

# Who Is Using Long-Acting Reversible Contraceptive Methods? Findings from Nine Low-Fertility Countries

**CONTEXT:** Long-acting reversible contraceptive (LARC) methods—IUDs and implants—are more effective than other reversible methods, yet are little used in the United States. Examining which U.S. women use LARC methods and how they differ from users in other low-fertility countries may help point the way toward increasing use.

**METHODS:** Data from married or cohabiting women participating in the National Survey of Family Growth (2008–2010) and in eight countries' Generations and Gender Programme surveys (2004–2010) were used in bivariate and multinomial logistic regression analyses examining LARC use within each setting.

**RESULTS:** The proportion of contraceptive use accounted for by LARC methods was generally greater in Europe (10–32%) than in the United States (10%) and Australia (7%). Compared with LARC use among comparable groups in other countries, use was particularly low among U.S. women who were married, were aged 40–44 or had had three or more children, yet was comparatively high among 18–24-year-olds. Among U.S. women, those aged 35–39 or 40–44 were more likely than 18–29-year-olds to rely on sterilization rather than on LARC methods (odds ratios, 3.0 and 10.7, respectively), those who had had three or more children were more likely to do so than were those who had had none or one (4.9), and women who had completed college were less likely than those who had not finished high school to do so (0.4).

**CONCLUSIONS:** Certain subgroups of U.S. women may benefit from the reversibility and effectiveness of LARC methods.

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Worldwide, one-fourth of married or cohabiting female contraceptive users rely on IUDs and implants.<sup>1</sup> These long-acting reversible contraceptive (LARC) methods protect against pregnancy for 3–10 years and are highly cost-effective.<sup>2</sup> Yet despite these benefits, reliance on LARC methods in the United States remains relatively low; among married or cohabiting women who were aged 15–44 and who used a contraceptive, only 9% reported LARC use in 2008–2010.<sup>3</sup>

Increasing LARC use in the United States is a particularly salient goal, given the high level of unintended pregnancy among U.S. women—more than half of all pregnancies in 2008 were mistimed or unwanted.<sup>4</sup> Moreover, 43% of unintended pregnancies in 2000–2001 were attributable to inconsistent or incorrect contraceptive use.<sup>5</sup> LARC methods are associated with lower rates of unintended pregnancy than most other methods, because their high efficacy is not dependent on user compliance.<sup>2</sup> They also have the potential for reducing the incidence of poststerilization regret.<sup>3</sup> Like sterilization, they are cost-effective, highly effective, “forgettable” methods;<sup>2</sup> yet, unlike sterilization, implants and IUDs have the advantage of being reversible. Estimates suggest that in 2006–2010, more than one in four U.S. women with a tubal ligation wanted to reverse the procedure.<sup>6</sup> Increasing LARC use in the United States could facilitate the achievement of women's and couples' often dynamic childbearing desires.

Efforts to increase reliance on LARC methods need to be grounded in a fuller understanding of the barriers to their wider use. Yet relatively little is known about how the correlates of LARC use in the United States differ from those observed in other low-fertility countries. Existing comparative information on recent patterns of LARC use, such as the United Nations World Contraceptive Use series,<sup>7</sup> lacks the standardization of samples and variables achievable within the framework of a single study. For example, samples used to produce estimates for the United Nations report vary across countries in terms of age and union status restrictions.<sup>8</sup> In addition, existing comparative reports contain little information on the background characteristics of LARC users in each country.

Even within the United States, knowledge of the characteristics of LARC users remains limited, as most studies examining the correlates of LARC use have been solely descriptive.<sup>3,9,10</sup> Multivariate models can help determine if, for example, greater LARC use among married or cohabiting women than among those without a coresidential partner is merely an artifact of their different age profile or higher achieved parity. The scarce research employing multivariate models also often excluded sterilized individuals, and thus could not investigate the variables that may be associated with decisions to use a LARC method instead of sterilization.<sup>11–14</sup> Knowledge of such variables is essential,

given that U.S. couples who have completed their families continue to rely heavily on sterilization,<sup>3</sup> even though LARC methods provide a valuable alternative. Finally, none of the multivariate studies analyzed the 2008–2010 NSFG data (the most recent), which showed a substantial increase in LARC use compared with that for 2006–2008.<sup>3</sup>

In this study, we compare women's patterns of LARC use in the United States with those in eight other low-fertility countries: Australia, Austria, Bulgaria, France, Georgia, Germany, Romania and Russia.\* We also employ multivariate models to determine if and how the characteristics of LARC users differ between the United States and these other countries.

## METHODS

### Data and Sample

Data for this study were drawn from the 2006–2010 NSFG and the first wave of the Generations and Gender Programme (GGP), which was conducted in 2004–2010.† NSFG data are representative of the U.S. civilian, noninstitutionalized population aged 15–44 when properly weighted, and include oversamples of respondents who are black or Hispanic. The response rate was 78% for women.<sup>15</sup> We used data only from 2008–2010, as the proportion of female contraceptive users relying on LARC methods more than doubled between the first and second two-year periods of the full 2006–2010 study.<sup>3</sup> In 2008–2010, face-to-face interviews were conducted with 6,428 women. All analyses and descriptive statistics were adjusted for the survey's complex sampling design using the *svy* command in Stata 12.

The GGP is a cross-national, comparative, multidisciplinary, retrospective and prospective study of the dynamics of family relationships in industrialized countries.<sup>16</sup> Face-to-face interviews were conducted with an average of 10,000 male and female respondents in each of 19 countries, but only our study countries gathered detailed data on contraceptive method use. Survey data are representative of the 18–79-year-old resident population in each country. Response rates ranged from 50% (in Russia) to 97% (in

Romania). Analyses and descriptive statistics based on GGP data were adjusted using sampling weights.

We placed a number of restrictions on our analytic samples. Information on contraceptive use was available in the harmonized GGP data (i.e., data formatted for cross-country comparison) only for married or cohabiting individuals, or those who were in other "intimate partnerships." Because of concerns about variability in the meaning of this term across respondents and countries (e.g., are intimate partnerships any ongoing sexual partnership or only more committed unions?), and to enhance comparability between the GGP and NSFG analyses, we limited the analytic samples to female contraceptive users who were married to or living with a man. We did not consider women who were currently pregnant or who indicated that they could not have a child for reasons other than surgical sterilization, as these women were categorized as not using a contraceptive in both GGP and NSFG data. Because of the age limits of the surveys, we further limited the samples to women aged 18–44.

### Measures

Our primary dependent variable is current contraceptive method used: sterilization (female or male), IUD or implant, the pill, other hormonal methods (injectable and, for the United States only, the hormonal ring and patch), condoms and other less effective methods (emergency contraception, withdrawal, rhythm, natural family planning, foam, cream, jelly, suppository, diaphragm and cervical cap). In both the GGP and the NSFG data, we first identified couples in which either partner was surgically sterilized. For nonsterilized couples, we then considered reports of current contraceptive use. In the GGP, this is based on a question about whether the woman or her partner is using one or more specific methods to prevent pregnancy "at this time." In the NSFG, we relied on the recoded measure (for which consistency has been checked and missing values have been imputed)<sup>15</sup> of current contraceptive use in the month of interview. In cases where multiple methods were reported,‡ we selected the most effective one, as determined on the basis of documented differentials in failure rates.<sup>17</sup>

We considered a number of social and demographic measures that have been associated with LARC use in previous studies:<sup>12</sup> age (18–24, 25–29, 30–34, 35–39, 40–44), parity (0, 1, 2, or 3 or more),§ early childbearing (first birth at age 15–19 or 20–24, or no early birth), union status (married or cohabiting) and nativity (native-born or not). Because of very low levels of LARC use among women aged 18–24 and nulliparous women in some study countries, the reference groups for age and parity in the multivariate analyses are 18–29 and 0–1, respectively. Educational level was assessed using the 1997 International Standard Classification of Education; categories were less than high school, completed high school (including vocational education or some college) and completed college. Because of the importance of racial and ethnic background to contraceptive use patterns in

\*In all of these countries, the total fertility rate in 2005–2010 was below that of the United States (2.1): Australia (1.9), Austria (1.4), Bulgaria (1.5), France (2.0), Georgia (1.6), Germany (1.4), Romania (1.3) and Russia (1.4) (source: United Nations, Department of Economic and Social Affairs, Population Division, World population 2010, 2011, <<http://esa.un.org/wpp/Other-Information/wall-chart.htm>>, accessed Jan. 4, 2014).

†The GGP's panel design means that Wave 1 respondents were reinterviewed at three-year intervals. We chose not to use Wave 2 data, as they do not include updated information on sterilization, are currently available for only four of our study countries and have a far more limited sample size because of high attrition (i.e., between 17%, in Georgia, and 67%, in Germany).

‡In our analytic sample, the proportion of respondents reporting multiple method use was 10% in the United States and ranged from 1% (in Georgia) to 27% (in Romania).

§In the Australian GGP, the variables parity and early childbearing include adopted children.

the United States,<sup>10</sup> we also controlled for race and ethnicity (white, black, Hispanic, other) in the U.S. analyses (results are available on request).

### Analyses

The analyses were conducted in three steps. First, we used t tests to examine if levels of overall IUD and implant use differed significantly ( $p < .05$ ) across study countries.

Second, we conducted chi-square tests to examine bivariate associations between respondents' characteristics and LARC use within each country, as well as t tests to compare levels of LARC use by each characteristic across countries. Third, we entered all independent variables simultaneously into a multinomial logistic regression model for each country to determine the relative odds of women's reliance on sterilization or some other method

**TABLE 1. Percentage of married or cohabiting women aged 18–44 using any contraceptive method, and percentage distribution of users by method—all according to country, National Survey of Family Growth and Generations and Gender Programme, various years, 2004–2010**

Country	N	% using any method	% distribution of users								
			LARC		Female sterilization†	Male sterilization	Pill	Other hormonal	Condom	Other less effective method	Total
			IUD	Implant							
United States	2,768	77.6	9.5	0.7	29.2	13.9	20.6	3.5	15.6	7.0	100.0
Australia	1,056	69.1	3.2	3.6	16.5	21.8	31.3	1.7	18.6	3.2	100.0
Austria	1,882	71.6	21.8	1.2	8.5	7.2	35.6	2.8	18.7	4.3	100.0
Bulgaria	2,973	66.3	17.6	0.0	3.2	0.1	10.6	0.0	25.9	42.6	100.0
France	1,567	76.1	25.0	1.8	4.2	0.8	58.4	0.1	7.1	2.5	100.0
Georgia	1,765	48.7	23.4	0.0	10.4	0.4	18.4	0.7	14.7	31.9	100.0
Germany	1,622	66.4	10.3	0.7	9.4	3.5	60.4	1.1	7.8	7.0	100.0
Romania	1,764	73.4	9.8	0.0	4.7	0.1	29.7	0.7	27.6	27.4	100.0
Russia	1,828	70.0	32.3	0.0	5.4	0.2	15.6	0.5	24.3	21.7	100.0

†Includes women in couples in which both partners have been sterilized. Notes: Survey periods are 2008–2010 for the United States; 2005–2006 for Australia; 2008–2009 for Austria; 2004 for Bulgaria and Russia; 2005 for France, Germany and Romania; and 2006 for Georgia. Percentages may not total 100.0 because of rounding. LARC=long-acting reversible contraceptive.

**TABLE 2. Percentage distribution of married or cohabiting women using any contraceptive method, by selected characteristics; and percentage with each characteristic who were using a LARC method—all according to country**

Characteristic	United States†		Australia		Austria		Bulgaria		France		Georgia		Germany		Romania		Russia		
	Any	LARC	Any	LARC	Any	LARC	Any	LARC	Any	LARC	Any	LARC	Any	LARC	Any	LARC	Any	LARC	
<b>Age</b>		**		**		**		**		***		***		**					*
18–24	12.2	14.6	6.2	4.2	7.9	13.8	6.7	9.0	11.3	5.6	8.5	13.9	7.1	1.7	7.6	6.7	11.5	24.7	
25–29	18.8	10.9	14.6	14.9	17.3	17.1	15.8	13.7	16.0	8.7	20.8	24.1	15.6	4.9	22.1	7.3	20.7	27.5	
30–34	20.0	11.8	21.5	5.9	20.5	21.3	24.9	17.4	20.1	26.0	25.0	23.6	21.0	14.1	33.1	10.3	19.5	34.3	
35–39	24.7	12.2	27.1	8.4	26.1	27.2	25.5	21.3	27.3	38.0	24.7	24.9	28.1	14.6	23.6	13.8	21.1	38.5	
40–44	24.3	4.2	30.6	2.9	28.3	26.4	27.1	18.6	25.2	36.3	21.0	24.8	28.2	10.4	13.6	7.2	27.3	33.1	
<b>Parity</b>		***		**		***		*		***		***		*					***
0	20.3	2.4	22.3	6.8	20.1	11.9	3.8	6.7	20.2	1.2	3.6	2.9	18.7	5.6	11.3	4.6	2.2	5.7	
1	15.9	18.2	12.0	2.5	24.0	21.8	35.5	17.9	22.2	21.6	19.5	14.8	28.9	9.3	40.9	8.6	46.7	27.9	
2	34.4	14.0	37.9	11.1	40.8	30.0	53.0	19.0	36.1	37.1	54.9	25.2	36.7	13.8	37.7	12.2	41.4	36.8	
≥3	29.4	6.9	27.8	3.1	15.1	20.6	7.7	11.9	21.5	38.8	22.0	30.0	15.7	13.6	10.1	11.6	9.7	40.6	
<b>Early childbearing</b>									*		***								**
At age 15–19	23.1	12.5	9.5	4.4	10.9	18.4	27.3	18.4	6.8	37.0	32.7	28.6	10.1	4.6	22.2	10.4	24.7	36.2	
At age 20–24	28.5	10.9	24.8	7.9	30.0	26.0	50.8	18.0	27.0	31.2	43.2	25.6	32.2	10.5	44.1	11.3	59.2	33.1	
No early birth	48.4	8.7	65.7	6.9	59.1	22.2	21.9	15.6	66.2	24.0	24.1	12.7	57.7	12.2	33.7	7.4	16.1	23.4	
<b>Union status</b>				**		*				**		***				**			*
Married	76.6	10.2	79.6	5.2	67.7	25.1	87.6	18.2	62.5	30.8	81.3	25.8	79.0	11.5	92.4	10.5	85.0	33.5	
Cohabiting	23.4	10.2	20.4	13.3	32.3	18.5	12.4	13.2	37.5	20.2	18.7	13.1	21.0	8.7	7.6	1.3	15.0	25.5	
<b>Education</b>								***											
<high school	16.9	8.5	28.3	3.1	14.1	19.1	17.6	8.0	16.6	27.2	6.6	23.6	12.5	9.5	26.3	8.2	4.7	27.9	
Completed high school	54.3	10.4	31.4	7.5	67.1	24.0	52.9	19.2	41.9	28.6	59.6	25.6	66.1	9.6	61.8	10.4	47.0	33.4	
Completed college	28.8	10.9	40.2	9.0	18.8	22.2	29.5	20.4	41.4	24.9	33.8	19.6	21.4	15.6	11.8	10.2	48.3	31.7	
<b>Nativity</b>																			
Native-born	82.2	10.0	77.2	6.6	81.8	24.1	98.9	17.5	90.2	26.2	98.1	23.5	82.9	11.5	99.9	9.8	90.3	32.7	
Not native-born	17.8	11.1	22.8	7.9	18.3	17.7	1.1	28.5	9.8	32.1	1.9	19.2	17.1	7.8	0.1	0.0	9.7	29.0	

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ . †In addition to the characteristics shown, analyses for the United States included race and ethnicity. Notes: Significance testing used chi-square tests. Percentages may not total 100.0 because of rounding. LARC=long-acting reversible contraceptive.

**TABLE 3. Odds ratios from multinomial logistic regression analyses assessing associations between selected characteristics and women’s use of sterilization or other methods, rather than LARC methods, by country**

Characteristic	United States		Australia		Austria		Bulgaria		France	
	Sterilization	Other	Sterilization	Other	Sterilization	Other	Sterilization	Other	Sterilization	Other
<b>Age</b>	***		***		***		***		***	
18–29 (ref)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
30–34	1.88	0.83	6.06**	2.12	1.95	0.87	1.38	0.73	3.13	0.32***
35–39	3.04***	0.49*	9.41**	1.21	3.18*	0.55**	1.81	0.55**	3.02	0.18***
40–44	10.66***	1.39	34.73***	2.96	4.53**	0.49**	5.37**	0.60*	15.05*	0.16***
<b>Parity</b>	***		***		***				**	
0–1 (ref)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2	1.71	0.43***	0.39	0.12***	1.77	0.47***	0.70	0.97	0.32*	0.34***
≥3	4.88***	0.81	1.63	0.23*	3.89***	0.58*	0.70	1.14	0.30*	0.37**
<b>Early childbearing</b>	***						*			
At age 15–19	0.79	0.33**	1.11	0.76	0.85	0.92	0.68	0.81	1.99	0.89
At age 20–24	1.04	0.46**	2.43	1.20	1.66	1.06	0.68	0.56**	1.51	0.47*
No early birth (ref)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
<b>Union status</b>			***							
Married (ref)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Cohabiting	0.84	1.28	0.12***	0.28**	0.92	1.08	0.67	0.92	0.92	0.75
<b>Education</b>	*						***			
<high school (ref)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Completed high school	0.69	0.77	0.43	0.50	0.73	0.81	0.26**	0.35***	0.35*	0.66
Completed college	0.37*	0.71	0.25*	0.36*	0.49	0.90	0.16***	0.29***	0.30*	0.64
<b>Nativity</b>										
Native-born (ref)	1.00	1.00	1.00	1.00	1.00	1.00	na	na	1.00	1.00
Not native-born	0.64	1.06	0.85	0.66	1.00	1.44	na	na	1.01	0.71

\*p<.05. \*\*p<.01. \*\*\*p<.001. Notes: Symbols opposite the names of characteristics indicate significance of associations between characteristics and contraceptive use patterns (based on Wald tests). Analyses for the United States included race and ethnicity; results are not shown. LARC=long-acting reversible contraceptive. ref=reference group. na=not applicable; characteristic was not included because of a lack of variation.

rather than on a LARC method. In addition, we conducted Wald tests to identify variables that were associated with contraceptive use patterns in the multivariate models. Limited use of implants in most of our study countries did not allow for multivariate models that separately examined IUD or implant use; however, analyses of IUD use only did not lead to substantively different conclusions. Unless noted otherwise, any differences mentioned in the following section are statistically significant. All analyses were conducted using Stata 12.

**RESULTS**

**Overall LARC Use**

Combined IUD and implant use accounted for only 10% of contraceptive use in the United States (Table 1), a proportion similar to that in Australia (7%), Germany (11%) and Romania (10%). Higher levels of LARC use were reported in Austria (23%), Bulgaria (18%), France (27%), Georgia (23%) and Russia (32%). In all countries except Australia, LARC use was made up primarily of IUD use.

\*Additional analyses of the U.S. data (not shown) reveal that the high level of LARC use among women younger than 25 reflects particularly high use among those who have one or more children—a finding that is in line with findings from other research.<sup>2</sup> Childless women younger than 25, like all childless women in the United States, display low rates of LARC use.

**LARC Use by Characteristic**

•**Age.** Despite a low rate overall, the prevalence of LARC use was comparatively high among young U.S. women: Some 15% of 18–24-year-olds relied on a LARC method (Table 2). \* Prevalence of LARC use within this age-group was significantly lower in Australia (4%), France (6%) and Germany (2%). The level of LARC use among women aged 40–44 was lower in the United States (4%) than in all other study countries except Australia (3%) and Romania (7%).

In multivariate analyses (Table 3), U.S. women in the two oldest age-groups were more likely than 18–29-year-olds to rely on sterilization rather than on LARC methods (odds ratios, 3.0 and 10.7 for those aged 35–39 and 40–44, respectively); 35–39-year-olds were less likely than those aged 18–29 to use other reversible methods instead of LARC methods (0.5). Among older age-groups, the same general patterns emerged across countries: Reliance on sterilization was greater than use of LARC methods, and (except in Australia and Georgia) use of other methods was lower.

•**Parity.** The level of LARC use was low (7%) among U.S. women who had had three or more children, and was significantly greater among comparable women in Austria (21%), France (39%), Georgia (30%) and Russia (41%). Notably, in Australia and Austria—two other countries with comparatively high levels of sterilization—women who had had three or more children also reported substantially less

Georgia		Germany		Romania		Russia	
Sterilization	Other	Sterilization	Other	Sterilization	Other	Sterilization	Other
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2.36*	0.91	3.15	0.26**	2.06	0.75	1.15	0.76
3.48**	0.81	5.05	0.29**	1.65	0.58*	4.22**	0.58**
5.88***	0.72	10.70**	0.37*	5.33**	1.23	7.03***	0.73
			**		*		
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.44*	0.62	0.96	0.53*	1.50	0.67	1.12	0.73*
0.35*	0.54*	1.10	0.42*	1.82	0.57	0.74	0.68
	*		**				*
0.74	0.48**	1.91*	1.15	0.49	0.71	1.10	0.66*
0.95	0.43**	6.87**	2.98	0.62	0.69	1.42	0.54**
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.40	1.85*	0.55	0.95	4.45	7.07	1.52	1.31
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.35*	1.09	1.67	1.50	1.03	0.67	0.36	0.91
0.52	1.22	0.73	1.03	0.94	0.52	0.30*	0.92
			*				
na	na	1.00	1.00	na	na	1.00	1.00
na	na	0.64	1.54	na	na	0.51	1.26

LARC use than women with two children. LARC use was generally uncommon among nulliparous women; in this category, only Austria had a significantly higher prevalence of LARC use than the United States (12% vs. 2%).

Multivariate analysis indicated that in the United States, women who had had three or more children were much more likely than those who had had no more than one to rely on sterilization rather than on LARC methods (odds ratio, 4.9). Furthermore, U.S. women who had had two children had reduced odds of using other methods rather than LARC methods (0.4). In general, these patterns were also seen in Australia and western Europe, with one important exception: In France, a negative association was found between parity and the use of sterilization instead of LARC methods (0.3 for women who had had two children or three or more). This can be explained by the country's low overall level of sterilization and very low level of LARC use among nulliparous women.

•**Early childbearing.** In the bivariate analysis, early childbearing was not associated with the use of LARC methods in the United States. Positive associations were found in France, Georgia and Russia.

In the multivariate models, U.S. women who had had an early birth were less likely than others to use other reversible methods as opposed to LARC methods (odds ratios, 0.3–0.5). Similar associations were found among some women who had had an early birth in Bulgaria, Georgia

and Russia (0.4–0.7). In Germany, women who had had an early birth were more likely than others to rely on sterilization rather than on a LARC method (1.9–6.9).

•**Union status.** In the United States, LARC use was equally prevalent (10%) among married and cohabiting women. By contrast, in most other study countries, LARC use was more common among married women. And in Australia, it was more prevalent among cohabiting than among married women, largely because of the high use of implants by cohabiting women (10%, compared with 2% among married women—not shown).

Few associations between union status and contraceptive use were found in the multivariate models. In Australia, cohabiting women were less likely than married women to rely on sterilization (odds ratio, 0.1) or other methods (0.3) as opposed to LARC methods. Separate analyses for implants and IUDs (not shown) confirmed that the Australian pattern was largely driven by a relatively high prevalence of implant use, though an overall association with union status was observed in the analysis for IUDs as well (but none of the specific contrasts reached statistical significance).

•**Education.** In bivariate analysis, educational level was associated with the use of LARC methods in only one study country. In Bulgaria, LARC use was least common among women who had less than a high school education. In regression analyses, an association emerged in the United States, where women who had completed college were less likely than those without a high school education to rely on sterilization instead of a LARC method (odds ratio, 0.4). A similar association was observed for women in Bulgaria who had completed high school (0.3) or college (0.2). Furthermore, high school and college graduates in that country were less likely than those without a high school degree to use other reversible methods rather than a LARC method (0.4 and 0.3, respectively).

•**Nativity.** No bivariate associations between LARC use and nativity status were found for any of the study countries. In multivariate analysis, a statistically significant correlation was observed for Germany, though none of the specific contrasts reached significance. Note that we did not include this measure in the multivariate models for Bulgaria, Georgia or Romania because of limited variation there (i.e., few residents were not native-born).

## DISCUSSION

Three key findings emerged from this study. First, we confirmed the generally low levels of LARC use in the United States, particularly compared with use in Austria, France, Georgia and Russia. In all study countries except Australia, LARC use is composed primarily of IUD use.

Low prevalence of IUD use in the United States has been attributed to numerous factors, including the high up-front cost of IUDs, the historical omission of IUDs or insertion costs from many health insurance plans, and the poor reputation and subsequent distrust of IUDs associated with litigation surrounding the Dalkon Shield in the 1970s.<sup>18–21</sup> Because this device was seldom used in Europe, its history

had much less of an impact there.<sup>22</sup> IUD use has increased in the United States since the levonorgestrel-releasing intrauterine system was introduced in 2000.<sup>12,23</sup> Even with this increase, however, U.S. levels of IUD use remain considerably below the levels of use in most other low-fertility countries.<sup>1</sup> Recent upticks in IUD use in the United States, as well as women's increased access to IUDs through the implementation of Women's Preventive Services Guidelines (under the Affordable Care Act), indicate that the level of IUD use may continue to rise in the United States, and eventually approach levels in other low-fertility countries.

A second key finding is that the prevalence of LARC use in the United States is comparatively high among 18–24-year-olds—a finding that seems at odds with the low level of use among nulliparous women. Although this finding is in line with reports of increases in LARC use among young women,<sup>12</sup> and with current recognition that these methods are safe and effective for this group,<sup>24</sup> most of this LARC use is concentrated among those who have at least one child. Practice guidelines dating from 1985, but revised in 2005, and unadjusted product labeling (one of the most widely available IUDs is still not labeled for nulliparous women) may contribute to persistent low levels of IUD use among nulliparous women of all ages.<sup>3,14,20</sup> Hence, nulliparous women may present an opportunity for future efforts to increase LARC use in the United States, particularly in light of recent increases in the mean age at first birth and the high likelihood that teenage females will rely on less effective methods (e.g., condoms), which they often use inconsistently and discontinue.<sup>25,26</sup> Moreover, data indicating a decrease in repeat teenage births and an increase in LARC use among teenage mothers suggest that efforts to promote LARC methods among this population should continue to be implemented and supported.<sup>27</sup>

Finally, women's reliance on sterilization is a critical factor in describing LARC use in the United States. For example, compared with U.S. women who have had no more than one child and women aged 18–29, we found that those who have had three or more children and those aged 35–44, respectively, rely much more heavily on sterilization than on LARC methods. Furthermore, women with a college education have a reduced likelihood of relying on sterilization rather than LARC methods. Serious safety concerns that emerged in the 1970s regarding the Dalkon Shield IUD may have contributed to increased use of sterilization—16% of married women aged 15–44 relied on female or male sterilization in 1973, compared with 38% in 1988.<sup>28</sup> In contrast, throughout the 1970s and 1980s, IUDs remained available in many European countries, training in insertion and removal became a standard part of the medical curriculum, and practice guidelines did not display a high level of negative attitudes, as they did in the United States.<sup>22,23</sup> In Europe, less favorable perceptions of sterilization, and often restrictive policies (e.g., in Bulgaria, France and Russia),<sup>29</sup> may have contributed to greater acceptance of IUDs among couples who had completed their families. Our findings demonstrate a continued reliance on sterilization among U.S. women of reproductive age, and highlight an important role for poli-

cies promoting LARC methods as a substitute for contraceptive sterilization. Such policies should also pay particular attention to subgroups found to have elevated levels of sterilization regret, including younger parous women,<sup>30</sup> those with relatively low educational levels<sup>28</sup> and those from ethnic minority groups.<sup>31</sup>

### Limitations

A few limitations should be noted regarding the interpretation of our results. First, in an effort to enhance the uniformity of our samples across the GGP and NSFG data sets, we restricted the samples to contraceptive users who were married to or living with a man. We caution against generalizing these results to the entire population of sexually active adults, given established differences in method choice and IUD use between cohabiting or married adults and those not in coresidential partnerships.<sup>3</sup> Moreover, response rates varied greatly (50–97%) across the surveys and may affect the generalizability of our results, particularly in countries with lower rates.

Second, given differences in when the various surveys were conducted, temporal differences in trends within and across countries may not be accounted for in these analyses. We believe this limitation is balanced, however, by the ability to compare findings across nine countries, and by the maximum difference of only six years between data collection points (2004–2010).

Finally, the scope of this study was restricted by our focus on country-level differences in LARC use. Considering U.S. contraceptive use patterns within a comparative context meant that we paid little attention to regional or racial and ethnic diversity within countries, which is potentially substantial. In addition, this study aimed to examine the characteristics of U.S. LARC users in a comparative context, rather than possible explanations for observed country differences in LARC use. For example, we did not examine the extent to which country differences in the level of LARC use among nulliparous women may be explained by variation between countries in the mean duration between marriage or cohabitation and the birth of a first child. Even though such demographic characteristics are unlikely to explain large general differences in LARC use across our study countries, they should be kept in mind when considering country-specific patterns in the profile of LARC users. Moreover, a literature review on variation in IUD use across countries has highlighted the important role of government policies and health care providers.<sup>32</sup> We acknowledge that these larger contextual and supply-side factors also contribute to patterns of LARC use; however, we were not able to examine these factors in our analyses.

### Conclusions

A full understanding of the barriers to wider use of LARC methods in the United States has been hampered by a lack of comparative research and limited knowledge of the characteristics of current U.S. users. This study provides valuable

insight into contraceptive use patterns across selected low-fertility countries, and identifies social and demographic groups in the United States that may benefit from the reversibility and effectiveness of LARC methods. Further investigation is needed to assess and address the persistent barriers to LARC use in the United States, and should not only focus on supply-side factors such as access and cost, but also seek to understand the perceptions of and demand for specific methods within and across subgroups that may inhibit the uptake or continued use of LARC methods.

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