Studying the Dynamics of Tick Prevention and Public Knowledge

Phin Green-Marshall

As humans are increasingly changing the landscape around them, this increases the risk of zoonotic diseases making their way into the population. One significant and increasing collection of these diseases in the U.S. are tickborne illnesses, including Lymes Disease, tickborne encephalitis, and alpha-gal syndrome. In addition to more explorations into their habitats, tick season is expanding as climates become milder. While a lot of studies investigate the ticks themselves, including migration patterns and preferred habitats, this study aims to interview participants based on their habits to determine which activities and occupations are most at risk.

The main populations at risk are people who are likely to be around brush and tall grass. That ranges from construction workers to families who go to parks, residents with big yards, and hikers. All of these groups are likely to come across ticks' preferred habitats, though depending on where they are might come in contact with different tick species.

Methodology

The design for this study is a cross sectional study, surveying those who are likely to have been exposed. This was chosen due to the fact that it will be able to assess burdens and knowledge. It will also be able to reach a lot of people without too much hassle from study coordinators.

Primary exposure is, of course, a tick bite. The outcome is a clinical diagnosis of a disease that is proven to have correlations with tick bites. Though, due to the burrowing and small nature of ticks, some participants might not know they got bit by a tick or have recognized when the tick bit them. This incongruence could be high or low, but could assess the ways in which more prevention measures should be advertised to the public.

The survey is looking at any diseases that are potentially tickborne. It is assessing a few things: 1) prevalence of tick-borne diseases, 2) knowledge of tickborne diseases and preventions, 3) whether participants know when they got bit, and 4) use of tick prevention methods.

Prevalence of tickborne diseases will end up showing up anyway, as the survey is measuring how many people have been diagnosed with diseases that could be considered tickborne. This is mainly to assess other measures.

This survey will also assess participant's knowledge of tick borne diseases. While ticks have been an increasing problem, participants might not be informed about all of the best prevention methods. There could also be some information that is known more than others, so its important to know what measures should be given.

Already kind of discusssed knowing the cause of the bite, but its important to know how much people are paying attention to the potential exposure.

The use of tick prevention methods goes along with knowledge of tickborne disease and prevention, but knowledge does not always mean practice. Assessing this is important for the same reasons of what to target with intervention programs.

While the population at risk is mainly people who are often outdoors, the population of the study will be the general public. This could identify potential confounding factors and unidentified populations. It also allows for people who aren't involved in outdoor activities but have gotten a tickborne disease to be represented. Plus, it allows for the use of survey websites.

The participants will be selected using survey sites that are designed for research. These will allow the survey to reach the general population.

The time frame of the study will take place over a few months: the time it takes to create the survey and then a few months to allow for enough responses. While the survey will not necessarily take too long, there should still be time set out for creation of a survey that is as unbiased as possible. Additionally, it allows for time to set up the hosting of the survey on the site.

The gathering of the data will take a few months, as there will need to be a significant amount of respondents for the survey to be more accurate. The time open for the survey will not be too long though, to ensure that the study does not overstay its welcome.

The survey hosted on the site could be leaving out people who don't spend time on survey sites. Additionally, the questions could be leading, the participants could have forgotten about potential exposures or other factors, participants could be misrepresenting themselves. All of these factors could lead to potential problems.

Data Collection

The study participants will be respondents to the survey that is done using an online host that is made for research design. This will specifically target residents of the U.S. which is an area that has a high prevalence of tick borne diseases. The aim is to represent the general population in order to assess general knowledge and tick preventing practices as best as possible.

The participants will answer survey questions about all of the issues already discussed. These are 1) existence of one or more tickborne diseases. Examples will include Lymes Disease, tickborne fever, tickborne encephalitis, and alpha-gal but will also include a place for an other option, as there a number of diseases and it would be difficult to include all of them. That could also potentially overwhelm the participants. In the question, it will also clarify that these should be

clinician diagnosed as self-diagnoses are not what this survey is trying to capture. Additionally, self-diagnoses are likely to be misassessments and thus could mess with the numbers.

For 2) there will be a few questions with multiple choice questions about tick prevention methods and additional knowledge. It would probably be best to put this in front of the questions about the diseases, as those could give information and create a bias for this set of questions. THis is also probably best put in tandem with 4) as that is about actual use of those tick prevention methods. Putting them together will probably streamline the survey.

For the third point of assessment, knowledge of any tick bites the participants might have had, the survey will ask about the amount of ticks they have found on themselves within a recent time period. This might be a year, though it could also be relevant to ask if participants have ever found a tick on themselves. Though this point will probably be very biased due to memory, it is also useful for assessing preventative measures taken, such as checking for ticks.

The survey will also ask about participant's demographic information, general area they live(not too precise, but probably state and depending on the size of the state, region), occupation, and any outdoor activities. This will allow for the determining of populations more at risk of tickborne disease. It could also identify populations that have been previously unseen.

Data Analysis

o What measure(s) of association will you calculate? And why?

The measures of association used will be odds ratio and proportional prevalence. Both of these are used to look back in time. Neither of them can determine causation but can instead find higher burdens of disease or risks among populations.

Odds Ratio will help to determine differences between exposure and outcome. Though, the exposure might be more ‘time spent outdoors’ than an actual tick bite. This could show the risk that those who spend significant time outdoors are at compared to those who do not spend as much time outdoors.

Proportional Prevalence is used to determine which populations are experiencing more tickborne diseases. This could show to what depth each population is at risk and to what depth they are affected.

There will be some limitations to this study, as there are in every study. Some will be: not all participants will be able to remember every prevention method they’ve taken, or other exposures, especially if they do not have a tickborne disease; the nature of the survey could leave people out, especially demographics not likely to participate in online surveys; and Causation cannot be determined with a cross sectional study.

Conclusion

This study is to assess the publics knowledge of preventative measures and the prevalence of tickborne diseases. This is to both plan for intervention methods to increase preventative measures but also assess which populations might need those interventions.

A key public health concern is how ticks are affecting people as their habitats and times grow larger. There are steady rises every year in how many people are gaining tickborne diseases and a lot of them are chronic, meaning that they don’t necessarily go away. So it is important to assess how much this disease affects people.

The policy implications are potential intervention methods, mainly focused on increasing knowledge of preventative measures. Though it can also provide information on which occupational and leisure activities are most at risk.

Bibliography

CDC. (2024, May 17). *About Ticks and Tickborne Disease*. Ticks. https://www.cdc.gov/ticks/about/index.html

Forrester, J. D., Kjemtrup, A. M., Fritz, C. L., Marsden-Haug, N., Nichols, J. B., Tengelsen, L. A., Sowadsky, R., DeBess, E., Cieslak, P. R., Weiss, J., Evert, N., Ettestad, P., Smelser, C., Iralu, J., Nett, R. J., Mosher, E., Baker, J. S., Van Houten, C., Thorp, E., … Mead, P. (2015). Tickborne Relapsing Fever — United States, 1990–2011. *Morbidity and Mortality Weekly Report*, *64*(3), 58–60. https://www.jstor.org/stable/24856305

Kianersi, S., Luetke, M., Wolfe, C. G., Clark, W. A., & Omodior, O. (2020). Associations Between Personal Protective Measures and Self-Reported Tick-Borne Disease Diagnosis in Indiana Residents. *Journal of Community Health*, *45*(4), 739–750. https://www.jstor.org/stable/48717070

Lindgren, E. (1998). Climate and Tickborne Encephalitis. *Conservation Ecology*, *2*(1). http://www.jstor.org/stable/26271666

Ostfeld, R. S. (1997). The Ecology of Lyme-Disease Risk: Complex interactions between seemingly unconnected phenomena determine risk of exposure to this expanding disease. *American Scientist*, *85*(4), 338–346. http://www.jstor.org/stable/27856811

Ostfeld, R. S., Cepeda, O. M., Hazler, K. R., & Miller, M. C. (1995). Ecology of Lyme Disease: Habitat Associations of Ticks (Ixodes Scapularis) In a Rural Landscape. *Ecological Applications*, *5*(2), 353–361. https://doi.org/10.2307/1942027

Parola, P., & Raoult, D. (2001). Ticks and Tickborne Bacterial Diseases in Humans: An Emerging Infectious Threat. *Clinical Infectious Diseases*, *32*(6), 897–928. http://www.jstor.org/stable/4461489

Plowright, R. K., Sokolow, S. H., Gorman, M. E., Daszak, P., & Foley, J. E. (2008). Causal Inference in Disease Ecology: Investigating Ecological Drivers of Disease Emergence. *Frontiers in Ecology and the Environment*, *6*(8), 420–429. http://www.jstor.org/stable/20440964

Smith, R. P., Rand, P. W., Lacombe, E. H., Morris, S. R., Holmes, D. W., & Caporale, D. A. (1996). Role of Bird Migration in the Long-Distance Dispersal of Ixodes dammini, the Vector of Lyme Disease. *The Journal of Infectious Diseases*, *174*(1), 221–224. http://www.jstor.org/stable/30126245

van Buskirk, J., & Ostfeld, R. S. (1998). Habitat Heterogeneity, Dispersal, and Local Risk of Exposure to Lyme Disease. *Ecological Applications*, *8*(2), 365–378. https://doi.org/10.2307/2641077