Medicine* 17:1271-1280.

Demographic and Health Surveys. 1988. *Description of the Demographic and Health Surveys: Individual Recode Data File.* Columbia, Maryland: Institute for Resource Development/Macro Systems, Inc.

Desoto, H. 1987. *El Otro Sendero.* Lima: ILD.

Escobar, G. 1983. Beliefs Regarding the Etiology and Treatment of Infantile Diarrhea in Lima, Peru. *Social Science and Medicine* 17:1257-1269.

Hakkert, R. 1986. Metropolitan Lima: Area Profile. *International Demographics* 5(11):1-8.

Harpham, T. 1986. Health and the Urban Poor. *Health Policy and Planning* 1:5-18.

Instituto Nacional de Estadística (INE). 1986. *Encuesta Nacional de Nutrición y Salud.* Lima, Peru.

Instituto Nacional de Estadística (INE). 1988. *Encuesta Demográfica y de Salud Familiar.* Lima, Peru.

Instituto Nacional de Estadística (INE). 1990. *Peru: Compendio Estadístico 1989-1990.* Lima, Peru.

Instituto Nacional de Estadística and Institute for Resource Development/Macro Systems Inc. (INE and IRD, 1990). 1990. *[Bolivia] Encuesta Nacional de Demográfia y Salud 1989.* Columbia, Maryland: INE and IRD.

Instituto Nacional de Estadística e Informática (INE) and Asociación Benéfica PRISMA and Macro International Inc. (MI). 1992. *[Peru] Encuesta Demográfica y de Salud Familiar 1991/1992.* Columbia, Maryland: INE and MI.

Mazumdar, D. 1987. Rural-urban Migration in Developing Countries. In *Handbook of Regional and Urban Economics* ed. Mills, E.S. USA: Elsevier.

Mosley, H. and L. Chen. 1984. An Analytical Framework for the Study of Child Survival in Developing Countries. *Population and Development Review* 10:25-45.

Mott, K.E. 1990. Parasitic Diseases and Urban Development. *Bulletin WHO* 68:691-8.

Oberai, A.S. 1987. *Migration, Urbanisation and Development.* Geneva: International Labor Office.

Organizacion Internacional del Trabajo. 1988. *Migración y Empleo en Bolivia: Los Casos de las Ciudades de La Paz y Santa Cruz.* Santiago de Chile: OIT.

Pabon, S.E. and C. Ledo. 1988. *Urbanización, Migraciónes y Empleo en la Ciudad de Cochabamba.* La Paz: CEDLA.

Palloni, A. 1981. Mortality in Latin America: Emerging Patterns. *Population and Development Review* 7:623-649.

Pan American Health Organization (PAHO). 1990. *Health Conditions in the Americas.* Washington, D.C.: PAHO.

Preston, S. 1979. Urban Growth in Developing Countries: A Demographic Appraisal. *Population and Development Review* 5:195-212.

Richman, J.A., M. Gaviria, J.A. Flaherty, S. Birz, and R.M. Wintrob. 1987. The Process of Acculturation: Theoretical Perspectives and an Empirical Investigation in Peru. *Social Science and Medicine* 25:839-847.

Rosenzweig, M.R. and K.I. Wolpin. 1984. *Migration Selectivity and the Effects of Public Programs.* Minneapolis: Department of Economics, University of Minnesota.

Secretariado Nacional de Pastoral Social. 1991. *Analisis de la Realidad Migratoria en Bolivia.* La Paz: SENPAS.

Suarez-Berenguela, R.M. 1988. *Informal Sector, Labor Markets and Returns to Education in Peru.* Washington, D.C.: World Bank.

Tam, L. 1990. *Factors Associated with the Use of Modern Prenatal Care and Birth Delivery in Peru.* Paper presented at the 119th Annual Meeting of the American Public Health Association, Atlanta, Georgia.

Todaro, M. 1989. Economic Development in the Third World. San Francisco: Longman.

UNICEF. 1991. *Statistics on Children in UNICEF-assisted Countries.* USA: UNICEF.

UNITAS. 1988. *El Alto desde El Alto.* La Paz: UNITAS.

Zschock, D. 1988. *Health Care in Peru: Resources and Policy.* Boulder, Colorado: Westview Press.

Appendix A. List of Variables

I. MIGRATION VARIABLES

URBAN NATIVE
Reference category for the next 3 "migration" dummy variables and denotes:
1=Mother is an urban native.
0=Mother is not an urban native

RURAL NATIVE
1=Mother is a rural native.
0=Mother is not a rural native.

RECENT MIGRANT
1=Mother is a recent migrant.
0=Mother is not a recent migrant.

LONG-TERM MIGRANT
1=Mother is a long-term migrant.
0=Mother is not a long-term migrant.

II. NON-MIGRATION VARIABLES

MATERNAL EDUCATION
In years of completed formal education.

MARITAL STATUS
0=Never married, widowed, divorced, not living together.
1=Married, living together.

PLACE OF CHILD'S BIRTH
0=Index child born in rural area.
1=Index child born in urban area.

HOUSEHOLD WEALTH INDEX
Based on the results of factor analysis (principal components method), an additive scale based on the following indicators was created:

Time to get to potable water source:
- 0=15 minutes or more.
- 1=Outside premises but less than 15 minutes.
- 2=Inside premises.

Type of toilet facility:
- 0=No facilities.
- 1=Any toilet facility (e.g., flush toilet, latrine).

Floor material:
- 0=Sand or earth.
- 1=Any other floor material.

The lowest value of this index is zero (0) and the highest is four (4).

USE OF CONTRACEPTION
Use of contraceptive methods during the intergestational period prior to the index child.
0=No contraception used.
1=Traditional methods used (periodic abstinence, withdrawal)
2=Modern methods used (pill, IUD, injections, diaphragm, foam, jelly, condom)

USE OF PRENATAL CARE
Use (at least once) of a modern practitioner for the prenatal care of the index child.
1=Used a medical doctor, trained nurse or birth attendant.
0=Used none or other provider.

USE OF MODERN BIRTH DELIVERY CARE
Use of a modern practitioner during the birth delivery for the index child.
1=Used a medical doctor, trained nurse or birth attendant.
0=Used none, a relative or other provider.

USE OF HEALTH SERVICES INDEX
Based on the results of the factor analysis (principal components method), an additive scale comprising the use of prenatal care, modern birth delivery and contraception variables was created.

MULTIPLE BIRTH
0=Single birth.
1=Twins or multiple birth.

MOTHER'S AGE AT MIGRATION
In years. It is set to zero (0) for rural and urban natives.

BIRTH ORDER 2-4 AND BIRTH INTERVAL OF DURATION 24+ MONTHS
Reference category for the next 5 "family formation pattern" dummy variables and denotes:
1=Having a birth order of 2-4 and a preceding birth interval of 24 months or longer.
0=Otherwise.

BIRTH ORDER 2-4 AND BIRTH INTERVAL OF DURATION <24 MONTHS
1=Having a birth order of 2-4 and a preceding birth interval shorter than 24 months.
0=Otherwise.

BIRTH ORDER 5+ AND BIRTH INTERVAL OF DURATION 24+ MONTHS
1=Having a birth order of 5 or more and a preceding birth interval of 24 months or longer.
0=Otherwise.

BIRTH ORDER 5+ AND BIRTH INTERVAL OF DURATION <24 MONTHS
1=Having a birth order of 5 or more and a preceding birth interval shorter than 24 months.
0=Otherwise.

BIRTH ORDER 1
1=First birth.
0=Otherwise.