Health, recount what is known about the H1N1 virus that caused the 1918 pandemic. They also stress that "virtually all 1918 influenza deaths were due not to influenza itself but to complicating secondary bacterial pneumonias,"(p1453) which often arose with great rapidity. This points to the need to "identify early biomarkers for impending bacterial pneumonia in influenza patients"(p1453) to enable rapid treatment. They also stress the importance of developing vaccines that provide broader protection. Although we may not be able to prevent the next pandemic, we should work to mitigate its effect.

In his contribution, Jason L. Schwartz (p. 1455) from the Yale School of Public Health examines the respective role of vaccines and nonpharmaceutical interventions in 1918 and today. As Schwartz explains, during the 1918 pandemic, many communities implemented a range of social distancing measures. Although these measures were long thought to be ineffective, recent research suggests that they may have had some positive effect. Conversely, the vaccines that were used were clearly ineffective. Since 1918, however, virology has advanced dramatically, and vaccines have improved, but much research is needed to develop a better influenza vaccine. Still, as in 1918, we will remain dependent on a mix of biomedical interventions and social distancing measures when the next pandemic strikes.

PANIC, XENOPHOBIA, AND FEAR

The continued and at times problematic role of nonpharmaceutical interventions is a point that Michael Greenberger (p. 1465), from the University of Maryland School of Law, develops in his article. After discussing why we remain vulnerable to a major pandemic, Greenberger focuses on the limitations of nonpharmaceutical interventions, especially quarantine, looking in particular at how it was misapplied during the 2014 Ebola outbreak. As Greenberger explains, "our approach to pandemics still follows a cycle of 'panic-neglect-panic-neglect,'"(p1467) in which we fail to prepare adequately and then respond to an outbreak with ineffective and needlessly draconian measures.

The theme of inappropriate responses spurred by panic is picked up by Trevor Hoppe (p. 1462) from the State University of New York at Albany. Hoppe treats the nomenclature given to the 1918 pandemic—the Spanish flu—as a window into the significant role that xenophobia, stigmatization, and the scapegoating of vulnerable populations play in pandemic response. As Hoppe explains, giving a disease the name of a foreign or minority community is closely related to the desire to wall off those who are viewed as threats of contagion. This leads to an excessive reliance on counterproductive measures, including travel bans that attempt to prevent the introduction of an emerging disease into a nation. As Hoppe argues, even though the debate continues in the literature, the evidence as a whole suggests that air travel plays a less important role in the spread of pandemics than is commonly believed. Xenophobia, rather than science, helps to explain the call for travel bans.

The fear that can accompany a pandemic affects more than public health responses. It also affects how physicians and other health care workers respond during an emergency. In his Commentary, David Orentlicher (p. 1459) of the University of Nevada, Las Vegas, analyzes the ethical obligations of physicians to treat patients during an epidemic both in 1918 and today. Orentlicher explains that in 1918, the ethical obligations of physicians were relatively clear: they had a duty to treat, even in the midst of an epidemic. Since then, the American Medical Association has diminished physicians' duty to treat, even as the risk to physicians has declined. Orentlicher argues for a more robust duty in recognition of physicians' role and the social contract between physicians and the public.

LESSONS LEARNED AND NOT

Taken together, these commentaries offer a sobering reminder of the dangers of pandemics and the inadequacies of our planning and response. Although many advances have been made since 1918, the authors in this special section show us that the threat of emerging infectious diseases remains, as does the danger of both panic and neglect. We hope that stressing the lessons we have learned and those that we are still attempting to learn can help us avoid that cycle, so that the horrors of 1918 will never be repeated. AJPH

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Tractor Rollovers Are Preventable

See also Myers et al., p. 1517.

The agriculture sector continues to have the highest rate of fatal occupational injuries (23.2 per 100 000 full-time-equivalent workers, with 593 fatalities in 2016) and the highest rate of nonfatal work-related illnesses and injuries (6.1 per 100 full-time-equivalent workers, with 58 300 cases in 2016).[1] Tractor deaths are responsible for approximately one third of these fatalities, with about half caused by tractor rollovers. Tractor rollovers occur for a number of reasons, including tractor operations near irregular, slippery, and sloped terrain; fixed pathway obstacles; and operator issues such as distraction, excessive speed, improper hitching, and failure to set the break when stopped (https://www.osha.gov/laws-regs/regulations/standardnumber/1928/1928.51).

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The most frequent victims are elderly farmers, although notably youths and hired farm workers are also affected.[2]

Tractor rollovers are preventable. Rollover protective structures and systems (ROPS) offer an engineering solution that, along with seatbelt use, protects drivers and virtually eliminates the potential for fatal or severe injuries.[3] It has been shown that engineering controls are the most effective means of controlling workplace hazards, followed by administrative controls (policies and practices) and, finally, personal protective equipment. Engineering controls are preferred because policies and personal protective equipment require promotion of their implementation, which is dependent on the availability of sound and effective protective equipment as well as the knowledge and impetus of workers to use it appropriately.

Some 4.2 million tractors are in use on US farms and ranches. By 1985, as a result of legislation and buy-in from the industry, all new tractors were being manufactured with ROPS. However, tractors have significant longevity, and only 59% had ROPS in place in 2006.[4] International research suggests that further reductions in tractor rollover fatalities will not occur until 75% to 80% of eligible tractors are retrofitted with ROPS.[5]

Research has led to the development of effective retrofit designs, including cost-effective designs, structures that deploy automatically (auto-ROPS), and stability indicator sensors. Qualitative research has identified barriers to retrofitting old tractors with ROPS: the expense involved, spatial clearance for specific environments, tractor housings that can support ROPS and withstand overturning, personal preferences, and risk perceptions on the part of tractor operators. Implementation research in this realm has focused on social marketing, training and education (sometimes including targeting of high-risk populations), and, more recently, an ROPS rebate program.[6]

COST-EFFECTIVENESS

In this issue of *AJPH*, Myers et al. (p. 1517) estimate the cost-effectiveness of a rebate program and a social marketing campaign in preventing tractor-related fatalities and injuries. The marketing campaign targets at-risk segments of the farming community (small-scale crop and livestock farms), identifies barriers to prevention (e.g., pressure to reduce costs and save time), includes incentives (e.g., cost reductions through provision of rebates), crafts messages on dangers to families and the economic burden of disability, and makes use of dramatic visual images.

A pilot of several combinations of these campaign components in four regions of New York State led to a significant number of ROPS retrofits. The investigators calculated "exposure time"—the time between dates of retrofitting and three different end dates (date of an injury or event, date of the latest survey, and December 2017)—through an annual survey of individuals who had obtained ROPS through the rebate program and hotline callers. They used information about the 17 reported overturns in New York as well as data from Kentucky and the Centers for Disease Control and Prevention to estimate the probability of a rollover event. They also used occupational fatal and nonfatal injury cost estimates provided by Leigh et al.[7]

The investigators estimated injury costs by calculating the probability of an event among retrofits versus nonretrofits, determining the number of injuries prevented, and multiplying probabilities by cost estimates, with some adjustments. The study showed a cost savings for the New York social marketing campaign and rebate program of more than $6 million with respect to injuries averted versus a total program cost of approximately $1.8 million.

The Myers et al. intervention study should serve as a model for implementation research in public health. Their investigation focused on a circumscribed problem; incorporated conceptual frameworks, mixed methods, and cost–benefit analyses; included multiple interventions in various combinations and focused on broad geographical swaths and subpopulations; combined substudies conducted by investigators from a wide array of disciplines; and involved a longitudinal time line, with funding secured over time. These elements are essential to amassing the kind of evidence needed to evaluate public health interventions with all of their "moving parts."

More specifically, the Myers et al. investigation focused on a public health problem that has been recognized around the world and has remained unsolved for almost a century. As is the case with many public health issues, we know what we have to do. As a moral society, and with growing appreciation of crop agriculture as a means of improving the quality and longevity of life in the United States, we need to protect the health of one of our most precious commodities: the US workforce. The goal of outfitting more than 80% of old tractors with ROPS is attainable and, now, demonstrably cost-effective. It is certainly worth the price. AJPH

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