

### **Extended Abstract**

While Guatemala is not the poorest of the seven Central American countries, the country has the highest infant and under-five mortality rates of these countries. For example, Nicaragua, the poorest country in the region, has 31 infant deaths per 1,000 live births and 40 deaths per 1,000 children younger than 5 years of age, both of which are less than Guatemala's rates—32 and 43, respectively (World Bank 2007). Statistical data indicate that in addition to child mortality, Guatemala has the worst levels in Central America on several other social indicators, such as literacy rates and primary school enrollment rates.

Guatemala's very high level of inequality (Gini index was .55 in 2002), the highest in the region, may lie behind the discordance between the rankings on income and on social indicators (World Bank 2007). Despite a very low per capita income in Nicaragua, the proportion of people living under the poverty line is lower there than in Guatemala (United Nations Development Programme 2006). Infant mortality rates in Central America correspond better with the level of socioeconomic inequality than with the per capita income. This pattern coincides with the finding by Caldwell (1986) that the level of income may not be a determining factor for child mortality at all.

The very high level of socioeconomic inequality in Guatemala derives, at least in part, from the high proportion of the population that is indigenous—the highest in Central America and the second highest in Latin America, surpassed only by Bolivia. Like other indigenous and ethnic minorities in Latin America, the indigenous people of Guatemala face far more serious socioeconomic difficulties than their non-indigenous or Ladino counterparts. Indeed, in terms of most, if not all socioeconomic indicators, such as literacy rates and access to the health system, the indigenous people lag far behind. For instance, Shapiro (2006) states that in 2000, 74% of indigenous people were poor compared to 38% of non-indigenous people. Part of this disadvantage is simply due to the fact that indigenous people in Guatemala are much more likely than Ladinos to live in rural areas, so they have less access to the basic infrastructure and health system.

Hirotooshi Yoshioka  
Thomas W. Pullum  
University of Texas at Austin

Despite these disadvantages, social policies targeted on indigenous people are still rare in Guatemala.

And even though it has been more than a decade since the end of the Civil War, which lasted for 36 years and had seriously negative effects on indigenous people, discrimination against indigenous people continues. In fact, the level of inequality has risen under the neoliberal agenda and open-market economy. Hence, even though the government of Guatemala does not officially discriminate against indigenous people, and the ILO Convention 169 on Indigenous and Tribal People was ratified by the national government, it seems that more indigenous people face socioeconomic inequalities today than ever before. What makes their situation more complicated is that there are 22 Mayan linguistic groups and two other non-Mayan groups—Xinca and Garifuna. The socioeconomic, demographic, and cultural characteristics of these groups are not necessarily similar to each other, but they all are poorer than non-indigenous people. Treating the indigenous groups as one is neither practical nor realistic in efforts to combat the social problems that indigenous people face. To promote socioeconomic equality and better welfare in a multiethnic and multicultural country like Guatemala, it is fundamental to understand the socioeconomic and demographic situations, not only of minorities as a whole, but the differences between these groups.

This study treats infant mortality as an indicator or proxy for a range of socioeconomic disadvantages. We examine differentials in infant mortality between several indigenous and non-indigenous groups. Infant mortality has been of substantial interest to researchers and policy makers for many decades (Forbes and Frisbie 1991). The infant mortality rate has often been regarded as one of the most sensitive indices of the level of health and quality of life (Roberts 1973; Cramer 1987; Gortmaker and Wise 1997). Newborn children have special vulnerability to poverty and substandard living conditions (Gortmaker and Wise 1997). Mosley and Chen (1984) argue that child mortality should be treated as a chronic disease process that derives from various origins, rather than as an acute, single-cause phenomenon. In this sense, infant mortality has often been seen as a kind of “social mirror” reflecting problems including poverty and inequality (Gortmaker and Wise 1997).

Hirotoishi Yoshioka  
Thomas W. Pullum  
University of Texas at Austin

In addition to economic factors, Mosley and Chen (1984) describe proximate or biological factors, such as birth interval and maternal age, which are related to socioeconomic factors at least to some degree. Balk and her colleagues (2004) argue that maternal risk factors are strongly related to neonatal or early infant deaths as they are associated with premature and low birth-weight and delivery complications. One of the most important maternal factors found to be related to childhood mortality is the pace of childbearing (Hobcraft et al.1985). This point also relates to the argument that infant mortality rates differ between different indigenous groups as it is probable that fertility rates differ by indigenous groups. Each indigenous group tends to concentrate in specific parts of the country. For example, indigenous Mayan K'ichee people tend to live in the Western Highland of the country, where Quetzaltenango, the largest Mayan city is located. And each group tends to maintain their own culture and thus, different fertility rates although all groups have higher fertility rates than Ladinos as a whole.

Ware (1984) states that, in less developed countries, there is clear evidence of differentials in child survival rates associated with the education of mothers. In Nicaragua, Sandiford and his coworkers (1991), Peña et al. (2000) and Blau (1986) found that levels of maternal education affect infant mortality rates negatively. A negative relationship between the level of maternal education and infants' risk of dying is clear, although the amount of education required to produce a significant reduction in mortality varies from culture to culture. Another important factor that may affect child mortality is the place of residence. This is especially relevant to indigenous and racial/ethnic minority groups in Guatemala because they are more likely to live in rural areas. Urban residents may take advantage of the better infrastructure than is available in rural areas.

To analyze infant mortality differentials by ethnic groups in Guatemala, we use the 2002 Encuesta Nacional de Salud Materno Infantil (National Survey of Maternal and Infant Health). For statistical analysis, we use a generalized linear model which is similar to a hazard model and produces coefficients that are analogous to the usual  $\lambda q_0$  (Balk et al. 2004). Using this method, the exponential of a coefficient for a covariate is the relative risk for that covariate. we analyze infant mortality using two kinds of independent variables for ethnic

Hirotooshi Yoshioka  
Thomas W. Pullum  
University of Texas at Austin

groups, controlling for several covariates such as proximate factors, the mother's and her household's socioeconomic status, and two regional variables. In the first analysis, we use a dichotomous variable that distinguishes indigenous from non-indigenous without further considering differences within the indigenous category. In the second analysis, we use mothers' maternal language, which has seven categories: two Spanish categories (non-indigenous Spanish-speaking mothers and indigenous mothers whose first language is Spanish); four major Mayan language groups that account for at least 5% of the total population; and an "other" category that combines indigenous groups whose language does not meet the 5% criterion and other non-Spanish language groups such as Xinca and Garifuna.

Preliminary results suggest that babies of indigenous mothers face significantly higher risks of infant death than infants whose mothers are not indigenous. The relative risk of early death among indigenous infants declines when several sociodemographic factors are taken into account, but indigenous infants are still about 15% more likely to die within the first year of their lives than non-indigenous infants. The significant disadvantage of indigenous children even after controlling for several covariates indicates the existence of other possible factors such as language barriers and less frequent use of public facilities including health clinic.

We also find a disadvantage of indigenous groups in terms of infant mortality compared to non-indigenous mothers whose mother tongue is Spanish. The Mam group is most disadvantaged, and this can be explained by their lower socioeconomic status. After controlling for all independent variables used in the study, only the K'ichee group shows a significant disadvantage in infant mortality compared to the non-indigenous Spanish speaking mothers. It is possible that the significant disadvantage among the Mam group disappears in this model partly because of the relatively small size of this group (less than half of the K'ichee population), which may be an issue for other groups in the study.

The finding that all indigenous groups have a socioeconomic disadvantage in terms of infant mortality compared to the non-indigenous group, but that the level of disadvantage differs across groups, indicates that the difficulties each group faces are not identical. Since the statistically significant disadvantage of the K'ichee

Hirotooshi Yoshioka  
Thomas W. Pullum  
University of Texas at Austin

group remains net of other socioeconomic and demographic factors, the disadvantage of this group derives from their specific characteristics that cannot be measured by the variables used in this study, which may be relevant only to this group. Hence, the study suggests that social programs directed at poverty alleviation and adult literacy, which can also lead to reductions in infant mortality, cannot be effective unless these programs take into account the different needs of different indigenous and minority groups. To date, little research has been done on racial/ethnic inequality beyond simple dichotomous groupings of indigenous/non-indigenous or majority/minority in most of Latin American countries other than Brazil. The study indicates the need for going beyond such simple comparisons, especially for the more divided and unequal societies in Latin America.

Hirotooshi Yoshioka  
 Thomas W. Pullum  
 University of Texas at Austin

Table 1. Percentage Distribution of Selected Variables Used in Analysis

	<b>Total</b>	<b>Non-Indigenous</b>	<b>Indigenous</b>
Is Indigenous	47.10	—	—
<b>Maternal Language</b>			
Spanish Ladino	51.88	98.08	—
Spanish Indigenous	4.87	—	10.34
Kaqchiquel	5.47	0.25	11.33
Q'eqchi	11.19	0.28	23.43
K'iche	13.05	0.36	27.31
Mam	5.24	0.44	10.63
Other	8.30	0.59	16.96
Lives in Urban Areas	26.74	33.24	19.44
Has Access to Piped Water	49.58	46.70	52.82
Has Access to Electricity	69.92	75.81	63.30
<b>Floor Material</b>			
Dirt	57.44	43.97	72.56
Other	42.56	56.03	27.44
<b>Socioeconomic Indicator</b>			
Low	37.57	29.33	46.82
Medium	43.17	40.61	46.05
High	19.26	30.06	7.12
<b>Mother's Level of Education</b>			
None	48.05	32.16	65.90
Primary	43.23	53.01	32.24
Secondary and Higher	8.72	14.84	1.86
<b>Mother's Religious Affiliation</b>			
Catholic	48.00	45.36	50.96
Evangelical	37.88	37.71	38.07
Other	1.63	0.92	2.42
None	12.49	16.01	8.55
<b>Marital Status</b>			
Married or Consensual Union	94.39	92.45	96.56
Single	1.02	1.34	0.66
Separated/Divorced	4.59	6.21	2.78
<b>Mother's Age at Child's Birth</b>			
<15	1.18	1.10	1.28
15-19	22.74	22.97	22.50
20-24	33.46	34.37	32.45
25-29	22.99	23.29	22.67
30-34	12.50	11.91	13.17
35+	7.11	6.37	7.94
<b>Infant Mortality (per 1,000 live births)</b>	6.71	5.73	7.81
<b>N</b>	27,624	14,613	13,011

Hirotooshi Yoshioka  
 Thomas W. Pullum  
 University of Texas at Austin

Table 2. Relative Risk Ratios from Log Probability Models Predicting Relative Risk of Infant Death

	Model 1	Model 2	Model 3
Is Indigenous	1.579 ***	1.511 ***	1.148 *
<b>Year of Birth</b>			
(1983<)			
1983 - 1987	0.894	0.961	0.977
1988 - 1992	0.519 ***	0.555 ***	0.571 ***
1993 - 1997	0.446 ***	0.467 ***	0.481 ***
1998 - 2002	0.332 ***	0.349 ***	0.362 ***
Child is Female		0.871 *	0.859 **
<b>Birth Order</b>			
(First)			
Second or Third		1.125	1.037
Fourth and Higher		1.433 ***	1.134
<b>Mother's Age at Child's Birth</b>			
(<15)			
15 - 19		0.517 ***	0.571 ***
20 - 24		0.367 ***	0.445 ***
25 - 29		0.324 ***	0.416 ***
30 - 34		0.286 ***	0.366 ***
35 - 39		0.450 ***	0.554 *
Lives in Urban Areas			1.005
Has Access to Piped Water			1.104
Has Access to Electricity			1.003
Non-Dirt Floor			0.846 *
<b>Socioeconomic Indicator</b>			
(Low)			
Middle			0.852
High			0.613 **
<b>Mother's Level of Education</b>			
(None)			
Primary			0.795 **
Secondary and Higher			0.572 **
<b>Mother's Marital Status</b>			
(Married/Consensual Union)			
Single			1.128
Separated/Divorced			1.000
<b>Mother's Religion</b>			
(Catholic)			
Evangelical			1.073
Other			1.539 *
None			1.127
Constant	0.089 ***	0.197 ***	0.269 ***
Log Likelihood	-5476.936	-5435.161	-5359.583
Chi2	155.8885	248.3166	362.932
N	27,624	27,624	27,624

\* p<0.05, \*\* p<0.01, \*\*\* p<0.001

Hirotooshi Yoshioka  
 Thomas W. Pullum  
 University of Texas at Austin

Table 3. Relative Risk Ratios from Log Probability Models Predicting Relative Risk of Infant Death

	Model 1	Model 2	Model 3
<b>Maternal Language</b>			
(Spanish Ladina)			
Spanish Indigena	1.246	1.226	1.090
Kaqchiquel	1.405 *	1.375 *	1.075
Q'eqchi	1.658 ***	1.499 ***	1.042
K'iche	1.614 ***	1.569 ***	1.215 *
Mam	1.968 ***	1.882 ***	1.338
Other	1.526 **	1.485 **	1.116
<b>Year of Birth</b>			
(1983<)			
1983 - 1987	0.896	0.960	0.977
1988 -1992	0.519 ***	0.554 ***	0.570 ***
1993 - 1997	0.446 ***	0.466 ***	0.481 ***
1998 - 2002	0.332 ***	0.349 ***	0.363 ***
Child is Female		0.870 *	0.860 **
<b>Birth Order</b>			
(First)			
Second or Third		1.126	1.041
Fourth and Higher		1.429 **	1.139
<b>Mother's Age at Child's Birth</b>			
(<15)			
15 - 19		0.519 ***	0.565 ***
20 - 24		0.369 ***	0.437 ***
25 - 29		0.326 ***	0.409 ***
30 - 34		0.289 ***	0.361 ***
35 - 39		0.451 **	0.542 **
Lives in Urban Areas			1.016
Has Access to Piped Water			1.096
Has Access to Electricity			0.989
Non-Dirt Floor			0.853 *
<b>Socioeconomic Indicator</b>			
(Low)			
Middle			0.849
High			0.607 **
<b>Mother's Level of Education</b>			
(None)			
Primary			0.793 **
Secondary and Higher			0.570 **
<b>Mother's Marital Status</b>			
(Married/Consensual Union)			
Single			1.130
Separated/Divorced			0.993
<b>Mother's Religion</b>			
(Catholic)			
Evangelical			1.069
Other			1.501
None			1.111
Constant	0.089 ***	0.197 ***	0.278 ***
Log Likelihood	-5472.432	-5431.423	-5357.333
Chi2	176.027	265.854	415.605
N	27624.000	27624.000	27624.000

\* p<0.05, \*\* p<0.01, \*\*\* p<0.001