Reproductive health laws and fertility decline in Ghana

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ABSTRACT

Background: An unresolved debate in demography concerns the causal sequence between the supply of contraception and the demand for smaller families in fertility decline. Through a mixed-methods approach, we explored the effect of a sudden increase in access to legal abortion on subsequent fertility decline when Ghana’s criminal code was amended in 1985. Methods: Using Ghana Demographic and Health Surveys, we constructed a panel of women aged 15–34 years and undertook a spline regression analysis to examine the effect of legal changes in 1985 and fertility decline controlling for social determinants of fertility. In addition, we conducted 17 key informant interviews (KIIs) to understand the reasons for the legal change and competing explanations for fertility decline. Results: Multivariate results indicated that the timing of the legalization of the abortion law coincided with the onset of Ghana’s fertility decline. The KIIs indicated that the reasons for the legalization of reproductive health laws were in response to famine and physician advocacy. Conclusions: While the timing of the abortion law liberalization coincided with the fertility decline in Ghana, we are unable to decouple the effect of the legal change from the effects of a severe famine that affected the region at the same time. Further research on documented and undocumented abortion in Ghana should be conducted to validate the contribution of legal abortion to fertility decline.

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be unrelated to other social changes that might affect fertility rates such as women's empowerment. Bailey [18], for instance, used changes in reproductive health laws to determine that the oral contraceptive pill accelerated the post-1960 decline in US marital fertility, successfully discerning the direction of causality between supply- and demand-side factors and exploiting random variations in the implementation of laws affecting contraceptive access.

The aim of the present study was to analyze 2 key elements of the change in Ghana's abortion law. First, the relationship between the timing of the legal change and the timing of the onset of Ghana's fertility decline was examined, using a unique panel dataset. Second, through key informant interviews (KII), perceived reasons for the change in the abortion law were assessed to determine whether the reasons were unrelated to other factors that might cause fertility decline.

2. Materials and methods

2.1. Quantitative analysis

A woman-year panel of women aged 15–34 years was constructed using detailed fertility history available through Ghana Demographic and Health Surveys (DHS) for the years 1988, 1993, 1998, 2003, and 2008. Although the DHS are a repeated cross-section, each woman's age, schooling, residence, and full birth history—including the year children were born, and if and when each child died—are known. From this, it is possible to assess the relationship between the odds of a woman giving birth in a particular year and a set of independent variables, including the introduction of the abortion liberalization in 1985. Rather than using the DHS to conduct the usual repeated cross-sectional analysis, we construct a woman-year panel by imputing the woman's age and birth history at an annual frequency between 1974 and 2008 (Supplementary Material S1 provides a detailed explanation of the panel construction).

The 1988 and 1993 Ghana DHS are self-weighted, so the samples are representative of the population; the 1998, 2003, and 2008 surveys are not self-weighted. Empirical results are not weighted in the present analysis, as individual weights provided in the recoded DHS are designed for survey year representativeness, and are not representative of the 15 years preceding the interview that are used in the present study in the construction of the woman-year annual panel. Applying the survey year weights to the retrospective data would bias the results generated from the annual panel.

The principal outcome variable was a dichotomous measure of whether or not a woman reported giving birth to a child in a given year, constructed from a detailed self-reported birth history. The abortion law was entered as a dichotomous measure coded as 0 prior to 1985 and 1 for 1985 and after, given that the law changed in February of 1985. To parse out the impact of the introduction of the abortion law from other factors that might have affected fertility rates, in keeping with previous studies, covariates included in the adjusted model were place of residence, education, parity and child mortality, marital status, household wealth, age, and desire for more children [5,19,20].

The effect of the abortion law change on fertility was estimated using a multivariate random-effects logit model. In addition to the social and demographic variables listed above, we also controlled for a linear time trend, and survey year dummies. We estimated the pooled analysis across all of Ghana, and we stratified by age and fertility desires to examine how the legal change may have affected these different strata. We expected the law to have a larger impact on older women and women desiring no more children.

To estimate the relationship between the change in the abortion law and subsequent fertility outcomes, a spline regression was conducted with 1 inflection point, or “knot,” occurring at an unknown location. Spline regression is a means of analyzing abrupt changes in data as may occur due to economic crises or political events [21]. To find the optimal knot—the year at which the trend in fertility rates changed in Ghana—32 spline regressions were run, each with a middle knot of year 1975 through to 2006. The fit of the regression is summarized, among other summary statistics, in the model sum of squares (MSS). The higher the MSS, the better the fit of the model. The year in which the model is best fit indicates when the structural shift occurred in Ghana. Through this strategy, we attempted to uncover whether the number of children born to women decreased after the abortion law change, controlling for other factors that might have affected fertility decisions.

2.2. Key informant interviews

To understand the reasons behind the changes in reproductive health laws, a series of KII's was conducted in Ghana in late September 2010. The aim of these interviews was to uncover how the legal change came about, any concurrent policies that may have affected fertility, effects of the legal change that might not be seen in the statistical analysis, and alternative explanations for fertility decline unrelated to the change in the abortion law.

Semi-structured KII's were conducted with 17 policy makers, academicians, government officials, and representatives of international governmental and non-governmental organizations who were knowledgeable about family planning and legal changes in Ghana (Table 1). Key informant interviews involve identifying approximately 15–25 members of a community with specialized knowledge about a topic ("key informants") and asking them about their experiences relevant to the research question [22].

We began with an initial list of key informants based on literature reviews and our personal knowledge base. Subsequently, we used "snowball sampling" to identify additional key informants. Systematic content notes were taken following each interview and the recordings were subsequently analyzed by a research assistant not involved in the interviews and coded for thematic content. Thematic content that occurred more frequently and that was confirmed by others was given greater weight in the interpretation of the qualitative results but compelling alternative explanations are also highlighted.

To conduct the empirical analysis using the secondary-source DHS, an exemption request was approved by the Harvard School of Public Health Office of Human Research Administration (OHRA) (protocol number 21213-101). For the KII's, an expedited review was approved by the Harvard School of Public Health OHRA (protocol number 19606-101). Informed consent was obtained from all key informants, in compliance with OHRA protocol, and the institutional review board made the following determinations: the study poses no greater than minimal risk to participants as set forth in 45 CFR 46.404; and waiver of documentation of informed consent as set forth at 45 CFR 46.117(c)(2).

3. Results

3.1. Empirical results

Table 2 summarizes the independent variables in the model (an explanation of each of the covariates is provided in Supplementary Material S2). The age band of women was constant across the panel (15–34 years) but the average age of women in the sample increased over time between 1974 and 2008. Over time, the probability of a woman being in school increased, cluster average mortality decreased,
m Nonetheless, men were less likely to work in agriculture, and women were more likely to live in cities.

Results from the multivariate regression show that a more liberal abortion law was associated with fewer children (odds ratio [OR] 0.985; 95% confidence interval [CI], 0.977–0.993) (Table 3). That is, following the liberalization of the abortion law, a woman had 1.5% lower odds of having a child in any given year. The effect of the law is significant for the pooled data but is primarily driven by women aged 25 years and older. Table 4 shows the multivariable random-effects logit regression results stratified by desired fertility. For women who wanted no more children at the time of the survey, the liberalization of the abortion law was associated with reduced fertility (OR 0.986; CI, 0.984–0.988). Such women had 2.6% lower odds of having a child following the liberalization of the abortion law. For women who, at the time of the survey, indicated that they wanted more children or were undecided, the liberalization of the abortion law had no effect on the odds of having a child.

Girls in school were less likely to have a child, women with less-educated husbands had more children, women whose husbands were working in agriculture had more children, and women who lived in the countryside had more children compared with women who lived in the city (Supplementary Material S3 and S4).

The spline regression results show that the turning point of fertility decline occurred at 1985 (Figs. 1 and 2). Fig. 1 is an illustration of reported MSS from 32 regressions that were estimated each with a middle knot point of a year between 1975 and 2005. This plot shows that the structural shift in the fertility trend around 1985. This translates to total fertility rates (TFRs) between 4.5 and 5 prior to 1985, falling to approximately 3.2 by 2006. The TFRs presented in Fig. 2 for 15 years of age from 1975 to 2000 overlaid with the spline regression results. This highlights the structural shift in the fertility trend around 1985. This translates to total fertility rates (TFRs) between 4.5 and 5 prior to 1985, falling to approximately 3 by 2006. The TFRs presented in Fig. 2 for 15–34-year-old women are calculated using the same 5 Ghana DHS used in the regression analysis. Calculation of the TFR is based on age-specific fertility rates.

### Table 3
<table>
<thead>
<tr>
<th>Year</th>
<th>Average age of women, y</th>
<th>Percentage of women in school</th>
<th>Percentage of women married or in union</th>
<th>Percentage of partners working in agriculture</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>21.40</td>
<td>10.6</td>
<td>59.3</td>
<td>35.7</td>
</tr>
<tr>
<td>1980</td>
<td>22.24</td>
<td>10.5</td>
<td>64.1</td>
<td>36.5</td>
</tr>
<tr>
<td>1985</td>
<td>23.11</td>
<td>8.4</td>
<td>67.7</td>
<td>37.3</td>
</tr>
<tr>
<td>1990</td>
<td>23.46</td>
<td>11.6</td>
<td>67.2</td>
<td>37.0</td>
</tr>
<tr>
<td>1995</td>
<td>23.77</td>
<td>16.4</td>
<td>64.9</td>
<td>34.7</td>
</tr>
<tr>
<td>2000</td>
<td>23.54</td>
<td>19.5</td>
<td>60.8</td>
<td>32.9</td>
</tr>
<tr>
<td>2005</td>
<td>24.02</td>
<td>20.8</td>
<td>59.7</td>
<td>29.0</td>
</tr>
<tr>
<td>2008</td>
<td>24.05</td>
<td>20.5</td>
<td>56.0</td>
<td>24.4</td>
</tr>
</tbody>
</table>

### Table 4
<table>
<thead>
<tr>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
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</thead>
<tbody>
<tr>
<td>Pooled</td>
<td>15–19 y</td>
<td>20–24 y</td>
<td>25–29 y</td>
<td>30–34 y</td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Dependent variable: birth of a child (1 = yes, 0 = no)
Adjusted odds ratios reported, random effects (robust standard errors in parentheses)

<table>
<thead>
<tr>
<th>Abortion law index</th>
<th>0.985d (0.977–0.993)</th>
<th>1.002</th>
<th>0.991</th>
<th>0.982d (0.978–0.996)</th>
<th>0.978d (0.961–0.996)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observations</td>
<td>238 467</td>
<td>79 691</td>
<td>65 646</td>
<td>50 894</td>
<td>36 340</td>
</tr>
<tr>
<td>Number of mothers</td>
<td>21 238</td>
<td>18 525</td>
<td>15 422</td>
<td>12 122</td>
<td>878</td>
</tr>
</tbody>
</table>

a Adjusted for woman’s age, woman’s age squared, attendance in school in previous year, number of siblings to index child, marital status, highest level of education achieved by partner, partner in agriculture indicator, place of residence, year trend, and cluster average child mortality rate in previous year.

b Adjusted odds ratios reported, random effects (robust standard errors in parentheses)

c Adjusted for woman’s age, woman’s age squared, in school in previous year, number of siblings to index child, marital status, highest level of education achieved by partner, partner in agriculture indicator, place of residence, year trend, and cluster average child mortality rate in previous year.

d P < 0.01.

e P < 0.05.

### 3.2. Reasons for the liberalization of the abortion law

Although there was an association between the timing of the liberalization of abortion and fertility decline, it is possible that the liberalization of abortion was brought about by forces that also influenced fertility or coincidently occurred alongside these other changes. To examine the reasons for the change in abortion laws and alternative explanations for the empirical results, we turn to the results of the KIs.

The 2 primary explanations for the abortion law liberalization were independent of other factors that might directly have influenced fertility. First, several key informants mentioned that national leadership liberalized abortion in response to a severe famine that affected the country in the early 1980s, in order to provide families with more family-planning options during a difficult natural disaster. A second explanation raised by 2 key informants was that concerns physicians advocated changes in abortion laws in response to high rates of clandestine abortion. Whatever the case, the change to the criminal code occurred without public input or deliberation, and thereby was not associated with concurrent underlying social changes that may have affected preferences for family size.

Most key informants also noted that liberalization of the abortion law was poorly implemented and that physicians and pregnant women may not have known about it, suggesting that the association could be coincidental. However, 2 physicians who had been involved in advocacy efforts stated that they knew about the change and that physicians were more willing to offer abortion services after the change.
occur. Thus, key informants suggested that, through informal channels of referral, access to safe abortion services may have increased.

Finally, an indirect liberalization in the abortion laws was also uncovered. According to a key informant, at the same time that medical abortion was liberalized, there was a concurrent liberalization of advertising laws of health tonics with abortifacient properties. The advertisements, which are purported to have been widely posted following the liberalization of the law, contained a disclaimer that women who are pregnant should not use the tonics, thereby advertising widely their abortifacient properties.

4. Discussion

Births declined significantly after the introduction of the new abortion law in February 1985. That the law affected only women who were at least 25 years of age indicates that abortion was used to keep families within a desired size. The finding that fertility was not affected for younger women indicates that abortion was not used to control the timing of first births or timing between births. Similarly, the law had no effect on women who indicated wanting more children at the time of the panel but women who did not want more children did have lower odds of having a child.

Because we had only a measure of desired fertility at the time of interview, and not for each year of the panel, desired fertility measures indicate only general preferences, and coefficients should be interpreted with caution. Spline regression validates these multivariate trends and shows 1985 to be a turning point in Ghana’s fertility decline. As the change in the law occurred in February 1985, the reduction in fertility from 1985 to 1986 (per the turning point in Fig. 1) indicates a delay of approximately 12 months as implementation of the law caught up with the change.

Although the empirical results indicate a turning point at 1985, we draw on the KIIIs to clarify the reason for the fertility decline and the potential contribution of increased access to abortion services. The KIIIs lent support to the hypothesis that the law changed independent of other social forces affecting fertility (e.g., female education) and the government changed the law in response to elite-driven events, including an executive decision to change the law in response to famine affecting the region at the time and physician advocacy for women’s health. However, the law was not widely implemented in practice and we cannot say definitively that the liberalization in the law led to the decline in fertility. Studies of abortion law liberalization in South Africa have noted similar barriers to implementation, including a lack of knowledge of the law and shortages of trained providers, but have nonetheless found other benefits stemming from liberalization apart from fertility decline, including that morbidity from unsafe, clandestine abortion declined following legalization [23]. Lower rates of clandestine abortion would indicate women are using safer, legal channels to obtain abortion services. Furthermore, the KIIIs suggested that there may have been direct impacts on fertility from the famine that prompted the legal change as well as a potential increase in the illicit use of abortifacient tonics.

A major limitation of the present study was lack of direct access to information on women’s use of abortion services. Lack of data on induced abortion is a chronic problem in most low-income countries [24]. Even fewer studies try to capture widespread knowledge of abortion laws. Data on abortion incidence or knowledge of abortion laws are not available for Ghana over the period under investigation. Even in very recent years, when there has been an increased effort to collect data on the incidence and knowledge of abortion in Accra, self-reported statistics remain prone to bias [25]. Furthermore, the qualitative results—while demonstrating that the change in the abortion laws was independent of other changes that might have affected fertility—do not confirm that a change in the law led to greater use of abortion services. The main strengths of the analysis were that a woman-year panel enabled reconstruction of the detailed fertility history of a large cohort of women over a long timeframe and that the mixed-methods approach facilitated better understanding of potential mechanisms for the association.

5. Conclusions

Multivariate logit results indicate that the timing of the liberalization of the abortion law coincided with the onset of Ghana’s fertility decline. Key informant interviews indicated that reasons for liberalization of abortion laws were unrelated to women’s changing preferences for family size. Yet, despite establishing the exogeneity of this legal change, there are difficulties in linking the legal changes to fertility decline, given that knowledge of the change seems to have remained low for some time. The present findings indicate that the legalization of abortion is just one plausible explanation for the empirical gap between reported use of family planning and observed rates of fertility decline.

The findings support previous research on unreported abortion as a mechanism that explains the gap between reported contraception and fertility decline. Oliveras et al. [25] meticulously examined hospital records to document inconsistency between documented contraceptive use and fertility rates. Similarly, while unable to explain fully the gap between fertility and modern contraceptive use with available data, Agyei-Mensah [11] concluded that “a nationwide survey on induced abortion is therefore needed to explain the gap between the current level of fertility and the low rate of modern contraception.”
Further research on documented and undocumented abortion in Ghana should be conducted to validate the contribution of the liberalization of abortion law to the decline in the total fertility rate.

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.ijgo.2013.07.008.

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Conflict of interest

The authors have no conflicts of interest.

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