EBOLA IN CONTEXT: UNDERSTANDING TRANSMISSION, RESPONSE AND CONTROL

# **WEEK** **3** STEP 3.6 CALCULATING VACCINE EFFICACY AND HERD IMMUNISATION THRESHOLD

This quiz will check your understanding of concepts around the potential population impact of vaccines, and asks you to apply them in a range of scenarios related to the Ebola outbreak.

## Question 1

Assume that Ebola has a basic case reproduction number (R0) of 2. What percentage of the population must be immune in order to reach the herd immunity threshold?

## Answer

Select one:

1. 33%
2. 50%
3. 67%

## Question 2

Vaccines are not 100% effective. The percentage of the population that needs to be vaccinated to reach the herd immunity threshold (the vaccine coverage) depends on the vaccine efficacy.

Assume a vaccine for Ebola is available with an efficacy of 75%, and that the R0 for Ebola is 2 (as in the previous example).

What proportion of individuals must be vaccinated in order to reach the herd immunity threshold? (Hint: the HIT has already been calculated and is 50%.

## Answer

Select one:

1. 50%
2. 67%
3. 33%

## Question 3

If the R0 for Ebola was 1.3 rather than 2 (e.g. in a totally susceptible population where procedures for contact tracing and isolation were already in place), which of the following is true, compared to the scenario in Q2.

## Answer

Select one:

1. You would need to vaccinate more people to reach the herd immunity threshold.
2. For the same vaccine coverage a vaccine with lower efficacy could be used to reach the herd immunity threshold
3. This would make no difference to the proportion of the population that would need to be vaccinated to reach the herd immunity threshold

# Feedback and correct answers

## Question 1

1. 33%

Feedback: Remember the formula for herd immunity threshold:

Herd immunity threshold = (R0-1)/R0

1. **50% (CORRECT)**

**Feedback: The formula for herd immunity threshold = (R0-1)/R0.**

**As such, in this case herd immunity threshold:**

**(2-1)/2= 0.50 = 50%**

1. 67%

Feedback: Remember the formula for herd immunity threshold:

Herd immunity threshold = (R0-1)/R0

## Question 2

1. 50%

Feedback: Remember that the required vaccine coverage = herd immunity threshold / vaccine efficacy.

1. **67% (CORRECT)**

**Feedback: Required vaccine coverage = herd immunity threshold / vaccine efficacy. Therefore, the proportion that would need to be vaccinated to get R=1 = 50% / 75% = 0.667 or 67%.**

1. 33%

Feedback: Remember that the required vaccine coverage = herd immunity threshold / vaccine efficacy.

## Question 3

1. You would need to vaccinate more people to reach the herd immunity threshold.

Feedback: Remember the herd immunity threshold is R0-1/R0. If the herd immunity threshold is lower you would need to vaccinate fewer people.

1. **For the same vaccine coverage a vaccine with lower efficacy could be used to reach the herd immunity threshold (CORRECT)**

**Feedback: Remember the herd immunity threshold is R0-1/R0, so is now (1.3-1)/1.3 = 23%. With a vaccine coverage of 67% (as in Q2) even a vaccine with quite low efficacy could be helpful.**

1. This would make no difference to the proportion of the population that would need to be vaccinated to reach the herd immunity threshold

Feedback: Remember the herd immunity threshold is R0-1/R0. If the herd immunity threshold is lower you would need to vaccinate fewer people.

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