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1. Introduction

Recent research on the determinants of child mortality indicates that the education of the mother is strongly and positively correlated with child survival rates. This pattern is observed in analyses of both aggregate and individual data from many countries and is evidently robust to the introduction of a variety of exogenous control variables. An important unresolved question concerns the identification of the principal mechanisms by which education affects child survival probabilities. One hypothesis explored in this paper is that education provides people with skills in acquiring and decoding new information and thus effectively lowers the costs of using more beneficial health and contraception technologies. Since one primary function of health and family planning programs is to disseminate information, general education and health or family planning programs may substitute for each other in the improvement of health or in the reduction of family size.

To investigate the roles of education in the determination of child health requires the study of the interrelationships among individual and community characteristics as they jointly influence child mortality and fertility. An important by-product of such an analysis is the identification of those households who benefit most from public policies that disseminate information on health and family planning technologies. The investigation of the roles of education in health can thus also shed

light on the interaction between the average cost-effectiveness of public programs aimed at reducing mortality and fertility and the distribution of the benefits of these programs across social and economic classes.

To assess the interactions between the impacts of education, the programs, and the health environment in which a household resides on child health and fertility, we use a data set which combines household-level restropective information on fertility, child mortality and schooling of mothers, obtained from the 1973 Colombian Census, and municipality-level data on the availability of medical services, on family planning activities, transportational infrastructure, and on climate. Our empirical findings, based on separate urban and rural samples for mothers in 5-year age-groups, confirm the importance of formal schooling for given levels of programs in augmenting child survival in both rural and urban areas of Colombia. Moreover, child mortality and fertility are most affected by health program interventions in urban families with less educated mothers. This evidence is consistent with the hypothesis that schooling enhances abilities in adopting more effective health technologies, and suggests further that government expenditures on health and family planning programs have been of greater value for the urban poor than the urban rich (educated). We find no fertility and child mortality effects of program interventions on rural populations, however, evidently because of the urban concentration of health and family planning facilities.

2. A Conceptual Framework for Policy Evaluation

To obtain information on the roles of education and public programs in the determination of child survival and fertility, it is useful to have an explicit model of the behavior of the family, where decisions which affect these outcomes are made. It is unsatisfactory for a program evaluation methodology to measure only the output of public services or to consider only the input of public resources used in the production of that service. In the former case, one does not know what effect the public service has on the behavior that the policy ultimately seeks to change. Nor is it possible to determine which segments of society accrue the final benefits of government expenditures and whose behavior, therefore, changes. In the latter case of measuring only the public sector use of inputs, there is no opportunity to discriminate among more and less productive policy undertakings, as for example, whether the scale of activity or the mix of inputs affects the cost-effectiveness of public sector activities. A more satisfactory framework for evaluating policy integrates analysis of the family's utility maximizing behavior and the public sector's mix of expenditures on subsidies and services.

2.1 Outlines of a Model

A woman is assumed to derive satisfaction from having children (C), in seeing that they survive, (H), and other forms of consumption goods (G):

$$U = U(C, H, G). \tag{1}$$

The relationship between child survival and the levels of consumption, G, specific health inputs, Z, and fertility, C is described by a production function:

$$(2) \qquad H = H(C, G, Z, \mu)$$

$$H_i \neq 0 \quad i = C, G, Z, \mu,$$

where μ is "endowment" health, that component of child health due to either genetic or environmental conditions which cannot be influenced by the mother's behavior, but which are partially known to her and which affect the productivity of the behavioral inputs. The associations between the inputs in (2) and health may also be affected by the mother's education or age, as discussed below.

There also exists a relationship between cumulative fertility, contraception, P, mother's age, A, and the survival of previous births, H, that is also described by a production function:

$$(3) \qquad C = C(P, A, H, \nu),$$

where ν is "endowment" fecundity, that component of reproductive capacity due either to genetic or to environmental conditions which are partially known but not subject to choice.

The woman maximizes (1), given (2) and (3), subject to the budget constraint:

$$(4) \qquad I = ZP_Z + GP_G + PP_P,$$

where P_Z and P_G and P_P are the prices of health inputs, general consumption level, and contraception, respectively, and I is income.

The general household model suggests five distinct roles for mother's education in affecting child health and fertility. (1) Education may jointly affect the productivity or effectiveness of the health or other inputs used in the production of child health, as hypothesized in Grossman (1972). Thus, more educated mothers may obtain more benefits from a given use of health services, Z; their higher "productivity" would also affect their demand for health services because their resources are effectively increased and health inputs are more valuable. (2) Education may also affect perceptions about the best allocation of the inputs in the production of health. In this case, more educated mothers would have healthier children because they have (can obtain more efficiently) better information on the optimal allocation of health resources. Moreover, such mothers would be particularly advantaged where information on "best" input allocations is scarce or costly to acquire. (3) Education may also increase total family resources. Even where women tend not to work in the market, more educated women may have greater resources because, due to assortative mating, they marry wealthier men. Such women might then invest more resources in the production of child health and thus would be observed to have healthier children. (4) More educated women may assign a high value to their own time, particularly, but not only, if they work in the market and receive a higher wage rate. If mother's time is an essential "input" in the production of child health, education could be negatively related to both fertility and the health of children. (5) Education may affect preferences for child health and family size, given total resources, prices and technology.

Pervasive evidence suggests that mother's education is associated with her child mortality, even when holding income constant (Cochrane et al., 1981; Schultz, 1980). To ascertain if education plays important roles in health production, it is desirable to obtain estimates of the actual production technology as in (2). Such estimates

would require, however, that all behavioral inputs be observed for each child--breastfeeding, other nutrient intakes, use of medical services, etc.--and, in the presence of population heterogeneity in health endowments, information on prices of all inputs would also be needed to avoid bias.[1] Few, if any, data sets provide this detailed information on all inputs and input prices. In the absence of production function estimates, can anything be learned about the non-income roles of schooling?

Before attempting to answer this final question, it is necessary to consider how governmental interventions enter the model. Derived from the maximization of the utility function (1) subject to the production functions (2) and (3) and the budget constraint (4) are demand equations for the three health and fertility inputs Z, G and P, and, thus for child survival and family size in terms of the exogenous variables--prices,

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[1] If we could vary by fiat the use of contraception and child health inputs, P and Z, we might observe their marginal product on C and H, respectively. But such controlled experiments are not feasible, and the association observed in reality between input demands and outcomes in a heterogeneous population will be a biased indicator of the marginal products of inputs. An example may illustrate the bias due to population heterogeneity. Women who concluded they were unusually fecund (ν) are, consequently, unusually motivated to seek out modern contraceptive techniques, other things being equal. The direct association across women who did and did not avail themselves of modern contraception and their cumulative fertility would, in this case, understate the efficacy (marginal product, C_P) of the modern contraceptive techniques. Similarly, mothers who are most likely to seek out medical care, Z, for their children may know something about their child's health endowment, μ, which can effect the observed marginal product of Z on H and explain their unusual input demand behavior. It is not possible, therefore, to infer from self-selected inputs and outputs alone the marginal product of the inputs and hence the effectiveness of public policies that disseminate or subsidize the use of these inputs. See also Rosenzweig and Schultz, forthcoming.

income, education (E), age and the endowments:[1]

$$(5) \qquad Z = D_Z(P_Z, P_G, P_P, I, A, E),$$

$$(6) \qquad G = D_G(P_Z, P_G, P_P, I, A, E),$$

$$(7) \qquad P = D_P(P_Z, P_G, P_P, I, A, E),$$

$$(8) \qquad C = D_C(P_Z, P_G, P_P, I, A, E),$$

$$(9) \qquad H = D_H(P_Z, P_G, P_P, I, A, E).$$

Public programs play two distinct roles in affecting health and health behavior through the demand equations (5) through (9): (A) Such programs may reduce the prices of the health inputs, through direct subsidization, or indirectly by increasing access. In the latter case, making services or inputs more readily available, i.e., by placing services in a remote area, reduces the time or travel costs to use the service. (B) Public programs may provide information on how to produce health more efficiently. This might include information on new inputs or on efficient practices with conventional inputs--when to breastfeed, how to sterilize baby formula, etc.--which yield greater survival rates for given total expenditures. This second role of programs is thus similar to that hypothesized for education, since both education and programs reduce the costs of acquiring information relevant to the production of health and the control of fertility.

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[1]Three goods enter the utility function, C, H and G, that are produced by three inputs: Z, G, P. These inputs are demanded by the woman according to her preferences and her understanding of the health and fertility production processes, H(.) and C(.), and her endowments μ and ν. Finally, the exogenous factors whose variability should influence both the input demands and production of C, H, and G are the woman's education, her age, and the prices of market and publicly subsidized goods and services, P_Z, P_G, and P_P.

The behavioral model suggests that programs which reduce the costs of health inputs will lead to greater investments in health and thus greater survival rates; similarly, reductions in contraceptive costs will lead to greater fertility control and to lower birth rates. The model cannot predict how reductions in the cost of fertility control will influence child health, nor how changes in the prices of the health inputs will influence fertility. Such "cross" effects are unlikely to be zero, however. An implication of the household framework is that any program which affects the cost of goods consumed, whether directly useful to the production of health or not, may influence the demand for health inputs and thus indirectly affect health or survival.

Dissemination of information on health technologies will also tend to increase health or survival, although the effect on the demand for any specific health input or on fertility is unclear. An important additional implication of the model, however, is that the effects of program interventions will differ by maternal education, depending upon the relative importance of the (five) roles of education in affecting health and on the predominance of either the user subsidy or the information effects of the programs. Table 1 outlines these possibilities, to the extent suggested by the model. The second row, column A, indicates that if the informational roles of both public health or family planning programs and maternal education are predominant, such programs are likely to have a greater effect on child health in families with less educated women

Table 1

Who Benefits Most from Health Program Interventions,

According to the Roles of the Programs and Mother's Education

Role of Education	Roles of Health or Family Planning Programs: A. Information Provision	B. Subsidy to "Modern" Input Use
1. Increase Productivity of Health Inputs	Unknown	Unknown
2. Reduce Costs of Information on Technology	Less Educated	More Educated
3. Increase Family Income	Unknown	More Educated
4. Increase Price of Time of Mothers	Unknown	Less Educated
5. Affect Preferences for Health or Family Size	Unknown	Unknown

compared to families in which the mother has a higher level of schooling. This difference reflects the fact that the availability of information is only of value to households who have not already acquired the information, i.e., to those who face higher costs of information acquisition. If programs mainly lower the user cost of modern health inputs (column B), however, higher educated families, who are already more aware of the "benefits" of such inputs, will be the ones benefitting most, given the informational role of education.

With respect to the four other educational roles, it cannot be established a priori who will benefit most from the public provision of technological information relating to the production of health or children (A) as the effects will depend on the type of information generated and on unknown differential income effects by education. For example, if the information suggests that visits to clinics are beneficial to health, mothers with higher opportunity costs of time (the more educated) are less likely to take advantage of this knowledge and thus will benefit less from this information than will (less educated) mothers with low time values. However, information could be provided which allowed mothers to conserve on time in producing health; the benefits would then accrue disproportionately to mothers with high time values.

Somewhat more can be said about the beneficiaries, by education, of input subsidies to users (B) if maternal education either increases family income or the cost of mother's time. In the former case, if the demand for health increases with income (row 3), an input subsidy will increase the real income of the more educated more than

that of the real income of the less educated. Health is then likely to increase more in families with higher educated mothers. If the major effect of education is to increase the value of time (row 4), however, and if subsidies are targeted to health services requiring travel or substantial waiting time by mothers,the less educated will tend to be the major beneficiaries of such a program.

Table 1 makes clear that estimates of the effects of education and public health programs on child health or on fertility are likely to be mispecified if the interactions between education and the health"infrastructure" are ignored. Moreover, while estimates of such interactions, in the absence of information on the characteristics of the health production function, cannot conclusively pin down the most important roles of education or of the health programs in augmenting health or influencing fertility, they can eliminate some possibilities. For example, if it is found that the effects of health programs on child survival are greater in families with less educated mothers, the joint hypotheses that the programs reduce input costs and that more educated mothers are more able and willing to take advantage of such subsidized health services (B.2) could be rejected.

3. The Colombian Setting: The Health Care System and Available Data

The total fertility rate in Colombia declined from about 7.0 in 1960-64 to the vicinity of 4.5 at the time of the 1973 Census. The decline was relatively steeper in urban areas, yet the reductions in total fertility rates were of similar absolute magnitudes in urban and rural areas--about one birth each. The improvements in Colombian life expectancy

have also been large by conventional standards, increasing from Lopez's estimate of 46 years for males in 1951-64 to 58 or more by 1973 (Potter and Ordoñez, 1976). Infant mortality is harder to estimate, but it has probably declined in this period from substantially in excess of a hundred per thousand births to about 65, based on 1973 Census figures. No one has, to our knowledge, decomposed the change in Colombian mortality into that which is due to income changes, education advances, and a host of public health related activities. A Working Committee (CCRP, 1979) has offered the estimate that 40 percent of the fertility decline is associated with subsidized provision of family planning services. Such an estimate would be difficult to sustain, however, unless better information could be obtained on regional activity levels of the program in the critical years before 1973. Even with vastly improved data on regional public expenditure patterns, the impact of the program might still be swamped by internal migration to the cities and overall educational advancements.

The public health care system in Colombia can be divided into two parts. The first is the national health system funded by the Ministry of Health from central government resources, national lotteries and contributions of departments and municipalities. The health ministry supports hospitals and health centers with in-patient facilities (with beds), health centers and clinics with out-patient functions (without beds), and puesto de salud, generally remote health outposts without a permanently assigned doctor.

The second part of the public health care system is linked to the provision of social security benefits and administers hospitals and health

centers for particular groups of public sector employees. Specific arrangements with ICSS, CAJANAL and CAPRECOM provide for funding by the federal ministry of health, supplemented by contributions of employees and employers (about a third of funds). This social security component of the system serves primarily members of the upper and middle classes living in urban areas.

Table 1 shows the magnitude of the public subsidies to these institutions and their location by region in 1974: large city (Bogotá, Cali, Medellín and Barranquilla), intermediate sized city, small towns, and rural areas. In most countries, health facilities are not often located in the rural areas, perhaps because of low population density and economies of scale. The subsidy to health institutions in rural locations of Colombia is less than a seventh as large per rural household as the national average; urban locations correspondingly receive one and a half times the national average health care subsidy per household (row 4, Table 2). As

Table 2

Regional Distribution of Public Subsidies to Health Institutions in Colombia by Households in 1974

Funding and Administrative Agency	Location of Institution/Household: Large Cities (500,000 or more)	Intermediate Cities (30,000 to 500,000)	Small Towns (1500-30,000)	Urban Total	Rural (less than 1500)	Total
	(millions of pesos)					
Hospitals	283.5	339.4	381.7	1004.6	13.8	1018.4
Health Centers with beds	-	-	5.3	5.3	3.2	8.5
Clinics without beds	106.5	54.5	49.5	210.4	19.1	238.3
Health Posts	1.2	7.3	34.5	43.0	57.5	100.5
Social Security						
ICSS	500.0	192.5	74.5	767.0	2.7	767.7
Cajas	112.6	11.5	6.4	130.5	19.0	149.5
1. Total Subsidy by Institution's Location (millions of pesos)	1003.7	605.2	55.19	2160.8	115.3	2276.1
2. Percentage Subsidy by Institution's Location	44.1	26.6	24.2	94.9	5.1	100.0
3. Percentage Households	28.9	17.5	15.5	61.9	38.1	100.0
4. Subsidy per Household by Institution Location Relative to National Average	1.53	1.52	1.56	1.53	.13	1.00
5. Total Subsidy Consumed by Households by Their Location (millions of pesos)	1002.7	465.1	292.5	1760.3	515.8	2276.1
6. Percent of Subsidy by Consumer Location	44.1	20.4	12.9	77.3	22.7	100.0
7. Subsidy per Household by Consumer Location Relative to National Average	1.53	1.17	.83	1.25	.60	1.00

Source: Derived from Selowsky (1979), Tables 1.1, 4.2, 4.9 and SA-20.

would be expected, rural residents seek medical care from the facilities located in urban areas, and it has been estimated by Selowsky (1979) from a 1974 household survey that about half of the public medical services provided in small towns, and half of the in-patient care delivered in intermediate sized cities are consumed by members of rural households. Hence, the final consumption of publicly subsidized services is less unevenly distributed across the population than the location of facilities would imply, with rural households consuming 60% of the national average, small town residents 83%, intermediate city residents 117% and large city residents 153% of the national average level of health care subsidies (row 7, Table 2).

It is more difficult to obtain good estimates of the public cost of supporting the health care institutions and the staff that operate these facilities. Mandatory tours of service in the public sector for young doctors add an additional distortion (subsidy) in the pricing of medical services. Selowsky's estimates for 1974 are that the annual subsidy to operate an out-patient health center is about 340,000 pesos, whereas the annual cost per available bed in a hospital is about 46,000 pesos. If the rural health posts are priced according to their use of staff doctors and auxiliaries, each costs about 64,000 pesos, per year.[1] Stated in another way, the cost of the existing supply of hospital beds appears to require a 90 pesos (1974) subsidy per capita, whereas the clinic-health center out-patient facilities cost 12 pesos (1974) per

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[1] See Selowsky, Tables SA-21 and SA-22. The figures from Table 1 above suggest that the social security and hospital public subsidies were 1,938 million pesos, which allocated across about 42,000 beds implies an average cost per bed of 46,097 pesos. The estimate of 1974 beds is based on a 2.5% growth rate in the number of beds in the health registry from 1976 to 1977, extrapolated backward to 1974. See supporting data in appendix Tables A-1 and A-2.

capita, and by 1977 the cost of family planning expenditures stood at 4.7 pesos (1977) per capita.

Since the late 1960s, private and public programs subsidized the spread and use of family planning services and contraceptives, but there are no consolidated figures on expenditures of these programs by region before 1977. Beginning about 1965, with the introduction of oral contraceptives and the IUD, a private charitable organization, Colombian Association for Family Welfare (Profamilia), opened clinics in the major cities. Then in 1967 the Colombian Association of Medical Faculties (ASCOFAME) began to coordinate family planning services provided at some 350 government health centers and it later organized a post-partum family planning program in the major maternity hospitals. The Ministry of Health avoided directly challenging the Church's position by only passively permitting ASCOFAME to train and supervise the program's staff, without explicitly appropriating government funds for this purpose. The growing cadre of suitably trained doctors were then encouraged to provide family planning services as they performed their public service assignments in the then 900 health posts and 400 health centers across the country. We cound not obtain records from this early period on the regional distribution of family planning expenditures or activity, except from the records of Profamilia which operated only metropolitan clinics.[1] Moreover, although the government explicitly assumed responsibility for the expanding

[1] It is estimated that through 1973 Profamilia had supplied 489,000 years of protection from pregnancy for Colombian women versus 444,000 years protection by ASCOFAME, and these shares have since remained relatively constant (Working Committee..., 1976) Table 3, p. 13).

program in the 1970s, no financial reports were found until 1977, allowing the aggregation of the expenditures of both private and public programs for some 88 regional urban and rural operations.[1] Other activities, such as mail distribution of contraceptive supplies and public information campaigns that were national in scope, cannot be regionally allocated.

The Colombian private market sector has also played a major role in disseminating modern methods of birth control. Not only do private physicians, clinics and hospitals provide family planning services mainly in urban areas, oral contraceptives have also been available without prescription at pharmacies since the late 1960s. It is estimated that by 1970 noninstitutional commercial sales of contraceptive pills account for half of their consumption (Little, 1972). These large nonprescription sales of the pill tend to be concentrated in the metropolitan areas. The time required to travel from a rural municipality to a neighboring city may, therefore, approximate not only the availability of in-patient hospital care that is rare in the smaller towns, it may also determine the private market supply price of contraceptives for persons living in the more remote areas of the country.[2]

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[1] These data are presented and discussed in the report by Trias and Ojeda (1978).

[2] Pharmacies in rural localities and small towns may have been reluctant to sell contraceptive supplies against the possible strictures of local clergy. It is likely that the subsidized public and private family planning programs contributed more to accelerating the spread and adoption of modern means of birth control than to their continuing use.

4. Estimation of Program and Education Effects on Child Mortality and Fertility: Data and Specifications

To ascertain the child health and fertility effects of variation in education, the cost or availability of health services, and their interactions, we use individual-level information on the fertility, child mortality, and educational attainment for women aged 15 to 64, obtained from a four percent sample of the 1973 Colombian census. These individual records are merged with municipio level data to estimate the demand equations for child health and fertility corresponding to equations (8) and (9) of the model. Because of the absence of information on the use by mothers of medical services, contraceptives, and other health-related inputs, no attempt is made to estimate the health and fertility production functions (2) and (3), or the input demand equations (5), (6) and (7). To obtain insights into the principal roles of health and family planning programs and education, we therefore focus on the interactions between schooling and the programs in the "reduced-form" equations. The Colombia census, because of its large size and extensive geographical coverage, is an ideal data set from which to obtain estimates of the interactive effects of community-level and household characteristics on family-level outcomes such as fertility and child survival. Variations in program levels and health characteristics are large in Colombia, and can be obtained for approximately 900 communities (municipios); both the individual-level education and the community-level variable effects and their interactions can be estimated therefore with a high degree of precision even within narrow age-groups.

Fertility and child survival are measured by the number of children

ever born alive to a woman and the ratio of the number of her children dead at the time of the census to the number ever born. For the child mortality ratio to be defined for the sample, women are excluded who do not report any births. The child mortality ratio is standardized by dividing it by the "average" ratio for all mothers of the same age, living in either rural or urban locations in Colombia. The standardized relationship with age is obtained by fitting a fifth degree polynomial in age to the underlying census data (see Table A-3).

The standardized child mortality ratio used here is not an exact measure of the probability of death for a child born at a particular time before reaching a specific age. Brass and Coale (1968), Trussell (1975) and others have estimated indirectly from aggregate data these conventional measures of mortality on the basis of average mortality ratios for adjacent age groups of women. Clearly, the mother's age at first birth and the number and timing of her subsequent births are related to the time periods her offspring are exposed to the risks of mortality. However, standardization of the child death ratio by mother's age using micro data appears to provide a good approximation to the life-table concept in many contexts (Trussell and Preston, 1981) in which better variables representing exposure to risk are unavailable.[1]

The two individual-level variables viewed as exogenous determinants of child mortality and fertility in this analysis are the mother's age and education. We do not use information on husbands' characteristics in order not to restrict the sample to currently married, spouse-present women. Thus our estimated education effects will in part reflect the

[1]Differences in the findings based on the crude child mortality ratio and more refined measures tend to be unimportant for our analysis as one considers older women. After age 30, alternative measures yield very similar results (Schultz, 1980).

effects, if any, of education on the mother's own income and on spouse selection (husband's income). To take into account non-linearities in the relaionship between mother's age, fertility and standardized child mortality as well as potentially important rural-urban and cohort differences, the sample is subdivided into five-year age groups of mothers and by urban and rural residence.

Table 3 reports the sample characteristics and the community and individual-level variable, definitions, and sources. The price of the health inputs, P_Z, and the level of health information are proxied by the availability of public and private hospital beds in the municipality and the availability of public and private medical centers, clinics, dispensaries and mobile care units as of 1976. Both types of health infrastructure variables are expressed on a per capita basis in each of Colombia's 900 municipalities based on the 1973 census community-level population data. Contraceptive costs and information on contraceptive techniques are represented in part by the level of family planning expenditures per-capita in 1977. However, it is important to note that health centers and maternity hospitals were also major sources of publicly-subsidized family planning supplies and services.

The characteristics of the municipality that are thought to have a pervasive effect on the production of child health and possibly also on fertility are average temperature and the time required to travel to a neighboring metropolitan area (department capital) where both public and private specialized hospital care exists. These metropolitan areas are also a convenient source of oral contraceptives, which are available from pharmacies on demand.

Table 3

Definitions of Variables and Their Summary Statistics

for Subsamples of the Colombian 1973 Census Sample

Name of Variable	AGE OF MOTHER: / Residential Area:	15-19 Urban	15-19 Rural	20-24 Urban	20-24 Rural	25-29 Urban	25-29 Rural	30-34 Urban	30-34 Rural	35-39 Urban	35-39 Rural	40-44 Urban	40-44 Rural	45-49 Urban	45-49 Rural	50-64 Urban	50-64 Rural
Census Individual Woman:																	
1. Children Ever Born		1.31 (.544)	1.45 (.610)	2.03 (1.18)	2.62 (1.42)	3.03 (1.80)	4.08 (2.07)	4.29 (2.43)	5.68 (2.74)	5.37 (3.03)	6.97 (3.30)	6.22 (3.57)	7.78 (3.76)	6.61 (3.90)	8.05 (4.06)	6.45 (4.03)	7.46 (4.03)
2. Children Dead to Children Ever Born		.0599 (.215)	.0887 (.249)	.0480 (.161)	.0809 (.193)	.0550 (.152)	.0964 (.182)	.0668 (.155)	.117 (.183)	.0793 (.164)	.131 (.185)	.0981 (.179)	.155 (.198)	.120 (.196)	.167 (.207)	.156 (.226)	.198 (.232)
3. Children Dead to Children Ever Born Divided by Fitted Value by Age for Urban/Rural Women		.314 (1.56)	.428 (1.50)	.432 (1.63)	.787 (1.66)	.716 (1.97)	.901 (1.68)	.849 (1.90)	.927 (1.42)	.889 (1.79)	.902 (1.25)	.917 (1.64)	.963 (1.21)	.943 (1.51)	.926 (1.12)	.901 (1.29)	.914 (1.66)
4. Schooling in Years		4.02 (2.71)	2.10 (1.90)	4.57 (3.06)	2.25 (2.00)	4.70 (3.31)	2.15 (2.06)	4.35 (3.25)	1.93 (1.96)	4.00 (3.16)	1.72 (1.90)	3.84 (3.09)	1.54 (1.82)	3.72 (3.08)	1.53 (1.87)	3.45 (3.05)	1.26 (1.79)
5. Age in Years		18.1 (1.00)	18.0 (1.07)	22.2 (1.38)	22.1 (1.40)	26.9 (1.40)	26.8 (1.41)	31.9 (1.45)	31.7 (1.49)	36.9 (1.41)	36.7 (1.43)	41.8 (1.45)	41.5 (1.49)	46.8 (1.43)	46.5 (1.46)	55.8 (4.27)	55.5 (4.32)
Merged Municipality:																	
6. Hospital Beds per capita[1] $(x10^{-4})^1$		.242 (.186)	.124 (.207)	.246 (.165)	.125 (.202)	.250 (.199)	.127 (.219)	.254 (.232)	.138 (.294)	.247 (.219)	.135 (.264)	.252 (.214)	.137 (.299)	.248 (.188)	.131 (.209)	.252 (.210)	.138 (.269)
7. Clinics per capita $(x10^{-4})^1$		.0974 (.0873)	.0511 (.0644)	.106 (.0939)	.0509 (.0654)	.109 (.0954)	.0502 (.0671)	.107 (.0943)	.0512 (.0680)	.104 (.0938)	.0498 (.0675)	.103 (.0935)	.0478 (.0646)	.102 (.0930)	.0472 (.0670)	.100 (.0915)	.0482 (.0669)
8. Family Planning Expenditures in Pesos per capita $(x10^{-2})^2$		.0566 (.0599)	.0281 (.0826)	.0579 (.0562)	.0248 (.0700)	.0588 (.0550)	.0270 (.0765)	.0592 (.0583)	.0250 (.0722)	.0575 (.0584)	.0257 (.0742)	.0572 (.0568)	.0246 (.0722)	.0578 (.0600)	.0260 (.0762)	.0574 (.0590)	.0255 (.0735)
9. Fraction of Day Required to Travel from Cabeceras (county seat) of Municipality to Capital of Department (state) [3]		.0826 (.301)	.339 (.787)	.0706 (.264)	.331 (.753)	.0662 (.275)	.308 (.680)	.0668 (.266)	.284 (.623)	.0724 (.291)	.303 (.678)	.0677 (.245)	.293 (.651)	.0732 (.271)	.290 (.636)	.0714 (.264)	.283 (.632)
10. Historical Average Temperature in Centigrade for Municipality Cabeceras $(x10^{-1})$ [4]		2.20 (.508)	2.26 (.464)	2.13 (.529)	2.20 (.471)	2.10 (.528)	2.17 (.473)	2.10 (.524)	2.14 (.472)	2.11 (.520)	2.14 (.475)	2.11 (.515)	2.13 (.469)	2.11 (.514)	2.11 (.472)	2.11 (.511)	2.07 (.490)
11. Historical Temperature as Above Squared $(x10^{-2})$ [4]		5.09 (2.15)	5.33 (2.03)	4.84 (2.22)	5.08 (2.04)	4.69 (2.20)	4.95 (2.03)	4.67 (2.18)	4.82 (2.02)	4.72 (2.17)	4.80 (2.03)	4.71 (2.15)	4.74 (2.00)	4.72 (2.15)	4.67 (2.00)	4.72 (2.13)	4.53 (2.02)
12. Estimate of Food Prices Derived from Discount on Daily Wages in Agriculture for Workers Receiving Food $(x10^{-2})$ [5]		.223 (.0498)	.236 (.0577)	.220 (.0483)	.234 (.0601)	.219 (.0479)	.232 (.0603)	.219 (.0480)	.232 (.0601)	.219 (.0474)	.233 (.0604)	.220 (.0487)	.233 (.0594)	.219 (.0479)	.235 (.0603)	.221 (.0485)	.233 (.0595)
13. Dummy Variable Equals One if Municipality Does Not Report Daily Agricultural Wages Paid Both with and without Food [5]		.0104 (.106)	.00543 (.0735)	.00850 (.0918)	.0110 (.104)	.00910 (.0949)	.0119 (.108)	.00909 (.0949)	.0117 (.107)	.00843 (.0914)	.0115 (.107)	.00851 (.0918)	.0111 (.105)	.00969 (.0990)	.0115 (.107)	.00829 (.0907)	.0110 (.104)
14. Municipal Average of Years of Schooling of All Women over Age 15 in the 1973 Census Sample [6]		4.23 (1.17)	2.61 (.867)	4.37 (1.17)	2.62 (.878)	4.43 (1.15)	2.63 (.881)	4.43 (1.14)	2.67 (.905)	4.37 (1.15)	2.65 (.871)	4.37 (1.15)	2.64 (.874)	4.35 (1.15)	2.63 (.863)	4.35 (1.17)	2.61 (.867)
Sample Size		3068	1840	11288	5621	13304	6217	12208	5652	11978	5832	9874	4664	8087	3743	14353	6725

Notes: [1] Data are from municipal registry of health establishments conducted first in 1976. DANE (1977). Population totals from DANE, Boletin, October 1974.

[2] Data are from first consolidation of governmental and private expenditures on family planning services done for 1977. Pattern of explicit distribution covers 88 municipalities including somewhat more than half the population. Regional pattern of activity may not have changed substantially in 1970s, but overall level of expenditures increased and sterilization rose over this decade. Earlier budgetary data is available only for private urban family planning program. See Trias and Ojeda(1978). Population totals from DANE, Boletin, October 1974.

[3] Time required to travel by census staff from municipality (county seat = cabeceras) to capital of state (department). Distance and time estimates prepared at the time of the 1973 Census in cooperation with the Secretary of Public Works, Registraduria Nacional del Estado Civil (1976).

[4] Geographical Dictionary prepared by Instituto Geografico "Agustin Codazzi," Bogota.

[5] Bank of Data at DANE has unpublished computer files of agricultural daily wages reported by municipality with and without the inclusion of food. The difference is used as the "price" of food for agricultural workers. 15 municipalities represented in the Census sample did not report wages with food, and for these no estimate of the price of food was possible. Hot and cold climatic wages reported and combined by regression techniques by quarter to derive mean food price (over year) used here. Imputations for missing quarters discussed in note to Table A-2.

[6] The average years of education completed for all women over age 15 is calculated from census 4 percent sample within each of the 899 municipalities of Colombia.

Finally, it would be desirable to include a measure of the level and distribution of personal economic resources in the municipaltiy, but no entirely satisfactory indicators are available at this time. Analysis of income data from Colombia shows relatively minor variation in incomes within an educational group across urban labor markets; however, rural incomes by education vary substantially by region (Fields and Schultz, 1980). Since a large fraction of income of the poor is expended on food, the price of food, as estimated by local agricultural agents, is, therefore, treated as an indicator of the price of a critical child health input. Higher local food prices may also be associated with higher wages, however. In rural areas, moreover, the incomes of most people depend directly or indirectly on food prices, so the net effect of these offsetting income and price effects on child mortality (or fertility) is ambiguous. There is clearly room to improve on the proxies considered here of the relevant input prices and incomes. This analysis thus represents only a start toward quantifying the market and policy determinants of vital rates.

Six specifications of the fertility and mortality equations are employed in the analysis. The first contains only the community-level program variables; the second and third add the schooling variable at the aggregate-community and at the individual-level, respectively, along with the mother's age. The fourth specification contains the individual-level education and age variables, the program variables and the community temperature, temperature squared, distance and food price characteristics in linear form. The fifth and sixth specifications add interactions between education and community variables. The fifth specification contains all variables but those for temperature and food price, while the sixth and final specification adds temperature

and temperature-education interaction variables to the fifth specification.

5. Empirical Findings

Tables 4 and 5 report the coefficients for each of the six specifications estimated using ordinary least squares. These are presented in parallel fashion, where the first dependent variable is children ever born and the second is the child mortality ratio, standardized for the mother's age and rural/urban residence. The regressions are reported separately for each of eight age groups of mothers in urban areas in Tables 4.1 through 4.8 and for mothers in rural areas in Tables 5.1 through 5.8. Discussion of these results is divided into two parts. The first compares the results across alternative specifications to assess the robustness of the estimated schooling and program effects and to test for the existence of interactions between the schooling and program variables. The second part explores the magnitudes of the estimated relationships derived from the preferred interactive specification.

5.1 Alternative Specifications of the Equations

Across age-groups of women, fertility and child mortality are in general significantly associated with the health and family planning variables in urban areas; these programs evidently do not influence those living outside of urban areas in a strong or consistent manner. Thus, the consideration of alternative specification will focus primarily on the regressions for the urban population in Tables 4.1 through 4.8.

For women residing in urban areas between the ages of 25 and 44, the presence of hospitals, clinics and family planning expenditures is associated

Table 4.1

Regressions of Fertility and Child Mortality Ratio

on Individual and Municipality Variables:

Mother's Age 15-19 in Urban Areas

(absolute value of t statistic reported in parentheses)

Explanatory Variables	Children Ever Born						Child Mortality Ratio Relative to Age/Region Level					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Individual:												
Schooling Years			-.0324 (9.13)	-.0314 (8.76)	-.0396 (5.18)	.0208 (.222)			-.0454 (4.28)	-.0455 (4.25)	-.0709 (3.11)	.0742 (.265)
Age Years		.141 (14.8)	.145 (15.4)	.145 (15.5)	.145 (15.4)	.145 (15.4)		.166 (5.93)	.172 (6.14)	.173 (6.18)	.172 (6.13)	.174 (6.20)
Municipality:												
Hospital Beds per capita ($x10^{-2}$)	-.113 (2.09)	-.0855 (1.56)	-.0920 (1.76)	-.0726 (1.32)	-.0643 (.727)	-.00175 (.0188)	-.0634 (.406)	-.0149 (-.0918)	-.0358 (.229)	-.0357 (.217)	-.0520 (.197)	-.127 (.459)
Clinics per capita ($x10^{-3}$)	-.329 (2.87)	-.139 (1.05)	-.197 (1.76)	-.0562 (.338)	-.472 (2.23)	-.136 (.464)	-.449 (1.36)	-.132 (.338)	-.269 (.809)	.011 (.0224)	-.916 (1.45)	-.712 (.812)
Family Planning Expenditures per capita (pesos $x10^{-2}$)	.00410 (.0241)	.0882 (.525)	.0509 (.311)	.0101 (.0584)	.0361 (.126)	-.142 (.488)	-.967 (1.98)	-.852 (1.72)	-.925 (1.89)	-.107 (2.09)	-1.55 (1.81)	-.0165 (1.90)
Time to Capital in days		.0407 (1.19)	.0571 (1.79)	.0440 (1.35)	.0323 (.687)	.0177 (.371)		-.00750 (.0741)	.0245 (.257)	.0200 (.206)	.0351 (.250)	.0699 (.490)
Average Temperature in Centigrade ($x10^{-1}$)				-.0232 (.0974)		.282 (.657)				.529 (.746)		1.39 (1.08)
Temperature Squared ($x10^{-2}$)				.0158 (.293)		-.0429 (.443)				-.117 (.728)		-.341 (1.18)
Price of Food (if reported, in pesos per day $x10^{-2}$)				.228 (.989)						.304 (.442)		
If no food price reported = 1				-.0337 (.313)						-.356 (1.11)		
Average Schooling of Women over age 15		-.0347 (3.09)						-.0573 (1.73)				
Interactions of Municipality Variables with Individual's Schooling:												
Hospital beds ($x10^{-3}$)					-.00807 (.366)	-.0161 (.703)					.00525 (.0797)	.0292 (.428)
Clinics ($x10^{-3}$)					.0642 (1.60)	.0251 (.422)					.143 (1.19)	.183 (1.03)
Family Planning ($x10^{-2}$)					.0291 (.486)	.0395 (.650)					.168 (.942)	.165 (.909)
Time to Capital					.0116 (.730)	.0132 (.822)					-.00638 (.135)	-.0155 (.323)
Temperature ($x10^{-1}$)						-.0408 (.474)						-.188 (.734)
Temperature Squared ($x10^{-2}$)						.00695 (.353)						.0511 (.869)
Intercept	1.37 (82.5)	-1.06 (6.08)	-1.14 (6.74)	-1.24 (4.00)	-1.11 (6.50)	-1.56 (3.06)	.430 (9.00)	-2.38 (4.64)	-2.52 (4.99)	-3.20 (3.45)	-2.43 (4.76)	-3.78 (2.49)
R^2 (F)	.0049 (5.00)	.0737 (40.6)	.0955 (53.8)	.0973 (32.9)	.0964 (32.6)	.0983 (23.8)	.0026 (2.66)	.0146 (7.54)	.0195 (10.1)	.0206 (6.42)	.0205 (6.39)	.0216 (4.80)
Sample Size	3068						3068					
Dependent Variable												
Mean	1.315						.3141					
Variance	.2958						2.428					

Table 4.2

Regressions of Fertility and Child Mortality Ratio

on Individual and Municipality Variables:

Mother's Age 20-24 in Urban Areas

(absolute value of t statistic reported in parentheses)

Explanatory Variables	Children Ever Born						Child Mortality Ratio Relative to Age/Region Level					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Individual:												
Schooling Years			-.102 (29.4)	-.0997 (28.7)	-.131 (16.7)	.120 (1.34)			-.0717 (14.0)	-.0705 (13.7)	-.0932 (8.02)	.0597 (.450)
Age Years		.196 (25.4)	.206 (27.5)	.206 (27.5)	.206 (27.5)	.206 (27.6)		-.00968 (.872)	-.00294 (.266)	-.00307 (.278)	-.00295 (.267)	-.00304 (.275)
Municipality:												
Hospital Beds per capita ($x10^{-3}$)	-.476 (6.83)	-.149 (2.09)	-.274 (4.16)	-.188 (2.68)	-.444 (3.90)	-.202 (1.66)	-.104 (1.07)	.139 (1.35)	.0294 (.302)	.0826 (.799)	-.0694 (.413)	.0789 (.439)
Clinics per capita ($x10^{-3}$)	-.951 (7.94)	.0306 (.218)	-.445 (3.89)	-.120 (.711)	-1.10 (5.11)	-.149 (.498)	-.790 (4.73)	.0279 (.138)	-.382 (2.26)	.193 (.775)	-1.12 (3.53)	-.209 (.471)
Family Planning Expenditures per capita (pesos $x10^{-2}$)	-.685 (3.34)	-.211 (1.04)	-.396 (2.04)	-.460 (2.28)	-.598 (1.76)	-.947 (2.70)	-.575 (2.01)	-.148 (.506)	-.312 (1.09)	-.488 (1.64)	-.394 (.784)	-.706 (1.36)
Time to Capital in days		.0185 (.419)	.130 (3.22)	.0958 (2.33)	.103 (1.76)	.0821 (1.39)		.0296 (.455)	.123 (2.05)	.113 (1.87)	.230 (2.68)	.233 (2.66)
Average Temperature in Centigrade ($x10^{-1}$)				-.282 (1.12)		.801 (1.82)				.745 (2.01)		1.52 (2.34)
Temperature Squared ($x10^{-2}$)				.0964 (1.68)		-.127 (1.26)				-.152 (1.79)		-.314 (2.11)
Price of Food (if reported, in pesos per day $x10^{-2}$)				.00496 (1.95)						.00578 (1.53)		
If no food price reported = 1				.246 (1.92)						-.0210 (.111)		
Average Schooling of Women over age 15		-.161 (12.29)						-.126 (6.67)				
Interactions of Municipality Variables with Individual's Schooling:												
Hospital beds ($x10^{-3}$)					-.0408 (1.90)	.0123 (.538)					.0228 (.719)	.00032 (.261)
Clinics ($x10^{-3}$)					.131 (3.59)	-.00396 (.0713)					.142 (2.63)	.0747 (.910)
Family Planning ($x10^{-2}$)					.0611 (.944)	.111 (1.64)					.0299 (.313)	.0513 (.513)
Time to Capital					.00650 (.420)	.00385 (.246)					-.0434 (1.90)	-.0434 (1.88)
Temperature ($x10^{-1}$)						-.203 (2.45)						-.127 (1.04)
Temperature Squared ($x10^{-2}$)						.0418 (2.19)						.0266 (.943)
Intercept	2.28 (114.)	-1.58 (8.94)	-1.95 (11.7)	-1.99 (6.34)	-1.83 (10.8)	-3.08 (6.08)	.574 (20.6)	1.17 (4.58)	.868 (3.52)	-.182 (.392)	.966 (3.86)	-.873 (1.17)
R^2 (F)	.0149 (57.0)	.0803 (164.)	.134 (292.)	.1375 (180.)	.136 (177.6)	.0140 (131.)	.0031 (11.8)	.0079 (14.9)	.021 (40.4)	.0223 (25.7)	.0224 (25.8)	.0236 (19.5)
Sample Size	11288						11288					
Dependent Variable												
Mean	2.027						.4320					
Variance	1.388						2.673					

Table 4.3

Regressions of Fertility and Child Mortality Ratio

on Individual and Municipality Variables:

Mother's Age 25-29 in Urban Areas

(absolute value of t statistic reported in parentheses)

Explanatory Variables	Children Ever Born						Child Mortality Ratio Relative to Age/Region Level					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Individual:												
Schooling Years			-.152 (34.2)	-.149 (33.3)	-.210 (20.6)	.0992 (.839)			-.0941 (18.2)	-.0934 (18.0)	-.136 (11.5)	.0777 (.566)
Age Years		.222 (20.8)	.214 (20.7)	.216 (20.9)	.214 (20.7)	.214 (20.8)		.0772 (6.38)	.0728 (6.07)	.0730 (6.09)	.0722 (6.03)	.0725 (6.05)
Municipality:												
Hospital Beds per capita ($x10^{-3}$)	-.299 (3.75)	.0467 (.584)	-.161 (2.14)	-.0707 (.904)	-.383 (3.22)	-.159 (1.29)	-.0672 (.760)	.117 (1.29)	.0357 (.408)	.0684 (.752)	.0362 (.262)	.169 (1.18)
Clinics per capita ($x10^{-3}$)	-2.28 (13.9)	-.197 (1.01)	-1.30 (8.26)	-.737 (3.19)	-2.74 (9.76)	-1.20 (3.05)	-1.39 (7.62)	-.365 (1.65)	-.769 (4.21)	-.345 (1.28)	-2.25 (6.91)	-1.033 (2.25)
Family Planning Expenditures per capita (pesos $x10^{-2}$)	-1.92 (6.65)	-.745 (2.59)	-1.37 (5.00)	-1.48 (5.22)	-1.77 (3.86)	-2.21 (4.72)	-.679 (2.12)	-.0498 (.153)	-.299 (.943)	-.514 (1.56)	-.696 (1.31)	-1.10 (2.03)
Time to Capital in days		.118 (2.01)	.351 (6.48)	.284 (5.18)	.312 (3.93)	.249 (3.10)		.203 (3.03)	.298 (4.75)	.297 (4.66)	.306 (3.32)	.284 (3.04)
Average Temperature in Centigrade ($x10^{-1}$)				-.562 (1.61)		.917 (1.55)				.709 (1.75)		1.58 (2.30)
Temperature Squared ($x10^{-2}$)				.185 (2.31)		-.108 (.797)				-.150 (1.61)		-.308 (1.95)
Price of Food (if reported, in pesos per day $x10^{-2}$)				.0118 (3.25)						-.0639 (.152)		
If no food price reported = 1				.304 (1.73)						-.324 (1.59)		
Average Schooling of Women over age 15		-.312 (17.2)						-.146 (7.12)				
Interactions of Municipality Variables with Individual's Schooling:												
Hospital beds ($x10^{-3}$)					.0635 (2.51)	.0405 (1.55)					.00233 (.0796)	-.0215 (.710)
Clinics ($x10^{-3}$)					.281 (6.12)	.0832 (1.14)					.290 (5.44)	.121 (1.43)
Family Planning ($x10^{-2}$)					.111 (1.29)	.163 (1.81)					.111 (1.11)	.180 (1.73)
Time to Capital					.00991 (.525)	.0119 (.622)					-.00471 (.215)	.000926 (.0418)
Temperature ($x10^{-1}$)						-.236 (2.15)						-.146 (1.14)
Temperature Squared ($x10^{-2}$)						.0455 (1.80)						.0240 (.816)
Intercept	3.46 (129.)	1.52 (5.17)	-1.79 (6.38)	-1.86 (4.00)	-1.53 (5.41)	-3.18 (4.57)	.924 (31.1)	-.715 (2.14)	.727 (2.24)	-1.55 (2.87)	-.529 (1.61)	-2.55 (3.17)
R^2 (F)	.0233 (106.)	.0777 (187.)	.133 (341.)	.138 (212.)	.137 (211.)	.142 (157.)	.0055 (24.3)	.0145 (32.5)	.0348 (79.8)	.0353 (48.7)	.0373 (51.5)	.0386 (38.1)
Sample Size	13304						13304					
Dependent Variable Mean	3.029						.7162					
Variance	3.228						3.892					

Table 4.4

Regressions of Fertility and Child Mortality Ratio

on Individual and Municipality Variables:

Mother's Age 30-34 in Urban Areas

(absolute value of t statistic reported in parentheses)

Explanatory Variables	Children Ever Born						Child Mortality Ratio Relative to Age/Region Level					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Individual:												
Schooling Years			-.190 (29.4)	-.187 (28.9)	-.259 (17.0)	-.0149 (.0905)			-.0928 (17.5)	-.0937 (17.6)	-.145 (11.6)	.380 (2.82)
Age Years		.283 (19.5)	.269 (18.9)	.270 (19.1)	.269 (18.9)	.269 (19.0)		.00963 (.819)	.00297 (.254)	.00179 (.153)	.00244 (.209)	.00139 (.119)
Municipality:												
Hospital Beds per capita ($x10^{-3}$)	-.510 (5.37)	-.135 (1.44)	-.311 (3.44)	-.219 (2.35)	-.425 (2.79)	-.242 (1.54)	-.125 (1.66)	.0459 (.602)	-.0328 (.440)	-.0500 (.654)	-.109 (.871)	-.146 (1.13)
Clinics per capita ($x10^{-3}$)	-3.30 (14.1)	-.280 (1.02)	-2.10 (9.30)	-1.53 (4.66)	-3.48 (9.06)	-2.19 (4.13)	-1.90 (10.3)	-.493 (2.21)	-1.318 (7.09)	-1.16 (4.32)	-2.78 (8.81)	-1.99 (4.57)
Family Planning Expenditures per capita (pesos $x10^{-2}$)	-2.37 (6.25)	-.743 (1.97)	-1.65 (4.54)	-1.68 (4.49)	-2.88 (4.68)	-3.19 (5.13)	-.894 (2.98)	-.117 (.384)	-.530 (1.78)	-.650 (2.11)	-.771 (1.53)	-.983 (1.92)
Time to Capital in days		.108 (1.24)	.514 (6.48)	.447 (5.55)	.439 (3.79)	.363 (3.09)		.0663 (.947)	.252 (3.87)	.294 (4.44)	.188 (1.97)	.267 (2.77)
Average Temperature in Centigrade ($x10^{-1}$)				-.790 (1.61)		.153 (.194)				1.18 (2.92)		3.38 (5.21)
Temperature Squared ($x10^{-2}$)				.249 (2.21)		.0711 (.390)				-.292 (3.15)		-.813 (5.44)
Price of Food (if reported, in pesos per day $x10^{-2}$)				.517 (1.01)						-.540 (1.28)		
If no food price reported = 1				.701 (2.82)						-.307 (1.50)		
Average Schooling of Women over age 15	-.464 (18.3)							-.216 (10.5)				
Interactions of Municipality Variables with Individual's Schooling:												
Hospital beds ($x10^{-3}$)					.0372 (1.06)	.0158 (.435)					.0260 (.907)	.0272 (.911)
Clinics ($x10^{-3}$)					.298 (4.48)	.134 (1.32)					.313 (5.74)	.164 (1.97)
Family Planning ($x10^{-4}$)					.335 (2.67)	.378 (2.92)					.0856 (.829)	.133 (1.26)
Time to Capital					.0218 (.666)	.0234 (.714)					.0190 (.706)	.00794 (.294)
Temperature ($x10^{-1}$)						-.180 (1.18)						-.519 (4.14)
Temperature Squared ($x10^{-2}$)						.0335 (3.85)						.123 (4.23)
Intercept	4.91 (137.)	-2.59 (5.50)	-3.11 (6.82)	-2.87 (4.21)	-2.83 (6.17)	-3.67 (3.85)	1.14 (40.0)	1.54 (4.02)	1.32 (3.52)	.369 (.657)	1.54 (4.08)	-1.77 (2.26)
R^2	.0266	.0842	.121	.125	.124	.127	.0111	.0219	.0371	.0385	.0400	.0427
(F)	(111.)	(187.)	(281.)	(174.)	(172.)	(127.)	(45.6)	(45.4)	(78.4)	(48.8)	(50.9)	(38.9)
Sample Size	12208						12208					
Dependent Variable												
Mean	4.285						.8486					
Variance	5.890						3.627					

Table 4.5
Regressions of Fertility and Child Mortality Ratio
on Individual and Municipality Variables:
Mother's Age 35-39 in Urban Areas
(absolute value of t statistic reported in parentheses)

Explanatory Variables	Children Ever Born						Child Mortality Ratio Relative to Age/Region Level					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Individual:												
Schooling Years			-.204 (24.)	-.201 (23.)	-.278 (14.)	-.178 (.81)			-.102 (19.8)	-.101 (19.5)	-.150 (12.7)	-.223 (1.70)
Age Years		.228 (12.0)	.215 (11.4)	.216 (11.5)	.217 (11.5)	.217 (11.5)		.0188 (1.64)	.0134 (1.18)	.0134 (1.18)	.0144 (1.28)	.0148 (1.31)
Municipality:												
Hospital Beds per capita ($x10^{-3}$)	-.641 (5.02)	-.0971 (.758)	-.420 (3.37)	-.373 (2.90)	-.726 (3.57)	-.469 (2.25)	-.245 (3.23)	-.0809 (1.05)	-.160 (2.13)	-.139 (1.80)	-.366 (2.99)	-.361 (2.87)
Clinics per capita ($x10^{-3}$)	-4.52 (15.3)	-.961 (2.78)	-3.28 (11.3)	-2.46 (6.07)	-4.63 (9.72)	-2.79 (4.28)	-1.77 (10.1)	-.655 (3.13)	-1.21 (6.88)	-.528 (2.16)	-2.42 (8.42)	-1.28 (3.27)
Family Planning Expenditures per capita (pesos $x10^{-2}$)	-1.84 (3.84)	.265 (.549)	-.820 (1.75)	-.925 (1.92)	-1.15 (1.57)	-1.59 (2.13)	-.766 (2.75)	-.112 (.384)	-.343 (1.21)	-.568 (1.96)	-.254 (.575)	-.542 (1.21)
Time to Capital in days		.134 (1.35)	.572 (6.13)	.551 (5.83)	.442 (3.32)	.365 (2.70)		.0698 (1.16)	.180 (3.20)	.209 (3.67)	.245 (3.05)	.287 (3.53)
Average Temperature in Centigrade ($x10^{-1}$)				.811 (1.33)		1.05 (1.09)				1.81 (4.92)		3.31 (5.67)
Temperature Squared ($x10^{-2}$)				-.150 (1.07)		-.113 (.507)				-.415 (4.88)		-.761 (5.63)
Price of Food (if reported, in pesos per day $x10^{-2}$)				1.10 (1.66)						-.150 (.37)		
If no food price reported = 1				.537 (1.63)						-.080 (.40)		
Average Schooling of Women over age 15		-.555 (17.6)						-.174 (9.13)				
Interactions of Municipality Variables with Individual's Schooling:												
Hospital Beds ($x10^{-3}$)					.100 (1.98)	.0495 (.95)					.0661 (2.17)	.0705 (2.24)
Clinics ($x10^{-3}$)					.314 (3.59)	.063 (.46)					.271 (5.14)	.164 (2.00)
Family Planning ($x10^{-2}$)					.108 (.71)	.179 (1.14)					-.0124 (.13)	(.0106 (.11)
Time to Capital					.0504 (1.18)	.0693 (1.61)					-.0350 (1.36)	-.0387 (1.50)
Temperature ($x10^{-1}$)						.038 (.19)						-.361 (2.96)
Temperature Squared ($x10^{-2}$)						-.031 (.65)						.0843 (2.98)
Intercept	6.11 (136.)	-.529 (.744)	-1.31 (1.87)	-2.68 (2.82)	-1.12 (1.60)	-3.03 (2.42)	1.18 (44.)	1.05 (2.43)	.972 (2.30)	-.929 (1.62)	1.10 (2.63)	-2.39 (3.18)
R^2 (F)	.0266 (109.)	.0659 (141.)	.0854 (186.)	.0865 (113.)	.0870 (114.)	.0895 (84.)	.0119 (48.)	.0205 (41.7)	.0449 (94.)	.0469 (59.)	.0481 (61.)	.0512 (46.)
Sample Size	11978						11978					
Dependent Variable												
Mean	5.370						.889					
Variance	9.201						3.206					

Table 4.6

Regressions of Fertility and Child Mortality Ratio

on Individual and Municipality Variables:

Mother's Age 40-44 in Urban Areas

(absolute value of t-statistic reported in parentheses)

Explanatory Variables	Children Ever Born						Child Mortality Ratio Relative to Age/Region Level					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Individual:												
Schooling Years			-.157 (13.5)	-.157 (13.4)	-.194 (7.23)	-.128 (.412)			-.0814 (15.2)	-.0822 (15.3)	-.122 (9.87)	+.405 (2.82)
Age Years		.200 (8.28)	.192 (7.96)	.191 (7.90)	.192 (7.95)	.189 (7.85)		$.729 \times 10^{-4}$ (.00649)	-.00269 (.241)	-.00317 (.285)	-.00156 (.140)	-.00229 (.207)
Municipality:												
Hospital Beds per capita ($\times 10^{-3}$)	-.659 (3.89)	-.199 (1.16)	-.483 (2.89)	-.487 (2.81)	-.695 (2.75)	-.580 (2.24)	-.169 (2.16)	-.0262 (.330)	-.0963 (1.25)	-.117 (1.46)	-.0774 (.664)	-.128 (1.08)
Clinics per capita ($\times 10^{-3}$)	-4.83 (12.5)	-1.67 (3.64)	-3.65 (9.37)	-2.73 (4.99)	-3.95 (6.20)	-2.18 (2.50)	-1.68 (9.43)	-.653 (3.08)	-1.11 (6.17)	-.631 (2.50)	-2.54 (8.66)	-1.43 (3.55)
Family Planning Expenditures per capita (pesos $\times 10^{-2}$)	-2.60 (4.03)	-.479 (.732)	-1.79 (2.80)	-2.01 (3.06)	-1.96 (2.01)	-2.42 (2.46)	-.419 (1.41)	.262 (.861)	-.112 (.379)	-.333 (1.10)	.0586 (.131)	-.236 (.521)
Time to Capital in days		.503 (3.22)	.993 (6.77)	1.05 (7.07)	.723 (3.21)	.690 (3.03)		.154 (2.13)	.282 (4.17)	.323 (4.70)	.222 (2.15)	.303 (2.90)
Average Temperature in Centigrade ($\times 10^{-1}$)				2.59 (3.14)		2.44 (1.87)				1.71 (4.50)		3.75 (6.26)
Temperature Squared ($\times 10^{-2}$)				-.601 (3.16)		-.482 (1.61)				-.406 (4.64)		-.881 (6.37)
Price of Food (if reported, in pesos per day $\times 10^{-2}$)				-.146 (.170)						-.152 (.383)		
If no food price reported = 1				.474 (1.09)						-.419 (2.10)		
Average Schooling of Women over age 15		-.485 (11.6)						-.154 (7.94)				
Interactions of Municipality Variables with Individual's Schooling:												
Hospital beds ($\times 10^{-3}$)					.0638 (1.14)	.0316 (.555)					-.00353 (.137)	.00267 (.102)
Clinics ($\times 10^{-3}$)					.0814 (.679)	-.165 (.851)					.339 (6.14)	.172 (1.93)
Family Planning ($\times 10^{-2}$)					.0791 (.327)	.168 (.669)					-.0209 (.188)	.0277 (.240)
Time to Capital					.122 (1.56)	.149 (1.89)					.0206 (.570)	.00770 (.212)
Temperature ($\times 10^{-1}$)						.0706 (.244)						-.509 (3.82)
Temperature Squared ($\times 10^{-2}$)						-.0399 (.597)						.119 (3.86)
Intercept	7.03 (118)	.185 (.181)	-.668 (.662)	-3.29 (2.49)	-.550 (.543)	-3.51 (2.05)	1.16 (42.4)	1.64 (3.46)	1.47 (3.15)	-.194 (.319)	1.57 (3.36)	-2.25 (2.86)
R^2 (F)	.0228 (76.7)	.0477 (82.3)	.0522 (90.5)	.0533 (55.5)	.0525 (54.7)	.0548 (40.8)	.0110 (36.7)	.020 (33.5)	.0363 (62.0)	.0391 (40.1)	.0401 (41.2)	.0444 (32.7)
Sample Size	9874						9874					
Dependent Variable												
Mean	6.218						.917					
Variance	12.77						2.68					

Table 4.7

Regressions of Fertility and Child Mortality Ratio

on Individual and Municipality Variables:

Mother's Age 45-49 in Urban Areas

(absolute value of t statistic reported in parentheses)

Explanatory Variables	Children Ever Born						Child Mortality Ratio Relative to Age/Region Level					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Individual:												
Schooling Years			-.149 (10.5)	-.150 (10.6)	-.234 (6.82)	-.200 (.546)			-.0819 (15.0)	-.0814 (14.9)	-.104 (7.86)	.281 (1.99)
Age Years		.107 (3.56)	.105 (3.49)	.105 (3.49)	.106 (3.53)	.105 (3.52)		.00738 (.634)	.00756 (.656)	.00820 (.712)	.00716 (.622)	.00692 (.604)
Municipality:												
Hospital Beds per capita ($x10^{-3}$)	-.727 (3.09)	-.115 (.471)	-.540 (2.30)	-.496 (2.03)	-1.33 (3.51)	-1.08 (2.77)	-.134 (1.47)	.108 (1.15)	-.0143 (.158)	-.0119 (.127)	.0236 (.162)	.0757 (.504)
Clinics per capita ($x10^{-3}$)	-4.92 (10.46)	-2.16 (3.88)	-4.01 (8.45)	-2.97 (4.54)	-4.90 (6.46)	-2.93 (2.88)	-1.79 (9.81)	-.780 (3.61)	-1.28 (6.99)	-.564 (2.25)	-2.23 (7.65)	-.977 (2.49)
Family Planning Expenditures per capita (pesos $x10^{-2}$)	-.192 (.259)	1.20 (1.59)	.268 (.363)	-.169 (.223)	1.16 (1.05)	.466 (.415)	.247 (.861)	.822 (2.82)	.540 (1.90)	.322 (1.10)	.868 (2.04)	.518 (1.20)
Time to Capital in days		.0196 (.114)	.397 (2.44)	.481 (2.92)	.130 (.620)	.121 (.573)		.181 (2.70)	.285 (4.56)	.313 (4.93)	.227 (2.81)	.268 (3.28)
Average Temperature in Centigrade ($x10^{-1}$)				3.40 (3.40)		3.05 (1.98)				2.00 (5.20)		3.48 (5.87)
Temperature Squared ($x10^{-2}$)				-.790 (3.43)		-.618 (1.74)				-.465 (5.25)		-.790 (5.80)
Price of Food (if reported, in pesos per day $x10^{-2}$)				-1.40 (1.30)						.357 (.857)		
If no food price reported = 1				-.314 (.625)				-.153 (7.65)		-.0444 (.230)		
Average Schooling of Women over age 15		-.442 (8.58)										
Interactions of Municipality Variables with Individual's Schooling:												
Hospital beds ($x10^{-3}$)					.252 (2.69)	.183 (1.90)					-.0108 (.299)	-.0197 (.534)
Clinics ($x10^{-3}$)					.223 (1.52)	-.0338 (.150)					.237 (4.21)	.0949 (1.10)
Family Planning ($x10^{-2}$)					-.232 (.916)	-.113 (.434)					-.0803 (.825)	-.0422 (.421)
Time to Capital					.133 (1.85)	.156 (2.16)					.0265 (.957)	.0254 (.915)
Temperature ($x10^{-1}$)						.129 (.379)						-.348 (2.67)
Temperature Squared ($x10^{-2}$)						-.0572 (.729)						.0773 (2.57)
Intercept	7.30 (98.7)	3.71 (2.63)	2.77 (1.97)	-.460 (.261)	2.97 (2.12)	-.764 (.355)	1.14 (39.9)	1.25 (2.29)	.975 (1.61)	-1.23 (1.82)	1.07 (1.98)	-2.65 (3.20)
R^2 (F)	.0162 (44.3)	.0276 (38.3)	.0321 (44.7)	.0336 (28.1)	.0336 (28.1)	.0365 (21.9)	.0126 (34.4)	.0236 (32.5)	.0433 (60.9)	.0470 (39.9)	.0454 (38.4)	.0505 (30.7)
Sample Size	8087						8087					
Dependent Variable												
Mean	6.609						.9430					
Variance	15.24						2.283					

Table 4.8

Regressions of Fertility and Child Mortality Ratio

on Individual and Municipality Variables:

Mother's Age 50-64 in Urban Areas

(absolute value of t statistic reported in parentheses)

Explanatory Variables	Children Ever Born						Child Mortality Ratio Relative to Age/Region Level					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Individual:												
Schooling Years			-.108 (9.71)	-.114 (10.2)	-.104 (4.07)	-.652 (2.22)			-.0608 (17.1)	-.0621 (17.3)	-.0766 (9.41)	.0205 (.218)
Age Years		.00502 (.643)	.000732 (.0938)	-.000251 (.0323)	.000552 (.0708)	$-.202\times10^{-4}$ (.00259)		-.00433 (1.72)	-.00665 (2.67)	-.00676 (2.71)	-.00657 (2.64)	-.00674 (2.71)
Municipality:												
Hospital Beds per capita ($\times10^{-3}$)	-.710 (4.35)	-.418 (2.49)	-.597 (3.66)	-.629 (3.73)	-.989 (3.79)	-.961 (3.59)	-.102 (1.94)	-.00501 (.0929)	-.0476 (.912)	-.0710 (1.32)	-.0848 (1.01)	-.0997 (1.16)
Clinics per capita ($\times10^{-3}$)	-4.96 (13.4)	-3.28 (7.53)	-4.41 (11.8)	-2.84 (5.52)	-3.30 (5.76)	-1.98 (2.59)	-1.50 (12.6)	-.934 (6.67)	-1.22 (10.2)	-.937 (5.70)	-1.66 (9.08)	-1.19 (4.88)
Family Planning Expenditures per capita (pesos $\times10^{-2}$)	-.897 (1.54)	.144 (.242)	-.480 (.822)	-1.09 (1.82)	-.117 (.135)	-.421 (.482)	-.151 (.805)	.202 (1.05)	.0453 (.243)	-.0792 (.412)	.204 (.740)	.0675 (.241)
Time to Capital in days		-.0189 (.136)	.222 (1.71)	.401 (3.06)	.0442 (.262)	.0914 (.538)		-.00717 (.161)	.0519 (1.25)	.0863 (2.06)	.0148 (.275)	.0437 (.803)
Average Temperature in Centigrade ($\times10^{-1}$)			6.28 (8.09)			3.77 (3.26)				1.29 (5.18)		1.62 (4.37)
Temperature Squared ($\times10^{-2}$)			-1.51 (8.43)			-.860 (3.22)				-.314 (5.48)		-.379 (4.43)
Price of Food (if reported, in pesos per day $\times10^{-2}$)			-1.73 (2.11)							-.00109 (.415)		
If no food price reported = 1			.606 (1.46)							-.0630 (.475)		
Average Schooling of Women over age 15		-.271 (6.99)						-.0911 (7.31)				
Interactions of Municipality Variables with Individual's Schooling:												
Hospital beds ($\times10^{-3}$)					.126 (1.92)	.0938 (1.41)					.0123 (.590)	.00980 (.460)
Clinics ($\times10^{-3}$)					-.288 (2.49)	-.261 (1.43)					.120 (3.23)	.0637 (1.09)
Family Planning ($\times10^{-2}$)					-.135 (.642)	-.213 (.985)					-.0382 (.567)	-.0276 (.397)
Time to Capital					.103 (1.73)	.134 (2.24)					.0179 (.942)	.0189 (.988)
Temperature ($\times10^{-1}$)						.651 (2.38)						-.0755 (.863)
Temperature Squared ($\times10^{-4}$)						-.174 (2.76)						(.0141 (.696)
Intercept	7.17 (130.)	7.77 (16.9)	7.38 (16.7)	1.56 (1.69)	7.36 (16.5)	3.36 (2.58)	1.09 (61.1)	1.62 (11.0)	1.61 (11.4)	.394 (1.34)	1.66 (11.6)	.00816 (.0196)
R^2 (F)	.0160 (77.6)	.0197 (48.2)	.0228 (55.8)	.0286 (42.2)	.0237 (34.9)	.0300 (31.7)	.0123 (59.5)	.0166 (40.4)	.0326 (80.7)	.0351 (52.2)	.0334 (49.6)	.0364 (38.6)
Sample Size	14353						14353					
Dependent Variable												
Mean	6.446						.9015					
Variance	16.23						1.675					

Table 5.1

Regressions of Fertility and Child Mortality Ratio

on Individual and Municipality Variables:

Mother's Age 15-19 in Rural Areas

(absolute value of t statistic reported in parentheses)

Explanatory Variables	Children Ever Born						Child Mortality Ratio Relative to Age/Region Level					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Individual:												
Schooling Years			-.0272 (3.84)	-.0252 (3.51)	-.0236 (2.01)	.0977 (.527)			-.0582 (3.15)	-.0568 (3.02)	-.0241 (.789)	-.115 (.237)
Age Years		.190 (15.1)	.192 (15.3)	.194 (15.4)	.193 (15.3)	.194 (15.5)		.129 (3.94)	.133 (4.07)	.134 (4.09)	.132 (4.04)	.133 (4.06)
Municipality:												
Hospital Beds per capita ($x10^{-3}$)	.0264 (.380)	-.0108 (.152)	-.0265 (.401)	-.0162 (.243)	.0275 (.237)	.0395 (.340)	-.0487 (.284)	.0268 (.145)	-.0473 (.274)	-.0493 (.284)	.308 (1.02)	.324 (1.07)
Clinics per capita ($x10^{-3}$)	-.205 (.921)	-.107 (.495)	-.169 (.809)	-.176 (.838)	.119 (.373)	.0679 (.211)	-.121 (.220)	.149 (.264)	-.0692 (.127)	-.0733 (.134)	.312 (.374)	.301 (.359)
Family Planning Expenditures per capita (pesos $x10^{-2}$)	-.221 (1.27)	-.181 (1.08)	-.210 (1.28)	-.207 (1.25)	-.306 (1.23)	-.307 (1.24)	-.559 (1.30)	-.412 (.947)	-.522 (1.22)	-.499 (1.16)	-.895 (1.38)	-.895 (1.38)
Time to Capital in days		-.0198 (1.11)	-.0192 (1.12)	-.0274 (1.54)	-.0394 (1.70)	-5.60 (2.35)		-.00425 (.0917)	.00409 (.0912)	-.00151 (.0326)	.0477 (.793)	.0455 (.730)
Average Temperature in Centigrade ($x10^{-1}$)				.199 (.661)		.415 (.861)				-.166 (.211)		-.262 (.208)
Temperature Squared ($x10^{-2}$)				-.0282 (.409)		-.0574 (.526)				.0450 (.250)		.0598 (.210)
Price of Food (if reported, in pesos per day $x10^{-2}$)				.107 (.427)						.249 (.382)		
If no food price reported = 1				.102 (.533)						.0964 (.192)		
Average Schooling of Women over age 15		-.0238 (1.31)						-.0793 (1.68)				
Interactions of Municipality Variables with Individual's Schooling:												
Hospital beds ($x10^{-3}$)					-.0212 (.515)	-.0201 (.487)					-.156 (1.46)	-.161 (1.50)
Clinics ($x10^{-3}$)					-.125 (1.18)	-.107 (1.01)					-.165 (.600)	-.169 (.609)
Family Planning ($x10^{-2}$)					.0419 (.532)	.0361 (.459)					.154 (.753)	.157 (.765)
Time to Capital					.0151 (1.33)	.0196 (1.71)					-.0313 (1.06)	-.0330 (1.10)
Temperature ($x10^{-1}$)						-.0661 (.382)						.0676 (.149)
Temperature Squared ($x10^{-2}$)						.00540 (.138)						-.0113 (.110)
Intercept		-1.88 (8.21)	-1.92 (8.51)	-2.28 (5.95)	-1.94 (8.55)	-2.61 (4.54)	.455 (12.3)	-1.68 (2.82)	-1.82 (3.09)	-1.77 (1.77)	-1.88 (3.17)	-1.62 (1.10)
R^2 (F)		.113 (39.1)	.120 (41.5)	.123 (25.7)	.121 (25.3)	.128 (19.1)	.0011 (.667)	.0108 (3.33)	.0146 (4.52)	.0148 (2.74)	.0164 (3.04)	.0166 (2.20)
Sample Size	1840						1840					
Dependent Variable Mean	1.452						.4275					
Variance	.3716						2.253					

Table 5.2
Regressions of Fertility and Child Mortality Ratio
on Individual and Municipality Variables:
Mother's Age 20-24 in Rural Areas
(absolute value of t statistic reported in parentheses)

Explanatory Variables	Children Ever Born						Child Mortality Ratio Relative to Age/Region Level					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Individual:												
Schooling Years			-.109 (12.1)	-.104 (11.5)	-.110 (7.81)	.343 (1.77)			-.0954 (7.69)	-.0935 (7.52)	-.0918 (4.72)	.0696 (.259)
Age Years		.282 (21.7)	.284 (22.2)	.289 (22.6)	.284 (22.2)	.290 (22.7)		.0247 (1.39)	.0270 (1.53)	.0291 (1.65)	.0271 (1.53)	.0296 (1.66)
Municipality:												
Hospital Beds per capita ($x10^{-3}$)	.149 (1.56)	.167 (1.67)	.135 (1.48)	.168 (1.84)	.0859 (.755)	.175 (1.53)	-.0803 (.639)	.0150 (.110)	.0113 (.0896)	.0549 (.436)	-.0388 (.247)	.00670 (.0424)
Clinics per capita ($x10^{-3}$)	.519 (1.78)	.676 (2.33)	.595 (2.15)	.498 (1.80)	.620 (1.52)	.442 (1.08)	.111 (.289)	.242 (.612)	.219 (.575)	.203 (.530)	.118 (.211)	.0708 (.126)
Family Planning Expenditures per capita (pesos $x10^{-2}$)	-.412 (1.50)	-.297 (1.11)	-.372 (1.42)	.401 (1.53)	-.193 (.530)	-.259 (.715)	.0815 (.226)	.216 (.587)	.180 (.502)	.00523 (.0145)	.593 (1.18)	.540 (1.08)
Time to Capital in days		.0328 (1.29)	-.0220 (.909)	-.0167 (.670)	.0200 (.624)	-.0139 (.421)		.134 (3.87)	.120 (3.61)	.113 (3.30)	.148 (3.36)	.140 (3.07)
Average Temperature in Centigrade ($x10^{-1}$)				.735 (1.99)		1.80 (3.17)				1.57 (3.09)		1.70 (2.16)
Temperature Squared ($x10^{-2}$)				-.101 (1.18)		-.329 (2.53)				-.329 (2.78)		-.353 (1.96)
Price of Food (if reported, in pesos per day $x10^{-2}$)				.378 (1.13)						-.0127 (2.75)		
If no food price reported = 1				-.0283 (.150)						-.856 (3.28)		
Average Schooling of Women over age 15		-.0491 (2.00)						-.0273 (.814)				
Interactions of Municipality Variables with Individual's Schooling:												
Hospital beds ($x10^{-3}$)					.0290 (.743)	.00604 (.154)					.0287 (.533)	.0154 (.284)
Clinics ($x10^{-3}$)					-.00636 (.0493)	.00764 (.0593)					.0542 (.305)	.0677 (.380)
Family Planning ($x10^{-4}$)					-.0836 (.738)	-.0835 (.741)					-.190 (1.22)	-.184 (1.18)
Time to Capital					.00158 (.118)	-.000193 (.0141)					-.0177 (.959)	-.0176 (.927)
Temperature ($x10^{-1}$)						-.400 (2.17)						-.136 (.532)
Temperature Squared ($x10^{-2}$)						.0859 (2.01)						.0276 (.466)
Intercept	2.58 (128.)	3.55 (12.2)	-3.47 (12.2)	-4.77 (10.0)	-3.47 (12.1)	-5.88 (8.80)	.789 (29.8)	.249 (.625)	.368 (.888)	-1.19 (1.82)	.337 (.857)	-1.67 (1.81)
R^2	.001	.0789	.102	.112	.102	.113	.0001	.0037	.0140	.0185	.0144	.0167
(F)	(2.15)	(80.2)	(106.)	(70.7)	(63.5)	(50.9)	(.185)	(3.46)	(13.2)	(10.6)	(8.20)	(6.82)
Sample Size	5621						5621					
Dependent Variable												
Mean	2.618						.787					
Variance	2.013						3.47					

Table 5.3
Regressions of Fertility and Child Mortality Ratio
on Individual and Municipality Variables:
Mother's Age 25-29 in Rural Areas
(absolute value of t statistic reported in parentheses)

Explanatory Variables	Children Ever Born						Child Mortality Ratio Relative to Age/Region Level					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Individual:												
Schooling Years			-.180 (14.7)	-.175 (14.2)	-.195 (10.1)	-.111 (.427)			-.0905 (8.81)	-.0916 (8.90)	-.110 (6.81)	.353 (1.62)
Age Years		.297 (16.3)	.297 (16.6)	.298 (16.7)	.297 (16.6)	.298 (16.7)		-.0258 (1.71)	-.0252 (1.68)	-.0254 (1.70)	-.0244 (1.64)	-.0241 (1.61)
Municipality:												
Hospital Beds per capita ($x10^{-3}$)	-.489 (4.04)	-.255 (2.01)	-.351 (2.99)	-.286 (2.44)	-.496 (2.39)	-.351 (1.69)	-.0618 (.629)	.0214 (.204)	.0283 (.288)	.0541 (.550)	.0829 (.477)	.127 (.728)
Clinics per capita ($x10^{-3}$)	.151 (.385)	.570 (1.45)	.335 (.885)	.358 (.945)	.549 (.962)	.402 (.702)	-.0946 (.297)	.0278 (.0855)	.0193 (.0612)	.0820 (.259)	-.881 (1.85)	-.694 (1.44)
Family Planning Expenditures per capita (pesos $x10^{-2}$)	-.777 (2.24)	-.413 (1.20)	-.577 (1.73)	-.597 (1.78)	1.59 (.333)	-.0103 (2.17)	-.294 (1.05)	-.169 (.593)	-.178 (.638)	-.365 (1.30)	-.227 (.571)	-.327 (.821)
Time to Capital in days		.0589 (1.48)	.0642 (1.71)	.0176 (.456)	-.00947 (1.99)	-.0435 (.886)		.148 (4.51)	.136 (4.34)	.152 (4.68)	.131 (3.28)	.147 (3.55)
Average Temperature in Centigrade ($x10^{-1}$)			1.92 (3.77)			2.18 (2.96)				1.85 (4.34)		2.51 (4.06)
Temperature Squared ($x10^{-2}$)			-.355 (2.99)			-.380 (2.23)				-.424 (4.26)		-.571 (3.99)
Price of Food (if reported, in pesos per day $x10^{-2}$)			.770 (1.62)							-.0147 (3.69)		
If no food price reported = 1			.883 (.341)							-.746 (3.44)		
Average Schooling of Women over age 15		-.136 (4.02)						-.0251 (.895)				
Interactions of Municipality Variables with Individual's Schooling:												
Hospital beds ($x10^{-3}$)					.0556 (.886)	.0281 (.447)					-.0210 (.400)	-.0387 (.615)
Clinics ($x10^{-3}$)					-.100 (.532)	-.0436 (.230)					.400 (2.54)	.359 (2.26)
Family Planning ($x10^{-2}$)					.171 (1.18)	.176 (1.22)					.0164 (.135)	.0344 (.284)
Time to Capital					.0289 (1.59)	.385 (2.05)					.00324 (.213)	.00196 (.125)
Temperature ($x10^{-1}$)						.00373 (.0151)						-.426 (2.05)
Temperature Squared ($x10^{-2}$)						-.0177 (.308)						.0941 (1.95)
Intercept	4.16 (157.)	-3.50 (7.11)	-3.45 (7.17)	-6.08 (8.61)	-3.43 (7.12)	-6.32 (6.93)	.922 (42.9)	1.61 (3.95)	1.73 (4.30)	.151 (.255)	1.75 (4.35)	-.914 (1.19)
R^2 (F)	.0039 (8.18)	.0478 (51.9)	.0772 (86.6)	.0878 (59.8)	.0779 (52.4)	.0891 (43.3)	.0003 (.596)	.0049 (5.09)	.0170 (18.0)	.022 (14.0)	.0182 (11.5)	.0211 (9.55)
Sample Size	6217						6217					
Dependent Variable												
Mean	4.081						.9011					
Variance	4.289						2.810					

Table[15] 5.4

Regressions of Fertility and Child Mortality Ratio

on Individual and Municipality Variables:

Mother's Age 30-34 in Rural Areas

(absolute value of t statistic reported in parentheses)

Explanatory Variables	Children Ever Born (1)	(2)	(3)	(4)	(5)	(6)	Child Mortality Ratio Relative to Age/Region Level (7)	(8)	(9)	(10)	(11)	(12)
Individual:												
Schooling Years			-.185 (10.1)	-.175 (9.60)	-.186 (6.93)	-.357 (.970)			-.0884 (9.18)	-.0888 (9.18)	-.102 (7.17)	-.0102 (.0522)
Age Years		.333 (13.8)	.337 (14.0)	.334 (14.0)	.335 (14.0)	.332 (13.9)		-.00449 (.352)	-.00200 (.158)	-.00291 (.230)	-.00188 (.148)	-.00311 (.246)
Municipality:												
Hospital Beds per capita ($x10^{-3}$)	-.0853 (.685)	-.0416 (.326)	-.0810 (.663)	-.00554 (.0455)	-.169 (.815)	-.0751 (.363)	-.0196 (.303)	.0255 (.378)	.0197 (.305)	.0377 (.581)	-.0126 (.115)	.00163 (.0148)
Clinics per capita ($x10^{-3}$)	1.07 (2.00)	1.06 (1.94)	1.12 (2.13)	1.18 (2.24)	2.16 (2.90)	1.91 (2.57)	-.249 (.894)	-.118 (.411)	-.0397 (.143)	.0102 (.0365)	-.440 (1.12)	-.379 (.959)
Family Planning Expenditures per capita (pesos $x10^{-2}$)	-.280 (.553)	.0122 (.0240)	-.124 (.250)	-.155 (.313)	-.457 (.674)	-.448 (.664)	.118 (.446)	.237 (.883)	.205 (.783)	.100 (.380)	.413 (1.15)	.359 (1.00)
Time to Capital in days		-.0194 (.321)	-.0248 (.430)	-.0951 (1.61)	-.110 (1.55)	-.213 (2.91)		.0944 (2.95)	.0851 (2.79)	.0911 (2.89)	.0624 (1.66)	.0677 (1.74)
Average Temperature in Centigrade ($x10^{-1}$)				2.32 (3.31)		2.00 (2.02)				1.39 (3.74)		1.47 (2.78)
Temperature Squared ($x10^{-2}$)				-.418 (2.55)		-.281 (1.22)				-.311 (3.57)		-.326 (2.66)
Price of Food (if reported, in pesos per day $x10^{-2}$)				1.01 (1.51)						-.655 (1.85)		
If no food price reported = 1				-.233 (.637)						-.476 (2.44)		
Average Schooling of Women over age 15	-.102 (2.25)							-.0313 (1.31)				
Interactions of Municipality Variables with Individual's Schooling:												
Hospital beds ($x10^{-3}$)					.0386 (.556)	.0317 (.459)					.0139 (.378)	.0136 (.371)
Clinics ($x10^{-3}$)					-.442 (1.97)	-.360 (1.59)					.171 (1.44)	.175 (1.46)
Family Planning ($x10^{-2}$)					.164 (.763)	.130 (.606)					-.0943 (.828)	-.0917 (.805)
Time to Capital					.0669 (2.07)	.0890 (2.71)					.0174 (1.01)	.0177 (1.01)
Temperature ($x10^{-1}$)						.339 (.957)						-.0727 (.385)
Temperature Squared ($x10^{-2}$)						-.115 (1.38)						.0133 (.301)
Intercept	+5.64 (164.)	-4.64 (6.03)	-4.68 (6.17)	-7.77 (7.56)	-4.64 (6.11)	-7.47 (5.91)	.940 (52.6)	1.12 (2.77)	1.13 (2.82)	-.163 (.299)	1.15 (2.87)	-.391 (.581)
R^2	.0009	.0337	.0502	.0608	.0517	.0641	.0002	.0027	.0170	.0205	.0177	.0201
(F)	(1.64)	(32.8)	(49.7)	(36.5)	(30.8)	(27.6)	(.349)	(2.53)	(16.3)	(11.8)	(10.1)	(8.27)
Sample Size	5652						5652					
Dependent Variable												
Mean	5.679						.9272					
Variance	7.489						2.025					

Table 5.5

Regressions of Fertility and Child Mortality Ratio

on Individual and Municipality Variables:

Mother's Age 35-39 in Rural Areas

(absolute value of t statistic reported in parentheses)

Explanatory Variables	Children Ever Born						Child Mortality Ratio Relative to Age/Region Level					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Individual:												
Schooling Years			-.116 (5.13)	-.107 (4.72)	-.147 (4.27)	-.685 (1.49)			-.0544 (6.28)	-.0569 (6.56)	-.0459 (3.49)	-.181 (1.02)
Age Years		.283 (9.43)	.288 (9.64)	.283 (9.50)	.287 (9.60)	.284 (9.56)		.00294 (.256)	.00521 (.455)	.00390 (.341)	.00501 (.438)	.00518 (.453)
Municipality:												
Hospital Beds per capita ($x10^{-3}$)	-.0573 (.347)	-.141 (.822)	-.0352 (.214)	.0445 (.272)	-.329 (1.29)	-.231 (.911)	-.0194 (.309)	-.0284 (.432)	.0104 (.165)	.0224 (.356)	-.00734 (.0753)	-.00507 (.0519)
Clinics per capita ($x10^{-3}$)	.420 (.656)	.218 (.335)	.595 (.937)	.592 (.931)	.294 (.332)	-.0723 (.0815)	-.103 (.424)	-.164 (.658)	-.0174 (.0718)	-.00265 (.0109)	-.0474 (.140)	-.0377 (.110)
Family Planning Expenditures per capita (pesos $x10^{-2}$)	.589 (1.00)	.497 (.844)	.642 (1.10)	.436 (.749)	1.14 (1.79)	1.41 (1.75)	.578 (2.60)	.571 (2.53)	.620 (2.79)	.490 (2.19)	1.08 (3.50)	1.065 (3.43)
Time to Capital in days		.105 (1.57)	.0510 (.801)	-.0166 (.253)	-.0176 (.225)	-.134 (1.68)		.0816 (3.21)	.0607 (2.50)	.0723 (2.87)	.0775 (2.60)	.0779 (2.53)
Average Temperature in Centigrade ($x10^{-1}$)				4.33 (5.16)		3.15 (2.78)				1.028 (3.19)		.566 (1.30)
Temperature Squared ($x10^{-2}$)				-.850 (4.32)		-.506 (1.92)				-.239 (3.16)		-.124 (1.22)
Price of Food (if reported, in pesos per day $x10^{-2}$)				-.644 (.808)						-.0126 (4.11)		
If no food price reported = 1				.483 (1.09)						-.442 (2.60)		
Average Schooling of Women over age 15		.0875 (1.57)						.0288 (1.35)				
Interactions of Municipality Variables with Individual's Schooling:												
Hospital beds ($x10^{-3}$)					.146 (1.54)	.134 (1.43)					.00880 (.243)	.00799 (.220)
Clinics ($x10^{-3}$)					.154 (.471)	.347 (1.06)					.0161 (.129)	.0381 (.302)
Family Planning ($x10^{-2}$)					-.471 (1.40)	-.556 (1.65)					-.278 (2.16)	-.285 (2.20)
Time to Capital					.0536 (1.50)	.0835 (2.27)					-.0131 (.956)	-.00706 (.500)
Temperature ($x10^{-1}$)						.731 (1.65)						.160 (.938)
Temperature Squared ($x10^{-2}$)						-.214 (2.05)						-.0439 (1.10)
Intercept	6.94 (167.)	-3.68 (3.33)	-3.46 (3.15)	-8.28 (6.02)	-3.37 (3.06)	-7.55 (4.71)	.895 (56.6)	.691 (1.63)	.770 (1.83)	.0655 (.124)	.764 (1.82)	.140 (.227)
R^2	.0003	.0161	.0201	.0341	.0211	.0375	.0012	.0030	.0094	.0135	.0103	.0120
(F)	(.505)	(15.9)	(19.9)	(20.5)	(12.6)	(16.2)	(2.30)	(2.91)	(9.21)	(7.97)	(6.06)	(5.03)
Sample Size	5832						5832					
Dependent Variable												
Mean	6.972						.9021					
Variance	10.87						1.570					

Table 5 6

Regressions of Fertility and Child Mortality Ratio

on Individual and Municipality Variables:

Mother's Age 40-44 in Rural Areas

(absolute value of t statistic reported in parentheses)

Explanatory Variables	Children Ever Born						Child Mortality Ratio Relative to Age/Region Level					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Individual:												
Schooling Years			-.0228 (.754)	-.0196 (.648)	-.0349 (.803)	-.489 (.804)			-.0562 (5.77)	-.0599 (6.15)	-.0643 (4.59)	.00159 (.00806)
Age Years		.329 (8.97)	.331 (9.03)	.334 (9.14)	.330 (8.99)	.329 (9.03)		-.0227 (1.92)	-.0191 (1.61)	-.0178 (1.51)	-.0191 (1.62)	-.0193 (1.64)
Municipality:												
Hospital Beds per capita ($x10^{-3}$)	-.191 (1.04)	-.222 (1.17)	-.186 (1.01)	-.0724 (.394)	-.389 (1.75)	-.284 (1.28)	-.102 (1.72)	-.0875 (1.42)	-.0764 (1.29)	-.0507 (.857)	-.0790 (1.10)	-.0608 (.847)
Clinics per capita ($x10^{-3}$)	1.85 (2.17)	.0161 (1.86)	1.74 (2.06)	1.62 (1.91)	2.11 (1.85)	1.67 (1.46)	-.491 (1.80)	-.452 (1.62)	-.414 (1.52)	-.359 (1.31)	-.652 (1.78)	-.557 (1.51)
Family Planning Expenditures per capita (pesos $x10^{-2}$)	-.236 (.308)	-.197 (.256)	-.123 (.161)	-.576 (.756)	.721 (.703)	.322 (.315)	.593 (.2.42)	.622 (2.50)	.621 (2.54)	.433 (1.76)	.700 (2.12)	.597 (1.81)
Time to Capital in days		.0661 (.747)	.0447 (.527)	-.0689 (.786)	-.327 (.325)	-.197 (1.88)		.0357 (1.25)	.0245 (.899)	.0348 (1.23)	.0181 (.558)	.0217 (.641)
Average Temperature in Centigrade ($x10^{-1}$)				3.65 (3.35)		2.55 (1.83)				1.87 (5.32)		1.75 (3.87)
Temperature Squared ($x10^{-2}$)				-.654 (2.55)		-.347 (1.06)				-.424 (5.13)		-.389 (3.68)
Price of Food (if reported, in pesos per day $x10^{-2}$)				-1.58 (1.53)						-.0114 (3.41)		
If no food price reported = 1				-1.25 (2.17)						-.611 (3.30)		
Average Schooling of Women over age 15		.0417 (.591)						-.00902 (.396)				
Interactions of Municipality Variables with Individual's Schooling:												
Hospital beds ($x10^{-3}$)					.0976 (1.66)	.0876 (1.47)					.00120 (.0634)	-.00190 (.0984)
Clinics ($x10^{-3}$)					-.217 (.467)	-.00758 (.0162)					.147 (.983)	.136 (1.03)
Family Planning ($x10^{-2}$)					-.517 (1.17)	-.457 (1.04)					-.0525 (.369)	-.0397 (.279)
Time to Capital					.0938 (1.39)	.132 (1.93)					.00792 (.363)	.0114 (.516)
Temperature ($x10^{-1}$)						.625 (1.06)						-.347 (.182)
Temperature Squared ($x10^{-2}$)						-.187 (1.34)						.00111 (.0247
Intercept	7.73 (152.)	-6.04 (3.95)	6.00 (3.94)	-10.34 (5.51)	-5.94 (3.89)	-9.64 (4.63)	.985 (60.6)	1.94 (3.93)	1.85 (3.77)	.101 (.167)	1.86 (3.79)	-.0037 (.0055
R^2	.0013	.0184	.0185	.0314	.0198	.033	.0024	.0037	.0108	.0193	.0110	.0166
(F)	(1.99)	(14.6)	(14.6)	(15.1)	(9.39)	(11.4)	(3.78)	(2.92)	(8.46)	(9.14)	(5.19)	(5.61
Sample Size	4664						4664					
Dependent Variable												
Mean	7.785						.9628					
Variance	14.16						1.455					

Regressions of Fertility and Child Mortality Ratio

on Individual and Municipality Variables:

Mother's Age 45-49 in Rural Areas

(absolute value of t statistic reported in parentheses)

Explanatory Variables	Children Ever Born						Child Mortality Ratio Relative to Age/Region Level					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Individual:												
Schooling Years			.00615 (.172)	-.000607 (.0170)	.0452 (.889)	-.0448 (.0649)			-.0500 (5.08)	-.0547 (5.53)	-.0349 (2.49)	.178 (.935)
Age Years		.140 (3.08)	.146 (3.21)	.143 (3.15)	.146 (3.21)	.140 (3.08)		-.00729 (.579)	-.00420 (.335)	-.00486 (.389)	-.00428 (.341)	-.00475 (.380)
Municipality:												
Hospital Beds per capita ($x10^{-3}$)	-.443 (1.37)	-.964 (2.76)	-.541 (1.66)	-.479 (1.47)	-.383 (.824)	-.356 (1.766)	-.0423 (.473)	-.0332 (.343)	-.0148 (.165)	.00610 (.0680)	.0842 (.655)	.0912 (.712)
Clinics per capita ($x10^{-3}$)	-.657 (.659)	-.100 (.0983)	.608 (.611)	.580 (.580)	1.97 (1.52)	1.48 (1.14)	.0756 (.274)	.0908 (.322)	.132 (.482)	.221 (.801)	.436 (1.22)	.493 (1.38)
Family Planning Expenditures per capita (pesos $x10^{-2}$)	2.19 (2.49)	1.76 (1.98)	2.18 (2.48)	1.72 (1.94)	2.35 (2.04)	2.07 (1.80)	.262 (1.07)	.265 (1.07)	.245 (1.00)	.0692 (.282)	.212 (.667)	.103 (.325)
Time to Capital in days		-.0741 (.680)	-.169 (1.61)	-.200 (1.83)	-.215 (1.76)	-.318 (2.51)		-.00903 (.298)	-.0165 (.567)	-.00182 (.0605)	-.00669 (.198)	+.00272 (.0777)
Average Temperature in Centigrade ($x10^{-1}$)				5.33 (4.10)		4.74 (2.89)				2.18 (6.07)		2.36 (5.21)
Temperature Squared ($x10^{-2}$)				-1.14 (3.70)		-.916 (2.38)				-.500 (5.90)		-.537 (5.04)
Price of Food (if reported, in pesos per day $x10^{-2}$)				-.0168 (1.34)						-.00770 (2.24)		
If no food price reported = 1				-.290 (.419)						-.352 (1.84)		
Average Schooling of Women over age 15	.297 (3.33)							-.00675 (.273)				
Interactions of Municipality Variables with Individual's Schooling:												
Hospital beds ($x10^{-3}$)					-.0454 (.436)	-.0665 (.638)					-.0305 (1.06)	-.0334 (1.16)
Clinics ($x10^{-3}$)					-.805 (1.63)	-.526 (1.06)					-.173 (1.27)	-.158 (1.14)
Family Planning ($x10^{-4}$)					-.143 (.305)	-.171 (.364)					.00334 (.0258)	.0107 (.0829)
Time to Capital					.0471 (.818)	.102 (1.70)					-.00714 (.449)	-.00362 (.220)
Temperature ($x10^{-1}$)						.359 (.531)						-.187 (.999)
Temperature Squared ($x10^{-2}$)						-.147 (.913)						.0378 (.851)
Intercept	8.02 (118.)	.879 (.416)	1.28 (.604)	-4.08 (1.65)	1.21 (.574)	-4.17 (1.55)	.921 (49.0)	1.28 (2.18)	1.19 (2.04)	-.843 (1.23)	1.17 (2.00)	-1.27 (1.71)
R^2 (F)	.0021 (2.62)	.0084 (5.30)	.0055 (3.45)	.0129 (4.90)	.0065 (2.44)	.0166 (4.48)	.0004 (.452)	.0005 (.307)	.0073 (4.59)	.0180 (6.85)	.0081 (3.03)	.0178 (4.82)
Sample Size	3743						3743					
Dependent Variable												
Mean	8.046						.9262					
Variance	16.51						1.261					

Table ...

Regressions of Fertility and Child Mortality Ratio

on Individual and Municipality Variables:

Mother's Age 50-64 in Rural Areas

(absolute value of t statistic reported in parentheses)

Explanatory Variables	Children Ever Born						Child Mortality Ratio Relative to Age/Region Level					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Individual:												
Schooling Years			.140 (5.08)	.124 (4.50)	.127 (2.86)	-.497 (.953)			-.0230 (3.16)	-.0280 (3.83)	-.0321 (2.74)	-.0110 (.0796)
Age Years		-.0192 (1.69)	-.0167 (1.47)	-.0161 (1.42)	-.0173 (1.52)	-.0152 (1.34)		.00178 (.594)	.00135 (.448)	.00142 (.473)	.00128 (.427)	.00155 (.517)
Municipality:												
Hospital Beds per capita ($x10^{-3}$)	.186 (1.01)	-.0753 (.386)	.192 (1.04)	.276 (1.51)	.275 (1.33)	.387 (1.88)	.0119 (.245)	.0220 (.498)	.0261 (.536)	.0374 (.771)	.00382 (.0699)	.0201 (.368)
Clinics per capita ($x10^{-3}$)	1.96 (2.66)	1.33 (1.77)	1.85 (2.52)	1.85 (2.51)	1.99 (2.24)	1.93 (2.17)	.197 (1.02)	.193 (.973)	.227 (1.17)	.278 (1.43)	.210 (.895)	.275 (1.16)
Family Planning Expenditures per capita (pesos $x10^{-2}$)	1.57 (2.33)	1.12 (1.65)	1.49 (2.21)	.785 (1.16)	.147 (.167)	-.459 (.522)	.0182 (.103)	.0428 (.238)	.0627 (.353)	-.0857 (.479)	.00213 (.00917)	-.107 (.460)
Time to Capital in days		.0975 (1.20)	.0328 (.418)	-.0229 (.284)	-.00185 (.0219)	-.101 (1.15)		.0718 (3.34)	.0649 (3.14)	.0719 (3.36)	.0582 (2.61)	.0578 (2.49)
Average Temperature in Centigrade ($x10^{-1}$)				6.64 (7.14)		5.35 (4.89)				1.56 (6.34)		1.45 (4.99)
Temperature Squared ($x10^{-2}$)				-1.40 (6.31)		-1.07 (4.08)				-.355 (6.06)		-.323 (4.67)
Price of Food (if reported, in pesos per day $x10^{-2}$)				-3.13 (3.38)						-.722 (2.94)		
If no food price reported = 1				-.364 (.700)						-.228 (1.66)		
Average Schooling of Women over age 15		.270 (4.15)						.00481 (.281)				
Interactions of Municipality Variables with Individual's Schooling:												
Hospital beds ($x10^{-3}$)					-.116 (.855)	-.164 (1.22)					.0328 (.915)	.0244 (.684)
Clinics ($x10^{-3}$)					-.109 (.276)	-.00889 (.0224)					.0229 (.219)	.0246 (.235)
Family Planning ($x10^{-2}$)					.919 (2.39)	1.00 (2.62)					.0363 (.358)	.0491 (.485)
Time to Capital					.0445 (.997)	.0772 (1.67)					.00921 (.781)	.0161 (1.32)
Temperature ($x10^{-1}$)						.742 (1.45)						.0102 (.0753)
Temperature Squared ($x10^{-4}$)						-.206 (1.68)						-.0103 (.317)
Intercept	7.30 (156.)	7.71 (11.8)	8.04 (12.7)	1.34 (1.19)	8.10 (12.7)	1.74 (1.36)	.902 (73.0)	.768 (4.47)	.833 (4.97)	-.621 (2.08)	.845 (5.03)	-.710 (2.10)
R^2 (F)	.0021 (4.64)	.0051 (5.69)	.0063 (7.11)	.0213 (14.6)	.0073 (4.96)	.0217 (10.6)	.0002 (.361)	.0019 (2.17)	.0034 (3.83)	.0104 (7.06)	.0036 (2.45)	.0100 (4.82)
Sample Size	6725						6725					
Dependent Variable												
Mean	7.456						.9136					
Variance	16.28						1.130					

with decreased levels of fertility, and in the case of clinics and sometimes hospital beds, the partial association with the child mortality ratio is also negative. While these associations persist in most specifications, the municipality policy variables, when taken alone, are much more closely related to fertility and mortality than when linear controls are included for the woman's schooling, age, and regional access to a major urban center (compare regression (3) to (1) and (9) to (7)). For example, the coefficient on clinics is -1.90 in the simple mortality regression on the three policy variables (regression (7), Table 4.4) for women age 30-34 in urban areas, but this coefficient decreases one third to -1.32 in regression (9). Thus, estimates of the effects of program policy variables are overstated unless one controls for the individual woman's education.

More surprising is the large effect of community average levels of female education in specifications (2) and (8). The inclusion of this variable reduces substantially the coefficients on the community health policy variables. For the same urban age group, 30-34, the clinic coefficient in the child mortality regression that includes the average municipality female schooling variable is only -.49 compared with -1.32 when the individual's schooling is specified. Similarly, the coefficient on the average schooling variable is -.22 or more than twice the magnitude of the individual schooling coefficient -.09 (compare regressions (8) and (9)). Community aggregate regressions may attribute more importance to education than seems warranted from the individual level data examined here; perhaps community levels of education proxy other omitted community characteristics or education benefits the community beyond the privately captured gain enjoyed by the individual. There is a long, if unsubstantiated, tradition of justifying public subventions to education in terms of the positive externalities of education for

society as a whole. Before endorsing this interpretation it should be noted that there is no such result in the rural population. We are of the opinion that the individual information is preferable in this context. The greater the time required to travel from the municipality to the capital of its department the higher is child mortality, as anticipated.

Estimates from the next specification (regression 4), which adds linear and quadratic temperature variables and the local price of food in the agricultural economy, indicate that food prices are not consistently related to either fertility or mortality in urban areas. In rural areas, however, the price of food appears to be negatively associated with child mortality, suggesting that the associated income effects are stronger than the price or substitution effects of food, since the rural population of Colombia is largely engaged in the production of foodstuffs.[1]

Colombia is situated on the equator and is divided by a series of high mountain ranges. The resulting altitude variation maps into large regional temperature differences that remain relatively constant over the year, with two regular annual cycles of heavy rainfall. There are many reasons to suspect that temperature affects the healthiness of the environment, particularly for poor people who are less capable of sheltering themselves from its effects. For example, exposure to malaria presumably is a greater health hazard in warmer climates where mosquitos thrive, while tuberculosis may be more serious in colder climates. But many other things vary across Colombia roughly according to temperature, and, therefore, we

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[1] Additional evidence confirms that wages (without food) are positively related to our estimate of food prices (Appendix Table A-4).

are not confident that temperature represents primarily the effect of climate on exposure to disease. It may also capture the effect of omitted regional and individual variables. But the results, whatever their final interpretation, are consistent across age and urban/rural samples.

For rural women over age 25 and urban women over age 30, there is a quadratic relationship between temperature and the child mortality ratio, which peaks between 22 and 24 degrees Centigrade, close to the sample mean.[1] If this is a biological effect of ambient temperature on various diseases and health problems of childhood, it is the first we have noted in the literature, but other work on this topic may exist. We are not yet sufficiently certain of this interpretation to offer it as more than a working hypothesis for further study.[2]

Fertility is also related to a quadratic in temperature, but the pattern is less pronounced and vacillates in shape. For urban women age 40 to 49, fertility peaks at 21-22° Centigrade, whereas for most of the rural population fertility increases until 26-28° Centigrade, which is one standard deviation above the sample mean. The relationship of fertility to temperature may be a response to the incidence or expectation of child mortality. Testing of this hypothesis, however, requires estimates of the fertility and child mortality production functions, which are not possible with these data.

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[1]For example, for rural women 30-34, regression (10) provides the estimates r = 1.39 Temp -.311 Temp^2 + other variables. Setting the derivative of r with respect to T to zero to obtain a maximum, one has T = 1.39/(2*.311) = 2.23 or 22.3° Centigrade.

[2]For example, agricultural daily wages are also strongly associated with mean municipality temperature, but here the maximum value of wages is associated with higher temperatures, 24-25° Centigrade, which is about one standard deviation above the average. See Table A-4 for regressions.

The last specifications include the interactions between the municipal policy variables and the mother's years of schooling, in regressions (5), (6), (11) and (12). In the urban areas where the policy variables frequently appear effective in reducing fertility and child mortality, these interactions are generally statistically significant and suggest that the programs have a greater effect in households with less educated mothers. For example, for urban women aged 35 to 39 in Table 4.5, the coefficients associated with per capita clinics and hospital beds in the child mortality regression (11) are negative, and the educational interactions with these two programs receive positive coefficients. This suggests that the effect of a hospital bed on child mortality is fully three times larger (-.37) for a woman with no schooling compared with the effect for a woman with the average four years of schooling (-.10). Similarly, for the clinic variable, the effect for a woman with no schooling is -2.42 versus -.25 for a woman with 8 years of schooling.

The educational interactions are not frequently statistically significant for the family planning program expenditures, with the exception occurring among urban women age 30-34. This may be misleading, however, since health centers and maternity hospitals were the major public providers of family planning services in the urban areas before 1973, even though there were no specific governmental appropriations for this purpose. The clinic and hospital variables do evidence the positive interaction with education in the fertility equations for urban women over the age of 20. Implicit government support of family planning may, therefore, have also benefited primarily the less educated urban women. Interactions

between the time-distance and education variables are also not statistically significant, except in the three oldest age groups where fertility is highest among highly educated women living farthest from the provincial capital. Thus while proximity to the capital, where important services may be located, is a significant determinant of child survival and fertility, the relationship between time-distance and these household outcomes appears to be generally independent of the level of maternal schooling.

The final regressions (6) and (12), which include the quadratic effect of temperature, indicate that after age 30 in the urban areas, the education-temperature interactions are statistically significant. However, these interactions are not evident among the rural population which exhibits the stronger temperature gradient in child mortality. The effect of temperature is diminished for better educated urban women, and the effect of temperature on child mortality is virtually eliminated in some age groups when the woman's education is substantially above the mean. For instance, consider the age group 35-39 again. The effect of shifting from a temperature of 20 to 15 degrees Centigrade is to lower the child mortality ratio by .37 if a woman has no education, but it would decline only .08 for a woman who has 8 years of schooling.

These findings suggest that public health infrastructure and activities have their greatest effect in reducing child mortality and fertility among the urban poor and uneducated. But our estimates also indicate that existing public health infrastructure and expenditure patterns may not be providing the Colombian population living in rural areas with health

services that reduce local child mortality or affect substantially fertility levels. Moreover, additional estimates (unreported) from regression specifications including such indicators of public health infrastructure as the existence of rural health posts, community water supplies, and proportions of households with modern sanitation facilities did not yield evidence that these variables play a significant role in reducing rural or urban child mortality. Nor did their inclusion significantly alter the results reported here for urban areas.

5.2 Estimates of Empirical Magnitudes

5.2.1 Schooling Effects

The number of years of schooling the woman has completed is negatively related to fertility and child mortality in all urban and rural age groups of women, with the exception that fertility becomes positively associated with education among rural women over the age of 40. A year of schooling is associated with a reduction of .07 to .10 in the maternal age/region standardized child mortality ratio among urban women age 20 to 49. For rural women the effect of schooling on our standardized measure of child mortality is only slightly less, between .05 and .10 per year completed. Since the proportion of children ever born that are now dead is about twice as large in rural areas as it is in urban areas for the same age group of mothers (Table 3) the absolute effect on the child mortality ratio of mother's receiving one more year of education is generally larger for rural than urban women.

Since mother's schooling appears to be a substitute for local public health services and family planning expenditures, the impact of education is greater in those urban areas that are least well served by the public health system. The average effect of a year's schooling of urban mothers age 35-39 is -.28 in the fertility equation and -.15 in the standardized child mortality equation in a municipality with the average per capita clinics, hospital beds and family planning expenditures (regressions 5 and 11, Table 4.5). If these three public sector activities had not existed in the municipality,our estimated effect of schooling would have increased about a fifth to -.34 in the fertility equation and to -.18 in the child mortality equation. As noted, however, the transportation time from the municipality to its department capital does not interact importantly with education.

5.2.2 Program Effects

Tables 6.1 through 6.4 are designed to facilitate comparisons across the alternative specifications in the estimated effects of the three local program variables--hospital beds, clinics, and family planning expenditures--on the individual levels of fertility and child mortality. These derivatives are the respective regression coefficients in the linear regressions (1) and (7) with only the policy variables, and regressions (3) and (9) controlled for individual schooling, age and transportation time to a major city. The derivatives are then evaluated at the mean education level in the sample based on the preferred interactive regressions (5) and (11), and reevaluated for women with three standard levels of education: none, four years and eight years. The

importance of the redistributive effect of these policies on the demographic outcomes for different education groups is thus illustrated by comparing the estimated effects across the last three columns in Tables 6.1 through 6.4.

If the allocation of public resources were dictated by the single goal of reducing child mortality at the least cost we might expect the derivative of child mortality with respect to clinics to be about seven or eight times the size of the derivative of child mortality with respect to hospital beds, since this is the ratio of their average cost, i.e., 340,000 pesos/46,000 pesos = 7.4. The ratio of estimated derivatives from Table 6.1, column (3) are larger: 13, 14, 82, 29, for the age groups 35 to 64 and undefined for the younger age groups when hospitals are essentially unrelated to child mortality. The stability and statistical significance of the coefficients on clinics in Tables 4.1 through 4.8 suggests that increases in clinics per capita in a municipality is associated with a noted reduction in urban child mortality. Thus, adding a clinic to an average municipality with 20,000 inhabitants is associated with a reduction in the child mortality ratio of the 60 percent of the representative municipality's population living in urban areas. For urban mothers age 45 to 49, their standardized child mortality ratio would be reduced from about .943 to .876 (1.35*.05) or a reduction of about 7 percent. In absolute terms their child mortality ratio at age 45-49 would be reduced from .12 to .11. But the effect is likely to be nearly twice as large for women with no education who would start with a child mortality

Table 6.1

Derivative of Child Mortality Ratio

with Respect to Municipality Program Variables

Sample Composition and Program Variable	Simple Regression with Only Programs (1)	Regressions with Individual Characteristics (2)	Interactive with Education Evaluated at Mother's Schooling in Years: Mean (3)	0 years (4)	4 years (5)	8 years (6)
Urban Residents						
Woman's Age:						
20-24						
Hospital Beds	-.104	.0294	.0349	-.0694	.0218	.113
Clinics	-.790	-.382	-.470	-1.12	-.552	.0160
Family Planning	-.575	-.312	-.257	-.394	-.274	-.155
25-29						
Hospital Beds	-.0672	.0357	.0472	.0362	.0455	.0548
Clinics	-1.39	-.769	.886	-2.25	-1.09	.0700
Family Planning	-.679	-.299	-.174	-.696	-.252	.192
30-34						
Hospital Beds	-.125	-.0328	.00420	-.109	-.00500	.0990
Clinics	-1.90	-1.32	-1.42	-2.78	-1.53	-.276
Family Planning	-.894	-.530	-.398	-.771	-.429	-.0862
35-39						
Hospital Beds	-.245	-.160	-.102	-.366	-.102	.163
Clinics	-1.77	-1.21	-1.34	-2.42	-1.34	-.252
Family Planning	-.786	-.343	-.304	-.254	-.304	-.353
40-44						
Hospital Beds	-.169	-.0963	-.0909	-.0774	-.0915	-.106
Clinics	-1.68	-1.11	-1.24	-2.54	-1.18	.172
Family Planning	-.419	-.112	-.0216	.0586	-.0250	-.109
45-49						
Hospital Beds	-.134	-.0143	-.0165	.0236	-.0196	-.0628
Clinics	-1.79	-1.28	-1.35	-2.23	-1.28	-.334
Family Planning	.247	.540	.570	.868	.547	.226
50-64						
Hospital Beds	-.102	-.0476	-.0423	-.0848	-.0356	.0136
Clinics	-1.50	-1.22	-1.25	-1.66	-1.18	-.700
Family Planning	-.151	.0453	.0721	.204	.0512	-.102

Source: Tables 4, see text.

Table 6.2

Derivative of Child Mortality Ratio
with Respect to Municipality Program Variables

Sample Composition and Program Variable	Simple Regression with Only Programs (1)	Regressions with Individual Characteristics (2)	Interactive with Education Evaluated at Mother's Schooling in Years: Mean (3)	0 years (4)	4 years (5)	8 years (6)
Rural Residents						
Woman's Age:						
20-24						
Hospital Beds	-.0803	.0113	.0259	-.0388	.0760	.191
Clinics	.111	.219	.2401	.118	.335	.552
Family Planning	.0815	.180	.165	.593	-.167	-.927
25-29						
Hospital Beds	-.0618	.0283	.0378	.0829	-.0011	-.0851
Clinics	-.0946	.0193	-.0222	-.881	.719	2.32
Family Planning	-.294	-.178	-.192	-.227	-.161	-.0958
30-34						
Hospital Beds	-.0196	.0197	.0142	-.0126	.0430	.0986
Clinics	-.249	-.0397	-.110	-.440	.244	.928
Family Planning	.118	.205	.231	.413	.0358	-.341
35-39						
Hospital Beds	-.0194	.0104	.00777	-.00734	.0279	.0631
Clinics	-.103	-.0174	-.0198	-.0474	.0170	.0814
Family Planning	.578	.620	.603	1.08	-.0320	-1.14
40-44						
Hospital Beds	-.102	-.0764	-.0772	-.0790	-.0742	-.0694
Clinics	-.491	-.414	-.426	-.652	-.0640	.524
Family Planning	.593	.621	.619	.700	.490	.280
45-49						
Hospital Beds	-.0423	-.0148	.0376	.0842	.-378	-.160
Clinics	.0756	.132	.172	.436	-.256	-.948
Family Planning	.262	.245	.217	.212	.225	.239
50-64						
Hospital Beds	.0119	.0261	.0451	.00383	.135	.266
Clinics	.197	.227	.239	.210	.302	.393
Family Planning	.0182	.0627	.0478	.00213	.147	.292

Source: Tables 5, see text.

Table 6.3

Derivative of Children Ever Born
with Respect to Municipality Program Variables

Sample Composition and Program Variable	Simple Regression with Only Programs (1)	Regressions with Individual Characteristics (2)	Interactive with Education Evaluated at Mother's Schooling in Years: Mean (3)	0 years (4)	4 years (5)	8 years (6)
Urban Residents						
Woman's Age						
20-24						
Hospital Beds	-.476	-.274	-.631	-.444	-.607	-.770
Clinics	-.951	-.445	-.501	-1.10	-.576	-.0520
Family Planning	-.685	-.396	-.319	-.598	-.354	-.109
25-29						
Hospital Beds	-.299	-.161	-.0844	-.383	-.129	.125
Clinics	-2.28	-1.30	-1.42	-2.74	-1.62	-.492
Family Planning	-1.92	-1.37	-1.25	-1.77	-1.33	-.882
30-34						
Hospital Beds	-.510	-.311	-.263	-.425	-.276	-.127
Clinics	-3.30	-2.10	-2.18	-3.48	-2.29	-1.10
Family Planning	-2.37	-1.65	-1.42	-2.88	-1.54	-.200
35-39						
Hospital Beds	-.641	-.420	-.326	-.726	-.326	.0740
Clinics	-4.52	-3.28	-3.37	-4.63	-3.37	-2.12
Family Planning	-1.84	-.820	-.718	-1.15	-.718	-.286
40-44						
Hospital Beds	-.659	-.483	-.450	-.695	-.440	-.185
Clinics	-4.83	-3.65	-3.64	-3.95	-3.62	-3.30
Family Planning	-2.60	-1.79	-1.66	-1.96	-1.64	-1.33
45-49						
Hospital Beds	-.727	-.540	-.394	-1.33	-.322	.686
Clinics	-4.92	-4.01	-4.07	-4.90	-4.01	-3.12
Family Planning	-.192	.268	.298	1.16	.232	-.696
50-64						
Hospital Beds	-.710	-.597	-.554	-.989	-.485	.0190
Clinics	-4.96	-4.41	-4.29	-3.30	-4.45	-5.60
Family Planning	-.897	-.480	-.583	-.117	-.657	-1.20

Source: Tables 4, see text.

Table 6.4

Derivative of Children Ever Born
with Respect to Municipality Program Variables

Sample Composition and Program Variable	Simple Regression with Only Programs (1)	Regressions with Individual Characteristics (2)	Interactive with Education Evaluated at Mother's Schooling in Years: Mean (3)	0 years (4)	4 years (5)	8 years (6)
Rural Residents						
Woman's Age:						
20-24						
Hospital Beds	.149	.135	.151	.0859	.202	.318
Clinics	.519	.595	.606	..620	.595	.569
Family Planning	-.412	-.372	-.381	-.193	-.527	-.862
25-29						
Hospital Beds	-.489	-.351	-.377	-.496	-.274	-.0512
Clinics	.151	.335	.334	.549	.149	-.251
Family Planning	-.777	-.577	1.96	1.59	2.27	2.96
30-34						
Hospital Beds	-.0853	-.0810	-.0946	-.169	-.0146	.140
Clinics	1.07	1.12	1.31	2.16	.392	-1.38
Family Planning	-.280	-.124	-.141	-.457	.199	.855
35-39						
Hospital Beds	-.0573	-.0352	-.0783	-.329	.255	.839
Clinics	.420	.595	.558	.294	.910	1.53
Family Planning	.589	.642	.331	1.14	-.744	-2.63
40-44						
Hospital Beds	-.191	-.186	-.239	-.389	.00140	.392
Clinics	1.85	1.74	1.78	2.11	1.24	.374
Family Planning	-.236	-.123	-.0731	.721	-1.35	-3.42
45-49						
Hospital Beds	-.443	-.541	-.452	-.383	-.565	-.746
Clinics	-.657	.608	.739	1.97	-1.25	-4.47
Family Planning	2.19	2.18	2.13	2.35	1.78	1.21
50-64						
Hospital Beds	.186	.192	.129	.275	-.189	-.653
Clinics	1.96	1.85	1.85	1.99	1.55	1.12
Family Planning	1.57	1.49	1.30	.147	3.82	7.50

Source: Table 5, see text.

ratio of .155 and decline to .135, whereas women with eight years of education would experience a smaller than average decline, from .062 to .060. Hospitals would have a much smaller effect on child mortality for their cost, and less often redistribute benefits to the less educated.

Family planning expenditures may have a small effect on child mortality among younger urban women, those whose children could have most benefited from the recent program. But the costs have also been low, perhaps only 3 pesos (1974) per capita. It may be the case that family planning has improved the chances of child survival through their more distinct effect of reducing fertility; however, estimates of the health production function would be required to establish firmly the linkage.

The time required to go from the cabeceras or administrative center of the municipality to the department capital, which is likely to be the closest location of a specialized hospital, may also be an important policy instrument with many effects on the development process. For the urban population this variable enters strongly as a correlate of the child mortality ratio, and is also associated with a slightly elevated child mortality ratio among all but the oldest rural women, age 20 to 49. Urban residents are on average only 1.7 hours removed from their department capital, whereas the rural population is 7.2 hours away from these metropolitan centers (Table 3). This five-hour difference explains some of the spread in rural-urban child mortality ratios and suggests the need for study in greater depth to determine the costs of transportation infrastructure and the resulting benefits of improved access to and delivery of rural health care.

The variation in fertility among urban women is much better explained by policy variables than is variation in the child mortality ratio. Among urban women from age 20 to 64, fertility is lower in municipalities with more clinics or health centers on a per capita basis. For example, among women age 35-39, the sample average supply of clinics is associated with a mother having on average 5.4 births. Had no local clinic been available, the regression estimates imply she would have had 5.7 births (i.e., 104*-3.37 = -.35 from Tables 3 and 6.3). The effect of clinics is twice as large for mothers with no formal schooling, -.48 births, as for mothers who had completed eight years of schooling, -.22. The inverse association between fertility and the local availability of hospital beds is about one-tenth the magnitude of that with clinics for women age 30 to 64. If our cost estimates are relatively accurate and thus the public costs of a hospital bed is one-seventh that of a clinic, then clinics are a more cost-effective means of helping Colombians reduce their fertility than are hospitals. Of course, both institutions perform many functions in addition to family planning and child health care, complicating the task of arriving at any unambiguous overall ranking.

The third policy instrument, direct expenditures on family planning, is also inversely associated with the fertility of urban mothers from age 20 to 44. Given the recent establishment of these programs, it was not expected that this program could have exerted any direct effect on the cumulative fertility of women 45 years old and older in 1973, since these women gave birth to their children, for the most part, before the inception of the family planning program. The association between the program's

expenditures and fertility of 35-39 year old urban mothers is that of an average reduction of about .04 births (.058 x -.72 = .042). However, it should be recalled that direct expenditures on family planning amounted to only about 3 or 4 pesos per capita in 1973. In comparison, 12 pesos per capita were spent to maintain health clinics, and 90 pesos per capita were spent on the public hospital system. Although these effects of the entire health system are not trivial, they sum to only about a reduction of only .47 births for women 35-39 who have on average had 5.37 births at the time of the Census in 1973.

Finally, as we have stressed, among the rural population, the urban-oriented health institutions and family planning programs do not have any apparent effect on cumulative fertility up to 1973. Indeed, the sign of the coefficier on the clinic variable is positive in four out of the eight age groups.

5.3 Interpreting the Effects of Schooling on Fertility and Mortality

The estimates of the fertility and mortality equations suggest that in the urban populations of Colombia, where health programs do appear to affect significantly child survival and fertility, it is the less educated who benefit most from such programs. What insights do these results provide in identifying the principal roles of education and the health programs in reducing child mortality and family size? The estimates clearly reject the hypothesis that the most important role of schooling is in augmenting family resources, which then allows the more educated to better take advantage of health service subsidies,

(hypothesis B.3 of Table 1). The joint hypothesis (B.2) that programs subsidize inputs about which the more educated can acquire information at lower cost than the less educated is also rejected. Moreover, results reported in Schultz (1980) based on samples restricted to Colombian mothers with husbands present indicate that the estimated relationship between education and fertility and child mortality controlling for husband's income or education are similar to those obtained here; income effects related to assortative mating cannot be the sole reason for the strong inverse association between maternal education, child mortality and family size.[1]

The positive signs of the estimated interaction effects between health program facilities and mother's education are, however, consistent with two of the hypothesized education-function and program-mechanism combinations summarized in Table 1, namely A.2 and B.4. The first of these (A.2), which assumes that the chief role of both education and the health programs is informational, predicts that the effects of programs on child mortality and fertility would be larger for <u>less educated</u> mothers. Because both education and health programs lower the implicit costs of obtaining information about the underlying health technology, leading to more efficient use of resources in producing health, these two variables are partially <u>substitutes</u> for one another. Schooling is, thus, less beneficial where

[1] Tabulations of these findings are in Schultz (1980) Tables A-1 through A-12 and regressions in Table C-1 and C-2. The effect on sample size of various restrictions on the working sample, such as marital status, positive fertility, husband present, are reported in Table D-1 of the same paper.

program activities are at a high level; conversely, programs which chiefly provide information are less effective when parents have already acquired much of this information.

The hypothesis B.4 predicts that if the main function of health programs is to reduce the monetary cost of health services and inputs to users by direct subsidy, a mother with less education also stands to benefit more, because the unsubsidized time costs she incurs to use the health program inputs are relatively less important to her. For the more educated woman, whose time value is larger, the input subsidy of the health program will apply to a smaller fraction of her total health production costs. Moreover, demand for public sector health facilities and services may also be governed by waiting time (queuing) when monetary prices are administratively fixed at low levels, discouraging further the use of public facilities by the more educated mother.

Another aspect of the empirical results rejects this second hypothesis, however. If the value of time of mothers is increased by education, the more educated mothers should be more deterred than the less educated by long-distance, time-consuming trips to obtain health services in a neighboring metropolitan area. But in fact we find no significant interaction effects involving time-to-capital and mother's education variables. Though proximity to metropolitan health services or time costs are virtually always an important determinant of child mortality, these effects do not vary substantially for mothers of different education levels.

Our findings thus do not permit us to infer precisely how <u>subsidized</u>

provision of health and family planning services affects child health and fertility; only the informational aspect of such services are clearly detected by the analysis. One reason may be that our measures of health service availability include both public and private sources, as recorded in the national health registry. Since public institutions are more highly subsidized than the private, discriminating between the effects of public and private facilities in future work may enable us to evaluate more precisely the importance of benefits arising from subsidies to health input use and the redistributional consequences of these input subsidies.

6. Conclusion and Summary

In this paper we merged information on socioeconomic and climatic-geographic characteristics and on the public health facilities of approximately 900 municipalities with a four percent sample of individual-household records from the 1973 Colombian Population Census. Estimated relationships are reported between the cumulative fertility and child mortality ratio of mothers and their education and age and the characteristics of the communities in which they reside within five-year age groups in rural and urban areas. The statistical patterns shown in Tables 4 and 5 are sufficiently consistent across age and regional samples to warrant several conclusions. As others have widely found, the education of mothers is strongly inversely correlated with their own child mortality ratio and fertility. The reason for this correlation is partially clarified by the interactions observed between the mother's schooling and the community's health inputs. These suggest that urban public health activities are substitutes for the health care knowledge and the management capacity that an

educated mother brings to her family. As a consequence it is in families with less educated mothers where health and fertility are evidently affected most by health and family planning activities. Clinics also appear a somewhat more cost-effective investment in reducing child mortality and fertility than hospitals.

Few leads emerge from our findings for the design of improved health priorities in the rural sector, however. Among the rural population there are no strong effects of the regional allocation of health institutions and expenditures. Only maternal education, transportation infrastructure, and a quadratic effect of temperature are consistently associated with variation in the much higher levels of child mortality among the rural poulation of Colombia. The weakness of the rural program effects may in part be due to the great dispersion in these activities in rural areas; more intensive investigations of the role of rural programs are needed.

The power of merged micro and community level information to illuminate the important channels through which education and health and family planning programs affect family size and child survival depends on the use of a consistent conceptual and statistical framework. The outlines of such a framework are stated in this paper. We emphasized the estimation of "reduced form" or unconditional demand/production equations, because of the limitations of our data. More insights into the interrelationships between education, household decisions, health programs and child survival and fertility can be obtained from the estimation of the household health production technology. The estimated form of the equations presented in

this paper combines the unobserved demand parameters and parameters describing these production technologies; this "reduced form" specification yields, nonetheless, measures of average policy effectiveness, the distributional consequences of health programs and the effects of education that can help resolve outstanding controversies in the field of health and development.

Table A-1

Distribution of Health Institutions,

by Type and Public/Private Operation, 1976

	Hospitals	Health Centers		Clinics and Dispensaries	Health Posts	Mobile Care Units
		Out Patient Services	In and Out Patient Services			
Total Number of Units	671	142	537	657	1505	27
Government	516	122	529	526	1504	27
Private	155	20	8	131	1	0

Source: DANE, 1976, Registro de Organismos de Salud, Bogota, 1977, Table 1, p. 7.

Table A-2

Distribution of Health Units and Available Beds

by Source of Financial Support, 1976

	Number of Organizational Units	Number of Beds Available
Total	3539	45334
Government:	3226	37391
Ministry of Health	2732	31631
Social Security (ICSS)	271	3817
National Provision Fund (CAJANAL)	1	208
Other Funds (Cajas)	102	0
Agency for the Poor (FFAA)	52	1287
Others	68	448
Private:		
Cash Payment by Families	22	0
Other	291	7943

Source: DANE, 1976, Registro de Organismos de Salud, Bogota, 1977, Table 2, pp. 7-8.

Table A-3

Regression of Average Child Mortality Ratio of Mothers by Single Year of Age on a Fifth Degree Polynomial in Mother's Age, within Urban and Rural Areas

Explanatory Variable	Region of Residence	
	Urban	Rural
Intercept	.5520 (2.58)	1.089 (3.98)
Age of Mother	-.06398 (2.05)	-.1477 (3.66)
Age^2	.003019 (1.73)	.008123 (3.56)
Age^3	-6.664×10^{-5} (1.42)	-2.105×10^{-4} (3.40)
Age^4	7.192×10^{-7} (1.18)	2.642×10^{-6} (3.27)
Age^5	2.993×10^{-9} (.98)	-1.289×10^{-8} (3.16)
R^2	.9697	.9732
Sample Size (Single Year Aggregates, Ages 16 to 65)	49	49
Durbur Watson-Statistic	1.89	2.29

Note: Standardized child mortality ratio is defined as the actual ratio divided by the predicted ratio obtained from the above fitted values for the mothers age and its powers.

Table A-4

Municipal Agricultural Daily Wage Regression for Rural Women in 1976

Individual Variables for Women aged 20-49:	(1)	(2)
Educational Attainment (years)	.274	.376
	(7.81)	(14.3)
Age (years)	.0020	-.0056
	(.23)	(.87)
Municipality Variables		
Temperature (centigrade/10.)	60.7	33.3
	(45.5)	(32.8)
Temperature Squared	-12.8	-6.69
	(40.8)	(28.2)
Travel Time to Department Capital (days)	-.534	-1.32
	(5.57)	(16.8)
Food Price (per day of work)		1.47
		(154.)
No Food Price Reported		18.9
		(35.6)
Intercept	8.59	-13.2
N_2	31,728	31,728
R^2	.1041	.4983

*The daily wage for agricultural labor is reported quarterly in pesos to the data bank of DANE. Where wages are not reported for all four quarters in a municipality, those municipalities that report complete data are used to obtain a prediction equation to impute a value to the missing quarters. Wages refer to those paid without daily food provisions. When no wage is reported for a municipality in 1976, a neighboring municipality wage is substituted which is most closely related by transportation route, such as a major road. The mean of this adjusted wage is 60.5 pesos per day. If all of the missing quarterly data on wages were simply set to zero, under the extreme assumption that no employment opportunities existed in these municipalities during these quarters, then the sample mean unadjusted wage is 59.2 pesos per day. In 1.14 percent of the individual observations no information is available on local food prices. In those regions reporting the difference between wages with and without the provision of food, the individual mean daily food provisions are valued at 23.6 pesos, or about 39 percent of the adjusted daily agricultural wage. In those regions without a "price" of food, a food dummy variable is set to one, and the food "price" variable is zero.

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