QUANTITATIVE QUESTIONS READING DRILL

Questions 12–21 are based on the following passage and supplementary material.

This passage is adapted from Gerardo Chowell, Cécile Viboud, Xiaohong Wang, Stefano M. Bertozzi, Mark A. Miller, *Adaptive Vaccination Strategies to Mitigate Pandemic Influenza: Mexico as a Case Study.* © 2009 by PLoS Currents.

Virological subtyping of a novel pandemic virus can provide an early clue to target vaccination efforts. While the elderly are normally at most risk
5 for severe outcomes during seasonal influenza, warranting the targeting of vaccination for direct protection to that group, they may have residual protection during pandemics. By contrast, younger
10 groups generally respond better to vaccine and provide a greater reduction of transmission. Given residual protection in seniors in early pandemic waves, younger age groups become a clear priority group
15 for pandemic vaccine allocation. In the current 2009 pandemic, those who were born between 1919 and around 1957 would have been first exposed to H1N1 during their childhood and may enjoy
20 protection against S-OIV infection and death, as observed in the early wave of S-OIV in Mexico.

Several studies have assessed the effects of potential vaccination strategies against
25 pandemic influenza in terms of reducing morbidity and mortality based on priority age groups, transmissibility, timing of vaccination efforts, and number of years of life lost. A recent study has evaluated
30 the influenza vaccine allocation problem considering a vaccination coverage of 35% at the pandemic onset or near the pandemic peak when the population is stratified by age and low and high risks.
35 Results suggest that vaccines should be allocated to individuals with high-risk complications whenever the vaccine becomes available late in the pandemic (close to the peak) while targeting high
40 transmitter groups (children) is more effective when the vaccine is available close to the start of the pandemic. Most studies of influenza vaccination strategies to date have assumed a given epidemiological
45 profile based on past influenza epidemics and pandemics but have not necessarily considered novel profiles that could arise in future pandemics. Given high levels of uncertainty as to the epidemiology of the
50 next outbreak of S-OIV or other novel influenza virus, unfortunately, no single strategy can fit all scenarios. Our adaptive strategy is flexible enough to accommodate a range of possible scenarios illustrating
55 our experience with past pandemics, and potentially new ones.

We note that other intervention strategies have been proposed to mitigate the burden of pandemic influenza. Social
60 distancing and facemasks have been suggested as mitigation strategies, but their efficacy against pandemics remains debated. Strategies involving antiviral treatments are helpful to mitigate disease
65 burden, but resources are limited and effectiveness assumes speedy delivery and susceptibility of circulating viruses. Any of these interventions could be used in combination with the adaptive vaccine
70 allocation strategy proposed here.

Mexico began vaccinating against seasonal influenza in 2004, and annual campaigns target children 6 to 23 months old, adults over 65 years, and those with
75 chronic conditions. In the past, Mexico has relied on other countries for influenza

vaccine production, which in the setting of a pandemic is likely to be available in limited supplies. Although a preparedness
[80] and response plan against pandemic influenza for Mexico had been drafted with the objective of optimizing resources and conducting a timely response, it lacks guidance on how to define priority groups
[85] in the scenario of a limited vaccine supply. Our study shows that even limited vaccine supplies, if used optimally, can have an impact on mitigating disease burden in a middle-income country like Mexico.
[90]   There are many limitations to policy models with respect to choice of parameter estimates and the incorporation of bio-medical, environmental, operational, political, economic features. No one model
[95] can claim to incorporate all assumptions and features given the limited data on the epidemiology of novel pandemic viruses and paucity of data on contact rates, especially in Mexico. This model
[100] illustrates a prioritization scheme based on age groups but does not further discriminate other sub-groups such as those persons with other medical conditions, including pregnancy. Models
[105] do not necessarily provide answers but help articulate the questions, assumptions and numerous uncertainties in rapidly evolving circumstances as a tool to formulate rational policy based on the
[110] best available evidence. Pandemics evolve rapidly relative to capabilities to enact policies; therefore, pre-formulated adaptive strategies can readily take into account new data. Knowledge of the
[115] specific sub-type circulating and real-time information on age-specific rates of severe outcomes are crucial to help policy makers infer who may be at most risk, and tailor intervention strategies accordingly. These

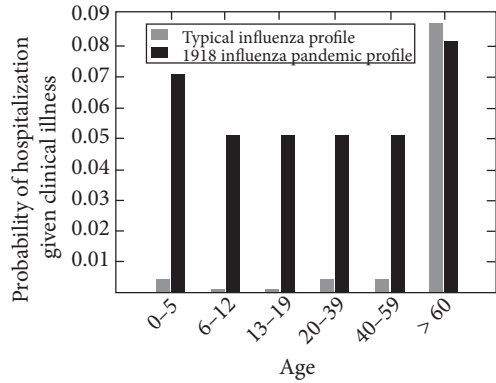[120] adaptive pandemic strategies could be readily adopted by other countries.
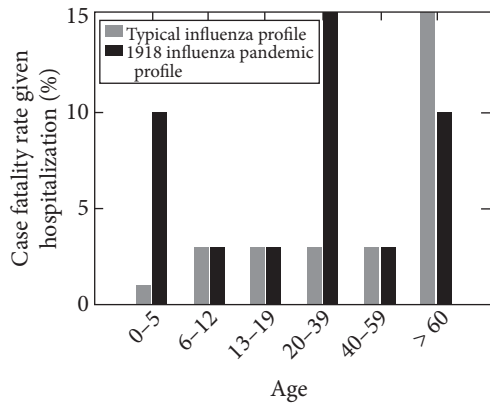

Figure 1

Figure 2

12

Based on the passage, the authors' statement "they may have residual protection during pandemics" (lines 8–9) implies that

A) younger people respond better to vaccines than older people do.

B) compared to younger people, elderly people aren't a priority during pandemics.

C) elderly people may be able to fight off pandemics better than younger people can.

D) younger people are less likely to get influenza.

13

The authors use the word "enjoy" in line 19 to indicate that children who are exposed to influenza

A) are unlikely to die from it as adults.

B) handle the effects of the illness well.

C) are happy to overcome it.

D) may have some immunity to it later in life.

14

A politician claims that Mexico is in dire need of more funds for creating its own vaccines, since, unless the majority of citizens are vaccinated, a pandemic could wipe out the population. Which of the following statements in the passage contradicts the politician's claim?

A) Lines 12–15 ("Given . . . allocation")

B) Lines 48–52 ("Given . . . scenarios")

C) Lines 86–89 ("Our study . . . Mexico")

D) Lines 94–99 ("No one . . . Mexico")

15

The authors' main purpose of including the information about how "Mexico has relied on other countries for influenza vaccine production" (lines 75–77) is to

A) provide a rationale for targeting vaccination efforts.

B) encourage Mexico to create more influenza vaccinations.

C) deter Mexico from seeking foreign vaccine producers.

D) discourage Mexico from venturing into a new industry.

16

As it used in line 102, the word "discriminate" most nearly means

A) differentiate.

B) rank.

C) condescend.

D) victimize.

17

The passage suggests that

A) a strategy that takes into account a variety of factors could lead to a better disease control policy.

B) young children should be given all doses of vaccine available at the beginning of a pandemic.

C) alternatives to vaccination have proven helpful in preventing the spread of pandemics.

D) viruses change too quickly for vaccine producers to adapt.

18

Which of the following provides the best evidence for the answer to the previous question?

A) Lines 9–12 ("By contrast . . . transmission")

B) Lines 59–63 ("Social . . . debated")

C) Lines 63–67 ("Strategies . . . viruses")

D) Lines 114–119 ("Knowledge . . . accordingly")

19

Based on the figures, which choice gives the correct percentage of the case fatality rate given hospitalization percentage for the 1918 influenza pandemic profile for ages 0–5?

A) 1%

B) 7%

C) 10%

D) 15%

20

Do the data in the tables support the authors' statement that elderly patients have some residual protection during pandemics?

A) Yes, the probability of hospitalization for age groups above 5 years and below 60 years is much higher for the 1918 pandemic than for the typical influenza profile.

B) Yes, the probability of hospitalization and the case fatality rate given hospitalization percentage for people older than 60 are higher for the typical influenza profile than for the 1918 pandemic.

C) No, the probability of hospitalization for age groups above 5 years and below 60 years is much higher for the 1918 pandemic than for the typical influenza profile.

D) No, the probability of hospitalization and the case fatality rate given hospitalization percentage for people older than 60 are lower for the typical influenza profile than for the 1918 pandemic.

21

According to the figures, which of the following pairs of percentages provides evidence in support of the answer to the previous question?

A) 15% and 10%

B) 15% and 5%

C) 15% and 2.5%

D) 10% and 7%