

Meningitis in U.S. Colleges

[Announcer] This program is presented by the Centers for Disease Control and Prevention.

[Sarah Gregory] Hi. This is Sarah Gregory, and today I'm talking to Dr. Heidi Soeters, an epidemiologist at CDC. We'll be discussing her article about the number of cases of meningococcal disease in U.S. colleges after a vaccine had already been developed. Welcome, Dr. Soeters.

[Heidi Soeters] Thanks, Sarah. Thanks for having me.

[Sarah Gregory] So let's start off with you explaining what Meningococcal B is.

[Heidi Soeters] Sure. So, meningococcal disease is an invasive bacterial illness caused by a bacteria called *Neisseria meningitidis*. This disease can present in a number of different ways, including meningitis, which is an infection of the lining surrounding the brain and the spinal cord; bacteremia, which is an infection of the bloodstream; or bacteremic pneumonia, which is pneumonia accompanied by an infection of the bloodstream. And there are 12 different types of this bacteria, and these are called *serogroups*. Each of these serogroups is assigned a letter, and six of these serogroups are the primary causes of invasive disease in the United States. And so, serogroup B is the most common serogroup that we have here in the U.S. And there are two vaccines recently available in the U.S. that can help prevent serogroup B meningococcal disease, and we call these MenB vaccines.

[Sarah Gregory] So this is actually the second major meningococcal vaccine that I'm aware of. There was one in the early 2000s, I think, called ACY or something like that.

[Heidi Soeters] Yeah, so previously in the United States we had meningococcal vaccines available that worked against four of the different serogroups, so they work against A, C, W, and Y. So, these vaccines had been around for a while and most people who are headed off to college these days have that MenACWY vaccine, but these new serogroup B vaccines are new to the market and are kind of...are newly available for students headed off to college.

[Sarah Gregory] So, if somebody, like, has already had the ACWY—is that what you said?

[Heidi Soeters] Mm-huh.

[Sarah Gregory] ...but they're maybe going to graduate school or something, should they get the B one then?

[Heidi Soeters] Yeah, so the MenACWY vaccine does not protect against serogroup B, as it sounds like from the name. And so, if a person has *only* received a MenACWY vaccine, they would not be protected against serogroup B meningococcal disease or be protected in the event of a serogroup B meningococcal disease outbreak. And so, it's kind of up to each person who, if they're headed off to college for undergraduate or if they're headed off to graduate school, to kind of discuss this with their clinical provider, as they get ready to go to school, and decide whether or not serogroup B vaccine would be a good option for them at that time.

[Sarah Gregory] Okay, well, tell us about your study now.

[Heidi Soeters] Right. So, as I mentioned, serogroup B has caused a number of recent outbreaks on college campuses in the U.S., keeping us all very busy. And each time one of these outbreaks occurs, the universities wonder whether they're going to have more cases and whether or how they should think about implementing a vaccination campaign using these new tools that we have, these new MenB vaccines. So, in this study, we wanted to take a really close look at the outbreaks that have occurred and what type of trajectory they took, and also, we wanted a chance to document the different approaches that universities were taking to using these MenB vaccines in an outbreak setting. And so, the goal was really to understand these outbreaks and then, also, to inform how best to stop them.

[Sarah Gregory] What was your hypothesis before you began? Did you have one or...?

[Heidi Soeters] Well, in my job at CDC, we provided a lot of onsite or remote technical assistance for each of these outbreaks, and so, we ourselves were very familiar with the data, but we really wanted to take all of this information and put it into one, easy-to-access place as a helpful resource for universities who might experience a serogroup B outbreak in the future. So, we didn't have a hypothesis, per se, but we just wanted to put everything into one place to be an easy resource.

[Sarah Gregory] Okay. So what were you looking at?

[Heidi Soeters] So we looked at two main categories of data, the first being data on the serogroup B meningococcal disease cases that occurred during each outbreak, and then also data looking at the MenB vaccination responses that each university undertook. So, the case data, for example, included information, such as the timing of the cases, the age or the sex of the student who had the disease, their clinical presentation, whether or not they were vaccinated, and any specific risk factors they might have had. And then on the other side, in terms of vaccination data, we looked at, for example, which MenB vaccine was used, since there are two different products available on the market, what the approach to vaccination was that the university took, and what type of vaccination coverage they were able to achieve.

[Sarah Gregory] Okay, so tell us what you found.

[Heidi Soeters] Sure. So, we looked at the time period of January 2013 to May 2018, and during this time period, we found that 10 university-based outbreaks of serogroup B meningococcal disease occurred in seven different states, causing a total of 39 cases of disease and two deaths. And these outbreaks occurred at universities anywhere from small private schools with around 3,500 undergraduate students, all the way up to very large state universities with up to 35,000 undergraduates—so, a broad range of settings. And the number of cases that occurred in each of these outbreaks ranged from two cases to nine cases. And these cases occurred anywhere from multiple cases occurring on the same day, and then that was the end of the outbreak, all the way up to cases occurring over the course of an entire year—so, quite a range.

And all of these 10 universities did decide to mount a MenB vaccination response in an effort to halt the outbreak, which required a lot of resources and effort on the part of the university, and lot of times, the state or local health departments that were assisting them. And we found that estimated vaccination coverage for at least one dose of MenB vaccine ranged from 14 to 98 percent in these different outbreaks, and in five of these outbreaks, fortunately, no additional cases of disease occurred following the implementation of MenB vaccination. However, in the

other five outbreaks, additional cases *did* occur following MenB vaccination initiation, for a variety of reasons.

[Sarah Gregory] So, why are colleges, and especially undergraduate colleges, particularly susceptible to these outbreaks? Why not work environments?

[Heidi Soeters] Yeah, that's a great question. So, for a number of reasons. One is the age group of students who are in college. So, the kind of late adolescence, early adulthood is really the peak for people experiencing meningococcal disease, but also, for people who asymptotically carry the bacteria in the back of their throats, and just can spread it between each other—that's how meningococcal disease is spread. So, this is just really the age group where this bacteria likes to live, unfortunately. And, as I mentioned, this bacteria is spread through people having contact with each other's respiratory secretions, and you can probably think of a lot of activities that may occur in a university setting that involve the swapping of respiratory secretions, such as, you know, partying, dating, those types of things. So, it's really the ideal transmission setting for this bacteria, unfortunately.

[Sarah Gregory] Beer pong is what leaps to mind.

[Heidi Soeters] Exactly.

[Sarah Gregory] So, Dr. Soeters, how did you conduct the study?

[Heidi Soeters] So, first we made a comprehensive list of all of the university-based serogroup B outbreaks that we knew of, that had occurred since MenB vaccines became available in the U.S. We reviewed our records here at CDC and for the outbreaks that we've participated in as part of response activities. We also reviewed cases reported to our national surveillance systems to see if there were any other cases or outbreaks that were not really on our radar. And then finally, we contacted states or universities to both verify and obtain some data and to get updates on their vaccination response efforts and their vaccination coverage. So, we took all of this information and then we summarized key characteristics of both the outbreaks and the vaccination response.

[Sarah Gregory] Okay. So, I think you already sort of covered this, but is there anything you'd like to add to who's most likely to get meningococcal serotype B?

[Heidi Soeters] Mm-huh. So, currently in the U.S., college students are at increased risk for serogroup B meningococcal disease. But actually, the highest disease burden is found among infants, who are too young to receive the licensed MenB vaccines.

[Sarah Gregory] Where do the outbreaks you study occur?

[Heidi Soeters] So, all 10 outbreaks occurred at residential, four-year, degree-granting universities all around the country. And often, but not always, the cases did belong to student groups that had very high levels of social mixing. I'm sure you can think of things such as Greek life or athletic teams, anywhere where students have a very high degree of contact with each other.

[Sarah Gregory] Okay, so how are these outbreaks contained?

[Heidi Soeters] So, the immediate response for any meningococcal disease outbreak, or even around a single case, is to provide antibiotic chemoprophylaxis to the close contacts of the case.

So you want to find anybody who had close contact with the case, give them antibiotics to quickly eliminate the bacteria that they might be carrying in their throats, and then, after that, a lot of communication efforts to both students and their parents, and also to providers to raise awareness about meningococcal disease transmission and symptoms, and prompt early-care synching behavior and then early diagnosis, in case more cases do occur.

And then, if multiple cases occur, that's considered an outbreak, and then the schools initiated a vaccination response. And schools used vaccine in a wide variety of ways, whether it be via mass vaccination clinics—you can picture like a flu clinic—whether it's giving the vaccine at student health, or whether it's partnering with area providers and pharmacies to help students get the vaccine that way.

[Sarah Gregory] Okay, so what's the bottom line here? Should colleges require this MenB vaccination to attend school, like most do with the measles vaccine?

[Heidi Soeters] Despite the high profile of these outbreaks, meningococcal disease is, in fact, extremely rare in the United States. Less than 400 cases occur each year, and most of those cases are actually what we call "sporadic," meaning they're not actually associated with an outbreak. And many of those cases are not serogroup B, which is the only serogroup covered by these new MenB vaccines. So, the data indicate that most universities will not actually experience a single case of serogroup B, let alone a serogroup B outbreak. However, it is up to each state and each university to decide their vaccination requirements. And we are hearing increasing reports of schools that are requiring MenB vaccine. And many universities do already require the MenACWY vaccine that we mentioned earlier.

[Sarah Gregory] Does CDC have any guidelines for managing outbreaks?

[Heidi Soeters] Yes. We revised this guidance in 2017, based on our experience with these serogroup B outbreaks, and this updated guidance can be found on CDC's meningococcal disease website.

[Sarah Gregory] Okay. And have these outbreaks increased in recent years or are they just being tracked better or something?

[Heidi Soeters] So this is a question we get a lot. Reports of these outbreaks have definitely increased, but it's hard to tell if the outbreaks themselves have actually increased, for a number of reasons. One is that, with the decreasing number of cases of meningococcal disease in the United States, it makes individual cases or small outbreaks much more apparent and, therefore, much more alarming. And we really lack historic data on university affiliation and, sometimes, on outbreak affiliation for cases looking backward, so it's hard to look at trends over time.

But we also have some increased tools. We have increased molecular tools to tell whether cases are genetically related and, therefore, can identify if cases are part of the same outbreak. And we also have a new tool with MenB vaccine, which means that outbreak response has a bigger option now, and is a much more involved response.

[Sarah Gregory] Why do you think *EID* chose to publish your paper, considering how many submissions we get?

[Heidi Soeters] This is hard for me to say, but from my perspective, this is the first comprehensive look at university-based outbreaks of serogroup B meningococcal disease and the first summary of the use of these new MenB vaccines for outbreak response in the United States. So, as many people know, university-based serogroup B outbreaks have been quite a hot topic lately. There have been frequent outbreaks of between one and four a year, which generate a lot of media attention. And with the recent licensure of these MenB vaccines, there have been a lot of discussions about when and how they should be used in outbreaks, and as you asked, a lot of questions about whether students should receive these MenB vaccines before they head off to college.

And another thing that makes this topic interesting is that there's really something new to learn from each outbreak. Every single one of them has been very different. And there are different subpopulations of students affected. There have been instances where we have to talk about whether immunologic data should be used to guide the choice of MenB vaccine that should be used for outbreak response. The schools have come up with novel strategies to deliver the vaccine to students or to rapidly achieve high vaccination coverage. So, this a new and constantly evolving topic with a lot to learn and a lot of attention.

[Sarah Gregory] If you could solve just one public health problem or disease or issue, what would you fix?

[Heidi Soeters] So, meningitis is a devastating disease, both here in the U.S., as we've been talking about today, but also internationally, especially in sub-Saharan Africa. Meningitis not only causes the acute disease and potential fatality, but it also can leave behind a lot of long-term complications, such as hearing loss or limb amputation, neurological deficits, seizure disorders—it's a very devastating disease that occurs here and elsewhere. So, if I could work towards making sure that no one has to experience this disease, either here or overseas, in the future, then I think that would be a great goal.

[Sarah Gregory] Okay. On that note, tell us about your job at CDC—how you became involved in this study and what you like best about working here.

[Heidi Soeters] Sure. So, I came to CDC as an Epidemic Intelligence Service officer, which is what we call "disease detectives," and I was assigned to the meningitis and vaccine preventable diseases branch, which is where I began working on this topic of university-based serogroup B outbreaks. I came into CDC right at the time that these MenB vaccines were licensed, so I've really witnessed this entire area. And following EIS, I stayed on as a staff epidemiologist with the meningitis branch, where I focused on a number of pathogens that can cause bacterial meningitis, including *Neisseria meningitidis*, like we've talked about today, but also *Streptococcus pneumoniae* and *Haemophilus influenzae*. And I have been able to work both domestically and internationally on these topics.

I'm currently transitioning to a new position in the Global Immunization Division, where I'll work on the introduction of new vaccines globally, which I'm very excited about. And I would say, my favorite part about my job here at CDC, is that it is such a unique combination of public health service and lifelong learning. I get to help people every day and enrich my mind at the same time. So, that's an ideal combination for me.

[Sarah Gregory] And finally, what is the best single or maybe couple of ways people can protect themselves from all these different global diseases?

[Heidi Soeters] So, I would say this even if I didn't work in the field of vaccination, but if you want to be protected from infectious diseases, get vaccinated. It's simply the easiest and most effective tool that we have available to prevent illness or death due to many infectious diseases, either here in the U.S. or overseas. So, I'm a big fan.

[Sarah Gregory] Good to hear. Well, thank you so much for taking the time to talk to me today, Dr. Soeters.

[Heidi Soeters] My pleasure.

[Sarah Gregory] You listeners out there can read the March 2019 article, University-Based Outbreaks of Meningococcal Disease Caused by Serogroup B, United States, 2013 through 2018, online at [cdc.gov/eid](https://www.cdc.gov/eid).

I'm Sarah Gregory for *Emerging Infectious Diseases*.

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