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PRENATAL CARE IN PERU

by

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CONTENTS

Abstract

Prenatal care saves the lives of mothers and their children and improves the quality of their lives This paper examines the use of prenatal care among Peruvian women during 1982-84 It considers four dimensions of prenatal care behavior (a) the decision to seek care, (b) the decision on where to seek care, (c) the decision on when to initiate care, and (d) the decision on the number of prenatal care visits Our primary aim is to identify government policies that would facilitate the use of prenatal care

We use data from the Encuesta Nacional de Nutrición y Salud (the ENNSA survey), which is composed of a stratified random sample of 19,277 households interviewed between April and November 1984 (INE 1986) Our study includes both a descriptive and an analytic analysis of these data

During 1982-84, 82 percent of pregnant women in urban Peru had at least one prenatal care check-up In rural areas that figure was 35 percent The use of private prenatal care was similar in urban and rural areas, 20 percent and 17 percent of all prenatal care, respectively Public care was much less common in rural areas About 78 percent of all care in urban areas was in public facilities, compared with around 53 percent in rural areas The reduced use of public prenatal care in rural areas compared with urban areas was balanced by a roughly comparable increase in the amount of care performed at home

Urban women initiated care much earlier than rural women Of those urban women that used prenatal care, 62 percent initiated care in the first trimester of their pregnancy, while only some 38 percent of the rural women initiated care this early About two-thirds of all rural women using care made three or fewer prenatal care visits, while for urban women that proportion was less than one-quarter Around 41 percent of urban users had seven or more visits compared with 10 percent of the rural users

Because of our interest in policy analysis, we divided the women in both the urban and rural areas into three groups based on their use of prenatal care the low use group, the average use group, and the high use group These three groups represent different socioeconomic and cultural strata of Peruvian society The core of the study is an analysis of why the prenatal care behaviors of the different groups varied We divided the list of potential variables associated with differences in prenatal care behavior into a number of categories, including demographic variables, socioeconomic and household structure variables, regional variables, accessibility measures, and measures of price and quality of available health care

An important variable for understanding which urban women seek health care is the quality variable, measured by whether or not women have access to hospitals run by the Instituto Peruano de Seguridad Social (IPSS) Our analysis indicates that if the Government of Peru could make hospitals with the IPSS level of quality available to all urban Peruvian women, the level of prenatal care use would come close to 100 percent even for women who previously had low levels of use

Over and over again, the woman's education proved to be one of the most important variables for understanding differences in prenatal care behavior across groups For example, this variable alone accounts for around 41 percent of the difference in behavior between the urban low use and average use groups in terms of seeking prenatal care, and 31 8 percent of the difference in terms of visits per month Further increases in women's educational levels would certainly help improve the levels of prenatal care in urban areas, although these are already reasonably high In contrast, improving women's educational levels is virtually a prerequisite for any improvement in rural areas

The women in the rural low use group had virtually no education, lived in areas with few facilities, and had virtually no access to health insurance Our results indicate that no single policy will have much of an effect on their prenatal care behavior A simultaneous program that provided them with at least four years of education, increased the number of hospitals and health centers in rural districts from 0 4 to 3 and increased the proportion with access to high-quality health care facilities from 0 to 50 percent would increase the proportion seeking care from about 20 percent to around 50 percent. Even with such an enormous program, the use of prenatal care among the rural poor would be below that of the high use rural group and the low use urban group

Introduction

Pregnancies result in new lives, but all too often in death as well "Over her lifetime the average woman in the developing world except China faces 1 chance in 33 that pregnancy or childbirth will cause her death" (Population Information Program, 1988, p 2) Most of these deaths are avoidable they are associated with poor nutrition and inadequate health care Governments all over the world have policies aimed at increasing prenatal health care coverage and decreasing maternal and infant mortality rates

Studies based on information gathered from countries at different levels of development around the world claim that prenatal care is a factor that directly influences infants' birthweights, and hence their chances of surviving to adulthood (Donaldson and Bill, 1984) Experts acknowledge that close monitoring of pregnant women is only one of the benefits of prenatal care Women that choose to have regular check-ups during their pregnancies are more likely to make other adjustments in their lives to improve their health and that of their children, like not smoking, getting more rest, and eating more nutritious foods In Peru, where the infant mortality rate was 10 percent in 1983 (World Bank n d), both the quantity and quality of life for mothers and children can be improved through the provision of more and better prenatal care

Peru has a mixed public/private system of health care delivery According to Zschock (1988, p 12), 66 5 percent of Peru's health care expenditures in 1984 were made by the public sector and 33 5 percent by the private sector The Peruvian Institute for Social Security (IPSS) was responsible for 49 percent of the public expenditures, the Ministry of Health for 41 percent, and other governmental groups, such as the armed forces and the police, for the remainder We do not know of any figures on expenditures per patient, but we can get a rough approximation to this from Mesa-Lago (1988, p 229) He wrote "IPSS spends more on health care annually than the Ministry of Health does , but covers only half as many people at over twice the cost per capita " From our data, it appears that this additional cost was translated into health care of considerably higher perceived quality

Care at IPSS facilities, like those of the Ministry of Health, is provided at little or no cost IPSS care, however, was available only to a select group of Peruvians, mainly employees of firms in the formal sector of the economy and their dependents (Mesa-Lago (1988, p 247)) In 1984, when our data were collected, women who themselves were covered by IPSS and wives of covered husbands were entitled to prenatal care Women workers with IPSS coverage had a special incentive to seek prenatal care According to Peruvian law, if their pregnancies were certified by an IPSS doctor, they were allowed 60 days of paid maternity leave at 60 percent pay, if they worked in the private sector, and 100 percent pay, if they worked for the government (Peruvian Law Number 285, articles 14-18, 20, 21, 23, 24, 26, 27, 29, and 33)

This paper focuses on the factors that influence the use of prenatal care in Peru In particular, we wanted to find out if policies exist that the government could implement to improve the use of that care Our report is divided into 5 sections In the second section, we discuss our data set, the Encuesta Nacional de Nutrición y Salud, a health and nutrition survey taken in 1984 We report on the origins of the data as well as provide a set of descriptive statistics about prenatal care and the delivery of the child In the third section, we describe the variables which we use in our study In the fourth section, we consider the factors influencing prenatal care behavior in urban Peru We focus on four aspects of this behavior (1) the decision to seek prenatal care, (2) the decision on where to seek care, (3) the decision on when to initiate care, and (4) the decision on how frequently to receive care We identify three groups of women according to their likelihood of using prenatal care, a low use, an average use, and a high use group We compute the contributions of the various factors to the inter-group differences in behavior for each of those four dimensions of prenatal care In the fifth section, we repeat our analysis for rural areas Our paper concludes with a summary of our findings

Our report has three appendixes Appendix 1 contains some interesting descriptive statistics that were not immediately germane to the discussion on the ENNSA data. Appendix 2 includes the statistical results that underlie our analysis of influences on prenatal care use Appendix 3 discusses the decomposition technique used and describes how the groups we identified were chosen

The ENNSA Survey Data

The ENNSA survey (National Survey on Nutrition and Health) was the first one of its kind in Peru (INE 1986) It was financed by the United States Agency for International Development (USAID), and was carried out by the National Institute of Statistics (INE) and the Ministry of Health USAID, the United States Center for Disease Control, the Pan American Health Organization, and the United Nations Statistics Office provided technical supervision

A random sample of 19,277 households was interviewed during April through November 1984 The survey was interested in those people living in single, noninstitutional dwellings The survey did not include three departments, Ayacucho, Apurimac, and Huancavelica, because they had been declared to be in a state of emergency at the time of the survey All 21 other departments and the constitutional province of Callao were surveyed at both the urban and rural levels

Peru is divided into three markedly different geographic regions The coast is a semidesert area, mostly at sea level, where Peru's largest population centers are located, including the Lima-Callao metropolitan area. Over half of Peru's 19 million people live along the coast and most

major economic activities are located here, both agricultural and industrial, even though the coastal region is only 11 percent of the country's territory

The Sierras are the Peruvian Andes They separate the coast from the jungle Forty percent of Peru's population lives in the Sierras, which make up nearly a quarter of the total land area Most population centers in this region are located between 6,700 and 11,600 feet above sea level

The third region is the jungle It is divided into two areas, the high jungle, which is close to the Sierras, and the low jungle or Amazones, which are flat tropical lands further to the east Ten percent of Peru's population lives here in scattered towns located along the rivers Most people have very limited access to the rest of the country This region has the lowest level of socioeconomic development, even though it has been the focus of extensive oil extraction activities

Peru's climate is greatly affected by the Andes and a strong sea current, the Humbolt Peru's climate is extremely varied, as is its ecology The coast has moderate temperatures and is humid, but has limited rainfall In the Sierras the weather varies from moderate to very cold, with a rainy season from November to April In the jungle, the weather is hot and humid with abundant rain between November and May

In this paper, Peru's departments are aggregated into geographical regions These regions cover areas that share similar socioeconomic characteristics, but which are different from each other The regions we used are (a) metropolitan Lima (Lima-Callao), (b) north coast, (c) central coast, (d) south coast, (e) north Sierra, (f) central Sierra, (g) south Sierra, (h) high jungle, and (i) low jungle

In 1985, 67 percent of the population lived in urban areas and 33 percent in rural areas The census figures for 1941 and 1981 show almost a complete reversal of figures for urban and rural areas In 1941, 35 4 percent of the population was urban, while 64 6 percent was rural, in 1981 64 8 percent was urban and 35 2 percent was rural (INE 1984)

The basic information for the statistical design of the ENNSA survey was obtained from the 1981 census on population and dwellings Sample units were defined for the urban and rural areas based on this information The urban primary sample units (urban PSU) were all urban towns with 2,000 or more inhabitants Rural primary sample units (rural PSU) were towns with less than 2,000 inhabitants, further divided into two types areas classified as rural in the census, with approximately 100 dwellings and 500 people, and areas considered urban in the census, with a population between 500 and 2,000 people Each PSU was divided into clusters of 100 private dwellings, which were the smallest sample units

The ENNSA data were collected using a stratified random sampling design, and the survey covered populations that had previously been classified by socioeconomic strata

The data used in this study

This study of prenatal care in Peru uses the ENNSA data supplemented with provincial and district level data on health care facilities, such as hospitals, health centers, and health posts, together with data on population and geographical size (ANNSA-Peru 1985, annex 2, INP 1985) We restricted our study to women who had completed a full-term pregnancy in the two years prior to the ENNSA survey We selected this time period for three reasons First, we were interested in the influence of factors such as spouse's income, ownership of items like televisions and refrigerators, and household structure (number of unmarried children, number of grandparents living in the household, and so on), on decisions about prenatal health care Measures of these variables were collected at the time of the ENNSA survey Hence, the shorter the time period that we selected, the more likely that the ENNSA data would be valid Second, the shorter the time period, the less likely that respondents would make recall errors in such details as when prenatal care was initiated and the number of prenatal visits The third reason is that, the longer the time period selected, the larger the sample Our choice of two years prior to the ENNSA survey was thus a compromise between conflicting considerations

We did not consider women who had reported miscarriages for three reasons First, the miscarriage rate in the ENNSA sample was low, suggesting that miscarriages were underreported We suspect that the underreporting of miscarriages is not just random, but may be correlated with variables such as education, income, and region Second, abortions and miscarriages are aggregated into a single category and behavior toward prenatal care is likely to differ according to whether or not the mother intends to abort the pregnancy Third, the interval over which prenatal care could be initiated varies with the length of the gestation period prior to the miscarriage We have no information on whether a woman who miscarried in, say, the second month of pregnancy without prenatal care would have otherwise initiated care subsequently Since we do not have data on the month in which miscarriages took place, we could not have made the statistical corrections needed for the analysis, even if we had thought that the data were strong enough to do so

Descriptive analysis of the ENNSA data

This section presents some general statistics about Peruvian women who had a full-term pregnancy in the two years prior to the survey Each observation in the ENNSA survey comes with a weight that is equal to the number of people in Peru represented by that observation Let us suppose that the ENNSA survey sampled 1 out of every 500 women in the urban area of the central Sierra and 1 out of every 250 women in the rural area of the central Sierra. If this were

the case, then, every ENNSA observation in the urban area of the central Sierra would represent 500 women and every observation in the rural area of the central Sierra would represent 250 women These sampling weights vary considerably even within departments All the tables in this section use weighted data. This means that the numbers in the tables are not the raw figures found in the ENNSA survey, but the ENNSA survey expanded to represent the entire Peruvian population

Table 1 shows the percentage of mothers who received prenatal care According to the ENNSA estimates, if every woman in Peru had been sampled, there would have been 535,875 urban women and 348,756 rural women who would have reported a completed pregnancy that terminated in the two years prior to the survey The four variables in table 1 are (a) use of prenatal care, (b) source of prenatal care, (c) month of initiation, and (d) number of visits

Eighty-two percent of urban women and 35 percent of rural women had prenatal care Among urban women who received prenatal care, most (55 percent) received their care at a public hospital, 20 percent went to a private clinic, 15 percent to a health center, and 7 percent to a health post Only 2 percent received prenatal care at home Among rural women who received prenatal care, the places at which they received their care were much more evenly represented 25 percent received care in a public hospital, 17 percent at a private clinic, 17 percent at a health center, 21 percent at a health post, and 18 percent at home

Not only did urban residents seek care far more frequently than rural residents, the urban women also initiated care much earlier Among those who received prenatal care, 62 percent of the urban women began care in the first trimester of their pregnancy, compared with 38 percent in the rural area

As we might expect, among women who received care, urban women have more prenatal care visits than rural women About two-thirds of all rural women with care had three or fewer prenatal care visits, while for urban women that proportion was less than one-quarter Around 41 percent of urban users of prenatal care had seven or more visits, compared with roughly 10 percent of the rural users

Table 1 Percentage of Mothers Using Prenatal Care, Source of Care, Month of Initiation, Number of Prenatal Care Visits, 1984

	Urban	Rural
1 Percentage using prenatal care		
Prenatal care	81 99	35 31
No prenatal care	18 01	64 69
2 Place of prenatal care (percent)		
Public hospital	55 41	25 12
Public health center	14 89	17 37
Public health post	6 85	20 76
2Private clinic	20 41	17 48
Community center	0 09	1 07
Home	2 15	17 88
Other	0 20	0 33
3 Month of first prenatal care visit (percent)		
First month	21 68	7 65
Second month	17 03	8 49
Third month	23 54	21 77
Fourth month	11 86	12 88
Fifth month	6 80	8 42
Sixth month	9 25	13 67
Seventh month	4 81	11 50
Eighth month	3 88	9 93
Ninth month	1 15	5 68
4 Number of Visits (percent)		
2-3 visits	23 64	67 26
4-6 visits	35 40	22 41
7-9 visits	32 03	8 85
120+ visits	8 92	1 48

Note The data in this table are computed from weighted observations from the ENNSA survey The urban data are based on 2,904 observations, which represent 535,875 urban women The rural data are based on 2,013 observations, which represent 348,756 rural women

Source Tabulations from the ENNSA survey tape INE (1986) contains information about the tape's contents

Table 2 presents data on who provided prenatal care, who assisted the delivery, and the place of delivery In urban areas, 96 percent of all prenatal care visits were performed by a doctor, obstetrician, or nurse, while in rural areas that figure was 61 percent In rural area, 12 percent of all prenatal care was provided by sanitarios or health aides, generally people with minimal training in health care, and 24 percent by midwives

Table 2 Who Provided Prenatal Care, Who Assisted Delivery, and Place of Delivery, 1984 (*percent*)

	Urban	Rural
1 Who provided prenatal care		
Doctor, obstetrician, or nurse	96 08	60 55
Sanitario (health aide)	0 85	12 35
Health promoter	0 07	1 72
Midwife	2 81	23 64
Traditional healer	0 15	1 15
Other	0 03	0 59
2 Who assisted delivery		
Doctor, obstetrician, or nurse	80 35	13 32
Sanitario (health aide)	0 71	1 09
Health promoter	0 09	0 53
Midwife	12 49	41 22
Traditional healer	0 12	0 78
Relative	5 84	40 62
Other	0 17	0 99
No one	0 23	1 46
3 Place of delivery		
Public hospital	64 12	9 87
Public health center	1 12	1 12
Public health post	0 49	0 39
Private clinic	9 69	1 30
Community center	0 01	0 10
Home	24 17	86 67
Other	0 39	0 55

See note to table 1

Source Tabulations from the ENNSA survey tape

Doctors, obstetricians, or nurses attended 80 percent of all births in urban areas, as opposed to only 13 percent of the births in rural areas In rural areas, most deliveries were assisted by a midwife (41 percent) or a relative (41 percent) In urban areas, the percentage of births attended by midwives and relatives was 12 and 6 percent, respectively In urban Peru, 64 percent of all children were delivered at a public hospital, 24 percent at home, and 10 percent in a private clinic In rural areas, the situation is very different 87 percent of all children were delivered at home and 10 percent were delivered in a hospital

The Lima-Callao area dominates urban Peru, 44 percent of the recent urban mothers lived there The north coast had the next largest concentration of recent urban mothers with 18 percent The regions with between 6-9 percent of the women include the central coast, the central Sierra, the south Sierra, and the low jungle The remaining regions had around 2 percent of the relevant

population The largest concentration of recent rural mothers is in the Sierra, with 26 percent in the north Sierra, 23 percent in the central Sierra, and 17 percent in the south Sierra. The jungle is next in importance with 11 percent in the high jungle and 7 percent in the low jungle The north coast has 11 percent of the women, and the other two coastal regions have very few

The first panel of table 3 shows that the percentage of women who received prenatal care varied greatly across the regions Let us consider the urban area first In Lima-Callao, 90 percent of the women received prenatal care On the coast, the percentages were also high, ranging from 80 to 85 percent in the three coastal areas In general, the lowest prenatal care use rates were in the Sierra, where they ranged from 66 to 73 percent. In the jungle regions, the percentage of care use was 78 percent in the high jungle and 71 percent in the low jungle

In the rural areas, the general regional pattern of use is similar, although the over all level is much lower The prenatal use rates are highest in the three coastal regions, intermediate in the two jungle regions, and lowest in the Sierra.

The second panel of table 3 shows the relationship between use of prenatal care and level of education The importance of education to a woman's decision to use prenatal care is clear In urban areas, 54 percent of women with no education received prenatal care This percentage rises steadily with educational level until it reaches 99 percent for women with a college education In rural areas, the relationship is more spectacular Women with no education received prenatal care only 24 percent of time The figure then rises steadily with level of education, and 91 percent of women with a college education used prenatal care The increase in prenatal care use with education bodes well for future increases in the use of prenatal care because the education of Peruvian women in both urban and rural areas has been increasing over time [1]

The third panel of table 3 presents information on the place of delivery Of urban women who had prenatal care, only 17 percent delivered at home, while among those who had no prenatal care 56 percent delivered at home and 42 percent in a public hospital. In the rural areas, among women with prenatal care, 73 percent delivered at home, while for those without care, the percentage rose to 94 percent. As in the urban areas, the main alternative in rural areas was delivery in a public hospital, but in contrast, that alternative was rarely chosen.

1 See appendix tables A1-3 and A1-4 in appendix 1

Table 3 Women Receiving Prenatal Care by Region, Education, and Place of Delivery for Women With and Without Prenatal Care, 1984
(*percent*)

	Urban		Rural	
1 Prenatal care by region				
North coast	80 07		53 17	
Central coast	84 81		65 10	
South coast	81 68		63 20	
North Sierra	66 47		24 84	
Central Sierra	66 19		30 14	
South Sierra	72 67		29 66	
High jungle	77 73		43 67	
Low jungle	71 31		40 67	
Lima-Callao	89 60		--	
2 Prenatal care by education				
None	54 27		24 31	
Elementary	72 91		39 37	
High school	88 76		61 61	
College	99 02		91 35	
3 Place of delivery for women with and without prenatal care				
	With	Without	With	Without
Public hospital	69 06	41 61	20 44	4 09
Public health center	1 34	0 12	2 69	0 27
Public health post	0 53	0 34	0 73	0 20
Private clinic	11 60	1 01	2 61	0 58
Community center	0 00	0 05	0 13	0 90
Home	17 08	56 48	72 96	94 15
Other	0 39	0 39	0 45	0 61

-- = not applicable

Note The total number of urban cases in this table is 2,894 In table 1, the number of cases is 2,904 The missing ten cases are due to errors in the variable that tells us whether the woman lived in province 1 or not

Source Tabulations from the ENNSA survey tape

Table 4 shows the relationship between prenatal care and pregnancy and delivery complications The pregnancy complications variable is derived from an ENNSA question that asked whether the woman had any pregnancy complications for which she sought medical attention Thus, the pregnancy complications variable is really a compound of two conditions (a) the woman had a pregnancy complication, and (b) she sought medical care because of it. As can be seen from the no care column, some women reported having seen someone for a pregnancy complication and also reported that they had no prenatal care

Table 4 Pregnancy and Delivery Complications by Prenatal Care Status, 1984 (*percent*)

	Care	No care
1 Complications experienced by urban women		
Pregnancy complications	22 46	9 17
Delivery complications	18 24	11 51
Delivery and pregnancy complications	39 04	36 72
2 Complications experienced by rural women		
Pregnancy complications	25 98	7 00
Delivery complications	13 95	7 02
Delivery and pregnancy complications	28 66	33 69

See note to table 1

Source Tabulations from the ENNSA survey tape

One striking feature of table 4 is that women who had prenatal care were more likely to have pregnancy complications than those who did not receive care In the urban area, for example, 22 percent of those women who had prenatal care had pregnancy complications, while only 9 percent of those with no prenatal care did The relationship works both ways Prenatal care is likely to reduce the frequency of pregnancy complications, but the presence of pregnancy complications is likely to induce prenatal care Further, women who were receiving prenatal care may have been more likely to discover complications than women who were not It is also interesting that women who had prenatal care were more likely to have delivery complications than those who did not In the rural area, for example, 7 percent of the women who did not have prenatal care had delivery complications, while 14 percent of those who did have prenatal care had delivery complications If the likelihood of delivery complications motivates prenatal care use, these results are not surprising [2]

Table 5 compares the weighted and unweighted percentages who sought prenatal care and the weighted and unweighted percentages of those with care who received it at a public institution. The first panel shows these percentages for urban areas cross-classified by region and whether or not the woman lived in province 1 of her department. Departments in Peru are equivalent to U S states and provinces to counties Province 1 is the province containing the department's capital city The division between the capital provinces and other provinces is made

2 Delivery complications, like pregnancy complications, may be culturally defined The people who sought prenatal care may have been more prone to report both pregnancy and delivery complications This may account for some of the observed relationship

here because the former tend to have larger populations and more health care facilities than the latter The second panel presents the same information for rural areas of Peru

We present table 5 to demonstrate that given the cross-classification there, the percentages who received prenatal care and the percentages who received public care are quite similar in the raw ENNSA data and in the weighted figures For simplicity, in the analysis that follows we use unweighted observations, knowing that the inferences that we make from the unweighted figures are not likely to be too different from those that we would make for the Peruvian population more generally

Variables Used

We could go about trying to understand the numbers presented in the previous section by creating cross-tabulations While this technique is useful, we would soon have too few observations in each cell to allow for a meaningful analysis Instead, we applied simple statistical techniques for the purpose of describing the data We study the choice of whether to seek prenatal care or not using a binary logit regression, the choice of whether to seek public prenatal care or private prenatal care using another binary logit regression, the choice of in which trimester to initiate care using a multinomial logit regression, and the choice of how many visits to make each month using an ordinary least squares regression All of these are techniques that measure the correlation between a dependent variable and an independent variable, holding constant a set of other independent variables We are engaged in data description here, not structural modeling

In carrying out the statistical analysis for the urban area, we used a subset of the ENNSA data in which we could identify the relationship of every person in the household to everyone else in the household We did this because we were interested in learning whether the distribution of income among household members influenced women's prenatal care behavior In rural areas, where farm income was not disaggregated across individuals in the household, we took the simpler, and more usual, approach of considering farm income as a variable without attributing it to any particular household member

Table 5 Comparison Between Weighted and Unweighted Percentages of Those With Prenatal Care and Those With Public Prenatal Care

Urban regions		Unweighted No cases	Unweighted Any Prenatal Care (%)	Weighted Any Prenatal Care (%)	Unweighted No cases	Unweighted Public Care (%)	Weighted Public Care (%)
North coast	Prov 1	242	81	81	180	78	79
	Others	118	81	80	87	70	71
Central coast	Prov 1	47	74	75	35	83	81
	Others	277	87	86	235	80	80
South coast	Prov 1	134	81	80	108	68	69
	Others	76	86	85	65	58	58
North Sierra	Prov 1	208	69	70	142	70	72
	Others	164	62	63	95	87	88
Central Sierra	Prov 1	159	74	74	117	62	62
	Others	131	58	58	71	90	90
South Sierra	Prov 1	188	79	80	148	86	86
	Others	80	55	55	44	77	79
High jungle	Prov 1	11	100	100	11	91	91
	Others	85	74	74	60	73	74
Low jungle	Prov 1	212	68	69	134	68	68
	Others	96	77	77	66	74	75
Lima-Callao*	Lima Prv	611	89	89	540	81	81
	Callao	55	96	96	52	83	84
Total	2,894	78	82	2,190	77	79	

Rural regions	Unweighted No cases	Unweighted Any Prenatal Care (%)	Weighted Any Prenatal Care (%)	Unweighted No cases	Unweighted Public Care (%)	Weighted Public Care (%)
North coast	333	54	53	135	59	59
Central coast	273	65	65	170	78	77
South coast	64	63	63	39	90	91
North Sierra	402	25	25	56	73	75
Central Sierra	218	30	30	63	89	88
South Sierra	239	28	30	64	98	99
High jungle	290	43	44	92	74	74
Low jungle	194	41	41	57	49	50
Total	2,013	41	35	676	74	78

* Other provinces of Lima department are included in central coast

Note The total number of cases in this table is 2,894 In table 1, the number of cases is 2,904 The missing ten cases are due to errors in the variable that tells us whether the woman lived in province 1 or not.

Sources Tabulations from the ENNSA survey tape

Table 6 contains the definitions of the variables used in the statistical analysis They are divided into two groups The first group contains the variables to be explained (the dependent variables), while the remaining group is made up of seven sets of explanatory variables (the independent variables) [3]

Table 6 Definition of Variables

Dependent variables

CARE	Dummy, 1 if the woman had prenatal care or only went to a doctor or nurse due to pregnancy complications
GO	Dummy, 1 if she had prenatal care
PUB	Dummy, 1 if she had prenatal care in a public facility
PRI	Dummy, 1 if she had prenatal care in a private facility
WHEN3	Trimester when she had her first prenatal visit
VMO	Number of prenatal visits per month

Independent variables

1 Demographic variables

AGE1	Dummy, 1 if age at delivery was under 20 years
AGE3	Dummy, 1 if age at delivery was over 35 years
TPREG	Total number of pregnancies
COMP	Dummy, 1 if she had pregnancy complications
FIRST	Dummy, 1 if this is her first pregnancy

2 Socioeconomic and household structure variables

EDUC	Woman's education, in years
OLI	Her own labor income, in hundred thousand soles (or their equivalent, hundreds of intis)
ONLI	Her own nonlabor income, in hundred thousand soles
SINC	Her spouse's income, in hundred thousand soles
HUBB	Dummy, 1 if her spouse lives with her
PINC	Parents' or parents-in-laws' income, in hundred thousand soles
NPAR	Number of parents (in-laws) living in her household
ORINC	Other relatives' income, in hundred thousand soles
NOR	Number of other relatives in her household
TV	Dummy, 1 if she owns one or more television sets
SED	Spouse's education in years
HHCASH	Household income from activities not related to farming, excludes her income and her spouse's income, in hundred thousand soles
OWNCASH	Woman's nonfarm income, in hundred thousand soles
SCASH	Spouse's nonfarm income, in hundred thousand soles
FINC	Income from farming, in hundred thousand soles
NPH	Number of persons in the household

3 The distinction between independent variables and dependent variables blurs in a few instances where the dependent variable in one analysis is used as an independent variable in another For example, we analyze the influences on the decision to seek public or private prenatal care In that regression, we use the variable indicating where the woman sought care as a dependent variable We also use that variable as an independent variable in the analysis of the influences on the trimester in which she initiated prenatal care

Table 6 (continued)

3 Regional variables

CCOAST	Dummy, 1 if she lives in the central coast region
CSIERRA	Dummy, 1 if she lives in the central Sierra region
HJUNG	Dummy, 1 if she lives in the high jungle region
JUNGLE	Dummy, 1 if she lives in the low jungle region
NCOAST	Dummy, 1 if she lives in the north coast region
NCONE	Dummy, 1 if she lives in the north cone area of Lima
NSIERRA	Dummy, 1 if she lives in the north Sierra region
SCOAST	Dummy, 1 if she lives in the south coast region
SCONE	Dummy, 1 if she lives in the south cone area of Lima
SSIERRA	Dummy, 1 if she lives in the south Sierra region
OTHER	Dummy, 1 if she lives in other districts of Lima

4 Accessibility variables

HHCD	Number of hospitals and health centers in her district
HPD	Number of health posts in her district
OHHCP	Number of hospitals and health centers in the rest of her province
OHPP	Number of health posts in the rest of her province
POPD	Population of her district
OPOPP	Population of the rest of her province
KM2	Size of her province, in square kilometers

5 Private price and insurance variables

PPRICE	Private price
INSUR	Dummy, 1 if she has either IPSS or private insurance
IPSS	Dummy, 1 if she has Social Security coverage

6 Farmer variable

FARMER	Dummy, 1 if there is a farmer in the woman's household

7 Other independent variables

WHEN9	Month when she had her first prenatal visit
PUB	Dummy, 1 if she had prenatal care in a public facility

Note A dummy variable is a variable that is coded 1 or 0 For example, the AGE1 variable is coded 1 if the woman's age at delivery was under 20 and 0 if it was 20 or above

In the first group, two variables indicate the use of prenatal care GO and CARE In the ENNSA survey, women were asked the month in which they had their first prenatal care check-up If a woman reported a month for prenatal care, the GO variable was coded "1" otherwise it was coded "0" [4] The mean of the GO variable is the proportion of women who were reported as having had prenatal care The ENNSA survey also includes another variable, which we call COMP Each woman was asked if during her last pregnancy she had any complication for which she sought attention by a doctor, obstetrician, or nurse A small proportion of women answered

4 This type of variable is sometimes called a dummy variable

yes to this question, but no to the question on whether they had had prenatal care during the pregnancy The CARE variable was coded as a "1" for all women who either had prenatal care or who had a pregnancy complication that required care and "0" otherwise The mean of the CARE variable is thus the proportion who reported having had prenatal care plus the proportion who reported both a complication that required medical care and no prenatal care

The coefficient estimates for the logistic regressions on the GO and CARE variables are quite similar (see appendix tables A2-1 and A2-2 for urban areas and A2-6 and A2-7 for rural areas) This section focuses on women who reported having had prenatal care, because we are interested in the whole configuration of prenatal care behaviors whether to seek care, where to seek care, when to seek care, and how often to seek care Women who had complications that required medical attention, but who report having no prenatal care, provide no information on where, when, and how often they sought care

The two variables PUB and PRI indicate whether women had their prenatal care in a public or a private facility PUB is coded as "1" if the woman had her prenatal care in a public institution and "0" otherwise PRI is coded as "1" if she had her prenatal care in a private institution and "0" otherwise We would expect that the mean of the PUB variable, which is the proportion of women having prenatal care in a public facility, plus the mean of the PRI variable, which is the proportion of women having prenatal care in a private facility, would equal the mean of the GO variable, the proportion of women seeking care Nonetheless, this is not exactly the case The mean of the GO variable is slightly higher than the sum of the means of the PUB and PRI variables because a small group of women who had their prenatal care at community centers or at home is omitted from both Community centers in Peru usually refer to institutions run by charitable organizations, and are thus neither public nor private

The WHEN3 variable refers to the trimester in which prenatal care was initiated We could have, but chose not to, use the month of the pregnancy in which prenatal care was initiated as the dependent variable because by aggregating into trimesters, we obtained more precise estimates of the effects in which we were interested Furthermore, we thought that it would be easier to focus a discussion on health care policies using trimesters rather than individual months

The VMO variable is the woman's average number of prenatal care visits per month after the initiation of care Thus, a woman with VMO equal to 1, who initiated care in the first month of her pregnancy, would have had 9 prenatal care visits, while one who initiated care in her ninth month of pregnancy would have had only 1 prenatal care visit

The first set of independent variables is demographic in nature Included in that set are the variables FIRST, AGE1, AGE3, TPREG, and COMP FIRST indicates whether the pregnancy that

terminated in the last two years was the woman's first pregnancy or not AGE1 indicates whether or not the woman was under the age of 20 at the termination of her pregnancy AGE3 indicates whether or not the woman was over age 35 at the termination of her last pregnancy TPREG is the woman's total number of pregnancies, excluding any in progress at the time of the interview, and COMP has already been explained The COMP variable is not used in the logistic regressions using GO or CARE as dependent variables

The second group includes the socioeconomic and household structure variables In the case of the urban areas these variables are EDUC, OLI, ONLI, SINC, HUBB, PINC, NPAR, ORINC, NOR, and TV EDUC is the woman's level of education in years OLI is the woman's own labor income ONLI is the woman's own nonlabor income Nonlabor income includes income from sources such as alimony, rent, dividends, and interest payments The woman's income is divided into labor income and nonlabor income because of the possibility that the two sorts of income would have different effects on prenatal care behavior SINC is the spouse's income (labor and nonlabor income combined) HUBB is a variable (coded "1" or "0") that indicates whether the husband lived in the household at the time of the ENNSA survey PINC is the total income of the woman's parents or parents-in-law NPAR is the number of parents or parents-in-law living in the household ORINC is the total income of the woman's other relatives NOR is the number of these other relatives in the household. TV is a variable (coded "1" or "0") that indicates whether or not the woman's household possessed a television set The presence of a television in the household is an indicator of wealth, and an indicator that the person lives in an urban area that has a television station In addition, a television can influence behavior through information dissemination We hypothesized that if the influence of a television was mainly due to information dissemination, then the impact of having a television on prenatal care behavior would be different for different educational groups In other words, if television's main effect was informational, then its effect on seeking prenatal care should be greater for women with less education and less for women with more education We found no such effects

In the rural areas, the socioeconomic variables are EDUC, SED, OWNCASH, SCASH, HUBB, HHCASH, FINC, NPH, and TV EDUC is the woman's education in years, and SED is her spouse's education in years OWNCASH is the woman's nonfarm income, SCASH is her spouse's nonfarm income, HUBB is a 1/0 variable indicating whether or not the woman's spouse was living in the household at the time of the ENNSA survey HHCASH is the nonfarm income of people in the household other than the woman and her spouse, FINC is the household's farm income, NPH is the number of people in the household, and TV is a 1/0 variable indicating the presence or absence of a television set in the household.

The third set of independent variables shows the region of the country in which the person lives We distinguish eight regions outside Lima and four regions within Lima. The eight regions

outside of Lima are the north, south, and central sections of the coast (NCOAST, CCOAST, and SCOAST), the north, south, and central sections of the Sierra (NSIERRA, CSIERRA, and SSIERRA), and the high and low jungle (HJUNG and JUNGLE) Within Lima, we distinguish metropolitan Lima-Callao (the omitted category[5]), the north cone of Lima (NCONE), the south cone of Lima (SCONE), and elsewhere in Lima province (OTHER)

The fourth set of independent variables deals with the accessibility of health care facilities to women The variables we have included under this category include OHHCP, the number of hospitals and health centers in the province in which the woman lives, but outside her district We refer to the area outside a woman's district of residence, but inside her province, as the "other" area Thus OHHCP stands for other hospitals and health centers in the province We also include OHPP, the number of other health posts in the province, OPOPP, the number of people in the other part of the province, and KM2, the geographical size of the province in square kilometers At the district level, we include HHCD, the number of hospitals and health centers in the district, HPD, the number of health posts in the district, and POPD, the population of the district [6] Unfortunately, we had no data with which to measure the woman's accessibility to private health facilities Differences in the accessibility to private health facilities across regions will be captured in the regional dummy variables

The fifth set of variables includes PPRICE, IPSS, and INSUR Economic access depends on the price of prenatal care The ENNSA survey does not contain enough information on the prices of prenatal care visits to allow us to make reasonable estimates of the price of care In our previous work using the ENNSA survey (Gertler, Locay, and Sanderson 1987), we found that the price of health care at public institutions was nearly constant over the whole country and over the period of the ENNSA survey at 1 inti (or in the currency at that time, 1,000 soles) per visit Thus it is plausible that the price of a prenatal care visit at a public institution would also have been constant, and thus it is likely that we would not have been able to use it in the statistical analysis anyway There was considerable variation in the prices of private office visits Therefore, we computed the average price of a single private office visit, and included this price, denoted by PPRICE, as a possible proxy for the price of a private prenatal care visit

Some people in Peru are covered by government health insurance This insurance not only allows people to receive health care for a nominal cost or no cost at all, but it allows them access

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5 Because of multicollinearity, we cannot include an exhaustive set of dummy (1/0) variables One category must be omitted This does not mean that the omitted category is left out of the analysis The effect of living in metropolitan Lima-Callao is automatically included in the constant term

6 The fourth set of independent variables do not appear in the ENNSA survey We collected these data and assigned them to each individual in the survey (ANNSA-Peru 1985, INP 1985)

to higher quality medical care than they would receive in other public health care facilities Since the price of care at other public facilities is nominal or zero for our purposes, the main difference between those with public insurance and those without it, is that the former group has higher quality public health care available [7] We call the dummy (1/0) variable that indicates whether a woman or her spouse is covered by public insurance IPSS, after the initials of the Peruvian government agency that administers public health insurance We use the IPSS variable for the urban area. For the rural area we use a comparable variable, INSUR INSUR is a 1/0 variable that includes not only people with government health insurance, but people working in the mining, sugar, and petroleum industries, because rural people working in those industries may have health insurance and access to industry-sponsored private health care facilities

The sixth set of independent variables includes only one variable, FARMER The variable FARMER is coded as a "1" if someone in the household is a farmer by occupation, and either owns or rents farm land or otherwise has some rights to the income it generates Otherwise it is set to "0" A farm laborer is not counted as being a FARMER Households where no one is reported to be a FARMER also do not report farm income [8] FARMER is kept in a separate category because it shares the characteristics of a socioeconomic variable and a variable that measures the accessibility of health care facilities Adding it to either group would have created ambiguities that we wished to avoid

The final set is composed of the variables PUB and WHEN9 PUB is a dummy variable that indicates whether a woman who sought prenatal care obtained that care at a public facility or not WHEN9 is the month in the pregnancy in which a woman who had prenatal care first initiated that care

Influences on Prenatal Care Behavior in Urban Peru

The object of the next two sections of the paper is to provide quantitative evidence on the factors that influence prenatal care behavior By prenatal care behavior we mean four interrelated decisions (a) the decision whether or not to seek prenatal care, (b) the decision on whether to

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7 For the most part, to be eligible for government health insurance from the Social Security Institute, a person must be working at a job in the formal sector of the economy People with these jobs are likely to have higher incomes and higher educations than people working in the informal sector However, since we always control for income, education, and region in our analyses, we treat the insurance variable as a variable indicating differences in the quality of available health care

8 So as not to confuse the income figures, we limited our rural sample to households in which only one person qualified as FARMER If we had not done this, we would have had to allocate two farm incomes across the people in the household, which would have been a difficult task. Since relatively few rural households had two or more people who qualified as FARMER, we thought it prudent simply to delete those households

seek prenatal care in the public or private sector; (c) the decision on when to initiate prenatal care, and (d) the decision on how frequently to have prenatal care once it is begun Our goal is to help policymakers better understand the sorts of actions they can take to improve maternal health care in Peru

A wide variety of factors influence prenatal care behavior We can measure only a few of them It is affected by demographic factors such as a woman's age and the number of previous pregnancies Government policy has little effect on the demographic variables Government policies toward family planning will influence the distribution and number of previous pregnancies in the population, but family planning policy is not likely to be used as a tool for altering women's prenatal care behavior Prenatal care behavior is also influenced by socioeconomic conditions and household characteristics Here the government has a significant role to play, particularly in the provision of education to women Government policy with respect to the placement of health care facilities also influences prenatal care behavior, especially as most prenatal care is performed in public facilities (as demonstrated earlier) The regions in which women live also influence their prenatal care choices The regional dummy variables capture the effects on care choices of all the unmeasured factors that vary across regions, such as culture, the quality of health care, and the quality of roads We do not know the extent to which government policies can alter the impacts of the regional variables, nonetheless, ascertaining their effects is still important Prenatal care choices are also influenced by the prices of prenatal care visits and the quality of medical care pregnant women receive The government directly affects the price of prenatal care in public institutions and indirectly affects the price of private care The government also decides on the quality of care to be provided in public health care facilities

Clearly, the policies of the Government of Peru influence prenatal care choices in a wide variety of ways Here we wish to disentangle these influences and provide them with a quantitative dimension

The decision to seek prenatal care

In our ENNSA sample of urban Peruvian women who completed a full-term pregnancy in the two years prior to the survey, 80 2 percent received prenatal care[9] Of those who sought care in the formal sector, 77 1 percent received it a public facility and 22 9 percent at a private facility (this excludes a small proportion of the population who received care in community centers or at home) On average, prenatal care was initiated between the third and fourth months of the

9 In this section of the paper all our figures refer to our subsample of urban women who live in households for which we could determine all the interpersonal relationships (husbands, wives, children, siblings, and so on) We did this so that we could study the effect of the distribution of household income on prenatal care behavior

pregnancy, with 65 7 percent of the women beginning care in the first trimester of the pregnancy, 27 8 percent in the second trimester, and only 6 6 percent in the third trimester The average number of prenatal care visits per month, once care was initiated, was 0 883 Thus having prenatal care was the norm among urban Peruvian women in 1982-84

To derive the policy implications of our statistical results, we generated the profiles of three hypothetical women on the basis of predicted probabilities of having prenatal care Before discussing these profiles, let us first consider the concept of the predicted probability of receiving prenatal care

We used the GO variable as a dependent variable and many of the independent variables discussed above and ran a binary logistic regression The binary logistic regression can be thought of as making predictions on whether or not each woman had prenatal care, and then choosing magnitudes for the effects of each of the independent variables so that those predictions match the data as closely as possible In essence, the binary logistic regression produces another variable, the predicted probability of receiving prenatal care and we can use this variable to differentiate between groups of women who have low, average, and high probabilities of receiving care [10]

One of the profiles we created was for a woman whose predicted probability of seeking prenatal care was identical to the urban proportion who received care This is our "average user," in the sense that her behavior toward seeking prenatal care is average for all the urban women in our sample If all the urban women behaved like our average woman, then we would see the same proportion using prenatal care as we observed for urban Peru [11] One profile is for the low user This is a woman whose predicted probability of seeking care is one standard deviation below the average The final profile is for the high user, whose predicted probability of seeking care is one standard deviation above the mean These profiles are not hypothetical They are the actual

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10 We have predicted probabilities of receiving care for all the women in our sample Therefore, we can treat the predicted probability of seeking care as another variable and determine measures such as its mean and its standard deviation. The mean of the predicted probability of seeking care must, because of the algebra of binary logit models, equal the observed proportion of women who received prenatal care

11 The average probability of seeking care for the women in our average user group is 80 1 percent The proportion of the population who sought care is 80 2 percent. The two percentages can differ slightly both because of the details of the process of creating the profiles and because of rounding error

characteristics of women in our sample who have low, medium, or high predicted probabilities of use, and are thus of considerable interest in their own right [12]

Table 7 shows the values of the four prenatal care variables for each of our three women Among low users in the urban area, 70 9 percent received prenatal care, compared to 78 1 percent among the average users, and 98 4 percent among the high users The following figures refer to the subset of women in the three groups who actually received prenatal care outside their home at a private or public health care facility In the low user group, 81 1 percent had prenatal care in a public facility, while that figure was 84 3 percent for the average user group, and 67 0 percent for the high user group In other words, the women in the low use group who actually had prenatal care went to private institutions slightly more frequently than women in the average group (18 9 percent private as opposed to 15 7 percent) Women in the high use group went to private institutions considerably more frequently than women in the average use group (33 0 percent private compared to 15 7 percent) Among women who had prenatal care, the average month of the pregnancy at the initiation of care was 4 08 for those in the low use group, 4 08 for those in the average use group, and 2 67 for those in the high use group The women in the low use group had an average of 0 73 prenatal care visits per month after care was initiated Those in the average use group had an average of 0 90 visits per month, and those in the high use group an average of 1 02 visits per month For example, a woman who initiated care in the third month of her pregnancy and who was in the low use group would have about five prenatal care visits, an average user about six prenatal care visits, and a high user about seven visits

In summary, women in the low use and the average use groups do not differ very much in where they obtain care and when they initiate care The average users do receive prenatal care more often than low users, given the month of initiation High users receive private care significantly more often than average or low users They also initiate care more than a month earlier than the women in the other two groups and go more frequently than the women in the other two groups

12 For the purpose of producing the profiles, we did not choose only those women who had exactly a given predicted probability of prenatal care use, but all the women in a small interval around that predicted probability The details of how we computed the profiles appear in Appendix 3

Table 7 Four Dimensions of Prenatal Care Use for Three Groups of Women, Urban Peru, 1984

	Low users	Average users	High users
1 All Women			
Percentage with prenatal care	70 9	78 1	98 4
Number of observations	55	114	315
2 Women who received care outside their home[a]			
Percentage with public care	81 1	84 3	67 0
Average month of prenatal care initiation	4 08	4 08	2 67
Average number of visits per month after use began	0 73	0 90	1 02
Number of observations	37	89	306

a excludes a small number of women who had their prenatal care at a community center

Table 8 shows the average characteristics of the women in the three groups as well as the average characteristics of all the urban women in our sample Column (1) contains the averages of the independent variables in the binary logistic regression on whether women received prenatal care or not and selected additional variables of interest The first four variables are the demographic variables The variable FIRST is a 1/0 variable indicating whether the pregnancy was the woman's first pregnancy or not The entry 0 204 in the first column for the variable FIRST is the mean of that variable In the case of a 1/0 variable, the mean is just the proportion of the population for which the variable is set equal to one The table, therefore, indicates that women with a first pregnancy comprise 20 4 percent of the urban sample The socioeconomic and household structure variables follow the demographic variables Here, for example, EDUC is the woman's education in years The figure 7 850 indicates that the average urban woman in our sample had 7 850 years of education (see table 6 for the definitions of the variables and their units of measurement)

Table 8 Average Characteristics of all Urban Women

Variables	All urban average (1)	Low users (2)	Average users (3)	High users (4)
FIRST	0 204	0 127	0 158	0 333
AGE1	0 102	0 200	0 132	0 038
AGE3	0 126	0 200	0 140	0 143
TPREG	3 682	4 564	4 061	2 648
EDUC	7 850	4 182	6 851	12 927
OLI	0 381	0 140	0 184	1 145
ONLI	0 025	0 004	0 016	0 062
SINC	1 723	1 026	1 281	3 277
HUBB	0 881	0 836	0 904	0 908
PINC	0 320	0 314	0 179	0 559
NPAR	0 334	0 273	0 281	0 460
ORINC	0 183	0 113	0 100	0 485
NOR	0 739	1 109	0 816	0 848
TV	0 596	0 273	0 579	0 895
NCOAST	0 118	0 182	0 105	0 063
CCOAST	0 117	0 018	0 132	0 133
SCOAST	0 086	0 055	0 061	0 083
NSIERRA	0 120	0 236	0 096	0 079
CSIERRA	0 085	0 109	0 088	0 067
SSIERRA	0 094	0 073	0 114	0 048
HJUNG	0 034	0 055	0 026	0 013
JUNGLE	0 085	0 236	0 123	0 054
NCONE	0 102	0 036	0 184	0 073
SCONE	0 047	0 000	0 009	0 111
OTHER	0 018	0 000	0 009	0 041
OHHCP	29 984	7 509	30 982	48 686
OHPP	16 314	11 600	17 088	20 254
OPOPP	1,041 652	228 005	1,091 980	1,705 332
KM2	6 600	9 459	7 821	5 750
HHCD	3 521	2 200	3 930	4 057
HPD	2 029	2 873	2 456	1 889
POPD	107 306	73 844	114 708	126 007
PPRICE	4 512	3 657	4 429	5 202
IPSS	0 094	0 000	0 000	0 483
GO	0 802	0 709	0 781	0 984
CARE	0 820	0 764	0 798	0 984
PUB	0 602	0 545	0 658	0 651
PRV	0 179	0 127	0 123	0 321
Average PRGO	0 802	0 619	0 801	0 986
PRGO/AC	0 919	0 619	0 801	0 993
Number of observations	1,655	55	114	315

The first thing to notice about table 8 is that the average urban woman does not have the average predicted probability of receiving prenatal care The average predicted probability of receiving care within a group is given by the variable PRGO in the second to the last row in the table The predicted probability of receiving care, for a woman with the average characteristics in

a particular column, is given in the last row of that column by the variable PRGO/AC, where AC indicates that the probability of having care is computed for a woman with the average characteristics given in the column Note that PRGO in the first column is 80 2 percent, while PRGO/AC in that column is 88 8 percent. A woman with the characteristics given in the first column of table 8 would have a 88 8 percent probability of having prenatal care If all urban women were like her, the proportion who had prenatal care would be 88 8 percent, but the observed proportion who had care was only 80 2 percent Clearly, a woman with the average characteristics of urban women cannot be our average user, because her predicted probability of receiving care would not be average

The result that the person with the average characteristics does not have the average predicted probability of receiving care occurs because in the binary logistic model, the predicted probability of receiving care is a nonlinear function of independent variables It has to be a nonlinear function, because the predicted probability of care can never go above 1 0 regardless of the values of the independent variables Let us consider an example The figures in Table 9 give the values of a characteristic and a hypothetical, associated, predicted probability of receiving prenatal care for five women The first woman has a value of 10 for the characteristic and a 50 percent probability of obtaining care The last woman has a value of 50 for her characteristic and a 94 15 percent probability of receiving care The average of the five predicted probabilities of care is 80 20 percent The average of the characteristic is 30 The predicted probability of receiving care for the woman who has the value of 30 for her characteristic is not 80 20, but 88 80 Thus, the person with the average of the characteristic does not have the average predicted probability of receiving care

Table 9 Hypothetic Relationship Between A Single Characteristic and the Predicted Probability of Receiving Care

	Value of the characteristic	Predicted probability of receiving care (in percent)
	10	50 00
	20	75 00
	30	88 80
	40	93 05
	50	94 15
Average	30	80 20
Predicted probability evaluated at the average of the characteristics	(30)	88 80

Returning to table 8, the variables GO, CARE, PUB, PRI, and average PRGO are all derived as averages for the indicated group of women For example, among the 1,655 urban

women in our sample, 60 2 percent had prenatal care in a public facility The average predicted probability of seeking prenatal care for these women is 80 2 percent This is not the case for the PRGO/AC variable If we were to take the characteristics of those women and assume that they applied to a given woman, that particular woman would have a predicted probability of having prenatal care of 91 9 percent.

Table 8 shows that low users, average users, and high users differ from one another on almost every variable For example, the pregnancy referred to in the sample was the first pregnancy for 12 7 percent of the women in the low use group and 33 3 percent of the women in the high use group The women in the low use group had an average education of 4 182 years, while those in the high use group had an average education of 12 927 years The women in the high use group had the highest levels of own labor income, own nonlabor income, spouse's income, parents' incomes, and other relatives' incomes They were also the most likely to own a television set The high users also live in different parts of the country from the low users The high users are less likely to live in the north coast, the Sierra, or the jungle than low users High users are more likely to live in the central or south coast, and anywhere in Lima than the low users Low users are more likely to live in provinces with smaller populations and fewer facilities than those in which the high users live Similarly, high users are more likely to live in districts with larger populations and more hospitals and health centers (but fewer health posts) The high users live in areas where the price of private health care is higher than the areas in which the low users live Finally, none of the low or average users are covered by government health insurance, while nearly half (48 3 percent) of the high users are covered These three groups of women reflect the dispersion of characteristics within urban Peru

Comparing the average values of the CARE and GO variables across the three groups in table 8 yields interesting results The GO variable is coded as 1 whenever a woman reports that she had prenatal care during her last pregnancy The CARE variable is coded as 1 whenever a woman reports that she had prenatal care during her last pregnancy or that she had a complication during her last pregnancy for which she had medical treatment The difference between the CARE variable and the GO variable is the proportion of women who reported a pregnancy complication that required medical attention, but who also reported no prenatal care For the low use women, 70 9 percent reported having prenatal care, while 76 4 percent reported either prenatal care or care during pregnancy for a complication Thus 5 5 percent of the low use group reported care for a pregnancy complication, but no prenatal care For the average use group, 1 7 percent had care for a complication, but did not report any prenatal care None of the high use group reported care for a complication and no prenatal care use

Two interpretations are possible of the observation that the difference between CARE and GO decreases as predicted probability of use increases One interpretation is that since the low

users have care less frequently, they are more often forced to seek care on an emergency basis and do not report this emergency attention as prenatal care The second interpretation is that since women in the higher use groups are more educated, they are more likely to report emergency medical attention during pregnancy as prenatal care In any event, when the proportion of women using prenatal care approaches 100 percent, emergency care for complications cannot increase it very much

In table 10, we treat the profiles as if they were the profiles of three different women representing different segments of urban Peruvian society The question that we wish to ask is why do the three types of women differ from one another in their prenatal care behavior? However, before we answer this question, we must clarify our approach To begin with, we are not asking why the behavior of a particular woman differs from that of some other woman Understanding the determinants of the behavior of individuals is too complex a matter for us to handle We want to know why the general behavior of a group of women with one set of characteristics differs from the general behavior of a group of women with another set of characteristics For example, in general, wealthier households in Peru are more likely to have automobiles than poorer households Still, some wealthier households will not have automobiles and some poorer households will have them. Broadly speaking, we can say that higher wealth is positively associated with higher automobile ownership rates, and that if the real wealth of households increased, other things being constant, the automobile ownership rate would rise

Table 10 Effect of Individual Variables and Groups of Variables on Intergroup Differences in Whether or Not to Have Prenatal Care (GO), Urban Women

Variable	Low-average percentage change (1)	Average-high percentage change (2)	Low-average percentage change (3)	Average-high percentage change (4)
Demographic variables			4 4	3 8
FIRST	2 0	2 1		
AGE1	2 3	0 6		
AGE3	-2 1	0 0		
TPREG	2 2	1 1		
Socioeconomic and household variables			77 6	35 1
EDUC	40 5	16 9		
OLI	-0 1	-0 3		
ONLI	0 8	0 5		
SINC	5 9	8 3		
HUBB	3 7	0 0		
PINC	1 5	-0 8		
NPAR	0 2	0 7		
ORINC	-0 6	3 1		
NOR	2 6	-0 1		
TV	23 5	4 4		
Regional variables			14 5	6 5
NCOAST	2 5	0 2		
CCOAST	0 4	0 0		
SCOAST	-0 4	-0 2		
NSIERRA	11 6	0 3		
CSIERRA	3 1	0 5		
SSIERRA	-4 3	1 2		
HJUNG	1 7	0 1		
JUNGLE	9 0	1 0		
NCONE	-10 3	1 4		
SCONE	0 8	1 6		
OTHER	0 5	0 4		
Measures of access			5 0	1 2
OHHCP	187 1	27 4		
OHPP	1 9	0 2		
OPOPP	-184 5	-25 3		
KM2	1 3	0 3		
HHCD	18 8	0 2		
HPD	-2 3	-0 6		
POPD	-17 4	-0 9		
Private price and IPSS			-1 2	29 2
PPRICE	-1 2	-0 2		
IPSS	0 0	29 5		
Interaction	-0 5	26 2	-0 4	24 2
Difference explained (in percentage points)	18 2	19 2	18 2	19 2

We find that women with more education receive prenatal care more often than women with less education, controlling for a large number of variables, such as location (urban versus

rural), demographic characteristics, other socioeconomic characteristics, household structure, region, medical facilities in the area, and insurance status Below we report that education differences are one reason that various groups of women have different behavior toward prenatal care Some people may not be happy with this answer, because education is not necessarily a proximate determinant of prenatal care decisions For example, they might argue that behavior toward prenatal care depends on the relative power of husbands and wives within households and that the education of the wife influences her relative power within the household Alternatively, they might argue that prenatal care behavior depends on whether women take a longer-run or a shorter-run approach to life More educated women might tend to take a longer-run view, either because the educational process taught them that, or because they selected more education because they initially had a longer-term perspective In either case, people with a longer-term perspective might both be more educated and choose more prenatal care Is it appropriate, then, for us to identify educational differences as one of the reasons why behavior differs across groups, when it could be that it differs because of variations in power or time perspective?

From a policymaker's perspective, whether education influences prenatal care behavior through relative power or time perspective is only of indirect relevance Education could influence both relative power and time perspective More important, the Government of Peru can influence education levels directly, while its influence on intrahousehold relative power and people's time perspectives are indirect. We are not attempting here to identify the detailed mechanisms that connect the independent and dependent variables Instead, our task is to find those variables whose association with various aspects of prenatal care are strong enough to suggest approaches that the government might wish to explore to influence behavior toward prenatal care In this sense, saying that educational differences are an important reason why prenatal care behavior varies from group to group is appropriate When we find that a certain variable or group of variables has an important influence on prenatal care behavior, we are suggesting that government policies that affect that variable or variables might be effective at altering prenatal care behavior, and vice versa.[13]

Let us return to table 10 where we treat each profile as if it belonged to a particular woman and ask why women have different probabilities of seeking care The low use woman has a probability of seeking care of 61 9 percent, the average use woman of 80 1 percent, and the high use woman of 99 3 percent (see row labelled PRGO/AC) We want to know why the predicted probability of receiving care is 18 2 percentage points higher for the average user than for the low

13 If the measured association is too strong because of the omission of some other influence on prenatal care, the result of the policy intervention will be smaller than predicted Of course, the reverse might be true as well.

user, and why it is 19 2 percentage points higher for the high user than for the average user [14] Column 1 shows the percentage of the total change between the low user and the average user that would occur if only one variable changed For example, consider the variable EDUC, the woman's level of education in years Table 8 shows that the low user has 4 182 years of education and the medium user has 6 851 years of education What percentage of the 18 2 percentage point change between the low user and the average user is due to this difference in educational levels alone? The answer given in table 9 is that 40 5 percent of the difference in the predicted probability of receiving prenatal care can be attributed to that educational difference alone In other words, if we kept all other characteristics of the low user constant and changed only her education from 4 182 years to 6 851 years, her predicted probability of receiving care would increase by 7 4 percentage points (40 5 percent of 18 2 percentage points = 7 4 percentage points)

Looking down column 1 of the table, we see that some of the percentage changes are negative and some of them are greater than 100 percent By definition, the average user has a greater likelihood of using care than the low user This does not mean that varying all the values of the independent variables of the low user, one by one, to those of the average user, would always produce an increase in the predicted probability of receiving prenatal care For example, consider the variable AGE3 AGE3 is a 1/0 variable that is coded as "1" if the woman was over 35 years old when she completed her last full-term pregnancy From table 8, we can see that 20 percent of the women in the low user group were above the age of 35, while only 14 percent of the women in the average user group were Appendix table A2-2 shows that the predicted probability of receiving prenatal care is greater for women over 35 than it is for younger women This is because the coefficient on the AGE3 variable is positive, while the coefficient on the AGE1 variable is negative Therefore, a reduction in the proportion of women in the over 35 age group, other things being held constant, should reduce the predicted probability of receiving care Nevertheless, the over all predicted probability of obtaining care increased by 18 2 percentage points The -2 1 percent figure for the AGE3 variable indicates that the change in the proportion of women over 35 from 20 percent to 14 percent would, by itself, have caused a 0 4 percentage point reduction (-2 1 percent of 18 2 percentage points equals -0 4 percentage points) in the predicted probability of getting prenatal care

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14 The actual change in proportions of those with prenatal care from the low users to the average users is considerably less than the predicted change The actual change is only 7 2 percentage points This is almost entirely due to the fact that the predicted probability of having prenatal care for the low use women is 9 percentage points below the actual value This 9 percentage point gap arises for two reasons (a) the logistic regression produces predictions that are somewhat low on the low use end and somewhat high on the high use end, and (b) sampling variation due to the small number of women in the low use group In fact, the difference between the predicted and the actual number of women who had prenatal care was only five women Decomposition analysis is not very sensitive to the difference between the actual change and the predicted change

Some of the percentages in column 1 are over 100 percent For example, the number associated with the variable OHHCP, the number of hospitals and health centers in a woman's province, but outside her district, is 187 1 percent If the number of other hospitals and health centers in the province were increased from 7 509 to 30 982 (see the variable labeled OHHCP in table 8), the predicted probability of receiving prenatal care would increase by 34 1 percentage points (187 1 percent of 18 2 percentage points equals 34 1 percentage points) Clearly, if some variable accounts for more than 100 percent of the change in the predicted probability of seeking care, some other variable must offset it In this case, it is easy to find the offsetting variable The variable OPOPP, other population in the province, would by itself cause a -184 5 percent change in the predicted probability of receiving care Women in the average use group live in places with both more hospitals and health centers and greater population The effect of these two variables taken together is an increase of 2 6 percent (187 1 percent minus 184 5 percent equals 2 6 percent) in the predicted probability of receiving prenatal care

The last row in the table is labeled Interaction That percentage measures the contribution to the overall percentage point change of the independent variables changing simultaneously In other words, it is the contribution that cannot be attributed to any one variable changing by itself The interaction effect in column 1 is small, only -0 5 percentage points, which indicates that most of the change in the predicted probability of receiving care can be attributed to one or another of the independent variables changing one at a time In column 2, the interaction effect is much larger, 26 2 percent. This means that changing one variable at a time would account for only 73 8 percent of the change in the predicted probability from the average to the high user The remaining 26 2 percent is due to the interaction of the changes in the independent variables

An alternative way to view the results is to change groups of independent variables This is motivated by the idea that government policies cannot always change just one variable at a time For example, if the government were to increase school enrollment rates, this would increase the woman's education, but also it would be likely to affect her husband's education and income and these in turn could influence the structure of the household in which they live In columns 3 and 4 of table 10, we go through the same sort of procedure described above, but now change all the variables in a group instead of changing the variables one by one demographic variables, socioeconomic and household structure variables, and so on For example, column 4 shows that only 1 2 percent of the increase in the predicted probability of receiving care between the average user and the high user can be accounted for by their differences in the access variables

We have taken some time explaining how to read tables 8 and 10 because they and similar tables that follow are the basic expository vehicles we use to communicate our results Now let us turn to the substance of what appears in table 10

We believe that for policy purposes, we must pay special attention to women with low probabilities of prenatal care use, so we begin our discussion by considering the change in predicted probabilities from the low use woman to the average use woman Most of the effects observed in columns 1 and 3 of table 10 are small The demographic variables taken as a group account for only 4 4 percent of the change In any event, the government can do little directly to affect those demographic variables The socioeconomic and household structure variables account for 77 6 percent of the difference in predicted probabilities of receiving care Two variables dominate the picture, the woman's education, which by itself accounts for 40 5 percent of the difference, and the presence of a television set in the household, which accounts for 23 5 percent of the difference Changes in husbands' incomes across the groups accounts for 5 9 percent of the difference, and changes in the proportion of households with husbands living there for 3 7 percent Virtually none of the change can be attributed to the woman's labor or nonlabor income

It is no surprise that the woman's education is an important variable in explaining the choice of whether or not to have prenatal care Other studies have demonstrated the importance of a woman's education in a whole constellation of behaviors, from contraceptive usage to infant health care (See, for example, Easterlin and Crimmins (1985), Cochrane (1983) and Rosenzweig and Schultz (1982)) The magnitude of the effect, though, is certainly of interest

The variable TV is the next most important of the socioeconomic variables The presence of a television set indicates a number of things about the household that owns it First, it shows that the household had enough discretionary income to purchase a set Second, it demonstrates that the housing unit is electrified Third, it demonstrates that the urban area in which the household is located has a television transmitter Fourth, it suggests that members of the household could be influenced by the sorts of messages conveyed on television programs and advertisements Since the analysis uses other variables that control for household income and the size of the province and district in which the household is situated, concluding that the major effect of the television variable is due to the information that the television set conveys is tempting We did two tests of this hypothesis We replaced the television variable with a variable for the presence of a refrigerator in the household and obtained similar results Second, we hypothesized that if the informational channel of influence were the dominant one, the influence of the TV variable would be different for women with different levels of education We tested that hypothesis and found that the data did not substantiate it The TV variable is clearly an important variable influencing prenatal care use, especially among the relatively poorer and less well-educated segment of urban Peruvian society, and we are not clear why this is the case Future research to find out why the TV variable is so powerful would be useful One word of caution As table 8 shows, only 27 3 percent of the households of the low users had television sets

Changes in the variables concerning the husband's income and the husband's presence in the household account together for 9 6 percent of the change in the predicted probability of using prenatal care As expected, the higher the husband's income, other things constant, the more likely the wife is to seek prenatal care Similarly, the husband's presence in the household, *cet par*, increases the wife's probability of seeking care

Neither the woman's labor income nor her nonlabor income has a significant influence on her use of prenatal care in our sample, once other factors are controlled The unimportance of the woman's labor income may well be due to our study design We considered only women who had completed a full-term pregnancy in the two years prior to the ENNSA survey Some of those women may have had a child two years before the survey and some may have had a child two days before the survey The fact that they had had a recent pregnancy may have affected their labor earnings in such a way as to make those earnings appear inconsequential in the analysis A woman's education may be a reasonable proxy for her lifetime earnings capabilities, and so may capture some of the true effect of her labor income The unimportance of the woman's nonlabor income appears to arise because of the infrequency with which Peruvian woman, especially married Peruvian woman, report any nonlabor income In the ENNSA survey if the household had any nonlabor income, such as rental income, for example, it was generally attributed to the husband

The regional variables as a group account for 14 5 percent of the change in the predicted probability of receiving care between the low users and the average users Regions have unmeasured characteristics that influence care probabilities Average users are more likely to live in regions more conducive to care than are low users, but this regional composition effect is not large

Average users are also more likely to live in provinces that are more densely populated than are low users Not only do these provinces have more people than those in which the low users reside, but more health facilities The same is true with regard to districts in which the women live Over all, the differences in accessibility measures account for only 5 0 percent of the difference in prenatal care probabilities because an increase in use due to the greater number of facilities is offset by a decrease in use due to the greater population Still, the extremely large effect of the OHHCP variable and the large effect of the HHCD variable suggest that we delve further here

Low users live in provinces with an average of 7 5 other hospitals and health centers, and districts with an average of 2 2 hospitals and health centers For average users, the figures are 31 0 other hospitals and health centers, and 3 9 hospitals and health centers in her district What would happen if the government targeted these small urban areas and increased the number of facilities by 50 percent, so that there would be 11 3 other hospital and health centers and 3 3

hospitals and health centers in the district? According to our figures, this policy would result in an increase in the predicted care probability of around 8 percentage points, or slightly over 40 percent of the change between the low users and the average users Clearly, increasing the number of hospital and health centers in small urban areas can have a substantial impact on prenatal care by low users

The final category of independent variable here contains two variables, PPRICE, the average price of a visit to a private doctor in the woman's province, and IPSS, a 1/0 variable reflecting whether or not the woman has government health insurance None of the women in either the low use or the average use group were covered by government health insurance, so in the computation in table 10, only the PPRICE variable is relevant in columns 1 and 3 People who have higher probabilities of care tend to live in larger cities where the price of a private consultation is higher Since higher prices of private care would tend to depress the probability of receiving prenatal care, the PPRICE variable shows up with a negative sign The magnitude of the PPRICE effect is also quite small

Our analysis shows that the most important variable is the one that does not show up when we are considering the low use group, the IPSS variable According to our figures, if, in 1984, the Government of Peru could have provided the low users (that is, the relatively poor and uneducated urban dwellers) with the same quality of health care already provided to other Peruvians through IPSS facilities (social security facilities), the predicted probability of prenatal care would have risen to 96 7 percent! If only 50 percent of the low user group were covered by government health insurance, the predicted care probability would rise to 87 3 percent from 61 9 percent Thus, our results indicate that if the Government of Peru in 1984 could have provided the same quality of health care to all its urban residents that it provided to a relatively small group of them, then virtually all pregnant women would have received prenatal care

There are two major differences in the health care provided to those with and without government health insurance cost and quality The cost differences are relatively small In 1984, a visit to a doctor or nurse in a publicly run health facility for an uninsured patient usually cost either nothing or 1,000 soles (see Gertler, Locay, and Sanderson 1987) We expect that this was also the case for prenatal care visits The average monthly income of the husbands of women in the low use group (those that lived in the household) was 122 7 thousand soles Thus for these women a prenatal care visit to a public facility was <u>at most</u> 1/122 7th of their husbands' monthly income To put the 1,000 soles fee into perspective, consider an American husband currently earning $36,000 per year or $3,000 per month If his wife paid the same proportion of his income on a prenatal care visit as a Peruvian wife in the low use group paid as a percentage of her husband's income, the cost of a single prenatal care visit would be $24 45 Some uninsured wives would not even pay the 1,000 soles fee, but could expect to get prenatal care for free Insured

wives could be more confident of getting their care for free The main difference between care at IPSS and other public hospitals seems not to be the price of care, but its quality The waiting times are shorter at IPSS hospitals and the care provided is generally perceived to be of much higher quality

Which effect dominates, the price effect or the quality effect? We have no direct evidence to offer here except to note that the price difference between care at IPSS and at other public hospitals is small even in soles If a pregnancy is progressing without problems, a 1,000 soles fee may deter some women from seeking care, but they may also be deterred by having to wait weeks for an appointment or by having to wait for hours in less than pleasant surroundings only to be seen by a nurse for ten minutes What we do know is that virtually all urban women would have prenatal care if free, high-quality care were available to them.

To summarize, our analysis indicates that increases in the education of women, the availability of health care facilities, and the spread of government health insurance at the 1984 quality level would all produce significant increases in the use of prenatal care among the lower educated, lower income segment of the urban Peruvian population

The explanation of the difference in prenatal care use between the average user and the high user contains basically the same elements as appeared in the discussion above The predicted prenatal care probability for the average user is 80 1 percent and for the high user it is 98 6 percent, so that we have an 18 5 percentage point difference to explain None of the average users have government health insurance, but a full 48 3 percent of the high users do This difference alone accounts for 29 5 percent of the 18 5 percentage point difference in predicted care probabilities between average and high users The interaction terms in columns 3 and 4 of table 10 are much larger than those in columns 1 and 2 Most of the size of the interaction term is due to the interrelationships between the IPSS variable and the socioeconomic variables

From column 4 of table 10, we can see that 35 1 percent of the difference in predicted probability between the average and the high user can be attributed to socioeconomic and household structure variables From column 2, we can see that the most important of these variables are the woman's education, which by itself accounts for 16 9 percent of the difference, spouse's education, which accounts for 8 3 percent of the difference, and the presence of a television set, which is responsible for 4 4 percent of the difference The effect of the presence of a television set is much smaller in this case than it was when we were explaining the difference in the behavior of the low user compared to the average user There the TV variable accounted for 23 5 percent of the difference in predicted behavior

None of the regional variables contribute much to the explanation of the differences in predicted behavior between groups Taken as a group those variables account for only 6 5 percent of the predicted change The access variables as a whole contribute even less, only 1 2 percent of the predicted change Still, the OHHCP and OPOPP variables are individually quite strong, even though they tend to offset one another in the aggregate Average users live in provinces with an average of 30 982 other hospitals and health posts, while high users reside in provinces with an average of 48 686 other hospitals and health posts In other words, high users live in provinces with around 57 percent more other hospitals and health posts That 57 percent increase in facilities accounts for 27 4 percent of the difference in predicted prenatal care behavior

The policies that would increase prenatal care use among wealthier and more educated urban Peruvian women are the same policies that work for their poorer and less educated sisters, namely, more education, greater access, and a wider availability of high-quality facilities

The decision on where to seek care

Table 11 refers to the subset of women in table 8 who reported receiving prenatal care at a private or public health care facility Two sorts of women are counted in table 11, but omitted from table 8 (a) women who reported that they had no prenatal care during their last pregnancy, and (b) women who had prenatal care in their home, at a community center, or at an unspecified place The first column in table 8 was based on a sample of 1,655 women Of these we lost 328 because they did not receive prenatal care, leaving us with 1,327 women who received care These include 35 women who either obtained their care at a community center, at home, or in an unspecified place Subtracting these left 1,292, the number that appears at the end of the first column in table 11 The low use group in table 8 is based on 55 women The low use group in table 11 is based on 37 women because 39 out of the 55 received prenatal care, but two of them received their care either at home or in a community center In this and the following two subsections of the paper, that is, where we discuss where, when, and how often urban women sought prenatal care, we will be speaking about the samples of women described in table 11

Table 11 Average Characteristics of Urban Women who had Prenatal Care

Variables	All urban average (1)	Low users (2)	Average users (3)	High users (4)
FIRST	0 225	0 135	0 169	0 337
AGE1	0 098	0 216	0 135	0 039
AGE3	0 117	0 189	0 146	0 137
TPREG	3 449	4 432	4 079	2 605
COMP	0 236	0 162	0 225	0 225
EDUC	8 687	4 162	6 888	12 987
OLI	0 434	0 166	0 201	1 159

Table 11 (continued)

Variables	All urban average (1)	Low users (2)	Average users (3)	High users (4)
ONLI	0 026	0 006	0 019	0 058
SINC	1 902	1 083	1 236	3 306
HUBB	0 894	0 838	0 876	0 908
PINC	0 348	0 452	0 204	0 575
NPAR	0 351	0 351	0 303	0 467
ORINC	0 207	0 151	0 117	0 481
NOR	0 735	1 432	0 955	0 843
TV	0 666	0 270	0 551	0 899
NCOAST	0 109	0 135	0 112	0 062
CCOAST	0 130	0 027	0 146	0 131
SCOAST	0 091	0 054	0 034	0 085
NSIERRA	0 104	0 216	0 090	0 075
CSIERRA	0 077	0 081	0 101	0 065
SSIERRA	0 085	0 081	0 112	0 049
HJUNG	0 033	0 081	0 034	0 013
JUNGLE	0 073	0 270	0 124	0 056
NCONE	0 106	0 054	0 157	0 072
SCONE	0 056	0 000	0 011	0 114
OTHER	0 022	0 000	0 011	0 042
OHHCP	33 407	9 595	30 730	49 016
OHPP	16 959	11 622	17 326	20 324
OPOPP	1,163 696	299 214	1,075 129	1,715 754
KM2	6 385	10 559	7 922	5 778
HHCD	3 733	2 514	3 809	3 987
HPD	1 998	3 000	2 360	1 899
POPD	111 962	87 226	111 335	125 186
PPRICE	4 641	3 686	4 565	5 193
IPSS	0 118	0 000	0 000	0 487
GO	1 000	1 000	1 000	1 000
PUB	0 771	0 811	0 843	0 670
PRV	0 229	0 189	0 157	0 330
WHEN9	3 427	4 081	4 079	2 670
WHEN3	1 481	1 568	1 663	1 281
Actual frq trim.1	0 622	0 568	0 505	0 755
Actual frq trim.2	0 275	0 297	0 326	0 209
Actual frq trim.3	0 103	0 135	0 169	0 036
VMO	0 883	0 730	0 897	1 015
Average PRGO	0 846	0 619	0 800	0 986
PRGO/AC	0 919	0 619	0 800	0 993
Average PRWHR	0 771	0 844	0 820	0 690
PRWHR/AC	0 794	0 854	0 836	0 700
Average PRWHEN3	1 481	1 689	1 582	1 307
PRWHEN3/AC	1 409	1 620	1 552	1 255
Average PRTRI1	0 622	0 500	0 551	0 736
Average PRTRI2	0 275	0 310	0 317	0 221
Average PRTRI3	0 103	0 189	0 132	0 043
PRTRI1/AC	0 657	0 527	0 565	0 767
PRTRI2/AC	0 278	0 326	0 318	0 211
PRTRI3/AC	0 066	0 147	0 117	0 022
Average PRVMO	0 883	0 728	0 855	0 997

Table 11 (continued)

Variables	All urban average (1)	Low users (2)	Average users (3)	High users (4)
PRVMO/AC	0 883	0 728	0 855	0 997
Number of observations	1,292	37	89	306

Notes

Average PRGO is the average of the predicted values of the GO variable PRGO/AC is the predicted value of the GO variable evaluated at the average of the group's characteristics

Average PRWHR is the average of the predicted values of the PUB variable

PRWHR/AC is the predicted value of the PUB variable evaluated at the average of the group's characteristics

Average PRWHEN3 is the average of predicted values of trimester of care initiation

PRWHEN3/AC is the predicted value of the trimester of care initiation based on the average of the group's characteristics

Average PRTRI1, PRTRI2, and PRTRI3 are the averages of the predicted values of the probabilities of initiating prenatal care in trimesters 1, 2, and 3 respectively

PRTRI1/AC, PRTRI2/AC, and PRTRI3/AC are the probabilities of initiating care in trimesters 1, 2, and 3 respectfully evaluated at the average of the group's characteristics

Average PRVMO is the average of the predicted values of the number of visits per month (VMO)

PRVMO/AC is the predicted number of visits per month (VMO) evaluated at the average of the group's characteristics

The variables which are evaluated at average of the group's characteristics are the ones used in the analyses below

The variables in the top panel of table 11 are the same as those in table 8, except that the complications variable, COMP, is now included as one of the demographic independent variables Looking down the four columns in table 11, and comparing them with the analogous columns of table 8, we see few differences of any significance However, two differences stand out. In the first column we see that those who actually received prenatal care were, on average, more educated than those who did not, also, among the low users, those who had care came from provinces and districts with both more people and more facilities

The variable to be studied here is PUB It is coded as a "1" if the woman obtained her prenatal care at a public institution and "0" otherwise The statistical procedure used was a binary logistic regression, the estimates from which are given in appendix table A2-3 Of the sample of women in table 11, 77 1 percent received care at a public institution, while 22 9 percent received

care privately The sectoral pattern of care is U-shaped over our three profiles The percentage seeking private care is 18 9 for the low user groups 15 7 for the average group, and 33 0 for the high user group The question that this observation immediately raises is why do women in the low user group, who are on average poorer and less educated than women in the average use group, nonetheless, seek private prenatal care more frequently than those in the average use group?

Our statistical analysis provides an answer to this question, although at first glance it appears to be the wrong answer The statistical analysis predicts that low users would use the private sector slightly less often than those in the average use group This can be seen from the row labelled Avg PRWHR which gives the average predicted probability of receiving care at a public facility The logit results are telling us that, in general, the best fit to the data is obtained when more educated and wealthier women are predicted to receive care more frequently from private sources than less educated and poorer women The logit results accord with common sense, but they do not accord with the observed behavior

Two phenomena are at work here, one of which the logit regression correctly reflects and one of which it misses altogether Private health care in Peru is high cost and high quality health care Richer families can afford more of the high cost and high quality care and purchase more of it Indeed, one would never trust any statistical procedure that showed that richer people purchased more low cost, low quality care The logit regression correctly picks up the fact that the wealthier buy more private (high quality) health care than the poor The low user group in table 11 is a somewhat unusual group The people in that group are people with low predicted probabilities of seeking care, who nevertheless seek care Who are these people? Many are people with serious problems with their pregnancies The severity of problems is an omitted variable that is correlated both with the probability of receiving care and the probability of seeking private prenatal care Women with very serious health problems associated with their pregnancy are more likely to obtain care and more likely to get it from a private facility The low use women who actually get prenatal care are more likely to have serious problems than the average use women, who are more likely to get care regardless of whether they had any problems or not

The missing variable, SEVERITY, implies a correlation between the GO variable and the PUB variable that is ignored in the statistical analysis carried out here [15] In our previous work we tested for that correlation in the context of general health care and did not find it, so we did not design our research strategy with it in mind (Gertler, Locay, and Sanderson 1987) Future researchers should be aware, however, that decisions on whether and where to receive care should be studied within a simultaneous framework.

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15 We did not just happen to overlook variables that measured the severity of pregnancy-related health problems We searched long and hard for such variables, but did not find any we could use

The lesson that we learn here from the pattern of the PUB variable is the same lesson we learned when we looked at the GO and CARE variables in table 8 For the poor and less educated, prenatal care more often takes on the character of crisis management when something is wrong seek care, otherwise do not

For our present purposes, the omission of the correlation between GO and PUB is not an overwhelming problem, because government policies probably would not influence that correlation very much anyway (although a policy of improving the quality of public care might reduce this correlation somewhat) For policy analysis, it is almost just as good to look at the determinants of the public/private choice as we have done it

The predicted probability of a low user having public prenatal care is 85 4 percent and 83 6 percent for the average user (see row labelled PRWHR/AC) This means that in table 11 we are decomposing a change of only -1 8 percentage points Any independent variable that would lead the predicted probability of going public to fall by 1 8 percentage points would account for 100 percent of the change If the variation in an independent variable would lead to a fall in the percentage going public of 18 percentage points, that variable would account for 1,000 percent of the change The reason why so many large percentages appear in columns 1 and 3 of table 12 is that the base difference to be explained is so small

Taken as a group, socioeconomic and household characteristics account for 204 percent of the change, or for a 3 7 percentage point decline in the probability of receiving prenatal care The woman's education is again the dominant variable, accounting for 131 percent of the decline An increase in the woman's education, like an increase in her spouse's income, makes it more likely that the woman would receive her prenatal care at a private facility The TV variable also contributes to the decrease in the probability of the woman obtaining public care This seems to us to be weak evidence of the TV variable standing as a proxy for income or wealth, and not as a proxy for the flow of information [16]

16 The coefficient on the TV variable is not statistically significant at the 10 percent level, so we need to be cautious in interpreting the effect of the presence of a television set on where people choose to get prenatal care

Table 12 Effect of Individual Variables and Groups of Variables on Intergroup Differences in Where to Have Prenatal Care, Urban Women

Variable	Low-average percentage change (1)	Average-high percentage change (2)	Low-average percentage change (3)	Average-high percentage change (4)
Demographic variables			11 7	15 0
FIRST	4 7	4 2		
AGE1	12 0	2 5		
AGE3	-14 9	-0 5		
TPREG	11 7	8 8		
COMP	-1 8	-0 0		
Socioeconomic and household variables			204 3	132 5
EDUC	131 4	53 2		
OLI	0 6	3 0		
ONLI	-0 4	-0 2		
SINC	31 6	77 3		
HUBB	-3 7	-0 6		
PINC	20 8	-5 6		
NPAR	-2 5	1 5		
ORIC	2 0	-3 9		
NOR	-14 4	-0 6		
TV	38 7	8 7		
Regional variables			160 3	24 0
NCOAST	20 5	8 2		
CCOAST	-132 6	3 1		
SCOAST	12 3	-5 6		
NSIERRA	155 3	3 3		
CSIERRA	-24 7	8 0		
SSIERRA	-35 3	12 9		
HJUNG	33 3	2 6		
JUNGLE	142 0	11 9		
NCONE	4 2	-0 6		
SCONE	-10 6	-17 6		
OTHER	-4 2	-2 1		
Measures of access			-244 1	-42 4
OHHCP	-1,218 6	-185 6		
OHPP	139 5	13 3		
OPOPP	831 6	122 6		
KM2	-19 7	-2 9		
HHCD	-115 8	-2 9		
HPD	46 3	6 0		
POPD	76 1	7 9		
Private price and IPSS			-32 3	-29 4
PPRICE	-32 3	-4 2		
IPSS	0 0	-25 2		
Interaction	16 7	-0 8	0 1	0 2
Difference explained (in percentage points)	-1 8	-13 6	-1 8	-13 6

Almost all the regional dummy variables have positive coefficients, which indicates that everything else being equal, urban Peruvian women living outside central Lima are more likely to obtain prenatal care at a public institution than women in central Lima. This is not surprising given the concentration of private medical facilities in central Lima The use of public health care is particularly prevalent in the Sierra, the central coast outside Lima, and the low jungle Average users are much less likely to live in the north Sierra and the low jungle than low users, and therefore, shifts away from those areas cause the predicted probability of seeking public care to decrease Average users are more likely to live in the central coast region, and this leads to an increase in the predicted probability of obtaining public prenatal care

By far the largest effects in columns 1 and 3 of table 12 are those for the access variables People in the average use group tend to live in provinces and districts with higher populations and with more public facilities By itself, an increase in the number of public facilities leads to an increase in the probability of receiving public care (see the signs for both the OHHCP and the HHCD variables in appendix table A2-3) The large negative effect of increased facilities is offset to some extent by the large positive effect of population size (see the OPOPP and POPD variables) [17] The effect of the private care price is like the effect of more facilities The average users live in places with higher private care costs On this ground, the average users should use public health care more often, but they do not

The choice of whether to have public or private prenatal care is strongly influenced in opposite directions by different sets of the independent variables Higher income and education lead to a greater demand for private health care The regional distributions of the low and average users also implies that the average users should seek private care more often Offsetting these are the access and price effects The average users live in areas with more public facilities and in areas where the cost of private health care is greater These two factors should lead to an increase in the demand for public care

A woman with the characteristics of the high use group would have a predicted probability of seeking public care of 70 0 percent The comparable woman with the characteristics of the average use group would have a predicted probability of seeking care of 83 6 percent (see row labelled PRWHR/AC in Table 11) Therefore, we are seeking to explain a 13 6 percentage point decline in the probability of public care as we move across the two groups Qualitatively, the explanation of the 13 6 percent decline is similar to the explanation we gave for the 1 8 percentage point decline obtained when moving from the low use to the average use group, but some of the quantitative magnitudes are different In comparing the low use to the average use group, the

17 The effect is negative in the sense that it would lead to an increase in the use of public health care, while we are trying to explain a decrease in the use of such care

woman's education had an effect that was more than four times greater than the effect of her spouse's income In comparing the average use group to the high use group, the effect of the woman's education is less than two-thirds as large as her husband's income effect The effects of the socioeconomic and household characteristics variables are much more important relative to the access variables for the wealthier group than for the poorer group

Table 12 as a whole shows that the decision to seek public or private care is sensitive to factors such as the woman's education, her spouse's income, and the relationship between the number of public facilities and the population in the area

The decision on when to initiate care

Table 13 shows the decomposition results for the decision on when to initiate prenatal care They are based on a multinomial logit regression where the dependent variable indicated whether the woman initiated care in the first, second, or third trimester of the pregnancy Before we get to that table, however, let us return for a moment to table 11 In that table, the WHEN9 variable indicates the average month of the pregnancy in which prenatal care was initiated Women in the low use group initiated care at month 4 081 of their pregnancy, the average use group at month 4 079, and the high use group at month 2 670 In other words, the timing of initiation of care is practically identical for the low use and average use groups, and the women in both these groups initiate care about a month and a half after the women in the high use group

Table 13 Effect of Individual Variables and Groups of Variables on Intergroup Differences in When to Initiate Prenatal Care, Urban Women

Variables	Low-avg %change (1) (1st trimester)	Low-avg %change (2) (2nd trimester)	Low-avg %change (3) (3rd trimester)	Avg-high %change (4) (1st trimester)	Avg-high %change (5) (2nd trimester)	Avg-high %change (6) (3rd trimester)
FIRST	-1 9	-6 1	-0 7	-1 6	-2 5	-0 6
AGE1	19 9	52 9	10 6	3 7	5 4	1 8
TPREG	15 8	22 8	13 8	9 5	10 7	8 2
COMP	16 6	27 7	13 4	0 0	0 0	0 0
EDUC	118 6	319 6	61 7	42 5	61 8	20 6
OLI	-1 0	-7 5	0 9	-5 9	-13 8	2 9
ONLI	-2 8	-7 6	-1 5	-1 3	-1 9	-0 6
SINC	4 8	21 7	0 1	11 9	21 9	0 7
HUBB	5 5	0 2	7 1	0 6	0 4	0 8
PINC	-42 4	32 4	-63 5	7 5	2 4	13 1
NPAR	12 7	-1 2	16 6	-5 5	-3 3	-7 9
ORINC	-5 2	-4 0	-5 6	7 6	6 9	8 4
NOR	7 7	51 2	-4 6	0 4	0 8	-0 1
TV	25 7	-16 9	37 8	3 8	1 4	6 5

Table 13 (continued)

Variables	Low-avg %change (1) (1st trimester)	Low-avg %change (2) (2nd trimester)	Low-avg %change (3) (3rd trimester)	Avg-high %change (4) (1st trimester)	Avg-high %change (5) (2nd trimester)	Avg-high %change (6) (3rd trimester)
NCOAST	19 1	-97 0	52 0	2 7	-8 7	15 6
CCOAST	-161 3	199 7	-263 6	2 3	0 2	4 7
SCOAST	20 9	-84 6	50 8	-4 1	7 8	-17 5
NSIERRA	125 3	-472 9	294 7	1 2	-1 9	4 6
CSIERRA	-24 8	53 4	-46 9	4 4	-1 8	11 5
SSIERRA	-34 3	104 4	-73 5	6 2	-6 3	20 4
HJUNG	48 8	-177 7	113 0	1 7	-2 7	6 7
JUNGLE	255 4	-154 7	371 5	14 2	5 7	23 8
NCONE	-23 4	-57 5	-13 7	3 0	4 3	1 7
SCONE	3 1	0 3	3 9	3 7	2 5	5 0
OTHER	-4 9	-16 3	-1 7	-2 3	-3 7	-0 8
OHHCP	-67 1	1,145 4	-410 5	4 8	51 7	-48 0
OHPP	-41 3	-29 7	-44 6	-3 0	-2 6	-3 3
OPOPP	-138 1	-392 3	-66 1	-18 5	-27 6	-8 2
KM2	-46 3	-133 6	-21 6	-6 1	-9 2	-2 7
HHCD	-1 2	8 8	-4 0	-0 0	0 1	-0 1
HPD	-27 8	-90 7	-10 0	-3 3	-5 3	-1 1
POPD	-11 9	-26 3	-7 8	-1 1	-1 4	-0 7
PPRICE	42 2	-161 7	100 0	2 4	-4 1	9 7
IPSS	0 0	0 0	0 0	11 7	12 1	11 2
PUB	-7 4	-8 0	-7 2	5 6	5 7	5 5
Interaction	2 4	9 7	0 3	1 1	-5 0	8 0
Demographic	48 8	93 3	36 2	11 7	13 6	9 5
Socioeconomic	123 7	387 8	48 9	61 5	76 0	45 1
Regional	227 1	-705 3	491 2	34 5	-5 9	80 0
Access	-355 2	508 1	-574 1	-27 5	6 3	-65 7
Pprice and IPSS	42 2	-161 7	100 0	14 1	8 0	20 9
Public	-7 4	-8 0	-7 2	5 6	5 7	5 5
Interaction	0 8	-14 3	5 0	0 1	-3 8	4 6
Difference explained (in percentage points)	3 8	-0 8	-3 0	20 2	-10 7	-9 5

We get a somewhat different impression when we look at the figures aggregated by trimester The average trimesters at initiation for the low, average, and high use groups are 1 568, 1 663, and 1 281 (table 11, WHEN3) Again, the high use group initiates earlier, but in this way of looking at the data, the average group initiates later than the low one The actual frequencies of initiating care in each trimester show the differences in the groups more dramatically Among the low users 56 8 percent initiated in the first trimester That figure is only 50 5 percent for the average users, and rises to 75 5 percent for the high use group (table 11) The question that we

must confront is whether the decline from 56 8 percent to 50 5 percent reflects something real or is just sampling error The number of women in the low use group is small, only 37 We could raise the proportion initiating care in the first trimester from 50 5 percent to 56 8 percent by changing the behavior of only two women We assume here that the decline for the average group is sampling error and proceed with the decomposition indicated by the multinomial logit When we have finished discussing our results, we will return to the possibility of there being a real decline between the low and average group In view of this, treating the decomposition of the difference between the low and the average group with more than the usual amount of caution is prudent

Evaluated at the average characteristics of the women in the low use group, the predicted probability of initiating care in the first trimester of a pregnancy is 52 7 percent Evaluated at the average characteristics of the women in the average use group, the predicted probability of initiating care in the first trimester is 56 5 percent (see row labelled PRTRI1/AC in table 11) Thus, we have a 3 8 percentage point increase to explain Only a comparatively small number of variables are statistically significant at the 5 percent level (one-tailed test) They are TPREG, COMP, EDUC, PINC, NPAR, ORINC, PPRICE, and PUB We will concentrate our discussion of the decomposition on these variables The greater the number of pregnancies, the less likely the woman is to seek care early The TPREG variable accounts for 15 8 percent of the 3 8 percentage point rise because the women in the average use group have fewer pregnancies than the women in the low use group An analogous explanation is appropriate for the complications variable, COMP, which accounts for 16 6 percent of change Note, however, that the greater the frequency of complications that result in medical attention, the more likely the woman is to seek care early

The woman's education variable is again the dominant variable, accounting for a full 118 6 percent of the change The parents' income variable, PINC, is positively related to the probability of initiating care in the first trimester, but since the average parents' income is lower for the average than for the low user group, that variable has a negative influence in the decomposition The more parents or in-laws in the household, the less likely is the woman to initiate care in the first trimester The NPAR variable accounts for 12 7 percent of the change The higher the incomes of other relatives in the household (besides the spouse, parents, and parents-in-law), the greater the probability of the woman seeking care in her first trimester This variable is responsible for -5 2 percent of the change

The higher the price of private health care, the more likely that a woman will initiate health care in her first trimester In our sample, the areas with the high prices for private care are the larger cities, particularly Lima. Here the price of private care is probably standing as a proxy for the accessibility of private health care This variable, PPRICE, has a substantial effect on the probability of initiating care in the first trimester, accounting for 42 2 percent of the change

Women who receive their care in a public institution have a lower probability of initiating care in the first trimester (see the coefficient of the PUB variable in Table A2-4) We have two possible explanations for this result First, the waiting time for care is longer at public facilities Second, people with severe problems were more likely to go to the private sector on an emergency basis When everything was progressing normally, women could take a little longer to initiate care and then seek care where it was cheaper

The explanation of the change between the average use group and the high use group is similar and there is no need to repeat the details here Note, however, that the EDUC variable again dominates the decomposition in that case

The discussion above decomposing the difference in the probability of seeking care in the first trimester of a pregnancy between the low use group and the average use group assumed that it was proper to interpret the multinomial logit results straightforwardly There is a possibility that the multinomial logit results are misleading in this case Low use women tend to treat prenatal care as crisis intervention more than the average use or high use women We showed earlier that they were more likely to use private care than were the average use women, and we will show later that once they initiate care, they go less frequently The low use and the average use women may both initiate care at the same time if a medical emergency occurs, but more of the average group might initiate care later even if no problem arose In this interpretation, the low use group initiates care earlier than the average use group for exactly the same reason that they receive their care more frequently at a private facility The reason is that more of their prenatal care is the treatment of emergencies

In an econometric sense, we are missing the variable SEVERITY (mentioned earlier) that would represent the severity of the pregnancy-related medical problems Women with very serious problems would be more likely to seek care, more likely to seek private care, and more likely to initiate care early The omission of the SEVERITY variable is felt much more seriously in the case of the low use group, where those who do actually seek care are much more likely to be those with severe problems The solution to this econometric problem is to study related prenatal care decisions in a simultaneous framework This is easier said than done, because the simultaneous estimation of a model with three qualitative dependent variables is an extremely difficult exercise

The decision on the frequency of prenatal care

Table 11 shows that our urban women had an average of 0 883 visits per month (VMO) once care was initiated For example, a woman who initiated care in her third month of pregnancy had about six prenatal care visits Women in the low use group had an average of 0 730 visits per

month after the initiation of care, those in the average use group 0 899 visits per month, and those in the high use group 1 015 visits per month

The statistical procedure that we used to study visits per month is ordinary least squares regression The decomposition analysis begins with computing the difference in the predicted number of visits per month for a woman with the average characteristics of the low use group and the predicted number for an analogous woman with the average characteristics of the average use group From table 11, we can see that the number for the low use woman is 0 728 visits per month and the number for the average use woman is 0 855 (PRVMO/AC) Thus we have an increase of 0 127 visits per month to explain

The decomposition results are presented in table 14 The socioeconomic and household variables account for 54 6 percent of that 0 127 difference, the regional variables for 52 8 percent, and the access variables for -7 2 percent Two of the socioeconomic variables are far and away the most important, the woman's education, EDUC, which accounts for 31 8 percent of the change, and the presence of a television set in the household, which is responsible for 15 0 percent of the change Women in Lima receive prenatal care more often than urban women in the rest of Peru Women in the Sierra and in the low jungle receive care least often, holding other measured variables constant The power of the regional variables primarily reflects the fact that the average use group contains smaller proportions of women from the Sierra and the low jungle than does the low use group and the lower frequency of care for those women

The average group lives in areas with more health facilities and larger populations Those effects roughly counterbalance one another A surprising finding is that the effect of the OHHCP variable is negative Since the coefficient of the OHHCP variable in appendix table A2-5 is very far from being statistically significant, we can probably assume that the number of other hospitals and health centers in the province has very little effect on the number of visits per month

Next, let us consider the decomposition of the change between the average use group and the high use group The average use group has a predicted value of 0 855 visits per month once prenatal care was initiated and the high use group has a predicted value of 0 997 visits per month (table 11, PRVMO/AC) Thus, we have a difference of 0 142 visits per month to explain The socioeconomic variables account for 90 3 percent of that difference The woman's education alone accounts for a full 63 4 percent of the change, the presence of a television set is associated with 16 6 percent of the change, and the spouse's income with 10 0 percent of the change

Table 14 Effect of Individual Variables and Groups of Variables on Intergroup Differences in the Number of Prenatal Visits per Month, Urban Women

Variable	Low-average percentage change (1)	Average-high percentage change (2)	Low-average percentage change (3)	Average-high percentage change (4)
Demographic variables			-1 7	-6 5
FIRST	-0 1	-0 6		
AGE1	-3 0	-3 2		
AGE3	-2 0	-0 4		
TPREG	-0 7	-2 5		
COMP	4 2	0 0		
Socioeconomic and household variables			54 6	90 3
EDUC	31 8	63 4		
OLI	-0 1	-2 5		
ONLI	0 0	0 1		
SINC	0 8	10 0		
HUBB	1 9	1 4		
PINC	1 6	-2 2		
NPAR	-0 6	1 7		
ORINC	-0 1	0 9		
NOR	4 3	0 9		
TV	15 0	16 6		
Regional variables			52 8	41 0
NCOAST	2 0	4 0		
CCOAST	-3 5	0 4		
SCOAST	2 5	-5 6		
NSIERRA	23 7	2 5		
CSIERRA	-4 6	7 3		
SSIERRA	-5 5	9 9		
HJUNG	6 6	2 6		
JUNGLE	23 6	9 8		
NCONE	5 7	-4 2		
SCONE	1 5	12 4		
OTHER	0 8	1 9		
Measures of access			-7 2	-21 9
OHHCP	-10 6	-8 1		
OHPP	34 1	16 0		
OPOPP	-32 8	-24 1		
KM2	-0 1	-0 1		
HHCD	15 6	1 9		
HPD	-4 2	-2 7		
POPD	-9 2	-4 7		
Private price and IPSS			1 1	35 4
PPRICE	1 1	0 7		
IPSS	0 0	-34 7		
Public and month of first visit			0 2	-38 2
PUB	0 3	-1 5		
WHEN9	-0 1	-36 8		
Interaction	0 0	0 0	0 0	0 0
Difference explained (VMO)	0 13	0 14	0 13	0 14

Regional variables account for 41 0 percent of the difference The most important variable is the 1/0 (dummy) variable for the south cone of Lima People in the south cone of Lima have a relatively high frequency of care, and the high use group has a greater proportion of south cone residents than does the average use group Access measures again have a negative effect Basically, this indicates that the negative effect of a larger population is more important than the positive effect of having more facilities

One of the most interesting single variables is the medical insurance variable IPSS The proportion covered by government health insurance in the high use group is 48 7 percent, while no one in the average use group has government insurance This increase in the proportion covered by insurance accounts for 34 7 percent of the change

Women who initiate care earlier have fewer visits per month subsequent to initiation than women who start their care later Our interpretation of this is that prenatal care is more frequently used toward the end of the pregnancy In this case, those who begin later will tend to have more visits per month Women in the high use group initiate care earlier than those in the average use group and this earlier initiation leads to the negative effect of the WHEN9 variable

Conclusions for urban areas

Prenatal care was already widely practiced in the urban areas of Peru in 1984 Over 80 percent of the women in our sample received care Of those, around 62 percent initiated care in the first trimester of the pregnancy The average woman who had prenatal care made around 0 9 visits per month once she started care, a visit every 33 or 34 days

The woman's education was an important variable for all dimensions of prenatal care Probably the next most important variable was the medical insurance variable We interpret the importance of that variable as indicating that women in the urban area could be encouraged to use more prenatal care if the quality of public sector care were improved Our results indicate that if the IPSS medical care system could be spread throughout urban Peru at its 1984 level of quality, prenatal care use would be virtually 100 percent, even for previously low use women [18]

On the theoretical level, we learned that the distribution of income within the household has a clear impact on prenatal care behaviors Our results both encourage and mystify us The

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18 An important item for future research is to determine the features of care at the IPSS hospitals that are so important in encouraging prenatal care use It may be that prenatal care use is very sensitive to how long women must wait between making an appointment and seeing a doctor If that were the case, it might be possible to encourage prenatal care use at other public facilities by shortening waiting times there

intrahousehold distribution of income does influence prenatal care behavior, but not in ways that we would predict For example, appendix table A2-2 shows that the impact of other relatives' income (ORINC) on the woman's probability of seeking prenatal care is twice as great as her spouse's income Before we began our work, we thought that other relatives' income, if it mattered at all, would have a smaller influence on the woman's prenatal care behavior than her spouse's income From a policy viewpoint, such problems are not of much interest Policymakers have no direct control over the incomes of other relatives, and as table 10 shows, the variations in the ORINC variable are not of much quantitative significance Nevertheless, from the perspective of someone interested in household decisionmaking in general, or more specifically in women's health care use in Peru, our work suggests a puzzle, which must be left for future research to solve

Our work has also given us some insight into how to study prenatal health care decisionmaking in the future It appears from our results that the error term in the GO regression is likely to be correlated with both the error terms in the PUB regression and the WHEN3 regressions (and probably also the VMO regression) Future work should study these decisions in a simultaneous framework

Influences on Prenatal Care Use in Rural Peru

The decision on whether to seek prenatal care

Tables 15-20, for the rural women of Peru are constructed similarly to tables 8 and 10-14 for urban Peruvian women Table 15 provides the characteristics of all the women in our rural sample, and of the women in the low use, average use, and high use groups These groups were constructed as they were for the urban areas The average use group was created so that a woman with characteristics of the average group women would have a probability of seeking care that was (nearly) equal to the proportion of the rural population who sought care The low use group was selected so that a woman with the low use group characteristics would have a predicted probability 2of seeking care that was (nearly) one standard deviation below that of the average use woman The high use group was selected so that a woman with the high use group characteristics would have a predicted probability of seeking care that was (nearly) one standard deviation above that of the average use woman

Table 15 Average Characteristics of all Rural Women

Variables	All rural average (1)	Low users (2)	Average users (3)	High users (4)
FIRST	0 123	0 067	0 135	0 147
AGE1	0 104	0 065	0 126	0 166
AGE3	0 202	0 329	0 164	0 080
TPREG	5 148	5 906	5 170	4 196
EDUC	2 743	0 635	2 449	4 276
OWNCASH	0 061	0 008	0 060	0 086
SCASH	0 266	0 084	0 163	0 498
SED	3 661	1 984	3 000	5 282
HUBB	0 879	0 877	0 856	0 896
HHCASH	0 122	0 047	0 100	0 209
FINC	0 376	0 257	0 472	0 197
NPH	6 990	7 159	7 076	6 252
TV	0 123	0 009	0 097	0 190
NCOAST	0 165	0 000	0 261	0 319
CCOAST	0 136	0 007	0 106	0 245
SCOAST	0 032	0 000	0 015	0 043
NSIERRA	0 200	0 485	0 091	0 012
CSIERRA	0 108	0 168	0 091	0 049
SSIERRA	0 119	0 242	0 079	0 043
HJUNG	0 144	0 060	0 202	0 190
JUNGLE	0 096	0 038	0 155	0 098
OHHCP	4 018	2 622	3 856	5 405
OHPP	11 827	11 251	12 812	12 650
OPOPP	9 683	7 820	9 566	12 405
KM2	0 891	0 596	1 107	0 990
HHCD	0 618	0 427	0 672	0 699
HPD	1 694	1 602	1 950	1 546
POPD	1 940	1 853	2 006	1 626
INSUR	0 030	0 000	0 015	0 061
FARMER	0 706	0 942	0 748	0 423
GO	0 415	0 221	0 352	0 638
CARE	0 460	0 273	0 393	0 675
PUB	0 250	0 130	0 188	0 436
PRV	0 086	0 020	0 073	0 104
Average PRGO	0 415	0 198	0 412	0 628
PRGO/AC	0 406	0 197	0 412	0 628
Number of observations	2,013	447	341	163

From the mean of the GO variable, we can see from table 15 that 41 5 percent of the rural women had prenatal care In the low use group 22 1 percent of the women had care, in the average use group 35 2 percent did. Note that the proportion of rural women in the high use group who had prenatal care is similar to the proportion of the urban women in the low use group The average predicted probabilities of seeking care can be seen from the row labeled Average PRGO Low users have a predicted probability of receiving prenatal care of 19 8 percent,

average users of 41 2 percent, and high users of 62 8 percent The predicted probabilities of receiving care evaluated at the average characteristics of the groups are very close to the average predicted probabilities

The difference between the CARE variable and the GO variable is the proportion of the population in each group who report having a pregnancy complication for which they had treatment, but who also indicate that they received no prenatal care Of the entire rural sample, 4 5 percent reported such a complication and no prenatal care This is around 10 percent of all those who received care In the low use group, the difference between CARE and GO is 5 2 percentage points This is around one-quarter of all those who received care As was the case in the urban area, the likelihood of reporting a treated complication and no prenatal care is largest for the low use group

The variable GO minus the variables PUB and PRI equals the proportion of the population who received prenatal care outside the formal health care sector In our first rural decomposition analysis we deal with all the women who receive care In the subsequent analyses of where, when, and how often prenatal care was received, we focus only on those who had prenatal care outside their home in either a public or a private facility

Since farm income is so difficult to measure properly, we did not perform the same sort of accounting for the incomes of each family member for the rural areas that we did for the urban areas The income variables are, therefore, different for the rural areas than they were for the urban areas OWNCASH refers to the woman's own nonfarm income For nonfarm women this variable would be the aggregate of the urban OLI and ONLI variables SCASH is the spouse's nonfarm income For nonfarm women, this would be the equivalent of the urban SINC variable SED is the spouse's education in years This variable does not appear in the urban analysis, because it was too closely related to the spouse's income there HHCASH is the nonfarm income of other members of the household besides the woman and her spouse For nonfarm women, this would be the equivalent of the sum of the urban variables PINC and ORINC plus the nonfarm income of nonrelatives in the household FINC is the household's reported farm income and NPH is the number of people in the household The variables INSUR and FARMER also do not appear in the urban analysis INSUR includes all women who are covered by government health insurance (IPSS), plus all women who either work in the petroleum, sugar, or mining industries or whose spouse does These industries often provide free or subsidized medical care to their employees FARMER is a 1/0 variable that is coded "1" if anyone in the household receives income because of his or her control of farmland

As we can see from table 15, in the rural area, the high user group has a greater proportion of women with first pregnancies than does the low user group High users are much more likely

to be younger (in the AGE1 group), and much less likely to be older (in the AGE3 group), than low users Again, the level of the women's education is an important differentiating feature Women in the low use group averaged only 0 635 years of education, women in the average use group had a mean of 2 449 years of education, and those in the high use group had an average of 4 276 years of education We have already commented on the similarity of the high use rural group to the low use urban group in terms of the proportion seeking care Their similarity in terms of educational attainment is also noteworthy The women in the high use rural group and the low use urban group also have similar levels of prenatal care use and almost identical levels of schooling All the nonfarm cash variables increase as we move from low to average to high users, as does the average level of the spouse's education The farm income variable, FINC, shows a more complex pattern After adjusting for the proportion of farm households in each group (using the FARMER variable), farm income is highest for the average users, next highest for the high users, and lowest for the low users Our interpretation of this is that many of the farm households in the high use group were making a transition between farm and nonfarm activities We conjecture that with many of these households, farming had become only a part-time activity, and hence their farm incomes were lower than those of households in the average use group

The regional differences between the low use and high use groups are as striking as they were in the urban areas In the rural areas, the low use group is dominated by people in the Sierra and the high use group is dominated by people who live on the coast Women in the jungle are more likely to be in the high use group than in the low use group People in the high use group are more likely to live in provinces that have more public health care facilities and a greater population, although this is not necessarily the case for the districts in which they live It is interesting to note how little the number of other health posts varies across the provinces in which women in the different groups live None of the women in the low use group have any insurance, while 6 1 percent of those in the high user group do Finally, 94 2 percent of the women in the low use group live in farm households, while only 42 3 percent of those in the high use group do

The probability of receiving care for a woman with the characteristics of the average user is 41 2 percent The probability of receiving care for a woman with the characteristics of the low user group is 19 7 percent (see row labeled PRGO/AC) What policies could the government implement to raise that 19 7 percent by the 21 5 percentage points necessary for it to reach the level of the average user?

Table 16 shows which variables account for the 21 5 percentage point gap The demographic variables do not cause a great deal of the difference When they are aggregated, the demographic variables only account for 0 3 percent of the gap Changes in the socioeconomic and household variables are responsible for one-third of the difference Here again, the change in the woman's education variable dominates Increases in the wife's education account for 23 4 percent of

the difference, while changes in her spouse's education account for another 7 6 percent All the remaining socioeconomic variables are of little consequence

The most important group of variables influencing the use of prenatal health care is the group of regional variables The regional variables capture all unmeasured effects that operate on a regional level They capture such regional differences as the existence and quality of roads and means of transport, the quality of public and private health care, and culture to the extent that they affect prenatal care use The importance of the regional variables for the rural poor does not imply any immediate policy prescriptions It only suggests that a vital next step in understanding the prenatal care behavior of poor rural women is to understand the origins of the unexplained regional variation measured here

The access variables taken as a whole account for 12 8 percent of the spread between the low and the average user Other hospitals and health centers in the province, other health posts in the province, and hospitals and health centers in the district all contribute positively to the explanation of the difference Note that differences in the number of health posts play almost no role in explaining why the use of prenatal care differs across groups

No one in the low use group was covered by insurance and only 1 5 percent of the average use group were covered (table 15, INSUR) Less than 1 percent of the change between groups is attributable to that difference in coverage If, however, all the people in the low use group were provided with the same sort of insurance and medical quality as is available to those with government health insurance and other private health insurance, the predicted probability of receiving prenatal care would rise to 41 0 percent, roughly the same level as that for the average use group

Farmers constitute 94 2 percent of the low use group and 74 8 percent of the average use group (table 15, FARMER) Since farmers use prenatal care less often than nonfarm rural people, this reduction in the percentage of farmers is one of the reasons that people in the average use group use prenatal care more often The change in the FARMER variable accounts for 9 3 percent of the difference between the groups The effect of the FARMER variable is open to a number of different interpretations Women in farm households may use prenatal care less often because the woman's time is very valuable in farming and support activities, because women living on farms tend to live farther from health care facilities or have worse access to them for other reasons, or because farmers differ culturally or in other ways from nonfarm rural residents

The most important variable we can identify to increase prenatal care use among the poor rural farmers is education, particularly of women Providing these women with health insurance and access to high quality care will also help Prenatal care use among these women is also much

more sensitive to the presence of hospitals and health posts in their district than it is to the presence of hospitals and health posts in their province, but outside of their district In 1984, they had an average of 0 427 hospitals or health centers in their district (table 15, HHCD) If this number could be increased to 2 427, the predicted proportion receiving prenatal care would rise to nearly 30 percent.

Our analysis suggests that no single policy can transform poor uneducated rural farm women into users of prenatal care at the level seen in the urban areas If the average education of the low users could be increased from 0 6 years to 4 years, the number of hospitals and health centers in each district could be increased from 0 427 to 3 000, and 50 percent of the women could be covered by health insurance, then the predicted probability of receiving prenatal care would increase to slightly over 50 percent This is a large increase from a starting level of 22 percent, but it is still not up to the level of the high use rural group or the low use urban group

The reasons why the high use group behaves differently from the average use group are interesting to consider in light of what we have just seen Evaluated at the average characteristics of the group, the average user has a probability of 41 2 percent of receiving care, while the high user has a 62 8 percent probability (table 15, Average PRGO) So the differential in probabilities that we need to explain is 21 6 percentage points

More than half the difference, 56 7 percent, can be attributed to the socioeconomic and household variables Here again the education of the woman and her spouse dominate When we were considering the change from the low use group, the woman's education was more than three times as important as the change in the husband's education In this case, the contribution of the woman's education is only around 40 percent higher than her spouse's

The regional variables contribute only 19 9 percent of the total change in predicted probabilities of care as we move from the average to the high user as opposed to 44 6 percent previously The high use group live in provinces where they have, on average, 5 405 other hospitals and health centers, while those in the average use group live in provinces with an average of 3 856 other hospitals and health centers This difference of roughly 1 5 hospitals and health centers accounts for 9 4 percent of intergroup difference

The insurance variable accounts for a bit more of the difference here than for the poorer women, but its effect is still small because so few people are insured The FARMER variable is twice as important in accounting for changes when dealing with the wealthier women than when dealing with the less wealthy women.

The access and insurance variables also matter when we are decomposing the difference between average users and high users in rural areas, but the most important variable that induces women to receive prenatal care seems to be education

Table 16 Effect of Individual Variables and Groups of Variables on Intergroup Differences in whether or not to Have Prenatal Care, Rural Women

Variable	Low-average percentage change (1)	Average-high percentage change (2)	Low-average percentage change (3)	Average-high percentage change (4)
Demographic variables			0 3	-4 6
FIRST	1 5	0 3		
AGE1	0 1	0 0		
AGE3	3 0	1 9		
TPREG	-4 4	-6 9		
Socioeconomic and household variables			33 0	56 7
EDUC	23 4	28 1		
OWNCASH	-0 7	-0 5		
SCASH	0 6	3 0		
SED	7 6	20 4		
HUBB	0 4	-1 0		
HHCASH	0 0	0 1		
FINC	0 5	-0 8		
NPH	0 6	6 7		
TV	0 6	0 8		
Regional variables			44 6	19 9
NCOAST	14 7	3 9		
CCOAST	5 2	8 8		
SCOAST	0 1	0 2		
NSIERRA	10 1	2 4		
CSIERRA	5 2	3 4		
SSIERRA	6 0	1 6		
HJUNG	3 5	-0 4		
Measures of access			12 8	7 3
OHHCP	6 3	9 4		
OHPP	4 0	-0 5		
OPOPP	-3 4	-6 6		
KM2	0 1	-0 0		
HHCD	7 1	1 0		
HPD	0 1	-0 2		
POPD	-1 4	4 2		
Insurance and IPSS			0 9	3 5
INSUR	0 9	3 5		
Farmer		9 3	18 6	
FARMER	9 3	18 6		
Interaction	-1 1	-1 5	-1 0	-1 3
Difference explained (%)	21 5	21 6	21 5	21 6

The decision on where to seek prenatal care

Table 17 shows the characteristics of the women in the various groups who reported receiving prenatal care at either a private or a public health care facility For simplicity, we shall refer to these women as women who received care Our rural sample consisted of 2,013 women Only 676 of them received care Among the low users, the sample size drops to only 67 The variables in table 17 are the same variables as in table 15 with the addition of a 1/0 variable concerned with complications

Table 17 Average Characteristics of Rural Women who had Prenatal Care

Variables	All urban average (1)	Low users (2)	Average users (3)	High users (4)
FIRST	0 158	0 030	0 135	0 136
AGE1	0 123	0 030	0 112	0 216
AGE3	0 155	0 418	0 169	0 091
TPREG	4 688	6 388	5 146	4 023
COMP	0 280	0 299	0 225	0 284
EDUC	4 250	0 552	2 371	4 023
OWNCASH	0 089	0 009	0 097	0 102
SCASH	0 420	0 112	0 226	0 641
SED	4 930	2 045	3 157	5 114
HUBB	0 880	0 910	0 876	0 864
HHCASH	0 169	0 005	0 139	0 195
FINC	0 412	0 270	0 454	0 130
NPH	6 698	6 672	7 258	6 239
TV	0 229	0 015	0 112	0 273
NCOAST	0 200	0 000	0 337	0 284
CCOAST	0 251	0 000	0 067	0 330
SCOAST	0 058	0 000	0 011	0 068
NSIERRA	0 083	0 388	0 045	0 011
CSIERRA	0 093	0 164	0 146	0 068
SSIERRA	0 095	0 313	0 124	0 057
HJUNG	0 136	0 119	0 135	0 148
OHHCP	4 990	2 537	4 146	5 545
OHPP	12 000	9 373	13 472	11 466
OPOPP	10 754	7 004	10 266	12 075
KM2	0 872	0 504	1 126	0 750
HHCD	0 749	0 373	0 876	0 614
HPD	1 740	2 284	1 876	1 443
POPD	1 911	1 594	2 383	1 340
INSUR	0 059	0 000	0 022	0 080
FARMER	0 528	0 910	0 697	0 307
GO	1 000	1 000	1 000	1 000
PUB	0 744	0 866	0 719	0 807
PRV	0 256	0 134	0 281	0 193
WHEN9	4 345	5 015	4 595	4 318
WHEN3	1 756	1 925	1 843	1 739
Actual frequency trim.1	0 445	0 343	0 416	0 466
Actual frequency trim,2	0 354	0 388	0 326	0 329

Table 17 (continued)

Variables	All urban average (1)	Low users (2)	Average users (3)	High users (4)
Actual frequency trim.3	0 201	0 269	0 258	0 205
VMO	0 675	0 488	0 607	0 744
Predictions				
Average PRGO	0 548	0 203	0 417	0 630
PRGO/AC	0 566	0 201	0 416	0 631
Average PRPUB	0 744	0 847	0 711	0 755
PRPUB/AC	0 804	0 903	0 786	0 810
Average PRWHEN3	1 756	1 941	1 864	1 693
PRWHEN3/AC	1 732	1 945	1 853	1 672
Average PRTRI1	0 445	0 322	0 391	0 481
PRTRI1/AC	0 453	0 316	0 396	0 490
Average PRTRI2	0 354	0 415	0 354	0 344
PRTRI2/AC	0 362	0 419	0 355	0 348
Average PRTRI3	0 201	0 263	0 255	0 175
PRTRI3/AC	0 185	0 265	0 249	0 162
Average PRVMO	0 675	0 502	0 636	0 709
PRVMO/AC	0 675	0 502	0 636	0 709
Number of observations	676	67	89	88

Notes

Average PRGO is the average of the predicted values of the GO variable PRGO/AC is the predicted value of the GO variable evaluated at the average of the group's characteristics

AVERAGE PRWHR is the average of the predicted values of the PUB variable

PRWHR/AC is the predicted value of the PUB variable evaluated at the average of the group's characteristics

Average PRWHEN3 is the average of predicted values of trimester of care initiation

PRWHEN3/AC is the predicted value of the trimester of care initiation based on the average of the group's characteristics

Average PRTRI1, PRTRI2, and PRTRI3 are the averages of the predicted values of the probabilities of initiating prenatal care in trimesters 1, 2, and 3 respectively

PRTRI1/AC, PRTRI2/AC, and PRTRI3/AC are the probabilities of initiating care in trimesters 1, 2, and 3 respectively evaluated at the average of the group's characteristics

Average PRVMO is the average of the predicted values of the number of visits per month (VMO)

PRVMO/AC is the predicted number of visits per month (VMO) evaluated at the average of the group's characteristics

The variables which are evaluated at average of the group's characteristics are the ones used in the analyses below

The means of the variables for those women who received care, for the most part, do not differ very much from the means in the entire sample However, the EDUC row contains some changes that, without explanation, may appear a bit confusing In the entire sample, the average education level of the rural woman was 2 743 years Among those who received care, the average level of education was 4 250 years This is precisely what one would expect because more educated women are more likely to seek prenatal care When we look across the row in table 15 and the same row in table 17, we find the surprising result that although the average level of education has gone up substantially, it did not go up in any of the three subgroups we are considering Further, the average level of education in our high use group is lower than the average level of education among those who received care

The answer to this mystery is simple enough In each of the subgroups the probability of receiving care was close enough to the predicted probability that there was little selection by education within groups There was substantial selection between groups Groups of women with higher predicted probabilities of receiving care are represented much more frequently in the group who received care than in the population at large Thus, it is possible for the average level of education within each group to remain constant and for the average level of education to rise A similar, but not quite so marked, phenomenon can be seen when looking at the spouse's education variable

The remaining changes from table 15 to table 17 are more or less what we would expect For example, 70 6 percent of the entire sample are women in farm households, while only 52 8 percent of the women who received care came from farm households Also 12 3 percent of the women in the full sample lived in households with television sets Among those who went for prenatal care 22 9 percent had television sets

In the rural area 74 4 percent of all those who received care obtained it at a public facility compared with 77 1 percent in the urban area. The sectoral pattern of use is just the opposite of what it is in the urban area The pattern in the urban area was inverted U-shaped In other words, it was lower for the low and high use groups and highest for the average use group In the rural area, the percentage of public care is lowest for the average use group and higher for both the low and high use groups The binary logistic regression reproduces this pattern The row labeled Average PRPUB gives the average predicted probability of having public care The pattern of the predicted probabilities is also U-shaped The PRPUB/AC row shows the predicted probability of having care in a public facility, when the logit is evaluated at the average characteristics in each column The differences in this row are the figures that we must decompose

A woman with the average characteristics of the low user group would have a predicted probability of seeking public health care of 90 3 percent and a woman with the average

characteristics of the average user group would have a predicted probability of 78 6 percent, so we must explain an 11 7 percentage point decline in the probability of seeking care in a public facility as we move from the low to the average use group In table 18, virtually all the variables besides the regional dummies are of marginal relevance, even the woman's education The low user group is dominated by women in the Sierra There are far few women from the Sierra in the average use group As a whole, the women of the Sierra are relatively heavy users of public health facilities This is particularly the case for the women of the south Sierra (see appendix table A2-8) The decrease in the number of women in the Sierra as we move from the low use to the average use group is the dominant force leading to the decrease in the percentage receiving public care

Next, let us consider the difference in behavior between the women in the average use group and the women in the high use group A woman with the characteristics of the average woman in the high use group would seek care in the public sector 81 0 percent of the time, while one with the characteristics of an average woman in the average use group would seek care in the public sector 78 6 percent of the time (table 17, PRPUB/AC) Thus, we have a 2 4 percentage point increase in the probability of seeking care in the public sector to explain

The small change in the percentage receiving care in a public institution is the result of a number of offsetting factors Women in the high use group are more educated than those in the average use group and have spouses who themselves are more educated The higher the education of the woman and her spouse, the more likely she is to receive private care These two education effects together are responsible for -83 5 percent of the change The regional variables again shift in a direction that encourages private care This is basically a shift away from the Sierra and to the coast

These two negative effects are counterbalanced by three large positive influences, the access effect, the farmer effect, and the insurance effect The most important access variable is the number of other hospitals and health centers in the province (OHHCP) The increase in that variable alone accounts for 60 0 percent of the gap Other health posts in the province account for 18 0 percent of the change The most surprising of the access variables is the number of hospitals and health centers in the woman's district This variable is associated with a decline in the probability of going public That, however, is not because the number of hospitals and health centers in the district has a negative effect on the probability of going public--indeed it has a positive effect on that probability--but because high users live in areas with fewer hospitals and health centers in their districts than do average users

Table 18 Effect of Individual Variables and Groups of Variables on Intergroup Differences in Where to Have Prenatal Care, Rural Women

Variable	Low-average percentage change (1)	Average-high percentage change (2)	Low-average percentage change (3)	Average-high percentage change (4)
Demographic variables			-8 6	14 7
FIRST	1 3	-0 1		
AGE1	-2 7	20 7		
AGE3	-7 0	13 5		
TPREG	1 7	-9 6		
COMP	-2 0	-9 8		
Socioeconomic and household variables			13 0	-59 3
EDUC	10 6	-60 0		
OWNCASH	3 1	-1 0		
SCASH	-0 7	16 2		
SED	2 1	-23 5		
HUBB	-2 8	6 6		
HHCASH	-0 5	1 2		
FINC	1 7	18 3		
NPH	-1 1	-11 6		
TV	0 5	-5 5		
Regional variables			118 0	-54 3
NCOAST	-0 3	-0 3		
CCOAST	-7 0	168 9		
SCOAST	-2 5	77 7		
NSIERRA	40 7	-24 7		
CSIERRA	3 9	-103 2		
SSIERRA	84 5	-183 6		
HJUNG	-2 1	11 0		
Measures of access			-12 0	70 3
OHHCP	-11 1	60 0		
OHPP	5 9	18 0		
OPOPP	-0 9	3 2		
KM2	-1 3	-5 0		
HHCD	-7 2	-23 4		
HPD	0 3	-1 7		
POPD	2 3	19 2		
Insurance and IPSS			-3 7	58 5
INSUR	-3 7	58 5		
Farmer		-6 2	70 1	
FARMER	-6 2	70 1		
Interaction	0 3	0 0	-0 5	0 0
Difference explained (percentage points)	-11 7	2 4	-11 7	2 4

Farmers are somewhat less likely to use public facilities than nonfarmers, holding constant the other measured variables (we conjecture that this occurs because farmers are more likely to use prenatal care in emergency situations) The decrease in the proportion of farmers in the high use group tends to raise the probability of going public Finally, the insurance variable is very strongly

and positively related to the probability of seeking public health care This suggests that most of the power of this variable comes from the people who have government health care insurance An increase in the proportion with insurance acts to increase the probability of receiving public care

Decision on when to initiate care

We study the decision on when to initiate prenatal care by considering the trimester of the pregnancy in which care was begun In table 17 (WHEN9), we can see that for all the women who received care, the average month of initiation was 4 345 This is about a month later than in the urban area where that figure was month 3 427 Women in the low user group initiated care, on average, in month 5 015, in the average group in month 4 595, and in the high use group in month 4 318 The average trimester at initiation for the whole sample is 1 756 (table 17, WHEN3) It is 1 925 for the low users, 1 843 for the average users, and 1 739 for the high users Again, the high users in the rural area are not very different in this dimension of prenatal care behavior from the low users in the urban areas The low users in the urban area initiated care at month 4 081 as compared to month 4 318 for the high rural users

The statistical procedure used in studying these trimester data is called multinomial logistic regression The estimated coefficients are given in appendix table A2-9

From table 17, we can see that as we move from the low use to the average use to the high use group, the actual proportion initiating care in the first trimester of the pregnancy increases Similarly reading across the row for the second trimester, we can see that the proportion initiating care at that time decreases The same is true for the proportion initiating care in the third trimester The predicted average probabilities of initiating care in each of those trimesters can be read off the rows labeled Average PRTRI1 for the first trimester, Average PRTRI2 for the second trimester, and Average PRTRI3 for the third trimester These predicted probabilities track the observed proportions quite well

The first question to address is to explain the differences between the three groups in their timing of the initiation of prenatal care A woman with the characteristics of the low user group would have a probability of 31 6 percent of initiating care in the first trimester A woman with the characteristics of the average user group would have a probability of 39 6 percent of initiating care in the first trimester Thus, we have an 8 0 percentage point increase to explain

As we can see from table 19, the changes in the socioeconomic and household characteristics account for 48 1 percent of that 8 0 percentage point increase Particularly important in inducing women to initiate care early are the woman's educational level, the presence of a television in the household, and the nonfarm income of people in the household excluding the

woman and her spouse The presence of a television in the household indicates that the residence is both electrified and probably not very far from an urban area with a television station The nonfarm income of other people in the household is not a statistically significant variable, and so we should be cautious in giving it an interpretation

Table 19 Effect of Individual Variables and Groups of Variables on Intergroup Differences in when to Initiate Prenatal Care, Rural Women

Variables (trimester)	Low-avg %change (1) (1st)	Low-avg %change (2) (2nd)	Low-avg %change (3) (3rd)	Avg-high %change (4) (1st)	Avg-high %change (5) (2nd)	Avg-high %change (6) (3rd)
FIRST	4 7	-1 8	31 7	0 1	-0 1	0 1
AGE1	5 8	-4 9	50 7	6 3	-35 0	9 7
AGE3	-42 3	-28 8	-98 7	-12 0	-94 7	-5 3
TPREG	18 4	13 8	37 6	15 3	129 0	6 0
COMP	-16 3	-13 2	-29 4	12 1	107 5	4 2
EDUC	20 0	5 6	80 4	16 3	73 0	11 7
OWNCASH	-8 8	-7 2	-15 4	-0 4	-3 9	-0 1
SCASH	3 8	3 7	4 2	12 6	129 2	3 1
SED	7 9	0 3	39 6	12 4	30 4	10 9
HUBB	0 2	-3 5	15 7	0 0	-10 2	0 9
HHCASH	10 3	17 3	-18 9	4 1	65 0	-0 9
FINC	0 4	-7 0	31 2	-0 1	95 8	-8 0
NPH	-1 4	-7 3	23 4	2 6	104 2	-5 7
TV	15 7	-0 2	82 0	22 9	44 3	21 1
NCOAST	119 6	91 0	238 7	-17 3	-147 4	-6 6
CCOAST	8 3	2 6	32 3	29 2	139 0	20 2
SCOAST	4 0	0 7	17 6	18 0	65 1	14 2
NSIERRA	-18 0	43 4	-274 0	-1 4	30 2	-4 0
CSIERRA	-3 9	-4 0	-3 5	-15 6	-166 9	-3 2
SSIERRA	-15 1	20 9	-165 5	-4 4	48 2	-8 7
HJUNG	3 0	1 6	9 0	2 3	15 0	1 2
OHHCP	4 1	-2 0	29 4	3 1	-6 9	3 9
OHPP	-27 6	-1 0	-138 2	12 0	28 7	10 6
OPOPP	-6 6	-17 7	40 0	-3 6	-84 0	3 0
KM2	-1 9	-12 9	43 5	1 3	63 3	-3 7
HHCD	-16 1	8 7	-119 4	7 3	-20 5	9 5
HPD	-0 5	-2 6	8 5	-0 5	-22 6	1 3
POPD	16 6	19 6	4 4	-20 5	-243 5	-2 2
INSUR	3 7	4 7	-0 7	8 7	110 9	0 3
FARMER	-1 2	-21 8	84 9	-3 4	-316 6	22 2
PUB	12 9	2 0	58 4	-6 9	-23 4	-5 5
Interaction	0 1	0 1	0 3	-0 3	-3 1	-0 1
Demographic	-29 7	-34 9	-8 1	21 6	106 6	14 7
Socioeconomic	48 1	1 6	242 1	70 3	527 0	32 9
Regional	97 9	156 0	-144 2	10 8	-16 7	13 1
Access	-31 8	-7 9	-131 7	-0 9	-285 4	22 4

Table 19 (continued)

Variables (trimester)	Low-avg %change (1) (1st)	Low-avg %change (2) (2nd)	Low-avg %change (3) (3rd)	Avg-high %change (4) (1st)	Avg-high %change (5) (2nd)	Avg-high %change (6) (3rd)
Ins and IPSS	3 7	4 7	-0 7	8 7	110 9	0 3
Farmer	-1 2	-21 8	84 9	-3 4	-316 6	22 2
Pub	12 9	2 0	58 4	-6 9	-23 4	-5 5
Interaction	0 1	0 3	-0 7	-0 2	-2 4	0 0
Difference explained (percentage points)	8 0	-6 4	-1 6	9 4	-0 7	-8 7

The regional variables taken together are the most important Regional shifts account for 97 9 percent of the difference The most important single influence on the probability of initiating care in the first trimester is the north coast dummy variable Women in the low jungle have the 2lowest probability of initiating care in the first trimester, with other measured variables held constant They are followed in ascending order by women in the central coast, the north Sierra, the central Sierra, the high jungle, the north coast, and south coast In other words, women in the north coast and south coast areas have the highest probabilities of initiating care early, holding other variables constant There are no women from the north coast in the low user group, but 33 7 percent of the average user group are from the north coast This large increase in the proportion of women from the north coast, coupled with the fact that north coast women initiate care earlier, explains the large north coast effect seen in table 19

A surprising feature of table 19 is the observation that the access variables contribute negatively to the probability of initiating care in the first trimester This negative effect is due primarily to two variables, HHCD and OHPP The HHCD variable is not statistically significant, so we will not spend any time explaining its sign The other health posts in the province variable, OHPP, is statistically significant, so we must address it Unfortunately, we have no clear argument for the sign of the OHPP variable Health posts are the lowest level of formal health care in Peru They are mainly found in rural areas and are often of low quality Possibly having more health posts is not an indicator of having easier access to prenatal care, but an indicator of the difficulty of obtaining prenatal care of acceptable quality

An interesting item is that the PUB variable has a positive influence on the probability of getting care in the first trimester Women who go to public facilities have a lower probability of initiating care in the first trimester than do women who obtain private care Since the average user group has fewer women who had public care than the low user group, the PUB variable has a positive effect We can think of two reasons why women who seek public care also go later

First, if the pregnancy is progressing normally, there is a tendency both to initiate care later and to have that care in a public facility where it is cheaper If an emergency arises that needs to be treated immediately, then the women tend both to go earlier and to seek private care The second possibility is that there is a longer wait for public care

Where does all of this leave us on the important question of how to induce poor, less educated, rural women to obtain prenatal care earlier in their pregnancy? The variable that induces more women to seek prenatal care and to seek care earlier is education No other policy variable appears to have the same power

Let us move now to an explanation of why the probability of seeking prenatal care in the first trimester is higher for women in the high use group than it is for women in the average use group From table 17 (PRTRI/AC), we can see that a woman with the average characteristics of the high use group would have a predicted probability of initiating care in the first trimester of 49 0 percent, while a woman with the average characteristics of the average use group would have a predicted probability of initiating care in the first trimester of 39 6 percent, so that we have a 9 4 percentage point increase to explain

In this case, the explanation is relatively easy From table 19, we can see that 70 3 percent of the difference is due to socioeconomic and household variables and 21 6 percent of the difference is due to demographic factors The remaining influences are comparatively minor The first group contains a number of important variables the woman's education, her spouse's nonfarm income, her spouse's education, and the presence of a television set in the household.

One of the variables in the demographic set is COMP, a 0/1 variable that indicates the existence of a pregnancy complication for which the woman received treatment If a woman had a complication, she was more likely to initiate care in her first trimester (see appendix table A2-9) Women in the high use group were more likely to have a complication than women in the average use group It is for this reason that the complications effect is positive It may seem odd at first that more educated and wealthier women are more likely to have pregnancy complications, but this is not necessarily the case The complications variable measures two things simultaneously (a) a pregnancy complication, and (b) a resulting health care visit. People who have higher probabilities of seeking prenatal care are more likely to visit a medical facility for a pregnancy complication of a given severity than women with lower probabilities of seeking care Therefore, women who report more complications for which they had treatment are not necessarily women with more complications

We could go through a discussion of the factors associated with the probabilities of seeking care in the second and third trimesters, but choose not to do it here First, most policy interest lies

with the issue of how to induce more women to initiate prenatal care in their first trimester Second, this paper already provides readers with a plentiful amount of statistical detail and we do not wish to burden them with even more figures that we believe to be of secondary importance

The decision on how frequently to use prenatal care

The average number of visits per month once prenatal care is initiated is 0 675 in our rural sample For the low use group the number of visits per month is 0 488, for the average use group it is 0 607, and for the high use it is 0 744 (table 17, VMO) Again in this instance, the high user rural group is quite similar to the low user urban group In the urban group, the mean number of visits per month is 0 730, slightly lower than in the rural area

The predicted number of prenatal visits per month once care is initiated is 0 502 for the low use group and 0 636 for the average use group (table 17, PRVMO/AC) Thus, we have a difference of 0 134 visits per month to explain The greater education of the women in the average use group compared with those in the low use group accounts for 27 1 percent of that difference This effect is offset somewhat by a spouse's education effect, which points to a reduction in the number of visits per month (-7 6 percent of the difference) [19] Almost uniformly throughout this analysis, husband's education and husband's income have tended to reinforce the effect of the woman's education This is one marked exception to the rule The higher her spouse's education, the more likely is the woman to seek prenatal care, the more likely she is to begin care in the first trimester of her pregnancy, but the fewer visits she is likely to make once care is initiated This negative husband's education effect is a puzzle to us and we must leave its explanation to future research The variable indicating the effect of the presence of the spouse in the household, HUBB, also has a negative effect on the number of visits per month From table 20 we can see that when the husband is present in the household, the wife has more visits per month The negative effect arises because in the average use group, the proportion without husbands present is slightly larger than it is in the low use group

The regional variables again have the strongest effect Women in the high jungle and the Sierra have fewer visits per month, controlling for all the other variables The women in the north coast appear to have more visits per month, controlling for the other factors The decrease in the proportion of women in the north and south Sierra and the increase in the proportion in the north coast as we move from the low use to the average use group are what cause the observed regional effects

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19 The negative husband's education effect is significant at the 10 percent level based on a two-tailed test See appendix table A2-10

The access variables, as a group, account for 10 7 percent of the difference Women in the average use group live in areas with more facilities and a larger population The increase in the number of other hospitals and health centers in the province, and the increase in the number of other health posts in the province account for 19 9 and 13 7 percent of the difference respectively These effects are largely offset by the influence of the larger population in the province, but outside the woman's district The same sorts of effects appear at the district level

Insured women seek care more frequently than do uninsured women, and women in farm households receive care less frequently than do women in nonfarm households Together these variables are responsible for about 10 percent of the difference

The WHEN9 variable is the month of the pregnancy in which care was initiated It alone contributes -17 2 percent of the difference Women in the average group initiate care earlier than women in the low use group Therefore, the negative contribution of the WHEN9 variable indicates that women who initiate care later have, on average, more visits per month than women who initiate care earlier As table 20 shows, the size of this effect is not very large For every month for which the initiation of care is delayed, the number of visits per month after the initiation of care increases by 0 05 This pattern would arise if the frequency of visits in the last month (or months) of the pregnancy is greater than in the earlier months

Women who seek public care have more frequent visits than women who have private care, once care is initiated, controlling for all the other variables including the month of initiation Again, the magnitude is small. Those who receive public care have 0 08 more visits per month than do women who receive private care This could be because of their tendency to seek infrequent emergency care at private facilities

Three policy variables appear to be important in inducing relatively poor rural women to obtain more prenatal care visits their education, the facilities in their districts and provinces, and whether they are covered by health care insurance The effects of these variables, taken singly, are none too strong Our analysis suggests than an effective policy would have to combine them.

Table 20 Effect of Individual Variables and Groups of Variables on Intergroup Differences in the Number of Prenatal Visits per Month, Rural Women

Variable	Low-average percentage change (1)	Average-high percentage change (2)	Low-average percentage change (3)	Average-high percentage change (4)
Demographic variables			8 5	-7 9
FIRST	2 8	0 1		
AGE1	-2 4	-5 5		
AGE3	11 2	6 5		
TPREG	-4 3	-7 2		
COMP	1 1	-1 7		
Socioeconomic and household variables			10 6	32 9
EDUC	27 1	45 7		
OWNCASH	-2 9	-0 3		
SCASH	0 2	1 3		
SED	-7 6	-24 9		
HUBB	-4 3	-3 0		
HHCASH	1 2	0 9		
FINC	0 4	-1 2		
NPH	-4 0	12 9		
TV	0 5	1 5		
Regional variables			86 7	42 7
NCOAST	0 5	1 5		
CCOAST	1 6	11 5		
SCOAST	-0 7	-6 6		
NSIERRA	40 5	7 4		
CSIERRA	1 8	14 1		
SSIERRA	34 0	22 2		
HJUNG	-1 7	-2 6		
Measures of access			10 7	7 2
OHHCP	19 9	32 1		
OHPP	13 7	-12 4		
OPOPP	-25 5	-26 2		
KM2	-0 2	0 3		
HHCD	12 3	-11 9		
HPD	0 5	1 0		
POPD	-9 9	24 3		
Insurance and IPSS			2 4	11 2
INSUR	2 4	11 2		
Farmer		7 4	25 1	
FARMER	7 4	25 1		
Decisions			-26 2	-11 2
PUB	-9 0	10 0		
WHEN9	-17 2	-21 1		
Interaction	0 0	0 0	0 0	0 0
Difference explained (VMO)	0 13	0 07	0 13	0 07

Next let us turn to the difference between the average use group and the high use group in their behavior toward visits per month From table 17 (PRVMO/AC), we can see that the average

number of visits per month after the initiation of care is 0 636 for the average use group and 0 709 for the high use group Therefore, we have an increase of 0 073 visits per month to explain The socioeconomic and household variables account for 32 9 percent of the difference The woman's education by itself accounts for 45 7 percent and it is offset by the spouse's education variables, which is responsible for -24 9 percent of the change The greater the number of people in the household (NPH), the smaller the number of visits Since the women in the high use group live in somewhat smaller households than the women in the average use groups, the NPH variable accounts for 12 9 percent of the change

The regional variables account for 42 7 percent of the difference More than half of this is due to the lower proportion of women from the south Sierra in the high use group The access measures together produce 7 2 percent of the increase This overall figure is the product of a number of offsetting forces The increase in the number of other hospitals and health centers in the province account for almost one-third of the difference The negative effects of the OHPP variable and the HHCD variable come about both because the number of other health posts in the province and hospitals and health centers in the district are smaller in the high use group than in the average use group If these two variables were held constant, the predicted difference in visits per month would be around 24 percent greater than it is

The increase in the percentage with insurance—from 2 2 percent to 8 0 percent—(table 17, INSUR) produces 11 2 percent of the change in visits per month A further increase in coverage to 50 percent of the population would, according to our figures, increase the average number of visits per month by 0 06, which is not a very large change Since women in farm households obtain care less frequently than women in nonfarm households, holding the other measured variables constant, the decrease in the percentage of farm women in the high use group as compared with the average use group produces 25 1 percent of the increase in the number of visits per month

Conclusions for the rural women

With respect to their behavior toward prenatal care, the rural women of Peru appear to demonstrate a smooth continuation of the patterns seen in the urban area The low user group in the urban area and the high user group in the rural area have very similar profiles of prenatal care behavior This is an interesting conclusion because it implies that similar sorts of policies should work in both areas Our analysis points to three sorts of policies that are most likely to succeed (a) improving the education of women, (b) providing more hospitals and health centers in rural provinces, and (c) providing medical insurance at facilities with a relatively high quality of care Another aspect of our results is worth emphasizing here The rural poor in Peru have education levels that are so low, live in areas with so few facilities, and have so little health care insurance

that there is no quick and easy answer to the problem of low, late, and infrequent prenatal care use Only a large simultaneous increase in education, facilities, and insurance will make a significant difference

Concluding Remarks

We have discussed at length the factors associated with changes across groups in four types of prenatal care behavior among urban and rural Peruvian women whether to seek prenatal care, whether to obtain that care at a private or public facility, when to initiate care, and how often to seek care We discussed our results for urban and rural women separately Here, for the sake of comparison, we bring together some of our urban and rural results

Table 21 contains information about prenatal care behavior for six groups rural low, average, and high use women and urban low, average, and high use women Panel A contains three measures of behavior toward seeking prenatal care The line labeled GO shows the proportions of all women in the respective groups who reported themselves as receiving prenatal care during their most recent pregnancy prior to the ENNSA survey The second line, labeled CARE, shows the sums of the proportions on the first line and the proportions who said that they had had a pregnancy complication for which they had sought medical attention, but who reported no prenatal care CARE is a more inclusive measure of the extent of prenatal care than GO, while the variable on the third line, FORMAL, is a less inclusive measure FORMAL is the proportion of women who received prenatal care at either a public or private health care facility Almost the entire difference between GO and FORMAL is accounted for by women who received prenatal care at home Panel B contains data only for women who received prenatal care at a public or private facility It shows the proportions in the six groups who obtained their care at public institutions (PUB), the average month of the pregnancy at which they initiated prenatal care (WHEN9), and the average number of visits per month once they began care (VMO)

Table 21 Meaures of Prenatal Care Behavior among Low, Average, and High Use Women in the Rural and Urban Areas of Peru 1984

	RURAL			URBAN		
	Low	Average	High	Low	Average	High
A Among all women						
GO	0 221	0 352	0 638	0 709	0 781	0 984
CARE	0 273	0 393	0 679	0 764	0 794	0 984
FORMAL	0 150	0 261	0 540	0 672	0 781	0 972
B Among women with formal prenatal care						
PUB	0 866	0 719	0 807	0 811	0 843	0 670
WHEN9	5 015	4 595	4 318	4 081	4 079	2 670
VMO	0 488	0 607	0 744	0 730	0 897	1 015

Note Women with formal prenatal care are those who received their care at either a public or a private health care facility It excludes women who had their prenatal care at home, and a very small number who had their care at a community center

Source The figures in this table are derived from tables 8, 11, 15, and 17

If the column headings were omitted from table 21, it would be difficult to ascertain where the rural figures ended and the urban numbers began The general impression, from all six series, is one of continuity in the prenatal care behavior as we move from the group of low use rural women to the group of high use urban women About 64 percent of the rural high use women reported having prenatal care during their last pregnancy, as compared with 71 percent of the urban low use women Roughly 81 percent of all the women in both groups who had formal care, received it at a public health care facility On average, the women in the rural high use group began their prenatal care in their fourth month of pregnancy, as did the women in the urban low use group The average number of visits per month once care was started was virtually identical for the two groups, 0 74 for the rural high use women and 0 73 for the urban low use women In terms of prenatal care behavior, Peru is not separated into two sharply different groups, one urban and the other rural. This suggests that policies to increase the use of prenatal care, such as increasing the education of women, might work in both urban and rural areas

While prenatal care use can clearly be increased in urban Peru, the most substantial problem of low usage arises in the rural areas Among the low use rural group, only 22 percent of the women reported having prenatal care, 15 percent in the formal sector, and 7 percent at home The vast majority of those women who had their prenatal care at home were treated by midwives This low use rural group is quite a distinctive segment of Peruvian society From table 15, we can see that the women average about 0 6 years of education, around 90 percent of them live in the Sierra, 94 percent of their husbands are farmers, and the husbands have an average of just less than 2 years of education In addition, these people live in provinces and districts where health care facilities are relatively scarce Among this group, medical intervention to alleviate pregnancy complications without on-going prenatal care is comparatively common From table 21, we can

see that about 20 percent of all those with CARE reported no prenatal care The distinctiveness of the rural low use group geographically, occupationally, and educationally makes targeting programs to improve their prenatal care use relatively straightforward

Table 22 summarizes the importance of various aggregate factors in explaining the differences in prenatal care behaviors between groups Each panel contains the percentages of the predicted change in a specific type of prenatal care behavior associated with a particular aggregate factor For example, 33 percent of the predicted change in the proportion seeking prenatal care between the rural low use and average use groups is attributable to the differences in the socioeconomic characteristics of those two groups Panel A refers to the proportion who sought prenatal care, panel B to the proportion who sought public care, panel C to the proportion who initiated care in their first trimester, and panel D to the number of visits per month after the initiation of care The table distinguishes eight factors that affect prenatal care behavior socioeconomic influences, access to health care facilities, insurance coverage and (in urban areas) the price of a private health care visit, region of residence, demographic characteristics, farming occupations (rural areas), whether or not the woman sought care in a public facility, and the month in which prenatal care was initiated

Table 22 Decomposition of Differences in Prenatal Care Behaviors Percentage of Predicted Changes across Use Groups Attributable to Various Factors

	Factors								
	Socio-economic	Access	Insur-ance	Region	demo-graphic	Farmer	where (Pub)	When (WHEN9)	Inter-action
A Seek prenatal care (GO)									
Rural									
Low-Avg	33 0	12 8	0 9	44 6	0 3	9 3	--	--	-1 0
Avg-High	57 6	7 3	3 5	19 9	-4 6	18 6	--	--	1 3
Urban									
Low-Avg	77 6	5 0	-1 2	14 5	4 4	--	--	--	-0 4
Avg-High	35 1	29 2	24 2	6 5	3 8	--	--	--	1 2
B Seek public care (PUB)									
Rural									
Low-Avg	13 0	-12 0	-3 7	118 0	-8 6	-6 2	--	--	-0 5
Avg-High	-59 3	70 3	58 5	-54 3	14 7	70 1	--	--	0 0
Urban									
Low-Avg	204 3	-244 1	-32 3	160 3	11 7	--	--	--	0 1
Avg-High	132 5	-42 4	-29 4	24 0	15 0	--	--	--	0 2
C First trimester (WHEN3)									
Rural									
Low-Avg	48 1	-31 8	3 7	97 9	-29 7	-1 2	12 9	--	0 1
Avg-High	70 3	-0 9	8 7	-0 9	21 6	-3 4	-6 9	--	-0 2
Urban									
Low-Avg	123 7	-355 2	42 2	227 1	48 8	--	-7 4	--	0 8
Avg-High	61 5	-27 5	14 1	34 5	11 7	--	5 6	--	0 1
D Visits per month after initiating care (VMO)									
Rural									
Low-Avg	10 6	10 7	2 4	86 7	8 5	7 4	-9 0	-17 2	0 0
Avg-High	32 9	7 2	11 2	42 7	-7 9	25 1	10 0	-21 1	0 0
Urban									
Low-Avg	54 6	-7 2	1 1	52 8	-1 7	--	0 3	-0 1	0 0
Avg-High	90 3	-21 9	35 4	41 0	-6 5	--	-1 5	-36 8	0 0

Note Each figure shows the percentage of the predicted change in the indicated variable across use groups associated with a particular factor For example, 90 3 percent of the predicted change in VMO when we move from the urban average use group to the urban high use group can be attributed to changes in socioeconomic variables between those groups

Source The figures in this table are taken from tables 10, 12, 13, 14, 16, 18, 19, and 20

Let us discuss these influences one by one First, in 14 out of 16 cases, socioeconomic effects have either the first or second strongest influence on prenatal care behaviors (here we are looking at the absolute values of the effects and not their signs) This is mainly due to the effects of the woman's educational level. Regardless of whether we look in the urban or rural area or

consider changes from the low use to the average use group or from the average use to the high use group, increasing women's schooling is a powerful tool for increasing prenatal care use Researchers in developing countries have generally found that increasing women's level of education is associated with decreases in their fertility and the mortality rates of their children (perhaps due in part to more or better prenatal care) Raising women's educational levels, particularly those of women in rural areas of Peru, appears to be a policy well worth pursuing This is certainly not a novel policy prescription, but in the case of Peru, it is undoubtedly one worth repeating

An interesting point is that the signs of the influences on the proportion seeking public care are exactly the opposite of one another when we look at the change from the rural low use to average use group as compared with the rural average use to high use group This arises because in the low-average case, our equation predicts a decline in the proportion seeking public care, while in the average-high case it predicts an increase This is consistent with the underlying data as we discussed earlier and does not represent an inconsistency in the signs of the effects of the factors on the proportion seeking public care

The access variables measure facilities in the province outside the woman's district, facilities in the woman's district, the population in her province but outside her district, the population in her district, and the area of her province Women in the low use group, both rural and urban, live in places with smaller populations and fewer facilities than women in the average use groups Women in high use groups reside in areas with even more facilities and even greater populations We believe that ease of access to prenatal care increases as we move from low use rural through high use rural and then from low use urban through high use urban, but nothing guarantees that this is the case

An increase in the ease of access increases the probability that a woman will seek prenatal care in both urban and rural settings The effects diminish in magnitude as we move down the column from the change between the rural low and average use groups to the change between the urban average and high use groups It appears that increasing the ease of access is most important for the change from the rural low to average use group and that its importance is reduced as we deal with women from more and more densely populated areas This is as we would expect it to be

In general, increasing access leads to a decline in the proportion of women, with prenatal care in the formal sector, who received their care at a public facility Our measure of ease of access is really a measure of ease of access to public facilities, so at first glance that result seems somewhat odd However, in the larger more developed areas where the ease of access to public facilities is greater, the ease of access to private care is probably relatively even greater

Therefore, the finding that private prenatal care is more common in larger more densely populated areas than in smaller less densely populated ones is not surprising

Perhaps the most surprising figures in table 22 are those for the effect of access on the probability of seeking care in the first trimester of the pregnancy All four numbers are negative, indicating that the greater the ease of access, in the sense indicated above, the lower the probability of seeking care in the first trimester of the pregnancy How is it possible that the same variables that are associated with higher probabilities of prenatal care use are also associated with later initiation of care? Our econometric analysis has allowed us to see this puzzle, but it does not, by itself, suggest an a solution The most likely answer is one based on composition effects Suppose that women who would ordinarily seek prenatal care early were relatively insensitive, in their date of initiation of care, to their ease of access These women, we hypothesize, are more committed to the idea of prenatal care and would, therefore, still begin care fairly early even if they had to travel a substantial distance to get it. In addition, there are women in the population who are less committed to the idea of prenatal care If a health care facility were not nearby, they may not seek care at all. An increase in access appears to affect the behavior of the more committed women relatively little, but it appears to affect the behavior of those with marginal commitment much more Some of these women, who otherwise would not receive care, may get it if a facility is close enough, but even then they may initiate care later than the women who are more committed to prenatal care The result would be that an increase in access, by encouraging women who would otherwise not receive care to do so, would cause a decrease in the proportion of those receiving care who initiate it in their first trimester In this light, the negative signs on the access variables are not at all unusual, and even indicate that the effects of access are more or less as we would anticipate

In rural areas, an increase in access is associated with more visits per month after care is initiated Here the pure access effect dominates the composition effect, which, by itself, would have a tendency to push the number of visits per month downward This is a plausible result because in rural areas, where the trip to the health care facility might well be an arduous one, increasing the accessibility of care is likely to have a large impact on the number of visits per month among those who previously had to make a longer journey In urban areas, the reverse in true increasing the ease of access decreases the number of visits per month This implies that the composition effect dominates the pure access effect. This is plausible in urban areas, because adding another health care facility in a city might decrease the duration of the trip to the nearest facility by less than an hour (and probably by even less) Consequently, it is plausible that the pure access effect is relatively weak in urban areas and that the composition effect dominates it. In addition, there may be a congestion effect in the urban areas, which is not present to such a degree in rural areas Possibly, as the size of the urban area grows, more and more women are constrained by the supply of prenatal care available to them

In summary, policies designed to increase the use of prenatal care by increasing the ease of access of health care facilities work Increasing accessibility is not quantitatively as important in explaining intergroup differences as are socioeconomic factors, but it is important nonetheless Certainly policymakers should certainly consider improving the accessibility of health care facilities for many reasons, among them the observation that this policy is likely to increase the use of prenatal care

Under the category insurance, we included the variable indicating whether the family was allowed to use the low-cost, high-quality system of public health care (IPSS) In addition, in urban areas, this category incorporates a variable indicating the price of a private health care visit, and in the rural area a variable indicating whether someone in the family worked in sectors likely to have company-provided health care facilities Two features of IPSS coverage are important here First, the price of IPSS care is almost identical to the price of care at other public institutions The major difference between care at an IPSS facility and at another public facility is in the quality of care, broadly defined Thus, families that are covered by IPSS have higher quality health care available to them than do families that are not covered Second, IPSS coverage was only available to people who had jobs in the formal sector of the economy These jobs, in general, are higher paying than positions in the informal sector Even though we control for husband's and wife's incomes and the presence of a television set in the household, the IPSS coverage variable may possibly be picking up some residual wealth effect Given these controls, however, our interpretation of the IPSS coverage variable is that it dominantly reflects differences in the quality of health care available to different groups of Peruvians

None of the women in the urban low and average use groups were covered by IPSS, but 48 percent of urban high use women were covered (see table 8) The effect of having IPSS facilities available was extremely strong Our figures imply that if all the women in the urban low use group had access to the same quality of care that was provided to only a relatively small group of Peruvians (through IPSS), their use of prenatal care would have jumped to 96 7 percent In table 22, we can see the effects of IPSS coverage by looking at the change between the average and the high use groups in the urban areas Clearly, IPSS coverage increases the use of prenatal care, increases the probability that care is initiated in the first trimester of the pregnancy, and increases the number of visits per month once care is initiated IPSS coverage also increases the probability that care would be sought in the public sector

In the rural areas, none of the women in the low use group had any sort of insurance coverage, only 1 5 percent in the average use group, and 6 1 percent in the high use group had coverage These figures are probably overestimates because they include families in which any member works in an industry in which firm health care facilities might be provided In rural areas, having some sort of insurance coverage might be associated with having facilities closer to one's

place of residence The effects of having coverage can be seen, again, by looking at the difference between the average and the high use groups The results are the same as in the urban areas

As we have already said, we believe that in urban areas, IPSS coverage is synonymous with a higher available quality of health care Whatever the interpretation put on the IPSS variable, though, Peruvians are now providing a type of health care to those participating in IPSS, which if generalized to the population, would have a dramatic impact on the demand for prenatal care, and, we expect, many other sorts of health care as well We recommend that the Peruvian government seriously consider the possibility of broadening the population base covered by IPSS

The region variables capture the effects of all other factors that vary across regions, but are not accounted for by the other variables in the analysis We would like to draw your attention to two features of the numbers in particular First, the sign of the region effect is almost always the same as the sign of the socioeconomic effect Second, in both urban and rural areas the region effect is always larger for the change between the low use and the average use groups than it is for the change between the average use and the high use group

The similarity in the signs of the region effect and the socioeconomic effect is very interesting It indicates that unobserved regional variables operate in the same direction as observed variables For example, in the rural Sierra, education levels are low, income levels are low, access to facilities is poor, and many people are farmers Prenatal care use is influenced by the levels of these observed variables, but in addition, prenatal care is influenced by unobserved variables as well. In the case of the rural Sierra these unobserved variables depress prenatal care use relative to other regions, just in the same way that the low levels of education in the Sierra depress prenatal care relative to regions where educational attainments are higher There are a number of interpretations of this observation, but two strike us as being particularly interesting, one cultural and the other structural The cultural explanation would suggest that culture influences income, occupation, place of residence, and attitudes towards health care, among other things We measure some culturally influenced variables, but not others, and therefore should not be surprised that the unmeasured variables seem to have influences similar to the measured ones The structural explanation would emphasize, however, that observations of measured variables, like low income, might well be correlated with levels of unmeasured variables, like the low quality of roads, which reinforce the effects of the measured variables on prenatal care behavior

The relatively large effects that we see for the region effect when we consider the change from the low use to the average use group in both the rural and urban areas arises because of the concentration of low use women in particular geographic locations For example, we see from table 15 that 89 5 percent of the rural low use women lived in the Sierra, while only 26 1 percent of the rural average use women lived there The large changes in the geographic mix of people

that occur when we move from the low use to the average use group cause the relatively large figures that we see there

Demographic factors seldom play an important role in explaining intergroup differences The farmer variable is also usually of secondary significance Farm women seek prenatal care less frequently, have fewer visits per month once care is initiated, and seek care more often from public health care facilities than do other rural women with otherwise similar characteristics

The signs of the effects of using a public facility on the timing of the initiation of care and on the number of visits per month once care was begun can be seen most clearly from appendix tables A2-4, A2-5, A2-9, and A2-10 Visiting a public facility in either the rural or the urban area is associated with a later date of the initiation of care, but more visits per months once care began (the magnitude of this effect in the urban area is extremely small) We suspect that the wait to initiate care is longer at public facilities than at private ones

The effect of when care was initiated on the number of subsequent visits per month is often sizeable in rural areas and in the change from average to high use groups in urban areas The later visits are begun, the more visits per month women make after care is initiated To a certain degree, a late start is compensated for by a more compressed set of visits

Rural and urban Peru, in our analysis, provides a continuous spectrum of prenatal care behavior Taken as a whole, table 22 indicates that factors that influence prenatal care do so in more or less the same way in both areas Policies that would increase the use of prenatal care in Peru, such as increasing the education of women, making health care facilities more accessible, and widening the population base of the IPSS system (without reducing its quality) would improve the welfare of Peruvians by also reducing infant mortality and fertility rates

We were limited in our analysis by the data in the ENSSA survey As a result, we did not have any way of assessing specific Peruvian policies encouraging prenatal care Thus, our analysis is clearly only a partial one Much remains to be learned about prenatal care behavior in Peru

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Appendix 1 Selected Weighted Frequencies and Cross-Tabulations

Table A1-1 contains selected weighted frequencies for the urban portion of Peru The variables included in that table are department, education (in years, aggregated and disaggregated), age group, television, first pregnancy, pregnancy complications, and delivery complications Table A1-2 contains the same frequencies for rural Peru Table A1-3 shows the cross-tabulation of education level and age group for urban Peru Table A1-4 shows the same cross-tabulation for rural women

Table A1-1 Weighted frequencies for selected variables
-- Urban Area --

********** FREQUENCY DISTRIBUTION FOR Department **********

Name	Code	Count	Percent	Cum Percent
Amazonas	1	4689	0 87	0 87
Ancash	2	22114	4 13	5 00
Arequipa	4	21538	4 02	9 02
Cajamarca	6	10300	1 92	10 94
Callao	7	20083	3 75	14 69
Cuzco	8	14903	2 78	17 47
Huanuco	10	7484	1 40	18 87
Ica	11	14979	2 80	21 66
Junin	12	20620	3 85	25 51
La Libertad	13	29838	5 57	31 08
Lambayeque	14	27777	5 18	36 26
Lima	15	233852	43 64	79 90
Loreto	16	25209	4 70	84 61
Moquegua	18	3848	0 72	85 32
Pasco	19	6494	1 21	86 54
Piura	20	30691	5 73	92 26
Puno	21	11298	2 11	94 37
San Martin	22	7507	1 40	95 77
Tacna	23	5415	1 01	96 78
Tumbes	24	10625	1 98	98 77
Ucayali	25	6612	1 23	100 00

********** FREQUENCY DISTRIBUTION FOR Education (in years) **********

Years	Count	Percent	Cum Percent
0	35322	6 59	6 59
1	14943	2 79	9 38
2	22387	4 18	13 56
3	27831	5 19	18 75
4	20727	3 87	22 62
5	102144	19 06	41 68
6	37	0 01	41 69
7	24902	4 65	46 33
8	27721	5 17	51 51
9	44399	8 29	59 79
10	21445	4 00	63 79
11	131747	24 59	88 38
13	11015	2 06	90 44
14	10224	1 91	92 34
15	7906	1 48	93 82
16	8245	1 54	95 36
17	24741	4 62	99 97
19	138	0 03	100 00

Table A1-1 (continued)

********** FREQUENCY DISTRIBUTION FOR Age group **********

Years	Value	Count	Percent	Cum Percent
Under 15	1	2132	0 40	0 40
16 - 25	2	241820	45 13	45 52
26 - 35	3	224384	41 87	87 40
36 - 49	4	67539	12 60	100 00

********** FREQUENCY DISTRIBUTION FOR Education Level **********

Years	Group	Count	Percent	Cum Percent
None	1	35322	6 59	6 59
Elementary	2	188068	35 10	41 69
High School	3	250214	46 69	88 38
College	4	62270	11 62	100 00

********** FREQUENCY DISTRIBUTION FOR Television **********

	Value	Count	Percent	Cum Percent
No	0	196490	36 67	36 67
Yes	1	339385	63 33	100 00

********** FREQUENCY DISTRIBUTION FOR First Pregnancy **********

	Value	Count	Percent	Cum Percent
No	0	416413	77 71	77 71
Yes	1	119462	22 29	100 00

********** FREQUENCY DISTRIBUTION FOR Pregnancy Complications **********

	Value	Count	Percent	Cum Percent
No	0	428767	80 02	80 02
Yes	1	107108	19 99	100 00

********** FREQUENCY DISTRIBUTION FOR Delivery Complications **********

	Value	Count	Percent	Cum Percent
No	0	444716	82 99	82 99
Yes	1	91159	17 01	100 00

Table A1-1 (continued)

********* FREQUENCY DISTRIBUTION FOR Place of Post-natal Care *********

	Code	Count	Percent	Cum Percent
No post-n care	70	256543	47 87	47 87
Hospital	10	162049	30 24	78 11
Health Center	20	24140	4 50	82 61
Health Post	30	13700	2 56	85 17
Comm Cent	40	476	0 09	85 26
Private clin	50	56193	10 49	95 75
Home	60	21681	4 05	99 80
Other	80	1320	0 20	100 00

********** FREQUENCY DISTRIBUTION FOR Total Pregnancies **********

Value	Count	Percent	Cum Percent
1	119462	22 29	22 29
2	112020	20 90	43 20
3	91167	17 01	60 21
4	63213	11 80	72 01
5	47987	8 95	80 96
6	27399	5 11	86 07
7	24426	4 56	90 63
8	17051	3 18	93 81
9	10168	1 90	95 71
10	8215	1 53	97 24
11	6652	1 24	98 49
12	3531	0 66	99 14
13	2521	0 47	99 61
14	1314	0 25	99 86
15	212	0 04	99 90
16	413	0 08	99 98
18	21	0 00	99 98
19	104	0 02	100 00

********** FREQUENCY DISTRIBUTION FOR Province 1 **********

Value	Count	Percent	Cum Percent
No 0	151426	28 26	28 26
Yes 1	384449	71 74	100 00

2904 observations were used in computing these frequencies

Since a weighting variable was specified, the number of observations used in computing percentages is the sum of the weights for the non-missing observations This sum equals 535,875

Table A1-2 Weighted frequencies for selected variables
-- Rural Area --

********** FREQUENCY DISTRIBUTION FOR Department **********

	Value	Count	Percent	Cum Percent
Amazonas	1	6242	1 79	1 79
Ancash	2	29795	8 54	10 33
Arequipa	4	9291	2 66	13 00
Cajamarca	6	62380	17 89	30 88
Callao	8	27773	7 96	38 85
Cuzco	10	25036	7 18	46 03
Huanuco	11	7533	2 16	48 19
Ica	12	29800	8 54	56 73
Junin	13	26319	7 55	64 28
La Libertad	14	11050	3 17	67 45
Lambayeque	15	11198	3 21	70 66
Lima	16	10587	3 04	73 69
Loreto	17	1245	0 36	74 05
Moquegua	18	1359	0 39	74 44
Pasco	19	6890	1 98	76 41
Piura	20	30354	8 70	85 12
Puno	21	32444	9 30	94 42
San Martin	22	10163	2 91	97 33
Tacna	23	1874	0 54	97 87
Tumbes	24	2020	0 58	98 45
Ucayali	25	5404	1 55	100 00

********** FREQUENCY DISTRIBUTION FOR Education (in years) **********

	Years	Count	Percent	Cum Percent
	0	148568	42 60	42 60
	1	27618	7 92	50 52
	2	42771	12 26	62 78
	3	30055	8 62	71 40
	4	16317	4 68	76 08
	5	50085	14 36	90 44
	7	6802	1 95	92 39
	8	7551	2 17	94 56
	9	6281	1 80	96 36
	10	2205	0 63	96 99
	11	7774	2 23	99 22
	13	688	0 20	99 41
	14	155	0 04	99 46
	15	221	0 06	99 52
	16	434	0 12	99 65
	17	1231	0 35	100 00

Table A1-2 (continued)

********** FREQUENCY DISTRIBUTION FOR Age group **********

Years	Value	Count	Percent	Cum Percent
Under 16	1	931	0 27	0 27
16 - 25	2	128814	36 94	37 20
26 - 35	3	141824	40 67	77 87
36 - 49	4	77188	22 13	100 00

********** FREQUENCY DISTRIBUTION FOR Education Level **********

Years	Value	Count	Percent	Cum Percent
None	1	148568	42 60	42 60
Elementary	2	166847	47 84	90 44
High School	3	30613	8 78	99 22
College	4	2728	0 78	100 00

********** FREQUENCY DISTRIBUTION FOR Television **********

	Value	Count	Percent	Cum Percent
No	0	325560	93 35	93 35
Yes	1	23197	6 65	100 00

********** FREQUENCY DISTRIBUTION FOR First Pregnancy **********

	Value	Count	Percent	Cum Percent
No	0	307514	88 17	88 17
Yes	1	41243	11 83	100 00

********** FREQUENCY DISTRIBUTION FOR Pregnancy Complications **********

	Value	Count	Percent	Cum Percent
No	0	300954	86 29	86 29
Yes	1	47803	13 71	100 00

********** FREQUENCY DISTRIBUTION FOR Delivery Complications **********

	Value	Count	Percent	Cum Percent
No	0	315744	90 53	90 53
Yes	1	33012	9 47	100 00

Table A1-2 (continued)

********* FREQUENCY DISTRIBUTION FOR Place of Post-natal care *********

	Value	Count	Percent	Cum Percent
Had no care	70	257716	73 90	73 90
Hospital	10	20727	5 95	79 85
Health Center	20	9683	2 78	82 63
Health Post	30	9591	2 75	85 38
Comm Cent	40	422	0 12	85 50
Private clin	50	7451	2 14	87 64
Home	60	42699	12 24	99 88
Other	80	468	0 12	100 00

********** FREQUENCY DISTRIBUTION FOR Total Pregnancies **********

Value	Count	Percent	Cum Percent
1	41243	11 83	11 83
2	42936	12 31	24 14
3	37318	10 70	34 84
4	43309	12 42	47 26
5	37548	10 77	58 02
6	37663	10 80	68 82
7	30568	8 76	77 59
8	24309	6 97	84 56
9	16798	4 82	89 37
10	15154	4 35	93 72
11	8815	2 53	96 24
12	7146	2 05	98 29
13	3347	0 96	99 25
14	826	0 24	99 49
15	1622	0 47	99 96
16	155	0 04	100 00

********** FREQUENCY DISTRIBUTION FOR Province 1 **********

Value	Count	Percent	Cum Percent
No 0	281629	80 75	80 75
Yes 1	67127	19 25	100 00

2013 observations were used in computing these frequencies

Since a weighting variable was specified, the number of observations used in computing percentages is the sum of the weights for the non-missing observations This sum equals 348,756

Table A1-3 Women's education levels attained by age groups

-- Urban Area --

FREQ PERCENT ROW PCT COL PCT	Education Level				
Age Group	None 1	Elem. 2	High School 3	College 4	Total
	214	963	1057	0	2234
	0 04	0 18	0 20	0 00	0 41
	9 57	43 12	47 31	0 00	
Under 16	0 60	0 51	0 42	0 00	
	7315	73642	145428	17899	244284
2	1 36	13 65	26 96	3 32	45 29
	2 99	30 15	59 53	7 33	
16-25	20 42	39 06	57 59	28 65	
	13870	82233	90701	38104	224908
3	2 57	15 25	16 82	7 06	41 70
	6 17	36 56	40 33	16 94	
26-35	38 73	43 61	35 92	60 98	
	14417	31712	15323	6479	67931
4	2 67	5 88	2 84	1 20	12 59
	21 22	46 68	22 56	9 54	
36-49	40 25	16 82	6 07	10 37	
Total	35816	188550	252509	62482	539357
	6 64	34 96	46 82	11 58	100 00

2920 observations were used in computing this crosstab

Since a weighting variable was specified, the number of observations used in computing percentages is the sum of the weights for the non-missing observations This sum equals 539,357

Table A1-4 Women's education levels attained by age groups
-- Rural Area --

FREQ PERCENT ROW PCT COL PCT	Education Level				
Age Group	None 1	Elem. 2	High School 3	College 4	Total
Under 16	0 0 00 0 00 0 00	673 0 19 72 37 0 40	257 0 07 27 63 0 84	0 0 00 0 00 0 00	930 0 27
16-25	33,709 9 67 26 17 22 69	75,538 21 66 58 64 45 27	19,159 5 49 14 87 62 58	408 0 12 0 32 14 96	128,814 36 94
26-35	63,628 18 24 44 86 42 83	66,379 19 03 46 80 39 78	10,375 2 97 7 32 33 89	1,442 0 41 1 02 52 85	141,824 40 67
36-49	51,231 14 69 66 37 34 48	24,257 6 96 31 43 14 54	822 0 24 1 06 2 69	878 0 25 1 14 32 18	77,188 22 13
Total	148,568 42 60	166,847 47 84	30,613 8 78	2,728 0 78	348,756 100 00

2013 observations were used in computing this crosstab

Since a weighting variable was specified, the number of observations used in computing percentages is the sum of the weights for the non-missing observations This sum equals 348,756

Appendix 2 The Econometric Results

We ran five statistical procedures each for urban and rural Peru The decision to seek prenatal care was studied using binary logit regressions on both the CARE and the GO variables The decision on where to seek care was also analyzed using a binary logit regression To study the decision on when to initiate prenatal care, we used a multinomial logit regression Finally, we specified an ordinary least squares regression for the decision of how often to use prenatal care, once care was begun

For the binary logit regressions and the ordinary least squares regression, the results are presented in five columns The first column contains the name of the variable, the second column contains its estimated coefficient, the third column its standard error, the fourth column its t-statistics, and the fifth column is p-value The coefficient measures the strength of the association between the dependent and the indicated independent variable The standard error of the coefficient is a measure of the uncertainty with which the coefficient is measured Other things being equal, smaller standard errors are preferred to larger ones The t-statistic is the ratio of the coefficient to its standard error It is used in testing the hypothesis that the coefficient is truly zero If the coefficient is positive (negative) the p-value is the probability of getting an estimate as large (small) or larger (smaller) than it plus the probability of getting an estimate as small (large) or smaller (larger) than the negative of the coefficient This p-value is for what is called a "two-tailed test" For example, consider the POPD variable in the binary logit regression reported in table A2-1 The coefficient is -0 003439 and its standard error is 0 001793 The p-value takes the information on the coefficient and the standard error and tells us that if the coefficient were truly zero, the probability of getting a coefficient less than or equal to -0 003439 or greater than or equal to 0 003439 would be 5 5127 percent To perform a "one-tailed test," which would be the probability of getting a coefficient less than or equal to -0 003439, we need to divide the printed p-value by two In other words, the probability of getting a coefficient less than or equal to the observed one, if the true coefficient were zero, would be 2 756 percent

The format for tables A2-4 and A2-9, which contain the multinomial logit results, are somewhat different The coefficients appear across from their names and underneath them in parentheses are their t-statistics Given the number of degrees of freedom in those tables, the t-distribution is closely approximated by the normal distribution The p-values, therefore, can be determined from tables of the standard normal distribution, which are widely available The probabilities of seeking care in the first, second, and third trimester are determined simultaneously Only the coefficients for the first two trimesters appear in those tables, because once the predicted probability of initiating care in the first and second trimesters are known, the probability of initiating care in the third trimester is known because all the women considered began prenatal care at some time

In the sections discussing influences on prenatal care, we considered the regressions using the GO variable, but not the CARE variable, because we did not have data on where, when, and how frequently for those who reported medical attention due to pregnancy complications, but no prenatal care As can be seen, by comparing the figures in tables A2-1 and A2-6 with those in tables A2-2 and A2-7, respectively, our results would have not changed much if we had used the CARE regression instead of the GO regression

Table A2-1 Binary Logit Results Urban

Dependent Variable CARE

Observations 1655 Degrees of freedom 1620

*** -Log Likelihood 629 164948 ***

Variables	Coefficients	Std Error	t-Stat	P-Value
CONSTANT	0 049998	1 022538	0 048896	0 961002
EDUC	0 135216	0 022387	6 039862	0 000000
FIRST	0 597827	0 253522	2 358084	0 018370
AGE1	-0 398712	0 252722	-1 577670	0 114641
AGE3	0 395046	0 248734	1 588229	0 112234
TPREG	-0 028343	0 035979	-0 787747	0 430844
OLI	-0 027205	0 058573	-0 464462	0 642317
ONLI	0 368000	0 613988	0 599360	0 548933
SINC	0 196940	0 080784	2 437846	0 014775
HUBB	0 525014	0 252267	2 081184	0 037417
PINC	-0 105685	0 118247	-0 893764	0 371448
NPAR	0 269697	0 204746	1 317226	0 187763
ORINC	0 347366	0 218692	1 588382	0 112200
NOR	-0 099581	0 057951	-1 718371	0 085729
TV	0 615151	0 161569	3 807352	0 000140
NCOAST	-0 203670	0 920946	-0 221153	0 824973
CCOAST	-0 125658	0 936956	-0 134113	0 893313
SCOAST	-0 575505	0 945466	-0 608701	0 542723
NSIERRA	-0 660215	1 017262	-0 649012	0 516331
CSIERRA	-1 219543	0 977465	-1 247660	0 212156
SSIERRA	-1 040077	0 934412	-1 113082	0 265673
HJUNGLE	-0 400564	1 042596	-0 384199	0 700831
JUNGLE	-0 790422	1 148970	-0 687940	0 491491
NCONE	-0 553002	0 487140	-1 135201	0 256291
SCONE	0 778540	0 722503	1 077560	0 281230
OTHER	0 343581	0 898781	0 382275	0 702258
OHHCP	0 066950	0 045565	1 469305	0 141750
OHPP	-0 006914	0 016270	-0 424943	0 670878
OPOPP	-0 001700	0 001151	-1 476396	0 139837
KM2	-0 000025	0 020851	-0 001186	0 999053
HHCD	0 079553	0 055369	1 436782	0 150780
HPD	0 031837	0 042014	0 757767	0 448591
POPD	-0 003439	0 001793	-1 917875	0 055127
PPRICE	-0 017034	0 057505	-0 296221	0 767062
IPSS	2 755013	1 021653	2 696624	0 007005

Table A2-2 Binary Logit Results Urban

Dependent Variable GO

Observations 1655 Degrees of freedom 1620

*** -Log Likelihood 629 164948 ***

Variables	Coefficients	Std Error	t-Stat	P-Value
CONSTANT	-0 178639	1 017444	-0 175577	0 860627
EDUC	0 136623	0 021784	6 271627	0 000000
FIRST	0 590016	0 247656	2 382404	0 017200
AGE1	-0 307567	0 249335	-1 233551	0 217370
AGE3	0 312963	0 241263	1 297186	0 194567
TPREG	-0 038772	0 035089	-1 104945	0 269183
OLI	-0 017936	0 063079	-0 284346	0 776145
ONLI	0 587247	0 655947	0 895266	0 370645
SINC	0 206143	0 078272	2 633679	0 008447
HUBB	0 489478	0 251269	1 948019	0 051413
PINC	-0 100393	0 116104	-0 864678	0 387216
NPAR	0 202120	0 198571	1 017876	0 308737
ORINC	0 405150	0 222785	1 818574	0 068976
NOR	-0 079988	0 057328	-1 395264	0 162936
TV	0 689413	0 157107	4 388180	0 000011
NCOAST	-0 298955	0 916510	-0 326189	0 744281
CCOAST	0 028001	0 935400	0 029935	0 976119
SCOAST	-0 568854	0 943089	-0 603182	0 546388
NSIERRA	-0 742698	1 010362	-0 735081	0 462290
CSIERRA	-1 286934	0 973408	-1 322091	0 186138
SSIERRA	-0 929855	0 930561	-0 999242	0 317677
HJUNG	-0 537560	1 031898	-0 520942	0 602407
JUNGLE	-0 715988	1 141670	-0 627141	0 530567
NCONE	-0 626597	0 467265	-1 340988	0 179924
SCONE	0 777685	0 672704	1 156058	0 247657
OTHER	0 554533	0 890763	0 622537	0 533589
OHHCP	0 073657	0 044658	1 649360	0 099074
OHPP	-0 003088	0 015971	0 193328	0 846702
OPOPP	-0 001973	0 001131	-1 744333	0 081101
KM2	-0 007192	0 020462	-0 351466	0 725239
HHCD	0 097571	0 054094	1 803717	0 071276
HPD	0 049806	0 041193	1 209087	0 226630
POPD	-0 003820	0 001750	-2 182534	0 029070
PPRICE	-0 014359	0 056017	-0 256331	0 797695
IPSS	2 880683	1 022558	2 817134	0 004845

Table A2-3 Binary Logit Results Urban

Dependent Variable PUBLIC (PUB)

Observations 1292 Degrees of freedom 1256

*** -Log Likelihood 618 648582 ***

Variables	Coefficients	Std Error	t-Stat	P-Value
CONSTANT	0 608948	0 856119	0 711289	0 476905
EDUC	-0 068052	0 021574	-3 154282	0 001609
FIRST	-0 196692	0 208351	-0 944044	0 345147
AGE1	0 208034	0 275038	0 756381	0 449421
AGE3	-0 486684	0 269522	-1 805732	0 070960
TPREG	0 046594	0 046138	1 009902	0 312542
COMP	0 039619	0 170470	0 232409	0 816220
OLI	-0 024507	0 049959	-0 490541	0 623751
ONLI	0 044560	0 348571	0 127836	0 898279
SINC	-0 291620	0 049767	-5 859646	0 000000
HUBB	0 136325	0 291052	0 468387	0 639508
PINC	0 117949	0 107801	1 094141	0 273893
NPAR	-0 072905	0 180405	-0 404121	0 686124
ORINC	0 083798	0 114715	0 730490	0 465091
NOR	-0 042526	0 057090	-0 744895	0 456335
TV	-0 195079	0 173533	-1 124161	0 260945
NCOAST	1 267850	0 724587	1 749755	0 080161
CCOAST	1 572298	0 713640	2 203209	0 027580
SCOAST	0 853727	0 712676	1 197917	0 230949
NSIERRA	1 735313	0 847711	2 047056	0 040653
CSIERRA	1 737491	0 790876	2 196919	0 028026
SSIERRA	1 595082	0 737994	2 161376	0 030666
HJUNG	0 993783	0 862080	1 152774	0 249003
JUNGLE	1 366723	1 024982	1 333411	0 182397
NCONE	-0 057582	0 400779	-0 143675	0 885757
SCONE	1 333899	0 583896	2 284482	0 022343
OTHER	0 522641	0 754102	0 693063	0 488270
OHHCP	0 796520	0 464898	1 713321	0 086653
OHPP	-0 345089	0 175885	-1 962013	0 049761
OPOPP	-0 149622	0 112013	-1 335762	0 181627
KM2	-0 010545	0 023571	-0 447366	0 654611
HHCD	1 262096	0 528533	2 387921	0 016944
HPD	1 020662	0 485640	2 101685	0 016944
POPD	-0 445530	0 179501	-2 482040	0 013063
PPRICE	0 051781	0 069034	0 750088	0 453202
IPSS	0 404436	0 251250	1 609699	0 107464

Table A2-4 Urban

MAXIMUM LIKELIHOOD ESTIMATES - WHEN3

Observations 2584 Degrees of freedom 2510

-2*Log Likelihood 2094 542688 ***

VARIABLE	FIRST TRIM	SECOND TRIM
CONSTANT	6 664742 (1 454945)	6 317101 (1 370793)
EDUC	0 082111 (2 703516)	0 020724 (0 641854)
FIRST	-0 089285 (-0 283129)	-0 001305 (-0 003912)
AGE1	-0 467222 (-1 325992)	-0 125085 (-0 340801)
AGE3	0 071830 (0 205490)	0 022304 (0 060631)
TPREG	-0 120334 (-2 291757)	-0 072022 (-1 308941)
COMP	0 673587 (2 523214)	0 371420 (1 306385)
OLI	0 037147 (0 215984)	0 112986 (0 651231)
ONLI	-0 401384 (-0 915052)	-0 105131 (-0 233810)
SINC	0 023468 (0 315236)	-0 035919 (-0 432649)
HUBB	0 517920 (1 496475)	0 415659 (1 137848)
PINC	0 701634 (2 736715)	0 616159 (2 363367)
NPAR	-0 974658 (-3 906583)	-0 795884 (-3 013795)
ORINC	0 480153 (1 710439)	0 342007 (1 189838)
NOR	0 010632 (0 124159)	0 050127 (0 566202)
TV	0 371750 (1 654983)	0 323108 (1 353942)

Table A2-4 (continued)

VARIABLE	FIRST TRIM	SECOND TRIM
NCOAST	-5 785882	-6 316607
	(-1 307590)	(-1 419961)
CCOAST	-5 961620	-5 448266
	(-1 312183)	(-1 193958)
SCOAST	-6 413689	-6 784226
	(-1 385901)	(-1 458521)
NSIERRA	-5 963896	-6 253103
	(-1 305922)	(-1 360252)
CSIERRA	-6 194997	-6 027447
	(-1 353402)	(-1 309966)
SSIERRA	-6 119528	-6 227532
	(-1 400740)	(-1 417629)
HJUNGLE	-6 148956	-6 411514
	(-1 300319)	(-1 347637)
LJUNGLE	-6 921760	-5 965310
	(-1 412247)	(-1 208983)
NCONE	-0 460931	-0 155963
	(-0 721620)	(-0 235455)
SCONE	0 980564	0 779104
	(1 228036)	(0 931053)
OTHER	-0 658523	0 030519
	(-0 798303)	(0 036228)
OHHCP	-0 457632	-0 579291
	(-0 670007)	(-0 801365)
OHPP	-0 228967	-0 164469
	(-0 909347)	(-0 613342)
OPOPP	-0 031912	-0 006118
	(-0 138383)	(-0 025843)
KM2	0 031031	0 005389
	(0 898453)	(0 147157)
HHCD	-0 076820	-0 088252
	(-0 098132)	(-0 106459)
HPD	0 661916	-0 014947
	(1 096699)	(-0 022802)
POPD	-0 108634	-0 045270
	(-0 401506)	(-0 160107)

Table A2-4 (continued)

VARIABLE	FIRST TRIM	SECOND TRIM
PPRICE	0 292390 (2 827654)	0 307012 (2 825776)
IPSS	0 487982 (0 927265)	0 316777 (0 578266)
PUB	-0 676643 (-2 308770)	-0 448956 (-1 446734)

(t-ratios in parentheses)

Table A2-5 OLS Results Urban

Dependent variable VMO

Observations	1292	Degrees of freedom	1254
R-squared	0 126	Rbar-squared	0 100
Residual SS	215 974	Std error of set	0 415
Total SS	247 169	F(38 ,254)=4 8952	P-value=0 00

Variables	Coefficients	Std Coef	Std Error	t-stat	P-Value
CONSTANT	0 486582	0 000000	0 143866	3 382183	0 001
WHEN9	0 037188	0 178024	0 005926	6 275806	0 000
EDUC	0 014814	0 147607	0 003475	4 262439	0 000
FIRST	-0 004664	-0 004454	0 034604	-0 134775	0 893
AGE1	0 047478	0 032203	0 043247	1 097834	0 272
AGE3	0 058349	0 042859	0 043192	1 350927	0 177
TPREG	0 002416	0 013868	0 006888	0 350760	0 726
COMP	0 086286	0 083776	0 027863	3 096768	0 002
OLI	-0 003771	-0 012889	0 008507	-0 443256	0 658
ONLI	0 003069	0 001369	0 062132	0 049397	0 961
SINC	0 006895	0 048301	0 004135	1 667475	0 095
HUBB	0 062925	0 044294	0 043138	1 458697	0 145
PINC	-0 008301	-0 019456	0 016313	-0 508840	0 611
NPAR	0 015003	0 024145	0 028955	0 518128	0 604
ORINC	0 003508	0 006075	0 019066	0 183965	0 854
NOR	-0 011431	-0 050079	0 009300	-1 229239	0 219
TV	0 067823	0 073112	0 027183	2 495051	0 013
NCOAST	-0 114204	-0 081414	0 120003	-0 951676	0 341
CCOAST	-0 037543	-0 028869	0 118553	-0 316674	0 751
SCOAST	-0 155967	-0 102726	0 119795	-1 301944	0 193
NSIERRA	-0 238186	-0 166033	0 142237	-1 674572	0 094
CSIERRA	-0 289886	-0 176294	0 131407	-2 206008	0 027
SSIERRA	-0 223670	-0 142720	0 121544	-1 840236	0 066
HJUNG	-0 177174	-0 071838	0 144714	-1 224300	0 221
JUNGLE	-0 204827	-0 121633	0 170640	-1 200346	0 230
NCONE	0 069560	0 048964	0 061271	1 135270	0 256
SCONE	0 171689	0 090045	0 079627	2 156151	0 031
OTHER	0 085361	0 028417	0 094709	0 901297	0 367
OHHCP	-0 006350	-0 067219	0 077758	-0 081659	0 935
OHPP	0 075942	0 205624	0 030029	2 528914	0 011
OPOPP	-0 005366	-0 209588	0 018752	-0 286135	0 775
KM2	0 000059	0 000949	0 003911	0 015190	0 988
HHCD	0 152843	0 140792	0 087607	1 744644	0 081
HPD	0 082769	0 048337	0 064005	1 293168	0 196
POPD	-0 048681	-0 116562	0 028100	-1 732429	0 083
PPRICE	0 001579	0 006587	0 010635	0 148441	0 882
IPSS	0 101448	0 074729	0 042415	2 391798	0 017
PUB	0 011962	0 011493	0 029166	0 410127	0 682

Table A2-6 Binary Logit Results Rural

Dependent Variable CARE

Observations 2013 Degrees of freedom 1983

*** Log Likelihood 1195 184537 ***

Variables	Coefficients	Std Error	t-Stat	P-Value
CONSTANT	-0 384391	0 356638	-1 077820	0 281114
EDUC	0 138011	0 022806	6 051652	0 000000
FIRST	0 196078	0 198822	0 986198	0 324036
AGE1	-0 072017	0 193324	-0 372519	0 709506
AGE3	-0 153455	0 158529	-0 967998	0 333046
TPREG	0 076814	0 025278	3 038765	0 002376
OWNCASH	-0 091735	0 127343	-0 720377	0 471293
SCASH	0 093781	0 069152	1 356169	0 175045
SED	0 082983	0 021425	3 873206	0 000107
HUBB	-0 314437	0 196781	-1 597904	0 110064
HHCASH	0 045645	0 103211	0 442251	0 658307
FINC	0 009819	0 039791	0 246757	0 805096
NPH	-0 072099	0 023245	-3 101758	0 001924
TV	0 160311	0 185702	0 863270	0 387989
NCOAST	0 353631	0 254092	1 391747	0 163999
CCOAST	0 444735	0 272859	1 629906	0 103121
SCOAST	0 107717	0 372161	0 289437	0 772247
NSIERRA	-0 285690	0 238303	-1 198854	0 230585
CSIERRA	-0 729670	0 259738	-2 809252	0 004966
SSIERRA	-0 565011	0 249774	-2 262093	0 023692
HJUNG	0 128016	0 227838	0 561874	0 574202
OHHCP	0 016871	0 028304	0 596064	0 551132
OHPP	0 024887	0 008387	2 967453	0 003003
OPOPP	-0 004727	0 010719	-0 440947	0 659252
KM2	-0 011333	0 034889	-0 324823	0 745315
HHCD	0 259166	0 079852	3 245584	0 001172
HPD	-0 001277	0 018607	-0 068627	0 945287
POPD	-0 076907	0 023977	-3 207552	0 001339
INSUR	0 622110	0 336721	1 847550	0 064667
FARMER	-0 522965	0 130024	-4 022056	0 000058

Table A2-7 Binary Logit Results Rural

Dependent Variable GO

Observations 2013 Degrees of freedom 1983

*** Log Likelihood 1165 177926 ***

Variables	Coefficients	Std Error	t-Stat	P-Value
CONSTANT	-0 720682	0 362174	-1 989876	0 046605
EDUC	0 133932	0 022558	5 937209	0 000000
FIRST	0 232422	0 199146	1 167093	0 243173
AGE1	0 010919	0 193577	0 056404	0 955020
AGE3	-0 190534	0 163669	-1 164138	0 244368
TPREG	0 061336	0 025837	2 373992	0 017597
OWNCASH	-0 148990	0 146319	-1 018255	0 308557
SCASH	0 078105	0 064023	1 219956	0 222482
SED	0 077757	0 021378	3 637309	0 000276
HUBB	-0 218734	0 201696	-1 084475	0 278154
HHCASH	0 005571	0 102078	0 054576	0 956477
FINC	0 024042	0 040724	0 590369	0 554943
NPH	-0 071066	0 023650	-3 004850	0 002657
TV	0 070013	0 181871	0 384962	0 700266
NCOAST	0 581827	0 256307	2 270040	0 023205
CCOAST	0 546816	0 273391	2 000123	0 045487
SCOAST	0 067156	0 366410	0 183280	0 854578
NSIERRA	-0 264265	0 244251	-1 081942	0 279278
CSIERRA	-0 699156	0 265558	-2 632785	0 008469
SSIERRA	-0 382930	0 253801	-1 508778	0 131355
HJUNG	0 254054	0 230236	1 103451	0 269831
OHHCP	0 052729	0 028448	1 853531	0 063806
OHPP	0 026716	0 008464	3 156258	0 001598
OPOP	-0 020293	0 010748	-1 888036	0 059021
KM2	0 002644	0 034963	0 075627	0 939716
HHCD	0 302660	0 081003	3 736415	0 000187
HPD	0 003296	0 018758	0 175712	0 860521
POPD	-0 096353	0 025104	-3 838176	0 000124
INSUR	0 644527	0 325207	1 981898	0 047491
FARMER	-0 498861	0 130116	-3 833958	0 000126

Table A2-8 Binary Logit Results Rural

Dependent Variable PUBLIC

Observations 676 Degrees of freedom 645

*** Log Likelihood 329 156777 ***

Variables	Coefficients	Std Error	t-Stat	P-Value
CONSTANT	0 955044	0 761458	1 254231	0 209758
EDUC	-0 055099	0 036636	-1 503940	0 132597
FIRST	-0 120409	0 355831	-0 338389	0 735070
AGE1	0 303843	0 354173	0 857895	0 390951
AGE3	-0 264580	0 326923	-0 809305	0 418340
TPREG	0 012976	0 048934	0 265161	0 790885
COMP	-0 251548	0 216560	-1 161562	0 245413
OWNCASH	-0 331058	0 274036	-1 208082	0 227016
SCASH	0 059274	0 090103	0 657849	0 510635
SED	-0 018215	0 035738	-0 509686	0 610271
HUBB	-0 780896	0 457334	-1 707498	0 087730
HHCASH	0 031712	0 163257	0 194244	0 845985
FINC	-0 085842	0 065522	-1 310133	0 190151
NPH	0 017300	0 046909	0 368792	0 712283
TV	-0 051987	0 276959	-0 187707	0 851106
NCOAST	0 008013	0 498468	0 016075	0 987174
CCOAST	0 977343	0 504125	1 938692	0 052539
SCOAST	2 068172	0 718322	2 879171	0 003987
NSIERRA	1 117324	0 537130	2 080175	0 037509
CSIERRA	2 008990	0 591650	3 395573	0 000685
SSIERRA	4 170319	1 083791	3 847900	0 000119
HJUNG	1 289650	0 438400	2 941719	0 003264
OHHCP	0 065022	0 057041	1 139919	0 254320
OHPP	-0 013624	0 016858	-0 808152	0 419003
OPOP	0 002665	0 022079	0 120720	0 903913
KM2	0 020348	0 084733	0 240143	0 810220
HHCD	0 135014	0 159958	0 844060	0 398636
HPD	0 005916	0 029758	0 198809	0 842412
POPD	-0 027922	0 049302	-0 566346	0 571159
INSUR	1 555296	0 729954	2 130678	0 033116
FARMER	-0 272764	0 238177	-1 145217	0 252119

Table A2-9 Rural

MAXIMUM LIKELIHOOD ESTIMATES - WHEN3

-2*Log Likelihood 1293 406462

Observations 1352 Degrees of freedom 1288

VARIABLE	FIRST TRIM	SECOND TRIM
CONSTANT	0 201881 (0 218641)	0 709810 (0 805889)
EDUC	0 051185 (1 204095)	0 021398 (0 491565)
FIRST	0 280890 (0 637491)	0 209172 (0 457622)
AGE1	0 526516 (1 196613)	0 466630 (1 027088)
AGE3	0 617662 (1 662566)	0 044819 (0 116413)
TPREG	-0 051436 (-0 905438)	0 000372 (-0 006470)
COMP	0 734718 (2 853951)	-0 058159 (-0 211327)
OWNCASH	-0 328540 (-0 958266)	0 031018 (0 099171)
SCASH	0 095652 (0 869678)	-0 031053 (-0 242911)
SED	0 037352 (0 899527)	0 020809 (0 490489)
HUBB	-0 288332 (-0 582408)	-0 447158 (-0 903639)
HHCASH	0 087721 (0 438582)	-0 299021 (-1 137128)
FINC	0 105814 (0 737141)	0 164457 (1 150106)
NPH	0 018615 (0 323303)	0 044552 (0 761246)
TV	0 864713 (2 305021)	0 507663 (1 299402)
NCOAST	1 222799 (1 862060)	-0 025147 (-0 040456)

Table A2-9 (continued)

VARIABLE	FIRST TRIM	SECOND TRIM
CCOAST	0 564717 (0 861906)	0 222752 (-0 364970)
SCOAST	1 733211 (1 948465)	0 834332 (0 954613)
NSIERRA	0 595727 (0 852853)	0 688386 (1 086384)
CSIERRA	0 599022 (0 894357)	-0 254954 (-0 408973)
SSIERRA	0 700427 (1 074355)	0 705204 (1 210512)
HJUNGLE	0 789355 (1 376902)	0 180472 (0 351477)
OHHCP	0 016690 (0 269704)	0 012980 (0 211431)
OHPP	-0 035266 (-1 841254)	-0 019765 (-1 051462)
OPOPP	0 002836 (0 115499)	0 016378 (0 675779)
KM2	0 034893 (0 280120)	0 076311 (0 702303)
HHCD	-0 213596 (-1 325649)	-0 170843 (-1 000376)
HPD	-0 009931 (-0 297114)	-0 023033 (-0 591585)
POPD	0 050627 (0 933022)	-0 037833 (-0 580573)
INSUR	0 347263 (0 671728)	-0 365466 (-0 664670)
FARMER	-0 225153 (-0 799809)	-0 407056 (-1 402986)
PUB	-0 435869 (-1 546777)	-0 216156 (-0 746494)

(t-ratios in parentheses)

Table A2-10 OLS Results Rural

Dependent variable VMO

Observations	676	Degrees of freedom	643
R-squared	0 235	Rbar-squared	0 197
Residual SS	84 663	Std error of est	0 363
Total SS	110 669	F(33 ,643)=6 1722	P-value=0 00

Variables	Coefficients	Std Coef	Std Error	t-stat	P-Value
CONSTANT	0 295251	0 000000	0 120462	2 450996	0 014
WHEN9	0 055377	0 305434	0 006754	8 198840	0 000
EDUC	0 020087	0 192239	0 005166	3 887864	0 000
FIRST	0 036476	0 032906	0 050953	0 715874	0 474
AGE1	-0 038551	-0 031269	0 049840	-0 773484	0 439
AGE3	-0 060556	-0 054210	0 048632	-1 245181	0 213
TPREG	0 004679	0 037015	0 007312	0 639938	0 522
COMP	-0 020459	-0 022693	0 032487	-0 629766	0 529
OWNCASH	-0 043899	-0 044536	0 037376	-1 174505	0 240
SCASH	0 002275	0 006191	0 013768	0 165214	0 869
SED	-0 009261	-0 092976	0 005250	-1 763926	0 078
HUBB	0 169849	0 136326	0 061091	2 780262	0 005
HHCASH	0 012221	0 019289	0 025647	0 476501	0 634
FINC	0 002736	0 012406	0 008142	0 336091	0 737
NPH	-0 009190	-0 057740	0 007003	-1 312267	0 189
TV	0 006735	0 006998	0 041062	0 164027	0 870
NCOAST	0 044737	0 044202	0 082806	0 540261	0 589
CCOAST	0 031959	0 034270	0 081967	0 389903	0 697
SCOAST	-0 084328	0 048595	0 097642	-0 863647	0 388
NSIERRA	-0 159062	-0 108360	0 088475	-1 797822	0 072
CSIERRA	-0 131734	-0 094648	0 086992	-1 514311	0 130
SSIERRA	-0 241723	-0 174903	0 082630	-2 925354	0 003
HJUNG	-0 147498	-0 124997	0 074035	-1 992266	0 046
OHHCP	0 016673	0 170839	0 007612	2 190501	0 028
OHPP	0 004492	0 079650	0 002500	1 796920	0 072
OPOPP	-0 010535	-0 278673	0 002954	-3 566569	0 000
KM2	-0 000492	-0 001623	0 014205	-0 034606	0 972
HHCD	0 032853	0 082698	0 021209	1 549007	0 121
HPD	-0 001710	-0 014898	0 004633	-0 369062	0 712
POPD	-0 016942	-0 127242	0 007419	-2 283758	0 022
INSUR	0 142225	0 082937	0 065258	2 179420	0 029
FARMER	-0 046721	-0 057645	0 034901	-1 338701	0 181
PUB	0 082615	0 089101	0 034593	2 388185	0 017

Appendix 3. The Decomposition Methodology

Let β be a column vector of coefficients and let x be a column vector of independent variables

Define

$$lgt(x) = \frac{exp(x'\beta)}{(1+exp(x'\beta))} \quad \text{and} \quad ols(x) = x'\beta$$

Let l be a column vector of the lower independent variables, let u be a column vector of the upper independent variables, let m be a column vector of the average values of the independent variables between the two groups

$$m = \frac{l + u}{2}$$

Define v_i to be equal to m except that the i-th element of m is replaced by the i-th element in l Define w_i to be equal to m except that the i-th element of m is replaced by the i-th element in u Now in the two binary logit cases the percentage of the change attributed to a given independent variable is just

$$\pi_i = \frac{lgt(w_i) - lgt(v_i)}{lgt(m)} \bullet 100$$

In the case of an ordinary least squares regression the percentage of the change attributed to a given independent variable is just

$$\pi_i = \frac{ols(w_i) - ols(v_i)}{ols(m)} \bullet 100$$

The case of the multinomial logit regression is slightly more difficult Let β_1 be the coefficients for the first trimester and let β_2 be the coefficients for the second trimester Let

$$mnl(x) = \frac{exp(x'\beta_1)}{(exp(x'\beta_1) + exp(x'\beta_2) + 1)}$$

Now a percentage of the change in the first trimester probability attributed a given independent variable is just

$$\pi_i = \frac{mnl(w_i) - mnl(v_i)}{mnl(m)} \bullet 100$$

The probabilities for the other trimesters are easily obtained by redefining mnl(x) to the predicted probability for that trimester

When groups of variables are changed simultaneously, we need to alter the interpretation of the w_i and the v_i above Now, w_i is set equal to m except that all the variables in the i-th group are set equal to their values in the u vector and v_i is set equal to m except that all the variables in the i-th group are set equal to their values in the l vector Given this change, the formulae above produce the percentages of the change attributable to a given group of variables

The groups were determined by including all women who had predicted probabilities of receiving care that were within $\pm 0\ 02$ of the required probability for the urban groups and $\pm 0\ 05$ for the rural groups For example, for the rural area, the proportion in the population with prenatal care was 0 415 Therefore, the average use group was comprised of all the women in the rural sample with predicted probabilities of seeking care between 0 365 and 0 465