



## Short communication

# Knowledge, attitudes, and practices of women of childbearing age testing negative for Zika virus in Kentucky, 2016

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## ABSTRACT

Because infection with Zika virus during pregnancy can cause microcephaly and other birth defects, women of childbearing age are an important population for targeting of Zika-related public health messaging. To improve Zika-related communication and outreach in Kentucky, we conducted a survey to assess Zika knowledge, attitudes, and practices among all women of childbearing age who received a negative Zika test result from the state public health laboratory during February to July 2016. Although > 90% of the 55 respondents knew the virus could be transmitted by mosquitoes and caused birth defects, just 56% (31/55) knew the virus could be sexually transmitted. These findings underscore the importance of continued efforts by CDC and state and local health departments to educate female travelers of childbearing age about risks for and prevention of Zika virus infection, particularly emphasizing use of condoms and abstinence to prevent transmission.

## 1. Introduction

Zika virus infection during pregnancy can cause microcephaly and other birth defects (Rasmussen et al., 2016). In the United States, national surveys conducted in the spring and summer of 2016 demonstrated a low level of public knowledge of Zika virus (Abramson & Piltch-Loeb, 2016; Harvard T.H. Chan School of Public Health, 2016; NORC at the University of Chicago, 2016). Because 45% of pregnancies in the U.S. are unintended (Finer & Zolna, 2016), education of women of childbearing age is critical to reduce the risk of Zika-related birth defects. Evidence from a survey in New York City indicated that CDC recommendations to avoid travel to Zika-affected areas were not known to 31% of pregnant women tested (Whittemore et al., 2017); these recommendations were also not known to 45% of pregnant women who attended a reproductive health clinic in southeast Texas (Berenson et al., 2017). State and local health departments have a central role in educating women of childbearing age regarding the risks of Zika virus infection, but limited data are available to guide tailoring of messages. Following CDC communication recommendations (CDC, 2016) since February 2016, the Kentucky Department for Public Health (KDPH) has issued multiple press releases, hosted a media event, and included Zika information on its website to educate the public about Zika risks and prevention. KDPH press releases were provided to local health departments to assist in educating healthcare providers on the local level. To improve Zika-related public health messaging in our state, we

conducted a survey to assess related knowledge, attitudes, and practices (KAP) among women of childbearing age who received a negative Zika virus test result in Kentucky.

## 2. Methods

During October–November 2016, we conducted a phone-based survey of women aged 18–49 years who received a negative Zika virus test result from the state public health laboratory during February to July 2016. Information from the Kentucky Zika Testing Registry was used to identify potential survey participants. Only women who were pregnant and/or experienced Zika symptoms and had travelled to or lived in a Zika-affected area in the past 12 weeks or who may have been exposed through sexual contact were eligible to receive laboratory testing. Three women who received a positive result during this period were excluded to avoid unnecessary emotional distress. The state public health laboratory communicated test results to providers as they became available, who in turn communicated results to patients. Four attempts were made to contact each potential participant. To protect the confidentiality of participants, we followed the standard KDPH protocol used to contact patients under investigation with sensitive diseases such as HIV/AIDS. Patient information was not revealed except when it could be verified that the patient alone would be the recipient of the information. A verbal consent script was read to all participants stating that participation was voluntary and any questions could be

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skipped if desired. Verbal consent was obtained from all participants. The survey, adapted from the World Health Organization KAP resource pack (WHO, 2016), included demographic characteristics and assessed Zika-related KAP. Age, month of the testing request, and pregnancy status were obtained from the Kentucky Zika testing registry. The survey was pre-tested with women of childbearing age at KDPH not working on Zika prevention and was revised prior to recruitment of participants. The survey was conducted in English or Spanish. This study was approved by the KDPH Institutional Review Board and verbal consent was obtained from all participants prior to the start of any study activities.

Being knowledgeable about Zika was defined as knowing all of four facts about the virus, specifically that the virus can 1) be transmitted by mosquitoes, 2) be transmitted sexually, 3) present asymptotically, and 4) cause birth defects. Having knowledge of the mosquito-borne and sexual modes of Zika virus transmission were defined as referencing mosquitoes or sex, respectively, in response to either “What causes Zika?” or “How does a person get Zika?” Women were considered as knowing that Zika virus infection may present asymptotically if they gave a negative response to the question “Does everybody who gets Zika show symptoms?” Women were considered as knowing that Zika virus infection could cause birth defects if they cited any type of birth defect to either of “If a pregnant woman has Zika, what are the risks she faces?” or “If a pregnant woman has Zika, what are the risks for her fetus or baby?” Frequencies were calculated for the responses to each question and associations of Zika knowledge with demographic characteristics, information sources, and attitudes were evaluated using Chi-square or Fisher's exact tests. Log-binomial models were used to assess trends in Zika knowledge with ordinal variables. The characteristics of participants and non-participants were compared using Chi-square tests and a test of independent medians. A *p*-value of 0.05 was used to determine statistical significance.

### 3. Results

Fifty-five of 99 eligible women completed the survey (56%); 35 women could not be contacted (35%), 8 declined participation (8%), and 1 was not contacted due to the possibility of causing additional emotional distress (1%). Ten (18%) women were interviewed in Spanish (Table 1). Surveyed women were similar to nonparticipants with regard to age, pregnancy status at time of testing, and month of the testing request (Table 2). Forty-four (80%) respondents were pregnant at the time of receiving Zika virus testing. The most frequently reported reason for having been to a Zika-affected area was vacation (56%), followed by visiting family (16%) and living in an affected country (9%).

Though > 90% of respondents knew the virus could be transmitted by mosquitoes and could cause birth defects, and 84% knew the infection could be asymptomatic, just 56% knew the virus could be sexually transmitted. Women who were younger or less educated were less likely to be knowledgeable about Zika, as were women interviewed in Spanish (although this difference did not achieve statistical significance; Table 1). Unadjusted estimates of the associations of Zika knowledge with age and education were similar to those generated by models adjusted for the other variable (data not shown); models adjusted for the language of the interview did not converge.

Forty-eight (87%) respondents believed that they were able to prevent Zika virus infection. Among the 55 women interviewed, the most commonly cited preventive measures respondents were aware of were use of mosquito repellent (76%), avoidance of travel to Zika-affected areas (66%), and wearing protective clothing (38%). Condom use or abstinence was cited by 22% as a method of infection prevention. The internet was by far the most frequently reported source of Zika information (76%).

Thirty-five (64%) women reported having taken action to prevent Zika virus infection while travelling or living in a Zika-affected area.

Among all 55 women interviewed, use of mosquito repellent was the most frequently reported method of prevention (53%), followed by wearing protective clothing (18%). Of the 20 women who reported not taking action, 15 (75%) were unaware of Zika virus or were unaware of local Zika transmission at the time of travelling or living in an affected area.

When asked what worried or concerned them most about Zika virus, participants most frequently reported the health of their fetus or baby (22%) and the possibility of the spread of local transmission in the U.S. or to Kentucky (20%). Seven (13%) women reported having no concerns about Zika. Fifty-seven percent of the women believed they had enough information about Zika, although this belief was not associated with knowledge of Zika virus (Table 1).

### 4. Discussion

The results of our survey demonstrate that although Kentucky women of childbearing age with potential exposure to Zika virus were aware of mosquito-borne transmission of the virus and of the association of infection with birth defects, they frequently did not know that the virus could be sexually transmitted. Additionally, some subsets of the women tested were less knowledgeable about Zika, specifically those who were younger and less educated, and more comfortable communicating in Spanish. The low level of Zika knowledge we observed among Kentucky women of childbearing age with potential Zika exposure is similar to that of surveys conducted among pregnant women in New York City (Whittemore et al., 2017) and Texas (Berenson et al., 2017) and among national surveys of women of childbearing age (Abramson & Piltch-Loeb, 2016) and of households with someone who is pregnant or planning to become pregnant (Harvard T.H. Chan School of Public Health, 2016). However, this result differs from the high level of Zika knowledge found in an online survey of pregnant women living in the U.S. (Guo et al., 2017); the education level of women who participated in this online survey was much higher than that of our study, which may account for this difference. The particularly low level of knowledge of sexual transmission of the virus observed in our study is supported by national (Harvard T.H. Chan School of Public Health, 2016) and clinic-based surveys (Berenson et al., 2017) but has not been observed in all studies (Guo et al., 2017). Our finding that women who had less education were significantly less knowledgeable about Zika was similar to that of a national survey of pregnant women (Guo et al., 2017) but dissimilar to the results of a national survey of women of childbearing age that found that level of education was not associated with Zika knowledge (Abramson & Piltch-Loeb, 2016).

This project has several limitations. First, the women surveyed had already received Zika virus testing and therefore may have been more knowledgeable about the virus than other women of childbearing age in Kentucky. Second, the small sample size may have obscured associations between participant characteristics and Zika knowledge. Third, the accuracy of responses may have been compromised by recall bias and social desirability bias.

Continued efforts by CDC and state and local health departments are needed to educate women of childbearing age regarding the prevention of Zika virus infection, particularly online. The low level of awareness of sexual transmission of Zika highlights the need to provide specific education about this risk and to emphasize condom use and abstinence to prevent infection. Messages should accommodate Spanish speakers and be appropriate for women of younger ages with differing educational backgrounds.

### Disclaimer

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

**Table 1**

Sociodemographic characteristics, reason for travel, and sources of Zika information of women who were knowledgeable and not knowledgeable about Zika virus infection, Kentucky, 2016.<sup>a</sup>

	Total (N = 55)		Knowledgeable <sup>b</sup> (n = 29)		Not knowledgeable <sup>b</sup> (n = 26)		P-value <sup>c</sup>	P for trend <sup>d</sup>
	n	(%)	n	(%)	n	(%)		
Age, years							0.03	0.14
19–29	19	(34.5)	6	(20.7)	13	(50.0)		
30–34	22	(40.0)	16	(55.2)	6	(23.1)		
35–49	14	(25.5)	7	(24.1)	7	(26.9)		
Education <sup>e</sup>							0.03	0.006
Less than bachelor's degree	15	(27.3)	4	(13.8)	11	(42.3)		
Bachelor's degree	24	(43.6)	13	(44.8)	11	(42.3)		
Graduate degree	16	(29.1)	12	(41.4)	4	(15.4)		
Interviewed in Spanish <sup>e</sup>	10	(18.2)	3	(10.3)	7	(26.9)	0.16	
Pregnant at time of testing	44	(80.0)	24	(82.8)	20	(76.9)	0.59	
Reason for travel <sup>e</sup>							0.13	
Vacation	31	(56.4)	17	(58.6)	14	(53.8)		
Visiting family	9	(16.4)	6	(20.7)	3	(11.5)		
Living in country	5	(9.1)	0	(0.0)	5	(19.2)		
Business	4	(7.3)	3	(10.3)	1	(3.8)		
Other	6	(10.9)	3	(10.3)	3	(11.5)		
Actions taken to prevent infection while in an affected area <sup>f</sup>								
None	20	(36.4)	12	(41.4)	8	(30.8)	0.41	
Insect repellent	29	(52.7)	16	(55.2)	13	(50.0)	0.70	
Covering clothing <sup>e</sup>	10	(18.2)	4	(13.8)	6	(23.1)	0.49	
Condoms/abstinence <sup>e</sup>	1	(1.8)	1	(3.4)	0	(0.0)	> 0.99	
Other	11	(20.0)	5	(17.2)	6	(23.1)	0.59	
Source of Zika information <sup>f</sup>								
Internet	42	(76.4)	24	(82.8)	18	(69.2)	0.24	
Primary care provider	19	(34.5)	10	(34.5)	9	(34.6)	0.99	
Television <sup>e</sup>	10	(18.2)	6	(20.7)	4	(15.4)	0.73	
Other	14	(25.5)	7	(24.1)	7	(26.9)	0.81	
Believes able to prevent Zika <sup>e</sup>	48	(87.3)	27	(93.1)	21	(80.8)	0.24	
Believes has enough Zika information	31	(56.4)	16	(55.2)	15	(57.7)	0.85	
Worries/concerns about Zika <sup>f</sup>								
Health of fetus/baby	12	(21.8)	7	(24.1)	5	(19.2)	0.66	
Spread of Zika in U.S./Kentucky <sup>e</sup>	11	(20.0)	7	(24.1)	4	(15.4)	0.51	
None <sup>e</sup>	7	(12.7)	3	(10.3)	4	(15.4)	0.70	
Lack of knowledge about the virus <sup>e</sup>	6	(10.9)	4	(13.8)	2	(7.7)	0.67	
Other	24	(43.6)	13	(44.8)	11	(42.3)	0.85	

<sup>a</sup> All women had travelled to a Zika-affected area and tested negative for Zika virus.

<sup>b</sup> Knowledgeable — answered the 4 Zika knowledge questions correctly. Not knowledgeable — answered 0 to 3 Zika knowledge questions correctly.

<sup>c</sup> P-value of a Chi-squared test unless otherwise specified.

<sup>d</sup> P-value for the ordinal trend modelled using a log-binomial model.

<sup>e</sup> Fisher's exact test; used for analyses of small numbers (at least one cell containing < 5 observations).

<sup>f</sup> Column percentages may exceed 100% because multiple responses were permitted for this question. Therefore, no overall p-value can be reported.

**Conflict of interest**

The authors have no conflicts of interest to disclose.

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**Table 2**

Characteristics of women who tested negative for Zika virus infection by knowledge, attitudes, and practices survey participation, Kentucky, 2016.

	Total (N = 99)		Nonparticipants (n = 44)		Participants (n = 55)		P-value <sup>a</sup>
	n	(%)	n	(%)	n	(%)	
Age, years							0.39
19–29	42	(42.4%)	22	(50.0%)	20	(36.4%)	
30–34	36	(36.4%)	14	(31.8%)	22	(40.0%)	
35–49	21	(21.2%)	8	(18.2%)	13	(23.6%)	
Pregnant at time of testing	81	(81.8%)	37	(84.1%)	44	(80.0%)	0.60
Median month of testing request <sup>b</sup> (range)	May (February–July)		May (March–July)		May (February–July)		0.83

<sup>a</sup> P-value of a Chi-squared test unless otherwise specified.

<sup>b</sup> P-value for the test of independent medians.

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#### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.pmedr.2018.01.002>.

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