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Religious Affiliation, Ethnicity, and Child Mortality in Chiapas, México

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Abstract

We investigate whether there is a relationship between religious affiliation and child mortality among indigenous and nonindigenous groups in Chiapas, México. Our analysis relies on Brass-type estimates of child mortality by ethnicity and religious affiliation and multivariate analyses that adjust for various socioeconomic and demographic factors. The data are from the 2000 Mexican Census 10 percent sample. Among indigenous people, Presbyterians have lower rates of child mortality than Catholics. However, no significant differentials are found in child mortality by religious affiliation among nonindigenous people. The indigenous health ministry of the Presbyterian Church and the social and cultural transformations that tend to accompany religious conversion may have an impact on child survival among disadvantaged populations such as the indigenous people in Chiapas.

As in numerous other countries in Latin America, Protestantism has increased rapidly in México during the last four decades. This increase has been especially pronounced among the indigenous population of Southern México. In this study, we examine the association between affiliation with a Protestant church and child survival in the state of Chiapas. Chiapas is the southernmost of the 32 states of México and the state with third highest proportion of indigenous population, about 25 percent. Chiapas has least benefited from the gains associated with modernization and economic globalization, and it has some of the lowest indicators of socioeconomic development and health status. For example, in 2000, Chiapas had the highest index of socioeconomic marginalization of any state in México (CONAPO 2001),¹ and also had the lowest life expectancy (Partida Bush 2006), and the second lowest rate of child survival (Partida Bush and Martinez Herrera 2006).

We focus on child survival because it is an important measure of human welfare, and one of the main millennium development goals (UN Millennium Project 2005). It is also an

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¹The index denotes poor housing conditions (lack of water, drainage system and toilet, electricity, and floors), low earnings, low literacy and education, and a high propensity to reside in rural areas (CONAPO 2001).

indicator that is sensitive to various aspects of socioeconomic development in a population such as living standards, female education, and the status of women, as well as the impact of preventive and curative medicine. Child survival has also been found to be associated with religious affiliation in the northeast of Brazil, another resource-poor setting in Latin America where children of Protestant mothers experienced lower mortality than children of Catholic mothers (Wood, Williams, and Chijiwa 2007).

The question we address in this article is whether the social, cultural, and behavioral changes that come with Protestantism may be particularly important for child survival among the indigenous population. Considering that social isolation, alcoholism, gender inequality, unfamiliarity with modern medicine, and poor access to health care are severe problems in the indigenous population of Chiapas (Granich et al. 1999; Herrera Torres et al. 2006; Rostas 1999), it is possible that affiliation with a Protestant church might have a especially noticeable impact on children's welfare in the indigenous context.

Our analysis is based on microdata from the 2000 Mexican Census that includes information on both child survival and religious affiliation. We first estimate indirectly the probability of dying for Chiapanecan children by maternal religious affiliation, and by whether the mother is indigenous. Then, we model child survival separately for the indigenous and nonindigenous mothers, assessing the role of religious affiliation as well as other covariates. Finally, we interpret our results with a view toward identifying the likely causal linkages between religion and health in this setting.

The Increase of Protestantism in Chiapas

The religious landscape in Chiapas is characterized by a high and increasing proportion of Protestants.² Although Protestantism has had a long presence in this state, in the last three decades the percentage of Protestants in the total population increased from 5 to 22 (INEGI 2005). Protestantism expanded most rapidly among the indigenous populations. In 2000, 32 percent of indigenous people in Chiapas were affiliated with Protestant religions, compared to 19 percent of the nonindigenous population (INEGI 2004a). Conversions to these religions have been from a Catholicism that is distinguished from Roman Catholicism by the influence of traditional pre-Hispanic beliefs, weak ties to Catholic institutions, and little knowledge about papal ordinances (Casillas 2003; Dow 2005). The most popular Protestant churches in Chiapas have been the Presbyterian and Adventist,³ followed by many other churches with Pentecostal and/or Evangelical roots (INEGI 2001).

In the attempt to coordinate the missionary work of North American Protestant churches, the south of México was considered Presbyterian territory in 1914 (Hernández-Castillo 1993). By that time, conversions to Presbyterianism had already taken place in Chiapas, variously promoted by believers from Guatemala, Tabasco, or the United States (Esponda 1986). In the 1920s, however, the expansion of this church gained strength with the arrival of missionaries from the Reformed Church in America, who partnered with Presbyterians in

²“Protestant” is used to name non-Catholic religions included under the Historical, Pentecostal or Evangelical, and Biblical Nonevangelical umbrellas.

³Fully 46 percent of the Presbyterians and 36 percent of the Adventists located in México are found in Chiapas (INEGI 2005).

their evangelization labor. A decade later, President Cárdenas supported the initiative of the Summer Institute of Linguistics (SIL) to preserve indigenous languages, which also benefited Presbyterianism. Besides accomplishing the goal of translating the Bible to native languages, missionaries affiliated with SIL encouraged religious conversion. For instance, the work of Marianna Slocum, a Bible translator, and her partner, Florence Gerdell, a nurse, are recognized as fundamental in the genesis of the Presbyterian Church of Oxchuc, Chiapas, and pioneers of its health ministry (Esponda 1986).

The history of the Seventh Day Adventist Church is less well documented, but there are records of an Adventist presence in Chiapas since the late 1910s (Ortiz Hernández 1989). However, the consolidation of Adventism among Zoques, one of the indigenous groups with the largest proportion of Adventists in Chiapas, dates from the 1970s (Báez-Jorge 1983). Like Presbyterians, Adventists took advantage of the SIL, which in this decade, together with the International Biblical Society, translated the gospel of Luke into the Zoque language. In contrast with the Presbyterian Church, which has reached mainly Tzeltal, Tzotzil, and Ch'ol indigenous groups in the regions of Altos and Selva, the Adventists gained more followers among Zoques and mestizos in the North and Central zones and among Tojolabal on the border with Guatemala, although the number of Adventists has grown in other indigenous communities as well (INEGI 2001).

Churches with Pentecostal roots such as the Assemblies of God and other Biblical Nonevangelical congregations appeared in Chiapas during the 1960s and 1970s, along with Neo-Pentecostal churches during the 1980s. While Pentecostal churches have successfully attracted populations of different socioeconomic backgrounds, other Biblical Nonevangelical congregations have been more visible in marginal urban areas or rural zones with a progressive loss of indigenous languages (Rivera-Farfán et al. 2005). The emergence of Pentecostal religions is important in México not only in terms of religious diversity, but also because of their influence on the culture of other Protestant religions. For example, Historical Protestant groups have adopted religious practices typical of Pentecostals in order to ensure their success in a context of religious competition (Bastían 1994). These practices include the adoption of a charismatic leadership style, the use of modern religious music similar to popular music, and delivery of evangelistic campaigns, sermons, and rituals that emphasize the experience of spiritual signs, speaking in tongues, miracles, and healing as manifestations of the spirit of God.

The Influence of Religious Affiliation on Child Mortality

There are grounds for thinking that changes in lifestyle and increases in social and cultural capital may result from conversion away from Catholicism, and that these shifts, in turn, may buffer the impact of poverty on health. The specific mechanisms through which religious factors may influence adult mortality are believed to be regulation of health behaviors and social integration (Durkheim [1897] 1951; Hummer et al. 2004). The same factors are likely to be the pathways through which religious affiliation affects child mortality. Joining a church might be important for child well-being due to the impact of a particular theology or social mission on illness control, either preventive or curative, or any of the other proximate determinants of child mortality (for a complete framework, see

Mosley and Chen 1984). Affiliation with a church may also have an unintended positive effect on child survival since it may constitute a platform for social interaction that facilitates support among families and diffusion of health-related ideas.

Some ethnographic studies have suggested that in Latin America, becoming a member of a Protestant church can offer spiritual, social, and, on occasion, material support through the formation of networks that go beyond kinship (Mariz 1994; Roberts 1968; Robledo Hernández 2002). Solidarity may be especially relevant in times of illness and during economic adversity or family crises, thus enhancing parents' ability to provide health care for their children. Furthermore, in a context of pronounced gender inequalities, where decision making surrounding health within the household is usually in the hands of the husband and his relatives, and where asking for help from others in a case of emergency is rare because of social segregation and lack of resources to return the favor (Herrera Torres et al. 2006), Protestant women may be empowered to pursue their own and their children's welfare by having access to a community where they can discuss their difficulties, share information, and obtain support (Robledo Hernández 2007; Rostas 1999).⁴

Unlike other settings where tolerance of alcohol consumption may differ by Protestant denomination, drinking alcohol is prohibited in virtually all of Mexican Protestantism. Although it is not always an immediate consequence of conversion (Eber 2001), giving up alcohol and other kinds of addictions are expected in Protestant congregations in both rural and urban contexts (Garma Navarro and Leatham 2004; Robledo Hernández 2002; Rostas 1999; Turner 1979). Men are encouraged to center their status achievement in their family and church well-being, rather than in the public realm that includes social or ceremonial drinking (Brusco 1993). For the Chiapanecan indigenous people, rejecting alcohol may be a cause of political conflict within communities since it challenges the power of those who sell alcohol, as well as indigenous beliefs about the sacred properties of alcohol. But it may also benefit a family's well-being in various ways. First, it may lead to a reduction in domestic violence, a common social problem among indigenous societies, since husbands often beat up their wives when drunk (Eber 2001; Robledo Hernández 2002; Rostas 1999). Second, consumption patterns may be reoriented toward the needs of the family (Brusco 1993; Mariz 1994), and the money formerly spent on alcohol may be used to buy furniture, clothes, and livestock, and to improve household conditions (Rostas 1999; Turner 1979).

Finally, as part of their social mission, Protestant churches in Chiapas promote literacy and increase awareness of the relevance of hygiene and preventive health care for physical well-being (Rostas 1999; Turner 1979). Since the 1970s, Presbyterians in particular have trained indigenous health promoters among Tzotziles, Tzeltals, and Choles from the Altos and Selva regions to offer basic health care and health education in their own communities and to refer individuals with more serious health problems to the government-funded clinics or hospitals, or to other private or church-funded medical services (Ocampo-Torres 1994; Ruiz-Guerra 2003). To get an idea of the scale of these programs, in 2000 just among

⁴Female empowerment within the household is thought to be an important factor that explains why maternal education reduces child mortality. According to Caldwell (1979), female empowerment lessens fatalism when children get sick, augments women's capability in manipulating the world, and ensures a better allocation of household resources for their children.

Tzotziles, there were health promoters in 43 separate indigenous communities.⁵ On the other hand, Adventists also funded two health clinics that provided health care, promoted family planning, and disseminated a lactovegetarian nutritional philosophy (Ortiz Hernández 1989). In addition, it has been suggested that largely Protestant communities in Chiapas, on account of their greater social organization, took more advantage than other communities of the government-sponsored programs for health and education that were expanded rapidly in the state following the Zapatista uprising in 1994.⁶

Despite the rapid growth in Protestantism, and the numerous reasons for thinking that this religious transformation might influence maternal and child health, the study of mortality differentials across religious groups in Latin America and México is only in its initial stages. Empirical evidence from the northeast of Brazil shows that women from Traditional and Pentecostal Protestant congregations have a lower risk of child mortality compared to Catholic women, after taking into account socioeconomic factors (Wood, Williams, and Chijiwa 2007). Also, results from México (Esparza and Yoshioka 2006) confirm that indigenous municipalities with greater religious heterogeneity, that is, a lower Catholic composition, have lower child mortality. While the reasons for survival disparity in Brazil are believed to be the changes in gender dynamics, intrahousehold behavior, and social organization that occur with conversion to Protestantism, the plausible explanations of this relationship in the Mexican study are greater social interaction and religiosity in Protestant churches, as well as the importance of their health and social ministries.

Finally, the only study to have touched on the topic in Chiapas found that, among a nonrandom sample of rural communities within the zones most affected by the Zapatista conflict, political or religious discrimination in health care provision was associated with higher maternal and/or perinatal mortality (Brentlinger et al. 2005). Even though discrimination in health care provision resulting from religious and political conflicts may offset the gains of affiliation to Protestant churches, it is unknown if child survival differs by religious affiliation and which socioeconomic factors influence survival differentials in this region of the world. Therefore, in this study, we explore whether maternal affiliation with Protestant religions is associated with lower child mortality in Chiapas from a demographic perspective.

Data and Methods

The microdata used in this analysis come from the 10 percent sample of the 2000 Mexican census (INEGI 2001). The “long form” of the census questionnaire records information about the number of children ever born (CEB) and surviving children ever born (SCEB) for women aged 12 and older, their religious affiliation and characteristics such as indigenous language, bilingualism, schooling, housing conditions, municipality and size of place of residence, use of health services, and participation in government-sponsored development programs. The data set for the analysis consists of matched individual and household records for 55,756 women aged 20–34 residing in Chiapas. The subsample sizes are specified within

⁵Personal conversation with Dr. Moisés Ocampo Torres, the coordinator of the Tzotzil Presbyterian health ministry, San Cristóbal de las Casas, August 2006.

⁶Personal conversation with Dr. José Gómez de León, the first director of Progres (now Oportunidades), March 1999.

each table (the sample size changes slightly according to the variables used due to missing values).

In 2000, for the first time, the Mexican census recorded religious denomination (INEGI 2001). We are able to consider the two largest denominational churches in Chiapas, Presbyterians and Adventists, as independent categories. We also created a category for Pentecostal churches that is not exclusive to any particular denomination since, for Pentecostals, the specific church is often not identified. This category is composed of individuals who classified themselves as Christians, Evangelicals, or Pentecostals as well as by those who declared affiliation with a particular Pentecostal church (see the Appendix). We classify the remaining Biblical congregations, Historical Protestant, Biblical Nonevangelical, or other Evangelical Non-Pentecostal churches in a residual category. Those who declared no affiliation with any religion constitute the last category. Other non-Christian and nonspecified religions are excluded from the analysis due to their small numbers.

In the long-form questionnaire used for the 10 percent sample, there are two variables related to indigenous ethnicity: self-reported ability to speak a native language and self-reported membership in an indigenous group. We use the linguistic criterion to distinguish between indigenous and nonindigenous women in this study. The alternative classification yielded a smaller proportion of indigenous people and had higher levels of nonresponse.

Literacy and years of schooling are combined to create the following educational categories: illiterate women and those with no formal schooling, women who did not complete primary school (1–5 years), those who completed grade school but did not complete secondary school (6–8 years), and those with secondary or higher level of education (9 years or more).

Size of place of residence is classified into rural areas (fewer than 2,500 inhabitants) and urban areas (over 2,500 inhabitants). A dichotomous variable for floors (dirt or not dirt) in the household is used as a proxy for household infrastructure (Cattaneo et al. 2007). Another dichotomous variable indicates whether the woman participated in *Progresa* or *Procampo*. *Progresa*, now *Oportunidades*, is a development program based on conditional cash transfers that target the poor in México (Skoufias 2005), while *Procampo* supports agricultural production of selected crops (Sadoulet, de Janvry, and Davis 2001).

Based on the census question about which services people used if they had a health problem, Chiapanecan women are classified as users or nonusers of health services. Users are further categorized by the place where they seek medical care. The first category comprises women who are users of the health services offered by the social security systems such as *Instituto Mexicano del Seguro Social* (IMSS), Instituto de Salud y Seguridad Social de los Trabajadores del Estado (ISSSTE), and *Petróleos Mexicanos* (PEMEX). These medical services constitute a benefit for employees with a formal employment contract; ISSSTE covers state employees, and PEMEX covers the national oil company's employees, while IMSS, the largest, covers all other salaried workers with formal public health insurance. Self-employed workers or small business owners may voluntarily pay insurance fees and have access to IMSS services if their economic activities are recognized and regulated by

the state. Users of the health clinics and hospitals of *Secretaría de Salubridad y Asistencia* (SSA) and *IMSS-Solidaridad* are considered separately since these services are open to all citizens regardless of insurance status, and target the uninsured, indigent, and rural sectors of society not covered by IMSS and the other public social security systems. Finally, those women who use *private or other* services are included in a final category. Mostly, these are small fee-for-service private hospitals and clinics.

Region of residence is utilized as a proxy for the economic, cultural, and social diversity among indigenous settlements. The census file has codes for 118 municipalities in Chiapas, which can be classified into nine socioeconomic regions. However, only regions in which over 40 percent of the population were indigenous are coded separately: *Norte*, *Altos*, and *Selva* (for a description of the demographic and sociopolitical characteristics of these regions, see Sánchez-Pérez, Arana-Cedeño, and Yamin 2006). The rest of the regions are grouped in a residual category (*Other*).

To estimate the cumulative probability of child mortality up to specific ages, $q(x)$, by maternal religious affiliation and language, we apply the Brass method (United Nations 1983). This method is derived from the linkage between the maternal age pattern of fertility and the distribution of the length of children's exposure to the risk of dying, and is based on census questions regarding maternal age, number of CEB, and number of SCEB. We use the adjustment factors developed by Trussell for the West model to reduce estimation errors, and estimate $t(x)$, the number of years before the census that the corresponding probability of child mortality was prevalent in the population under study.

In the second part of our analysis, we further explore the relationship between child mortality and religious affiliation among indigenous and nonindigenous women using negative binomial regression models. The dependent variable is the number of deceased children per woman, and the exposure term is the number of CEB (hence taking parity into account implicitly). This model is appropriate for a count-dependent variable characterized by a variance that differs from its mean, such as the number of deceased children per woman. An advantage of this model over Poisson is that it accounts for unobserved heterogeneity among observations and includes an additional parameter alpha that indicates the degree of dispersion in the predictions (Long and Freese 2001). Estimates of incidence-rate ratios ($\exp \beta$) are presented in the results section. The expression $(\exp \beta - 1) \times 100$ is interpreted as the percentage change in the incidence or risk of child mortality for categories of an independent variable with respect to the reference group, net of the effect of other covariates.

We use two model specifications for both indigenous and nonindigenous people. In the first model, we assess the differences in child mortality by religious affiliation net of the effect of maternal age, an indicator of the length of exposure of the mother's children to the risk of death. In the second model, we also include socioeconomic covariates that are expected to be associated with the differentials in mortality, and that could account for some part of the statistical association between religion and child mortality. Finally, after finding significant differentials in child survival by religious affiliation among indigenous people, and hypothesizing that a possible causal mechanism is that the Presbyterian Church has made an

explicit effort to promote more and better use of medical services, we tested the interaction between religious affiliation and use of health services in a third model for indigenous mothers.

The regression models were run using Stata 9 statistical software (Statacorp 2005). The Brass-type estimates of child mortality and the multivariate analyses were carried out using unweighted data. The weights in the census file varied considerably in size and one municipality was not covered by the census, presumably due to the difficulty of enumerating the population in zones controlled by rebel groups. Thus, we decided that it would be better to sacrifice generalizability to the whole state, and give equal weight to each woman in the sample.

Results

Brass-type estimates of the probability of child mortality are shown in Table 1. In both panels, and in all groups, as expected, the probability of a child dying from birth to exact age X increases as the index age and the reference period increase. Panel A shows that children born to indigenous women have higher probabilities of dying at all ages compared to nonindigenous women. Panel B indicates that the estimated probabilities of dying among the children of women affiliated with the Presbyterian Church, to congregations of Pentecostal line (except for those aged 30–34), and other Biblical churches are lower than those of Catholics, even though, as seen in Table 2, Presbyterian and Pentecostal are favored by indigenous women. The differences are especially pronounced for Presbyterians among the children of women aged 20–29.

Together, the two panels suggest that religion may have an independent effect on child survival, one that is especially influential in the indigenous population. To examine this possibility, we turn next to a multivariate analysis of the factors associated with child survival. Given the socioeconomic differences between the indigenous and nonindigenous populations, and their difference in child survival, the indigenous and nonindigenous populations are considered separately.⁷

Table 2 presents the distribution of mothers aged 20–34, by ethnicity, according to the variables that are included in the multivariate analysis. Parous indigenous women are less likely to be Catholic and more likely to be Presbyterian, Adventist, or Pentecostal, compared to their nonindigenous counterparts. Indigenous women are also somewhat younger and less educated, and more likely to participate in governmental development programs, live in a house with dirt floors, and reside in rural areas than nonindigenous women. In addition, they are less likely to use health services and to access the medical services of the social security systems or private providers than nonindigenous women. In contrast, indigenous women are more likely to use SS A or IMSS-Solidaridad services. In addition, they are located mostly in Norte, Selva, and Altos, and only half of them are bilingual.

⁷The pooled model including interactions between religion and ethnicity is not shown, but is available upon request. Overall, nonindigenous women and Presbyterian indigenous women had significantly lower child mortality than indigenous Catholics, net of the effect of socioeconomic covariates.

Results from the multivariate analysis are presented in Table 3 for indigenous and nonindigenous women. Model 1 for indigenous women shows that the risk of child mortality is estimated to be 23 percent lower for Presbyterians compared to Catholics. The chances of child mortality increase with maternal age, as would be expected with increased exposure and the decline in death rates over time. The incidence-rate ratios of child mortality for Presbyterians with respect to Catholics remains significant after introducing socioeconomic variables in the second model for indigenous mothers, and the mortality gap only decreases very slightly. Thus, religious affiliation presents an independent association with child mortality not accounted for by the socioeconomic characteristics of the indigenous mothers.

With respect to the socioeconomic factors included in the second regression for indigenous women, bilingual women present a risk of child mortality 12 percent lower than that of monolingual women. Education shows a strong gradient with child mortality: studying one to five years diminishes the incidence of child mortality by 11 percent, and studying nine or more years by 39 percent compared to no schooling. Having floors other than dirt reduces the risk of dying by 15 percent. Residing in the Selva region is associated with decreased risks of child mortality compared to living in Norte. Regarding health services, using SSA or IMSS-Solidaridad medical services is associated with 12 percent decline in child mortality risk versus being a nonuser. A slightly larger but insignificant effect is observed for the relatively few users of IMSS, ISSTE, or PEMEX health services. In addition, the risk of child mortality is 10 percent lower if the women participated in Progresa or Procampo.

Figure 1 shows the relative level of child mortality for indigenous users of particular health services, for both Catholics and Presbyterians, compared to Catholics who do not use health services.⁸ These results come from the third model for indigenous mothers in which the interaction between religion and use of health services is estimated.⁹ For simplicity, we only illustrate the findings regarding the Protestant Church that exhibited an overall significant advantage in child survival with respect to Catholics in the previous model, but the complete results are available upon request. As seen in Figure 1, for Catholics, nonusers have virtually the same child mortality experience as those women who report making use of any of the three kinds of health services after adjusting for other covariates. In contrast, for Presbyterians, although in general the risk of child mortality among both nonusers and users of health services is smaller than for Catholics, there are notable differences in child survival according to the type of health service used. Users of *IMSS*, *ISSSTE*, and *PEMEX* services and of *Private* services have the lowest child mortality (statistically significant at $p < .05$), and users of *SSA* or *IMSS-Solidaridad* services have a smaller but still significant advantage in child survival. Only among nonusers, Presbyterians and Catholics exhibit no statistically significant differential in child mortality, holding other covariates constant. Use of health services might be a mediating factor between affiliation with Presbyterianism and child survival. Given that the indigenous Presbyterians' pattern of using health services are very similar to the overall distribution of indigenous users presented in Table 2,¹⁰ we cannot

⁸Catholic nonusers is the reference category when estimating the interaction between the type of health service used and religious affiliation. We expected to obtain the poorest child survival outcomes for this group of women, given both their nonuse of health services and their Catholic affiliation.

⁹The interaction between the type of health service used and religious affiliation among indigenous women led to a significant improvement in the log-likelihood ratio

infer that indigenous Presbyterians show an advantage in child survival because they have more access to a particular health service than indigenous Catholics; however, it seems as if Presbyterians make better use of the health services available.

Table 3 also shows the incidence-rate ratio of child mortality among nonindigenous women. In the first model, women without any religious affiliation present a 17 percent higher risk of child mortality compared to Catholics, but there are no significant differences in child mortality associated with other religions. Also, maternal age is positively associated with child mortality. Contrary to the findings for indigenous women, with the introduction of socioeconomic factors in the second model, the size and significance of the relationship between religious adscription and child mortality among nonindigenous women declines markedly. As with indigenous women, additional schooling, living in a house with floors other than dirt, and residence in Selva versus Norte are significantly associated with reductions in child mortality. Finally, with respect to nonusers, the use of medical services offered by the social security system significantly reduces the risk of child mortality, and participation in development programs does not appear to have a significant impact on child survival.

Discussion

The central finding of this study is that child mortality is significantly lower among indigenous women affiliated with the Presbyterian Church compared to indigenous Catholic women in Chiapas. These differentials remain significant after adjusting for the socioeconomic circumstances of the mother. In contrast, we find no association between religious affiliation and child survival in the nonindigenous population. The strong relationship between affiliation with the Presbyterian Church and child survival found among indigenous people is consistent with research findings in the northeast region of Brazil (Wood, Williams, and Chijiwa 2007). However, why only the Presbyterian denomination confers such an advantage, and why it only benefits the indigenous population are intriguing questions.

Possible answers include variations in health-related knowledge and behaviors, as well as use of health services across congregations. As revealed in the interaction between type of health service used and religious affiliation among indigenous people shown in Figure 1, it would seem that among Catholic indigenous women, even women who have access to health services and occasionally use them are less able than Presbyterian indigenous mothers to take advantage of modern medicine to improve their children's chances of survival in what are clearly difficult socioeconomic circumstances. The fact that Presbyterian users of health services present statistically significant lower risks of child mortality than Catholics nonusers might be attributable to the role played by this church's indigenous health promoters providing health education, detecting or treating health problems, and making referrals to public or private health services.

¹⁰Among indigenous Presbyterians, 14 percent do not use health services compared to 13 percent of all indigenous women. Only 8 percent of Presbyterians use IMSS, ISSSTE, or PEMEX health services and 68 percent use SS A or IMSS-Solidaridad services compared to 11 percent and 66 percent of indigenous women, respectively. Finally, Presbyterians report exactly the same frequency of private or other health service use compared to all indigenous women.

However, other factors might also be responsible for indigenous Presbyterians making better use of health services and having overall lower child mortality risks than indigenous Catholics. It might be that the more ascetic behavior of the husbands of Presbyterian mothers may lead to greater economic resources for the household, which in turn may facilitate getting opportune medical help for their children. The relative advantage of religious affiliation in this respect might be greater among the indigenous as compared to the nonindigenous population if the prevalence of alcoholism and its social and economic impact were particularly important in the former.¹¹

In addition, if, especially among indigenous women, social integration and organization were stronger among Presbyterians than among Catholics or other Protestants, that might enable women more freedom and resources to cope with disease, and ensure that their children receive regular preventive care such as immunizations and growth monitoring. Although both the Catholic Church (Casillas 2003) and the Adventist Church (Ortiz Hernández 1989) also fund health ministries, nominal religious affiliation and lower direct involvement in the health programs by indigenous women may be offsetting their impact. Moreover, the longer presence of the Presbyterian Church in Chiapas, and the large number of indigenous parishioners, may favor greater integration within and across indigenous communities compared to other Protestant churches.

Among nonindigenous women, Presbyterians account for less than 3 percent of all mothers in our sample. Therefore, proportional representation is also likely part of the reason why affiliation with a Presbyterian, or for that matter any Protestant church, has no impact on child survival among the nonindigenous population. Moreover, for nonindigenous people in Chiapas, the effect of religious affiliation through social integration may be less influential on child survival since they are more likely to live in urban settings, have higher levels of education, and have greater exposure to the mass media and other sources of information. Overall, they are less marginalized socioeconomically and less isolated from the mainstream of the national society.

We are aware of some of the limitations of using census data to uncover the relations between religion and child survival, and the need to consider how they might bear on the interpretation of our results. One limitation stems from the absence of information in the census questionnaire about the intensity of religious practices, as well as the failure to distinguish between the different types of Catholicism that a Chiapanecan woman might practice. Thus, “Catholic” in these data refers to a large, undifferentiated group that almost certainly includes women with quite varying degrees of religiosity. Such variation is very likely to be much less within Protestant groups since their minority status and the demands such churches make on their parishioners means that one does not declare affiliation with such churches as a matter of course. However, although, in this sense, we may be comparing

¹¹To our knowledge, there are no available data on the differential in the prevalence of alcohol use and abuse by ethnicity and by religious affiliation in México and in Chiapas in particular. The Encuesta Nacional de Adicciones 2002 (National Survey of Addictions) includes questions on religious affiliation, indigenous language, and alcohol abuse, but has not been released for public access (INEGI 2004b). However, results from case studies on alcoholism in indigenous communities residing in other states of México show higher abstention from alcohol among Protestants compared to Catholics. That is the case, for example, of the Nāhñu community in Mezquital Valley (Garcia-Andrade et al. 2005).

groups with varying degrees of religiosity, among the indigenous in Chiapas, we can say that Presbyterians do noticeably better than average with respect to child survival.

A second limitation is that we only know the mothers' religious affiliations at the time of the census rather than at the time their children were born and were growing up. However, estimates of the period of reference for the probability of child mortality (Table 1) show that those deaths occurred on average in a recent period. When contrasting those dates with the conversion process in Chiapas (Dow 2005), we notice that most of the conversions were likely to occur before the timing of a majority of the deaths; 16 percent of the state population was already Protestant by 1990. The problem may be especially important for older mothers, but if "mis-matching" were at play, such a limitation should lead us to underestimate the association between Protestantism and child survival. A related but more problematic issue in studies such as ours is selection bias (Regnerus and Smith 2005). Might it be that the women who convert to Presbyterianism are more likely to have beliefs and attitudes that are favorable to child survival? If such positive selection were at work, we think that important factors of selectivity would have been detected once socioeconomic factors were introduced in the multivariate analyses for indigenous women. However, neither education, use of a particular type of health service, nor participation in anti-poverty programs seems to mediate the influence of religion on child survival in Chiapas, contrary to what has been reported in other studies (Gyimah 2007).

Even considering these limitations, we have a striking finding: a strong positive association between child survival and affiliation with the Presbyterian Church among the indigenous population of Chiapas. Although the indigenous health ministries undertaken by Presbyterians are a logical interpretation for their child survival advantage in this context, we cannot disregard other complementary explanations. It is notable that conversion to Protestantism has been greatest in precisely the population where, at least in terms of child survival, it seems to be having the greatest impact. Future studies should focus on a more direct evaluation of the Presbyterian health ministry, as well as the critical pathways leading to improved child survival among indigenous Protestants.

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Appendix

Appendix

Percentage distribution of women 20 to 34 years old by disaggregated categories of religious affiliation and ethnicity, Chiapas, México, 2000

Religious Affiliation	Indigenous	Nonindigenous	Total
Catholic	53.0	65.4	61.1
Presbyterian	12.0	2.7	5.9
Seventh-Day Adventist	9.0	6.7	7.5
Pentecostal line			
Assemblies of God	.4	.1	.2
Full Gospel Church	.2	.2	.2
Christian Societies	.2	.2	.2
Pentecostal	6.3	4.3	5.0
Other Pentecostal	.2	.4	.3
Pentecostal no specified	.1	.1	.1
Christian	.1	.5	.4
Evangelical	1.2	1.5	1.4
Other Biblical			
Baptist	1.0	.6	.7
Nazarene	.0	.6	.4
Church of Christ	.4	.2	.2
Mormon	.0	.2	.1
Jehovah Witnesses	.4	3.6	2.5
Other Evangelical Non-Pentecostal	.5	.5	.5
Other non-Christian	.0	.0	.0
No affiliation	14.3	12.2	12.9
Undetermined	.6	.3	.4
Total	100.0	100.0	100.0
<i>n</i>	19,314	36,442	55,756

Source: Estimations based on the 10 percent Mexican Census Sample, INEGI, 2000.

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Figure 1.

Interaction between religious affiliation and type of health services used; indigenous women 20 to 34 years old with children ever born, Chiapas, Mexico, 2000

Table 1

Brass-type estimates of child mortality by ethnicity and by religious affiliation, Chiapas, México, 2000

Women's Age	x	n	CEB	SCEB	$q(x)$	$t(x)$
Panel A: Ethnicity						
Indigenous						
20–24	2	8,072	12,097	11,479	.0516	2.64
25–29	3	6,418	19,333	17,971	.0698	4.51
30–34	5	4,824	21,397	19,596	.0850	6.67
Nonindigenous						
20–24	2	14,725	16,314	15,521	.0489	2.64
25–29	3	11,890	25,741	24,400	.0513	4.58
30–34	5	9,827	30,720	28,913	.0590	6.82
Panel B: Religious affiliation						
Catholic						
20–24	2	13,748	15,655	14,870	.0508	2.62
25–29	3	11,273	25,954	24,398	.0595	4.49
30–34	5	9,126	30,491	28,399	.0693	6.65
Presbyterian						
20–24	2	1,357	1,830	1,756	.0413	2.58
25–29	3	1,112	3,127	2,964	.0520	4.40
30–34	5	813	3,312	3,095	.0665	6.51
Seventh-Day Adventist						
20–24	2	1,795	2,602	2,462	.0535	2.76
25–29	3	1,297	3,659	3,430	.0617	4.65
30–34	5	1,096	4,499	4,175	.0726	6.79
Pentecostal line						
20–24	2	1,871	2,616	2,493	.0475	2.61
25–29	3	1,434	3,967	3,739	.0567	4.54
30–34	5	1,128	4,522	4,200	.0715	6.79
Other Biblical						
20–24	2	962	1,029	984	.0447	2.51
25–29	3	761	1,630	1,539	.0552	4.46
30–34	5	638	2,053	1,933	.0586	6.75
No religious affiliation						
20–24	2	3,001	4,593	4,353	.0518	2.71
25–29	3	2,397	6,624	6,197	.0624	4.81
30–34	5	1,809	7,083	6,557	.0733	7.23

x = children's exact age; n = number of women; CEB = children ever born; SCEB = surviving children ever born; $q(x)$ = probability of dying from birth to exact age x ; $t(x)$ = reference period to which the values of $q(x)$ refer.

Note: Estimation of $q(x)$ based on Trussell's coefficients for the West model.

Source: Estimations based on the 10 percent Mexican Census sample (INEGI 2000).

Table 2

Percentage distribution of selected variables, women 20 to 34 years old with children ever born, Chiapas, México, 2000

Independent Variable	Indigenous	Nonindigenous
Religious affiliation		
Catholic	52.3	64.0
Presbyterian	11.6	2.7
Seventh-Day Adventist	9.9	7.2
Pentecostal line	9.5	7.7
Other Biblical	2.0	5.1
No religious affiliation	14.7	13.4
Age		
20–24	35.3	31.5
25–29	35.7	35.8
30–34	28.9	32.7
Language		
Indigenous monolingual	46.3	–
Indigenous bilingual	53.7	–
Education		
No instruction	44.4	15.3
1–5 years	32.2	31.7
6–8 years	18.5	25.4
9 years and more	5.0	27.6
Floor		
Dirt	76.9	36.3
Other	23.1	63.7
Rural place of residence		
–	83.5	51.0
Region of residence		
Norte	24.2	13.8
Altos	38.7	3.2
Selva	23.7	5.0
Other	13.4	78.1
Medical service commonly used		
None	12.8	3.3
IMSS, ISSSTE, or PEMEX	10.7	17.7
SSA or IMSS Solidaridad	66.2	51.4
Private or other	10.3	27.6
Progresa or Procampo		
–	41.9	24.0
<i>n</i>	13,325	25,610

Source: Estimations based on the 10% Mexican Census sample (INEGI 2000).

Table 3

Incidence-rate ratios of child mortality, women 20 to 34 years old with children ever born; negative binomial regression, Chiapas, México, 2000

Independent Variable	Indigenous		Nonindigenous	
	Model 1	Model 2	Model 1	Model 2
Religious affiliation (Catholic)				
Presbyterian	.77 ***	.79 ***	1.02	.96
Seventh-Day Adventist	.94	.94	1.13	.99
Pentecostal line	.91	.92	1.04	.99
Other Biblical	.90	.86	.99	.97
No religious affiliation	.99	.93	1.17 **	1.04
Age (20–24)				
25–29	1.36 ***	1.33 ***	1.10	1.12 *
30–34	1.66 ***	1.59 ***	1.23 **	1.24 ***
Language (monolingual)				
Bilingual		.88 **		—
Education (no)				
1–5 years		.89 *		.86 **
6–8 years		.75 ***		.71 ***
9 years and more				.48 ***
Floor (dirt)				
Other		.85 ***		.84 ***
Residence (urban)				
Rural		.95		1.07
Region (Norte)				
Altos		1.05		.93
Selva		.82 **		.68 **
Other		1.13		.99
Medical service used (none)				
IMSS, ISSSTE, or PEMEX		.86		.76 **
SSA or IMSS Solidaridad		.88 *		1.00
Private or other		.92		.92
Progres a or Procampo (no)				
Yes		.90 **		.96
Alpha	1.01 ***	.92 ***	1.28 ***	1.11 ***
Log likelihood	–7,493.6	–7,432.6	–9,662.7	–9,504.0

Coefficients statistically significant at

Note: Reference category is in parenthesis. The number of children ever born is taken as exposure.

Source: Estimations based on the 10 percent Mexican Census sample (INEGI 2000).

*
 $p < .05$

**
 $p < .01$

 $p < .001$.