The following bibliography is a reference tool for planning household energy and health intervention studies in Guatemala. Articles and reports referenced herein describe the improved stoves experience in Guatemala from environmental, health, social, and cultural perspectives. The main health focus of the bibliography is acute respiratory infections (ARI) in children, including several articles on risk factors that may confound the relationship between indoor air pollution and ARI. Articles on the epidemiology of tuberculosis and a general section on health interventions in Guatemala are included in this revised version. References from other Central American countries and Mexico are included where the topics are directly relevant to the potential of improved stove interventions for reducing indoor air pollution and health impacts in Guatemala. The thesaurus lists the categories in the “Subject Index.” The “Author Index,” beginning on page 12, includes abstracts and is ordered alphabetically by first author.

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**THESAURUS**

Acute Respiratory Infections: Management, Risk Factors and Prevention

Air Pollution Measurements

  Guatemala

  Other Central America and Mexico

Diarrheal Disease

Fuelwood Consumption and the Energy Ladder in Central America

  Guatemala

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Health Effects of Indoor Air Pollution

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  Education

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Acute Respiratory Infection: Management, Risk Factors and Prevention


Saenz de Tejada, S. (1997). Management of acute respiratory infections in a Kaqchiquel community in
Air Pollution and Exposure Measurements

Guatemala


**Other Central America and Mexico**


**Diarrheal Disease**


**Fuelwood Consumption and the Energy Ladder**

**Guatemala**


Caceres, E. et. al. (1991). **Domestic firewood consumption in the Guatemalan rural area.** In K. R. Smith, J. Ramakrishna, et. al. (Eds.), *Stoves for People* (pp. 11-18). London: Intermediate Technology Pubs.


**Other Central America and Mexico**


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INfectious Disease Journal, 10, 752-57.


**Risk Factors for Acute Respiratory Infection**

**Maternal Education**


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Low Birth Weight


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Bogin B, Keep R (1999). Eight thousand years of economic and political history in Latin America revealed by


**Socioeconomic Status and Intra-Household Allocation of Resources**


**Tuberculosis in Guatemala**


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Improved biomass cookstoves have the potential to reduce pollutant emissions and thereby reduce pollution exposure among populations in developing countries who cook daily with biomass fuels. However, evaluation of such interventions has been very limited. This article presents results from a study carried out in 30 households in rural Guatemala. Twenty-four hour PM3.5 concentrations were compared over 8 months for three fuel/cookstove conditions (n = 10 households for each condition): a traditional open fire cookstove, an improved cookstove called the plancha mejorada, and a liquefied petroleum gas (LPG) stove/open fire combination. Twenty-four hour geometric mean PM3.5 concentrations were 1560 g/m³ (n = 58; 95% C.I. 1310, 1850), 280 g/m³ (n = 59; 95% C.I. 240-320), and 850 g/m³ (n = 60; 95% C.I. 680-1050) for the open fire, plancha, and LPG/open fire combination, respectively. A generalized estimating equation model showed a 45% reduction in PM3.5 concentrations for the LPG/open fire combination as compared to the open fire alone. The difference approached significance (p < 0.0737). The plancha showed an 85% reduction in PM3.5 concentrations as compared to the open fire (p < 0.0001). An analysis of the interaction of time with stove type showed that the temporal trend in pollution did not significantly differ among the three stove types. The reduced PM3.5 concentrations were maintained over time. Season did not affect pollutant concentrations. Of the two interventions, the plancha appears to offer the best prospects for achieving substantial reductions in indoor air pollution levels, although issues of cost and stove maintenance remain to be addressed.


This paper focuses on conceptualizations of the common cold among Latin Americans, as compared with middle-class Americans. Four geographically dispersed groups of Latin Americans were chosen for study: Guatemalans in Guatemala; Mexicans in Guadalajara, Mexico; persons of Mexican descent in Edinburg, Texas (on the Texas-Mexican border); and Puerto Ricans in Hartford, Connecticut. In addition, a comparison group of middle-income Americans living in Tampa, Florida, was also studied to see the extent to which folk concepts were seen in what is considered to be a "mainstream" population. The data suggest a great deal of both intra- and intercultural agreement as to causes, symptoms, and treatments of the common cold. The cold seems to be viewed as very much in the realm of a biomedical illness, with the exception of ascribing the hot/cold system of causality to the common cold, among all five populations. Finally, the cold is clearly differentiated from "the flu," which seems to exist as an illness only among English-speaking populations in the United States. Key Words: colds, Latinos, middle-income American, flu


This paper sketches the history of medical anthropology in Guatemala, focusing on how investigations carried out during the 1950s served as methodological and ideological foundations for subsequent work. Problematic
examples from the literature and from the author's experience are used to provide insight into the nature of the anthropologist's role in applied research and development. For example, medical anthropologists are often hired to help navigate the gulf between the ideological identities of indigenous peoples and those of biomedical researchers and international development specialists. Instead of recognizing the inherently ethical nature of this work and acting accordingly, many anthropologists have adopted a detached, "scientific" and impossibly value-free perspective. This paper proposes a transformation of this role into one that (1) maintains an independent and critical relationship to mainstream science, (2) elaborates and advocates the indigenous agenda, and (3) adopts an explicitly value-filled ideology, methodology and theoretical framework.


We conducted a 1-year longitudinal prospective study of infants born in a traditional rural indigenous community of Guatemala. Three hundred twenty-nine infants surviving birth and the first day of life were followed during the first 3 months of life. Surveillance included routine household and well baby clinic visits and clinic visits for minor illnesses. Detection of potentially lethal illnesses depended on orientation of families and midwives to important symptoms and to the need for immediate medical evaluation if such symptoms were identified. We identified 38 episodes of lethal and potentially lethal illness. Thirty-five (92%) of these episodes were infectious diseases, principally sepsis during the neonatal period and acute lower respiratory infection in Months 2 and 3. Of all study infants, low birth weight (less than 2500 g) infants comprised 14% and premature (less than 37 weeks gestation) infants comprised 1%. Premature infants had a relative risk of lethal and potentially lethal illnesses of 11.1 (95% confidence interval, 3.6 to 34.4) compared with normal term infants, and no premature infant survived the first 3 months of life despite medical intervention. Low birth weight infants had a relative risk of 3.2 (95% confidence interval, 1.5 to 6.6), but with medical intervention all but 2 survived. Despite their lower risk, because of their much greater number normal term infants experienced 60% of lethal and potentially lethal illnesses. Among all study infants medical intervention was associated with survival of 86% of lethal and potentially lethal infectious illnesses and with a rate of neonatal mortality among study children significantly lower than rates documented in previous years in the same community.


We identified high rates of intrapartum and neonatal mortality among children born in a traditional indigenous community in rural Guatemala. To examine the potential association of maternal characteristics and obstetric and newborn care practices with this mortality, we conducted a retrospective case-control study. Case were infants born in 1986 and 1987 who died during birth or in the first month of life, as identified by civil records; for each case, the next child born who survived the first month of life was selected as control. In interviews with mothers of cases and controls standardized data were collected on demographic and socioeconomic characteristics of the mother, her general obstetric history, history of the pregnancy, labor, and delivery, condition and care of the infant at birth, and morbidity and treatments of the infant after birth. Sixty-one cases and their controls were included in the study. Based on clinical condition at birth, we subcategorized cases into infants stillborn or dying in the first 24 hours of life (intrapartum cases) and those dying in the first month after day 1 (neonatal cases). Factors significantly associated with both subcategories of cases were maternal illiteracy, primagravity, failure to use "modern" prenatal care, and inter-birth interval less than 14 months. Intramuscular injection of oxytocin by the midwife during labor, and performance of greater than or equal to 3 vaginal examinations by the midwife were each significantly associated only with the intrapartum subcategory of cases. Mother's estimate of infant size as "smaller than normal" was associated with neonatal, but not with intrapartum, cases.(ABSTRACT TRUNCATED AT 250 WORDS)


We examined the association between water and hygiene-related behaviors and persistent diarrhea (duration >
or = 14 days) among children under age three years in an indigenous rural Guatemalan community. Behavior indicators were specific aspects of the appearance of the mother, study child, other children and household that could be observed using a spot observation technique. Thirty-four percent of children had one or more episodes of persistent diarrhea during the year of study. Bivariate analyses found that a higher proportion of observations in which the anti-hygienic condition was observed was significantly associated with persistent diarrhea for 11 of 26 behavior indicators; these 11 indicators were also strongly correlated with each other. In individual logistic regression models, which included overall rate of diarrhea and other child characteristics associated with persistent diarrhea, six behavior indicators maintained significant association with persistent diarrhea: presence of toy on the ground, presence of baby bottle on the ground, the hands of the mother being dirty, presence of a fecally soiled diaper on the ground in the household compound, presence of feces in the yard, and the study child wearing a fecally soiled diaper. Three additional indicators closely approached significant association with persistent

Chemist Donald Blake of University of California, Irvine, announced that the major cause of pollution in Mexico City is caused by the emission of hydrocarbon from liquefied petroleum gas, which is used extensively by residents of the city. Using gas chromatography to measure air samples across Mexico City, Blake discovered that propane and butane levels were substantially higher than ethane levels. He claims that high hydrocarbon concentration accounted for the high ozone levels in urban areas, which is unhealthy for people.

Zinc deficiency has been associated with growth deficits, reduced dietary intake and appetite, and has been hypothesized to result in reduced activity. This randomized, double-blind, placebo-controlled study examined whether 10 mg of oral zinc as zinc sulfate, given daily for up to 7 mo, affected activity patterns of 85 Guatemalan infants recruited at 6-9 mo of age. Infant activity was assessed by time sampling-observation method at 10-min intervals during a 12-h data collection period, at base line, 3 and 7 mo follow-up. Motor development and the percentage of time infants were observed in various positions (being carried, lying down, sitting, crawling, standing or walking) and engaged in various activities (eating, sleeping, resting, crying/whining or playing) were compared by treatment group. No differences in motor development were observed by treatment group. However, at follow-up 2 (after 7 mo of supplementation), zinc-supplemented infants were significantly more frequently observed sitting up compared with lying down, and were playing during 4.18 +/- 1.95% (P < 0.05) more observations than unsupplemented infants. They were also somewhat less likely to be observed crying or whining (P < 0.10) compared with those receiving the placebo. These effects are independent of other factors including infant age, motor development, sex, maternal education, family socioeconomic status and nutritional status at base line. Further research must be conducted to determine the long-term developmental importance of these differences in activity patterns associated with zinc supplementation in this setting.


The decision in 1987 by the pharmaceutical firm Merck &amp; Co. to provide Mectizan (ivermectin) free of charge to river blindness control programs has challenged the international public health community to find effective ways to distribute the drug to rural populations most affected by onchocerciasis. In the Americas, PAHO responded to that challenge by calling for the elimination of all morbidity from onchocerciasis from the Region by the year 2007 through mass distribution of ivermectin. Since 1991, a multinational, multiagency partnership (consisting of PAHO, the endemic countries, nongovernmental development organizations, the
Centers for Disease Control and Prevention in Atlanta, Georgia, as well as academic institutions and funding agencies) has developed the political, financial, and technical support needed to move toward the realization of that goal. This partnership is embodied in the Onchocerciasis Elimination Program for the Americas (OEPA), which is supported by the River Blindness Foundation (RBF) and now by the Carter Center. OEPA was conceived as a means of maintaining a regional initiative to eliminate what is otherwise a low priority disease. Since its inception in 1993, the OEPA has provided more than US$ 2 million in financial, managerial, and technical assistance to stimulate and/or support programs in Brazil, Colombia, Ecuador, Guatemala, Mexico, and Venezuela, so as to take full advantage of the Merck donation. Now halfway into a five-year, US$ 4 million grant provided through the Inter-American Development Bank, the OEPA's capacity to support the regional initiative is assured through 1999.


Human growth in height may be used as a cumulative record of the nutritional and health history of a person or a population, and often reflects the economic, social and political environment in which those people live. This paper explores the relationship between growth in height and the economic, social and political environment in Latin American populations. Adult height is analysed over an 8250 year period. It is shown that economic, social and political change prior to the European conquest of the Americas resulted in positive and negative trends in mean stature. Following the European conquest, there was a decline in mean adult stature in Middle and South America that continued until about 1939. From 1940 to 1989 there was a trend for increasing mean stature. A negative trend in stature for children is found in a second analysis. Economic decline and political unrest in Guatemala since 1978 is associated with a significant decline in the mean stature of 10- and 11-year-old children from families from very high, moderate, and very low socioeconomic status.


In Tlaxcala State, Mexico, we determined that 80% of children who died from diarrhoea or acute respiratory infections (ARI) received medical care before death; in more than 70% of the cases this care was provided by a private physician. Several strategies have been developed to improve physicians’ primary health care practices but private practitioners have only rarely been included. The objective of the present study was to evaluate the impact of in-service training on the case management of diarrhoea and ARI among under-5-year-olds provided by private and public primary physicians. The training consisted of a five-day course of in-service practice during which physicians diagnosed and treated sick children attending a centre and conducted clinical discussions of cases under guidance. Each training course was limited to six physicians. Clinical performance was evaluated by observation before and after the courses. The evaluation of diarrhoea case management covered assessment of dehydration, hydration therapy, prescription of antimicrobial and other drugs, advice on diet, and counselling for mothers; that of ARI case management covered diagnosis, decisions on antimicrobial therapy, use of symptomatic drugs, and counselling for mothers. In general the performance of public physicians both before and after the intervention was better than that of private doctors. Most aspects of the case management of children with diarrhoea improved among both groups of physicians after the course; the proportion of private physicians who had five or six correct elements out of six increased from 14% to 37%; for public physicians the corresponding increase was from 53% to 73%. In ARI case management, decisions taken on antimicrobial therapy and symptomatic drug use improved in both groups; the proportion of private physicians with at least three correct elements out of four increased from 13% to 42%, while among public doctors the corresponding increase was from 43% to 78%. Hands-n training courses thus seemed to be effective in improving the practice of physicians in both the private and public sectors.

Keywords: child, preschool; diarrhoea; acute respiratory infections; infant; medical education, continuing; physician's practice patterns.

Changes in the diagnosis and treatment of helminthic infection were examined during a longitudinal study in a rural community in Guatemala. Self-diagnosis was predominant, with an increase in perceived helminthic infection during an economic crisis within the community. Allium sativum L. and Chenopodium ambrosioides L. were used as anthelmintics, often in conjunction with commercial drugs. During the economic crisis the use of plants as treatment for perceived infection increased whereas use of commercial helminthic medicine decreased. Dietary modifications were observed during periods of perceived infection, but were not consistent in the food items modified or the nature of the modification. Within the community individuals exhibited considerable heterogeneity in their approaches to treatment.


Around two-thirds of the populations of developing countries are still primarily dependent on biofuels for domestic use, and it is now well documented that this results in high levels of indoor air pollution. The fuel efficiency and pollution emitted from biofuel stoves therefore have important implications for a number of important, interrelated aspects of development, including health promotion, protection of the environment, and the household economy. This study reports on the fuel efficiency of a popular wood-burning stove (the plancha) in western Guatemala, in comparison with the traditional open fire. This stove has been shown previously to substantially reduce levels of indoor air pollution. In standard water boiling and cooking tests, the plancha consumed more fuel and took longer than the open fire. Modification of the plancha combustion chamber by inclusion of a baffle resulted in a 12% improvement in overall thermal efficiency, bringing it up to the value for the open fire. In five-day tests of routine cooking, the modified plancha (with the baffle) was found to use 39% less fuel wood than the open fire. In selecting plancha stoves for the study, a high proportion were excluded due to cracks and other faults, and this highlights the pressing need for more attention to be paid to the long-term sustainability of improved stoves. Nevertheless, the potential that stoves such as the plancha may have for substantially reducing fuel use as well as household pollution has important implications for poor populations in many parts of Latin America and other developing countries.

Recent evidence has suggested that woodsmoke exposure in developed countries is associated with acute and chronic health impacts. Accordingly, it is increasingly important to investigate the much higher woodsmoke exposures associated with the use of wood and other biomass for cooking and heating in developing countries. Particulate concentrations were measured in rural Mexican kitchens using biomass combustion for cooking. To investigate differences in indoor particle concentrations between kitchens using different fuels and stove types, measurements were made in eight kitchens using only biomass, six using only liquefied petroleum gas (LPG), six using a combination of biomass and LPG, and three using biomass in ventilated stoves. Outdoor samples were collected at the same time as the indoor samples. PM10 and PM2.5 measurements were made with inertial impactors, and particle light scattering was measured continuously with an integrating nephelometer. Nephelometer and particulate mass measurements were highly correlated ($r^2$ of 0.9 and 0.83 for PM2.5 and PM10, respectively), indicating that the light scattering measurements could be used to estimate short-term concentrations. PM10 and PM2.5 concentrations (mean concentrations of 768 and 555 µg m$^{-3}$, respectively) in
the kitchens burning only biomass were greater than in all other types (biomass > biomass + LPG > ventilated > LPG > outdoor). A similar trend was evident for the indoor/outdoor concentration ratio. Based on the short-term measurements estimated from the nephelometer data, PM10 and PM2.5 cooking period average and 5-min peak concentrations were significantly higher (p < 0.05) in kitchens using only biomass than in those using LPG, a combination of LPG and biomass, or a ventilated biomass stove.

The present study was conducted with the objective to determine the effects of altitude above sea level, on the cooking time and nutritional value of common black beans (Phaseolus vulgaris). Three 100 g samples of the Ostua variety were cooked at 8 individual locations, ranging in altitude from 0 to 2256 meters, in Guatemala, to establish water uptake and cooking time. The cooked samples were separated into cooked beans and cooking broth for chemical analysis. This included moisture, protein, lysine, tannins, total and enzyme susceptible starch, and fiber fractionation. The cooking liquor was analyzed for total solids, moisture, protein, ash and K. A 1200 g sample was cooked for the cooking time established previously, for biological testing of nutritional value, which included Net Protein Ratio (NPR), Protein Efficiency Ratio (PER), and protein digestibility. Altitude influenced cooking time which increased from 78 min at 0 m, to 264 min at 2256 m. Final moisture content in the cooked bean was similar at all altitudes and there was a tendency to yield smaller amounts of solids in the cooking broth at higher altitudes. The increase in cooking time was significant. Bean water uptake at all times was significantly slower and smaller at ambient as compared to water uptake at boiling T, at all altitudes. Protein and lysine content were not affected by altitude, however, tannin and catechin were lower in cooked samples, as compared to the raw material. Altitude did not affect the content of these substances. Total starch and total sugars were higher in the raw sample, as compared to the cooked samples, but there was no effect of altitude. Enzyme susceptible starch (ESS) was lower in the raw sample as compared to the cooked samples, which contained similar amounts with respect to altitude. No change was observed in fiber fractions of the cooked beans. Likewise, the composition of the cooking broth was very similar between cooking locations. There was a small tendency to a lower protein quality, with respect to altitude, the effect of which was more obvious in the apparent protein digestibility values. Undercooking or overcooking at one location influenced protein quality values. The extended cooking time of beans at high altitudes, has important economic and environmental implications, since significant amounts of wood have to be used.

BACKGROUND: A number of studies have reported associations between indoor biofuel air pollution in developing countries and chronic obstructive lung disease (COLD) in adults and acute lower respiratory infection (ALRI) in children. Most of these studies have used indirect measures of exposure and generally dealt inadequately with confounding. More reliable, quantified information about this presumed effect is an important pre-requisite for prevention, not least because of the technical, economic and cultural barriers to achieving substantial exposure reductions in the world's poorest households, where ambient pollution levels are typically between ten and a hundred times higher than recommended standards. This study was carried out as part of a programme of research designed to inform the development of intervention studies capable of providing quantified estimates of health benefits. METHODS: The association between respiratory symptoms and the use of open fires and chimney woodstoves ('planchas'), and the distribution of confounding factors, were examined in a cross-sectional study of 340 women aged 15-45 years, living in a poor rural area in the western highlands of Guatemala. RESULTS: The prevalence of reported cough and phlegm was significantly higher for three of six symptom measures among women using open fires. Although this finding is consistent with a number of other studies, none has systematically examined the extent to which strong associations with confounding variables in these settings limit the ability of observational studies to define the effect of indoor
air pollution adequately. Very strong associations (P < 0.0001) were found between the type of fire and a number of household and socioeconomic factors including the arrangement of rooms, floor type, and possession of a radio and television. The spouse's economic activity type was also significantly associated (P < 0.05). Thus, while 82% of open fire users had dirt floors and only 18% cement or tile floors, the situation was reversed for plancha users, only 16% of whom had dirt floors. CONCLUSIONS: Confounding presents a substantial problem for observational studies of indoor air pollution and health, although there is a reasonable case for believing that the observed association is causal. Intervention studies are required for stronger evidence of this association, and more importantly, to determine the size of health benefit achievable through feasible exposure reductions.


All available estimates of rates of infant mortality, vaccination coverage (for BCG, DPT 3, polio 3, measles, and tetanus toxoid), and ORS use in Guatemala in the 1980s were identified and investigated. A large number of sources and estimates were found. Large discrepancies were also found between the estimates for a given indicator, even when the estimates were reported for the same year by the same source. For instance, reports for 1985 yielded 10 different infant mortality estimates ranging from 56.0 to 79.8 deaths per 1,000 live births; vaccination coverage estimates ranging from 30% to 60.5% for BCG, 3.5% to 34.2% for DPT 3, 3.5% to 33.5% for polio 3, 11% to 58.2% for measles, and 1% to 8.2% for tetanus toxoid; and estimated use rates of oral rehydration solution ranging from 3.5% to 7.2%. In this same vein, three Guatemalan Ministry of Health estimates of infant deaths per 1,000 live births in 1984 ranged from 52.4 to 79.8; four UNICEF estimates for 1985 ranged from 65 to 79.8; and three USAID estimates for 1987 ranged from 59 to 72. The many reasons found for this diversity point to significant problems influencing the reliability of current data.


Findings from Chile, Barbados, Guatemala, and Mexico are reviewed in this article to shed light on the consequences of adolescent childbearing for mothers' economic and social opportunities and the well-being of their first-born children. The studies include retrospective information and a comparison group of adult childbearers to account for the effects of background factors (poverty) and the timing of observations. The findings show that early childbearing is associated with negative economic rather than social effects, occurring for poor rather than for all mothers. Among the poor, adolescent childbearing is associated with lower monthly earnings for mothers and lower child nutritional status. Also, among this group of women only, improvements in the child's well-being are associated with mother's education and her contribution to household income. These findings suggest that social policy that expands the educational and income-earning opportunities of poor women could help to contain the intergenerational poverty associated with early childbearing among the poor.


Respiratory ailments are important causes of morbidity and mortality in developing countries. Ethnobotanical surveys and literature reviews conducted in Guatemala during 1986-88 showed that 234 plants from 75
families, most of them of American origin, have been used for the treatment of respiratory ailments. Three Gram-positive bacteria causing respiratory infections (Staphylococcus aureus, Streptococcus pneumoniae and Streptococcus pyogenes) were used to screen 68 of the most commonly used plants for activity. Twenty-eight of these (41.2%) inhibited the growth of one or more of the bacteria tested. Staphylococcus aureus was inhibited by 18 of the plant extracts, while 7 extracts were effective against Streptococcus pyogenes. Plants of American origin which exhibited antibacterial activity were: Gnaphalium viscosum, Lippia alba, Lippia dulcis, Physalis philadelphica, Satureja brownei, Solanum nigrescens and Tagetes lucida. These preliminary in vitro results provide scientific basis for the use of these plants against bacterial respiratory infections.


an interagency committee of the Pan American Health Organization/World Health Organization, the Inter-
American Development Bank, the World Bank, and other multilateral and bilateral agencies. In response, in
1997 the Pan American Health Organization and the United States Agency for the International Development
launched the Latin America and Caribbean Regional Health Sector Reform Initiative. The Initiative has
approximately US$ 10 million in funding through the year 2002 to support activities in Bolivia, Brazil, the
Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua,
Paraguay, and Peru. Now in its third year of implementation, the Initiative supports regional activities seeking
to promote more equitable and effective delivery of basic health services.

For the purpose of better understanding the epidemiology of acute and persistent diarrhea, 130 infants of a
marginal urban area in Guatemala City were studied. The subjects were kept under surveillance by weekly
home visits, for periods that varied from three to nine months. The diarrhea episodes were detected and
microbiological studies were done in fecal material. Additionally, the children were weighed and measured to
determine their nutritional status. The infants suffered, on the average, 5.2 episodes per child annually; 9.4% of
all the episodes lasted at least two weeks. The children who were less than six months old had more episodes
of persistent diarrhea (0.052/child-month) than the older ones (0.017/child-month), with previous diarrhea
morbidity and number of infecting enteropathogens being important factors. Furthermore, a child who had
already suffered an episode of persistent diarrhea had a higher probability (relative risk = 2.2) of developing an
additional one. Adherent E. coli, Cryptosporidium, toxigenic E. coli and Campylobacter jejuni are the
pathogens more commonly associated with persistent diarrhea. Diarrheal illnesses have a deleterious effect on
nutritional status, especially persistent episodes, which interfere with gain in weight and length of the children.

tract infections among Guatemalan ambulatory preschool children. Rev Infect Dis 12 Suppl 8 : S1029-34.
Acute respiratory tract infections (ARI) were studied during a 2-year period in 521 preschool children living in
a marginal area of Guatemala City. There were 3,646 episodes of ARI detected during 26,329 child-weeks at
risk, for an incidence of 14 per 100 child-weeks or 7.2 episodes per child per year. The median duration of
ARI episodes was 11 days. The highest incidence of ARI was observed in children 6-23 months old. Boys had
more respiratory tract illnesses than did girls; the presence of a cigarette smoker in the household was
associated with higher morbidity. Acute lower respiratory tract illnesses (ALRI) were more common among
younger infants 0-5 months old, with nutritional status having no apparent effect. Parental formal education
and crowding in households were found to be directly related to the incidence of ALRI. In general, ARI
morbidity interfered with appropriate physical growth.

A prospective, longitudinal two-year study to determine the epidemiology of persistent (> or = 14 days' 
duration) diarrhea in rural children of Guatemala was undertaken. Three-hundred and twenty-one children
aged 0-35 months were kept under surveillance by twice-a-week home visits. The overall incidence of diarrhea
was 0.147 per child-week; the incidence of persistent diarrhea was 0.014 per child-week. The peak of
persistent diarrhea was observed in infants below six months of age, with a continuous decline thereafter. This
trend in incidence of persistent diarrhea was associated with a higher proportion (16%) of illnesses persisting
for more than 13 days in children younger than six months of age as compared to children 30-35 months old
(4%). Males had more diarrhea (0.156 per child-week) than females (0.139 per child week). Among children
above 18 months of age, the proportion of episodes that lasted for more than 13 days was lower in females
than in males.

Environ. Contam. & Tox. 26 : 24-30.
This study was conducted in the Guatemalan highland department of Sacatepequez, in a sample of 146 rural women insured by the Social Security system. It examined their health care behaviour when their children presented common childhood symptoms such as diarrhoea, fever, cough, and worms. The mothers generally sought help and treatment advice from an older woman in the family, and did so more often for diarrhoea (82%) and fever (64%) than for cough (43%) or worms (28%). Obtaining advice in a pharmacy or from a drug seller ranked second (range: 8%-38%, depending on the symptom), before the procurement of professional help at a medical service (range: 8%-23%). Traditional healers were hardly consulted (range: 0%-3%). In the case of self-treatment the women predominantly relied on Western drugs: around 80% in diarrhoea and fever, and above 50% in cough. Herbs and traditional external remedies were little used, except in cough (27%) and worms (58% external remedies). None of the mothers reported ORS as home treatment for diarrhoea. Problems of geographical or financial accessibility could not explain the low utilisation of the Western health care system. The acceptability of public services, however, was poor. Largely because the Social Security clinic did not prescribe the "potent" modern drugs mothers preferred for the treatment of childhood symptoms—at least, not for uncomplicated illness episodes. Women hence turned to the—partially informal—private sector, which unabashedly responds to their demands. Clear away the discrepancy between the "rational" needs perceived by the official health sector and the demands of the population is one of the bigger challenges to health care planning in transitional communities such as the one studied.


The relative effects of fathers' and mothers' income on children's nutritional status were examined with a sample of 294 peri-urban Guatemalan children aged 8-47 months. Whether or not incomes tended to be pooled, and the relation of income earning to decision-making about purchases were examined. Four measures of income were constructed for both mother and father: total income, contribution to the household food budget, percentage of her/his income contributed to the household food budget, and a percentage of total family income earned by that person. In the majority of households, women did not report pooling their incomes. Women who earned a higher proportion of the family income had significantly more control over decision-making in all areas except food purchases, which were already primarily women's decisions. Relationships of income measures with children's nutritional status were examined with multiple linear regression analyses controlling for potentially confounding variables. For mothers, the percentage of the total family income they earned was most highly associated with children's nutritional status, suggesting that income control by mothers may have benefits for children. For fathers, the percentage of their income they contributed to the household food budget was most highly associated with children's nutritional status, suggesting that father investment or attitude toward children has important benefits for children.

The present study investigated how food is distributed to various family members differing in age, sex, earning status, family role, and status as target child in families enrolled in supplementary feeding programs in urban Guatemala. Two patterns to explain intra-household food distribution patterns were hypothesized: a Contributions Rule, that individuals considered in the culture to have higher economic value would receive a higher percentage of the family's food; and a Needs Rule, in which those considered to have greater need (but
not contribution) would receive a higher percentage of the family's food. The results with 45 families (230 individuals) suggested that the Contribution Rule was a better predictor of food distribution patterns in this setting than the Needs Rule. Specifically, male heads of households received a relatively higher proportion of the family's proteins, and the female heads of households received a relatively higher proportion of the family's calories, given their nutritional requirements, than other family members. There was no evidence that mothers were giving the child targeted as undernourished by the health center any more food than any other similarly-aged child.


In order to measure accurately indigenous Guatemalan women and young children's exposure to smoke from cooking fires, three techniques were compared: 1) observation; 2) recall 24 hours later based on duration of activities; and 3) recall 24 hours later based on the time each activity started and stopped (elapsed time). To measure recall accuracy, 43 women and their children under two years were observed during meal preparation and consumption, and the next day were asked to recall these activities. Women were reasonably accurate when recalling durations, but recall was significantly less accurate using elapsed times. Recall accuracy increased when two days' measurements were averaged. Women spent more time in the kitchen if they had a husband, and spoke only the indigenous language. For children, mothers' patterns and child's age were associated with time in the kitchen. Children who could walk spent significantly less time in the kitchen than non-walkers. Implications for action to prevent indoor air pollution for women and children are discussed.


Data collected in the late 1980s from eight countries in Sub-Saharan Africa (Burundi, Ghana, Togo, and Uganda), Asia/North Africa (Sri Lanka and Morocco), and the Americas (Bolivia and Guatemala) were combined and analyzed to test whether incremental health effects regarding diarrhea and nutritional status result from incremental improvements in water and sanitation conditions. Rural (n = 11,992) and urban (n = 4,888) samples were analyzed separately. Optimal (i.e., on the premises) and intermediate (improved public water) water supplies were compared with unimproved water conditions. Optimal (flush toilets or water-seal-latrines) and intermediate (latrines) sanitation levels were compared with unimproved sanitation. Nationally representative (random) samples of ever-married women age 15-49 years, with or without children, were interviewed in all countries, and children aged 3-36 months with available weight and height data were included in the analyses. Multiple linear regression controlled for household, maternal, and child-level variables; in addition, dummy variables were included for each country. Improvements in sanitation resulted in less diarrhea and in taller and heavier children with each of the three levels of water supply. Incremental benefits in sanitation were associated with less diarrhea and with additional increases in the weights and heights of children. The effects of improved sanitation were greater among urban dwellers than among rural dwellers. Health benefits from improved water were less pronounced than those for sanitation. Benefits from improved water occurred only when sanitation was improved and only when optimal water was present. These findings suggest that public health intervention should balance epidemiologic data with the cost of services and the demand for water. There should be efforts to develop compatible technologies so that incremental improvements in service can be made.
The Child Survival Revolution has produced inconsistent results in reducing global infant and child morbidity and mortality rates. Several recent studies employ concepts of 'parental incompetence' and 'selective neglect' as catch-phrases to account for variations in the outcome of family health programs. This concept shifts liability for illness from health agencies and providers to beneficiaries. It associates program failure with noncompliance resulting from parental ignorance or indifference to the welfare of offspring. This paper presents data which support a view of parents as concerned and pro-active health seekers whose parenting standards sometimes conflict with those of external health agents, and whose caretaking decisions sometimes force them to weigh concerns for individual children against demands of the family as a whole. Implications of parental accountability for child survival are discussed as they shape research and health policy.


Gender bias in food intake and its subsequent effects on growth and illness were examined using data from rural Guatemalan children. Multiple regression controlled for energy requirements, illness, and maternal and economic factors. Gender bias in energy and protein intake favored boys; the magnitude for ages 2-5 y was 247 kJ/d. Analysis of subsequent effects showed that boys had higher rates of weight gain due to gender bias in energy intake than did girls for ages 1-2 y (0.27-0.97 kg/y), when there were no differences in illness rates due to gender bias in energy intake. For age 3-5 y, boys and girls did not differ in weight gain due to gender bias in energy intake. For ages 1-2 y for weight and stature, the growth rate for boys was faster than that of girls by 6-49% due to gender bias. This study provides evidence of gender bias in food intake in a Latin American population, but more work on the existence of and reasons for gender bias in food intake is needed before advocating that education or health programs should focus on this issue.

OBJECTIVES: This study examines the relatively low use of modern pregnancy-related care in Guatemala, especially among indigenous women, and explores the role of socioeconomic status, social and cultural variables, and access to biomedical health facilities in accounting for ethnic differences in care. METHODS: The data for the analysis come from the Guatemalan Survey of Family Health—a population-based survey of rural women that contains detailed data on care received during pregnancy and delivery along with extensive background information. Binomial and multinomial logit models are used to identify the variables that affect the likelihood of receiving different types of care during pregnancy and delivering in a medical facility and the extent to which sociocultural factors and measures of access account for the observed ethnic differences. RESULTS: The estimates not only confirm previous findings of a large ethnic difference in the use of modern pregnancy-related care, but also extend them by identifying a gradient within the indigenous population. The analysis demonstrates that, in general, sociocultural variables are more strongly associated with modern pregnancy-related care than are measures of access and that the former variables explain more of the ethnic variation in care than the latter. The results also demonstrate that pregnant women, especially indigenous women, are more likely to seek biomedical care in conjunction with traditional midwifery care rather than to rely solely on the former. CONCLUSION: The findings suggest that midwives are likely to continue to be key providers of pregnancy-related care in the future, even as access to modern health facilities improves. Current
efforts directed toward the training and integration of midwives into the formal health system are likely to be much more effective at improving pregnancy-related care than the replacement of midwives with biomedical providers.


BACKGROUND: During the past two decades, health interview surveys have become an increasingly common source of information about current morbidity patterns and utilization of health services in developing countries. This study describes a recent effort to enhance the utility of these surveys by incorporating a calendar format. METHODS: A calendar of morbidity and treatment behaviour during the 2-week period prior to interview was implemented in the Guatemalan Survey of Family Health (EGSF), a large-scale sample survey that was fielded in 60 communities in rural Guatemala in 1995. A total of 2872 women aged 18-35 were interviewed and provided information on 3193 children born since 1990. RESULTS: The EGSF calendar data provide estimates of diarrhoeal illness that are consistent with those obtained from more conventional questionnaire designs. However, in contrast to conventional health survey questions, these calendar data: (1) permit a much more complete evaluation of the accuracy of reporting; and (2) offer a richer and more complex description of child illness and treatment behaviour. For example, the results demonstrate that even the preferred 2-week recall period suffers from underreporting of diarrhoeal illness, that the majority of children with diarrhoea experience at least one additional symptom, and that mothers assess severity of diarrhoea from the type and number of accompanying symptoms. CONCLUSIONS: The findings indicate that additional implementation and evaluation of calendar formats is warranted in order to provide the most useful and accurate data possible at relatively low cost.


Relying on data from the 1995 Guatemalan Survey of Family Health (EGSF), we analyse the relationship between child illness and health-seeking behaviour. Information on illness was collected for 3193 children. This analysis is based on 870 of these who became ill with diarrhoeal or respiratory disease during a 13-day period prior to interview. Estimates are derived from logistic models of the probability of seeing any or a specific type of health care provider as a function of characteristics of the illness on a given day and the child. The results indicate that modern medical care plays a major role in the treatment of infectious illness among children in rural Guatemala, with visits to pharmacists, doctors and the staff at government health facilities occurring much more frequently than visits to curers and other traditional practitioners. In general, families are much more likely to seek out a health care provider when a child experiences fever and gastrointestinal symptoms than when suffering from respiratory and other symptoms, and when a mother perceives the illness to be serious. The results also indicate that infants, low parity children, and children assessed as having generally been in good health are more likely to visit health care providers than other children. However, the particular associations often vary by type of health care provider.


In this paper, we explore the diffusion of beliefs pertaining to the causes of childhood diarrhea in rural Guatemala. The analysis focuses on the importance of interpersonal and impersonal contacts as conduits for information and norms related to hygiene and contamination. Estimates from multivariate models reveal that there is evidence of a diffusion process through social contacts, primarily through interpersonal ones. The analysis also identifies striking differences between (1) the diffusion process related to hygiene (e.g. dirtiness) and that related to contamination (e.g. pathogens); and (2) beliefs about the causes of diarrheal illness among children in general and those among respondents’ own children.

Current health reform proposals in most developing countries stress health gain as the chief evaluation criterion. Essential service packages are formulated using cost-effectiveness methods for the selection of interventions without sufficient regard for other factors that are significant for successful implementation and acceptance by the needy. This paper presents the results of research undertaken in Mexico and Central America to test the hypothesis that population groups view health gain as only one among several benefits derived from health systems. The goal at this stage was two-fold: (a) to identify through qualitative methods the range of benefits that are significant for a wide cross-section of social groups and (b) to classify such benefits in types amenable to be used in the development of instruments to measure the benefits intended and actually produced by health systems. Fourteen focus groups were undertaken in Costa Rica, El Salvador, Guatemala, Mexico and Nicaragua representing diverse age, gender, occupation and social conditions. Six major types of health system benefits were identified besides health gain: reassurance/uncertainty reduction, economic security, confidence in health system quality, financial benefits derived from the system, health care process utility and health system fairness. Benefits most often mentioned can be classed under health care process utility and confidence in system quality. They also have the most consensus across social groups. Other benefits mentioned have an affinity with social conditions. Human resource-derived utility stands out by its frequency in the range of benefits mentioned. Health systems and health sector reform proposals must emphasise those aspects of quality related to human resources to be in accord with population expectations.


Iron deficiency anemia is a serious health problem that affects the physical and cognitive development of children. Therefore, it is important to develop cost-effective interventions to improve the hematologic status of the millions of children affected by this condition worldwide. We studied 69 Guatemalan infants who had been randomly assigned to one of three groups at the time of delivery: 1) cord clamping immediately after delivery (n = 21); 2) clamping when the cord stopped pulsating, with the infant placed at the level of the placenta (n = 26); or 3) clamping when the cord stopped pulsating, with the newborn placed below the level of the placenta (n = 22). Maternal and infant hematologic assessments were performed at the time of delivery and 2 mo postpartum. At baseline the groups had similar socioeconomic, demographic, and biomedical characteristics and the newborns had similar hematocrit status. Two months after delivery, infants in the two groups with delayed cord clamping had significantly higher hematocrit values and hemoglobin concentrations than did those in the early-clamping group. The percentage with hematocrit values < 0.33 was 88% in the control group compared with 42% in group 2 and 55% in group 3 (P = 0.01). These results suggest that waiting until the umbilical cord stops pulsating (approximately 1 min after delivery) is a feasible low-cost intervention that can reduce anemia in infants in developing countries.


This paper examines the potential bias in estimates of child mortality determinants produced by the questionable assumption that sibling data are independent, and estimates the unmeasured familial effects shared among siblings. The parameter estimates yielded by the multivariate hazard model are very similar to those yielded by the standard hazard model. The standard errors of the parameter estimates, however, tend to be underestimated in conventional analyses. The contribution to child mortality from the familial factors seems modest net of household socioeconomic status, at least in this Guatemalan data set.

Henderson AD (1998). "Epidemiology and Clinical Consequences of Drug-Resistant Tuberculosis in a
Guatemalan Hospital". Tuberculosis & Airborne Disease Weekly, 14.

OBJECTIVE: This study compared the sensitivity and specificity of three assessment methods to detect the performance of key clinical tasks by health workers in a primary care setting. DESIGN: Health worker performance during patient encounters for acute respiratory infections, acute diarrhea and family planning counseling was assessed through checklist-based observation of the consultation, interview with the mother following the consultation, and review of the patient's clinical record. The results of each method regarding the performance of key tasks by health workers were compared to a 'gold standard', defined as the application of the observation checklist by observers with extensive quality assessment experience. Patient encounters were studied in three Ministry of Health facilities in the Department of Totonicapan, Guatemala, involving care by physicians, nurses and auxiliary staff RESULTS: The three methods showed reasonably high levels of sensitivity (generally about 70%) for the detection of failures in the performance of most health worker tasks. The greatest problem experienced by each method related to specificity, i.e. capacity to recognize quality successes and only detect real failures. CONCLUSION: Direct observation demonstrated the best overall balance of sensitivity and specificity. Exit interview of the mother demonstrated good sensitivity and better specificity than record review.

This paper uses a new calendar design implemented in the Guatemalan Survey of Family Health to analyze diarrheal and respiratory illness among children. The calendar provides a much richer description of child illness and treatment behavior than do conventional data typically collected in health interview surveys. The resulting estimates reveal that Guatemalan children experience high rates of diarrheal and respiratory illness and that these illnesses often involve multiple symptoms that only partially overlap one another. In addition, estimates from the calendar demonstrate that the measurement of illness frequency is fairly complex and that classification of illness into distinct categories may not always be feasible or meaningful. Results regarding treatment behavior indicate that the vast majority of illnesses are treated and that mothers almost always receive advice regarding their children's illnesses from relatives. On the other hand, health providers are sought for advice and treatment in only about one-third of illnesses. When families do seek providers, they are more likely to rely on biomedical ones - especially pharmacists, doctors and personnel at health posts and centers - than traditional practitioners. By far, the most common form of treatment - recommended by both relatives and providers - consists of readily available Western medicines. In contrast, the use of traditional remedies appears to be relatively low.


A study was done to determine whether the use of Durnin-Womersley equations in obtaining individualbody
composition estimates have low validity in certain populations. The relationship between body mass index, body composition estimates and fat-free mass were also examined. It was shown that the Quatelet body mass index cannot explain the high proportion of the variation in body fat and fat-free masses estimated by direct body densitometry.

Child morbidity and growth failure are multidimensional phenomena. An assessment was undertaken of the food and nonfood risk factors of poor health and growth failure in children of different age groups in the central highlands of Guatemala. The aim was to identify high risk factors in under-five and school-age children. Under-five children at high risk of being ill tended to come from households with: high needs of child care, a lack of access to a private well or piped water, and no sewage connection. Women's illiteracy constituted an additional risk factor for diarrheal disease in under-five children. Growth failure in under-five children was mainly due to chronic factors: 74% were stunted, 6% were wasted and 44% were weight deficient. These prevalence rates were lower among school-age children. Low per capita food availability, and particularly the absence in the household of self-produced staple foods, was the most significant risk factor of growth failure in under-five children, followed by high risk of being ill, and participation by women in farm production. The latter was particularly a risk factor of wasting. Nonfood risk factors were most important for growth failure in school-age children. These factors included: sanitation, housing conditions, women's literacy status, and adult women's body mass index. Participation in farm production by school-age children was associated with a higher risk of growth failure in younger siblings. It is concluded that multisectoral programs need to reduce the impact of various risk factors of poor health and growth failure in children, and be careful not to introduce new risk factors. Depending on which age group is targeted, such programs should either prioritize improvements in household food availability, or nonfood interventions that reduce women's illiteracy and improve sanitary and housing conditions.

This article explores the unanticipated consequences of formative research conducted as part of a dengue prevention intervention. It argues that the rapid assessment formative research was successful not only because it uncovered gaps in knowledge concerning dengue and community preferences for organizing the intervention, but because it provided an opportunity to negotiate the relevance of project activities with the community. The significance of this negotiating process is explored by addressing Good's critique of health belief approaches in applied anthropology. It concludes by arguing that community-based intervention research - even if narrow and self-limiting - can be successful if it negotiates a working or practical 'project' epistemology with the community. Key words: dengue, formative research, formal qualitative research, community-based interventions; Honduras

The paper presents results of a comparative analysis of the health and nutritional effects of cash crop production in 6 countries - the Gambia, Guatemala, Kenya, Malawi, the Philippines, and Rwanda. The 6 country case studies were conducted during the same time period and used a similar, although not identical, research protocol. Participation in cash crop schemes resulted in increases in household income. Short-term increases in household income did not result in a decrease in the incidence of illness in preschool-aged children nor in the total time that preschoolers were ill. Increases in household income did result in increases in the preschooler's energy consumption; however, the income/calorie consumption links, although significant, were weak. The household income gains did not have an immediate or large impact on preschooler nutritional status. While, in the longer term, increases in income may bring about improvements in preschooler health, in the short term, it appears that increases in income must be accompanied by improvements in the health environment in order to have a significant effect in reducing preschooler morbidity and improving child
nutritional status.


Developing countries which have somewhat reliable vital statistics but poor or incomplete information about maternal mortality must make the most of the data available. Such data may require modification for maternal mortality analyses. What is important, however, is the decision to use available information and to analyse it properly. The analysis of maternal mortality in Guatemala, using data from 1986 birth and death certificates, identified particular areas, health regions, and particular ethnic groups that had significantly higher maternal mortality ratios than others. Small but disproportionately affected populations that had no available maternal health assistance were identified—a problem found in many developing countries. These groups urgently need the services of traditional birth attendants or other forms of assistance before, during and after delivery. The analysis of vital statistics led to the beginning of operative research and the collection of background information for establishing an epidemiologic surveillance programme for maternal mortality.


OBJECTIVE: To test the efficacy of a high dose of vitamin A as adjuvant treatment for radiographically confirmed cases of acute lower respiratory tract infection (ALRI). DESIGN: Randomized, double-masked, placebo-controlled clinical trial. SETTING: Two large urban hospitals in Guatemala City. PATIENTS: Sequential sample of 263 children aged 3 to 48 months, identified in the emergency departments and admitted to the hospital. INTERVENTIONS: Vitamin A (100,000 IU for children less than 1 year of age, and 200,000 IU for older children) or placebo in addition to standard treatment for ALRI which included antibiotics, oxygen, bronchodilators, and intravenously administered solutions. MEASUREMENTS AND MAIN RESULTS: The children were assessed every 8 hours. There were neither statistically nor clinically significant differences by treatment group in the rate of normalization in respiratory rate, oxygen saturation, temperature, or clinical score. Duration of hospitalization was not different by treatment group. Adverse outcomes (mechanical ventilation, prolonged hospitalization, readmission or transfer, and death) were equally distributed between the two groups. CONCLUSIONS: Treatment with high doses of vitamin A over and above standard care for infants and children with non-measles-related ALRI is not efficacious for the current episode. Additional trials among populations in which vitamin A deficiency is more prevalent and severe should be considered.


As part of an effort to involve community members in malaria control activities, we studied knowledge, beliefs, and practices of residents of both the Pacific coastal plain and northeastern Guatemala related to malaria transmission and Anopheles albimanus control. Most residents recognized the role of mosquitoes in malaria transmission, but few knew how mosquitoes acquired their infections or understood the risk of having an untreated person in their midst. If this were more widely known, residents might put greater pressure on infected patients to seek timely and appropriate antimalarial treatment. Seventy-three percent of families owned one or more bed nets; however, even though most informants believed that bed nets help protect against malaria, the major reason for using them was to prevent nuisance mosquito bites. It is concluded that efforts should be made to promote bed net use by seeking ways to make them more affordable and by emphasizing their effectiveness as a barrier to nuisance mosquitoes. Although residents have a very positive opinion of the National Malaria Service spray teams, it is proposed that cooperation might be improved if malaria workers would emphasize the fact that house spraying reduces the numbers of nuisance mosquitoes and other pest insects, rather than focusing solely on malaria prevention, which most informants believed was less important. This study emphasizes the importance of understanding community beliefs and practices when planning or evaluating vector control activities.

We have previously reported that in Guatemala, the calcium, iron, and zinc contents of tortillas from rural areas are higher than that of tortillas from urban centers. This study examines variation in the calcium, iron, zinc and copper content of tortilla according to the implements used for making tortillas and inquires as to whether preparation effects mediate rural-urban variation in tortilla mineral content. Tortilla samples and information on how the tortillas were prepared were collected from the female heads of a total of 50 households from three rural, two semi-urban and one low income urban community. Samples of lime used for making tortillas were collected from 31 households. To grind masa, a hand mill was found to be used in some rural households whereas a motorized mill predominated in the semi-urban and urban areas. Most women used grinding stones called the "mano y metate" to further refine the texture of the masa. Tortillas prepared with the combined use of the hand mill and "mano y metate" had a significantly (p < 0.05) higher iron content. Use of the "mano y metate" was also associated with a significantly (p < 0.05) higher zinc content. These results suggest that the use of certain grinding implements may mediate rural-urban variation in tortilla iron and zinc content. The cooking surface, pot used for nixtamalization, source of water, and amount of lime used did not significantly account for variation in the content of these minerals.


This is a descriptive study of the beliefs and practices of the traditional midwives in a rural Guatemalan village. During pregnancy and birth, traditional midwives who have received minimal or no training attend more than 80% of the indigenous Mayan women. Data were obtained from interviews with the midwives and from direct observation of midwives attending births. The midwives had few skills with which to handle complications. They failed to use basic aseptic technique and were unfamiliar with lifesaving skills such as fundal massage and proper infant stimulation. Even though most of the midwives interviewed had attended a Ministry of Health training course, they lacked basic knowledge of safe obstetric practices. To reduce infant and maternal mortality rates, traditional midwives must be adequately trained. The teaching methods used by an indigenous Guatemalan group training elderly, illiterate midwives are described as an example of an effective training program.


BACKGROUND: Studies in developed countries have shown that reduced fetal growth is related to raised blood pressure in childhood and adult life. Little is known about this association in developing countries, where fetal growth retardation is common. METHODS: In 1994-1995, we measured blood pressure in 1570 3-6-year-old children living in China, Guatemala, Chile, Nigeria and Sweden. We related their blood pressure to patterns of fetal growth, as measured by body proportions at birth. The children were all born after 37 weeks gestation and weighed more than 2.5 kg at birth. RESULTS: In each country, blood pressure was positively related to the child's current weight. After adjusting for this and gender, systolic pressure was inversely related to size at birth in all countries except Nigeria. In Chile, China and Guatemala, children who were proportionately small at birth had raised systolic pressure. For example, in Chile, systolic pressure adjusted for current weight increased by 4.9 mmHg (95% CI : 2.1, 7.7) for every kilogram decrease in birthweight, by 1 mmHg (95% CI : 0.4, 1.6) for every centimetre decrease in birth length, and by 1.3 mmHg (95% CI : 0.4, 2.2) for every centimetre decrease in head circumference at birth. In Sweden, systolic pressure was higher in children who were disproportionately small, that is thin, at birth. Systolic pressure increased by 0.3 mmHg (95% CI : 0.0, 0.6) for every unit (kg/m3) decrease in ponderal index at birth. These associations were independent of the duration of gestation. CONCLUSIONS: Raised blood pressure among children in three
samples from China, Central and South America is related to proportionate reduction in body size at birth, which results from reduced growth throughout gestation. The relation between fetal growth and blood pressure may be different in African populations. Proportionately reduced fetal growth is the prevalent pattern of fetal growth retardation in developing countries, and is associated with chronic undernutrition among women. Improvement in the nutrition and health of girls and young women may be important in preventing cardiovascular disease in developing countries.


Masera OR, Saatkamp BD, Kammen DM (2000). From linear fuel switching to multiple cooking strategies: a critique and alternative to the energy ladder model. World Development 28 (12): 2083. Promoting sustainable development requires evaluating the technical and policy options that will facilitate the adoption and use of energy efficient and less polluting cooking stoves and practices. The transition from traditional to modern fuels and devices has been explained by the "energy ladder" model that suggests that with increasing affluence, a progression is expected from traditional biomass fuels to more advanced and less polluting fuels. In this paper we evaluate the energy ladder model utilizing data from a four-year (1992-96) case study of a village in Mexico and from a large-scale survey from four states of Mexico. We show that an alternate "multiple fuel" model of stove and fuel management based on the observed pattern of household accumulation of energy options, rather than the simple progression depicted in the traditional energy ladder scenario, more accurately depicts cooking fuel use patterns in rural households. The "multiple fuel" model integrates four factors demonstrated to be essential in household decision making under conditions of resource scarcity or uncertainty: (a) economics of fuel and stove type and access conditions to fuels, (b) technical characteristics of cookstoves and cooking practices; (c) cultural preferences; and (d) health impacts. This model also allows better estimates of the expected fuelwood demand and indoor air pollution in rural households.


McCracken, J., & Smith, K. (1998). Emissions and efficiency of improved cookstoves in Guatemalan Highlands. Environmental Int 24: 739-47. A comparison was made of the thermal efficiency and emissions of traditional three-stone fire and the "Plancha" improved stove burning wood. Simultaneous measurements of efficiency and emissions of suspended particulates and carbon monoxide (CO) were taken in order to incorporate both of these factors into a single standard of performance -- emissions per standard task. These factors were measured during both a Water Boiling Test (WBT) and a Standardized Cooking Test (SCT). No statistical difference in efficiency between the Plancha and traditional stove was found. The Plancha required more time to perform
both of the tests, and this difference was statistically significant (p=0.048) for the WBT. The Plancha emitted 87% less suspended particles less than 2.5um in diameter (PM2.5) and 91% less CO per kJ of useful heat delivered compared to the open fire during the WBT. The relative environmental performance of the Plancha improved during the SCT, resulting in a 99% reduction of total suspended particulates (TSP) emissions and a 96% reduction of CO emissions per standardized cooking task. A strong correlation (r² = 0.87) was found between the average kitchen concentrations of CO and PM2.5 during the Water Boiling Tests, indicating the usefulness of CO measurements as an inexpensive and accurate way of estimating PM2.5 concentrations.


Fumonisin B1 (FB1) is a common contaminant of corn worldwide and is responsible for several diseases of animals. In the preparation of tortillas, corn is treated with lime (producing nixtamal) that when heated hydrolyzes at least a portion of the FB1 to the aminopentol backbone (AP1), another known toxin. This study analyzed the amounts of FB1 and AP1 in tortillas and nixtamal from two communities in the central highlands of Guatemala where corn is a major dietary staple (Santa María de Jesús, Sacatepéquez, and Patzicia, Chimaltenango). The amounts of FB1 and AP1 in tortillas from Santa María de Jesús were, respectively, 0.85 +/- 2.0 and 26.1 +/- 38.5 microg/g dry weight (mean +/- SD), and from Patzicia were 2.2 +/- 3.6 and 5.7 +/- 9.4 microg/g dry weight. Less than 6% of the tortillas from both locations contained &GT; or = 10 microg FB1/g dry weight; whereas, 66% of the samples from Santa María de Jesús and 29% from Patzicia contained &GT; or = 10 microg AP1/g dry weight. The highest amount of AP1 (185 microg/g dry weight) was found in tortillas from Santa María de Jesús. The highest amounts of FB1 were 6.5 and 11.6 microg/g dry weight in tortillas from Santa María de Jesús and Patzicia, respectively. The mean concentration of FB1 in nixtamal was significantly higher in Santa María de Jesús compared to Patzicia. Surprisingly, AP1 was not detected in any of the nixtamal samples. The human impact of exposure to these amounts of fumonisins is not known. However, based on findings with other animals, where corn is a dietary staple, long-term consumption of FB1 and AP1 (especially at &GT; or = 10 microg/g of the diet) may pose a risk to human health.

**OBJECTIVE.** To assess the effects of glucose (G)-oral rehydration solution (ORS), rice dextrin (RD)-ORS, and rice flour (RF)-ORS on fluid intake, rapidity of rehydration, and stool output of children with acute diarrhea and mild or moderate dehydration. **METHODS.** The study was a randomized, double-masked clinical trial. One hundred forty-six male infants, ages 3 to 36 months, were randomly assigned to one of three treatment groups. Clinical evaluations and fluid balances were conducted every 2 to 4 hours for 48 hours. Principal outcome variables were ORS consumption, recovery of hydration status, and fecal output. **RESULTS.** The groups were similar at admission with regard to age, nutritional status, history of the current episode, and clinical status. There were no differences in ORS consumption by treatment group during any period of study. During the first 6-hour period, patients in group RF had less stool output (16 +/- 14 g/kg/body weight) than those in group G (22 +/- 20 g/kg) or RD (21 +/- 19 g/kg; P < .05). After 12 hours of hospitalization, there were no differences by treatment group. Recovery of hydration status, changes in serum sodium and potassium, and duration of diarrhea in the hospital were similar in all three groups. **CONCLUSION.** There was a 24% to 27% reduction in stool output during the first 6 hours of treatment among children who received RF-ORS compared with those who received G-ORS or RD-ORS, but this effect did not persist after the first 12 hours of therapy. Because this difference was of small magnitude and limited duration, it has minor clinical importance. Thus, we conclude that the three solutions had similar efficacy for children with acute, watery diarrhea and mild or moderate dehydration.


Research indicates that leaking liquified petroleum gas canisters account for at least one-third of the high ozone levels of the smog in Mexico City, Mexico. The city has some of the most polluted air in the world, as 98% of the days in 1992 exceeded the air safety level.


Vitamin A deficiency (VAD) has been known to exist in Latin America and the Caribbean since the mid-1960s; however, except for pioneering work by the Institute of Nutrition of Central America and Panama/Pan American Health Organization on sugar fortification in Central America, there was little interest in controlling it because of the low frequency of clinical findings. More recently, implications of the effect of subclinical VAD on child health and survival has generated increased interest in assessing the problem and a greater commitment to controlling it. The information available by mid-1997 on the magnitude of VAD in countries of the Region was extensively reviewed. Internationally accepted methods and cutoff points for prevalence estimations were used to compile information from relevant dietary, biochemical, and clinical studies carried out between 1985 and 1997 in samples of at least 100 individuals. VAD in the Region of Latin America and the Caribbean is mostly subclinical. The national prevalence of subclinical VAD (serum retinol < 20 micrograms/dl) in children under 5 years of age ranges between 6% in Panama and 36% in El Salvador. The problem is severe in five countries, moderate in six, and mild in four. There are no recent data from Chile, Haiti, Paraguay, Uruguay, Venezuela, and the English-speaking Caribbean. The population affected amounts to about 14.5 million children under 5 years of age (25% of that age group). Schoolchildren and adult women may also have significant VAD. Actions currently implemented to control VAD include (a) universal or targeted supplementation, with sustained high coverage rates through national immunization days in some countries; (b) sugar fortification, which is well established in El Salvador, Guatemala, and Honduras (a significant effect has been documented in Guatemala and Honduras) and is under negotiation in Bolivia, Colombia, Costa Rica (to be resumed), Ecuador, Nicaragua, and Peru; and (c) limited dietary diversification activities.

Stoves in Three Test Homes. Geneva: WHO - Programme for Control of ARI.


Continuous particles less than 2.5 microm in diameter (PM2.5) and carbon monoxide (CO) were monitored during breakfast, lunch, and dinner in three high-density and four low-density villages near Quetzaltenango, Guatemala to help assess the viability of this region for a proposed respiratory health and stove intervention study. Approximately 15 homes were visited during each mealtime in each of the seven villages; in all, 98 homes were visited, with a sampling duration of 2-3 min per home per meal. For each village, a line (transect) was drawn on a village map along existing roads from one end of the village to the other; homes and between-home outside locations along the transect were monitored. Although the predominant stove type was the open fire, several other stoves, in various levels of disrepair, were observed frequently. The highest indoor concentrations of PM2.5 were observed in homes using the open fire (avg. = 5.31 mg/m³; SD=4.75 mg/m³) or equivalent, although homes using the plancha--indigenous wood-burning stove with chimney--also had measurements > 13.8 mg/m³, PM2.5 limit of detection. The highest indoor concentrations of CO were also observed in homes using the open fire (avg. = 22.9 ppm; SD = 28.1 ppm), with a maximum measurement of > 250 ppm. For both PM2.5 and CO, levels measured in homes with plancha, lorena, or open fire were significantly higher than levels taken in the street or in homes using a gas stove. The Spearman correlation coefficient between PM2.5 and CO for all data combined was 0.81, and ranged from 0.30 for the lorena to 0.68 for the plancha in homes using wood-fueled stoves. Although indoor PM2.5 and CO levels were not significantly different between high- and low-density villages, street-level PM2.5 (p = 0.002) and CO (p= 0.002), were significantly higher in the high - density villages. These data provide a useful picture of the pollution levels coming from a range of cooking stoves in various levels of disrepair, as well as a representation of how outdoor particle mass and CO levels vary from high- versus low-density villages.

Area 22-h average carbon monoxide (CO), total suspended particulates (TSP), particles less than 10 mm in diameter (PM₁₀⁻), and particles less than 2.5 mm in diameter (PM₂.₅⁻) measurements were made in three tests homes of highland rural Guatemala in kitchens, bedrooms, and outdoors on a longitudinal basis, i.e. before and after introduction of potential exposure-reducing interventions. Four cookstove conditions were studied sequentially: background (no stove in use), traditional open woodstove, improved woodstove with flue (plancha), and bottled-gas (LPG) stove. With nine observations each, kitchen PM₂.₅⁻ levels were 56 mg/m³ under background conditions, 528 mg/m³ for open fire conditions, 96 mg/m³ for plancha conditions, and 57 mg/m³ for gas stove conditions. Corresponding PM₁₀⁻ levels were 173/174, 717/836, 210/276, 186/218 mg/m³. Corresponding CO levels were 0.2, 5.9, 1.4, 1.2 ppm. Comparisons with other studies in the area indicate that the reductions in indoor concentrations achieved by improved wood-burning stoves deteriorate with stove age. Mother and child personal CO and PM₂.₅⁻ measurements for each stove condition demonstrate
the same trend as areas measurements, but with less differentiation. 


Kitchen-area 22-h gravimetric PM2.5 and passive diffusion stain-tube carbon monoxide (CO) concentrations were measured in homes with open fire and improved wood cookstoves in two studies. In the first study (Guat-2), which also studied homes with gas cookstoves, three samples were collected per stove condition from each of three test houses. In the second study (Guat-3), one sample was collected per house from 15 open fire and 25 improved-stove houses. CO personal samples were also taken for mother and child in both studies. Spearman correlation coefficients (R) between kitchen-area CO and PM2.5 levels in homes using open fires or improved wood cookstoves were high ranging from 0.92 (Guat-2) to 0.94 (Guat-3), as were those between the personal samples for mother and child ranging from 0.85 (Guat-3) to 0.96 (Guat-2). In general, the correlations were lower for less-polluted conditions. The study found that CO is a good proxy for PM2.5 in homes using open fires or planchas (improved wood cookstove with chimney) but not under gas stove use conditions. It also determined that mother personal CO is a good proxy for child's (under 2 years of age) personal CO and that area CO measurements are not strongly representative of personal CO measurements. These results generally support the use of Draeger CO passive diffusion tubes as a proxy for PM2.5 in such cases where a single type of emission source is the predominant source for CO and PM2.5.


In order to determine the relationship between nutritional, sociodemographic, and obstetrical variables and fetal malnutrition, a study was done on a group of mothers of nonpremature neonates born in a hospital in the central mountainous region of Guatemala. Of the 306 neonates, 105 (34%) presented fetal malnutrition (intrauterine growth retardation, IUGR), which in 77% of the cases was chronic (fetal atrophy, or IUGR type I) and in 23% of the cases was acute (fetal emaciation, or IUGR type II). The maternal factors related to fetal atrophy were puerperal nutritional indicators (weight, height, skinfold thickness, and arm circumference) and sociodemographic indicators (schooling, literacy, and socioeconomic level). Fetal emaciation was found to be related to obstetrical characteristics such as number of previous deliveries and birth interval. The results suggest that poverty, malnutrition, and precarious living conditions over prolonged periods of time are related to chronic fetal malnutrition (fetal atrophy), which is very frequent in this population.


This paper is an investigation of the effects of social inequality in Guatemala on children's health and nutritional status as measured by attained height. Guatemala remains a highly stratified and poor society. We examine the association of land distribution, land tenure, occupation, and other aspects of family social and
economic status with children's height between the ages of three months and 36 months, using data from a cross-sectional survey. An important consequence of the poverty and poor living conditions of the majority of the Guatemalan population is substantial deficits in children's growth. Our results suggest that children's growth is affected by ethnicity, their father's occupation, land distribution in the area where they live, and maternal education. Substantial growth deficits are observed among children living at altitudes above 1500 metres; we hypothesize that this is because, in Guatemala, higher altitude is associated with land scarcity, poorer agricultural conditions, and greater remoteness from transport networks and other public services.

In this paper we investigate family choices about pregnancy-related care and the use of childhood immunization. Estimates obtained from a multilevel logistic model indicate that use of formal (or "modern") health services differs substantially by ethnicity, by social and economic factors, and by availability of health services. The results also show that family and community membership are very important determinants of the use of health care, even in the presence of controls for a large number of observed characteristics of individuals, families, and communities.

Beliefs about child illness were investigated using semi-structured interviews with mothers and providers in four rural Guatemalan communities. The two most common forms of child illness in Guatemala--diarrhoea and respiratory disease--were focused upon. These illnesses are particularly difficult to prevent and treat, especially with the rudimentary health services available in rural areas of developing countries. Comparisons with other ethnographic studies in Guatemala suggest that some traditional models of illness causation identified in these earlier investigations are relatively unimportant in the communities studied here. This finding, in conjunction with frequent responses related to hygiene and water, suggests that traditional explanations may be co-existing with biomedical views of illness causation to a greater degree today than in the past.

According to conventional methods of classifying cause of death, approximately 70% of child deaths (0-4 y) worldwide are due to a small number of priority infectious diseases which, in turn, receive the vast majority of donor and national resources in the health sector. Despite the long-recognized synergism between malnutrition and infection in the causation of child mortality, malnutrition does not appear as a major cause of death in health statistics from developing countries. Part of the reason for this has been the difficulty of estimating the percent of deaths due to malnutrition, because the conventional methods of classifying cause of death do not recognize the potentiating effect of malnutrition on the disease. The purpose of this paper is to develop and test a simple methodology to estimate the percent of child deaths in a given country or community that is due to malnutrition's potentiating effects on prevailing infectious diseases. The cornerstone of the methodology is knowledge of the strength of the association between malnutrition and mortality in developing countries, as measured in eight prospective studies. These studies reveal remarkable consistency in relative risk across different grades of malnutrition. The mean and SE of relative risk for severe malnutrition is 8.4 +/- 2.1, for moderate malnutrition it is 4.6 +/- 0.9, and for mild malnutrition it is 2.5 +/- 0.3. When applied to survey data from Ethiopia, Malawi, Guatemala and India for illustrative purposes, this methodology indicates that 42-57% of all child deaths in these samples (6-59 mo) are due to malnutrition's potentiating effects on infectious disease, of which 76-89% is attributable to mild-to-moderate malnutrition. This methodology is recommended for use in a variety of policy and planning applications.

Objectives. This study assessed the effect of poverty and social inequity on infant mortality risks in Nicaragua
from 1988 to 1993 and the preventive role of maternal education.

Methods. A cohort analysis of infant survival, based on reproductive histories of a representative sample of 10867 women aged 15 to 49 years in Leon, Nicaragua, was conducted. A total of 7073 infants were studied; 342 deaths occurred during 6394 infant-years of follow-up. Outcome measures were infant mortality rate (IMR) and relative mortality risks for different groups.

Results. IMR was 50 per 1000 live births. Poverty, expressed as unsatisfied basic needs (UBN) of the household, increased the risk of infant death (adjusted relative risk [RR] = 1.49; 95% confidence interval [CI] = 1.15, 1.92). Social inequity, expressed as the contrast between the household UBN and the predominant UBN of the neighborhood, further increased the risk (adjusted RR = 1.74; 95% CI = 1.12, 2.71). A protective effect of the mother's educational level was seen only in poor households.

Conclusions. Apart from absolute level of poverty, social inequity may be an independent risk factor for infant mortality in a low-income country. In poor households, female education may contribute to preventing infant mortality. (Am J Public Health. 2000;90: 64-69)


OBJECTIVE: To search for an association between tuberculosis and use of biomass stove found recently in a cross-sectional study.

DESIGN: In a case-control study based in a chest referral hospital, the cases were 288 patients with active smear positive or culture positive tuberculosis, and the controls were 545 patients with ear nose and throat ailments with no evidence of chest disease studied at the same time as the cases. Exposure to present or previous biomass smoke, by history of cooking with traditional wood stoves, was assessed by positive or negative response.

RESULTS: Exposure to biomass smoke was significantly higher in cases than in controls. Crude odds ratios for tuberculosis and biomass smoke exposure were 5.2 (95%CI 3.1-8.9) for current exposure, 3.4 (95%CI 2.4-5.0) for past or present exposure and 1.8 (95%CI 1.1-3.0) for past exposure. Association was observed only for patients living in Metropolitan Mexico city and urban or suburban areas in the center of Mexico providing most cases and controls. For rural areas the power of the study was low and the origin of the patients heterogeneous. Odds ratio for Mexico City Metropolitan area and the center of Mexico was 2.4 (95%CI 1.04-5.6), adjusted for age, sex, level of education, crowding, smoking, socio-economic level, zone of residence and state of birth. In the same model, smoking had an OR of 1.5 (95%CI 1.0-2.3 for tuberculosis.

CONCLUSION: Our results support a causal role of current domestic biomass smoke exposure in tuberculosis.


Central America is composed of seven countries: Belice, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama. Chagas disease exists in all seven countries, but with major prevalence in El Salvador, Guatemala, Honduras and Nicaragua. The main species of triatomine vectors are: Rhodnius prolixus, Triatoma dimidiata y Rhodnius pallescens. In 1997 the Central American countries launched an Initiative for the Vectorial and Transfusion Transmission Control of Chagas disease. The objectives of the Initiative are: 1. elimination of Rhodnius prolixus, 2. control of Triatoma dimidiata and 3. serological screening for Trypanosoma cruzi of 100% of the blood donors. This Initiative is supported by the Resolution for &quot;The Elimination of Transmission of Chagas Disease&quot;, of the World Health Assembly in 1998.


A study of the relationship between child growth and zinc deficiency in Guatemala is presented. Moderate or severe zinc deficiency has been shown to depress growth and zinc supplementation has been shown to promote growth in severely malnourished children. However, zinc supplements given to growth-retarded Guatemalan children did not improve weight or height over the 25-week study period, although the proportion of body fat
did increase.


If ivermectin distribution programs are to have maximum impact on the morbidity and transmission of human onchocerciasis there must be broad and sustained acceptance within the endemic communities. Educational activities, developed with careful consideration of community attitudes, should promote positive treatment seeking behavior while simultaneously addressing local reservations about the control effort. To better understand the ambient knowledge, attitudes, and practices concerning onchocerciasis in the context of ivermectin use in Guatemala, we conducted a survey among 145 heads of households in five endemic communities. Given the country's long-standing nodulectomy program, it was not surprising that 100% of persons interviewed had heard of the disease 'la filaria', which they defined as a skin nodule that could cause blindness. Ninety-five percent of respondents identified surgery as the only cure for the condition. Relatively few (39%) knew that la filaria was caused by worm, although slightly more (50%) knew that the condition was acquired by the bite of an insect. The term microfilaria was not broadly recognized. We also determined that onchocerciasis was not perceived as a serious health problem: few persons (12%) mentioned la filaria when requested to provide a complete list of illnesses that occurred in the community, and the gravity of infection (based on rank ordering of common illnesses) was similar to that of a bad cold. Recommendations were made which might assist long-term acceptance of a national chemotherapy initiative against onchocerciasis in Guatemala.


Permethrin-impregnated bed nets were evaluated as a control measure for malaria in northern Guatemala. Twelve hundred forty participants were allocated to one of three experimental groups (impregnated bed nets [IBN], untreated bed nets [UBN], and controls) and followed up for a period of 13 months. The incidence density of malaria was significantly lower in both IBN (86 cases/1,000 person-years) and UBN groups (106/1,000) compared with that in controls (200/1,000). No difference in malaria incidence was noted between the IBN and UBN groups. Complaints of fever and chills were less frequent in the IBN group compared with controls. The participants were enthusiastic about the nets, which they saw as a means for avoiding nuisance insects more than for preventing malaria. Most (85%) wanted to wash their nets every 4-12 weeks, a practice known to shorten the duration of residual insecticide action. Larger studies are needed to determine whether or not impregnated bed nets offer an advantage over untreated nets in this setting.


The onset of growth retardation among rural Guatemalan children is studied. Results show that growth retardation begins soon after birth, with about 19% to 34% of growth retardation in children three years of age occurring during their first three months of life. Growth retarded children have lower birth weight, poor diets and large families. Breast feeding has also failed to prevent growth retardation.


BACKGROUND: Because hospital records rarely exist for a representative sample of the population in developing countries, researchers frequently rely on birthweight data from surveys. Yet, the quality of these data has rarely been evaluated. This study explores the accuracy of birthweight information in six demographic and health surveys in Latin America conducted in the early 1990s: two in Guatemala, and one each in Bolivia, Costa Rica, El Salvador and Peru. METHODS: The quality of the birthweight reports is assessed by examining the plausibility of estimates of the proportion of newborns reported to have been weighed and estimates derived from the numerical weights, by characteristics of the delivery and maternal education. RESULTS: The
estimates suggest that a substantial proportion of women whose newborns were probably never weighed report a birthweight. For all of the surveys, with the possible exception of Costa Rica, the average birthweights appear to be too high, and the estimates of the prevalence of low birthweight too low. In addition, the data reveal anomalous patterns, such as higher birthweights for home as compared with hospital deliveries.

CONCLUSIONS: These findings suggest that estimates of low birthweight derived from surveys in developing countries are likely to portray an overly optimistic picture of children's and women's health status. More information about the underlying source of these data are needed not only to provide additional insight into the degree of error characterizing existing estimates, but also to improve data collection strategies in future health interview surveys.


In most rural areas of Latin America, malaria surveillance and treatment is carried out by a network of unpaid village malaria workers, known as Volunteer Collaborators, who are trained and supervised by the National Malaria Service. To identify ways in which the performance of these volunteer workers could be improved and to test changes that would make the Volunteer Collaborator Networks (VCNs) a more attractive model for community participation in malaria case detection and treatment in other regions, we tested a series of modifications in the VCN of Guatemala. These modifications included improved methods for selecting, supervising, and evaluating the volunteer workers and for collecting blood smears and reporting results, and the use of volunteer workers, known as Volunteer Medicators, who administered presumptive antimalarial therapy without taking a blood smear. A cost-effectiveness analysis of the modified VCN was also carried out. Two years after the modifications were introduced, Volunteer Collaborators identified nearly twice as high a percentage (33% versus 17%) of patients with suspected malaria in their villages. Delays in examining blood smears were reduced from 23 days to 11 days and delays from blood smear examination to curative treatment were reduced from 21 days to 7 days. The Volunteer Medicators identified and treated only a slightly higher percentage of patients than the Volunteer Collaborators (36% versus 33%). However, the cost of maintaining a network of Volunteer Medicators ($0.61 per patient treated) was much lower than the traditional VCN ($2.45) or the modified VCN ($1.85). Thus, with a few, simple and relatively inexpensive modifications, the efficiency and cost-effectiveness of Volunteer Collaborators can be markedly improved. Additionally, the VCN can be modified to make it a more suitable model for community-based malaria control and surveillance networks in other malarious areas of the world, which differ in terms of their level of endemicity, the goals of the malaria program, or the available health care infrastructure.


OBJECTIVE: A community-based, randomized, double-blind intervention trial was conducted to measure the impact of zinc supplementation on young Guatemalan children's morbidity from diarrhea and respiratory infections. METHODS: Children aged 6 to 9 months were randomly assigned to receive 4 mL of a beverage containing 10 mg of zinc (as zinc sulfate) daily (7 d/wk) for 7 months (n = 45) or a placebo (n = 44). Morbidity data were collected daily. Diagnoses of diarrhea, fever, and anorexia were based on mothers' definitions. Respiratory infections were defined as the presence of at least two of the following symptoms: runny nose, cough, wheezing, difficulty breathing, or fever. RESULTS: High rates of diarrhea and respiratory infections were reported. Children from the placebo group had a 20% episodic prevalence of diarrhea, with 8 episodes/100 d, and a 7% episodic prevalence of respiratory infections, with 3 episodes/100 d. The median incidence of diarrhea among children who received zinc supplementation was reduced by 22% (Wilcoxon rank test), with larger reductions among boys and among children with weight-for-length at baseline lower than the
median of the sample (39% reductions in both subgroups). Zinc supplementation also produced a 67% reduction in the percentage of children who had one or more episodes of persistent diarrhea (chi2 test). No significant effects were found on the episodic prevalence of diarrhea, the number of days per episode, or the episodic prevalence or incidence of respiratory infections. CONCLUSIONS: The large impact of zinc supplementation on diarrhea incidence suggests that young, rural Guatemalan children may be zinc deficient and that zinc supplementation may be an effective intervention to improve their health and growth.


The "energy ladder" relating improvements in socioeconomic status with transitions to more sophisticated stoves and to higher quality, less polluting fuels is often invoked as a theoretical model for analyzing household energy management practices. We report here on an integrated study of the energy, health and economic implications of fuel switching in the small village of Jaracuaro, Michoacan State, Mexico, that challenges and extends the traditional energy ladder model. We monitored fuel and stove use, economic status, exposure to respirable suspended particulates (RSP) and trace gases (CO, CO2, NOx, SO2), and morbidity during both wet and dry seasons for a sample of 141 persons living in 21 homes. The families surveyed utilized simple "three stone" fires, traditional enclosed or improved stoves, and gas ranges or a combination of these technologies. In Jaracuaro, people who cook regularly are twice as likely as non-cooks to exhibit acute respiratory infection (ARI), (relative risk = 2.0, 95% CI = 1.3 - 2.7). The use of improved stoves correlates with reductions in indoor concentrations of RSPs and CO, and decreases in reported cases of ARI, eye infections, and intestinal disorders. These changes are consistent with the technology component of the energy ladder, relating improvements in stove and fuel type to emissions and then to respiratory ailments. This suggests an associated "health ladder" for families adopting improved stoves or kitchen designs. We find that the energy ladder framework, while useful, is also an oversimplification that masks some of the strategies used in household decision-making. This is reflected in Jaracuaro where the socioeconomic correlate of stove "quality" and income breaks down: the more affluent families do not necessarily use cleaner fuel and stove combinations or invest in kitchens that are more healthy or energy efficient. Some of the most affluent households even exhibited the highest RSP and CO concentrations. These findings lead to a more eclectic model of fuel and stove adoption and use that has implications for integrated health and development policies. One direct conclusion from this study is the need and the opportunity for educational programs to facilitate transitions to more efficient stoves and cleaner fuels for the rich and poor alike.


Acute respiratory infections (ARI) are among the principal causes of childhood morbidity and mortality in Latin America. In Guatemala, pneumonia is the leading cause of death in young children and is responsible for approximately one-third of the out-patient visits to pediatric services. A large proportion of these deaths result from deficient management, attributable to a failure to recognize the first signs of pneumonia, the presence of barriers that impede immediate care-seeking, consultation with unsuitable providers, or inappropriate treatment recommendations. The purpose of this brief qualitative study was to investigate the perceptions and behaviors with respect to ARI of the residents of San Juan Comalapa, a Kaqchiquel community in the central highlands of Guatemala. Thirty-two mothers were interviewed in their homes to determine how they classified ARI and what signs and symptoms made them seek medical attention immediately. The results revealed that the mothers could recognize the presence of rapid breathing but not that of chest retraction (two important signs of pneumonia). When they sought care for the child, they usually went to physicians or other providers at health centers and occasionally at private clinics, but rarely did they seek care at an early stage of the illness, owing to poor accessibility of the services and underestimation of the severity of the symptoms. This conduct can be modified by education. The authors make recommendations aimed at improving verbal communication between health care providers and mothers.

Sanchez Perez HJ, Halperin Frisch D (1997). Obstacles to overcome in the control of pulmonary

OBJECTIVE: To improve the control of the pulmonary tuberculosis in the Border Region of Chiapas, Mexico.

DESIGN: Academic researchers, health development workers from the nongovernmental sector and government health authorities met in a workshop to analyze recent experiences with tuberculosis.

RESULTS: Among the important issues addressed were: with regard to official health services, the lack of resources, particularly medication, organizational problems which result in poor or absent communication within and among different health entities, the under diagnosis of cases and the lack of sufficient index of suspicion for tuberculosis among health personnel. With regard to the population at risk, there are profound socio-cultural barriers which include a lack of confidence in the quality of government health care centers and little attention given to chronic cough. Poorest, indigenous and more remote people have less access to care and are more likely to have advanced tuberculosis before seeking treatment if at all. New strategies proposed were to integrate communication efforts in tuberculosis control among all the involved health services, including private physicians, identify those patients at greatest risk, improve diagnostic skills of health providers, develop education campaigns in rural areas.

CONCLUSIONS: Certain factors which impede better TB control seem amenable to change, others, such as severe poverty, particularly among peasants and indigenous people, as well as the current political disruption, will require much broader intersectorial interventions.


Peri-neonatal mortality is a serious health problem in Guatemala, especially in rural areas where most deliveries occur at home and are overseen by traditional birth attendants (TBAs) who function in the role of midwives. The three aims of the work reported here were to identify important predictors of peri-neonatal mortality within a rural area of Guatemala; to assess the effects of traditional and modern health care providers on such mortality; and to find ways of identifying high-risk women who might benefit from transfer to a hospital or clinic. For these purposes a case-control study was conducted of 120 women in the rural department of Quetzaltenango who had lost their babies from the 20th week of pregnancy through the 28th day of life. These women and 120 controls were interviewed in their homes by trained physicians, using questionnaires in Spanish or the appropriate Indian dialect, and the results were analyzed through a series of statistical tests. It was found that the complications of pregnancy and delivery with the greatest statistical significance were prematurity, malpresentation, and prolonged labor. Population-based attributable risks of these complications demonstrated that they accounted for significant proportions of the observed peri-neonatal mortality. While these conditions cannot be eliminated, within the rural Guatemalan context it appears that early referral of women with these complications to more specialized care settings could result in improved delivery outcomes.


A community-based, randomized trial was conducted to evaluate a locally available diet for the management of acute diarrhea (n = 99 episodes) in 90 Guatemalan children, 4-42 months of age. The Test Diet (TD), a combination of a semi-solid pap (maize flour, black beans, oil) and a liquid gruel, Incaparina (maize flour, cotton seed flour, sugar), in addition to breast-milk and other home foods (group TD, n = 45 episodes) was offered for 14 d and compared to usual home feeding (group HF, n = 54 episodes). Diarrhea episodes after admission were significantly shorter for group TD (median 2.0 d) than group HF (median 4.4 d, p = 0.003) after adjusting for potential confounders. Weight gains did not differ significantly between groups. We conclude that community-based dietary management of acute childhood diarrhea using energy-dense, locally available foods is feasible and may shorten diarrhea duration. This may encourage mothers to follow recommendations for continued feeding during diarrhea in developing country environments.

To examine whether poor growth in utero or young childhood is associated with adult abdominal fatness in a developing country context, the authors analyzed prospectively collected data on 372 female and 161 male Guatemalans measured as children between 1969 and 1977 and remeasured as adults in 1988-1989 (men and women) and 1991-1994 (women only). Childhood stunting (height-for-age z score) was associated with a lower body mass index and percent body fat in men, while no associations were found in women. In both sexes, however, severely stunted children had significantly greater adult abdominal fatness (waist:hip ratio), once overall fatness and confounders were controlled. The adult waist:hip ratio (x100) was increased by 0.65 (95% confidence interval 0.10 to 1.20) in men and 0.29 (95% confidence interval -0.03 to 0.61) in women for each height-for-age z score less at age three. Migration to urban centers was significantly associated with an even greater waist:hip ratio in severely stunted females (p = 0.03). In a subsample of 137 women, short and thin newborns had significantly greater adult fatness compared with long and thin or short and fat newborns or children who became stunted postnatally. The adult waist:hip ratio (x100) was increased by 1.58 (95% confidence interval 0.35 to 2.81) for each kilogram less birth weight. The authors conclude that, in countries where maternal and child malnutrition exists alongside rapid economic development and urban migration, abdominal obesity and related chronic diseases are likely to increase.


Cigarette smoking is the most unnecessary of modern epidemics in the world today, according to the World Health Organization. In response to declining sales at home, multinational cigarette companies are increasingly targeting allegedly developing countries with their deadly products, often with the strong support of the U.S. government. While Asian countries have been most heavily targeted in recent years, Latin American countries have not been overlooked. This paper discusses macro-level and micro-level implications of the tobacco companies' promotions, based on data gathered in Mexico and Guatemala during 1990. Recommendations for combating the corporations' efforts are also discussed.


This article constitutes a case study of the development and implementation of the "results framework," an innovative planning and evaluation tool that is rapidly becoming a standard requirement for United States Agency for International Development (USAID) projects. The framework is used in a USAID-funded regional initiative for HIV/AIDS prevention in Central America. This new program evaluation and monitoring tool provides many advantages over traditional evaluation approaches that use outside consultants to provide midterm and end-of-project evaluations. The results-framework process, which spans the life of the project, provides an opportunity for program staff, donors, partners, and evaluators to work as a team to collect and use rich, longitudinal data for project planning, implementation, and evaluation purposes.


This study attempts to identify and describe factors associated with the choice of a health care source in rural Guatemala. Because of limited choice options, rural Guatemala makes an excellent location for studying the factors that affect utilization patterns. Illness case histories were collected from a random sample of 270 households in six villages. Then, two different methodological approaches were used to predict treatment actions. First, a sociobehavioral model, which encompasses enabling, predisposing, and need factors, was used to predict treatment choices. Using discriminant analysis we identified factors associated with the use of home remedies, a pharmacy, the health post, a physician, or folk healer. In a second, parallel study, descriptive interviews were used to identify important factors in choosing a treatment strategy. From these interviews, and from responses to hypothetical illness cases, we developed a decision model of treatment actions. Both models were tested against the set of illness cases. Results indicate that both approaches identify similar variables (especially, severity), although selection of variables through the multivariate analysis was much more successful in predicting treatment actions.


An international effort is underway to develop a new international growth reference for assessing the growth of young children, especially breastfed infants who appear to falter relative to the currently recommended National Center for Health Statistics/World Health Organization reference. While limited data from high socioeconomic status children from different parts of the world suggest that their growth patterns are similar, there is no comprehensive study of breastfed infants. The WHO Multinational Study of Breastfeeding and Lactational Amenorrhea provides bi-weekly weights and 2-4 weekly length measurements on breastfed babies from selected sites in Australia, Chile, China, Guatemala, India, Nigeria and Sweden. Multi-level modelling was used to analyse between-site differences in the growth of approximately 120 infants per site, after adjustment for maternal stature and infant feeding pattern. All mothers were literate and mean educational levels were well above national averages, but the study was not restricted to infants of high socioeconomic status. Maternal education was significantly associated with infant weight only in India. The growth curves of infants from most sites were strikingly similar, but relative to the Australians (the reference category), the Chinese babies were about 3% shorter at 12 mo of age and the Indians up to 15% lighter. The present results suggest that breastfed babies from reasonably well-off families in different continents show very similar growth patterns. However, it is important that the growth of children from South and East Asian populations be rigorously assessed in the process of developing the new international growth reference. This paper discusses the relative importance of environmental versus genetic influences in the growth of young children and illustrates the complexities involved in the analysis of growth data.

To evaluate the effect of a nutritional supplement on change in women's weight during a reproductive cycle and on the difference in birth weight between one infant and the previous one, we analyzed data on 176 complete reproductive cycles from an experiment that was conducted in rural Guatemala. Women with an initial weight <50 kg were classified as marginally nourished or malnourished. Women whose intake of the supplement was in the top 2 tertiles were distinguished from those whose intake was in the lowest tertile. Linear regression modeling was used to estimate the effect of supplementation on these outcomes and to control for confounding factors. Malnourished women gained weight during the reproductive cycle, but their second (study) infant tended to weigh less at birth than their prior-born infant. Higher intakes of supplement were associated with a less negative difference in birth weight. Marginally nourished women lost weight during the reproductive cycle and their second (study) infant tended to weigh more at birth than their prior-born infant. Higher intakes of supplement were associated with a less negative weight trend for the women themselves. Well-nourished women and their infants did not show any of these benefits from supplementation. These findings help explain past contradictory findings on maternal depletion as well as on the benefits of nutritional supplementation for mothers and their infants.


This article reviews the current status of the use of insecticide-impregnated mosquito nets and other impregnated materials in the Americas. Studies from Brazil, Colombia, Ecuador, Guatemala, Peru, Suriname, and Venezuela are examined. It is concluded that most studies have suffered from experimental design errors, short duration problems, and/or inadequate measurement of health indicators. The review brings out the great difficulty of conducting scientific studies that attempt to measure the impact of insecticide-treated materials on malaria incidence. In particular, the low incidence of malaria in the Americas, the high prevalences of P. vivax and relapsing cases, and the relationship between human activity patterns and the crepuscular biting patterns of certain malaria vectors stand in the way of easy experimental design and execution. The utilization of impregnated mosquito nets or other impregnated materials as a major component of an integrated malaria control program would be premature at this time. However, it is recommended that well-conceived large-scale trials and interventions be considered when they are based on a thorough understanding of the dynamics of malaria transmission in the area of study.