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Guatemalan Regional Fertility Patterns 1987-2002

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ABSTRACT

This research examines recent trends in Guatemala's regional fertility. Guatemala is characterized by the highest total fertility rate (TFR) in Central America and the second highest rate in Latin America. The poorest quintile of the population has a TFR exceeding 7 births per woman as compared to 2.9 births per woman for the wealthiest. Moreover, Guatemala has one of the lowest contraceptive prevalence rates in Central America. However, recent country-level declines in fertility rates and rising contraceptive use have resulted in guarded optimism among policy and health professionals about the future of family planning in the country. These positive changes in overall TFR at the country-level, however, belie high and sometimes increasing regional TFRs. Using data from the 1987, 1995, and 1998/99 Demographic and Health Surveys (DHS) and data from the 2002 Reproductive Health Survey, this research aims to explore regional fertility differentials over time. The results of the analysis highlight the impact of social, political, and cultural differences on regional fertility levels. Also, by evaluating macro-level fertility trends within the context of regional attributes, this research provides information crucial for informing fertility and family planning policies at the regional level.

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INTRODUCTION

Population scientists have recently observed inconsistent trends among developing countries, indicating that impending global fertility decline may not be inevitable (Bongaarts, 2008; Rosero-Bixby, Martin & Martin-Garcia, 2008). Within Latin America, Guatemala stands out as the only country with no definitive pattern of fertility decline. Characterized by pervasive poverty, a tumultuous political history, low socio-economic mobility, high maternal and infant mortality, and low contraceptive prevalence, Guatemala, second only to Haiti, maintains the lowest score of the United Nations Human Development Index among the Latin American/Caribbean nations (UN, 2005). High fertility among the marginalized Guatemalan population portends a cycle of poverty, social exclusion, and inequality among the already destitute. The aim of this research is to examine the recent fertility trends of Guatemala to disaggregate characteristics of the Guatemalan reproductive population through an examination of regional fertility trends and patterns. This research explores the complexities and inconsistencies of fertility decline in Guatemala and contributes to a growing body of contemporary research exploring unanticipated developing world fertility patterns (Bongaarts, 1999, 2008).

BACKGROUND

Nearly 50% of the population of Guatemala is Indigenous. The high proportion of Indigenous combined with extreme social/political and economic inequality has resulted in the characterization of Guatemala as “the most segregated country in Latin America” (De Broe & Hinde, 2006; Glei & Goldman, 2000; Wearne, 1994). High rates of illiteracy, infant, and

maternal mortality and limited social mobility underscore the challenges facing women and children, particularly among rural and Indigenous communities (De Broe & Hinde, 2006). Fertility levels, as seen in Table 1, are among the highest in Latin America and indicate limited social and health programs and impact future development (De Broe & Hinde, 2006; Instituto Nacional de Estadistica, 1999, 2002). In fact, the high fertility levels promise a doubling of the population within the next 40 years, from the current level of 13.4 million to 27.5 million by 2050 (PRB, 2007). The doubling rate places Guatemala nearer to the population trajectories of much of sub-Saharan Africa rather than Latin America and with the bulk of population growth attributable to the poorest half of the country, already stretched education and health resources will continue straining to meeting the needs of the population.

Table 1: Central American Total Fertility Rates

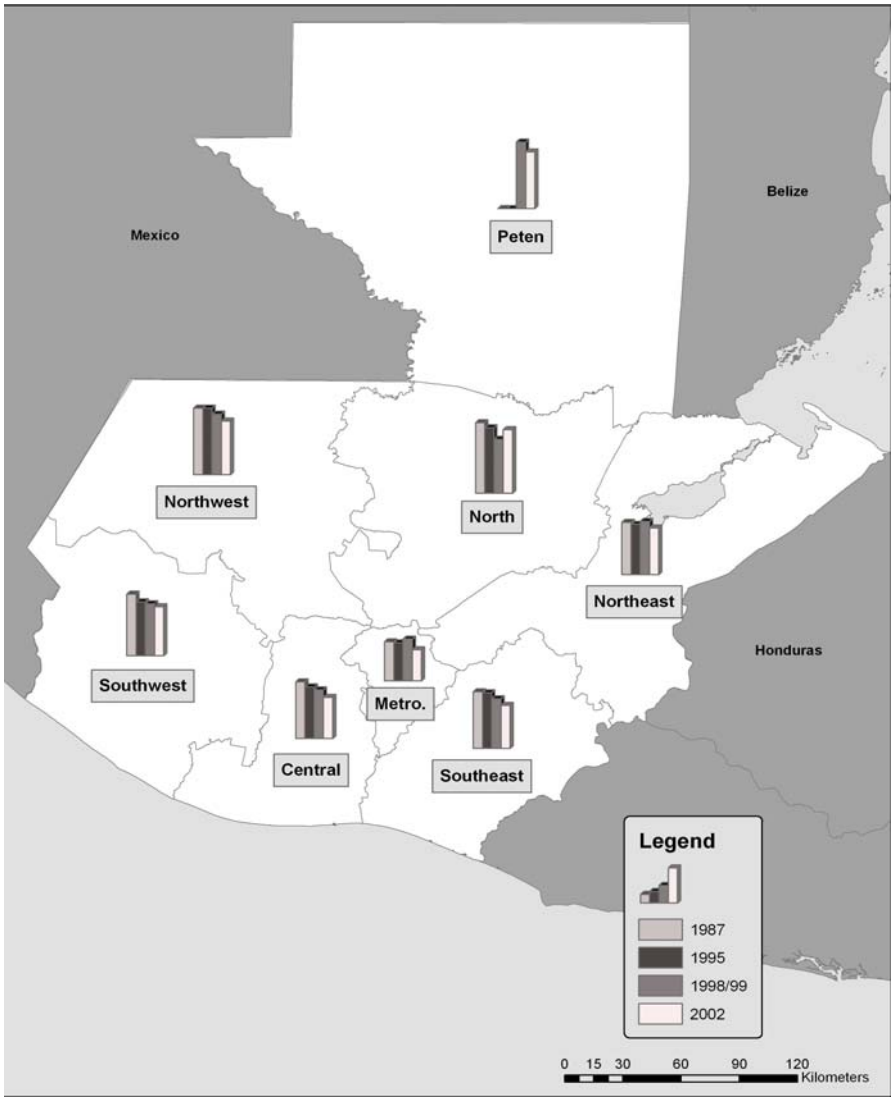
Country	TFR
Guatemala (98/99)	5.0
Guatemala (2002)	4.4
Honduras (1996)	4.9
Honduras (2001)	4.4
El Salvador (1998)	3.6
El Salvador (2002/03)	3.0
Nicaragua (1998)	3.9
Nicaragua (2001)	3.2

Sources: Guatemalan National Maternal and Child Health Survey 2002;
Guatemalan Demographic and Health Survey 1998-99;
Republic of El Salvador National Family Health Survey 2002/03;
Honduran National Survey of Epidemiology and Family Health 2001;
Nicaraguan National Demographic and Health Survey 2001;

At the country-level, fertility and population reports from 1987-2002 reveal a relatively slow but steady decrease in total fertility rate (TFR) occurring simultaneously with a similar increase in contraceptive use and education levels (CDC, 2005). These changes signal some

degree of progress in terms of family planning and socio-economic status. Table 2 presents the country-level information on fertility levels and contraceptive use in addition to select socio-demographic variables. The bottom four rows of the table present the country-level rates and highlight the increases in development indicators (education and electricity status) and the expansion of family planning (as seen by contraceptive use).

Figure 1: Total Fertility Rates across the Eight Regions of Guatemala: 1987-2002



Note: Bars are of the same scale and are therefore comparable across all regions/time periods.

Country-level strides in development and reproductive health however, belie the trends in regional behavior. In two regions, the Petén and the North, fertility levels remain extremely high (see Figure 1) while education, electricity, and contraceptive use remain limited. Largely an Indigenous region, the significant and sacred role of reproduction (both human and agricultural) among this sub-population may partially explain the North region's fertility levels (Wilson, 1999). While the potential resurgence in Maya "pride" after the conclusion of the civil war may have resulted in an increased fertility rate as shown by the 2002 TFR (Wilson, 1999). The Petén region, home to some of the most bio-diverse and heavily deforested natural areas in the world (Carr, in progress), also has extremely high fertility. The availability of "free" land (squatters frequently move onto protected forest lands), the need for labor to aid in the conversion of forest to agricultural lands, and the high rates of rural in-migration are hypothesized as important components for the high TFR in this region (Carr, in progress; Grace and Carr, in progress). The Metropolitan region records fluctuating fertility rates that demonstrate no consistent pattern of fertility decline. The high rates of rural migration into the Metropolitan region and the lag in the adoption of fertility regulation techniques among recent migrants is a possible cause of the slow or inconsistent regional decline (De Broe & Hinde, 2006). In sum, the unique characteristics of the Metropolitan, North, and Petén regions have created social and political environments more or less supportive of high fertility. Regional analysis will help determine the presence of spatial variation of fertility masked by country-level results.

Table 2: Select Socio-Demographic Characteristics 1987-2002

Region		TFR	Education Level				W/O Electricity	Widowed	Indigenous	Catholic	Contraceptive Use*	
			% None	% Primary	% Secondary	% Higher	%	%	%	%	% Modern or Trad.	N
Metropolitan	**1987**	4.0	17.24	55.00	23.88	3.88	16.04	1.72	12.91	.	45.0	1,340
	1995	3.9	13.90	42.24	36.03	7.83	11.92	1.46	16.84	68.20	50.1	4,238
	1998/99	4.3	14.06	45.34	34.93	5.68	7.48	1.61	13.83	53.97	57.2	2,112
	2002	3.2	12.88	35.12	43.25	8.76	2.16	2.35	14.79	55.64	60.0	3,198
North	**1987**	7.2	69.30	22.80	7.29	0.61	83.28	4.26	84.50	.	10.6	602
	1995	6.7	55.67	36.59	6.62	1.12	81.03	1.68	81.03	73.80	13.7	892
	1998/99	5.5	45.50	43.19	10.03	1.29	65.13	1.28	71.98	71.00	20.8	389
	2002	6.5	49.04	41.08	8.92	0.96	50.32	1.91	81.34	62.02	32.3	628
Northeast	**1987**	5.3	26.55	60.55	12.73	0.18	52.00	1.82	2.00	.	28.3	1,158
	1995	5.1	30.04	52.52	16.96	0.48	48.26	1.07	13.09	55.57	25.7	1,032
	1998/99	5.4	28.48	51.77	17.46	2.29	44.28	1.25	11.85	60.10	31.5	481
	2002	4.7	27.98	50.65	19.69	1.68	36.40	2.20	11.51	56.93	41.7	772
Southeast	**1987**	5.8	31.41	56.69	11.52	0.37	48.70	2.23	1.30	.	23.3	643
	1995	5.7	30.11	59.24	9.97	0.68	47.63	1.36	1.84	65.39	29.1	1,033
	1998/99	5.1	22.65	57.96	18.78	0.61	25.15	1.84	3.47	55.90	32.9	490
	2002	4.4	28.82	57.52	11.93	1.74	22.36	0.87	1.74	59.55	32.9	805
Central	**1987**	5.8	38.54	51.33	9.47	0.66	44.35	2.49	36.21	.	21.9	329
	1995	5.3	23.11	53.70	19.79	3.40	29.20	1.96	31.00	61.32	32.8	1,324
	1998/99	5.0	19.79	53.94	23.64	2.63	23.47	1.93	25.74	50.28	39.1	571
	2002	4.2	21.68	50.68	24.19	3.46	9.73	2.20	28.24	48.79	48.0	956
Southwest	**1987**	6.3	45.85	42.06	11.23	0.86	57.94	1.81	50.60	.	14.8	550
	1995	5.5	32.82	51.15	14.81	1.23	40.21	1.58	45.47	48.16	23.1	2,525
	1998/99	5.3	28.67	52.78	16.74	1.82	25.00	1.66	44.70	45.65	30.4	1,208
	2002	5.0	29.73	50.72	17.91	1.63	14.73	2.11	47.41	37.16	35.7	1658

(Cont'd)

Table 2 – Cont'd

Region		TFR	Education Level				W/O Electricity	Widowed	Indigenous	Catholic	Contraceptive Use*	N
			% None	% Primary	% Secondary	% Higher	%	%	%	%	% Modern or Trad.	
Northwest	**1987**	6.8	68.74	28.30	2.80	0.16	81.65	3.42	85.23	.	6.5	538
	1995	6.8	49.63	42.49	7.44	0.44	61.22	1.84	68.71	51.48	11.8	1,358
	1998/99	6.2	46.68	46.03	6.81	0.49	52.67	0.81	70.83	45.84	13.9	617
	2002	5.5	43.99	42.59	12.72	0.70	25.76	2.10	67.37	45.45	27.3	858
Petén	**1987**	.	.	.	.	.	.	.	.	.	.	.
	1995	.	.	.	.	.	.	.	.	.	.	.
	1998/99	6.8	36.18	50.66	12.50	0.66	64.47	0.66	29.41	41.74	23.5	152
	2002	5.8	30.96	50.53	18.15	0.36	46.79	2.86	31.32	44.67	33.9	281
Total	**1987**	5.5	38.35	47.05	13.20	1.40	48.45	2.27	35.29	.	23.2	5,160
	1995	5.1	28.34	47.17	20.97	3.52	35.90	1.56	32.91	60.70	31.4	12,403
	1998/99	5.0	25.32	49.25	22.44	2.99	26.70	1.51	30.14	52.60	38.2	6,021
	2002	4.4	25.48	44.43	25.94	4.15	16.77	2.11	30.67	51.20	43.3	9,155

*Among women in union

In an effort to pin-point the correlates and determinants of high fertility and low contraceptive use, research studies have examined subsets of the Guatemalan population at the micro-level. Reflecting the discussion in fertility research, the individual level hypotheses underlying these analyses are frequently rooted in the theories of ideation (diffusion of information) and/or the economics of childrearing (supply/demand or the New Home Economics approach) and highlight a web of socio-demographic measures, land use characteristics, and ideational factors as determinants of variability in fertility (Seiber & Bertrand, 2002; Bertrand, Seiber & Escudero, 2001; Grace & Carr, in progress; Becker, 1981). Among these characteristics, socio-economic and education variables are consistently among the statistically significant correlates of fertility and highlight the significant impact of secondary education and household economic status on women's family planning decisions (Seiber & Bertrand, 2002; Grace & Carr, in progress; Grace, in progress). The significance of these factors supports both the supply/demand theory of fertility decline and the notion that ideational changes motivate fertility change. Access to contraception and family planning services, limited among the Indigenous population because of linguistic and cultural differences, has also been cited as an important component of contraceptive prevalence and service use, and supports the theory that a limited supply of services has inhibited family planning and reproductive health program expansion (Glei & Goldman, 2000; Bertrand et al., 2001; Shiffman & Garcés del Valle, 2006). The cumulative results of the micro- and multi-level analyses underscore the interplay of supply/demand and diffusion of information as necessary components of fertility transition.

A few studies have also incorporated broader, community-level factors into an individual analysis of family planning variation. Through the use of socio-demographic factors and factors representing access to contraception, researchers have generally determined that contextual

supply/demand and ideational characteristics are also important components of individual behavior (Bertrand et al., 2001; DeBroe & Hinde, 2006; Grace & Carr, in progress). These multi-level analyses provide insight into the individual decision-making process and motivate the continued exploration of the contextual factors framing fertility change to improve future research.

Micro- and multi-level studies reveal important determinants and correlates of fertility and family planning in Guatemala. However, macro-level studies capable of documenting long-term aggregate level change in fertility and family planning and providing important background information for future research and policy decisions are almost non-existent. The regional-level factors underlying the macro-level rates of fertility and the timing of births in each unique geographical context remain unknown. The assumption that fertility decisions are made throughout an individual's life and are impacted by historical events motivates an in-depth exploration of regional fertility in a high-fertility context. The results of this descriptive analysis can provide an excellent base for future micro-level and qualitative research. Moreover, programmatic decisions, frequently implemented at the regional-level, can be formed with enhanced knowledge of past reproductive trends and events that may have an impact on program implementation and efficiency. The results of this research will provide important insight into Guatemalan fertility trends and patterns and will serve to enhance scientific understanding of population patterns in the modern developing world.

"The Delayed Contraceptive Revolution"

A recent analysis, departing from more traditional case-studies of fertility behavior, seeks to explain the stall in the demand and supply of family planning in Guatemala at the country-level. This analysis provides a macro-level overview of family planning in Guatemala. The authors,

Santiso-Galvez & Bertrand (hereafter identified as S-G & B) combined their decades of experience in Guatemala to prepare a qualitative, macro-level analysis examining the historical context and factors leading to the current state of Guatemalan family planning (Santiso-Galvez & Bertrand 2004). (Santiso-Galvez served as the director of the largest private family planning organization in Guatemala from 1976-1996 and Bertrand is regarded as a leading researcher of reproductive health of Guatemala). S-G & B identify four factors that together have created a unique social and political environment completely unsupportive of contraceptive use and fertility decline:

1) Leftist movements in the 1960s and 1970s. A component of these movements was concern that family planning intended to serve as a concession by the government to revolutionaries in place of economic and land reforms. Leftist leaders also viewed family planning programs as part of a larger imperialistic movement (driven by the U.S.) to control developing country populations. This was inconsistent with the "revolutionary goals" of the time and ultimately inhibited the family planning training of medical practitioners.

2) Ethnic Composition of Guatemala. Guatemala's Mayan population, as non-Spanish speaking citizens and marginalized by the dominant Latino leaders, has limited access to and limited trust in government-sponsored family planning. The cosmovision of Mayans and other cultural factors embracing the supreme role of nature also limit the wide-spread acceptance of family planning among this population.

3) Civil Unrest. The impact of the protracted civil-war on the contraceptive revolution is twofold. 1) Most development programs were halted during the extreme violence and political unrest of the war, effectively halting the expansion of health and education

programs. 2) An atmosphere of distrust towards the government and individuals from different communities, particularly acute among rural and small communities, severely undermined the establishment of effective family planning clinics and programs.

4) Church, State, and Family Planning. Governmental opposition to family planning, strengthened by the dominant Catholic church's stance, limited the role of international programs and non-governmental aid organizations and served to limited expansion of family planning programs.

S-G & B's four factors are suspected to have impacted the development of the entire country throughout the second half of the 20th century. However, based on their differing socio-demographic characteristics, each region of Guatemala may have experienced one or more of these four factors to different degrees. Evaluating regional fertility behavior with respect to these factors may provide key evidence as to why some regions of Guatemala seem to be experiencing a decline in fertility while others have maintained extremely high rates. In this application, these factors serve as distal causes of Guatemala's unusual fertility behavior. The socio-economic and demographic factors shown in other research to be direct determinants of family formation and reproductive health are assumed to be broadly impacted by the four factors. For example, education, which is negatively impacts fertility, has been impacted by both the war and the ethnically divided population. The war stymied educational program development while the diverse population required the implementation of a multi-lingual and multi-cultural pedagogical system. In Shiffman & Garcés del Valle, the similar use and interpretation of the S-G & B framework successfully explained the variation in maternal mortality experiences of mother's in Guatemala as compared to Honduras (2006).

DATA

The Demographic and Health Survey (DHS) data collected in 1987, 1995, and 1998/99 by the Guatemalan Instituto Nacional de Estadistica and Measure/DHS+, Macro International, will be used for this analysis. DHS is the largest ongoing survey in the world and is the primary source of data on population, health, and socio-economic indicators for developing world nations. The DHS data is invaluable for conducting fertility analyses with respect to regional characteristics in Guatemala. Not only do the DHS results provide extensive information regarding individual and family health and cultural norms, the large sample size (more than 12,000 respondents in some cases) can be used to provide a detailed overview of large-scale trends, ultimately enabling regional and temporal comparisons of fertility. Moreover, the 1998/99 survey represents the first large-scale data collection of reproductive health information of inhabitants of the Petén, the northernmost region in Guatemala. Previously, this extremely impoverished population was excluded from surveys and was therefore largely un-represented in policy decisions. The Reproductive Health Survey (RHS) collected in 2002 with the assistance of the Centers for Disease Control (CDC), will also be used.

METHODS

Demographers have established the important impacts of age, parity, and timing on developing a macro-level understanding of fertility (Bhrolchain, 1992; Bongaarts & Feeney, 1998; Bongaarts, 1999; Kohler & Ortega, 2000). Therefore, to explore macro-level Guatemalan fertility in the relevant political and social context, standard age specific fertility rates (ASFRs) and cohort parity progression ratios (PPRs) were calculated for each time period (1987, 1995, 1998/99, and

2002) across each region. In addition to these fertility measures, TFR, completed cohort fertility rates (CFR), and mean age at first birth (MAB) were also evaluated.

In other contexts (almost exclusively relevant to the developed world) macro-level analyses evaluating these different components of fertility behavior have highlighted distinctly behaving sub-populations within a greater context of fertility decline or advancement. Using education levels or urban residence (among other variables) to group the population, scientists have used the macro-level measures to explore and compare population sub-groups (see De Broe and Hinde, 2006; CDC, 2005). Disaggregating a population can reveal important behaviors that may have otherwise been masked by the behavior of the larger population. These tools, however, have only been limitedly applied to Guatemalan fertility studies and have never been applied, including descriptively, to examine regional fertility trends (see De Broe and Hinde, 2006; DHS and CDC reports). The identification of unusual fertility trends can highlight the importance of temporal or spatial characteristics that facilitate the maintenance of outlying reproductive behavior. Neglecting to spatially disaggregate the population limits the usefulness of existing information and ignores important social and political regional differences.

ASFR, TFR, and MAB: The use of TFR to characterize and classify populations into high, mid, and low fertility is widespread. Virtually every governmental and non-governmental agency interested in population dynamics evaluates country, regional, and global fertility using TFR. TFR and its controversial variants are used by most population scientists and have been an important tool used to identify the recent trends in global fertility decline (see Bongaarts and Feeney, 1998; von Imhoff and Keilman, 2000; Sobotka, 2003, for more information on variants of TFR).

The construction of TFR first requires the construction of ASFRs. The numerator is the frequency count of the number of births within a period (DHS generally uses the three years preceding the survey date) for each of the seven 5-year age groups. The sum of the months each woman spent in each age group over the 36 pre-survey months (women-years of exposure), serves as the denominator. For this analysis, women's ages and birth experiences are recoded into number codes by calculating the number of months between the event and January 1900 (century month codes). To illustrate, a woman born in February 1987 has a century month code of 1046. Using this type of coding allows a woman to contribute as little as one month to one age-specific denominator and allows her to divide her exposure to more than one age group (as many as two) (De Broe & Hinde, 2006). The TFR is then constructed by adding the ASFRs.

The TFR and the ASFR are subject to tempo changes – the effect of birth period postponement can cause birth period frequencies to decrease only to result in a "catch-up" later, increasing period fertility rates (where women delay their births but eventually attain the same final number of children as they would have had they not postponed childbearing). Ryder first identified the impact of timing changes in his work on *demographic translation* (Ryder, 1964). Bongaarts & Feeney further developed and altered Ryder's original concept to create a TFR measure that attempts to adjust for tempo changes (Bongaarts & Feeney, 1998). This technique will not be explored here, but the change in MAB, a measure of delay, will be incorporated into the descriptive analysis of TFR and ASFR to assess the potential impact of timing changes on fertility levels.

PPRs and CFR: The use of PPRs to evaluate trends in this region of the world is uncommon. PPRs incorporate both age and parity and, in this case, provide measures of cohort trends in fertility at the regional level (Bhrolchain, 1992). The purpose of the PPR tool is to

model the movement of an individual from one parity to the next. This measure differs from the birth order TFR as rates of movement out of one parity and into the next rely on the exposure of women who are actually at risk for entering into a higher parity. For example, when calculating the rate of 15-19 women who move into parity two during a particular time period, the count of 15-19 women who had already attained parity one serves as the divisor (as opposed to the entire population of 15-19). In this sense, the PPR serves as a hazard. While the primary focus will be the rates of movement, particularly comparing the movements among the lower parities to those among the higher parities, CFR levels will also be presented. Performing this macro-level analysis will identify the large-scale trends in parity dependent on regional family size decision-making.

CFR, the calculation of average total births among women who have completed their childbearing, will also be calculated for the same populations used to construct the PPRs. CFR provides information on actual family completion. The use of the hypothetical cohort construct of TFR is irrelevant, therefore removing any impact from changes in birth timing. Waiting until cohorts have completed their childbearing enables analyses of factors that may have impacted or motivted past fertility behavior, but remains useless for practitioners or program planners interested in current fertility trends corresponding to women in the midst of their prime reproductive years. CFR can, however, detect a definitive trend in fertility decline and will be evaluated here to detect regional changes in family size over time.

Table 3: Wartime Murder Rates

Region	Counts of Killings*	Rate (using the 2002 population)
Metropolitan	3,080	1.20
North	5,610	5.70
Northeast	742	0.80
Southeast	654	1.75
Central	4,968	4.00
Northwest	15,863	10.60
Southwest	2,098	0.80
Petén	1,447	1.60

S-G & B: Operationalized variables corresponding to components of the S-G & B theory, Indigenous population, direct impact of the war as measured by the murder rate (Table 3) during war time and percent of the population widowed, and the Catholic population may play a significant role in the region's adoption of family planning. Table 2 shows the Indigenous, Catholic, and widowhood rates and Table 4 shows the murder rate information. S-G & B developed their hypothesis to explain the macro-level causes of Guatemala's delayed contraceptive revolution. In this paper, contraceptive revolution is interpreted and operationalized as both the supply of and demand for contraception. Therefore high fertility levels, which can either result from an unmet need for contraception or the desire to have a large family, are considered a component of the contraceptive revolution. The delay thus refers to limited interest in decreasing one's own fertility as well as the limited expansion of health programs and availability of contraceptive technologies. While not directly incorporated into mathematical models as independent variables, the four factors provide contextual information and may help to explain the cohort and regional variation in fertility.

RESULTS

The first portion of this section will explore the socio-demographic characteristics presented in Table 2, followed by an exploration of the differences in regional fertility measures. The civil war, which dominated the second half of the 20th century, undoubtedly had a strong impact on the expansion of education and the accessibility of electricity. Now, as Guatemala moves past the war, the expansion of services and the increase in development programs previously placed on hold should show consistent indications of progress. Increasing the number of households with electricity further supports the suggestion that there is a demand for electricity but that development was stalled during the civil war, inhibiting access. However, education patterns do not show the same consistent inclines. Rates of educational attainment vary over time and across regions. Fertility rates similarly vary while contraceptive use rates, like electricity status, show consistent patterns of incline.

Figure 2: Regional Age Specific Fertility Rates: 1987-2002

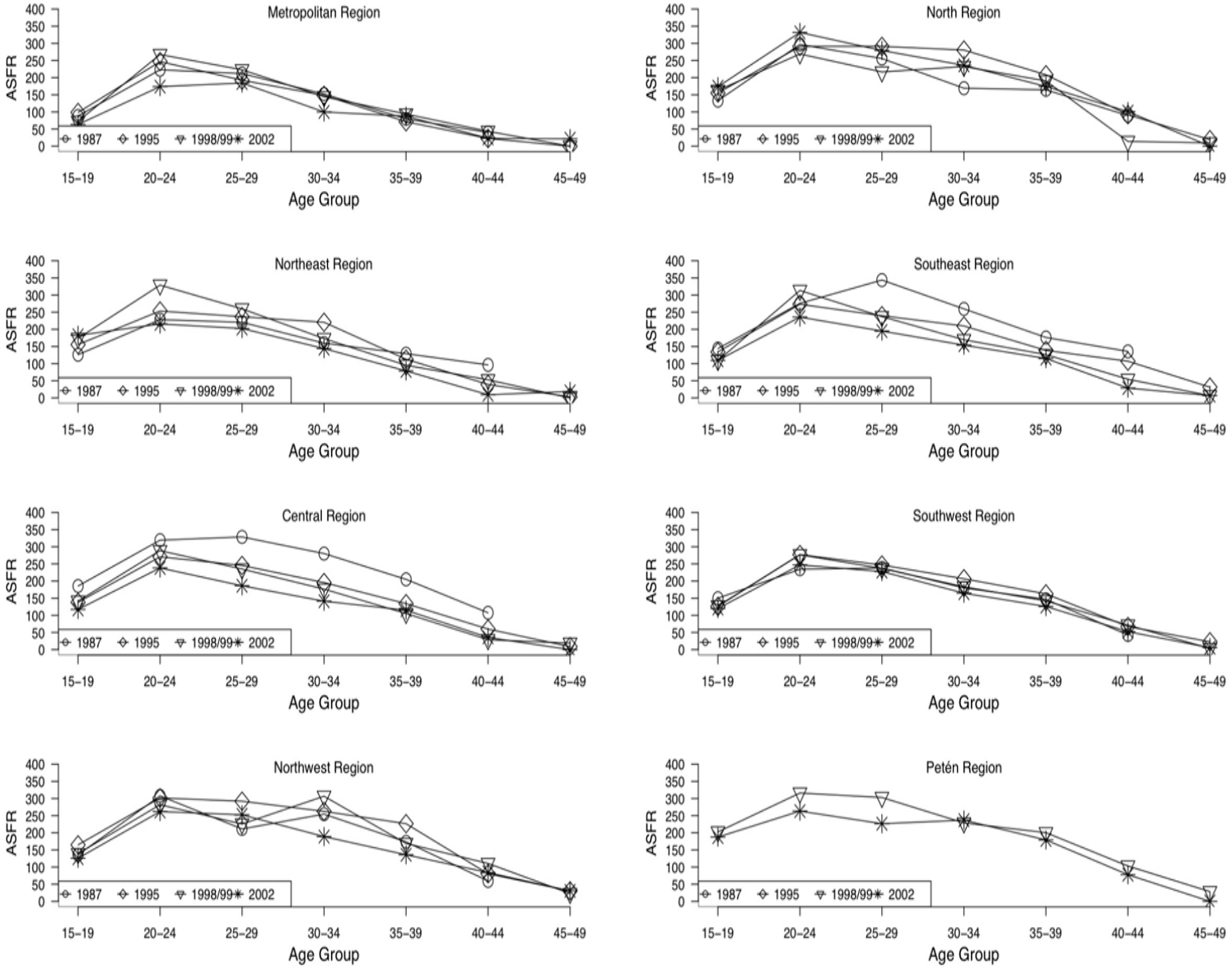


Figure 2 presents the ASFR calculated for each region and for each time period of data analyzed. The variation in the regions over time is immediately apparent. The Metropolitan region, home to the capital city and characterized as the region with the lowest CFR, shows relatively consistent behavior for the youngest age-group. An increase does appear in the ASFR in 1995 and 1998/99 for the 20-24 age group, but then declines significantly in 2002. The 2002 ASFR points to lower fertility across virtually all age-categories (except for the higher age categories, which merge across the years). The Northern region, the region with the highest current TFR, generally has the highest ASFR across regions. During the 1995 period, there is some indication that there may have been a delay of births as seen by the crossing of the 1995 curve over the 1987 curve and the higher rate of births for the 30-34 age group as compared to the 25-29 age group. When reviewing the regional TFR, there is a sharp decrease in 1998/99 fertility rates. The ASFRs indicate that the decline may actually have been following a steeper path as the 1987 TFR may have been impacted by changes in timing of births, resulting in a lower level of period TFR than actually occurred. Likewise, because of similar patterning in the Northwest, tempo effects may be to blame for the apparent decline in regional TFR during the 1995 period. The ASFRs of the Southwest and Northwest regions also indicate that there may have been some tempo effects in those regions as well. The inconsistent results of the Northeast region are most likely a result of small sample sizes for some periods (particularly 1998/99).

Table 4: Mean Age at First Birth

	1987		1995		1998/99		2002	
	Mean	**N**	**Mean**	**N**	**Mean**	**N**	**Mean**	**N**
Region								
Metropolitan	21.56	138	21.53	456	21.41	225	20.96	229
North	19.28	52	18.96	86	19.32	36	19.58	79
Northeast	19.96	127	19.86	98	20.08	56	19.72	59
Southeast	19.55	66	19.87	89	20.39	41	19.76	50
Central	18.64	25	20.96	137	20.93	61	20.11	97
Northwest	20.32	64	20.14	231	20.42	131	20.54	156
Southwest	20.25	53	19.61	130	19.55	66	20.07	79
Petén	.	.	.	.	19.31	16	19.09	35
Country	20.25	512	20.57	1,227	20.61	631	20.29	786

Age at first birth (Table 4) has been shown in preliminary analyses of Guatemalan fertility (not presented here) to be strongly correlated with total children ever born and was therefore a factor of interest. In these results, age varies limitedly over the first three time periods for both the region with the youngest mean age (Northern region) and the highest mean age at first birth (Metropolitan region). The 2002 data shows a decline in mean age at first birth for the Metropolitan region and an incline in age for the Northern region. The region with the youngest mean age at first birth then becomes the Petén, which remained relatively consistent across the time periods (only two time periods as Petén was excluded from the earlier surveys). The remaining regions are characterized by mean values that fall between the high and low values of

the Metropolitan and Northern regions (exclusive of the 2002 period where Petén claims the lower bound). The 2002 values show less variability and a general tendency towards a common middle value (near 20 years old). The low value of the Central region in 1987 may result from the small sample size used to construct this value (25 observed first births in this region between 1984-1987) or it may reflect the regional cultural characteristics motivating early entry into motherhood (Rosero-Bixby et al., 2008).

When excluding the Petén region, the Northern region provides the lower bound of age at first birth for all four survey periods. This region has had the highest TFR for nearly all the survey periods (with the exception of 1998/99 where it had the third highest value) even experiencing an increase in TFR from 1998/99 to 2002. Age at first birth is increasing with time, however, and may eventually limit women's exposure to higher-order births and cause a decline in completed fertility. The decline over time in mean age at first birth in the Metropolitan region should be interpreted with the knowledge that this area has been receiving increasing amounts of migrants from rural and impoverished areas who may not have adjusted their fertility schedules to mirror those of the native metropolitan women (De Broe & Hinde, 2006). Alternatively, consistent with increased contraceptive use, it may indicate a choice by women to enter into earlier motherhood and regulate their fertility as they age or attain their family size goals.

Table 5: Parity Progression Ratios and Completed Fertility for Women aged 40-49

Region		1	2	3	4	5	6	7	8	Completed Births
Metropolitan	**2002**	0.94	0.95	0.79	0.69	0.72	0.76	0.75	0.81	4.29
	1998/99	0.95	0.97	0.91	0.76	0.71	0.79	0.74	0.60	4.96
	1995	0.95	0.93	0.78	0.72	0.71	0.65	0.67	0.65	4.01
	1987	0.96	0.96	0.93	0.84	0.74	0.77	0.66	0.74	5.28
North	**2002**	0.95	0.98	0.98	0.92	0.89	0.88	0.84	0.66	6.83
	1998/99	0.92	0.97	0.93	0.88	0.94	0.87	0.79	0.78	6.08
	1995	0.96	0.98	0.96	0.94	0.96	0.87	0.83	0.90	7.17
	1987	1.00	0.97	0.92	0.89	0.84	0.83	0.77	0.76	7.08
Northeast	**2002**	0.96	0.96	0.94	0.78	0.81	0.80	0.82	0.74	5.43
	1998/99	0.99	0.99	0.86	0.83	0.81	0.80	0.80	0.82	5.70
	1995	0.92	0.95	0.95	0.87	0.85	0.77	0.87	0.78	5.66
	1987	0.93	0.97	0.93	0.90	0.85	0.83	0.75	0.78	5.71
Southeast	**2002**	0.98	0.99	0.96	0.88	0.86	0.80	0.78	0.75	6.48
	1998/99	0.99	0.99	0.93	0.92	0.92	0.93	0.94	0.95	5.59
	1995	0.96	0.99	0.97	0.96	0.91	0.86	0.81	0.78	6.87
	1987	0.98	0.96	0.92	0.90	0.85	0.82	0.77	0.77	5.86
Central	**2002**	0.95	0.96	0.86	0.83	0.69	0.86	0.83	0.74	5.04
	1998/99	0.93	0.96	0.93	0.88	0.80	0.83	0.75	0.68	5.43
	1995	0.95	0.95	0.93	0.88	0.84	0.82	0.81	0.71	5.83
	1987	0.98	0.97	0.92	0.87	0.78	0.80	0.72	0.72	6.14
Southwest	**2002**	0.97	0.95	0.90	0.87	0.85	0.83	0.82	0.68	5.81
	1998/99	0.96	0.96	0.95	0.92	0.84	0.85	0.72	0.76	6.18
	1995	0.99	0.97	0.94	0.90	0.87	0.86	0.82	0.76	6.51
	1987	0.92	0.97	0.92	0.89	0.83	0.83	0.76	0.75	6.06
Northwest	**2002**	0.99	0.97	0.97	0.91	0.90	0.88	0.83	0.79	7.03
	1998/99	0.96	0.94	0.96	0.94	0.91	0.87	0.85	0.82	6.69
	1995	0.98	0.97	0.96	0.93	0.90	0.89	0.85	0.77	6.94
	1987	0.95	0.97	0.92	0.89	0.82	0.83	0.75	0.74	6.13
Petén	**2002**	1.00	0.97	0.95	0.90	0.95	0.85	0.86	0.76	6.93
	1998/99	0.98	1.00	0.95	0.96	0.93	0.91	0.89	0.88	7.78
	1995	NA								
	1987	NA								

The parity progression analysis presents a different perspective of fertility in Guatemala. The rates in Table 5 present birth-order transition rates of women ages 40-49 (40-44 for the 1987 period). At this age, childbearing is completed or near completed and final fertility levels can be evaluated. The final column of Table 5 provides completed CFRs and enables an assessment of family size by region and over time. The values in the body of Table 4 measure the probability that a woman who already had, for example, two children proceeded to have a third. In 2002, the probability of this event in the Metropolitan region is .79 whereas the probability in the North region is .98. Declines consistent with the reduction of the observed TFR coincide with declines in the progression to higher order births, especially births of order four or more in the Metropolitan region (also characterized by the lowest TFRs). This presents the likely scenario that fertility decline is occurring as a result of choices made by older women to reduce or stop their entry into higher parities. In the North region, where observed TFRs are the highest and have recently shown signs of increase, the likelihood of progressing to higher order births generally remains higher than the other regions and exhibits limited indication of decline.

Figure 3: Parity Progression Ratios and Confidence Intervals for Women Aged 40-49 in 2002

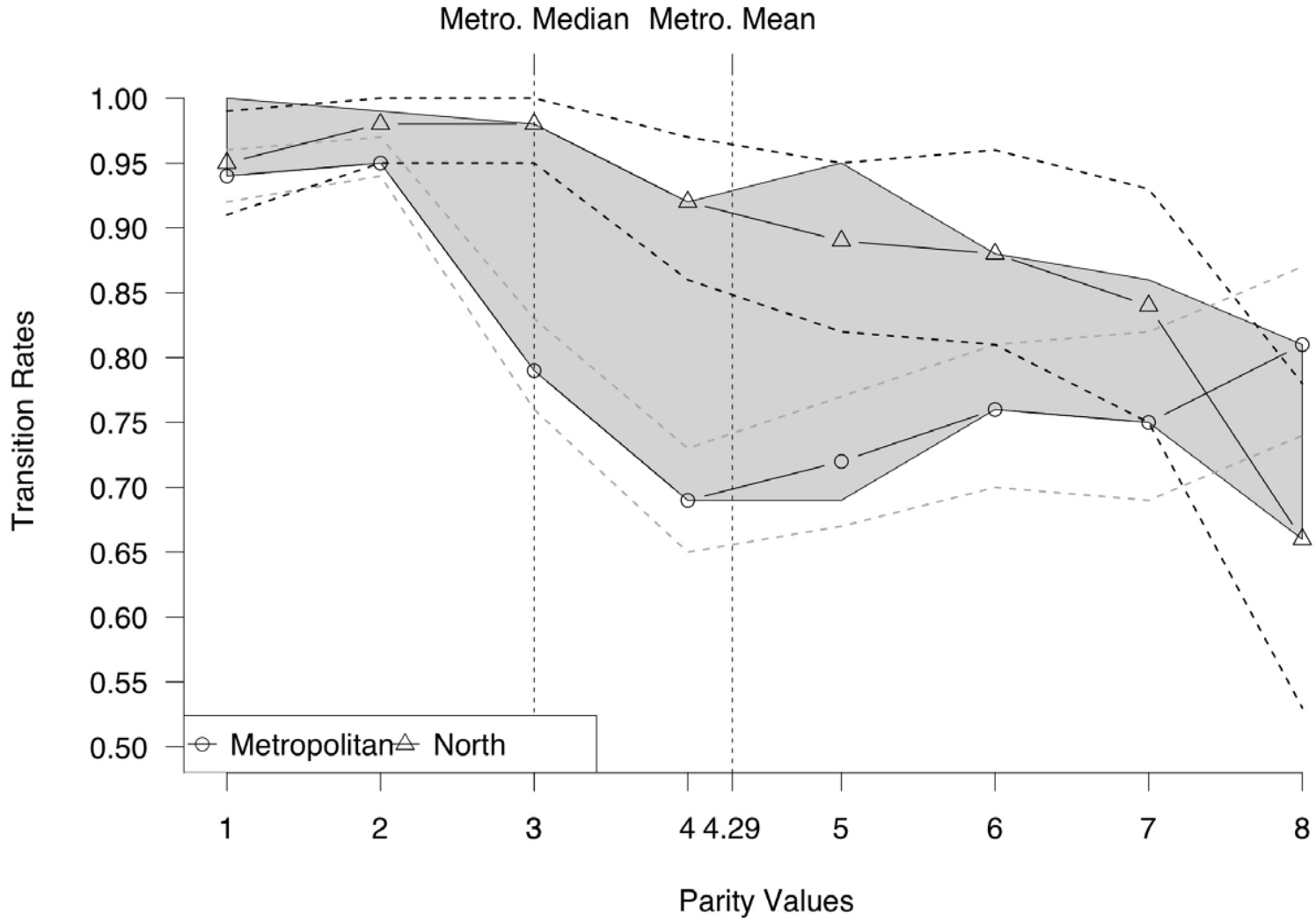


Figure 3 graphically depicts select portions of the Table 5. Included in the plot are the 2002 cohort parity progression ratios with North and Metropolitan regional PPRs, the highest and lowest fertility regions of the time, and the corresponding 95% confidence intervals. The shading provides the area within the boundaries of the highest and lowest overall rates of transition from the entire sample of regions. The confidence intervals overlap for entrance into motherhood and almost overlap at the second parity. The bulk of the differences in completed cohort fertility can be explained by the different rates of transition between parities three and seven, where the higher fertility region has significantly higher rates of movement.

The Central and Metropolitan regions show the largest decrease in completed fertility values (when comparing cohorts born between 1938-1947 to those born between 1953-1962). Although restricted to only the two most recent time periods (representing women born between 1949- 1958 and 1953-1962), the Petén region nonetheless shows the third largest decline in completed fertility. Both the Northwest and Southeast show increases in completed fertility values.

DISCUSSION

From 1987 through 2002, Guatemala has consistently maintained the highest fertility levels in Central America. Moreover, as Central America has steadily progressed through the stages of fertility decline, some Guatemalan regional TFRs remain virtually unchanged. The possibility that Guatemala's fertility decline may actually have stalled is gaining increasing popularity (Rosero-Bixby et al., 2008; Bongaarts, 2008) and provided the initial motivation for this research.

At the country level, Guatemala shows slow but consistent decline in fertility and similarly slow but consistent incline in contraceptive use. The 2002 TFR shows a decline of about one birth in a woman's lifetime and the 2002 CPR reveals an impressive 20% improvement. These country level strides however, mask regional trends. The wavering education and fertility rates only found at the regional level occur at the same time as consistent behavior at the country level. If the fertility decline is indeed stalling, then the contribution of specific high fertility regions to the overall TFR is to blame. Interestingly, these high fertility regions are maintaining their rates even among increasing CPR, suggesting the need for further research of contraceptive use and demand, and fertility behavior.

The fluctuations in education rates are also notable as they mirror, in terms of timing and region, the fluctuations in fertility. Limiting children's educational opportunities and maintaining high fertility may be a cultural preservation strategy used by the Indigenous population (Wilson, 1999). The link between human fertility and land production is an important cultural component and the fear of *ladinization* (the process by which the Indigenous population adopts dominant Ladino language and dress (Adams, 1994)) among the Indigenous may deter families from utilizing educational opportunities (Glei & Goldman, 2000; Shiffman & Garcés del Valle, 2006). If this is indeed the case, then culturally sensitive educational programs incorporating Indigenous beliefs and language are necessary. Moreover, regions in which large families remain desirable and are a reality need to cater health, education, and women's employment opportunities to the special needs of families with many children. In terms of supply of contraceptive technology, clinics and health providers in highly Indigenous areas should encourage spacing techniques as beneficial to the health of the mother/child rather than as a tool to limit family size. Instead of focusing exclusively on supply/demand of contraception,

family planning strategies should also support a woman's decision to have large families. Regardless of the approach, however, the extreme regional differentials in fertility behavior make a case for region-specific family planning programs and implementation strategies, as a single Guatemala-specific plan will not adequately meet the diverse needs of the population.

At the conclusion of their article, S-G & B suggest that Guatemala's reproductive health future looks bright. Temporal distance from the war, changing leftist politics, and the declining role of the Catholic church should remove the barriers to increasing both the supply and demand of contraception. However, while the rates of contraceptive use have continued to improve, fertility rates have not shown the same consistent behavior. The idea of the contraceptive revolution is only relevant in a context where there is demand for contraception and interest in reducing the number of births. The inconsistent fertility levels in the presence of increasing knowledge and use of contraception suggest that the demand for fertility reduction may not be present. Consequently, at least in a few of the regions, the contraceptive revolution continues to be delayed.

LIMITATIONS

This research provides an overview of regional fertility differentials over time, but is limited by relatively imprecise information on age at birth. This is a limitation of all related birth data collected in Guatemala as the large rural-dwelling population and the large number of women who birth at home limit the feasibility of extensive birth records. Additionally, the 2002 data was collected and processed with the assistance of the CDC while the other surveys were collected with the assistance of Macro DHS. In general, the surveys do contain the same information. However, some questions and responses are translated somewhat differently. Any

large or unusual differences in behavior for the 2002 time period may reflect these differences in sampling and/or data processing. Another limitation of the analysis is the operationalization of the S-G & B hypothesis. The variables selected to represent the components of the S-G & B hypothesis may not be the ideal measures of the four qualitative factors and may not fully contain the ideas developed by the theorists.

CONCLUSIONS

Using infrequently applied macro-level descriptive and birth history data to explore regional fertility differentials has revealed important differences in behavior among the eight regions of Guatemala. Regions with a large Indigenous population (particularly the North region) show slow signs of decline and low levels of educations, supporting theories of Indigenous marginalization and isolation, and highlight the need for cultural sensitivity in health and social programs. Future research evaluating regional or municipality characteristics of unmet contraceptive need and high fertility rates may help to explain the increase in contraceptive use concomitant to extremely high fertility.

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