Closing the Poor–Rich Gap in Contraceptive Use in Rwanda: Understanding the Underlying Mechanisms

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CONTEXT: Evidence suggests that as Rwanda has strengthened its family planning program, disparities in contraceptive use by socioeconomic status have narrowed. However, the changes in these gaps, and the mechanisms that underlie them, are not well understood.

METHODS: Data from the 2005, 2010 and 2015 Rwanda Demographic and Health Surveys on 19,028 in-union women aged 15–49 were analyzed to examine trends in socioeconomic disparities in contraceptive use. Descriptive statistics and multivariate regression with interaction terms were used to identify changes in these disparities, as well as to describe trends in desired fertility, and in types and sources of contraceptives used.

RESULTS: Between 2005 and 2015, the prevalence of modern contraceptive use rose from 11% to 48%. In the regression analysis, interaction terms indicated that prevalence increased to a lesser extent among women who were wealthy, had a least a secondary education or lived in urban areas than among those who were poor, were uneducated or lived in rural areas (odds ratios, 0.5–0.7). In parallel, declines in desired fertility were greater among women with no education than among those with at least a secondary education (by 0.7 vs. 0.5 children); among the poorest than the richest women (by 1.0 vs. 0.5 children); and among rural than urban residents (by 0.9 vs. 0.4 children).

CONCLUSIONS: The shrinking of gaps in contraceptive use by socioeconomic status coincided with narrowing of disparities in demand for children and with improvements in family planning services, suggesting that disadvantaged populations may have especially benefited from public programs to increase contraceptive access.

Family planning is one of the most influential interventions in developing countries, and has benefits for maternal and child health, socioeconomic development and environmental sustainability.[1,2] Yet despite the undeniable progress made in recent decades, contraceptive use in Sub-Saharan Africa is still low: Across countries, the median contraceptive prevalence rate (CPR) among women of reproductive age was only 28% in 2015.[3] However, prevalence varies widely across regions and countries. For example, in 2015, the CPR was 64% in southern African, but only 17% in western Africa. Similar disparities are evident within countries, which may reflect inequity in access to family planning[4] and indicate a need for intervention. Such inequalities frequently exist between districts and provinces, between rural and urban areas, and between socioeconomic groups. In Kenya, for example, regional CPRs range from 44% in the Coastal region to 73% in the Central region.[5] In the Democratic Republic of the Congo, 45% of women of reproductive age in Kinshasa use contraceptives, compared with only 11% in the country's Eastern province.[6]

Like other African countries, Rwanda has experienced inequalities in contraceptive use in the past. However, with the scaling-up of its family planning program, which during the past two decades has expanded reproductive services across the country and improved service delivery,

Rwanda has made great progress in reducing disparities. For instance, in 2005, the modern CPR was 23% in the city of Kigali, but less than half of that—10%—in the Northern province;[7] by 2015, the proportions had risen substantially in both locations, and were actually slightly higher in the North than in Kigali (55% vs. 50%).[8] Similar reductions in disparities have occurred between other subpopulations, such as urban and rural women.[9,10]

These developments have occurred in one of the least developed countries in the world. Rwanda is primarily rural—almost 80% of the 12 million Rwandese live in the countryside—and its gross domestic product is only US$707 per capita; 40% of the population lives below the poverty line.[11,12] Moreover, Rwanda ranked 158th out of 189 countries on the 2018 Human Development Index list.[13] This picture does not align with the demographic transition theory, which posits that desire for small families and adoption of contraceptive use starts among privileged groups (e.g., educated, wealthier individuals), and raises the question of how a country with a predominantly poor, rural population has had such a large increase in CPR.

Previous studies on Rwanda have generally been country-level analyses.[9,10,14] Although these studies revealed a general increase in contraceptive use and some convergence in CPR between urban and rural areas, they

lacked a deep analysis of the mechanisms underlying these trends. Disaggregation of the data—for example, by women's socioeconomic status or urbanity—is important to understand the sustainability of contraceptive progress and of continued decline of population growth, a major concern of the government.

The literature identifies three categories of factors that contribute to inequalities in contraceptive use.[15] The first is women's fertility preferences, knowledge and behaviors, including attitudes toward contraception and pregnancy. The second is factors related to the health care system, such as access to family planning services, which may be hindered by poverty and geographic distance. The third consists of provider-related factors, which may play a role through unequal treatment of clients or pressure on women to use certain types of contraceptives. Together, these factors, which can be categorized as demand-related factors (those in the first category) and supply-related factors (those in the second and third categories),[16–18] determine the level of contraceptive use in the population.

The aim of this article is to analyze the degree to which, and the pathways through which, the gap in contraceptive use between poor and rich women has narrowed in Rwanda. More specifically, this analysis examines the extent to which convergence in contraceptive use is associated with the demand for children and family planning services. Understanding these mechanisms is essential for both policymakers and family planning providers, and may help Rwanda to evaluate its family planning program and take the best route toward sustainable control of population growth. It may also provide guidance for other countries that are seeking to improve their family planning programs, and advance current theory on the mechanisms through which poor populations engage in family planning.

Family Planning in Rwanda

In 2000, Rwanda's government launched its Vision 2020 development program, which aimed to raise Rwanda to a middle-income country by increasing the average annual income from US$290 to US$900.[19] Recognizing that population growth was a major barrier to the achievement of this ambitious goal, the government decided to strongly support family planning.[14] To translate this commitment into action, the government ran a massive campaign to strengthen the demand for family planning, increased access to contraceptives through expansion of services and improved the quality of service provision.[20]

Nonetheless, the 2005 Rwanda Demographic and Health Survey (DHS) revealed a total fertility rate of 6.1 births per woman.[7] In 2007, the Minister of Health declared that family planning is "a tool of development,"[14(p. 4)] and the government sought to curb the high rate of population growth that was compromising development efforts. Thus, Rwanda initiated an intensive family planning education program to raise awareness that reducing fertility was an essential component of efforts to reduce poverty. All key health personnel and local administrators were asked to participate in the campaign,[21] and many government ministries* incorporated family planning into the agendas of their regular meetings. The Rwandan Parliamentarians' Network on Population and Development—a commission created in 2003—played an important role in the campaign by reaching the country's lower-level politico-administrative entities. Several channels of communication were used, including television, radio and meetings with religious leaders to request their support for family planning.

Notable innovations have included the introduction of a community health worker program and monthly community service meetings called *Umuganda* (which means "community work" in the national language). The community health workers program is a part of the national health system and is designed to reach many individuals,[20] especially residents of rural areas where there is a shortage of health care providers.[3] Each of Rwanda's 14,837 villages† votes for three community members (two females and one male) to serve as community health workers, whose mission is to monitor and promote maternal and child health. Community health workers are trained to provide information about and stimulate demand for all contraceptive methods, although they deliver only short-acting methods (e.g., injectable, pill, condoms, standard days method) that do not require medical intervention.[9,22] They do not receive remuneration, but they are required to be honest, reliable and trustworthy, and enjoy great respect in their community.[23] Their efforts are aided by Umuganda, which is not a community health program but rather a community work program focusing on infrastructure development and cleaning; however, because nearly all residents of a village participate, Umuganda facilitates the spread of information, including information concerning family planning.

In addition, the government made great efforts to increase the availability of a range of modern contraceptive methods and to promote use of long-acting methods.[7,14–24] The diversification of contraceptive methods available at health centers was coupled with systematic training of family planning providers to improve service delivery.[24] In Rwanda, the most commonly used modern method is the injectable (which accounted for 50% of modern method use in 2015),[8] followed by the pill and implant; only 5% of women rely on traditional methods. In addition to implants, available long-acting and permanent methods are the IUD, and female and male sterilization; the Ministry of Health has been promoting the latter as an option for men, and demand for the procedure is increasing.[8]

One challenge for the Rwandan health system is that roughly one-third of health facilities are "faith-based" and do not offer modern contraceptives.[14,25] To overcome this barrier, the government constructed secondary health

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*These included, among others, the ministries of education, local government, finance and economic planning, youth, health, defense, and trade and industry.

†In Rwanda, a village is the lowest administrative unit of government in both rural and urban areas, and generally comprises 100–150 households.

posts not far from religious-affiliated health facilities to meet the needs of local residents.[25] This approach increased access to family planning services for many populations.[18]

Finally, apart from these direct interventions, the family planning program may have benefited from health system reforms, such as the implementation of performance-based financing of health facilities and the staff-performance contracts system,‡ as well as from a universal health insurance scheme that has increased use of health facilities.[21,26]

Although the analysis that follows is not a formal evaluation of the efforts described above, the trends in outcomes we describe largely coincided with the government's repositioning of family planning.

METHODS
Data and Variables
This study used data from the 2005, 2010 and 2015 rounds of the Rwanda DHS, which were designed to be representative at the national level, and for urban areas and rural areas. Sampling involved two stages: random sampling of clusters across the country and selection of households within clusters. In selected households, all women aged 15–49, whether residents or visitors, were eligible to be interviewed. The current analysis was restricted to women in union, because they constitute the sample commonly used to measure contraceptive prevalence. We excluded 154 women who did not provide valid answers to the question on ideal number of children, yielding a final analytic sample consisting of 19,028 women—5,321 who took part in the 2005 survey, 6,817 who took part in the 2010 survey and 6,890 who took part in the 2015 survey.

The key dependent variable was use of any modern contraceptive method at the time of interview. Specifically, women were asked, "Are you currently doing something or using any method to delay or avoid getting pregnant?" Women were classified as using a modern contraceptive method if they reported using a short-acting method (pill, injectable, spermicide, female or male condoms, standard days method or lactational amenorrhea method), or a long-acting or permanent method (IUD, implant, or female or male sterilization). Women were considered to be using a traditional method if they reported using periodic abstinence, withdrawal or other folkloric methods to avoid pregnancy. We chose modern method use as the outcome variable to be consistent with the objectives of Rwanda's 2012 family planning policy, which sought to increase the prevalence of modern contraceptive use to 70% by 2016.[22]

The main independent variable was women's socioeconomic status. Because socioeconomic status is complex and multidimensional, we operationalized it using two variables: educational level and household wealth. The education variable measures self-reported educational

attainment and encompasses three categories: none, some primary and some secondary or higher. The wealth variable is an indicator of a household's economic status; index scores were computed from 12 variables used in the 2015 DHS,[27] including source of drinking water, type of toilet, type of household construction materials, land ownership, number of residents per sleeping room and ownership of vehicles. The scores were then used to classify households into quintiles: poorest, poor, middle, richer and richest. The analysis also examined rural or urban residence, another characteristic associated with disparities;[28,29] the residence variable distinguished rural from urban residents on the basis of the official administrative definitions.[8]

To understand the mechanisms that may underlie the differences in contraceptive use trends among socioeconomic subgroups, we linked these trends with changes in fertility preference (demand side) and family planning services (supply side). Fertility preference was measured as the respondents' mean ideal number of children. Although most women gave numeric responses to the question about their ideal number of children, 2% provided nonnumeric responses (e.g., "God wants," "I don't know" or "any number"); we excluded from the analyses women who gave such answers on the assumption that doing so did not change the composition of the remaining sample. The remaining responses were divided into four categories (≤3, 4, 5–6 or ≥7) that align with Bongaarts' classification of fertility levels along the fertility transition[30] (the shift from high to low fertility), and with the country's family planning campaign, which promotes three or fewer children as an ideal family size.[31] Demand for family limitation was measured as the proportion of respondents who wanted to limit their childbearing—i.e., those who indicated that they had been sterilized or who answered "no" to the question "Would you like to have a(nother) child, or would you prefer not to have any (more) children?"

Our indicators of family planning services captured the types and sources of contraceptives used. Method source was determined from responses to a question asking where the woman had most recently obtained the contraceptive method she was using at the time of the survey; answers were categorized as public medical sector, community health worker or private sector. The public medical sector includes all government health facilities, ranging from health posts to referral hospitals; community health workers, as described earlier, are nonmedical staff that provide outreach services and distribute some types of contraceptives; and the private sector consists of private medical and all other independent sources and distributors (e.g., private clinics, private pharmacies, shops, churches, friends).

Finally, our analyses included three control variables: women's age (15–24, 25–34 and 35–49), number of living children (0, 1–3, 4–5 or ≥6) and religion (Catholic, Protestant, Adventist, Muslim or other/none).

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‡A staff performance contract is an annual contract between an employer and a staff member detailing the professional goals that the staff member agrees to accomplish during the year. At the end of the year, the staff member is evaluated in reference to these targets. This system is used throughout the public sector.

Analyses

We first calculated descriptive statistics on socioeconomic differentials in contraceptive use during the study period to show the extent to which the poor-rich trends in contraceptive use have converged. We then conducted a multivariate logistic regression analysis to identify associations between selected independent variables and contraceptive use, and to evaluate how the poor-rich gap has varied over time. To assess these changes, we included in the regression analysis terms for interactions between the key variables (education, household wealth and residence) and survey year. The analysis, which was performed using Stata version 13, adjusted for the complex sample design by applying the svy command. Finally, using descriptive statistics, the analysis linked the narrowing of the poor-rich gap in contraceptive use with the trends in fertility preference, and with trends in the types and sources of modern methods used.

RESULTS

Sample Characteristics

During the decade-long study period, women's educational levels increased considerably (Table 1). The proportion of women with no education declined from 29% in 2005 to 16% in 2015, while increases were evident in the proportion with some primary education (from 62% to 71%) and at least some secondary education (from 9% to 13%). Across the full sample, the vast majority of women lived in rural areas (85%) and were Christians (83%), with roughly equal distribution between Catholics (42%) and Protestants (41%)—although, over time, the proportion of the former decreased and the proportion of the latter increased. Nearly half of the women (46%) were aged 25–34.

Slightly more than half (54%) had 1–3 children, while 6% had no living child. Women with six or more children represented 15% of the pooled sample, but the proportion diminished across surveys, from 18% in 2005 to 12% in 2015. About two-fifths of respondents desired a small family of three or fewer children, and another one-third wanted exactly four children; only 5% wanted seven or more children. The proportion of women desiring three or fewer children rose dramatically across surveys, from 20% in 2005 to 53% in 2010 and 52% in 2015. Although only 43% of respondents in the pooled sample were using contraceptives, the percentage increased substantially between 2005 and 2015, from 18% to 53%. Short-acting methods accounted for most contraceptive use; the proportion of women using such methods rose from 10% to 38%, while use of long-acting and permanent methods rose from 1% to 10% and use of traditional methods declined slightly, from 7% to 6%. The public medical sector was the largest provider of contraceptive methods in all three surveys, although its share of provision declined. Community health workers emerged as an important source of contraceptives—they served 10% of contraceptive users in 2010 and 34% in

TABLE 1. Percentage distribution of in-union women aged 15–49, by selected characteristics, according to survey year, Rwanda Demographic and Health Survey, 2005, 2010 and 2015

Characteristic	All (N=19,028)	2005 (N=5,321)	2010 (N=6,817)	2015 (N=6,890)
Education				
None	21.2	29.4	19.6	16.4
Primary	67.8	61.7	69.9	70.5
≥secondary	11.0	8.7	10.5	13.1
Household wealth				
Poorest	19.6	20.5	19.6	18.8
Poorer	20.7	20.4	20.2	21.0
Middle	20.4	20.0	20.2	20.8
Richer	20.4	21.0	20.6	19.8
Richest	19.1	18.1	19.5	19.6
Residence				
Rural	85.2	86.4	86.5	82.8
Urban	14.8	13.6	13.5	17.2
Religion				
Catholic	41.8	46.3	41.9	38.1
Protestant	41.2	36.3	40.4	45.7
Adventist	13.4	13.2	14.3	12.8
Muslim	1.8	1.8	1.4	2.1
Other	1.8	2.4	1.9	1.3
Age				
15–24	16.1	19.2	15.9	14.0
25–34	45.9	43.1	46.9	47.1
≥35	37.9	37.7	37.2	38.9
No. of living children				
0	5.8	6.0	6.2	5.1
1–3	53.9	51.5	52.5	57.2
4–5	25.4	24.6	26.0	25.5
≥6	14.9	17.9	15.3	12.2
Ideal no. of children				
0–3	43.2	19.5	52.8	52.0
4	34.2	42.8	30.4	31.4
5–6	17.8	31.1	12.7	12.7
≥7	4.8	6.7	4.1	3.9
Contraceptive method used				
None	57.1	82.2	48.2	46.6
Short acting	29.7	9.5	37.7	37.5
Long acting or permanent	6.7	1.0	7.7	10.2
Traditional	6.4	7.2	6.4	5.8
Contraceptive method source†				
Public medical sector	70.8	73.9	82.3	58.9
Community health worker	20.3	0.2	10.0	34.0
Private sector/ other	8.9	26.0	7.7	7.1
Total	100.0	100.0	100.0	100.0

†Among women using a modern method. *Note:* Percentages may not total 100.0 because of rounding.

2015—but the private sector's share of provision declined dramatically, from 26% in 2005 to 7% in 2015.

Trends in Socioeconomic Disparities

The proportion of in-union women using a modern method of contraception increased from 11% to 48% between 2005 and 2015, and varied according to

women's education, household wealth and area of residence (Table 2). For all of these indicators, inequalities in use have narrowed over the years. For example, between 2005 and 2010, the prevalence of contraceptive use increased sharply among women with no education (from 6% to 38%), but more modestly among those with at least some secondary education (from 29% to 52%). In the following interval (2010–2015), a further (albeit small) increase occurred among women with no education (from 38% to 41%), while prevalence declined slightly among the most educated women (from 52% to 49%). As a result, the ratio between the prevalence among women with at least some secondary education and that among women with no education declined from 4.8 in 2005 to 1.2 in 2015.

The contraceptive use gap associated with household wealth narrowed as well. In 2005, the ratio between contraceptive prevalence among women in the richest quintile of households and that among women in the poorest quintile was 3.8 (23% vs. 6%); the ratio dwindled to 1.3 (50% vs. 39%) in 2010 and to just 1.1 (50% vs. 45%) in 2015. This trend was the result of larger increases in contraceptive uptake among the poorest women (from 6% in 2005 to 39% in 2010 and 45% in 2015) than among those from the richest households (from 23% in 2005 to 50% in both 2010 and 2015). Finally, the ratio between urban and rural women, which was 2.5 in 2005, declined to 1.0 in 2010 and was 1.1 in 2015.

The multivariate analysis that included pooled data from the three surveys further explores these trends (Table 3). Overall, the odds that a woman was using a modern

TABLE 2. Percentage of women using a modern contraceptive method, by selected characteristics, according to survey year; and ratio of percentage of women in 2015 to that in 2005, by selected characteristics

Measure	2005	2010	2015	Ratio, 2015:2005
WOMEN'S CHARACTERISTICS				
All	**10.5**	**45.4**	**47.7**	**4.5**
Education				
None	6.1	37.5	40.7	6.7
Primary	10.0	46.5	48.9	4.9
≥secondary	29.5	52.3	49.3	1.7
Household wealth				
Poorest	6.3	38.6	45.1	7.2
Poor	7.7	41.4	46.1	6.0
Middle	8.7	47.4	48.0	5.5
Richer	8.4	49.3	48.8	5.8
Richest	23.1	50.0	50.3	2.2
Residence				
Rural	8.8	45.1	46.9	5.3
Urban	21.7	47.1	51.4	2.4
RATIOS				
≥secondary:none	4.8	1.4	1.2	na
Richest:poorest	3.8	1.3	1.1	na
Urban:rural	2.5	1.0	1.1	na

Note: na=not applicable.

TABLE 3. Odds ratios (and 95% confidence intervals) from binary logistic regression analysis assessing associations between selected measures and modern contraceptive use among women

Measure	Odds ratio
WOMEN'S CHARACTERISTICS	
Year	
2005 (ref)	1.00
2010	9.23 (6.33–13.05)**
2015	12.15 (8.56–17.24)**
Education	
None (ref)	1.00
Primary	1.44 (1.13–1.82)**
≥secondary	3.13 (2.25–4.36)**
Household wealth	
Poorest (ref)	1.00
Poor	1.18 (0.84–1.64)
Middle	1.29 (0.92–1.81)
Richer	1.25 (0.89–1.74)
Richest	2.58 (1.89–3.51)**
Residence	
Rural (ref)	1.00
Urban	1.43 (1.10–1.87)**
Religion	
Catholic (ref)	1.00
Protestant	0.72 (0.67–0.78)**
Adventist	0.97 (0.87–1.08)
Muslim	0.87 (0.67–1.14)
Other	0.93 (0.69–1.24)
Age	
15–24 (ref)	1.00
25–34	1.03 (0.92–1.14)
≥35	0.71 (0.62–0.81)**
No. of living children	
0	0.02 (0.01–0.03)**
1–3 (ref)	1.00
4–5	1.37 (1.24–1.50)**
≥6	1.18 (1.04–1.35)*
Ideal no. of children	
0–3 (ref)	1.00
4	0.72 (0.66–0.78)**
5–6	0.65 (0.58–0.73)**
≥7	0.58 (0.48–0.70)**
INTERACTION TERMS	
Education x survey year	
Primary in 2010	0.91 (0.69–1.19)
Secondary in 2010	0.51 (0.34–0.76)**
Primary in 2015	0.90 (0.68–1.19)
Secondary in 2015	0.43 (0.29–0.64)**
Wealth x survey year	
Poor in 2010	0.96 (0.66–1.40)
Middle in 2010	1.13 (0.77–1.66)
Richer in 2010	1.26 (0.86–1.83)
Richest in 2010	0.61 (0.42–0.89)**
Poor in 2015	0.90 (0.62–1.31)
Middle in 2015	0.88 (0.61–1.29)
Richer in 2015	0.96 (0.67–1.38)
Richest in 2015	0.46 (0.32–0.68)**
Residence x survey year	
Urban in 2010	0.69 (0.49–0.96)*
Urban in 2015	0.80 (0.57–1.10)
Intercept	*0.08 (0.06–0.12)** *

*p<.05. **p<.01. *Note*: ref=reference group.

contraceptive method was substantially higher in 2010 and 2015 than in 2005 (odds ratios, 9.2 and 12.1, respectively). Moreover, a few differences by socioeconomic status are evident. The odds of modern contraceptive use increased progressively with education, such that they were higher among women with some primary education or at least some secondary education than among women with no education (1.4 and 3.1, respectively). No differences were apparent between women in the lowest household wealth quintile and women in the middle three, but those in the wealthiest quintile were more likely than those from the poorest households to be using a modern method (2.6). Surprisingly, women living in urban areas were no more likely to use modern contraceptives than were those residing in rural areas, after adjustment for other variables. Results for other variables generally matched expectations: Women had reduced odds of modern contraceptive use if they were older than 35 rather than aged 15–24, if they were Protestant rather than Catholic, or if they desired at least four children rather than a smaller family (0.6–0.7); women had elevated odds of use if they had four or more children rather than 1–3 children (1.2–1.4). The odds of contraceptive use were negligible among women without children (0.02).

The interaction terms for education and survey year indicate that the odds of contraceptive use in 2010 and 2015 were reduced among women with at least some secondary education (odds ratios, 0.5 and 0.4, respectively) relative to those with no education. The terms for interactions between household wealth and survey year indicate that in both 2010 and 2015, use of modern methods increased more slowly among women in the richest quintile than among those from the poorest quintile (0.6 and 0.5, respectively). Finally, in 2010, women residing in urban areas had lower odds of contraceptive use than did women living in rural areas (0.7). These results suggest that, over time, gaps in modern contraceptive use by women's educational attainment, wealth and place of residence declined because women who were better educated, wealthier or residents of urban areas had smaller increases in modern method use than did those who were less educated, poorer or residents of rural areas. In other words, the lower socioeconomic strata of the population have made more progress than the higher strata have.

Trends in Family Size

During the study period, women's ideal number of children declined among all socioeconomic groups, although at different rates (Table 4). Analyses by women's educational attainment show that the decline in ideal number of children was slightly larger among women with no or some primary education (0.7 and 0.8 children, respectively) than among those with at least some secondary education (0.5 children). As a result, the difference in ideal family size between women with no education and those with a least some secondary education declined

from 0.9 in 2005 to 0.7 in 2015. The household wealth findings show that although the poorest women desired 0.4 more children in 2005 than the richest women did, the difference between the two groups had become negligible by 2010 and 2015 because family size preferences had declined to a greater extent among the poorest women (by 1.0 children) than among the richest (by 0.5 children). Likewise, the ideal number of children declined more in rural areas (by 0.9) than in urban areas (by 0.4), so that family size preferences no longer differed by area of residence in 2015.

Moreover, the proportion of women desiring to limit their childbearing increased substantially between 2005 and 2010, from 24% to 39%, and then declined slightly, to 36%, in 2015. During the study period, the proportion of women who wished to limit their family size increased by 20 percentage points among those with no education, but actually declined by seven percentage points among those with at least some secondary education. In addition, the increase was larger among rural women (14 percentage points) than among women who lived in an urban area (one percentage point). The pattern of differentiation among subgroups was less clear in the case of household wealth, as the two wealthiest groups had the largest and the smallest declines.

Types and Sources of Methods

The distributions by method type of women in union who were using any contraceptive show a dramatic decrease in the use of traditional methods, from 41% in 2005 to 12% in 2010 and 11% in 2015 (Table 5). At the same time, substantial increases occurred in the use of modern methods. The proportion of contraceptive users who were using short-acting methods increased between 2005 and 2010, from 54% to 73%, and then declined slightly, to 70% in 2015. The proportion using a long-acting or permanent method increased steadily, from 6% to 15% to 19%. These changes show a shift to use of more effective methods.

The extent of these changes varied among socioeconomic subgroups. The proportional decline in use of traditional methods between 2005 and 2015 was roughly similar among women with no education (a 67% decline, from 46% to 15%) and women with at least some secondary education (a 64% decline, from 28% to 10%). In contrast, the use of long-acting and permanent modern methods more than tripled among women with no education (from 5% to 17%), but only doubled among those with at least a secondary education (from 13% to 27%). As a result, the ratio between these two groups in the use of long-acting and permanent methods declined from 2.8 to 1.7 (not shown). Similar trends occurred by women's household wealth and area of residence.

Finally, the public medical sector remains the main provider of contraceptives in Rwanda, despite a 28% decline between 2010 and 2015 in the proportion of contraceptive users who obtained their method from this sector

(from 82% to 59%; Table 6). Similarly, reliance on the private sector has decreased substantially; this sector served 26% of contraceptive users in 2005 but only 7% in 2015. The decline in women's use of the public medical and private sectors was the result of the introduction of the community health program, which was essentially nonexistent in 2005 but was the method source for 10% of users in 2010 and 34% in 2015. Although contraceptive provision by the public medical sector decreased substantially among uneducated women (from 87% to 55%), it remained almost unchanged among the most educated women. Meanwhile, the contribution of the community health program to contraceptive provision increased to a much greater extent among women with no education (to 12% in 2010 and 42% in 2015) than among women with at least some secondary education (to 6% and 16%, respectively), and by 2015 was substantially higher among the poorest women than among those in the wealthiest quintile (40% vs. 18%). The private sector remained an important provider only among the most educated subgroup; in 2015, it served as a contraceptive source for 21% of these women, but for only 3% of the least educated women. Comparable patterns were found according to women's household wealth and area of residence. Ratios between the poorest and richest quintiles, and between rural and urban residents, in the use of the public medical and private sectors as sources of contraceptives declined, while the ratios for community health worker services increased; these trends indicate that poor and rural women are shifting from the public medical sector to the public community sector to a greater degree than the richest women and urban residents are.

DISCUSSION

By analyzing differentials in trends in the demand for children and family planning services over a 10-year period, this article investigates potential mechanisms by which the poor-rich gap in contraceptive use is narrowing in Rwanda. We found that although contraceptive use increased considerably in all socioeconomic groups between 2005 and 2015, the increase was notably higher among women in lower socioeconomic groups and in rural areas than among those in higher socioeconomic groups and in urban areas, leading to shrinking of the contraceptive use gap.

Multiple factors have contributed to the increases in contraceptive use and uptake among lower socioeconomic groups. The first is changes in fertility preference. Ideal family size has declined considerably in Rwanda, reaching an average of 3.3 children in 2015,[8] the lowest level in Sub-Saharan Africa outside of South Africa, Lesotho and Eswatini.[32] We found that the decline was larger among poorer and rural women than among richer and urban women. Some evidence suggests that a lack of jobs outside agriculture and declines in the size of household plots in rural areas have reduced the benefits of having many children.[31] Because of the high population density in Rwanda (about 500 people per square kilometer), the amount of

TABLE 4. Women's mean ideal number of children, and percentage of women desiring to limit childbearing—both by selected characteristics, according to survey year

Characteristic	Mean ideal no. of children				% desiring to limit childbearing			
	2005	2010	2015	Change 2005–2015	2005	2010	2015	Change 2005–2015
All	**4.4**	**3.6**	**3.6**	**–0.8**	**23.7**	**38.7**	**35.5**	**11.8**
Education								
None	4.7	4.0	4.0	–0.7	25.7	45.1	45.3	19.6
Primary	4.4	3.6	3.6	–0.8	21.6	36.7	35.2	13.6
≥secondary	3.8	3.4	3.3	–0.5	32.0	39.9	24.6	–7.4
Household wealth								
Poorest	4.5	3.6	3.5	–1.0	21.5	35.4	34.3	12.8
Poor	4.5	3.7	3.6	–0.9	23.3	36.9	33.7	10.4
Middle	4.5	3.6	3.7	–0.8	22.6	37.0	35.2	12.6
Rich	4.4	3.8	3.7	–0.7	20.1	43.3	39.2	19.1
Richest	4.1	3.5	3.6	–0.5	32.0	40.7	35.3	3.3
Residence								
Urban	4.5	3.7	3.6	–0.9	22.3	39.0	35.9	13.6
Rural	4.0	3.4	3.6	–0.4	32.4	36.8	33.5	1.1

TABLE 5. Percentage of contraceptive users who were using traditional, short-acting, or long-acting or permanent contraceptive methods, by selected characteristics, according to survey year

Characteristic	Traditional			Short acting			Long acting/permanent		
	2005	2010	2015	2005	2010	2015	2005	2010	2015
All	**40.7**	**12.3**	**10.8**	**53.6**	**72.8**	**70.2**	**5.6**	**14.9**	**19.1**
Education									
None	45.8	13.6	15.3	49.6	70.3	68.1	4.6	16.0	16.6
Primary	43.6	11.8	10.0	52.8	75.0	72.0	3.6	13.1	18.0
≥secondary	27.7	13.4	10.2	59.6	63.0	62.4	12.7	23.6	27.4
Household wealth									
Poorest	45.4	10.7	7.3	50.5	79.4	78.0	4.1	9.9	14.7
Poor	50.7	13.1	8.4	45.1	75.0	75.8	4.2	11.9	15.8
Middle	45.9	10.6	11.9	51.6	75.4	70.6	2.5	13.9	17.4
Richer	43.2	13.9	13.6	52.6	70.5	69.9	4.3	15.6	16.6
Richest	29.5	12.8	12.0	61.1	65.6	58.2	9.5	21.5	29.8
Residence									
Rural	43.4	12.5	11.1	52.1	73.3	72.0	4.5	14.2	16.9
Urban	32.8	11.3	9.5	58.2	69.2	61.8	9.0	19.5	28.6

land that the typical household owns is too small to grow enough food to feed a large family and reduces the need for labor.[33] In this context, having many children is of little or no benefit, because the children cannot contribute to household production, which in agrarian societies is often the main motivation for having a large family. Instead, children may be considered a burden to parents because their basic needs must be satisfied. The lack of benefits to having a big family therefore compels many people—especially those in rural areas who lack resources—to prefer smaller families, similar to their richer counterparts.

This finding, which stands in contrast to the general perception that poorer individuals want large families, is consistent with other research. A study of trends in ideal number of children in various African countries found a greater decline among poorer women than among non-poor women.[34] In Nigeria, during a period of crisis, women who had experienced economic hardship had lower fertility preferences than did women who had not.[35] In the Philippines, women from poorer households wanted fewer

TABLE 6. Percentage of contraceptive users who obtained their current contraceptive method from the public medical sector, private sector or community health workers, by selected characteristics, according to survey year

Measure	Public sector			Private sector			Community health workers		
	2005	2010	2015	2005	2010	2015	2005	2010	2015
WOMEN'S CHARACTERISTICS									
All	**73.9**	**82.3**	**58.9**	**26.0**	**7.7**	**7.1**	**0.1**	**10.0**	**34.0**
Education									
None	86.9	84.5	55.1	13.1	3.7	3.0	0.0	11.8	41.9
Primary	75.2	84.4	58.8	24.8	5.3	5.5	0.0	10.3	35.6
≥secondary	61.5	66.5	64.0	37.9	27.3	20.5	0.0	6.2	15.5
Household wealth									
Poorest	84.3	84.5	57.1	15.7	1.4	2.7	0.0	14.1	40.2
Poor	84.8	86.5	59.6	15.2	2.5	3.3	0.0	11.1	37.1
Middle	81.2	87.0	58.9	18.8	2.8	3.3	0.0	10.3	37.8
Richer	79.9	86.0	57.8	20.1	5.6	5.1	0.0	8.4	37.1
Richest	60.8	68.3	61.2	38.8	24.3	21.0	0.4	7.4	17.8
Residence									
Rural	81.8	85.3	58.8	18.2	4.4	3.9	0.0	10.4	37.3
Urban	53.3	63.7	59.7	46.2	28.3	21.6	0.5	7.9	18.6
RATIOS									
None:≥secondary	1.4	1.3	0.9	0.3	0.1	0.1	0.0	1.9	2.7
Poorest:richest	1.4	1.2	0.9	0.4	0.1	0.7	0.0	1.9	2.3
Rural:urban	1.5	1.3	1.0	0.4	0.2	0.2	0.0	1.3	2.0

children than did those from richer households.[36] These examples suggest that in a situation of poverty or crisis, the relationship between fertility preference and socioeconomic status may reverse. The decline in desired number of children can lead to increased demand for birth control and reduced family size, especially among the poorer and rural populations that have been the drivers of high fertility in Sub-Saharan Africa. This seems to have been the case in Rwanda.

Another important factor is changes in types and sources of contraceptive methods used. The disproportionate increase in the use of modern methods among poorer women, and the corresponding reduction in the use of traditional methods, coincided with efforts to increase contraceptive access for rural and lower socioeconomic populations though the construction of secondary health posts, training of community health workers and other health staff providers, and the diversification and increased availability of contraceptive commodities across the country. All of these activities benefited poorer and rural residents more than richer and urban women, who already had access to contraceptives.

In particular, the innovative solution of constructing secondary health posts reduced the distance that women needed to travel to satisfy their family planning needs.[24] The introduction of the community health worker program further improved women's access to contraceptives, and was especially welcomed by the poor; we found that the proportion of women who had obtained their contraceptives from community health workers was substantially higher among women in the poorest quintile than among those in the wealthiest quintile. Previous research has also found that community health worker programs can help increase the prevalence of contraceptive use among disadvantaged groups.[37–39] However, the effectiveness of community health worker programs depends upon their quality and context, and in many African countries, such programs have not yet received the support they deserve from national leaders.

The declining gap in contraceptive use between the poor and rich in Rwanda is not surprising given the strong commitment of the country's leadership and the sensitization campaign run in the last decade. Moreover, similar trends have been observed elsewhere. An analysis of trends in contraceptive use between 1990 and 2013 in 46 developing countries found that wealth-based gaps had substantially narrowed in Asian and Latin American countries, but not in many Sub-Sahara African countries.[40] Declines in disparities were largest in regions where family planning programs were strongest, and were due mainly to greater increases in contraceptive use among the poor. Findings have been heterogeneous in studies focusing on Sub-Saharan Africa.[34,41] Overall, evidence suggests that disparities by socioeconomic status and area of residence have declined in eastern and southern Africa, but have widened in western and central Africa, where increases in contraceptive use among the poor have stalled or even reversed.[42] Findings have also been mixed with regard to rural-urban disparities. The gaps decreased substantially in such countries as Morocco, Senegal and Ghana, but no change was evident in Malawi, and disparities widened in Chad, Kenya and Zambia.[4] In general, gaps among socioeconomic subgroups declined in countries where contraceptive use was high or increasing, often as a result of progress among the poor and rural populations; this suggests that a country's CPR depends largely on the progress achieved by poor and rural populations.

This scenario is consistent with the theory of fertility transition, according to which fertility control starts in privileged (e.g., educated, rich, urban) groups who are the first to desire small families and use contraceptives; these trends spread later to other socioeconomic groups, including the poor, who often are bounded by sociocultural beliefs—such as religious beliefs about procreation and the belief that a woman's value depends on the number of children she has—and by strong kinship, which shares the burden of rearing children among members of a large family.[43,44] The diffusion of positive attitudes about small family size and contraceptive use to the poor can be considered as an indicator of progress in the fertility transition. The diversity among Sub-Saharan African countries in contraceptive disparities related to education, wealth and residence reflects heterogeneity in progress in the fertility transition: Some countries have experienced a notable decline of their fertility, while in others it remains high.

The contraceptive success among the poor and rural populations in Rwanda is a demonstration of how political will and government efforts can mobilize disadvantaged populations to engage in family planning. The activities that contributed to the impressive increase in

contraceptive use were made possible by strong political commitment from the country's leaders.[1] In this regard, the study supports recommendations from researchers and international conferences calling for political willingness, community engagement and increased access to contraceptives to raise contraceptive use.[1,34,45,46]

Limitations

Interpretation of these findings must take into account some limitations. First, the concept of poverty is multidimensional and cannot be fully measured by one or two indicators. We used variables for education level, household wealth and urban or rural residence; use of other proxies or a combination of other variables may have led to different results and conclusions. However, the essential message is that contraceptive use increased faster among the poorest segment of the population than among the wealthiest one, so that the gap between them is narrowing. A second limitation is the difficulty of capturing the multiple causal factors that contributed to behavior change over the study period. In a 2008 analysis, Solo listed six factors that had played a role in increasing contraceptive use in Rwanda.[14] In our article, the framework was limited to available, measurable proximate factors related to demand for, access to and quality of services. Third, because the study used cross-sectional data, it was not possible to demonstrate causal relationships between variables, or between programmatic activities and increased contraceptive use, and thus our analysis identifies only associations and correlations between measures. A fourth limitation concerns the comparability of surveys conducted over the course of a decade; the definitions and effects of education, wealth and urbanity may change over time. Finally, our outcome variable was contraceptive prevalence, because Rwanda's family planning policy has aimed to increase contraceptive use to curb population growth. Thus, the research only partially captures the impact of the family planning program; a supplementary outcome variable could have been unmet need, which considers women in need of family planning rather than the total population. Nevertheless, the study findings are consistent with the conclusion that the Rwanda family planning program has been effective in reducing the contraceptive use gap within the population.

Policy Implications

This study has revealed that the higher level of contraceptive uptake among the poor coincided with a number of innovative strategies that removed barriers and consequently responded to population needs. The effectiveness of these strategies should, however, be interpreted in the context of Rwanda. Their exportation to other contexts may produce different results, and governments that want to see their poor populations engaged in family planning should consider designing strategies based on the country context.

Another lesson from this study is that the community health program appears to have succeeded among poor and rural residents, and that it addressed barriers that other approaches did not. In this regard, our study supports the community health program approach for expanding access to family planning services, particularly in poor, predominately rural regions where health providers are in short supply.[47] Moreover, because the community health program is a public-sector program, the findings provide support for public funding, even in countries with high-performing family planning programs, as experience has shown that slackening of financial support can result in reversal of progress.[48]

Finally, the study highlights that increasing contraceptive use among poor and rural populations in Sub-Saharan Africa can substantially improve outcomes for the entire country, given that these subgroups account for large shares of the total population and of national fertility. Rwanda experienced an increase in overall contraceptive use because the poor and rural populations made important progress. Other African governments that want to curb high population growth that hinders socioeconomic development and achievement of Sustainable Development Goals may similarly benefit from increased investment targeting rural areas and the poor strata of the population.

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RESUMEN

Contexto: *La evidencia sugiere que a medida que Ruanda ha fortalecido su programa de planificación familiar, las disparidades en el uso de anticonceptivos con base en el nivel socioeconómico se han reducido. Sin embargo, los cambios en estas brechas y los mecanismos subyacentes no son bien comprendidos.*

Métodos: *Se analizaron datos de las Encuestas Demográficas y de Salud de Ruanda de 2005, 2010 y 2015 correspondientes a 19,028 mujeres de 15 a 49 años que vivían en unión libre, con el fin de examinar las tendencias en las*

disparidades socioeconómicas en el uso de anticonceptivos. Se utilizaron estadísticas descriptivas y regresión multivariada con términos de interacción para identificar cambios en estas disparidades, así como para describir tendencias en la fecundidad deseada y los tipos y fuentes de anticonceptivos utilizados.

Resultados: *Entre los años 2005 y 2015, la prevalencia del uso de anticonceptivos modernos aumentó del 11% al 48%. En los análisis de regresión, los términos de interacción indicaron que la prevalencia aumentó en menor medida entre las mujeres con buena posición económica, que tenían al menos educación secundaria o que vivían en áreas urbanas en comparación con las que vivían en condiciones de pobreza, carecían de escolaridad o vivían en áreas rurales (razón de probabilidades, 0.5−0.7). Paralelamente, los descensos en la fecundidad deseada fueron mayores entre las mujeres sin escolaridad que entre aquellas con al menos educación secundaria (en 0.7 vs. 0.5 hijos); entre las mujeres con mayor pobreza que las de mayor riqueza (por 1.0 vs. 0.5 hijos); y entre residentes rurales en comparación con las residentes urbanas (por 0.9 vs. 0.4 hijos).*

Conclusiones: *La reducción de las brechas en el uso de anticonceptivos por el nivel socioeconómico coincidió con la reducción de las disparidades en la demanda de hijos y con mejoras en los servicios de planificación familiar, lo que sugiere que las poblaciones desfavorecidas podrían haberse beneficiado especialmente de los programas públicos para aumentar el acceso a los anticonceptivos.*

RÉSUMÉ

Contexte: *Les données laissent entendre, à mesure du renforcement du programme de planification familiale au Rwanda, un rétrécissement des écarts de la pratique contraceptive suivant la situation socioéconomique. L'évolution de ces disparités, et les mécanismes qui la sous-tendent, ne sont cependant pas bien compris.*

Méthodes: *Les données des Enquêtes démographiques et de santé 2005, 2010 et 2015 du Rwanda concernant 19.028 femmes en union âgées de 15 à 49 ans ont été analysées pour examiner les tendances des disparités socioéconomiques sur le plan de la pratique contraceptive. L'évolution de ces disparités, de même que les tendances concernant la fécondité désirée et les types et sources de contraceptifs utilisés, ont été identifiés et décrits par statistiques descriptives et régression multivariée avec termes d'interaction.*

Résultats: *Entre 2005 et 2015, la prévalence de la contraception moderne est passée de 11% à 48%. Dans les analyses de régression, les termes d'interaction indiquent une hausse moindre de cette prévalence parmi les femmes riches, instruites au niveau pour le moins secondaire ou vivant en milieu urbain, par rapport à leurs homologues pauvres, non instruites ou résidentes des milieux ruraux (RC, 0,5−0,7). Parallèlement, la baisse de la fécondité désirée s'est avérée plus importante parmi les femmes non instruites par rapport à celles dotées d'une éducation de niveau au moins secondaire (dans une mesure de 0,7 vs 0,5 enfant); parmi les femmes les plus pauvres par rapport aux plus riches (1,0 vs 0,5) et parmi les résidentes des milieux ruraux par rapport aux milieux urbains (0,9 vs 0,4).*

Conclusions: *L'amoindrissement des écarts de la pratique contraceptive en fonction de la situation socioéconomique coïncide avec celui des disparités du désir de fécondité et avec l'amélioration des services de planification familiale, laissant entendre que les populations défavorisées peuvent avoir particulièrement bénéficié des programmes publics d'élargissement de l'accès à la contraception.*

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