Binomial distributions in public health

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According to Gerstman (2007), a binomial event is that which has only two outcomes, and therefore if the probability for one of the outcomes is known, then the probability that the other outcome will occur is simply the difference of the known probability from 1. Treating repeated trials as independent events, the compilation of results of a binomial experiment altering the number of desired successes while keeping the number of trials fixed forms a binomial distribution.

The binomial probability distribution thus gives an idea of how likely it is that successive successes can occur over a given number of trials. For say a simple experiment of throwing a fair coin 4 times, the probability of getting a heads in any toss is 0. 5. Thus, the probability of getting no heads at all in the four tosses is 0. 5^4 while the probability of getting exactly 1 heads is 0. 5^2, and the probability of getting 2 heads is 0.

5 and then the probability of getting more than 2 heads decreases in the same manner that the probabilities increased in the progression described. If the probabilities are altered in such a way that success is much more likely in a single event thanfailure, then given five trials it would be expected that having successive successes would be more probable than successive failures. The binomial distribution also allows probabilities for multiple events to simply be added in order to give an idea of the total probability for that event.

For example when determining what the probability of getting at most 2 heads in four tosses of a coin, the probabilities of getting exactly 0 heads, 1 heads, and 2 heads can simply be added to give the correct probability for getting no more than 2 heads. Give this nature of the binomial probability

distribution, its applications to publichealthbecomes apparent. Villeneuve (2002) states that the binomial distribution can be used “ to describe the number of times an event [such as a disease] will occur in a group of [people]” if the probability concerning the occurrence of that event is known.

For example, if the probability of getting infected by rabies if you were bitten by a particular animal is known, then given a certain number of people who were all bitten by that particular animal in an area it would be possible to reasonably determine how many of those people are likely to be inflicted with rabies. Public health practitioners need to be well briefed with what binomial probabilities and distributions are so that they will be able to make sound decisions based on data that they have on hand.

Oftentimes, public health practitioners that have responsibilities at the macro-level are placed with decisions involving prioritization wherein the one responsible needs to make a decision that would concern the division of a limited amount of resources. With information that can be modeled using a binomial distribution, the public health practitioner would be able to have a more reliable idea on how to allocate such resources.

Going back to the example of rabies, if several outbreaks occurred at the same time in different areas with a different animal causing each outbreak, then based on the probability of getting rabies from each particular animal and the number of patients bitten in each area, a public health practitioner can use binomial distributions as a good basis for allocating a limited number of personnel, equipment, and medicine for each of the areas. Many diseases such as cancer or AIDS can be described as a binomial experiment. That is, one either has cancer or does not and one either has AIDS or does not.

In such cases, knowledge of the binomial distribution can be very useful to public health officers in enabling them to predict the likelihoods associated with the condition occurring on a certain population. References Gerstman, B. (2007). Basic Biostatistics: Statistics for Public Health Practice. Jones & Bartlett Villeneuve, P. (2002). " Binomial Distribution. " Encyclopedia of Public Health. Ed. Lester Breslow. Gale Cengage. Retrieved December 26, 2008 from eNotes. com: http://www. enotes. com/public-health-encyclopedia/binomial-distribution