The determinants of use of maternal and child health services in Metro Cebu, the Philippines[*]

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Abstract

The determinants of the use of family planning, prenatal care, childhood immunizations and oral rehydration salts (ORS) were studied with survey data of 8000 women in Metro Cebu, the Philippines. Polytomous logistic regression methods were used. The level of maternal education was the most consistent and important determinant of use of these four health services in both urban and rural areas. For example, the estimated odds of using modern contraception increased by six and eleven per cent for each additional year of schooling in urban and rural strata respectively. Economic status and access to service variables had less consistent patterns: women's work status, for example, was associated only with contraceptive use.

Family planning, prenatal health services, and child health care improve the survival and quality of life for mothers and children (UNICEF 1989) but are often underutilized by those mothers and children who are in greatest need. This is particularly true in developing countries, where child mortality is high because the burden of disease is greater and services are less available. One of the challenges in public health is to identify high-risk groups and to provide them with needed preventive and curative health services.

The use of health services is a complex behavioural phenomenon. It is related to the organization of the health-delivery system and is affected by the availability, quality, costs, continuity and comprehensiveness of services; social structure and health beliefs also affect use (Andersen 1968; Fiedler 1981; Kroeger 1983). For preventive services like prenatal care, family planning or immunizations, the perception of need is more complicated than in the case of disease recognition, and involves beliefs about susceptibility, consequences and effectiveness of the intervention (Rosenstock 1966).

Empirical studies of preventive services have often found that use of services is more strongly correlated with demographic and socioeconomic characteristics than with health beliefs (Hingson, Lin and Hingson 1976; Fiedler 1981). Many studies in developing nations have found a strong effect of

maternal education on use of maternal and child health services (Parker and Reinke 1983; Monteith et al. 1987; Warren et al. 1987; Rutstein, Sommerfelt and Schoemaker 1990; Canovas 1991). For example, in a recent study of women's education and other determinants of use of prenatal-care and delivery services in Peru, Elo (1992) found that a strong education effect persisted after controlling other determinants.

The purpose of this paper is to describe the patterns and determinants of use of maternal and child health services by mothers of children under 30 months of age in Metro Cebu, the Philippines. The study is part of a larger investigation of health services that is designed to assess their impact on child health. For this study, the health behaviours and services of interest are contraception, prenatal care, childhood immunizations, and use of oral rehydration salts (ORS). The determinants of use that we examine are demographic, socioeconomic, education, and access and communication variables.

Methods

Study population and fieldwork

Cebu City is located on Cebu Island, one of the central Visayan islands of the Philippines. The metropolitan area (known as Metro Cebu) has a population of approximately 1.5 million people. Metro Cebu is predominantly urban although there are agricultural and fishing villages within the area which are officially classified as rural. Each of 253 *barangays* (the local political administrative unit) is served by a public primary health clinic, although smaller *barangays* often share clinics with neighbouring *barangays*. Obstetric care, family planning, immunizations and treatment of simple diseases are among the services provided free of charge at these clinics; patients are referred to nearby secondary and tertiary facilities as needed. In addition to the public system, there is a private sector where both modern and traditional medicine are practised. In the urban areas the public facilities are managed by several government bodies, while the rural facilities are coordinated by the provincial office of the Department of Health.

For this study, 33 *barangays*[1] in the Metro Cebu area were selected in a stratified random sample of urban and rural *barangays* so that approximately equal numbers of urban and rural children could be included. In the selected *barangays* a census of households was done in early 1988 to identify children under 30 months of age eligible for the study. A baseline survey of all mothers with eligible children was conducted between July 1988 and January 1989, by trained local interviewers using a piloted, precoded questionnaire. (Two per cent of the respondents were not mothers of the children and are excluded from the present analyses.) Verbal informed consent was obtained with a response rate exceeding 99 per cent. Information was obtained from 8,330 mothers with 9,586 eligible children.

The interviewer obtained information at three levels: household, mother, and eligible child. At the household level questions were asked on household composition, facilities and type of construction of the home, ownership of television, radio and means of transportation, and distance to the nearest health provider. Information on maternal characteristics included questions on formal education, employment, obstetric history, knowledge and use of ORS, and current contraceptive use. For the eligible children, questions were asked about immunizations, breastfeeding and recent illnesses.

Analysis

For analysis we selected all currently married mothers who were not pregnant at the time of the survey and had an eligible child at least six months of age (n=4629). The mothers' ages ranged from 15 to 52

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[1] Four *barangays* were excluded because of insurgency problems, and another small one (a high socioeconomic neighbourhood) was dropped because of low participation in the initial census.

though only one per cent were older than 44. If the mother had two eligible children (fewer than ten per cent of mothers) the youngest child was selected. Incomplete questionnaires were excluded (9%), mostly due to missing or not applicable information on husbands.

There are four dependent health-care variables in the study and each was divided into three levels of the adequacy of care as follows:

Prenatal care. The mother was asked if she had received prenatal services, and if so, when she was first seen and how many visits she had for her most recent birth. More than 98 per cent of women in Cebu obtained some prenatal care, but often at a late gestational age. Three groups of mothers were distinguished: those who received care in the first trimester and had five or more visits (adequate care); those with no care or only one visit, or who had the first visit in the third trimester and fewer than five visits (poor care), and any other (intermediate care).

Contraception. Mothers reported current use of contraception. Contraceptive use was classified into none, traditional, or modern. Abstinence and rhythm methods were defined as traditional, while modern methods include sterilization, oral contraception, intrauterine devices and barrier methods.

Immunization status. The mother reported immunizations received by the child and for more than 80 per cent of children. The reports were confirmed by immunization records. Children were classified as fully immunized if all available antigens were received (BCG, DPT3, OPV3, and measles); partly immunized (some, but not all antigens received); or not immunized. Measles vaccination status was considered for children older than twelve months but not for children aged six to twelve months.

Knowledge and use of ORS. Mothers were classified as never having heard of ORS; having heard but never used; or having heard and used ORS.

Table 1

Independent variables used in the analyis: means of continuous variables and per cent distributions for categorical variables, by place of residence

Variable	Units or categories	Urban	Rural
	Continuous variables	**Mean**	
Demographic variables			
Women's age	years	28.3	28.0
Child's age	months	15.2	14.0
Number of children <30 months	number	1.1	1.3
Mobility	years lived in the *barangay*	11.2	15.7
Socioeconomic variable			
Crowding	persons per room in the household	2.8	2.9
Access variable			
Access to health facility	minutes needed to reach the nearest facility	12.2	13.5
Education variables			
Mother's education	years of formal education	8.9	7.4
Husband's education	years of formal education	9.4	7.6
	Categorical variables	**Percentage**	
Socioeconomic variables			
Occupation: husband	not employed	4	3
	employed in manual occupation	77	85
	employed in non-manual occupation	19	11
mother	not employed	51	51
	employed inside the home in manual work	11	18
	employed inside the home in non-manual work	23	20
	employed outside the home in non-manual work	10	7
Housing materials:			
wall materials	wood	67	61
	cement	21	14
	other	12	24
floor materials	bamboo	45	57
	wood	17	10
	cement	28	22
	other	10	11
Fuel and lighting:			
lighting	gas or oil	23	43
	electric	77	57
cooking fuel	wood	68	88
	gas or oil	32	12
Water and sanitation:			
water source	open well	12	15
	purchased	36	12
	pipe/pump	52	73
toilet	none	18	55
	pit or sealed	82	45
Access and communication variables			
Own transportation	no	75	76
	yes	25	24
Own radio or television	no	27	32
	either	73	68

Table 1 shows for the independent variables used in the analysis the mean of the continuous independent variables and the percentage distributions of the categorical variables, for urban and rural strata. The variables were categorized as demographic, education, socioeconomic, and access and communication variables. These data have been reported previously for the entire sample (Becker and Peters 1991). Occupation was classified initially into eleven categories according to the Philippine Standards Occupational Classification (Republic of the Philippines 1977), and thence into three categories: not employed, manual worker, and non-manual worker. Mothers were further distinguished according to whether the employment was inside or outside the home.

Since the sample was stratified and relationships may vary in the two strata, analyses were performed separately for urban and rural areas without adjustment for design effects. For bivariate analysis, chi-square statistics were used to test for categorical factors, while F-statistics (from ANOVA) were used for discrete or continuous variables.

For the multivariate analyses, a trichotomous logistic regression was employed (Hosmer and Lemeshow 1989). For model fitting we first included all independent variables that were significant (p < .05) in bivariate analyses for any of the four dependent variables in a given stratum. Within the family of trichotomous regression models we then tested the proportional-odds assumption. The hypothesis of proportional odds for each dependent variable and stratum was rejected, indicating the need for a trichotomous logistic regression. The program CATMOD in the SAS software was used (SAS Institute 1985). Because the processing of 2500 urban cases exceeded the memory limits of SAS, a random sample of 2088 (the same number as in the rural area) was selected for analysis.

To determine the best trichotomous model we removed from the full model variables not significant at the ten per cent level using the Wald chi-square test for individual coefficients (Hosmer and Lemeshow 1989) to obtain a reduced model. For categorical variables defined by two or more dummy variables, all significance levels had to be above ten per cent for removal. With the reduced model, we added back significant variables (or grouped dummy variables) and evaluated whether to retain the variable using the change in log-likelihood ratio criterion (at the five per cent level of significance). Child's age was included as a control variable in all models. The statistical theory and software for testing goodness of fit in polytomous logistic regression are poorly developed (Hosmer and Lemeshow 1989). Therefore, in the spirit of the Hosmer-Lemeshow test for binary logistic regression, we used the following procedure to assess fit: with the covariates in the final model for each health behaviour, we calculated the expected probability of having each outcome for each individual; for a fixed table of four covariates,[2] these probabilities were summed within each cell to determine the expected number of women with each outcome; and expected and observed numbers were used to estimate a chi-square goodness-of-fit statistic.[3]

Results

Table 2 shows the distributions of the dependent variables in the urban and rural samples. There is greater contraceptive use and more adequate prenatal care in urban areas, but adequate childhood immunization and ORS use are more common among rural women.

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[2] Four covariates that were important in nearly all models were chosen: child's age, maternal age, maternal educational level and time to health facility. Thus the table had 16 cells. Since the table covariates is arbitrary, to determine if the results were sensitive to the table specification, two other combinations of variables were chosen and the results led to the same conclusions in all cases except for immunization in rural areas which had a lack of fit in two specifications but an acceptable fit in the third.

[3] The goodness-of-fit statistics were calculated using coefficients for the models with radio and television ownership combined as one variable.

Table 2

Percentage distribution of health-behaviour variables in urban and rural areas

Variable	Group	Area of residence	
		Urban %	Rural %
Contraception	none	43	52
	traditional	26	20
	modern	31	28
Prenatal care	poor	7	9
	moderate	61	73
	adequate	31	18
Immunization	none	23	17
	some	60	59
	adequate	17	24
ORS knowledge/use	never heard	35	26
	heard, not used	29	28
	used	36	46
		100	100
(N)		(2541)	(2088)

Note: All differences between rural and urban areas are statistically significant

With four dependent variables (each with three levels), 19 independent variables (Table 1) and two strata, the number of bivariate analyses is very large.[4] Numerous associations were found to be significant in the bivariate analyses. For the sake of brevity we will concentrate on the results of the multivariate analyses.

For all health-care outcomes, higher parental education, and particularly maternal education, was associated with increased utilization in both urban and rural areas (Tables 3a and 3b). In the trichotomous logistic model for contraception older women had increased odds of traditional method use, but lower likelihood of modern method use. Maternal work status was an important determinant of traditional or modern contraceptive use, relative to women who did not work for pay. Also, household characteristics were inconsistently associated with contraceptive use in urban and rural areas. The effects of access to communications and services varied. In urban areas, possession of a television was associated with use of traditional and modern contraception but this association was not present in rural areas. However, in rural areas a longer travel time to family-planning facilities was associated with lower use.

Table 3a

Adjusted odds ratios for significant variables estimated from trichotomous logistic regression of four utilization variables: urban women

Variable	Contraception (ref=none)	Prenatal care (ref=poor)	Immunization (ref = none)	ORS (ref = not used)

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[4] The results, which consist of means of continuous independent variables and the percentage distribution across the three levels of the dependent variables for each group of the categorical independent variables, are available as appendix tables on request from Stan Becker or Connie Gultiano.

	trad.	modern	some	adeq.	some	full	heard only	used
Demographic variables								
Child's age (6 months)	1.02	1.05	1.04	1.04	1.03	0.81		
Women's age (5 years)	1.11	0.89	0.97	0.81	–	0.96		
No. children < age 30 mo.	–	1.56	0.60	0.46	0.71	0.48		
Years in *barangay* (5 yrs)	0.93	–						
Education variable								
Mother's education (yrs)	1.04	1.06			1.10	1.15	1.04	–
Father's education (yrs)	1.07	1.07	1.09	1.14				
Economic variables								
Persons per room			–	0.82			–	1.17
Women's work (ref=unemployed)								
manual at home	1.98	–						
manual outside	1.56	1.68						
non-manual outside	1.48	–						
Water avail. (ref=open)								
purchased					4.78	10.34		
pipe/pump					3.37	6.92		
Sanitation (ref=no toilet)								
any toilet	1.37	1.58			1.78	2.34		
Housing materials (ref=not wood or cement)								
wood							–	1.47
Access/communic.variable								
Minutes to facility (5 min)							–	0.94
Radio/TV (ref=neither)								
radio only	–	–	1.42	1.50	1.63	2.07	–	0.79
television	1.97	1.73	1.54	2.11	1.73	2.16	0.68	0.54
Own transport. (ref=no)	1.43	–						
Goodness-of-fit chi-square (32 degrees of freedom)		102*		53		65*		39

*p<.01

Education was again an important predictor of prenatal care in urban and rural areas. In urban areas, each year of husband's education raised the odds that the wife had received some prenatal care by nine per cent and of adequate care by 14 per cent. In rural areas the effect of women's education was even larger; an eleven per cent increase in the odds of receiving moderate levels of prenatal care and a 19 per cent increase in the odds of receiving adequate care for each additional year of schooling. Possession of radio and/or television was also associated with adequate prenatal care in both areas.

Table 3b

Adjusted odds ratios for significant variables estimated from trichotomous logistic regression of four utilization variables: rural women

Variable	Contraception (ref=none)		Prenatal care (ref=poor)		Immunization (ref = none)		ORS (ref = not used)	
	trad.	modern	some	adeq.	some	full	heard only	used

Demographic variables								
Child's age (6 months)	1.03	1.06	1.02	1.03				
Women's age (5 years)	1.15	0.84			0.83	0.83		
No. children < age 30 mo.								
Years in *barangay* (5 yrs)								
Education variable								
Mother's education (yrs)	1.10	1.11	1.06	1.19	1.10	1.10	1.06	1.06
Father's education (yrs)	–	–	–	1.09				
Economic variables								
Persons per room					–	0.90		
Women's work (ref=unemployed)								
manual at home	1.52	–			–	–		
manual outside	–	1.56			–	0.70		
non-manual outside	–	1.70			–	–		
non-manual at home	1.95	–			–	–		
Water avail. (ref=open)								
purchased					0.53	–		
pipe/pump					1.73	2.27	–	0.64
Sanitation (ref=no toilet)								
any toilet					1.64	2.20	2.04	2.55
Housing materials (ref=not wood or cement)								
wood							0.42	–
Lighting fuel (ref=gas/oil)								
electric	1.75	1.40						
Cooking fuel (ref=wood)								
gas/oil							–	0.53
Access/communic.variable								
Minutes to facility (5 min)	–	0.93			–	0.98	0.94	0.91
Radio/TV (ref=neither)								
radio only			–	1.57				
television			1.90	–				
Own transport. (ref=no)					–	0.70		
Goodness-of-fit chi-square (32 degrees of freedom)	122*		88*		56*		37	

*p<.01

Parental education and water/sanitation variables were consistently important for childhood immunizations in both strata. In urban areas, children in households with water supplied by pipe or pump had three times the odds of having some immunizations and seven times the odds of full immunization (versus none) relative to children in households that used an open-water source, and the corresponding increase in odds in rural areas was two times the level for the reference group after controlling other variables. Similarly, children in households with any toilet had about twice the odds of having some or full immunizations relative to those who had no toilet in both urban and rural areas. In the rural strata, time to the nearest health facility was an important predictor, whereas in urban areas access to mass media as measured by availability of television and radio was strongly associated with immunization.

The effect of women's education on ORS knowledge and ever use was less than for prenatal care and immunization. In the rural stratum, sanitary facilities were associated with increased ORS knowledge and use, but inversely associated with distance from the health facility. Paradoxically, in urban areas possession of either a television or radio was associated with significantly decreased ORS use.

Figure 1 summarizes the net effects of women's education on the four health-utilization variables. In rural areas increased education has the greatest effect on the odds of receiving adequate prenatal care, while in urban areas, the greatest effect is on the odds of the index child receiving full immunizations. Relatively speaking, ORS use is little affected by increasing years of education, net of other variables.

The chi-square values at the bottom of Tables 3a and 3b give an indication of goodness of fit of the models. The models for ORS use fit well while the chi-square statistics for immunization, prenatal care and birth control indicate relatively poor model fits.

Discussion

Several findings were common to all models of health-services use. Education, particularly mother's education, was a significant predictor in all models except for the use of prenatal care among urban women. The finding of a strong education effect is consistent with findings (cited above) from other regions of the world. Caldwell (1981) has postulated that education gives women greater power over their circumstances, leading to a greater utilization of modern health care. We were unable to determine the mechanisms for the maternal education effect in this study. The results do suggest that in the short term health programs need to focus on attracting less educated women.

Socioeconomic indicators were important predictors of contraceptive use, adequate immunizations and ORS knowledge and use, but had no effect on use of prenatal care in rural areas and a minor effect in urban areas. The direction of the effect of work of husband and wife was different for the different dependent variables: while any maternal work increased the odds of contraceptive use, for certain maternal and paternal work categories the odds of immunization were decreased. The latter may indicate a problem of access since the immunization clinics are open only during working hours.

Figure 1
Estimated odds for use of four health services, by years of education (adjusted for other effects)
by area of residence

Rural areas

Urban areas
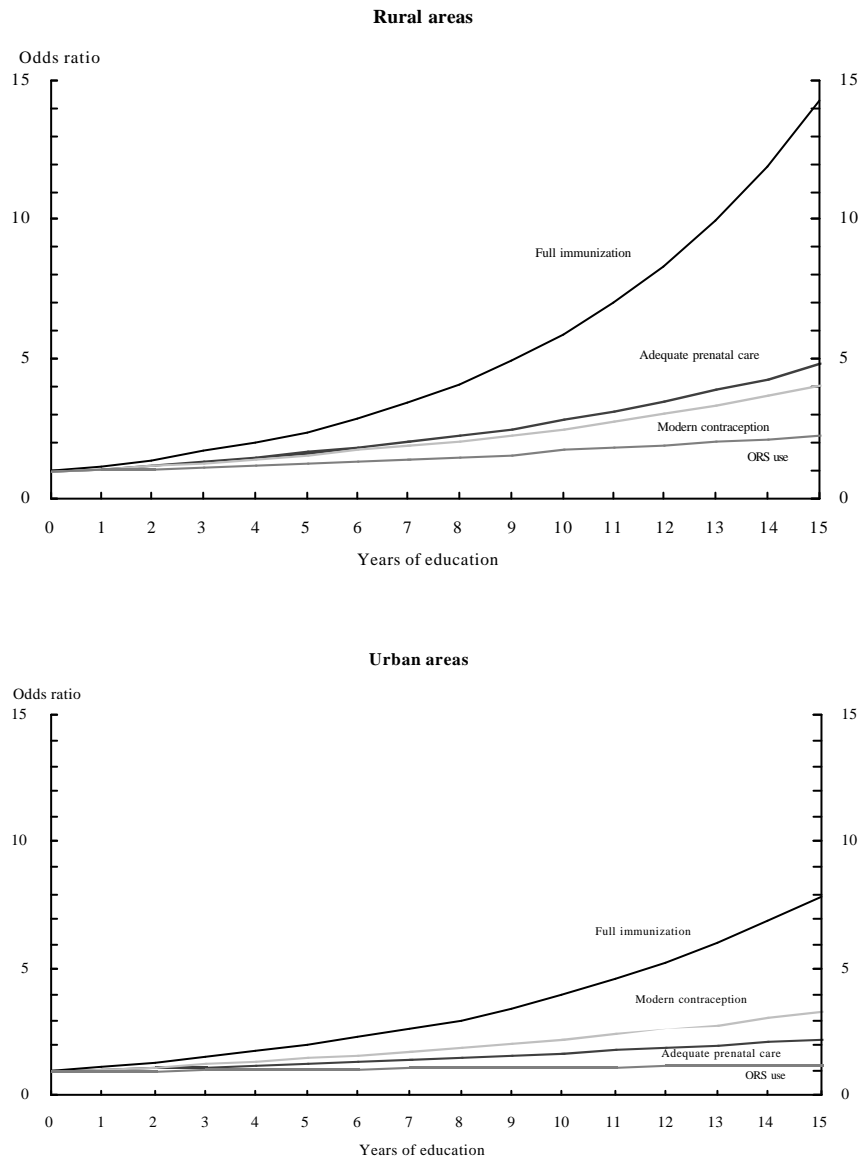
With respect to health communication, possession of a radio and/or television was more important in urban than in rural *barangays*, increasing the odds of use of contraception, prenatal care and immunization. Since the associations with other indicators of economic status were less frequently significant, ownership of radio and television may be more a measure of access to information on health than a proxy for wealth. While 38 per cent of study households in urban areas possessed a television, the comparable figure in rural areas was 23 per cent. The positive associations between possession of a television and use of the three health services (prenatal care, immunizations and contraception) were even stronger than those between possession of a radio and use of the same services. During the time period of the study, the Philippine Department of Health sponsored several health information campaigns using television messages and it is possible that such mass-media campaigns may have had an effect, independent of other factors. However, the lower odds of use of ORS in households with a radio and/or television does not support this hypothesis and suggests that the diffusion of ORS use in Cebu did not depend on the media. In two Asian countries, Sri Lanka and Thailand, studied by the Demographic and Health Surveys, it was also noted that ORS use was not higher among households with a radio than without one (Table 3.13 in Boerma, Sommerfelt and Rutstein 1991).

Regarding physical access to care, travel time to health facility was unimportant in urban *barangays*, but in rural *barangays* it was significant for all outcome variables except prenatal care. In the urban area health facilities are quite accessible, but women in rural areas who live far from facilities need more attention from health-care providers. In addition, since in both areas the proportion of women with some or adequate prenatal care was greater than the proportion with some or adequate immunization, the importance of immunization needs to be stressed at the time of prenatal visits.

Aside from these common findings, the models differed for each type of service, and different factors affected utilization in urban and rural areas, that is, explanations about utilization behaviour were specific to location and type of service. Many characteristics of urban and rural women and children are different (Tables 1 and 2) as are the services provided in these areas. Rural children had higher immunization rates than urban children, and rural mothers had used ORS more than their urban counterparts, but the latter were more likely to get early prenatal care and to use contraception. The organization of the public health system in rural *barangays* appears to be better suited to providing preventive services than does the organization in urban areas. Actually, with the exception of immunizations, which were obtained from public clinics for over 90 per cent of all children in both strata of Metro Cebu, urban women were more likely to use private services than were rural women (Peters et al. 1991).

But private providers charge fees, which could explain the lower use of preventive care among urban women. One might ask why urban women of lower socioeconomic status do not use public health centres. Women's informal responses to this question reflected the perceptions that the centres often run out of medical supplies, that there are long waits at public facilities, that some private doctors charge a very minimal fee for indigent women and give out 'samples' to their patients, and that urban Department of Health personnel are often unapproachable and tend to favour friends and relatives in the distribution of medical services and supplies.

Other barriers to health care exist in Metro Cebu. As noted above, clinic hours are inconvenient for many mothers, and nonusers may perceive the quality of care to be poor. A recent study of the quality of health care in the same *barangays* did find that communication with mothers was particularly deficient, even when services were otherwise adequate (Peters et al. 1991). Improving advice to mothers, particularly about the importance of prenatal visits, the use of ORS, and when children should return for vaccination, could increase utilization.

Several strengths of the study deserve mention: the large sample sizes, the meticulous data collection which meant there were very few inconsistent or unknown values, and the detailed information about all four health behaviours. Two limitations of this study also must be noted. First, in order to avoid not-applicable codes, the sample for analysis was restricted to non-pregnant currently-married women with a child over six months of age. Pregnant women and women without husbands had a different profile of health behaviours (data not shown). Secondly, based on goodness-of-fit analyses, only the models for immunization fit the data well, despite the significant coefficients in all the models. However, it is not uncommon in regression models with large samples for there to be highly significant coefficients but a poor overall fit of the model.

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Appendix Table 2A

Percentage distribution of contraceptive use, prenatal-care use, immunization status of youngest child and knowledge and use of oral rehydration therapy, by selected categorical variables by place of residence

		URBAN											
		Contraception			Prenatal			Immunizations			ORS			No. women
Variable	Group	none	trad.	moder.	poor	some	adeq.	none	some	all	no	heard	used	
Woman's work	not working	48	23	29***	8	62	30***	23	29	47***	33	30	37	1290
	manual in home	40	28	32	7	66	27	22	31	47	36	27	38	290
	manual outside	33	33	34	5	50	45	30	29	41	38	30	32	574
	nonmanual home	46	30	25	8	62	29	27	28	46	32	27	41	134
	nonmanual outside	34	29	37	6	60	34	10	32	58	39	28	33	253
Husband's work	not working	29	29	43***	6	58	36***	16	23	61***	41	29	31**	101
	manual	46	25	29	8	64	28	26	29	44	33	28	38	1971
	nonmanual	34	29	37	4	52	44	14	32	54	40	30	30	469
Wall material	other	55	20	25***	13	59	28***	36	25	39***	35	25	40***	295
	wood	45	25	30	7	64	28	24	31	45	31	30	39	1711
	cement	28	34	38	4	54	42	15	29	56	48	26	26	535
Floor material	other	43	27	29***	13	59	28***	36	25	39***	35	25	40***	295
	bamboo	49	24	27	9	65	27	29	29	42	30	29	42	1137
	wood	45	26	29	10	63	28	22	33	45	31	33	36	436
	cement	31	30	39	4	59	37	16	31	53	44	26	30	723
Cooking fuel	wood	48	24	28***	9	65	26***	27	30	43***	32	29	40***	1713
	gas/oil	31	31	38	5	61	33	20	29	51	37	29	33	1937
Light	gas/oil	57	21	22***	14	61	25***	34	33	33***	27	27	47***	604
	electric	38	28	34	5	61	33	20	29	51	37	29	33	1937
Water source	open	44	25	32***	11	65	24***	52	27	20***	37	30	33***	301
	purchased	52	26	23	9	65	26	19	32	49	28	30	42	902
	pipe/pump	37	27	36	5	58	37	19	29	52	39	28	33	1338
Toilet	none	58	21	21	13	63	24	42	32	26	31	26	44	455
	any toilet	40	27	33	6	61	33	19	29	51	36	29	35	2086
TV/radio	none	55	20	25***	12	65	23***	33	29	38***	27	29	44***	699
	radio &/or TV	38	29	33	6	60	34	20	30	50	38	29	33	1842
Transportation	none	45	24	31***	8	63	29***	25	29	47*	32	29	39***	1900
	own	36	33	32	6	57	37	20	33	47	42	27	30	641

* p value < .05   ** p value < .01   *** p value < .001

Appendix Table 2B

Percentage distribution of contraceptive use, prenatal-care use, immunization status of youngest child and knowledge and use of oral rehydration therapy, by selected categorical variables by place of residence

Variable	Group	Contraception			Prenatal			RURAL Immunizations			ORS			No. women
		none	trad.	moder.	poor	some	adeq.	none	some	all	no	heard	used	
Woman's work	not working	57	18	26***	10	72	18***	15	18	67**	26	29	45	1068
	manual in home	52	23	24	8	75	17	16	16	69	22	30	48	374
	manual outside	48	19	33	9	75	15	23	17	60	26	24	50	421
	nonmanual home	40	37	23	6	67	27	20	13	67	23	27	50	86
	nonmanual outside	35	25	40	3	69	28	12	23	65	33	30	37	139
Husband's work	not working	51	23	26***	11	66	23***	11	16	73**	30	30	40	70
	manual	53	19	28	4	73	17	18	16	66	25	28	47	1781
	nonmanual	45	27	28	4	70	27	12	25	62	31	28	41	237
Wall material	other	58	18	24**	11	76	13***	17	15	68*	23	30	47*	509
	wood	51	21	28	8	74	18	18	18	64	25	28	47	1278
	cement	44	22	34	8	62	30	12	18	70	32	23	45	301
Floor material	other	45	23	32***	9	75	16***	13	17	71*	26	23	51	232
	bamboo	58	18	23	10	75	15	19	16	65	24	28	48	1187
	wood	47	23	30	7	72	21	19	18	63	28	29	43	208
	cement	42	22	36	7	66	27	13	20	67	28	30	43	461
Cooking fuel	wood	53	20	27***	9	74	16***	18	17	65***	25	27	48***	1842
	gas/oil	41	22	37	7	70	23	14	18	68	27	29	43	1183
Light	gas/oil	62	15	23***	11	76	13***	21	16	63***	23	26	51**	905
	electric	44	24	31	7	70	23	14	18	68	27	29	43	1183
Water source	open	58	19	23***	14	72	14***	28	20	52***	20	28	52***	321
	purchased	58	20	22	9	75	16	25	8	67	18	27	55	251
	pipe/pump	50	21	30	8	72	20	13	18	69	28	28	44	1516
Toilet	none	59	17	24	11	75	14	24	17	59***	23	28	49	1137
	any toilet	44	24	33	7	70	24	9	17	74	28	28	43	951
TV/radio	none	61	17	22***	11	76	13***	18	15	66	24	27	49*	665
	radio &/or TV	48	22	30	8	71	21	16	17	66	27	28	45	1423
Transportation	none	53	19	28	9	73	18	16	17	67	26	28	46	1585
	own	49	23	28	9	72	19	20	17	63	26	27	48	503

* p value < .05   ** p value < .01   *** p value < .001