



# BMJ Open Condom use among women of reproductive age (18–49 years) in Puerto Rico during the 2016 Zika virus outbreak: secondary analysis of data from a cross-sectional, population-based, cell-phone survey

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## ABSTRACT

**Objectives** Zika virus (ZIKV) can be sexually transmitted, and ZIKV infection during pregnancy can cause birth defects. Contraception is a medical countermeasure to reduce unintended pregnancy and ZIKV-associated birth defects. We estimated the prevalence of condom use and associated factors among women at risk for unintended pregnancy in Puerto Rico during the 2016 ZIKV outbreak.

**Design** Secondary analysis of a cross-sectional, population-based, cell-phone survey.

**Setting and participants** Women, 18–49 years, living in Puerto Rico during July–November 2016. We limited our analytical sample (n=1840) to women at risk for unintended pregnancy, defined as those who were sexually active with a man in the last 3 months and did not report menopause, hysterectomy, current pregnancy or desiring pregnancy.

**Outcome measures** We estimated the weighted prevalence of any condom use among women at risk for unintended pregnancy. We calculated crude and adjusted prevalence ratios (aPRs) to examine the association between condom use and ZIKV-related factors, stratified by use of more effective versus less effective or no contraception.

**Results** Overall, 32.7% (95% CI: 30.2% to 35.1%) of women reported any condom use in the last 3 months. Among women using more effective contraception, condom use was higher for women who received ZIKV counselling (aPR: 1.61, 95% CI: 1.15 to 2.25) and those worried about having a child with a ZIKV-associated birth defect (aPR: 1.47, 95% CI: 1.03 to 2.10). Among women using less effective or no contraception, condom use was associated with being worried (aPR: 1.20, 95% CI: 1.01 to 1.43) compared with those not worried about ZIKV infection or with a previous known infection.

**Conclusions** During the 2016 ZIKV outbreak, one in three women at risk for unintended pregnancy reported any condom use. Counselling to promote consistent and correct condom use may address concerns regarding ZIKV among women of reproductive age, which may differ by use of effective contraception.

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ Survey contained comprehensive information about contraception, sexual activity and Zika virus (ZIKV)-prevention behaviours.
- ⇒ Analyses were stratified by contraceptive use (more effective vs less effective or no contraception) and adjusted for potential confounders.
- ⇒ Women's self-reports may be subject to recall and social desirability biases.
- ⇒ While consistent and correct condom use is recommended to prevent sexual transmission of ZIKV, only a small number of women reported consistent condom use in this population, and instead, 'any condom' use is reported.

## INTRODUCTION

Zika virus (ZIKV) is a flavivirus primarily transmitted by *Aedes* mosquitoes, but can also be transmitted sexually and from a pregnant woman to her fetus.<sup>1–4</sup> The first outbreak of ZIKV in the Americas was reported by the Brazil Ministry of Health in May 2015, after which ZIKV spread rapidly throughout North America, South America and the Caribbean region.<sup>5</sup> The Puerto Rico Department of Health reported the first locally acquired case of ZIKV virus on 31 December 2015.<sup>6</sup> Among US states and territories, Puerto Rico was the most severely affected by the ZIKV outbreak.<sup>7 8</sup> ZIKV infection has a generally mild course in adults and can often be asymptomatic.<sup>5 7 9 10</sup> However, ZIKV infection during pregnancy was found to be associated with adverse pregnancy and birth outcomes including pregnancy loss, congenital microcephaly, other brain malformations, ocular birth defects, arthrogryposis and clubfoot,

and after carefully reviewing all available evidence in April 2016, the Centers for Disease Control and Prevention concluded that ZIKV infection during pregnancy caused neonatal microcephaly and other serious brain anomalies.<sup>1–3</sup> Additionally, in Puerto Rico, it was estimated that 5900–10 300 pregnant women would be infected during the initial ZIKV outbreak, and as a result, 100–270 infants may be born with microcephaly in the absence of prevention measures.<sup>9</sup>

For women of reproductive age (WRA) not desiring pregnancy and living in an area with risk of Zika, contraception is a medical countermeasure to reduce unintended pregnancy and subsequent ZIKV-associated birth defects.<sup>1–3</sup> Couples who are not trying to conceive can consider using condoms consistently and correctly during sex to protect against sexual transmission of ZIKV.<sup>6–7</sup> A focus group analysis with women in Guatemala reported that most women did not realise that Zika could be sexually transmitted.<sup>8</sup> While a previous study estimated the prevalence of condom use among pregnant women,<sup>9</sup> less is known about condom use among WRA.

A previous analysis of the survey data used here reported most WRA using some form of contraception (82.8%) during the 2016 ZIKV outbreak.<sup>10</sup> In this secondary analysis, we assessed condom use among WRA (18–49 years) living in Puerto Rico during the 2016 ZIKV outbreak and examined the association of condom use with ZIKV-related characteristics, including receiving healthcare provider counselling about ZIKV, worrying about getting infected with ZIKV or worrying about having a baby with a birth defect, stratified by contraceptive use (more effective vs less effective or no contraception).

## METHODS

### Design, setting and participants

Leveraging the Behavioral Risk Factor Surveillance System<sup>11</sup> platform, the Puerto Rico Department of Health conducted a cross-sectional, population-based, cell-phone survey, among women aged 18–49 years living in Puerto Rico during July–November 2016.<sup>12</sup> The survey was available in English and Spanish; approximately 99% of respondents completed the Spanish version. Marketing Systems Group, provided the study with randomly generated samples of cell phone numbers. Interviewers varied times and days of the week to include evenings and weekends and repeated calls up to six times if no one answered. Interviewers obtained verbal consent from respondents, and then used WINCATI, a computer-assisted telephone interview software, to administer the survey.<sup>11</sup> As previously described in the primary study, the survey comprised 48 questions about demographics, contraception, sexual activity and ZIKV-prevention behaviours. In total, 16 311 individuals answered the phone, 3169 women were eligible, 110 refused and 3059 women participated in the survey (69% response rate).<sup>10</sup> To produce estimates that were representative of the population, the data were weighted using raking methodology.<sup>12</sup> The raking

margins used were based on population estimates available by age and sex from the US Census Bureau's American Community Survey in Puerto Rico for 2015.<sup>12</sup> The data were raked to the population estimates for women aged 18–49 using seven age categories (18–19, 20–24, 25–29, 30–34, 35–39, 40–44, 45–49) and five marital status categories (married, separated, divorced, widowed, never married). The Centers for Disease Control and Prevention determined the survey to be a non-research, public health practice activity during an emergency response.<sup>13</sup>

### Measures

For this secondary analysis, we defined women at risk for unintended pregnancy as those who were sexually active with a man in the last 3 months, and did not report menopause, having had a hysterectomy, current pregnancy or desiring pregnancy. Factors of interest were receiving healthcare provider counselling about ZIKV at any time, worrying about ZIKV infection (very worried/a little or somewhat worried/already had ZIKV/not worried) and worrying about having a child with a ZIKV-associated birth defect (very worried/a little or somewhat worried/not worried). Women were asked, 'What are you or your spouse or partner using or doing to keep you from getting pregnant?'. Answer options were contraceptive implant, intrauterine device (IUD), shots/injections, birth control pills, contraceptive patch, contraceptive ring, male condoms, diaphragm, female condoms, not having sex at certain times (rhythm or natural family planning) and withdrawal. More effective contraception included sterilisation, implant, IUD, shot, pill, patch, ring while less effective contraception included male/female condom, diaphragm, rhythm method, withdrawal. Only the most effective method reported was recorded in the survey as the current method used to keep from getting pregnant. Women were also asked, 'When you had sex during the last 3 months, how often did you and your partner use a condom?'. Condom use was measured as every, most, some or none of the time during sex in the last 3 months. Women were also asked, 'What was your most important reason for not using condoms every time you had sex during the last 3 months?'. For this question, there were originally 19 possible response options which were collapsed into the following six relevant (ie, some response options were exclusions for this analysis, such as 'currently pregnant') and remaining responses: did not think about it/forgot/do not know; do not like condoms; using another method; in a committed relationship; partner objects; and other (includes cost/access, breast feeding, recently had a baby and other not specified).

### Statistical analysis

We describe characteristics of women included in our analytical sample. We estimated the weighted prevalence of any condom use for women at risk for unintended pregnancy. Missing data were minimal ( $\leq 2.5\%$  missing data), and weighted percentages were estimated excluding missing data. We calculated crude and

adjusted prevalence ratios (aPRs) to examine the association between any condom use and receiving ZIKV counselling, worrying about ZIKV infection (very/a little/somewhat worried vs self-report of already had ZIKV/not worried) and worrying about having a child with a ZIKV-associated birth defect (very/a little/somewhat worried vs not worried). Analyses were conducted in SAS V.9.4 using modified Poisson regression with robust error variance, stratified by use of more effective contraception versus less effective or no contraception and adjusted for age, education and health insurance. Adjustment variables were determined to be potential confounders a priori based on previous research and the primary analysis.

### Patient and public involvement

There was no patient or public involvement.

### RESULTS

We excluded women who were not sexually active or missing information on sexual activity in the last 3 months (n=890), reported menopause or having had a hysterectomy (n=80), current pregnancy (n=75) and desiring pregnancy (n=174) from our analytical sample (n=1840). Overall, 44.8% (95% CI: 42.4% to 47.3%) of women were 35–49 years, 42.1% (95% CI: 39.7% to 44.6%) had a college degree, 54.0% (95% CI: 51.5% to 56.5%) had Medicaid/public insurance and 44.8% (95% CI: 42.4% to 47.1%) were married, living with, or in a long-term relationship with a man (table 1).

Over half (59.9%, 95% CI: 57.5% to 62.4%) of women reported using a more effective contraceptive method. One-fourth (25.3%, 95% CI: 23.2% to 27.4%) of women reported talking to a healthcare provider about ZIKV. Most women were worried about ZIKV infection (28.4% (95% CI: 26.2% to 30.6%) very worried and 45.4% (95% CI: 42.9% to 47.8%) little/somewhat worried) and having a child with a ZIKV-associated birth defect (53.3% (95% CI: 50.8% to 55.7%) very worried and 9.1% (95% CI: 7.7% to 10.6%) little/somewhat worried). Overall, 32.7% (95% CI: 30.2% to 35.1%) of women reported any condom use. The most common reasons for not using condoms included being in a committed relationship (47.6%, 95% CI: 44.9% to 50.4%), using another contraceptive method (21.5%, 95% CI: 19.3% to 23.7%) and not liking condoms (11.4%, 95% CI: 9.6% to 13.2%).

Among women using more effective contraception, any condom use was higher among women who talked to a healthcare provider about ZIKV (19.2%; aPR: 1.61, 95% CI: 1.15 to 2.25) versus those who did not (12.7%; referent) (table 2).

In this same group, any condom use was higher in women who were worried (18.4%; aPR: 1.47, 95% CI: 1.03 to 2.10) versus not worried (10.3%; referent) about having a child with a birth defect. Among women using less effective or no contraception, any condom use was associated with being worried about ZIKV infection (62.4%; aPR: 1.20, 95% CI: 1.01 to 1.43) compared with

those not worried about ZIKV infection or with a previously self-reported ZIKV infection (52.7%; referent).

### DISCUSSION

One in three women at risk for unintended pregnancy reported any condom use. This finding is similar to another study conducted in Puerto Rico during the ZIKV outbreak that found 22% of pregnant women reported any condom use.<sup>9</sup> This finding is also similar to a 2014 study (pre ZIKV) which noted the need for sexually transmitted infection (STI) prevention education throughout the lifespan in Puerto Rico; which found that only 22% of women ages 21–49 reported condom use during all sexual practices, and was highest (more than 30%) among the youngest women (ages 21–22) who reported vaginal intercourse in the last 3 months.<sup>14</sup> During the ZIKV outbreak, condom use remained low despite the public health prevention strategy for women at risk for unintended pregnancy. This strategy was twofold: (1) promote condom use to prevent sexual transmission of ZIKV and (2) promote use of effective contraception to prevent unintended pregnancy.<sup>6 7</sup> Because reasons for condom use differed among women using more effective contraception versus those using less effective or no contraception, distinct counselling approaches to promote condom use may be needed.

Among women using more effective contraception, condom use was associated with receipt of ZIKV counselling and concerns about having a child with a birth defect, while concerns of ZIKV infection were associated with condom use among women using less effective or no contraception. Women in the latter group may also benefit from information on effective contraception to prevent unintended pregnancy, if desired. However, women using more effective contraception may be more likely to have routine encounters with the healthcare system for method insertion or for a prescription, which may allow for opportunities for ZIKV prevention counselling especially raising awareness of ZIKV as sexually transmitted. For example, a study in Guatemala noted that women in focus groups were not aware that ZIKV could be sexually transmitted.<sup>8</sup> Those using less effective or no contraception may not visit a healthcare provider and may require population-based efforts to reach them. Education campaigns like Detén El Zika primarily targeted pregnant women and focused on healthy babies<sup>15</sup>; similar campaigns targeting both pregnancy and STI concerns among WRA and men may also be needed.

This analysis is subject to the following limitations. First, the survey asked about sexual behaviours and experiences over the past 3 months; therefore, women's self-reports may be subject to recall bias. Estimates of condom use may be biased if women overstated their frequency of condom use due to social desirability. The survey was administered only to women 18 years and older and did not include those younger than 18 years. Women also had to have a cell phone to participate in this survey, which

**Table 1** Characteristics of women of reproductive age (18–49 years) at risk of unintended pregnancy,\* 2016 contraceptive assessment for Puerto Rico

	n (Unweighted)	N (Weighted)	% (Weighted)	(95% CI) (Weighted)
Overall	1840	432 952	100	(–)
Age group, years				
18–24	303	90 941	21.0	(18.9 to 23.2)
25–34	659	147 842	34.2	(31.8 to 36.5)
35–49	878	194 169	44.8	(42.4 to 47.3)
Education completed†				
Less than high school	112	26 078	6.0	(4.9 to 7.2)
High school	406	98 210	22.7	(20.6 to 24.8)
Some college	532	126 029	29.1	(26.9 to 31.4)
College	789	182 273	42.1	(39.7 to 44.6)
Health insurance‡				
Private/through employer	788	178 189	41.5	(39.1 to 43.9)
Medicaid or other public insurance	957	231 728	54.0	(51.5 to 56.5)
No insurance	81	19 315	4.5	(3.5 to 5.5)
Relationship status§				
Married/long-term relationship with a man	1153	193 183	44.8	(42.4 to 47.1)
Married/long-term relationship with a woman	1	163	0.04	(0 to 0.1)
Divorced/widowed/separated	193	62 967	14.6	(12.6 to 16.6)
Never married/not in a long-term relationship	489	175 263	40.6	(38.1 to 43.2)
Use of a more effective method of contraception¶				
Yes	1188	259 023	59.9	(57.5 to 62.4)
No	649	173 249	40.1	(37.6 to 42.5)
Talked to a healthcare provider about ZIKV				
Yes	495	109 564	25.3	(23.2 to 27.4)
No	1345	323 388	74.7	(72.6 to 76.8)
Worried about getting infected with ZIKV**				
Very worried	533	122 609	28.4	(26.2 to 30.6)
A little/somewhat worried	832	195 852	45.4	(42.9 to 47.8)
Already had Zika	354	86 546	20.0	(18.0 to 22.1)
Not worried	116	26 654	6.2	(5.0 to 7.4)
Worried about having a baby with a birth defect††				
Very worried	938	226 935	53.3	(50.8 to 55.7)
A little/somewhat worried	163	38 848	9.1	(7.7 to 10.6)
Not worried	713	160 365	37.6	(35.2 to 40.0)
Condom use in the past 3 months‡‡				
Yes	488	140 619	32.7	(30.2 to 35.1)
No	1343	289 861	67.3	(64.9 to 69.8)

\*Women who were not sexually active or missing information on sexual activity in the last 3 months (n=890), reported menopause or having had a hysterectomy (n=80), current pregnancy (n=75) and desiring pregnancy (n=174) were excluded.

†One missing response.

‡Seventeen missing responses.

§Five missing responses.

¶More effective method of contraception includes sterilisation, implant, intrauterine device, shot, pill, patch and ring.

\*\*Five missing responses.

††Fifty-four missing responses.

‡‡Nine missing responses.

ZIKV, Zika virus.



**Table 2** Association of ZIKV-related factors on condom use stratified by use of more effective contraception versus less or no effective contraception, 2016 contraceptive assessment for Puerto Rico

Zika-related factors	Used condoms in the past 3 months (%*)	PR (95% CI)	Adjusted PR† (95% CI)
Women using more effective contraception‡ (n=1188§)			
Overall	14.5	–	–
Talked to healthcare provider about ZIKV	19.2	1.51 (1.08 to 2.11)	1.61 (1.15 to 2.25)
Did not talk to healthcare provider about ZIKV	12.7	1.00	1.00
Worried about ZIKV infection¶	14.6	1.01 (0.69 to 1.48)	0.93 (0.64 to 1.37)
Not worried about/already had ZIKV infection	14.4	1.00	1.00
Worried about having a child with a birth defect	18.4	1.79 (1.26 to 2.55)	1.47 (1.03 to 2.10)
Not worried about having a child with a birth defect	10.3	1.00	1.00
Women using less effective or no contraception** (n=649§)			
Overall	59.8	–	–
Talked to healthcare provider	60.4	1.01 (0.87 to 1.18)	1.03 (0.88 to 1.20)
Did not talk to healthcare provider	59.7	1.00	1.00
Worried about ZIKV infection¶	62.4	1.18 (1.00 to 1.41)	1.20 (1.01 to 1.43)
Not worried about/already had ZIKV infection	52.7	1.00	1.00
Worried about having a child with a birth defect††	60.2	1.02 (0.85 to 1.21)	0.93 (0.78 to 1.11)
Not worried about having a child with a birth defect	59.3	1.00	1.00
*Weighted percentages.			
†Adjusted for age group, education completed and health insurance.			
‡More effective methods of contraception includes sterilisation, implant, intrauterine device, shot, pill, patch and ring.			
§Unweighted n.			
¶Worried about ZIKV infection includes those a little/somewhat worried and very worried.			
**Less effective methods of contraception includes diaphragm, rhythm method and withdrawal.			
††Worried about having a child with a birth defect includes those a little/somewhat worried and very worried.			
PR, prevalence ratios; ZIKV, Zika virus.			

may have biased the selection of participants. However, in 2016 Puerto Rico had a high rate of mobile subscriptions (99 per 100 people).<sup>16</sup>

Additionally, while consistent and correct condom use is recommended to prevent sexual transmission of ZIKV, we were limited by the small number (n=350, weighted n=102 304, weighted % 13.7%, 95% CI (11.4% to 15.9%)) of women who reported consistent condom use in this population, and instead, we report ‘any condom’ use. Furthermore, the question on contraceptive use in the survey asked only about current use and not use during the last 3 months. We were unable to differentiate whether women were using condoms as a primary or back-up method for preventing pregnancy versus for preventing sexual transmission of ZIKV, or for preventing other sexually transmitted diseases. The data are limited, and it is not clear whether sexual transmission is a salient consideration for women in the study. The lack of women reporting condom use may reflect low levels of awareness despite media or counselling, or those messages may have raised awareness but still had little effect on condom use behaviours. Women using effective contraception may have wanted to avoid having a baby with a birth defect and actively avoided ZIKV through a mosquito bite, but they may not have realised that sexual

transmission from an infected partner posed a risk. Worry about ZIKV was associated with women who were using less effective or no contraception, using condoms, but it is unclear if some other confounding variables (like poverty or other structural measures) compounded or were independently associated with the likelihood of ZIKV. The Zika Contraception Access Network (Z-CAN), was established in Puerto Rico during May 2016 through August 2017 to address a short-term emergency response need to provide client-centred contraceptive counselling and same-day contraceptive services at no cost to those who chose to prevent pregnancy. Overall, more than 21 000 women received services through Z-CAN. While the first Z-CAN contraceptive services were offered on 4 May 2016, the overwhelming majority of initial Z-CAN visits occurred after the completion of this our survey in November 2016.<sup>17</sup> During the evaluation of this programme, they found that ZIKV was not a motivating factor in contraception, but rather economic factors were the drivers of contraceptive behaviours.<sup>17</sup> Finally, our findings may have limited generalisability considering the large burden of ZIKV cases in Puerto Rico during the 2016 ZIKV outbreak.

## CONCLUSIONS

One in three women at risk for unintended pregnancy reported any condom use during the 2016 ZIKV outbreak in Puerto Rico. Counselling to promote consistent and correct condom use may address concerns regarding ZIKV among WRA, which may differ by use of effective contraception. Strategies to educate women and their partners about preventing sexual transmission of ZIKV and reducing risk of unintended pregnancy may need to consider both healthcare-based and population-based approaches.

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