Perceived Infertility Among Young Adults in Balaka, Malawi

By Chelsea B. Polis, Ann M. Moore, Abdallah Chilungo and Sara Yeatman

CONTEXT: *Perceived infertility—an individual's belief that she or he is unable to conceive or impregnate a partner—may lead to contraceptive nonuse and unintended pregnancy, among other concerns, but has not been widely studied in low-income settings.*

METHODS: *A measure of perceived infertility previously used in the United States was included in a 2015 survey of young adults in Balaka, Malawi. The prevalence of potential perceived infertility (i.e., believing it is a little or substantially likely that one is infertile, or would have difficulty getting pregnant or impregnating a partner; PPI) was estimated among the analytic sample of 1,064 women and 527 men aged 21–29. Multivariable logistic regression was used to identify variables associated with PPI; respondents' reasons for PPI and their estimates of the probability of pregnancy after unprotected sex were also investigated.*

RESULTS: *The prevalence of PPI was 8% overall, and 20% among nulliparous women. Factors associated with PPI and reasons for PPI varied by gender. For women, PPI was significantly associated with age, education, an interaction term between age and education, number of sexual partners, feelings if she were to become pregnant next month, parity and contraceptive use. For men, PPI was associated with an interaction term between age and education, number of sex partners and marital status. Respondents tended to overestimate the probability of pregnancy after unprotected sex.*

CONCLUSIONS: *Perceived infertility was lower in Malawi than in the United States, although substantial among certain subgroups. Educational interventions aimed at increasing knowledge about pregnancy probabilities and the return of fertility after contraceptive discontinuation may reduce concerns around perceived infertility.*

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Infertility is defined as "a disease characterized by the failure to establish a clinical pregnancy after 12 months of regular, unprotected sexual intercourse or due to an impairment of a person's capacity to reproduce either as an individual or with his/her partner."[1] Perceived infertility, on the other hand, has been defined as an individual's belief that she or he is unable to conceive or impregnate a partner, regardless of whether the belief is in fact medically accurate.[2] Few studies have investigated factors associated with perceived infertility,[2] although the phenomenon could both affect and be affected by contraceptive use and method choice. For example, if someone believes that she is unlikely to get pregnant, she may be less likely to use an effective contraceptive method than someone who perceives herself to be at risk of unintended pregnancy.[2–4] Conversely, misperceptions that contraceptive use harms future fertility could also mean that such use (coupled with inaccurate information) may increase future perceived infertility.[5–8] Thus, some portion of contraceptive nonuse or inconsistent use may result from perceived infertility. In the United States, among women with a recent unintended birth, the most common reason for contraceptive nonuse prior to conceiving was the respondent's belief that she could not get pregnant.[4]

As a subjective experience,[9] perceived infertility may or may not align with an individual's actual probability of getting pregnant (or impregnating a partner).[10] Prior research suggests that people dramatically overestimate the likelihood of pregnancy. In one study conducted in the United States, fewer than one in 10 young adults knew that the average chance of getting pregnant after one act of intercourse without a contraceptive is less than 10%.[2]

In the United States in 2009, among unmarried people aged 18–29, 19% of women and 13% of men reported believing they were very likely to be infertile or would have difficulty getting pregnant or impregnating a partner when they wanted to.[2] Among women who believed they were very likely to be infertile, 41% cited a doctor's statement, 37% mentioned not getting pregnant after having sex without contraception, 18% had an infertile relative and 33% identified another, unspecified cause.[2] Such perceptions may be linked to certain medical experiences (e.g., irregular periods, polycystic ovarian syndrome, anorexia, anemia, tilted uterus), having previously taken a long time to get pregnant or other factors.[9]

One might hypothesize that the prevalence of self-reported perceived infertility would be lower in low-income settings than in other contexts, given that childbearing

tends to begin at younger ages in such settings,[11] thus "proving" one's fertility occurs earlier. Furthermore, the social and economic consequences of infertility are serious in these settings,[12] which may contribute to underreporting of infertility—real or perceived. Infertility may lead to intimate partner violence,[13,14] relationship dissolution,[15] social ostracism and marginalization,[12,16] economic instability[17] and mental health concerns,[18] and is associated with high-risk sexual behaviors.[19–22] These social costs are exacted most often on women,[23,24] even if the issue stems from a male partner's infertility.[25] Given the high stigma regarding infertility in many settings,[12,16] perceived infertility could theoretically have other negative outcomes, such as stress, anxiety, depression or changes in sexual behaviors.

While individuals in low-income settings could be less likely than others to report perceived infertility for all of the above reasons, they may in fact be more likely to experience clinical infertility as a result of elevated rates of HIV, tuberculosis, untreated pelvic infections stemming from STIs, schistosomiasis, and complications from unsafe abortion and fistula.[26–29] This epidemiological context may serve to increase perceived infertility. In Malawi in 2010, estimates suggest that 1% of all women aged 20–44 exposed to the risk of pregnancy were unable to attain a live birth within five years of trying; among women who had previously had a live birth, 5% were unable to have another within five years of trying.[30] However, clinical definitions of infertility generally use a 12-month time frame, so clinical infertility is likely to be higher. We are not aware of nationally representative estimates of infertility in Malawi using a 12-month time frame, although inexpensive, novel approaches to obtaining such estimates have been proposed and applied elsewhere.[31]

Given the dearth of understanding around perceived infertility in low-income settings, and the potential for adverse effects stemming from this phenomenon, we applied a measure previously used to estimate perceived infertility among young adults in the United States[2] to a population-based survey of young adults (aged 21–29) in Balaka, Malawi to investigate how the same measure operates in different contexts. We also examined factors associated with this perception, elucidated reasons for perceived infertility (according to open-ended responses) and investigated respondents' understandings of pregnancy probabilities.

METHODS

Survey Design and Sampling

Data come from the second phase of Tsogolo La Thanzi (TLT), a population-based, longitudinal study examining how young adults navigate reproduction in an AIDS epidemic. TLT was conducted in Balaka, a district capital in Malawi—a pronatalist country where women's median age at first birth is 19.[32] Balaka is a religiously and ethnically diverse commercial center, surrounded by trading centers and situated along Malawi's main road connecting the city of Zomba with Lilongwe, the national capital. The town is home to people with many different ethnicities, but Yaos and Ngonis predominate.

Details on the TLT study design are provided elsewhere.[33] In brief, the study included two phases: TLT-1 (2009–2012) and TLT-2 (2015). In 2009, a complete household listing was conducted of all residents living within a seven-kilometer area from the center of Balaka. Using simple random sampling, a representative sample of 1,562 young women and 614 men aged 15–25 was drawn from this list; of those, 1,505 young women and 574 young men completed a baseline survey (a 95% response rate). In addition, at each wave, women were asked to recruit their current male sexual or romantic partners to the study. Women were given tokens to give to their partners; the partners could bring those tokens to the research center for an interview. At Wave 1, 433 male partners joined the study. All participants were followed up three times per year until 2012. After the eighth round, a refresher sample of 315 women (drawn from the original 2009 sampling frame) was added to offset study attrition.

TLT-2 consisted of a single survey conducted in 2015 among 1,453 women and 407 men, which represented 78% of TLT-1's core and refresher samples, along with an additional 573 male partners.

Surveys, which took approximately 1.5 hours to administer, asked respondents about social and demographic characteristics, relationships, fertility behaviors and intentions, HIV-related information and other life experiences. Interviewers of the same gender as the respondent administered the questionnaire in Chichewa (the official national language, which is widely spoken in Balaka) in private rooms at the TLT research center. Survey questions had been translated from English to Chichewa by an experienced translator, and then back-translated to English to confirm accuracy. All interviewers were fluent in English and entered responses to open-ended questions in English. Following completion of the interview, respondents were given 2,000 kwacha (about US$4). Ethical approval for this secondary data analysis was obtained in Malawi from the National Health Sciences Research Committee and in the United States from the Social and Behavioral Sciences Institutional Review Board at the University of Chicago.

For our analysis, we used cross-sectional data from the TLT-2 sample, since we had an opportunity to include the key question on perceived infertility during that survey. Of the 2,433 TLT-2 participants, we excluded 21 women and 21 men who reported being sterilized, 119 women who were currently pregnant and 87 male partners of currently pregnant women, and 220 women and 336 men older than 30 to enhance comparability with a prior analysis in the United States.[2] We also excluded 29 women and nine men who responded "don't know" to the key question on perceived infertility, resulting in the final analytic sample of 1,591 (1,064 women and 527 men). Of the men included in the sample, 62% were from the male random sample and 38% were from the partner sample. As the original

sample was drawn as a simple random sample (stratified by gender) in 2009, we present unweighted analyses stratified by gender.

Dependent Variable

Our main variable of interest, perceived infertility, was based on a question used in a 2009 survey in the United States:[2] "Some people are unable to become pregnant, even if they want to. How likely do you think it is that you are infertile or will have difficulty getting pregnant (or impregnating a woman) when you want to?"; in Malawi, response options included "not at all likely," "a little likely," "somewhat likely," "very likely" or "don't know." We excluded "don't know" responses, and collapsed "somewhat" and "very" likely options into a "substantially likely" category for comparability with the prior analyses. Respondents who indicated any likelihood (i.e., other than "not at all likely") were invited to provide an open-ended response regarding why they held this belief.

Because the proportions of respondents categorized as a little or substantially likely to be infertile or have difficulty getting pregnant (or impregnating) when desired were small, we further collapsed the perceived infertility measure into a dichotomous variable to enable examination of characteristics associated with perceiving any likelihood versus not at all likely. Hereafter, we refer to any likelihood as perceived potential infertility (PPI). This term accommodates a spectrum of perceptions, ranging from serious to mild fertility concerns.

Independent Variables

We examined a number of independent variables that might be related to PPI, selected on the basis of their theoretical relationship with PPI and to maximize comparability with the prior analysis in the United States; these included demographic characteristics, sexual and contraceptive use behaviors, and pregnancy and childbearing preferences.

• *Demographic characteristics.* We included a continuous measure of age. We classified marital status as either "currently married or cohabitating" or "never or formerly married," which included people who were never married, or who were separated, divorced or widowed. We combined never and formerly married individuals since our sample contained few formerly married individuals, particularly men. We classified educational status as having completed less than primary school, having completed primary school but not secondary school, or having completed secondary school or more. Residence was classified as urban or rural. In addition, we defined religiosity as the frequency of attending religious services within the past 12 months; categories included never, sometimes (ranging from two to three times per month to a few times per year), or weekly or more.

• *Sexual behavior and contraceptive use.* We included a dichotomous variable indicating whether respondents reported being sexually experienced and a continuous variable capturing their number of sexual partners during the last 12 months. We included a measure that examined current contraceptive use with up to three recent partners among individuals who reported having any. We classified people as modern contraceptive users if they used a condom at least once during any of the last three times they had sex with a recent partner, or used another modern contraceptive (i.e., the pill, the injectable, the implant, the IUD or sterilization, with or without concurrent use of a traditional method) with a recent partner. We classified traditional method users as having used only traditional methods (e.g., calendar, withdrawal, a string tied around the waist or other folk methods) with a recent partner. Given that very few respondents reported traditional method use (four men and 11 women), we combined traditional and modern method users in the final multivariable model to avoid estimation issues.

• *Childbearing preference and pregnancy experience.* We included a continuous variable indicating the number of children wanted, and a dichotomous variable indicating whether the respondent wanted a child (or another child) or was unsure, versus not wanting any (or more) children. We asked respondents what their feelings would be if they discovered they were pregnant (or had impregnated someone) in the next month; possible responses were "very bad," "fairly bad," "neither good nor bad," "fairly good," "very good," "don't know" or "missing." We collapsed responses into a dichotomous variable in which respondents were coded as stating that they would feel "good" if they responded either "fairly good" or "very good;" all other responses were combined into a single category of "bad, neutral, don't know or missing." We asked only women about two variables pertaining to pregnancy experiences: a continuous variable for the number of births they had had, and a dichotomous variable to indicate whether they had experienced a miscarriage, stillbirth or abortion since 2012.

• *Probability of pregnancy variables.* Participants were asked to estimate the probability that the average woman would become pregnant after a single instance of sexual intercourse without contraception; female respondents were also asked to estimate the likelihood that they themselves would become pregnant in that scenario. Both were estimated on a scale from zero to 10, which we converted to a 0–100% scale.

Analysis

We are unaware of prior analyses modeling characteristics associated with the measure of PPI in Sub-Saharan Africa; thus, we performed an exploratory analysis to identify covariates. We examined bivariate associations with PPI using chi-square tests for categorical variables and t tests for continuous variables. We constructed separate multivariable logistic regression models for men and women, and included age and education based on theoretical considerations and for comparability with prior analyses.[2] Since we did not collect certain variables on pregnancy experiences

TABLE 1. Selected characteristics of survey participants aged 21–29, by gender, Tsogolo La Thanzi study (TLT-2), Balaka, Malawi, 2015

Characteristic	% or median		
	All (n=1,591)	Women (n=1,064)	Men (n=527)
Median age	24 (5)	24 (5)	25 (4)
Education			
<completed primary	37	39	31
Completed primary but not secondary	39	40	37
≥completed secondary	25	21	32
Marital status			
Currently married/cohabitating	65	70	55
Never/formerly married	35	30	45
Residence			
Rural	89	89	90
Urban	11	11	10
Religious service attendance in last year			
Never	9	10	7
Sometimes	43	45	40
≥weekly	47	45	52
Sexually experienced			
Yes	97	97	98
No	3	3	2
No. of sex partners in last year			
0	10	10	9
1	79	86	65
≥2	11	4	26
Current contraceptive use†			
Modern	63	62	65
Traditional	1	1	1
None	22	25	17
No partner	14	12	17
Median no. of births	na	2 (2)	na
Median no. of children wanted	4 (1)	4 (1)	3 (1)
Desire for a(nother) child			
Wants/unclear	90	88	96
Does not want	10	12	4
Miscarriage/abortion/stillbirth since 2012			
No	na	96	na
Yes	na	4	na
Feelings if became pregnant next month			
Bad/neutral/don't know/missing	74	74	73
Good	26	26	27
Perceived infertility			
Not at all likely	92	92	92
A little likely	3	3	3
Substantially (somewhat or very) likely	5	5	5

†Modern contraceptive use includes any condom use in the last three sexual episodes or any modern contraceptive use with any of up to three reported partners; traditional contraceptive use includes only traditional method use with all of up to three reported partners, and no condom use in the last three sexual episodes. *Notes:* Percentages may not add to 100 because of rounding. Figures in parentheses are interquartile ranges. na=not applicable.

among men, constructing separate models enabled us to include those variables in the women's model. To avoid estimation issues, we excluded from the multivariable models variables that had small (<5) cell sizes when cross-tabulated with the PPI variable; these included residence for men, and sexual experience and desire for children for both men and women. We also considered additional variables hypothesized as potentially associated with our outcome, quadratic transformations of continuous variables to allow for potential curvilinear effects and interaction terms hypothesized to be important. We identified the most parsimonious models, separately for men and women, by examining changes in the Akaike information criterion and the Bayes information criterion when variables were removed from the model. We used Wald tests to determine the overall significance of each covariate. We report descriptive statistics with continuous variables expressed as medians with their interquartile range, categorical variables expressed as frequencies by group and estimated odds ratios with 95% confidence intervals, using robust standard errors.

Among all respondents with PPI, we collected open-ended responses regarding their reason for this perception. We carefully reviewed and considered all open-ended responses, and iteratively identified the prevalent themes that emerged from participant responses. This process resulted in 10 themes into which we grouped responses. We assessed the frequency of men and women (by PPI status) whose responses were classified into each theme, and provided selected illustrative quotes in each theme. We lightly edited these quotes for clarity, and revised answers recorded by interviewers in the third person to be in the first person.

Respondents reported pregnancy probabilities for different scenarios. We report medians and interquartile ranges, comparing responses by PPI status using the Wilcoxon ranksum test. All analyses were conducted in Stata 14.2.

RESULTS

Sample Characteristics

Participants in our sample ranged from 21 to 29 years of age; the median age was 24 for women and 25 for men (Table 1). Seventy percent of women and 55% of men were currently married or cohabiting. A greater proportion of men than women had completed secondary school (32% vs. 21%; p=.000). Overall, 89% of participants lived in rural areas and 97% were sexually experienced. Most participants (86% of women, and 65% of men) reported having one sexual partner in the last 12 months (range, 0–25). Among the 86% of participants who reported a current sex partner, current modern contraceptive use (with any of up to three reported partners) was reported by 71% of women and 79% of men (not shown); this is equivalent to modern contraceptive use among 62% of all women and 65% of all men. About 1% of both women and men with a current sex partner reported traditional contraceptive method use, while 28% of women and 20% of men reported no contraceptive use (not shown). The median number of births among women was two (range, 0–7). Only 14% of women had never given birth (not shown), while 52% had given birth to 1–2 children and 34% had given birth to 3–7. Few women (4%) self-reported having experienced a miscarriage, abortion or stillbirth since 2012. Only 12% of women and 4% of men did not want

any more children, and about a quarter (26–27%) said they would feel "good" if they learned they were pregnant (or had impregnated someone) in the next month.

Prevalence of Perceived Infertility

Most participants (92%) believed it was "not at all likely" that they were infertile or would have difficulty getting pregnant (or impregnating a partner) when they wanted to (Table 1); among both men and women, 3% believed it was "a little likely" and 5% believed it was substantially likely. Thus, the prevalence of PPI was 8% in our sample. Among the 153 women who reported never giving birth, however, the proportion rose to 20% (not shown).

Factors Associated with PPI

• *Bivariate findings.* In the bivariate analysis among women, PPI was significantly associated with several of the included sexual behavior, pregnancy and childbearing measures (Table 2). For example, the proportion of women with PPI increased with greater numbers of sex partners in the last year, from 5% for those who reported zero partners to 18% for those who had had two or more. PPI was also more common among women not currently using contraceptives than among those using traditional or modern contraceptives (16% vs. 9% and 6%, respectively). The mean number of births was lower among women with PPI than among those without PPI (1.3 vs. 2.0). In addition, the proportion of women with PPI was greater among those who wanted more children than those who did not (9% vs. 2%). Finally, PPI was more common among women who reported that they would feel good about becoming pregnant in the next month than among other women (16% vs. 6%).

The bivariate analysis among men yielded somewhat different results. As was seen among women, the number of sex partners in the last year was found to be associated with PPI among men; however, the proportion with PPI was greater among those who had had no partners than among those who had had at least one (29% vs. 6–7%). PPI was also more common among men who had no sexual partner (and thus were not asked about contraceptive use) than among men in other contraceptive use categories (18% vs. 0–8%). Finally, marital status was found to be associated with PPI: The proportion of men with PPI was greater among those who were never or formerly married than among those who were currently married or cohabitating (14% vs. 3%).

• *Multivariable findings.* In the multivariable analysis among women, the relationship between age and PPI varied by educational level: For women who completed less than primary school, each additional year of age increased their odds of PPI by 20% (odds ratio, 1.2; Table 3). Conversely, for women with at least a completed secondary education, each additional year of age decreased their odds of PPI by 20% compared with those who had not completed primary education (0.8).

In addition, women who had one sexual partner in the last year and those who had two or more had greater odds of PPI than women with no recent partners (odds ratios, 3.0 and 5.0, respectively), although the confidence intervals were wide. Women who reported not currently practicing contraception were more than twice as likely as those currently using a method to have PPI (2.1). Furthermore, each additional birth was associated with a 53% decrease in the odds of PPI (0.5). Finally, women who reported that

TABLE 2. Selected characteristics of young adults, by gender and perceived potential infertility status

Characteristic	Women			Men		
	No PPI	PPI	p value	No PPI	PPI	p value
Mean age	24.6	24.4	.51	24.8	24.2	.17
Education			.52			.21
<completed primary	92	8		95	5	
Completed primary but not secondary	92	8		91	9	
≥completed secondary	90	10		90	10	
Marital status			.17			.00
Currently married/cohabitating	92	8		97	3	
Never/formerly married	90	10		86	14	
Residence			.26			.94
Rural	92	8		92	8	
Urban	89	11		92	8	
Religious service attendance in last year			.15			.39
Never	96	4		87	13	
Sometimes	92	8		92	8	
≥weekly	90	10		93	7	
Sexually experienced			.80			.32
Yes	92	8		92	8	
No	90	10		85	15	
No. of sex partners in last year			.03			.00
0	95	5		71	29	
1	92	8		94	6	
≥2	82	18		93	7	
Current contraceptive use†			.00			.00
Modern	94	6		94	6	
Traditional	91	9		100	0	
None	84	16		92	8	
No partner	94	6		82	18	
Mean no. of births	2.0	1.3	.00	na	na	
Mean no. of children wanted	3.5	3.3	.09	3.4	3.2	.38
Desire for a(nother) child						
Wants/unclear	91	9	.01	92	8	.51
Does not want	98	2		96	4	
Miscarriage/abortion/ stillbirth since 2012			.45			
No	92	8		na	na	
Yes	88	12		na	na	
Feelings if became pregnant next month			.00			.83
Bad/neutral/don't know/missing	94	6		92	8	
Good	84	16		92	8	

*p≤.05. **p≤.01. ***p≤.001. †Modern contraceptive use includes any condom use in the last three sexual episodes or any modern contraceptive use with any of up to three reported partners; traditional contraceptive use includes only traditional contraceptive use with all of up to three reported partners, and no condom use in the last three sexual episodes. *Notes:* Significant differences were determined using t tests for continuous variables and chi-square tests for categorical variables. PPI=perceived potential infertility. na=not applicable.

TABLE 3. Adjusted odds ratios (and 95% confidence intervals) from logistic regression analysis assessing young adults' likelihood of potential perceived infertility, by selected characteristics, according to gender

Variable	Women		Men	
	Odds ratio	p value†	Odds ratio	p value†
Age	1.20 (1.03–1.39)	.02	0.89 (0.67–1.16)	.53
Education		.06		.81
<completed primary (ref)	1.00		1.00	
Completed primary but not secondary	0.60 (0.33–1.09)		1.41 (0.49–4.07)	
≥completed secondary	0.38 (0.17–0.86)		1.33 (0.47–3.72)	
Age x education		.09		.04
Age x <completed primary (ref)	1.00		1.00	
Age x completed primary but not secondary	0.92 (0.76–1.12)		1.04 (0.73–1.51)	
Age x ≥completed secondary	0.76 (0.60–0.97)		1.44 (1.03–2.01)	
Marital status		na		.02
Currently married/cohabitating (ref)	na		1.00	
Formerly/never	na		2.67 (1.17–6.13)	
No. of sex partners in last year		.05		.00
0 (ref)	1.00		1.00	
1	3.01 (1.12–8.13)		0.24 (0.10–0.58)	
≥2	4.96 (1.32–18.62)		0.24 (0.09–0.61)	
Current contraceptive use		.01		na
Modern/traditional (ref)	1.00		na	
None	2.08 (1.29–3.37)		na	
No partner	1.04 (0.43–2.55)		na	
No. of births	0.47 (0.34–0.64)	.00	na	na
Feelings if became pregnant next month		.05		na
Bad/neutral/don't know/missing (ref)	1.00		na	
Good	1.62 (1.01–2.58)		na	

†p values for overall significance of the variable from Wald tests. *Notes:* ref=reference group. na=not applicable.

they would feel "good" if they learned in the next month that they were pregnant were more likely than others to have PPI (1.6).

Among men, the association of age with PPI also varied by educational level, but with a pattern opposite to that among women: For men who had completed secondary school, each additional year of age increased their odds of PPI by 44% compared with men who had not completed primary school (odds ratio, 1.4). In addition, unmarried men had nearly three times the odds as currently married men of PPI (2.7). Also, in contrast to women, men with one sex partner in the last year and those with two or more had decreased odds of PPI compared with men with no recent partners (0.2 for each).

Since our primary question on perceived infertility involves thinking about wanted future fertility, we considered if those reporting not wanting any additional children should be included in our model. While the question is not necessarily premised on their desire for future children (i.e., somebody who does not want future children could still perceive that they may be infertile), we reran our models after excluding 23 men and 130 women who reported not wanting any more children; results did not change substantially.

Reasons for PPI

Among 89 female respondents with PPI, the three most common reasons for PPI fit into the following themes (Table 4): PPI as a result of past or present contraceptive use (36 respondents), being unsure about their fertility or having a medical concern (15), and never having been or having tried to get pregnant (11). Among 42 men with PPI, the most common reasons included never having impregnated or tried to impregnate a partner (24 respondents) and being unsure about their fertility or having a medical concern (5); five men had an uninterpretable or missing response. Categories containing less frequent responses for both men and women included trouble conceiving or carrying a pregnancy to term, requiring traditional medicine to be able to conceive, reporting no pregnancy after a prior pregnancy had ended, fatalism or feeling things are up to God, being unsure of a partner's fertility and believing they had been bewitched.

Estimated Likelihood of Pregnancy

The probability of pregnancy from one randomly timed (i.e., not specifically timed around ovulation) instance of sex without contraception is estimated as 2–5%;[34] around ovulation, the probability may be as high as 38%.[35] When asked about the chance an average woman would become pregnant after one sex act without contraception, the vast majority of respondents (87% of women and 89% of men; not shown) believed the chances were more than 40%. In other words, most people substantially overestimated the risk of pregnancy. On average,

TABLE 4. Distribution of young adults, by reason given for perceived infertility, according to gender and perceived infertility status; and selected illustrative quotations

Reasons and quotations	Women		Men	
	A little likely (n=34)	Substantially likely (n=55†)	A little likely (n=15)	Substantially likely (n=27)
Past/present contraceptive use • *Due to contraceptives' side effects—some people say they can cause infertility.* (female, 22) • *Use of contraceptives weakens the production of sperm.* (male, 25)	15	21	1	1
Never been pregnant (or for men, impregnated) or never tried to get pregnant (or for men, impregnate) • *I have never conceived, so I don't know if I am fertile.* (female, 23) • *I have never impregnated a woman, so I don't have any proof.* (male, 21)	6	5	4	20
Unsure about fertility or has a medical concern • *I have mwanamphepo, a condition where I have some sores in my stomach. This causes a fertility problem unless I take some herbals. I got married in 2009 but did not conceive till 2013.* (female, 22) • *May be due to beers.* (male, 29)	4	11	4	1
Reported requiring need to use traditional medicine to be able to conceive • *I have to take local herbs to conceive.* (female, 23)	4	6	0	0
Uninterpretable or missing response	0	4	2	3
Trouble conceiving or carrying to term • *I had a sexual partner. We had sex without using condoms but I did not conceive.* (female, 25) • *I once had a miscarriage, so I am afraid it may happen again.* (female, 22) • *I have been married for a year now, and my wife is yet to get pregnant.* (male, 25)	2	4	2	1
No pregnancy since last pregnancy • *Since giving birth to a dead child, I am failing to conceive.* (female, 24)	2	2	0	0
Up to God • *Up to God, since he is the one who decides.* (female, 27)	1	1	2	0
Bewitching • *Sometimes people can bewitch you in the village so that you cannot have another child even though you want to.* (male, 25)	0	0	0	1
Unsure of partner's fertility • *Since the birth of my first child, I have never gotten pregnant, but my husband is not the father of the child.* (female, 29)	0	1	0	0

†One woman who responded "substantially likely" did not give a reason for her response. *Note:* Quotes taken from open-ended responses and were lightly edited for clarity.

women and men reported a probability of 70% and 60%, respectively; responses did not vary by PPI status for either women or men.

When women were asked to estimate their own chances of pregnancy after one instance of sex without contraception, most (87%) believed chances were more than 40%. Responses differed by PPI status: The median probability among women with no PPI was 80%, compared to 50% among those with PPI. Estimates were similar when restricted to nulliparous women. A greater proportion of women with PPI than of those without believed that they were less likely than an average woman to become pregnant after a single instance of sex without contraception (33% vs. 20%; p=.00).

DISCUSSION

To our knowledge, this study represents the first time that a measure used to examine perceived infertility in a high-income setting was applied in a low-income setting. We found that among young adults in Balaka, 5% of women and men were categorized as believing it "substantially" likely that they are infertile or would have difficulty getting pregnant when they want. These figures are substantially lower than the proportions of young adults in a U.S. study analogously categorized as believing it "very" likely that they are infertile or would have difficulty getting pregnant when they want (19% of women and 13% of men;[2] see Appendix for comparison of response options and categories used in the two studies). The use of essentially the same measure reduces the likelihood that differences in the instrument explain the differences in results.

Instead, several factors could explain the difference. First, compared with the U.S. sample, TLT participants were slightly older (median age, 24 vs. 22 in the United States) and more likely to have "tested" their fertility (nulliparous, 14% vs. 70%). Indeed, age at first marriage is older in the United States than in Malawi (median, 28 vs. 18 for women and 30 vs. 23 for men), as is the age at first birth (mean, 24 vs. 19).[32,36,37] Second, interpretation of the question, or the experience of acknowledging even a potential for fertility challenges, may vary across cultural contexts and influence participant responses; greater social stigma regarding infertility may lead to

underreporting of perceived infertility. Third, participants from Balaka may simply experience less concern than U.S. participants about the possibility because of sociocultural reasons. However, PPI rose to 20% among women in Balaka who reported never having given birth, including when the variable was restricted to the youngest women in the sample (those younger than 25), suggesting that concerns about PPI may be particularly salient among those who have not begun childbearing.

Two previous studies in Malawi have assessed difficulty conceiving: A 2014–2015 study in Lilongwe found that 20% of women aged 15–39 reported trying and failing to conceive a pregnancy for two years or longer,[38] and a 2000–2002 study in Mangochi found that 20% of women (aged 15–34) and men (aged 20–44) perceived and reported ever experiencing a difficult time conceiving.[39] The author of the Mangochi study suggested that difficulty conceiving may not translate to someone believing they may be infertile; among those reporting ever having difficulty conceiving, only 38% of women and 27% of men suspected infertility in themselves or their spouse. This translates to an overall prevalence of suspected infertility of 7% among all women and 5% among all men in Mangochi, which is similar to the 5% of women and men in our study who reported believing they were quite likely to be infertile or to have difficulties conceiving (or impregnating a partner) when they wanted to. In the Mangochi study, only individuals who reported a difficult time getting pregnant were asked about perceived infertility. Our question, which asked simultaneously about difficulty getting pregnant or having perceived infertility, does not assume that perceived infertility may only occur among those who have previously tried to get pregnant or impregnate a partner. In addition, compared with the participants in our sample, participants in Mangochi were older (mean age, 27 for women and 33 for men), less educated, and reported higher rates of miscarriages and higher numbers of sex partners. Despite differences in the approach to measuring perceived infertility and the analytic populations, young adults in both Malawian studies were less likely than those in the United States to report perceived infertility.

As a result of small cell sizes, our multivariate models examined factors associated with PPI—a less granular measure than that used in the United States. PPI was reported by 8% of our sample, among both men and women. Among women, PPI was inversely associated with parity, and positively associated with nonuse of contraceptives, number of sexual partners and reporting she would feel good if she learned that she was pregnant in the following month. Among less educated women, age was positively associated with PPI; while among more highly educated women, age was inversely associated with PPI. When considered net of parity, this might be explained by women with less education having longer exposure to the risk of pregnancy than women with more education, who tend to initiate sexual activity and marry later.[32] In men, the patterns were reversed: PPI was inversely associated with number of sex partners, and among more highly educated men, age was positively associated with PPI, perhaps because these men are delaying childbearing and, thus, less likely to have tested their fecundity.

Open-ended responses revealed reasons for PPI in this setting. Most notably, two in five women with PPI pointed to past or present contraceptive use as a reason for their belief. This may reflect the misperception that contraceptive methods, especially the injectable, cause infertility (beyond the expected contraceptive effect).[8,40–42] In much of eastern and southern Africa, the injectable is the most commonly used contraceptive.[43] Return to fertility takes an average of nine months after the last injection;[44,45] one study reported a range of four to 31 months.[44] Some counseling tools state that return to fertility occurs "several months after discontinuation," which may be insufficient to convey what women who discontinue using an injectable should expect. Improved counseling on duration of time to return to fertility after contraceptive discontinuation may clarify expectations and help prevent belief in the myth that contraceptives cause infertility.

Similarly, education focused on pregnancy probabilities also offers a promising way of aligning expectations with biological reality, given that respondents in our study substantially overestimated the likelihood of pregnancy after a single act of sex without contraception. Such overestimation could lead to interpreting a lack of conception after a single act of sex without contraception as an indication of fertility problems. Our recommendation echoes those from a prior study in Malawi, which noted that providing information via field health workers and local traditional educators (known as *nankungwis*) about normal variation in the length of time taken to achieve pregnancy could reduce inaccurate perceptions of infertility, but added that such education would remain in competition with observations of couples who conceive quickly.[19]

Limitations

This study has several limitations. Although female respondents were selected randomly in 2009, representativeness may have decreased over time because of attrition—perhaps offset slightly by the refresher sample. Men were selected either via random sampling in 2009 (also subject to attrition over time) or included as a partner of an enrolled woman, so results for men may be less representative of the population of Balaka. In addition, several considerations regarding our dependent variable are worth noting. First, the key question does not distinguish between respondents who believe they are currently infertile and those who believe they have the potential to be infertile later. Second, our data on PPI were cross-sectional, which precludes our ability to test if PPI affected contraceptive use trajectories or other outcomes, such as stress, anxiety, depression or changes in sexual behaviors. In women, multivariable models suggested that nonuse of contraceptives is associated with elevated odds of PPI, but we are unable to establish directionality in these data, although

open-ended responses on reasons for PPI were also informative. Third, our dichotomized independent variable is less granular than the three-level variable used in the United States.[2] While this could blur distinctions between response categories, this pragmatic approach enabled us to perform the first assessment of this measurement of PPI in a low-income setting.

Collecting open-ended responses on reasons for PPI is a strength of this study, as it does not impose assumptions around reasons for this response, but it also has limitations. Coding responses into categories facilitated assessment of key reasons for the belief, but some responses were complex and could have fit into multiple categories. Also, some categories were difficult to interpret or overly broad because some responses were too vague to further disaggregate. Nonetheless, these responses point toward categories that could be included in future surveys measuring perceived infertility. In addition, future research should examine the proportion of contraceptive nonuse resulting from perceived infertility.

Conclusions

While perceived infertility was reported among fewer young adults in Balaka than in the United States, a proportion of young adults in Balaka did indicate some level of concern about their fertility, particularly those without children, but this concern may not be based on medical information. Reproductive health education that addresses variation in the time to conception and return to fertility after discontinuation of contraception may help establish more accurate understandings of conception and potentially reduce concerns about perceived infertility. Further research is needed to understand if improved reproductive health literacy in this domain could improve contraceptive use and further minimize exposure to unintended pregnancy and its sequelae.

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RESUMEN

Contexto: *La infecundidad percibida – la creencia de una persona de que ella o él no puede concebir o embarazar a una pareja – podría conducir a la falta de uso de anticonceptivos y al embarazo no planeado, entre otras preocupaciones, pero esto no se ha estudiado ampliamente en entornos de bajos ingresos.*
Métodos: *Una medida de la infecundidad percibida utilizada anteriormente en los Estados Unidos se incluyó en una encuesta de 2015 aplicada a adultos jóvenes en Balaka, Malawi. La prevalencia de infecundidad potencial percibida (es decir, creer que es poco o muy probable que una persona es infecunda, o que tendría dificultades para quedar embarazada o para embarazar a una pareja; IPP) se estimó entre la muestra analítica de 1,064 mujeres y 527 hombres de 21 a 29 años de edad. Se usó regresión logística multivariable para identificar variables asociadas con la IPP; también se investigaron las razones de las personas encuestadas para experimentar IPP y sus estimaciones de la probabilidad de embarazo después de tener relaciones sexuales sin protección.*
Resultados: *La prevalencia de IPP fue del 8% en general y del 20% entre mujeres nulíparas. Los factores asociados con la IPP y las razones para experimentar IPP variaron según el género. Para las mujeres, la IPP se asoció significativamente con la edad, la escolaridad, un período de interacción entre la edad y la escolaridad, el número de parejas sexuales, los sentimientos si quedara embarazada el próximo mes, la paridad y el uso de anticonceptivos. Para los hombres, la IPP se asoció con un período de interacción entre edad y escolaridad, número de parejas sexuales y estado conyugal. Las personas encuestadas tendieron a sobreestimar la probabilidad de embarazo después de tener relaciones sexuales sin protección.*
Conclusiones: *La infecundidad percibida fue menor en Malawi que en los Estados Unidos, aunque fue sustancial entre ciertos subgrupos. Las intervenciones educativas destinadas a aumentar el conocimiento sobre las probabilidades de embarazo y el retorno de la fecundidad después de la interrupción de los anticonceptivos pueden reducir las preocupaciones sobre la infecundidad percibida.*

RÉSUMÉ

Contexte: *L'infertilité perçue – le fait de croire, pour une personne, qu'elle ne peut pas concevoir ou causer une grossesse – peut conduire, entre autres préoccupations, à l'absence de*

contraception et à la grossesse non planifiée, sans toutefois avoir été largement étudiée dans les contextes à faible revenu.

Méthodes: *Une mesure de l'infertilité perçue utilisée précédemment aux États-Unis a été incluse dans une enquête menée en 2015 auprès de jeunes adultes de Balaka (Malawi). La prévalence d'une éventuelle infertilité perçue (c'est-à-dire croire qu'il est légèrement ou fortement probable qu'on soit infertile, ou qu'on aurait des difficultés à concevoir ou à causer la grossesse d'une partenaire; IPP) a été estimée dans l'échantillon analytique de l'étude, composé de 1 064 femmes et de 527 hommes âgés de 21 à 29 ans. Les variables associées à l'IPP ont été identifiées par régression logistique multivariable. Les raisons d'IPP données par les répondants et leurs estimations de la probabilité d'une grossesse après un rapport sexuel non protégé ont aussi été étudiées.*

Résultats: *La prévalence de l'IPP était de 8% au total, et de 20% parmi les femmes nullipares. Les facteurs associés à l'IPP et les raisons de l'IPP variaient suivant le sexe. Pour les femmes, l'IPP était significativement associée à l'âge, à l'éducation, à un terme d'interaction entre l'âge et l'éducation, au nombre de partenaires sexuels, aux sentiments que susciterait la découverte d'une grossesse le mois suivant, à la parité et à la pratique contraceptive. Pour les hommes, l'IPP était associée à un terme d'interaction entre l'âge et l'éducation, au nombre de partenaires sexuelles et à la situation matrimoniale. Les répondants tendaient à surestimer la probabilité d'une grossesse après un rapport sexuel non protégé.*

Conclusions: *L'infertilité perçue s'est révélée inférieure au Malawi, par rapport aux États-Unis, bien qu'elle soit apparue considérable dans certains sous-groupes. Les interventions éducatives visant à accroître les connaissances sur les probabilités de grossesse et le retour à la fertilité après l'arrêt de la contraception peuvent réduire les préoccupations concernant l'infertilité perçue.*

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APPENDIX TABLE 1. Operationalization of measures of perceived infertility used in the United States and Malawi

United States		Malawi		
Variable levels as collected	**Variable levels as collapsed & used**	**Variable levels as collected**	**Variable levels as initially collapsed**	**Variable levels as further collapsed & used**
Not at all likely	Not at all likely	Not at all likely	Not at all likely	Not at all likely
Slightly likely	Slightly likely	A little likely	A little likely	Potential perceived infertility
Quite likely	Very likely	Somewhat likely	Substantially likely	
Extremely likely		Very likely		