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Creating A Backyard Buzz: Evaluating the Effectiveness of Using a Video Infographic To Increase Knowledge About Mosquito Populations and Diseases in TN

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Creating A Backyard Buzz: Evaluating the Effectiveness of Using
a Video Infographic To Increase Knowledge About Mosquito
Populations and Diseases in TN

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Abstract

Despite increased awareness of mosquito bites and diseases, many people continue to not use preventative measures such as repellent and protective clothing. In the United States, the most commonly reported pediatric mosquito-borne arbovirus is La Crosse virus, which causes La Crosse encephalitis (also known as La Crosse disease). It is frequently identified in East Tennessee children. The aim of this study was twofold. First, using CDC information on La Crosse Encephalitis and mosquito bite prevention, we created a video infographic to increase awareness of mosquito-borne diseases in East Tennessee and to prevent cases by sharing bite-prevention information. Second, to determine the effectiveness of the video infographic in communicating information by conducting a pre- and post-test survey. Knowledge scores were compared across the two-time points by demographic variables (e.g., sex, education level, home environment). This data set shows current familiarity with mosquito populations and diseases and gives insight into how video infographics could be useful for communicating public health information to people from various backgrounds and education levels. This project investigates the benefit of using an approachable media form to communicate health information to improve community health.

Introduction

There has been an increase in using online videos to communicate science information and increase education about scientific findings. As social media use has grown, online videos are shared to raise awareness and education via social media platforms. This is especially true with video-based platforms, such as TikTok and YouTube, growing significantly in popularity. Previous research demonstrated that video communication could help create an engaging and informative form of communicating science.¹ Using videos to share scientific findings and effectively communicate those findings has been around for many years, with educational profiles like TED being on YouTube since 2006. This is most clearly seen in the popularity of TED Talks, where scientists repackage their findings for a broad audience, and TED broadcasts that science via YouTube; these talks often improve the dissemination of scientific findings beyond the academic community.² Using videos to communicate scientific information to a general population allows the content to be more engaging for the audience.¹ By allowing researchers to connect with larger audiences and not depend on scientific literacy or access to information, science can be communicated through videos that are more accessible to more people.

As part of preparing for this study, we reviewed several studies using videos to communicate important public safety information as part of a public safety campaign. Looking at Hamilton et al.'s study on floodwater and driving, it seems that public service announcement (PSA) videos were effective for safety announcements;⁴ however, there

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is sometimes a lack of representation of accurate health information in video communications.⁵

We also reviewed current information about mosquito-borne disease educational outreach efforts and attitudes. Previous studies have shown that as part of increasing information about mosquito-borne diseases, it is important to share the effectiveness and safety of DEET and other prevention techniques.⁶ Additionally, Butterworth et al. (2010) note a lack of recognition of regional mosquito-borne disease awareness and concerns about risk.⁷

This lack of familiarity with mosquito populations, the diseases associated with these populations, and how to prevent mosquito bites and mosquito-borne diseases are especially applicable to areas with mosquito populations and diseases present. This study focuses on applying the findings of science communication and public safety videos to public health to increase awareness and desired health behaviors regarding mosquito bite prevention in a community. We hypothesize that a video infographic can help communicate information about La Crosse Encephalitis mosquito-borne disease and prevent mosquito bites.

Methods & Materials

This study was approved by the University of Tennessee's IRB (#21-06698-XM).

Video Infographic

To test whether a video infographic effectively shares knowledge and impacts future intended behavior, we created a 3-minute educational video using Canva, a web-based tool (<https://youtu.be/YIXrfTgyMfY>). The video contained information from the CDC webpage about La Crosse Encephalitis (<https://www.cdc.gov/lac/index.html>) and mosquito bite prevention (<https://www.cdc.gov/mosquitoes/mosquito-bites/index.html>). It used written information, images, and narration to communicate information. Images for the video were sourced from Canva's open-source library to provide context for what was communicated in the video. Narration and images were used to improve accessibility for individuals who were not able to read or were unfamiliar with the terms. Written information and a transcript were provided for people with hearing disabilities. The first half of the video (approximately 1 min 37 sec) focused on communicating disease information such as symptoms, regional distribution, transmission pathway, and treatment measures. The second half (approximately 1 min 25 sec) focused on mosquito bite prevention techniques, insect repellent, clothing treatment, and ambient repellents such as mosquito coils.

Pre-test and post-test surveys

To evaluate knowledge gained, we developed a Qualtrics survey to ask questions before and after viewing the video. The survey was designed so that respondents

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answered a series of pre-test questions about their experience and familiarity with mosquitoes. They then viewed the video infographic and were finally asked a series of post-test questions about the video they had watched and their future experiences with mosquitoes. The survey was created using independently developed questions and questions from a variety of mosquito bite prevention surveys. Questions were about how often people think about mosquitoes,⁸ respondents' intent to behave a certain way in situations,^{4,9} respondents' use of repellents,¹⁰ and information about the disease. This question selection was adapted to understand the current and expected use of insect repellent measures, information knowledge, and attitudes related to mosquito populations and diseases in East Tennessee. The survey used is provided in the appendix. To distribute the survey, team members posted links to the survey on their personal social media profiles, including Twitter, Facebook, Instagram, and NextDoor. The survey was open for one month (April 2022) directly prior to mosquito season in East Tennessee. During this time, researchers posted a total of 26 times (Facebook 10 times, Twitter 9 times, Instagram 3 times, emailed to colleagues 3 times, and NextDoor twice). Survey respondents were volunteers and eligible if they identified as at least 18 years of age. 70 respondents completed the survey, with 47 respondents being from Tennessee.

Sampling procedures

To assess the knowledge of La Crosse encephalitis we compared pre/post responses to the following questions:

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- How is La Crosse virus transmitted to a person?

Select all that apply: mosquito bite, in the air, don't know/others, blood transmission, in water

- What do you do when you suspect your child has La Crosse Encephalitis?

Select all that apply: seek medical attention / treatment, Use medication as prescribed after seeing the doctor

- Which mosquito transmits the virus causing La Crosse Encephalitis?

Select all that apply: Aedes, Anopheles, Culex, Don't know / Others

To assess the knowledge of mosquito populations, we compared pre/post responses to the following questions:

- When outdoors, do you take additional actions to reduce your risk of getting bitten by mosquitoes? (yes/no)
- (True/False) Mosquito bites can be prevented using insect repellent.
- (True/False) There are many species of mosquitoes.
- (True/False) Mosquitoes are only active at sunset/night.

To assess the repellent use of adults and children, we compared pre/post responses to the following questions:

- The chances of getting bitten by a mosquito while doing outdoor activities are:
(Likert Scale: very unlikely to very likely)
- If I did not apply insect repellent while doing outdoor activities, the consequences could be: (Likert Scale: not severe at all to severe)

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- How often do you intend to apply mosquito repellents? (Never, once, every 3 hours, every 5 hours)
- When outdoors, do you take additional actions to reduce your risk of getting bitten by mosquitoes?
 - Select: yes, no

Data Analysis

Knowledge of mosquito bite prevention was assessed using the pre-test and post-test survey responses and comparing the change in means and frequencies. Analysis was conducted on responses from all participants who completed the survey.

Paired-samples t-tests and chi-square analysis were used to determine if responses were significantly different pre/post survey using SPSS. Analysis was conducted on all 70 responses.

Results

A total of 70 respondents completed the survey, with 47 respondents being from Tennessee. The analysis below was conducted on all 70 responses. Using responses from the pre/post-test survey, we found that the video increased the total correct responses compared to the pre-test regarding repellents' effectiveness for mosquito bite prevention ($T_{66} = 2.30$, $P = 0.002$), mosquito-borne disease prevention tool use ($T_{66} = 2.82$, $P = 0.003$), and La Crosse encephalitis transmission method information ($T_{34} = 2.84$, $P = 0.004$).

Respondent Demographics

Respondents identified primarily as female (68.5% female, 29.6% male, and 1.9% prefer not to answer) and college-educated (44.9% bachelor's degree or equivalent, 38.8% graduate degree or equivalent, 10.2% some college, 4.1% high school, and 2.0% associate's degree or equivalent). Additionally, 89.4% of respondents identified as living in a suburban (44.7%) or urban (44.7%) area compared to a rural (10.6%) area. The majority of respondents identified as having a Tennessee zip code (67.7%) compared to a non-Tennessee zip code (32.4%), but we found that Tennessee respondents had similar responses to those in other regions for all questions analyzed. Non-Tennessee respondents were mostly from Texas (33.3%), but respondents also identified from 10 additional states (California, Georgia, Idaho, Kansas, Kentucky, Maine, Michigan, Ohio, Pennsylvania, and Virginia). Also, we had responses in Canada (4.8%). Since some team members research mosquitoes and science communication and our social

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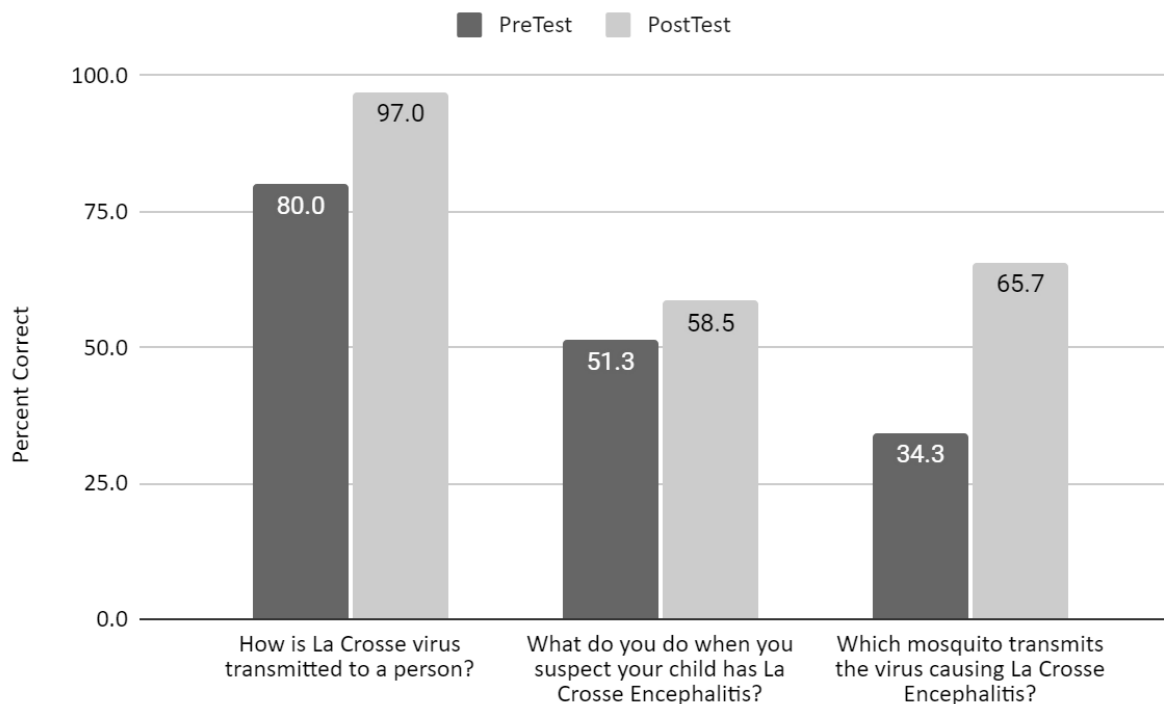
scholarnetworks are related to this work, we also asked respondents about their familiarity with mosquitoes to account for ascertainment bias. This question indicated that most respondents knew about mosquitoes (37.0% learning from friends/family, 26.3% regularly consuming popular media about mosquitoes, 26.1% personal experience, 6.5% regularly reading scientific literature about mosquitoes), and few of the respondents knew little about mosquitoes (2.2%). Importantly, none of the respondents indicated they conducted scientific research on mosquitoes. Most respondents (77%) also indicated that they were aware that mosquito-borne diseases are common in the area where they live.

Knowledge of La Crosse Encephalitis

In the pre-survey, 48.5% of respondents indicated that they had not heard of La Crosse encephalitis and 13.2% were unsure if they had heard of it; 38.2% of respondents had heard of La Crosse encephalitis. In the pre-survey, 77% of respondents indicated that they were in an area with mosquito diseases present. After watching the video, 97.2% of respondents answered correctly how La Crosse virus is transmitted compared to their pre-test answers (80.6% correct); this was a significant increase in knowledge ($t_{34} = 2.84, p = 0.004$; Figure I). After viewing the video, more respondents correctly indicated how to respond when their child shows symptoms of La Crosse encephalitis ($\chi^2 (1, N = 34) = 10.49; p = .002$). There was no significant increase in the selection of the *Aedes* mosquito genera relating to the transmission of La Crosse Encephalitis ($\chi^2 (6, N = 35) = 10.59; p = .052$).

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Fig. 1: After viewing the La Crosse video, participants responded with significantly more correct answers to key questions about La Crosse transmission and treatment.



Knowledge of Mosquitoes

All 70 respondents were aware that mosquitoes could carry agents that cause disease and that the bite of a mosquito could transmit that agent. Respondents correctly indicated that there were many species of mosquitoes (93.0%) and that mosquitoes were active throughout the day and night (96.6%).

Knowledge and Behaviors Related to Bite Prevention

The video was effective at communicating that insect repellent would prevent mosquito bites as measured by a true/false question about this belief ($t_{66} = 2.99, p = .002$).

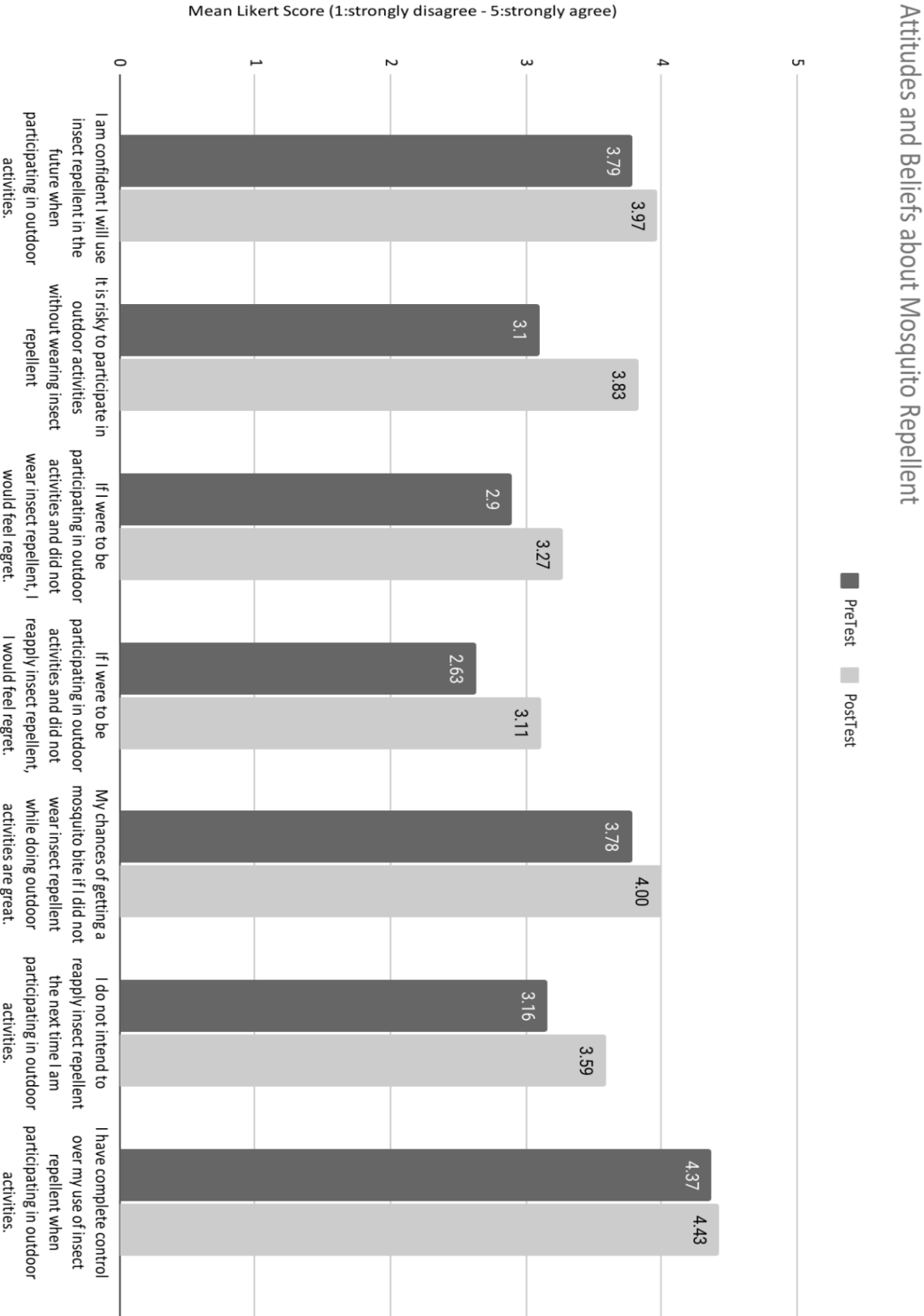
Throughout the survey, we asked questions regarding the respondents' likelihood to use

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insect repellent in outdoor environments near them. After viewing the video, respondents indicated an increase in perceived risk for not wearing repellent ($t_{70} = 6.91$, $p < .001$), feelings of regret for not wearing repellent ($t_{69} = 5.64$, $p < .001$), feelings of regret for not re-applying repellent ($t_{69} = 5.01$, $p < .001$), and future intention of using repellent ($t_{68} = 4.44$, $p < .001$). There was a significant increase in perceived chances of being bitten if not wearing repellent ($t_{69} = 1.87$, $p = .033$). There was no significant impact on reported confidence in using repellent ($t_{70} = 1.46$, $p = .075$), or perceived control of personal use ($t_{68} = .89$, $p = .187$). This means that respondents did not feel more or less confident that they will use repellent in the future, or in control of their personal use of repellent. Additionally, after watching the video, respondents indicated that they were significantly more likely to use additional mosquito bite preventive measures in the future ($t_{66} = 2.82$, $p = .003$).

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Fig. II: After viewing the La Crosse video, participants reported an increased likelihood to use repellent to prevent mosquito bites.



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Use of Repellent on Adults and Children

Of the respondents, 29 were guardians to at least one child under the age of 18 years. We also assessed the relationship of guardians applying repellent to themselves and to their child/ren. We learned that there was a significant correlation between adult repellent use and repellent use on their children ($r = .72, p < .001$). This is similar to the finding that respondents identify a significantly higher perceived risk of a bite to their child when not wearing repellent ($t_{35} = 3.25, p = .001$). When looking at the belief that severe consequences would come from not using mosquito repellent or being bitten by a mosquito in the pretest, respondents associated more severe consequences to their children than themselves ($r = .84, p < .001$).

Discussion

The results of this study support the findings of Hamilton et.al. (2018) that videos are effective for communicating information to large groups of people and encouraging a change in behavior. These findings help us identify that alternative forms of communication, besides papers, can be effectively used to share research with a large audience. This alternative form of information distribution could be helpful for many types of research that impact the community. Understanding that videos can be useful for communicating information about a disease and its prevention could be helpful for public health information campaigns going forward. Especially as the results show that an increase in awareness about preventative measures increases people's desire to use the preventive measures. Video's potential to be a tool for communication of health information seems especially true for messaging that has a female target demographic, as the majority of our respondents were female.

While our study is a first for Tennessee and La Crosse encephalitis, we recognize that there are several limitations to this study. First, a majority of the respondents had completed some higher education, which likely impacted the base knowledge and decreased the percent of learned knowledge; in other words, some of the respondents knew quite a bit about the topic. Also, it should be noted that the majority of respondents were white, highly educated females, which is not representative of all Tennessee residents or eligible participants.

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Another limitation was in survey design, including how the questions were asked when the survey was distributed, and how the survey was distributed. There were several questions where respondents were confused about a specific question and could choose multiple answers to a single question, which provided some uncertainty to a respondent's intent. The survey also took approximately 15 minutes for each respondent, so it would have been advantageous to assign respondents to one of three groups answering questions regarding knowledge, answering questions regarding decisions, and answering questions about both knowledge and decisions. This could increase participation and increase response rates. Second, the survey was distributed in early spring before most people think about mosquitoes and several months after they were last bitten by a mosquito; it is likely that respondents may have forgotten their previous experiences with mosquitoes the season before.

Additionally, running the survey for only one month restricted the number of responses. It would be informative to conduct a seasonal or temporal study that occurred multiple times in the year (e.g., early spring, summer, late summer, and early fall) when mosquitoes are still active to get an accurate response to how people use repellent and how they view their risk with mosquitoes.

A significant limitation of this study is the lack of a control group, preventing the ability to prove causation. Instead, it is cross-sectional. Future studies should consider control groups for further evaluation of video effectiveness.

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The final and important limitation of the study was the use of research team members' personal social media profiles for distribution. This likely reduced the reach of the survey since it depended on the contacts that individual researchers had rather than a more broad survey; future work should incorporate trusted individuals to also distribute the survey (e.g., Tennessee Department of Health, local health departments, school groups).

Considering these limitations, the video successfully increased knowledge about mosquito diseases and bite prevention. Results from our study validate the findings of Sugimoto & Thewall³ that videos are a useful form of scientific communication. Our results demonstrated that information communicated through a video was understood by the viewer, processed by the viewer, and the viewer was able to apply the learnings to future situations. Our study results support the suggested adoption of video-sharing applications, such as TikTok, shared by Zhu et al.¹¹ for public health organizations to communicate health information with a large number of people. Especially as our results demonstrate, support for the idea of people who are educated about the disease, take responses to prevent disease. This study confirms that video infographics are a powerful and useful tool for public health campaigns going forward since we are often trying to educate people about a problem, its solution and get them to use the knowledge provided in their life.

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Appendix

Distributed Survey

Backyard Buzz: La Crosse Encephalitis

Study Title: Creating a Backyard Buzz: Using Video To Communicate Information and Increase Awareness About Mosquito Populations and Diseases in TN

Researcher(s): Caroline Barnes, University of Tennessee, Knoxville Dr. Cristina Barroso, University of Tennessee, Knoxville Dr. Julie Andsager, University of Tennessee, Knoxville Dr. Rebecca Trout Fryxell, University of Tennessee Institute of Agriculture

Start of Block: Demographic Questions

Q7 Demographic Questions:

For the following questions, please select the response that best represents you. There are no right or wrong answers.

Q1 Are you a caregiver to a child or children under the age of 18?

Yes (1)

No (2)

Display This Question:

If Are you a caregiver to a child or children under the age of 18? = Yes

Q2 If yes, what is/are your child's/children's age(s)? (select all that apply)

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	1 child (1)	2-4 children (2)	5+ children (3)
0 - 4 years (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5-9 years (2)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10-13 years (3)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14-17 years (4)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q3 What best describes the environment you currently live in?

Rural (1)

Suburban (2)

Urban (3)

Q6 What is your zip code? (fill in the blank)

Q7 What is the highest level of education you have completed? (Check one)

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- Some high school (1)
- High school only (no college) (2)
- Some college (no degree) (3)
- Associate's degree (or equivalent) (4)
- Bachelor's degree (or equivalent) (5)
- Graduate degree (6)

Q9 What is your sex? (Check one)

- Female (1)
- Male (2)
- Prefer not to answer (3)

Q19 For the following questions, please select the response that best represents you. There are no right or wrong answers.

Q10 Which of the following best describes how you MOST OFTEN think about mosquitoes?

- I rarely think about mosquitoes. (1)
- I am just a little concerned about getting mosquito bites. (2)

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I am just a little concerned about getting a disease from a mosquito bite. (3)

I am very concerned about getting mosquito bites. (4)

I am very concerned about getting a disease from a mosquito bite. (5)

Q11 Which of the following best describes your knowledge of mosquitoes?

I have conducted research on mosquitoes. (1)

I regularly read scientific research about mosquitoes, but I haven't conducted research on mosquitoes. (2)

I regularly read popular media and/or news articles about mosquitoes, but not scientific research. (3)

I have learned about mosquitoes from family and friends, but do not regularly read about mosquitoes. (4)

I know about mosquitoes only from my personal experience with them. (5)

I know very little about mosquitoes. (6)

Q12 Which calendar months do you most commonly notice mosquitoes? (select all that apply)

January (1)

February (2)

March (3)

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- April (4)
- May (5)
- June (6)
- July (7)
- August (8)
- September (9)
- October (10)
- November (11)
- December (12)

Q13 Based on the months you identified above, how often do you recall being bitten by mosquitoes?

- never (1)
- rarely (2)
- sometimes (3)
- often (4)

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Q14 In the past 6 months, how often have you heard about mosquito illnesses in the media (news, TV, internet, movies, etc.)?

- never (1)
- rarely (2)
- sometimes (3)
- often (4)

Q15 How many of your friends/family wear/use insect repellent?

- none (1)
- fewer than half (2)
- about half (3)
- more than half (4)
- all (5)

Q16 How many mosquito bites can you tolerate before taking action to avoid mosquito bites during an outdoor activity? Action could include leaving the setting or applying a mosquito repellent.

End of Block: Demographic Questions

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Start of Block: Repellent Use Questions

Q22 For the following questions, outdoor activities refers to spending more than 30 minutes outside of an enclosed area, such as a house, car, or screened in porch. For the next questions, please think about your typical time spent in outdoor activities. For example, think about the scenario where you are at a park or other outdoor setting in your home area. You have been at the park for a period of time. Now consider your future use of insect repellent.

Q17 Please answer the following questions using the scale below.

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
Most people who are important to me would disapprove of me using insect repellent. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am confident I will use insect repellent in the future when participating in outdoor activities. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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It is risky to participate in outdoor activities without wearing insect repellent. (3)

If I were to be participating in outdoor activities and did not wear insect repellent, I would feel regret. (4)

If I were to be participating in outdoor activities and did not reapply insect repellent, I would feel regret. (5)

My chances of getting a mosquito bite if I did not wear insect repellent while doing outdoor activities are great. (7)

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I do not intend to reapply insect repellent the next time I am participating in outdoor activities. (10)

I have complete control over my use of insect repellent when participating in outdoor activities. (11)

Q18 In this scenario, I am likely use insect repellent to avoid mosquito bites.

	applied to myself (1)	applied to my child/ren (2)
strongly disagree (1)	<input type="checkbox"/>	<input type="checkbox"/>
disagree (2)	<input type="checkbox"/>	<input type="checkbox"/>
neither agree nor disagree (3)	<input type="checkbox"/>	<input type="checkbox"/>

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agree (4)	<input type="checkbox"/>	<input type="checkbox"/>
strongly agree (5)	<input type="checkbox"/>	<input type="checkbox"/>
N/A (6)	<input type="checkbox"/>	<input type="checkbox"/>

Q19 In this scenario, using insect repellent would be a _____ idea in this scenario.

	for myself (1)	for my child/ren (2)
very bad (1)	<input type="checkbox"/>	<input type="checkbox"/>
bad (2)	<input type="checkbox"/>	<input type="checkbox"/>
neither good nor bad (3)	<input type="checkbox"/>	<input type="checkbox"/>
good (4)	<input type="checkbox"/>	<input type="checkbox"/>
very good (5)	<input type="checkbox"/>	<input type="checkbox"/>
N/A (6)	<input type="checkbox"/>	<input type="checkbox"/>

Q20 The chances of getting bitten by a mosquito while doing outdoor activities are:

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	myself (1)	my child/ren (2)
very unlikely (1)	<input type="checkbox"/>	<input type="checkbox"/>
unlikely (2)	<input type="checkbox"/>	<input type="checkbox"/>
neither likely nor unlikely (3)	<input type="checkbox"/>	<input type="checkbox"/>
likely (4)	<input type="checkbox"/>	<input type="checkbox"/>
very likely (5)	<input type="checkbox"/>	<input type="checkbox"/>
N/A (6)	<input type="checkbox"/>	<input type="checkbox"/>

Q21 If I did not apply insect repellent while doing outdoor activities, the consequences could be:

	to yourself (1)	to your child/ren (2)
not severe at all (1)	<input type="checkbox"/>	<input type="checkbox"/>
a little severe (2)	<input type="checkbox"/>	<input type="checkbox"/>
more than a little severe (3)	<input type="checkbox"/>	<input type="checkbox"/>

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severe (4)	<input type="checkbox"/>	<input type="checkbox"/>
very severe (5)	<input type="checkbox"/>	<input type="checkbox"/>
N/A (6)	<input type="checkbox"/>	<input type="checkbox"/>

Q22 How often do you intend to apply mosquito repellents?

	to yourself (1)	to your child/ren (2)
never (1)	<input type="checkbox"/>	<input type="checkbox"/>
once (2)	<input type="checkbox"/>	<input type="checkbox"/>
every 3 hours (3)	<input type="checkbox"/>	<input type="checkbox"/>
every 5 hours (4)	<input type="checkbox"/>	<input type="checkbox"/>
N/A (5)	<input type="checkbox"/>	<input type="checkbox"/>
Other (6)	<input type="checkbox"/>	<input type="checkbox"/>

Q23 When do you typically apply mosquito repellents?

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	to yourself (1)	to your child/ren (2)
Never (5)	<input type="checkbox"/>	<input type="checkbox"/>
During the daytime (1)	<input type="checkbox"/>	<input type="checkbox"/>
During the night (2)	<input type="checkbox"/>	<input type="checkbox"/>
During the day and night (3)	<input type="checkbox"/>	<input type="checkbox"/>
N/A (4)	<input type="checkbox"/>	<input type="checkbox"/>

Q24 If you use mosquito repellent, which active ingredients are used? (select all that apply)

	Never (1)	Rarely (2)	Sometimes (3)	Often (4)	Never Heard Of (5)
DEET (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
picaridin (known as KBR 3023 and picaridin outside the US) (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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IR3535 (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
oil of lemon eucalyptus (OLE) (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
para-menthane-diol (PMD) (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2-undecanone (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Don't know/Don't use (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q25 If you use mosquito repellent on your child/ren, which active ingredients are used? (select all that apply)

	Never (1)	Rarely (2)	Sometimes (3)	Often (4)	Never Heard Of (5)
DEET (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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picaridin
(known as
KBR 3023
and picaridin
outside the
US) (2)

IR3535 (3)

oil of lemon
eucalyptus
(OLE) (4)

para-menthan
e-diol (PMD)
(5)

2-undecanon
e (6)

Other (7)

Don't
know/Don't
use (8)

Q26 When outdoors, do you take additional actions to reduce your risk of getting bitten by mosquitoes?

Yes (1)

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No (2)

Display This Question:

If When outdoors, do you take additional actions to reduce your risk of getting bitten by mosquitoes? = Yes

Q27 If yes, which ones?

(Please note that some of the actions listed have been proven to be ineffective!)

	Everytime (1)	Occasionally (2)	Never (3)	Never Heard of (4)
mosquito net (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
light-coloured clothing (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
long-sleeved shirts/ trousers (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
air conditioning (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ultrasonic devices (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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insecticide treated clothes (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
vitamin B (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
perfume (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
citronella candles (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
fans (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
window screens (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
misting systems (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other. Please share in the blank below (13)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q28 When outdoors, do you take additional actions to reduce your child/ren's risk of getting bitten by mosquitoes?

(Please note that some of the actions listed have been proven to be ineffective!)

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	Everytime (1)	Occasionally (2)	Never (3)	Never Heard of (4)
mosquito net (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
light-coloured clothing (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
long-sleeved shirts/ trousers (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
air conditioning (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ultrasonic devices (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
insecticide treated clothes (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
vitamin B (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
perfume (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
citronella candles (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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fans (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
window screens (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
misting systems (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other. Please share in the blank below (13)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q29 Please answer the following questions using the scale below, based on your 2021 experience with mosquitoes.

	Never (1)	Rarely (2)	Sometimes (3)	Often (4)
How often did you wear insect repellent during outdoor activities to yourself? (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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On days you used insect repellent, how often did you reapply insect repellent during outdoor activities to yourself? (2)

How often did you apply insect repellent during outdoor activities to your child/ren? (4)

On days you used insect repellent, how often did you reapply insect repellent during outdoor activities to your child/ren? (5)

Q30 I intend to apply insect repellent the next time I participate in outdoor activities.

to yourself (1)

to your child/ren (2)

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strongly disagree (1)	<input type="checkbox"/>	<input type="checkbox"/>
disagree (2)	<input type="checkbox"/>	<input type="checkbox"/>
neither agree nor disagree (3)	<input type="checkbox"/>	<input type="checkbox"/>
agree (4)	<input type="checkbox"/>	<input type="checkbox"/>
strongly agree (5)	<input type="checkbox"/>	<input type="checkbox"/>

End of Block: Repellent Use Questions

Start of Block: Mosquito Knowledge Questions

Q31 There are many species of mosquitoes.

True (1)

False (2)

Q32 Mosquitoes are only active at sunset/night.

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True (1)

False (2)

Q33 Mosquito bites can be prevented using insect repellent.

True (1)

False (2)

Q34 Mosquito diseases are not commonly found in the area where I live.

True (1)

False (2)

Q35 Mosquitoes may carry viruses (such as West Nile, Zika, etc) that can cause illness and even death in people.

True (1)

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False (2)

End of Block: Mosquito Knowledge Questions

Start of Block: Knowledge of La Crosse Encephalitis

Q36 Have you heard of La Crosse Encephalitis?

No (1)

Not Sure (2)

Yes (3)

Display This Question:

If Have you heard of La Crosse Encephalitis? != No

Q37 How is La Crosse virus transmitted to a person?

Mosquito bite (1)

In the air (2)

Don't know / Others (3)

Blood transmission (4)

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In water (5)

Display This Question:

If Have you heard of La Crosse Encephalitis? != No

Q38 Which mosquito transmits the virus causing La Crosse Encephalitis?

Aedes (1)

Anopheles (2)

Culex (3)

Don't know / Others (4)

Display This Question:

If Have you heard of La Crosse Encephalitis? != No

Q39 What are the signs and symptoms of La Crosse Encephalitis that you know of?

Fever (lasting 2-3 days) (1)

Enlarged lymph nodes (2)

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- Diarrhea (3)
- Chills (4)
- Deep muscle and joints pain (5)
- Fatigue (6)
- Headache (7)
- Loss of appetite (8)
- Eye pain (9)
- Nausea and vomiting (10)
- Not Sure/Don't Know (11)

Display This Question:

If Have you heard of La Crosse Encephalitis? != No

Q40 What do you do when you suspect your child has La Crosse Encephalitis? (Select all that apply)

- Seek medical attention / treatment (1)
- Use medication as prescribed after seeing the doctor (2)

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End of Block: Knowledge of La Crosse Encephalitis

Start of Block: Video

Q70 You will now be shown a video. Please watch carefully.

End of Block: Video

Start of Block: Post Test Repellent Use

Q41 For the following questions, outdoor activities refers to spending more than 30 minutes outside of an enclosed area, such as a house, car, or screened in porch. For the next questions, please think about your typical time spent in outdoor activities. For example, think about the scenario where you are at a park or other outdoor setting in your home area. You have been at the park for a period of time. Now consider your future use of insect repellent.

Q42 After watching the video, in the above scenario, I am likely use insect repellent to avoid mosquito bites.

	applied to myself (1)	applied to my child/ren (2)
strongly disagree (1)	<input type="checkbox"/>	<input type="checkbox"/>
disagree (2)	<input type="checkbox"/>	<input type="checkbox"/>

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neither agree nor disagree
(3)

agree (4)

strongly agree (5)

N/A (6)

Q43 After watching the video, using insect repellent would be a _____ idea in this scenario.

for myself (1)

for my child/ren (2)

very bad (1)

bad (2)

neither good nor bad (3)

good (4)

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very good (5)

N/A (6)

Q44 Please answer the following questions using the scale below.

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
I am confident I will use insect repellent in the future when participating in outdoor activities. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is risky to participate in outdoor activities without wearing insect repellent. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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If I were to be participating in outdoor activities and did not wear insect repellent, I would feel regret. (4)

If I were to be participating in outdoor activities and did not reapply insect repellent, I would feel regret. (5)

My chances of getting a mosquito bite if I did not wear insect repellent while doing outdoor activities are great. (7)

I do not intend to reapply insect repellent the next time I am participating in outdoor activities. (10)

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I have complete control over my use of insect repellent when participating in outdoor activities. (11)

Q45 After watching the video, I believe the chances of getting bitten by a mosquito if I'm not wearing insect repellent are:

	for myself (1)	for my child/ren (2)
very unlikely (1)	<input type="checkbox"/>	<input type="checkbox"/>
unlikely (2)	<input type="checkbox"/>	<input type="checkbox"/>
neither likely nor unlikely (3)	<input type="checkbox"/>	<input type="checkbox"/>
likely (4)	<input type="checkbox"/>	<input type="checkbox"/>

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very likely (5)

N/A (6)

Q46 After watching the video, I believe if I did not apply insect repellent while doing outdoor activities, the consequences could be:

	for myself (1)	for my child/ren (2)
not severe at all (1)	<input type="checkbox"/>	<input type="checkbox"/>
a little severe (2)	<input type="checkbox"/>	<input type="checkbox"/>
more than a little severe (3)	<input type="checkbox"/>	<input type="checkbox"/>
severe (4)	<input type="checkbox"/>	<input type="checkbox"/>
very severe (5)	<input type="checkbox"/>	<input type="checkbox"/>
N/A (6)	<input type="checkbox"/>	<input type="checkbox"/>

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Q47 After watching the video, how often per summer day do you intend to apply mosquito repellents?

	to myself (1)	to my child/ren (2)
never (1)	<input type="checkbox"/>	<input type="checkbox"/>
once (2)	<input type="checkbox"/>	<input type="checkbox"/>
every 3 hours (3)	<input type="checkbox"/>	<input type="checkbox"/>
every 5 hours (4)	<input type="checkbox"/>	<input type="checkbox"/>
N/A (5)	<input type="checkbox"/>	<input type="checkbox"/>

Q48 After watching the video, when outdoors, do you plan take additional actions to reduce your risk of getting bitten by mosquitoes? (Please note that some of the actions listed have been proven to be ineffective!)

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Yes (1)

No (2)

Display This Question:

If After watching the video, when outdoors, do you plan take additional actions to reduce your risk... = Yes

Q49 If yes, which ones?

(Please note that some of the actions listed have been proven to be ineffective!)

	Everytime (1)	Occasionally (2)	Never (3)
mosquito net (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
light-coloured clothing (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
long-sleeved shirts/ trousers (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
air conditioning (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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ultrasonic devices (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
insecticide treated clothes (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
vitamin B (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
perfume (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
citronella candles (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
fans (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
window screens (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
misting systems (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other. Please share in the blank below (13)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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After watching the video, when outdoors, do you take plan additional actions to reduce your child/ren's risk of getting bitten by mosquitoes? (Please note that some of the actions listed have been proven to be ineffective!)

	Everytime (1)	Occasionally (2)	Never (3)	N/A (4)
mosquito net (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
light-coloured clothing (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
long-sleeved shirts/ trousers (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
air conditioning (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ultrasonic devices (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
insecticide treated clothes (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
vitamin B (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
perfume (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
citronella candles (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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fans (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
window screens (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
misting systems (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other. Please share in the blank below (13)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q51 I intend to apply insect repellent the next time I am participating in outdoor activities.

	to myself (1)	to my child/ren (2)
strongly disagree (1)	<input type="checkbox"/>	<input type="checkbox"/>
disagree (2)	<input type="checkbox"/>	<input type="checkbox"/>
neither agree nor disagree (3)	<input type="checkbox"/>	<input type="checkbox"/>

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agree (4)

strongly agree (5)

N/A (6)

End of Block: Post Test Repellent Use

Start of Block: Post Test Mosquito Knowledge Questions

Q52

After watching the video, is the following statement true or false?

Mosquito bites can be prevented using insect repellent.

True (1)

False (2)

Q53 After watching the video, is the following statement true or false?

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Mosquitoes may carry viruses (such as West Nile, Zika, etc) that can cause illness and even death in people.

- True (1)
- False (2)

End of Block: Post Test Mosquito Knowledge Questions

Start of Block: Post Test Knowledge of La Crosse Encephalitis

Q54 How is La Crosse Encephalitis transmitted to a person?

- Mosquito bite (1)
- In the air (2)
- Don't know / Others (3)
- Blood transmission (4)
- In water (5)

Q55 Which mosquito transmits La Crosse virus?

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- Aedes (1)
- Anopheles (2)
- Culex (3)
- Don't know / Others (4)

Q56 What are the signs and symptoms of La Crosse Encephalitis? (Select all that apply)

- Fever (lasting 2-3 days) (1)
- Enlarged lymph nodes (2)
- Diarrhea (3)
- Chills (4)
- Deep muscle and joints pain (5)
- Fatigue (6)
- Headache (7)
- Loss of appetite (8)

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- Eye pain (9)
- Nausea and vomiting (10)

Q57 What do you do if you suspect your child has La Crosse Encephalitis? (Select all that apply)

- Seek medical attention / treatment (1)
- Use medication as prescribed after seeing the doctor (2)
- Other (3) _____

Q58 If there is anything you would like to share about your experience(s) or your child/ren's experience(s) with mosquitoes? If so, please comment below.

End of Block: Post Test Knowledge of La Crosse Encephalitis