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## **'Herd immunity,' vaccinations importance**

Dr. Anju Goel

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This week, guest columnist Dr. Anju Goel returns to discuss "herd immunity" in regard to the influenza vaccinations.

This important public health concept is often mentioned in the media, but it's rarely explained in depth. Here to remedy this situation is Anju Goel, MD, MPH, the deputy public health officer for the Marin County Department of Health and Human Services:

You've probably seen the advertisements on public buses and in movie theatres in Marin: "Herd Immunity - Join the Herd! Build Community Immunity!"

The ads encourage you to get immunized as a double whammy against disease:

- To protect you, the individual.
- To protect the community.

It's the protecting the community part that can be confusing. How can a vaccine, given to individuals, have a far-reaching effect across the county and beyond? Herd immunity is like a firewall that prevents a contagious disease from taking hold in a community. Immune people don't become sick from the disease and thus cannot pass it on to others either. The higher the proportion of immune individuals, the lower the likelihood that a susceptible person will come into contact with an infectious person and become ill. As long as that number of non-immune individuals remains low, the disease cannot easily spread.

Most commonly, protection is the result of having been vaccinated. Having previously had a disease also plays a role since we build immunity to many infections that we experience. The duration of immunity, whether via immunization or illness, varies from a few months to lifelong.

The level of immunity needed to achieve community protection varies by disease and depends on how easily an organism is transmitted between people. The greater the transmissibility, the higher the immunity threshold required to keep most of us safe.

For measles and pertussis, 94 percent of the population must be immune to protect the 6 percent that are not. The figure is about 85 percent for rubella and diphtheria. Below these critical thresholds, diseases will spread more easily. Herd immunity is vital to people who cannot get a vaccine because of age or medical conditions. It also helps those with impaired immune systems who receive a vaccine but don't build a sufficient immune response to it.

In short, herd immunity protects everyone who is not immune, including those who choose not to vaccinate for personal belief reasons.

Here's a concrete example of just how important herd immunity is, especially to families with young children.

In the past 14 years, nearly every person (except one) in California who died because of pertussis was less than 3 months old. Why are infants so susceptible to severe pertussis? Children receive their first pertussis vaccine at 2 months and their last at 4 to 6 years old, excluding the booster. So infants younger than 3 months have only partial to no immunity.

To protect them, family members and caregivers must be vaccinated. These vaccinations form a cocoon, or circle of protection, around the infant. Lack of herd immunity and breaks in the circle, then, are partly responsible for the current pertussis outbreak.

Though most Marin children have received their primary vaccine series, many preteens, teens and adults have not received the booster shot. They serve as a reservoir for the disease. California is one of only 11 states that does not require the pertussis booster for middle school students. Now that Assembly Bill 354 has passed, this will change in the 2011-12 school year and boosters will be required for seventh through 12th-graders.

Once we achieve herd immunity, we have to keep immunizing to maintain it. If we were to stop immunizing, we would see resurgence in disease. As the CDC describes on its website, the situation is much like bailing out a boat with a slow leak. When we started bailing (immunizing) the boat was filled with water (the community had rampant disease). But we have been bailing fast and hard, and now it is almost dry and disease is almost gone. We could say, "Good. The boat is dry now, so we can throw away the bucket and relax."

But the leak hasn't stopped.

Before long we'd notice a little water seeping in, and soon it might be back up to the same level as when we started. Until we can "stop the leak" (eliminate the disease), it is important to keep immunizing.

This risk of disease resurgence is more than theoretical. There are numerous recent examples. Some, such as the resurgence of measles in Europe, have been well publicized. When an (intentionally) unvaccinated American child visited Switzerland in 2008, he

returned home with measles and consequently San Diego experienced its largest measles outbreak since 1991. The child exposed 839 people. Eleven of them, all unvaccinated children, became seriously ill including an infant who needed to be hospitalized. All as a result of a potentially deadly disease that is vaccine preventable.

Vaccines are one of the most significant public health advancements of the last century. They save literally millions of lives each year. They're most effective when a substantial portion of the population is vaccinated. Choosing to vaccinate means choosing to contribute to community immunity. The majority that does vaccinate provides protection to the few who do not. So give it some thought, and if you haven't done so already, I hope you decide to join the herd and immunize. Do it for yourself and for your family. Do it for your community.

Dr. Dustin W. Ballard is an emergency physician at Kaiser Permanente San Rafael and the author of "The Bullet's Yaw: Reflections on Violence, Healing and an Unforgettable Stranger." His Medically Clear column appears every other Monday.