A spatial and temporal analysis of fertility in Guatemala

Research Question

Recent demographic research has largely been focused on the rapid decline of fertility rates throughout the developed and developing world. The classic theories of the determinants of population change frequently used to model and explore fertility decline and transition in all populations have resulted from substantial empirical research. However many questions about the mechanisms involved in maintaining high fertility rates or in catalyzing a decline among current high fertility populations remain unanswered. While research inspired by the quick and unanticipated decline in birth rates can provide valuable insight into the demographic transition, it is important that population science maintain a commitment to empirical research of high fertility populations. Besides being the fastest growing populations, high fertility groups also tend to be those who suffer the most extreme poverty, nutrition, and dearth of health care and education. Concomitantly, they tend to live in rural remote regions which are increasingly situated in and around the world's ecological "hot spots" on which they have a considerable impact given that they are nearly all farmers and depend on the forest for felling in order to open agricultural fields and for fuel-wood. Analysis of the correlates of high fertility with attention to modern advances in technology (contraceptive, transportation, communication, etc.) and contemporary concepts of household and community gender equity will update and enhance the applicability and the generalizability of the traditional demographic transition theory and ultimately improve scientific understanding of population change.

The objective of this research project is to explore, across time and space, fertility and reproductive health dynamics within a population with one of the highest total fertility rates (TFR) in the western hemisphere, Guatemala. The particular focus of this paper is to compare, employing under utilized tools from formal demography, trends in family size decision making. Related research has indicated that this population may be entering a decline yet, because of limited research focusing on trends across time, by age group and by parity, it is difficult to determine the extent, potential impact or even actual existence of the decline (De Broe & Hinde 2006). In general, little research exists exploring the age and parity specific behavior of high fertility populations and therefore there is a noticeable gap in the understanding of the mechanisms underlying the entrance into or pace of the transition. Therefore, conducting this research at this pivotal time in Guatemala's transition will provide key information vital to the development of a macro-scale perspective of fertility, ultimately contributing to an enhanced and broadly applicable theory of fertility decline and transition.

Setting

Guatemala's population is roughly equally ethnically divided (50% Indigenous and 50% of Ladino descent) and during the latter half of the 20th century suffered a turbulent civil war characterized by extreme violence directed towards the indigenous community (Lovell 1999). Furthermore, Guatemala's rates of contraceptive use trail other Central American countries while its fertility rate is one of the highest (Bertrand, de Salazar, Mazariegos, Salanic, Rice & Sow 1999, Bertrand, Seiber & Escudero 2001, De Broe & Hinde 2006). Indeed, in rural areas of Guatemala the TFR exceeds 6 births per woman while in rural regions of the Petén, the region containing the Guatemalan frontier fertility rates are close to 8 births per woman (Grandia &

Schwartz 2001), a fertility level that approaches the observed limits for any world region at any time in world history. The fertility differences between indigenous and ladino populations and rural and urban communities are extreme. Although aggregate Guatemalan fertility rates and lack of contraceptive use, as mentioned earlier, are unusually high for Latin America, the 6% contraception use rate among rural Mayas is extraordinarily low (compared to 50% of ladinos) (Bertrand et al. 2001).

Classic and recent research has attempted to explain the ethnic and country wide variation in use of contraception using elements of the diffusion processes (related to diffusion of contraceptive information), family planning access, family and community migration experiences, and the usual socioeconomic indicators (age, education, wage earning employment, etc.) (Bertrand et al. 2001, Seiber & Bertrand 2002, Lindstrom & Munoz-Franco 2005). Yet significant unexplained variation in fertility and reproductive health behaviors remains. This research aims to explore this variation over time and ultimately advance understanding of reproductive health decisions in the developing world.

Data

The Demographic and Health Survey (DHS) data collected in 1987, 1995, 1997, 1998/99, by the Guatemalan Instituto Nacional de Estadistica and Measure/DHS+, Macro international, will be used. The 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 research of this type among this high fertility and dynamic population. Not only do the DHS results provide extensive information regarding individual and family health and cultural norms, the large sample size (more than 8000 respondents in some cases) provides a fantastic overview of large-scale trends and ultimately enables country-wide generalizability of the results. Moreover, the 1998/99 survey represents the first large-scale data collection of reproductive health information of inhabitants of the Petén region. Previously, this extremely impoverished population was excluded from surveys and was therefore un-represented in policy decisions based on large-scale analyses. The reproductive health census (ENSMI) collected in 2002, will also be used.

Methods

In fertility analyses, the total fertility rate (TFR) serves as a measure of the "completed fertility" of a synthetic cohort women. Essentially it evaluates fertility as"if the age-specific fertility rates observed in a given year applied throughout the childbearing years" (Bongaarts & Feeney 2000). The TFR, however, can be distorted by changes in the timing of births. Without adjusting for changes in timing an inaccurate measure of fertility, which may incorrectly signal a decline, stall, or even incline in fertility may result. Timing of births, either postponement or advancement, can therefore impact period measures of fertility and lead researchers and policy makers to incorrect conclusions about fertility trends. Demographers generally agree on the importance of distinguishing timing effects from the actual level of fertility however they disagree on the best approaches to adjust for these *tempo distortions* (Kohler & Ortega 2000). Bongaarts and Feeney, have developed an adjusted TFR (TFR') (Bongaarts & Feeney 1998, Bongaarts & Feeney 2000) to help combat the TFR's sensitivity to changes in timing of births. Bongaarts and Feeney's (1998) controversial technique adjusts the traditional total fertility rate

(TFR) to produce a "TFR that would have been observed in the absence of changes in timing in the period in which the TFR is measured" (Bongaarts & Feeney 1998).

The purpose of this research paper is to calculate and compare standard TFRs with the tempo adjusted TFRs as well as the resulting parity progression ratios (PPRs), a derivative of the TFR which can be adjusted to reflect tempo distortions (Kohler & Ortega 2000), to explore fertility in Guatemala. These TFRs, adjusted TFRs and PPRs will be calculated and compared for each time period, 1987, 1995, 1998/99, and 2002 and compared across the eight political regions of Guatemala. A unique aspect of this analytic approach is the application of tools, which have almost exclusively been applied to developed world populations with extensive and detailed birth registries, to a developing world setting where only survey data is readily available. Despite doubts about the validity of the underlying assumption of the Bongaarts-Feeney technique (van Imhoff & Keilman 2000), that "the shape of the period age-specific fertility schedule does not change and its implied assumption about equal changes in timing of births at all reproductive ages", Yi and Land's (2001) sensitivity analysis showed that the Bongaarts-Feeney formula is actually 'robust' enough to produce sufficient tempo adjusted TFRs (Yi & Land 2001). Therefore the technique developed by Bongaarts and Feeney, also later applied to DHS data in Bongaarts' 2000 analysis of Colombia, will be applied to the Guatemala data sets to develop "tempo free" measurements using the available data. However, the alternative "tempo free" technique of Kohler and Philipov (2001) which accommodates variation in timing within the cohort will be approximated to accommodate the limited available data and applied here as well (Kohler & Philipov 2001). The differences between the rates resulting from these approaches have not been explored within the context of a high fertility population. Kohler and Ortega (2002) developed a related tempo adjusted technique to explore the future completed fertility of current cohorts. These techniques are designed for more detailed birth registries but it may be possible to develop high and low estimates of cohort fertility based on the available survey data. Depending on the appropriateness of using this tool, given the data limitations, approximate population forecasts may also be produced.

Similarly, the use of PPRs to evaluate trends in this region of the world has been rare. In Bhrolchain's 1992 paper where she discusses the merits of cohort and period measures of fertililty, she encourages that analysts advance their analysis of fertility beyond the traditional TFR and incorporate prior parity as well as maternal age into analyses. PPRs incorporate both age and parity and provide insightful measures of period as well as cohort trends in fertility (Bhrolchain 1992).

These fertility measures will be evaluated within the political and cultural context of Guatemala paying close attention to the different experiences and characteristics of specific cohorts (migration, political turmoil, agriculture trends, etc.) and how these factors may impact birth timing. Ultimately the understanding of the context within which women make their fertility decisions will guide the acceptability of the debatable Bongaarts-Feeney assumption.

Performing this macro type analysis, as opposed to a micro analysis, will identify the large-scale trends in family size decision making, and help determine the location of Guatemala within the fertility transition curve. Techniques, like regression analysis for example, are frequently used to explore the correlates or determinants of individual behavior whereas these population derived rates are used to compare populations over large sections of space and time. In order to evaluate large scale fertility change (which reflects, in a way, changes at the individual level and which may be less subject to the influence of anomalous behavior), and to develop an

accurate understanding of Guatemala's current and future positioning within the demographic transition, these measures are invaluable.

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