The 2009 H1N1 Influenza Vaccination Campaign: Summary of a Workshop Series

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Forum on Medical and Public Health Preparedness for Catastrophic Events

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Willing is not enough; we must do."
—Goethe

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This report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the National Research Council's Report Review Committee. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the process. We wish to thank the following individuals for their review of this report:

Kristen R. Ehresmann, Minnesota Department of Health
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Although the reviewers listed above have provided many constructive comments and suggestions, they did not see the final draft of the report before its release. The review of this report was overseen by **Kristine M. Gebbie,** City University of New York. Appointed by the Institute of Medicine, she was responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the authoring committee and the institution.

Contents

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Introduction[1]

In response to the 2009 H1N1 influenza pandemic, public health authorities launched an ambitious vaccination campaign to protect tens of millions of Americans from the virus. The goal was to ensure that everyone who wanted to be vaccinated was able to be vaccinated. Providing one dose of vaccine to everyone in groups considered to be at high risk for serious complications would have required 159 million doses, a far greater undertaking than reaching the approximately 85 million people who are vaccinated annually for seasonal influenza (CDC/ACIP, 2009; Medlock and Galvani, 2009). Launched in October 2009, the nationwide campaign was made possible through collaboration among a wide range of stakeholders, including federal, state, tribal, territorial, and local governments; healthcare providers; health systems; pharmacies; community organizations; and health insurers, among others. Despite challenges stemming from delays in supply, the identification of priority groups to receive the initial supply of vaccine, and associated messaging complexities, 61 million Americans—about a quarter of the U.S. population—were vaccinated in the first 3 months of the program (CDC, 2010a).

In April and May 2010, the Institute of Medicine's (IOM's) Forum on Medical and Public Health Preparedness for Catastrophic Events hosted three regional workshops on the 2009 H1N1 influenza vaccina-

[1]The workshop was organized by an independent planning committee whose role was limited to the identification of topics and speakers. This workshop summary was prepared by the rapporteurs as a factual summary of the presentations and discussions that took place at the workshops. Statements, recommendations, and opinions expressed are those of individual presenters and participants and are not necessarily endorsed or verified by the Preparedness Forum or The National Academies and should not be construed as reflecting any group consensus.

tion campaign. Participants from across the nation met in Raleigh, North Carolina; Austin, Texas; and Seattle, Washington, to review, evaluate, and learn from their experiences during the vaccination campaign. The 2009 H1N1 vaccination campaign was one of the biggest public health initiatives in U.S. history, and a thorough and critical evaluation of the campaign presents an important opportunity to examine the nation's response to a public health threat and to identify useful lessons, promising practices, and other strategies to improve future emergency vaccination campaigns.

Background: Preparing for the Vaccination Campaign

In April 2009, the first cases of a new strain of influenza A—referred to as the 2009 H1N1 influenza—were detected in California. Because of the potentially severe health consequences of a pandemic influenza, the detection of these cases set off a coordinated wave of activity across the public health system to minimize public health consequences.[2] Each year in the United States, between 5 and 20 percent of the population is infected with the seasonal flu, and on average approximately 24,000 people die of flu-related causes (range 3,300 to 48,600) (CDC, 2010c). However, in a pandemic, the infection rate and death toll can be much higher. The pandemic of 1918 killed an estimated 50 million people worldwide (about 3 percent of the global population) and approximately 675,000 people in the United States alone (CDC, 2010d). Pandemics also occurred in 1957 and 1968, although they were less severe.

Adding to the sense of urgency, previous pandemic response planning efforts had largely focused on influenza A virus subtype H5N1. Unlike 2009 H1N1, H5N1 has a low human-to-human transmission rate but a very high mortality rate; more than half of humans known to have been infected with the current Asian strain of H5N1 avian influenza died from it (WHO, 2006). The surveillance and laboratory systems developed by the Centers for Disease Control and Prevention (CDC) as part of these planning efforts were responsible for the early detection of 2009

[2]According to the Centers for Disease Control and Prevention, "An influenza pandemic occurs when a new influenza A virus emerges for which there is little or no immunity in the human population, begins to cause serious illness, and then spreads easily person-to-person worldwide. A pandemic is determined by spread of disease, not its ability to cause death" (CDC, 2010b).

H1N1 in the United States. However, because the characteristics of the 2009 H1N1 influenza pandemic were different from those of H5N1—in the severity, timing, and geographic origin of the disease—significant modifications were needed to the existing pandemic influenza plans. A detailed account of the CDC's activities in response to the 2009 H1N1 influenza virus is available on the CDC website (CDC, 2010e). A timeline of the 2009 H1N1 disease incidence and vaccination campaign is also available on the CDC website (CDC, 2010f).

By June 11, 2009, the virus had spread so extensively around the world that the World Health Organization declared that a global pandemic was under way (WHO, 2009). This declaration reflected the fact that the virus had spread throughout multiple parts of the world, but was not indicative of the severity of the illness in those infected. Most people in the United States who became ill from 2009 H1N1 influenza recovered without hospitalization and, in many cases, without medical treatment. However, the pattern of those who did become seriously ill and required hospitalization was different from seasonal influenza, which usually has the greatest impact on older adults. Data from the initial wave of influenza in the spring showed that the highest rate of hospitalization was in children under age 5, followed by young people ages 5 to 24. Data also showed that pregnant women, along with people with underlying chronic medical conditions, were at particularly high risk for hospitalization and death (CDC, 2009a).

Efforts to produce a vaccine for the 2009 H1N1 virus began within days of detection of the first cases in the United States. The CDC immediately began to develop a high-yield vaccine virus that would be effective against the new virus. Once developed, it was sent to the vaccine manufacturers to begin production, even though at that point the U.S. government had not yet determined whether the vaccination campaign would be implemented. Over the summer, the National Institutes of Health (NIH) conducted clinical trials on pilot lots of the vaccine and the Food and Drug Administration (FDA) developed a plan for licensing the vaccine.

Meanwhile, in parallel to the process of developing, licensing, and producing the vaccine, federal, state, tribal, territorial, and local public health officials worked to plan an ambitious vaccination program. The CDC's Advisory Committee on Immunization Practices (ACIP) met in July to develop recommendations on who should receive the 2009 H1N1 vaccine. On the basis of the epidemiological data from the spring 2009

wave of influenza, ACIP recommended that vaccination efforts focus on five initial target groups:

- Pregnant women,
- People who lived with or cared for infants younger than age 6 months,
- Healthcare and emergency medical services (EMS) personnel,
- Infants ages 6 months and older through young adults age 24; and
- Adults ages 25 through 64 who were at higher risk for complications because of chronic health disorders or compromised immune systems (CDC/ACIP, 2009).

At the time the ACIP recommendations were developed, it was not yet known how many doses of vaccine would be required to provide sufficient immunity. Providing one dose of vaccine to everyone in these groups would have required 159 million doses (CDC/ACIP, 2009). Later clinical testing revealed that one dose was sufficient for most people, with children under 9 requiring two doses to achieve sufficient immunity and children under 3 requiring two half-doses. These recommendations are discussed in more detail below.

The prototype of the national vaccine distribution strategy was the federal Vaccines for Children (VFC) program, through which healthcare providers routinely work with their state and local health departments to provide recommended pediatric vaccines to eligible children. In preparation for the vaccination campaign, the CDC expanded its contract with McKesson Corporation for the VFC program, to enable centralized distribution of the 2009 H1N1 vaccine. Funded by the federal government, vaccine was allocated to states in proportion to their population. State health departments, in turn, worked with local health departments and other partners to develop plans to distribute and administer vaccine within the state. Because of the scope and short time frame of the campaign, unprecedented efforts were made to strengthen existing vaccine distribution partnerships and to integrate new partners into the distribution and administration system, particularly for vaccination of pregnant women, other high-risk adults, and children. These partners included healthcare providers, health systems, pharmacies, community organizations, health insurers, and large companies with occupational health clinics, among others. The distribution and administration systems used by

jurisdictions, as well as the partnerships that were important in the response, are discussed in greater detail in subsequent sections.

In September 2009, the NIH announced that results of the clinical trials indicated the vaccine was safe and effective. The FDA approved four of the 2009 H1N1 influenza vaccines (a fifth was later approved in November), and the CDC had organized a centralized distribution system for shipping the vaccine to public and private provider vaccination sites based on orders placed by the states. Manufacturers had some vaccine available for use, although in much smaller quantities than had been predicted throughout the summer months. This caused significant problems throughout all aspects of the vaccination campaign during the first months, as described in detail below. With these pieces in place, the national vaccination campaign was launched at the beginning of October.

Workshop Goals and Objectives

In spring 2010, the IOM's Preparedness Forum organized three workshops to discuss and examine the vaccination campaign. The workshops were held in Raleigh, North Carolina (April 15); Austin, Texas (April 27); and Seattle, Washington (May 11). They were organized by a planning committee that included representatives from relevant federal agencies and state and local public health authorities and associations. The workshops were designed to facilitate a series of conversations focused on the following objectives:

- Examine innovative efforts used to distribute and administer vaccine and discuss how they may inform future efforts;
- Examine how jurisdictions and providers interpreted and applied the CDC/ACIP recommendations for use of 2009 H1N1 vaccine;
- Highlight successful approaches used by jurisdictions to develop and use innovative partnerships with traditional and non-traditional partners, such as community groups and the private sector; and
- Discuss strategies used to collect, monitor, evaluate, and use data during the 2009 H1N1 vaccination campaigns.

For each area, participants discussed lessons learned and challenges that arose during the vaccination campaigns and identified strategies to

address these challenges for future emergency vaccination programs and other medical countermeasures dispensing campaigns.

Participants and attendees included federal, state, tribal, and local public health officials; national healthcare providers' associations and healthcare providers (including pediatricians, family physicians, obstetricians/gynecologists [OB/GYNs], nurses, EMS providers, and healthcare administrators); private-sector representatives, including pharmacies and health insurers; journalists; and representatives from community organizations. Participants came from across the nation, not just from states where the workshops were held. The workshop agendas are in Appendix B, and a list of the speakers and registered attendees is in Appendix C.

About This Summary

This document is intended to highlight and summarize the presentations and discussions at the three workshops, including participants' success stories, challenges faced, and lessons learned. The summary also highlights opportunities and areas for further work that participants suggested to help improve future vaccination programs and other medical countermeasures dispensing campaigns. Whenever possible, unique ideas or concepts presented at the workshop are attributed to the individual who first advanced those concepts. In situations where many participants made similar points, the recurring themes are identified. Any opinions, conclusions, or recommendations discussed in this workshop summary are solely those of the individual participants and should not be construed as reflecting consensus or endorsement by the workshop, the Forum on Medical and Public Health Preparedness for Catastrophic Events, or The National Academies.

2

Vaccine Supply

The greatest challenges in vaccine distribution and administration arose because vaccine supply and demand were poorly matched throughout the 2009 H1N1 influenza vaccination campaign, said public health officials and healthcare providers at the workshops. During the early months, demand far outstripped supply, and in the later months, supply far exceeded demand. Participants characterized the supply of vaccine as "trickling in" during fall 2009. They described the challenges of equitably and fairly distributing the limited supplies of vaccine with little information about future vaccine supply. These challenges were exacerbated by raised expectations from overly optimistic projections of vaccine supply and problems with communications about the vaccine supply.

The issues related to vaccine supply are introduced here because many participants said these issues shaped most other aspects of the response. More detailed information about how these issues impacted vaccine distribution and administration as well as communications is included in each of the respective main sections below. Figure 2-1 shows estimates of the number of 2009 H1N1 cases and vaccine doses distributed, from the beginning of the vaccination campaign in October 2009.

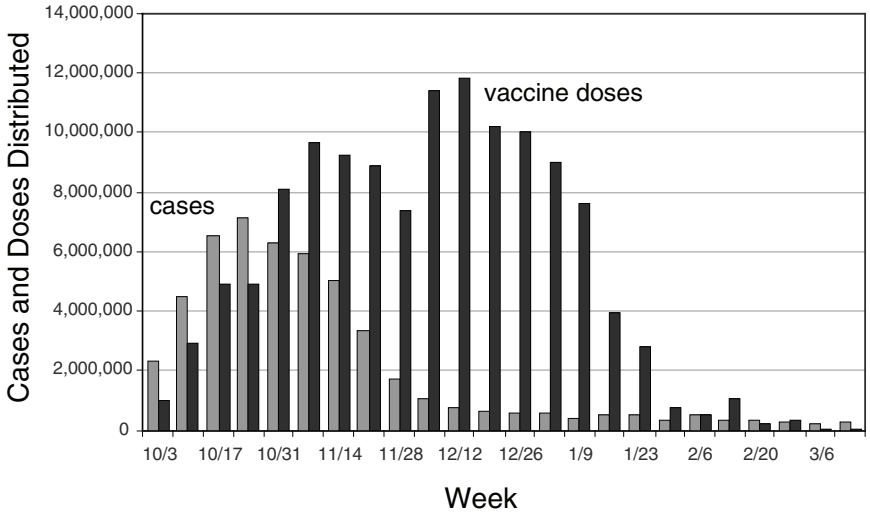

FIGURE 2-1 Estimated 2009 H1N1 cases and vaccine doses distributed, October 2009–March 2010.
SOURCE: Personal communication, Toby Merlin, deputy director of the CDC's Influenza Coordination Unit, September 17, 2010.

Supply and Demand

Over the summer and through September, expectations for the vaccination campaign grew, fueled partly by wide media coverage and disease incidence. In July 2009, the CDC's ACIP recommended that initial vaccination efforts focus on five target groups, as mentioned above and discussed in greater detail below (CDC/ACIP, 2009). Providing one dose of vaccine to everyone in these groups would have required 159 million doses. Workshop participants noted that members of these target groups were generally aware that vaccine was recommended for them and expected that vaccine would be available for all members of the target groups once the vaccination campaign began.

Vaccine production delays led to a supply of vaccine that was slower than expected. The first doses were administered to the public on October 5, 2009, but the supply of vaccine during the first 2 months of the program was not sufficient to cover the target groups for whom the ACIP had recommended vaccination. Adding to this difficulty, the majority of the vaccine that was initially available was Live-Attenuated Influenza

Vaccine (LAIV), which was contraindicated for the very young, for those with certain conditions such as asthma, and for pregnant women—among the target groups considered highest priority. Further, many healthcare workers were reluctant to receive LAIV, often because of unfounded concerns about transmission to patients in healthcare settings and vaccine efficacy. This is discussed in more detail below. Unfortunately, this limited supply of vaccine occurred when demand for vaccine was at its highest and around the time of the peak of the fall 2009 wave of influenza. Pediatricians and other healthcare providers at the workshops reported that they were inundated by calls from large numbers of patients and anxious parents of pediatric patients demanding the vaccine or asking where to go for the vaccine.

As vaccine supply started to increase, the incidence of 2009 H1N1 disease declined and the media frenzy quieted. By January 2010, patient demand for vaccine had decreased to the point where many providers were left with vaccine on the shelf. Some public health representatives noted that influenza vaccine demand generally drops at this time of year, even in years in which seasonal influenza activity peaks in January. They said that this likely added to the challenges that were specific to 2009 H1N1. A CDC spokesperson later said that out of the 162 million doses of 2009 H1N1 vaccine produced for the general public, only 90 million doses were used (Moyer, 2010).

Participants noted that vaccine production was accomplished within the desired time frame laid out in the *National Strategy for Pandemic Influenza Implementation Plan,* issued May 2006. The plan says, "The Federal Government has established two primary vaccine goals: (1) establishment and maintenance of stockpiles of pre-pandemic vaccine adequate to immunize 20 million persons against influenza strains that present a pandemic threat; and (2) expansion of domestic influenza vaccine manufacturing surge capacity for the production of pandemic vaccines for the entire domestic population within 6 months of a pandemic declaration" (Homeland Security Council, 2006, p. 104). In response to 2009 H1N1, vaccine was first available in October (4 months after the WHO pandemic declaration) and widely available in December (6 months after the WHO pandemic declaration). Although the planning parameter was met, workshop participants emphasized that much work is needed to shorten the interval between pandemic declaration and vaccine availability.

Supply Projections

The challenge of dealing with an initially limited supply of vaccine was exacerbated because expectations had been raised by overly optimistic projections of vaccine supply. During summer 2009, state and local public health authorities planned vaccination programs based on robust federal vaccine supply forecasts. When the production schedule fell significantly short of predictions, large-scale changes were needed in planned distribution strategies.

In addition to developing recommendations for five target groups, ACIP also developed recommendations for a subset of these groups to be used in case of limited vaccine availability. This subset of target groups covered approximately 42 million people in the United States. At the workshops, however, state and local public health participants said that during the summer planning phase of the vaccination campaign, the possibility of limited vaccine supply was not emphasized in the communications they received from the federal authorities. Indeed, ACIP's report said, "Current projections of initial vaccine supply indicate that establishment of a subset of the five initial target groups will not be necessary in most areas" (CDC/ACIP, 2009).

Jay Butler, director of the CDC's H1N1 Vaccine Task Force, noted, "At many levels throughout the distribution [system], the strategy was not robust for the shortage that we were dealing with. . . . We prepared for being able to move as much vaccine as quickly as possible and really were concerned that there would be a glut of vaccine. What we had to deal with then was a trickle, and a trickle that really continued for a number of weeks." David Fleming, director and health officer for Public Health–Seattle & King County, agreed, saying, "We spent months planning for a response where the rate-limiting step was going to be the vaccine distribution system, and that's not what happened." For this reason, Fleming continued, "It is important to go back and critically look at . . . the system that allowed us as a nation to miss for so long that the fundamental problem we were going to be facing was a vaccine shortage." Many participants agreed with Fleming that there was an opportunity to "figure out how that happened, and to take steps to make sure that that does not happen again in the future."

Many state and local public health officials and healthcare providers at the workshops also noted that problems with supply projections continued through the initial months of the campaign, when vaccine supply

was still limited. They discussed a lack of information and predictability for future weeks regarding when various locations would receive vaccine and which formulations would be delivered. Participants noted that much of the uncertainty arose because of lack of information about upcoming supply from manufacturers. However, they were also concerned about tracking vaccine through the distribution system, which will be discussed in the next main section. The lack of accurate projections about future supply presented challenges in developing equitable distribution plans, planning clinics, and developing messaging for healthcare providers and the public.

Several participants suggested that federal authorities should develop stronger and more formal partnerships with vaccine producers to ensure they have the most up-to-date information on production and inventory to generate more accurate supply projections. A number of participants also recommended that communications to state and local authorities should include timely, specific information to improve response activities.

2009 H1N1 and Seasonal Influenza

The partial overlap in timing of the 2009 H1N1 and seasonal vaccination campaigns added an extra layer of complexity to planning and response. As a result of the usual production schedule that makes seasonal influenza vaccine available prior to the regular flu season, seasonal vaccine was available prior to the 2009 H1N1 vaccine. This caused some confusion when patients arrived at their healthcare provider's office expecting to be vaccinated for 2009 H1N1, because that disease was prominent in the media, but often found that only seasonal flu vaccine was available. The situation was further complicated because the two vaccines had different target populations and because later in the fall of 2009, seasonal flu vaccine was no longer available after manufacturers switched to producing 2009 H1N1 vaccine. When 2009 H1N1 vaccine supply increased, participants noted that many patients who had been turned away earlier, or offered the seasonal vaccine, did not return for the 2009 H1N1 vaccine. Participants speculated that these patients had been discouraged by the earlier lack of availability or encountered logistical barriers to making a second trip.

Despite the complications caused by the partially overlapping 2009 H1N1 and seasonal vaccination campaigns in summer and fall 2009, par-

ticipants noted throughout the workshops that seasonal and emergency vaccination campaigns share many common elements. They suggested that improvements to the annual seasonal vaccination campaign would also result in improvements to future emergency vaccination campaigns. To this end, several participants emphasized the importance of continued attention and resources for the seasonal campaign.

Opportunities for Improving Planning Related to Vaccine Supply

Participants acknowledged that the pharmaceutical industry and the CDC overcame enormous challenges to develop, produce, and test the 2009 H1N1 vaccine in just 6 months. However, many also emphasized the importance of developing new technologies and manufacturing techniques to accelerate vaccine production. A concern was that in a more virulent pandemic, 6 months may simply be too long. "We have to redouble the effort to once again give us the science that could put out vaccine quicker, in order to impact a pandemic that's much bigger," said Mark Horton, director of the California Department of Public Health.

The need to increase the capacity and speed of vaccine production was discussed in a recent review of the Public Health Emergency Medical Countermeasures Enterprise by the Department of Health and Human Services' (HHS's) Office of the Assistant Secretary for Preparedness and Response. The review articulated the following strategic vision: "Our Nation must have the nimble, flexible capacity to produce MCMs [medical countermeasures] rapidly in the face of any attack or threat, known or unknown, including a novel, previously unrecognized, naturally occurring emerging infectious disease" (ASPR, 2010). Among the recommendations for new infrastructure initiatives and enhancements to the current system for developing MCMs from discovery through procurement and stockpiling, the report highlighted immediate needs related to pandemic influenza vaccines. These needs include the development of influenza vaccine candidates that can be manufactured without dependence on virus grown in eggs or cells.

At the workshop, individual suggestions were also made about ways that public health officials can improve planning given the current vaccine supply system. These suggestions are compiled here as part of the factual summary of the workshops and should not be construed as re-

flecting consensus or endorsement by the workshops, the Preparedness Forum, or The National Academies. They are as follows:

- **Federal authorities, state and local public health officials, and other entities involved in planning and communications efforts should "underpromise and overdeliver."**
- **Federal authorities should develop a stronger and more formal partnership with vaccine producers to ensure they have the most up-to-date information on production and inventory and can generate more accurate supply projections.**
- **Plan for a range of vaccine supply scenarios when supply is uncertain.**

3

Vaccine Distribution

Funded by the federal government, vaccine was allocated to states in proportion to the size of their total population, regardless of the disease burden in each state and the number of state residents in the ACIP target groups. Each state then developed its own plan to distribute and administer vaccine. Vaccine was shipped directly to public and private provider vaccination sites from the central distributor, based on orders placed by the states. All healthcare providers who received vaccine shipments had to agree to comply with their state's requirements for administering vaccine.

States developed many kinds of distribution plans. Some states distributed vaccine to a combination of state and local public health authorities, private healthcare providers, and pharmacies. Other states relied more heavily on local health departments, which then distributed to other stakeholders. A smaller number of states received all the states' vaccine supply and handled the physical redistribution to vaccine administrators themselves. The diversity in distribution approaches meant that neighboring jurisdictions often had different distribution systems. This caused confusion and communications challenges, some participants noted, especially in states in which each local health department developed its own distribution plan. Some state, city, and county distribution approaches are described in more detail below.

The topic of this section goes hand-in-hand with the topic of the next main section, which is the interpretation and implementation of the ACIP recommendations for target groups. States' decisions about how to implement the ACIP recommendations heavily influenced their decisions about which stakeholders should receive vaccine. The following hypothetical example illustrates this tight relationship: If a state decided to

focus on vaccinating pregnant women first, they might initially distribute more vaccine to OB/GYNs so they could administer vaccine to their patients, and allocate less vaccine to pediatricians. These issues are discussed in greater detail in that section.

The topic of this section is also closely related to the subsequent section of vaccine administration methods and partners. Unprecedented efforts were made during the vaccination campaign to strengthen existing vaccine distribution partnerships and to integrate new partners into the distribution and administration system, particularly for vaccination of pregnant women, other high-risk adults, and children. These partners included healthcare providers, health systems, pharmacies, community organizations, health insurers, and large companies with occupational health clinics, among others. More detailed discussion of the roles of partners, along with the issues they faced during the campaign and potential opportunities to enhance their participation in the future, are discussed in the later section below on vaccine administration methods and partners.

Vaccines for Children Program

The prototype of the national vaccine distribution strategy was the federal VFC program, through which healthcare providers routinely work with their state and local health departments to provide recommended pediatric vaccines to eligible children. McKesson Corporation, the distributor for the VFC program, provided centralized distribution of vaccine directly to the public and private provider sites, as specified in orders from each state.

Many workshop participants noted that the infrastructure of the VFC program served as a foundation for their state vaccination distribution programs. Many components of the VFC program were found to be helpful during the 2009 H1N1 campaign. Some states used or adapted their VFC healthcare provider registration system for provider registration to receive 2009 H1N1 vaccine. Several participants noted that healthcare providers and clinics that participated in the VFC program found it easier to participate in the 2009 H1N1 vaccination campaign because they were already generally familiar with the system. Tiffany Sutter, information and education section chief of the Immunization Branch of the California Department of Public Health, mentioned that it used the VFC customer

service system as a hotline for healthcare providers seeking information about H1N1 vaccination.

Several workshop participants noted the challenges posed by the lack of a national program for adult vaccination with linkages to the public health system, analogous to the VFC program. With so many new healthcare providers participating in the 2009 H1N1 vaccination program, they noted, there is an opportunity to work with those providers to build on what has already been started in response to the 2009 H1N1 pandemic. To continue some of the progress, one jurisdiction will be providing some free vaccine in the fall of 2010, although it most likely will not be sustainable in future years because of uncertain funding.

Disbursed State Distribution Models

A variety of state, city, and county distribution approaches described below give an overview of the different approaches and the decisions that were made and highlight aspects of approaches that participants identified as being particularly successful. This section is not meant to be a comprehensive review of state and local plans.

Tennessee: Susan Cooper, Tennessee's health commissioner, shared the model that was used in her state. In early spring and through the summer, the state brought together all of the interested parties to create a plan that would best serve the needs of the state as a whole. The state used the existing web-based immunization system for its VFC program as a starting point to preregister healthcare providers who would offer 2009 H1N1 vaccine. The state also reached out to healthcare providers not already participating in the system. When providers registered, they provided practice information so that the state could create an estimate of how to reach high-risk patient populations. The process also collected information on vaccine storage capabilities and ship-to sites. Tennessee also worked through existing relationships with the pharmacy association and the board of pharmacy to engage chain and independent pharmacies; in Tennessee, the Board of Pharmacy allows trained pharmacists to vaccinate anyone over age 3. Large employers with occupational health clinics (which had the necessary systems to maintain cold storage of vaccine) and health clinics located at Tennessee's colleges and universities were also engaged in these discussions.

Preregistration in the system did not guarantee receipt of vaccine, nor did registering practices uniformly want to receive vaccine, but it did allow the state to create a road map for distribution. "As the vaccine became available, it allowed us to strategically make some decisions about how the distribution would go," Cooper said.

As noted above, vaccine was shipped directly to healthcare providers, hospitals, and pharmacies, according to the state's instructions. Private healthcare providers had vaccine shipped directly to their offices. For chain pharmacies in Tennessee, instead of shipping to 100 locations, the vaccine was shipped to the pharmacy's central distribution point, where it was distributed through the pharmacy's regular distribution channels across the state.

Tennessee's vaccine registry and provider preregistration program were also adapted to preposition Tamiflu and other countermeasures across the state. The system was built to accommodate the distribution of other stockpiled countermeasures in future events (e.g., antibiotics in case of an anthrax attack). The system also included a tool that allowed healthcare providers, in real time, to publish information about the type of vaccine available at a given site, whether it was for the practices' patients or the public, whether an appointment was needed, and whether a cost was associated with vaccine administration. "We could have clinics set up within 2 hours of receipt of any vaccine within our public health system, and get that information out in real time," Cooper noted.

North Carolina: Amanda Fuller of the North Carolina Department of Health and Human Services described the state's distribution system. In the state, 85 local health departments and a federally recognized tribal nation selected the healthcare providers in their areas to receive vaccine. The state delegated this decision because it believed local health departments have the greatest understanding and knowledge about their healthcare providers and communities.

North Carolina also relied heavily on pharmacies for vaccine administration. The state limited the number of ship-to sites by having vaccine shipped directly to pharmacy chains and healthcare systems, which then distributed the vaccine to their locations. Pharmacies knew which of their pharmacists were able to vaccinate, allowing for a rational and efficient distribution of product. Having a single point of distribution meant that the state had a single point of contact with each company, limiting confusion. The role of pharmacies in vaccine distribution and administration

is discussed in more detail in the section below on vaccine administration methods and partners.

California: California took advantage of large statewide health plans such as Kaiser Permanente, which provides insurance for roughly 15 percent of the state's population. "We did deliver directly to Kaiser, and they took responsibility for distributing it," said Horton of the California Department of Public Health. The plan worked so well it may be used again. California also developed a parallel system to allow for delivery of vaccine to individual vaccinators who requested less than the 100-dose lots, which accounted for nearly 20 percent of vaccine, Horton said. He added that we "need to rethink that process, and if not eliminate that [100-dose minimum] restriction, at least provide more options."

Los Angeles (LA) County was a direct grantee, so it received vaccine to cover its population separately from the state. Eighty percent of the vaccine allocated to LA County was distributed to the private sector. The remaining 20 percent went to the county health department for mass-vaccination clinics to target the uninsured, roughly 20 percent of LA's population. Although both were effective avenues for distribution, this dual system did have problems, said Laurene Mascola, chief of the Acute Communicable Disease Control Program in the LA County Department of Public Health. One problem was that the two simultaneous distribution mechanisms were not equally visible. The high profile of the public program overshadowed the fact that more vaccine was available from private healthcare providers. This led some members of the public who could have received vaccine from their own providers to visit the mass-vaccination clinics.

Illinois: Chicago, also a direct grantee, decided to distribute the vaccine it received to as many facilities as possible. Part of the rationale, explained Julie Morita, medical director of Chicago Public Health, was that her department knew that the vaccination administration sites and healthcare provider offices did not already have systems in place to vaccinate all of their patients at once. They were given small amounts so that each site and office could get their systems in place and roll vaccine out.

Maryland: In Baltimore the city health department received the bulk order and redistributed it through its public health system. The department had no interactions with private healthcare providers, which were handled separately by the state.

Centralized State Distribution Models

Alaska: Unlike most states, Alaska handled distribution with a centralized approach. It was one of only two states that had only one ship-to site for vaccine for the entire state; the other was South Dakota, another rural/frontier state. Once received in the central location, vaccine was redistributed directly by the state. In Alaska's case, the choice to use a centralized distribution model was partly because of weather challenges; the health department did not want the vaccine to freeze while in transit to remote areas. The centralized approach also gave the state flexibility to distribute vaccine in response to disease hotspots. This was done twice: once in response to significant disease on the island of Little Diomede, population 128, and once in response to the island of Kodiak, which reported school absenteeism of 40 percent during the outbreak.

Alaska had four streams of vaccine coming into the state: The state allocation, vaccine for federal employees from the federal occupational health program, vaccine for the military, and vaccine shipped directly to pharmacy chains. Through strong relationships with each entity, the state was able to track where each stream of vaccine supply was headed and take that into account for the state's distribution plans.

Challenges arose in communications and coordination among the entities providing the different sources of vaccine, said Sally Abbott, Alaska's preparedness director. For example, delayed communications from the Indian Health Service (IHS) about vaccine for IHS hospital employees caused complications because IHS employers had already been included in plans for distributing and administering the state's supply of vaccine.

Distributing vaccine to Alaskan oil field workers was a challenge, Abbott noted. With 85 percent of the state budget coming from oil, shutting down the North Slope because of 2009 H1N1 would have been disastrous for Alaska. But the state could not preferentially send vaccine to ConocoPhillips and BP on the North Slope when there were pregnant women and children elsewhere in the state who needed vaccine. The state decided to treat the oil slope as a community, even though it was not included on any Census tract because workers typically do not reside permanently on the North Slope. Therefore, when vaccine was distributed by population, oil slope workers received the appropriate allocation. The vaccine was still prioritized for target groups: The oil slope has

healthcare workers and people who fell into the target groups who needed the vaccine but had no other way to get it.

Situational Awareness

The inability to fully track vaccine throughout the distribution and vaccine administration system, from manufacturer to administration to the individual, exacerbated the challenges posed by vaccine shortage and complicated efforts to efficiently and equitably distribute and administer vaccine and, in particular, to communicate effectively with the public regarding local vaccine availability. With regard to the distribution system specifically, some state and local public health authorities, healthcare providers, and pharmacy representatives described problems receiving up-to-date communications about the timing and content of shipments en route to their offices or locations. Some noted that the shipments arrived several days later than expected, or with different amounts or formulations than ordered. They noted that even a small amount of advance notice provided during the time the shipment was en route would have helped their efforts to plan clinics, set up patient appointments, and determine staffing needs. Several participants emphasized the need to enhance systems for tracking distribution to improve situational awareness. Participants suggested further integrating existing systems and technologies, such as bar coding and electronic tracking, throughout the distribution and administration system to improve the ability to track vaccine.

Department of Defense Distribution System

The Department of Defense (DoD) has a policy of mandatory influenza vaccination for all uniformed personnel, with non-uniformed personnel highly encouraged to receive vaccinations, said Colonel Wayne Hachey, director of preventive medicine in the Office of the Assistant Secretary of Defense (Health Affairs). During the response to 2009 H1N1, DoD received vaccine from three sources: (1) HHS for uniformed personnel, (2) individual states for its dependent population in-country, and (3) the U.S. government civilian employee program for government employees. About a third of all U.S. government civilian employees work for DoD.

Like the rest of the nation, DoD did not receive vaccine until October 2009, but it quickly ramped up its vaccination campaign, Hachey said. By the end of March 2010, 89 percent of uniformed personnel were vaccinated, and by the end of April, that percentage rose to the mid-90s. One gap DoD identified was dependents living outside the continental United States. No vaccine source was allocated to them, so vaccine from other areas was redistributed to cover them. The high vaccination rate in the DoD program is easily explained, noted Hachey: DoD does a seasonal vaccination campaign each year, and vaccination is mandatory for uniformed personnel.

Distribution to Tribal Areas

Many challenges were associated with vaccination campaigns in tribal areas. The population is young and therefore has a higher percentage of pregnant women than any other racial/ethnic group, explained John Redd, chief of the infectious disease branch of the IHS Division of Epidemiology and Disease Prevention. He also noted that tribal areas have a high prevalence of diabetes and other comorbidities. The death rate from 2009 H1N1 for American Indians and Alaska Natives (AI/AN) was four times higher than the rate for all other racial/ethnic populations in aggregrate (CDC, 2009b). Recognizing that AI/AN would have high prevalence and risk factors for 2009 H1N1, some states prioritized 2009 H1N1 vaccine for AI/AN, but others did not.

Within the Northwest, Oregon, Idaho, and Washington each used different methods of getting vaccine to tribal populations. Oregon distributed vaccine directly to tribes, leaving them to decide about local administration. In Idaho, local health departments kept the vaccine and held clinics, with the tribal populations invited to participate. In Washington, the state gave the local health departments the vaccine, which was then given to the tribes. Some tribes felt frustration during the vaccination campaign because they believed they were not treated as sovereign governments, but rather as healthcare providers or clinics, reported Joe Finkbonner, executive director of the Northwest Portland Area Indian Health Board. He noted that the tribes wanted more flexibility to develop vaccine distribution and administration plans, including the ability to transfer vaccine to other tribes that had none. Other participants noted the impor-

tance of including IHS and tribal entities from the beginning of the planning process.

Other challenges arose because IHS healthcare workers and their patients received vaccine through separate distribution systems. HHS directly covered the healthcare workers, but vaccine for the general population was distributed from the jurisdiction in which they were located. This set up complexities in many sites where IHS operates, Redd noted, particularly in remote tribal sites where the distinction between what would be population vaccine and what would be employee vaccine is difficult, if not impossible, to determine. The 100-dose ordering minimums were also difficult because many individual tribes are very small. Finally, tribal elders—like other older adults—were not included in the initial vaccination efforts because they were not included in the priority groups. This was thought to have reduced vaccination rates in some American Indian communities because elders are highly respected role models in their communities. Tribal participants requested flexibility to vaccinate elders in future programs in order to improve vaccination rates throughout their communities.

Ancillary Supplies

In addition to the free vaccine, the federal government also provided ancillary supplies (e.g., syringes, medical-waste disposal equipment) that were shipped separately from the vaccine. Although participants said that it was very helpful to have auxiliary supplies provided, they also noted problems. Supplies were sometimes inappropriate for their intended use, did not always arrive at the necessary time, and were of varying quality, reported workshop participants. For example, some local health departments and healthcare providers reported receiving sharps containers that were too large to be usable. Ann Salyer-Caldwell, associate director of Tarrant County Public Health in Texas, reported having to dip into the public health department's own supplies to give vaccinations, which was not a problem until they tried to buy more syringes and found there was a lock on purchasing. Jason Terk, a pediatrician in Keller, Texas, noted, "The promised supplies of syringes and sharps containers did not arrive until much later" than the vaccine.

Opportunities for Improving Distribution Systems in Future Emergency Vaccination Campaigns

Numerous individual suggestions were made about how distribution systems could be improved in future emergency vaccination campaigns. These suggestions are compiled here as part of the factual summary of the workshops and should not be construed as reflecting consensus or endorsement by the workshops, the Preparedness Forum, or The National Academies. They are as follows:

- **Develop better systems for tracking vaccine distribution to ensure improved situational awareness.** Integrating existing systems and technologies, such as bar coding and electronic tracking, would improve the ability to track vaccine throughout the distribution system.
- **Continue to use the Vaccines for Children program infrastructure as a foundation for emergency vaccination distribution programs.**
- **Consider developing an immunization program for adults analogous to the Vaccines for Children program.**
- **Include the ability to successfully ship in cold-weather environments as part of the criteria for awarding distribution contracts.** Participants from some of the coldest states noted that on some days, vaccine could not be shipped because of concerns about freezing. They noted that systems that can ship in freezing temperatures exist and should be used.
- **The federal government should deal directly with tribes (nation to nation).**
- **If federal authorities distribute ancillary supplies, they should ensure that the distribution process includes timely delivery of quality ancillary supplies that are appropriate for their intended use.**

4

Implementation of ACIP Recommendations

Implementation of the Initial Target Group Recommendations

To facilitate vaccine administration to those at highest risk for illness and complications, CDC's ACIP recommended an initial set of target groups for vaccination (Box 4-1). ACIP also developed a subset of target groups for use during times of limited vaccine supply. The specific implementation strategy for these recommendations was left to state and local jurisdictions.

Because initial vaccine supplies were low, most state and local public health departments, including all of those represented at the workshops, requested that vaccine be given first to members of the initial target groups. However, within this broad approach, jurisdictions had many decisions to make. For example, jurisdictions had to decide whether to focus initially on reaching all members of the initial target groups or whether to first focus on the subset of target groups. Practical considerations, such as the availability of particular formulations, impacted the order in which groups and subgroups were vaccinated. Jurisdictions and healthcare providers also had to decide how rigidly to enforce the recommendations.

BOX 4-1
Advisory Committee on Immunization Practices (ACIP) Recommendations

Initial Target Groups (estimated 159 million Americans) (CDC/ACIP, 2009)

ACIP recommended that initial vaccination efforts focus on persons in the following five target groups (order does not indicate priority):

- Pregnant women,
- Persons who live with or provide care for infants younger than age 6 months (e.g., parents, siblings, and daycare providers),
- Healthcare and emergency medical services personnel,
- Persons ages 6 months to 24 years, and
- Persons ages 25 to 64 years who have medical conditions that put them at risk for influenza-related complications.

Subset Target Groups (estimated 42 million Americans)

ACIP recommended that the following subset of the initial target groups receive priority for vaccination if supply of the vaccine initially available was not adequate to meet demand for vaccination among the five target groups listed above (order does not indicate priority):

- Pregnant women,
- Persons who live with or provide care for infants younger than age 6 months (e.g., parents, siblings, and daycare providers),
- Healthcare and emergency medical services personnel who have direct contact with patients or infectious materials,
- Children ages 6 months to 4 years, and
- Children and adolescents ages 5 to 18 years who have medical conditions that put them at risk for influenza-related complications.

Prioritizing Within Initial Target Groups

ACIP provided both an initial set of target groups and a subset of those groups; jurisdictions were free to decide whether to focus initially on the broader set or on the subset. However, Utah's deputy director for public health practice, Teresa Garrett, said, "We were almost forced into moving to the subgroups just because of what we had—not necessarily because of what we wanted to do and where we wanted to go first, but because of what was physically in our possession." The first deliveries of vaccine to many places were LAIV nasal spray formulations that were contraindicated for many members of the target groups. Because of this practical consideration, in many jurisdictions initial efforts focused primarily on healthcare workers and pediatric patients without contraindica-

tions for LAIV. The issues surrounding vaccine formulations and LAIV are discussed in more detail below.

In LA County, the decision was made to use ACIP recommendations for the larger initial target groups and to not explicitly use the subset of target groups. Instead, however, messaging, images, and media were used to target members of subset groups such as pregnant women and adults with chronic conditions, though no one was turned away at the clinics when vaccine was available.

Many state and local public health authorities operationalized the implementation of ACIP recommendations by distributing vaccine to partners that already provided care to targeted populations. For example, many states preferentially filled vaccine orders for pediatricians and OB/GYNs. In Chicago, vaccine was given to clinics that served the targeted populations.

Workshop participants also discussed how decisions were made when not enough vaccine was available to cover all members of groups or subgroups indicated for the formulation of vaccine available. For example, would the LAIV dose be given to a healthcare worker or to a 12-year-old without contraindications? Some jurisdictions left the decisions up to healthcare providers, positing that they were the ones who knew their populations best. Cathy Slemp, acting state health officer and director of the Division of Threat Preparedness for the Bureau of Public Health in the West Virginia Department of Health and Human Resources, noted that West Virginia empowered private clinicians to use their best judgment in terms of priority groups. Most importantly, physicians had to use the vaccine and not let it sit on shelves.

"Our duty, our ethical obligation, was to provide vaccine to the highest-risk individuals, and so we tailored our policies to reflect that," said Kristen Ehresmann, director of the Infectious Disease Epidemiology, Prevention, and Control Division of the Minnesota Department of Health and a member of ACIP. As far as how to make determinations within the target groups, Ehresmann explained that Minnesota had previously done work with an ethics committee on the question of resource allocation in times of scarcity. The committee discussed the fact that at some point, random selection techniques would need to be employed—something that Minnesota did use when vaccine supplies were low. Although there may be many contributing factors, Ehresmann cited coverage data as support for the use of random selection technique: Minnesota had the highest rate in the nation for vaccination for persons ages 25–64 with underlying risk conditions (CDC, 2010a).

Enforcement of ACIP Target Group Policies

Some jurisdictions and organizations followed the ACIP recommendations as strict guidelines, and others were more fluid in their approach. David Grossman, medical director for preventive care and senior investigator at Group Health Cooperative, a large healthcare system in the Seattle area, pointed out the difficulty for healthcare providers to impose any sort of limits. Group Health found it useful to refer to the ACIP recommendations when restriction of vaccine was necessary. Alonzo Plough, director of the Emergency Preparedness and Response Program of LA County, also appreciated the recommendations as a foundation, giving him the ability to point and say, "CDC is making us do this."

Other jurisdictions, such as Chicago, took a different approach, focusing on the recommended target groups but not turning anyone away who showed up at mass vaccination clinics. Herminia Palacio, director of Harris County Public Health and Environmental Services in the Houston, Texas, area, explained that they worried that if they were too strict with the recommendations, they would be left with unused vaccine—a lesson learned from the seasonal vaccination campaign in 2004, when restrictive guidelines aimed at dealing with vaccine shortage eventually resulted in substantial surpluses.

Lauren Smith, medical director of the Massachusetts Department of Public Health, agreed. She discussed the struggle between wanting to respond to the prioritization and not wanting to miss the chance to vaccinate people who were on-site and waiting and might miss a call back when vaccine became more widely available. "The idea of balancing the restrictiveness to try and meet the guidelines with the idea that maybe you let some other people come along for the ride. If, ultimately, you are going to get more people vaccinated overall—who knows? You might actually get more people in your target groups vaccinated if you are less restrictive," she suggested.

First Responders

The use of the ACIP target groups as the focus for initial vaccine efforts was a change from prior pandemic preparedness planning, which provided for immunization of first responders and critical infrastructure personnel in the first tier of vaccinations. The change was made because 2009 H1N1 had different characteristics from the H5N1 strain on which

plans had been based. Workshop participants noted that it is difficult to change the eligible population after publicly stating and training for a particular program. For example, one challenge was educating groups such as law enforcement about the new recommendations and why the scope was changed. Communicating the rationale for putting some people in target groups and not others was sometimes difficult. Smith of the Massachusetts Department of Health noted that in her state, the definition of healthcare providers did not include all first responders, which caused challenges for the state.

Some workshop participants also noted that they heard concerns from teachers and daycare providers that they were not in the priority groups, even though they had close and constant contact with children—one of the priority groups recommended to receive vaccine.

Older Adults

The 2009 H1N1 influenza virus did not affect the same patient population as typically seen during seasonal influenza outbreaks—older adults. Instead, it seemed to affect predominantly younger people. Workshop participants noted that older adults are a major constituency for the seasonal influenza vaccine and were alienated when they were excluded early in the campaign. Although participants said this factor should not change the way priority groups are formed, several noted that public health authorities should be aware of the impact of excluding older adults in vaccine campaigns and should consider this when developing communications strategies.

This was a particular concern in tribal areas, where the exclusion of tribal elders was believed to have reduced vaccination rates among American Indians for whom vaccination was recommended because elders are highly respected role models and messengers in their communities. Finkbonner of the Northwest Portland Area Indian Health Board said giving tribal clinics flexibility to vaccinate elders in the future would improve vaccination rates throughout tribal communities.

Expanding to the General Public

Although the exact timing differed across the nation, workshop participants reported that most jurisdictions waited until December to open

up vaccination to all members of the public. In many cases, jurisdictions waited until they had sufficient vaccine to cover their plans for vaccinating target groups. For example, Alabama waited until sufficient vaccine was received to begin vaccination of children in schools. Once that was done, the state began shipping vaccine to pharmacies and other stakeholders for general distribution.

Grossman of Group Health noted that when public health authorities decided to offer vaccine to the general public, Group Health was conflicted about whether to also offer vaccination to all its patients. He said Group Health did not believe it had exhausted all possible means to ensure that their highest risk patients were vaccinated. He described how it wanted to continue to focus on members of the target groups for a little longer, using electronic records to identify those at highest risk and calling them again to encourage them to be vaccinated. However, he said that in the end, being a single organization restricting vaccine was too difficult when the surrounding community and public health authorities had distributed vaccine to the general public.

One lesson learned during the 2009 H1N1 vaccination campaign was that making the decision to expand vaccination beyond the original priority groups to the general public does not necessarily result in a significant rise in vaccine administration rates. Workshop participants discussed possible reasons. The public had been receiving messages indicating that vaccine was not available to the general public. By the time vaccine was open to the public, many potential recipients may have assumed it would never be available—the window of opportunity to reach them had closed. Also, if disease was not prevalent locally, or was not receiving the same media coverage that it previously had, the drive to find vaccine was less urgent. These behavioral aspects need to be considered in the future, noted Brian Johnson, public health preparedness coordinator for Lane County, Oregon. He suggested incorporating realistic thresholds in the planning process—triggers that signal when to move from concentrating solely on target groups to widening the net to reach those in the public who may not get vaccinated as time passes. Participants noted that the rate of vaccination among target group members will never be 100 percent, so looking closer at that timeline would be an important future response. "Anecdotally," Johnson said, "it was probably 4 to 6 weeks where we really had people's attention, and then after that they started to trickle off quickly—right about the time, ironically, that the vaccine became readily available."

Flexibility and Consistency

Two notions of flexibility were discussed with regard to the ACIP recommendations. First, participants discussed the flexibility afforded to state and local public health jurisdictions to determine their own vaccine distribution and administration plans. Second, participants discussed whether the recommendations should have been revised as additional epidemiological data became available. These are discussed below.

Cross-Jurisdictional Flexibility and Consistency

In general, public health officials at the workshops reported that they valued the flexibility in implementing ACIP recommendations, despite the associated challenges. State public health officials also valued the flexibility to implement their own distribution plans in accordance with existing infrastructure and state needs. However, variability across state and county lines also created challenges for state and local public health officials. Jurisdictions that decided to maintain consistency with neighboring jurisdictions were concerned that their approach was not optimized for their population; jurisdictions that pursued their own plans found it harder to communicate effectively to the public about why one county or state was vaccinating a certain subset of its population and why another was not. Communicating those differences was a huge challenge, especially when national media outlets carried stories across the nation.

Not all jurisdictions, however, valued the flexibility provided in implementing ACIP recommendations. "I actually heard more frequently, particularly from states out west with high percentages of American Indian/Alaska Native populations, that they would have appreciated clearer recommendations from ACIP," said Redd of the IHS Division of Epidemiology and Disease Prevention.

Participants also noted that the flexibility might have been appropriate only because the pandemic was mild to moderate in severity. "If that had been a severe pandemic," Minnesota's Ehresmann said, "I really think the consequences of inconsistency would have been devastating." Jeffrey Duchin, chief of the Communicable Disease and Immunizations Section of the Public Health–Seattle & King County, agreed, saying, "If it is a severe problem, we're not going to look as kindly upon healthy, young adults getting vaccines when persons with underlying medical conditions aren't getting it and are dying."

In contrast to many of the public health representatives at the workshops, many of the representatives from multijurisdictional healthcare systems, large chain pharmacies, large companies with occupational health programs, and tribal authorities whose reservations crossed multiple state boundaries said that having different strategies in different jurisdictions was problematic for them. "One of the biggest challenges we faced was the cross-jurisdictional interpretation of recommendations and decisions that were made to prioritize vaccine for specific populations," said Grossman of Group Health. The company serves patients across multiple jurisdictions, each of which had its own plan. In one county, he said, children were the priority; in another, healthcare workers. "I think that we need to have one public health standard in this country, and it needs to be consistent across jurisdictional lines," Grossman added.

States and jurisdictions such as Minnesota and Washington, DC, also ran into challenges along border areas when neighboring jurisdictions had different policies. DC, for instance, is intimately tied to its surrounding states, where many DC workers live. Beverly Pritchett, senior deputy director at the DC Department of Health, noted, "It is critical to keep pace with your immediate adjacent jurisdictions, particularly as they may impact you, but we probably needed to selectively consider how we would implement those on a varied basis." In the case of DC, university students make up a sixth of the population, more than in surrounding states. The recommendations called for not vaccinating those over age 24, excluding many who attend graduate programs. Pritchett noted that DC public health officials wanted to use flexibility to vaccinate these students, but decided not to so they could be consistent with surrounding jurisdictions.

Several participants suggested that further consideration about the appropriate balance between flexibility and standardization would be valuable.

Flexibility to Revise Recommendations

A few participants felt that there were problems with the ACIP recommendations during the early vaccine shortage. "It became clear during the outbreak that actual mortality risk was greatest in individuals with underlying disease who were between 25 and 64 years old," said Fleming from Seattle & King County. Although this group was included in the broader ACIP target groups, it was not included in the subset of target groups that was recommended if vaccine supplies were limited. Duchin,

also from Seattle & King County, said when the vaccination campaign started in October, ACIP members discussed whether to revise the recommendations for the subset of target groups to include adults who had medical conditions that put them at higher risk for 2009 H1N1–related complications. However, he noted, the ACIP voting group decided not to make this change for several reasons. First, it believed that changing recommendations during the campaign might cause confusion; second, it noted that local flexibility let healthcare providers vaccinate patients they believed to be at highest risk, including adults with relevant medical conditions; and third, at the time it believed that the shortage of vaccine supply would be brief and therefore that overprioritizing the vaccine would be counterproductive.

Workshop participants discussed the difficulties that would be associated with changing target groups during an event, including the challenge of communicating the change to the public, the difficulty of changing operational plans midcourse, and the overall potential for confusion. However, they also acknowledged that during the course of a pandemic, the epidemiology may change or data may become available that indicate that a revision to the prioritization plan is warranted. "The system needs to be nimble enough so that when data support a change to a recommendation, it can be made—and it needs to be uniform," noted Ehresmann of Minnesota. Duchin suggested it would be valuable to review the prioritization decision-making process to identify any areas where potential improvements could be identified to help future prioritization situations.

Vaccine Formulations and Target Groups

The variety of vaccine formulations from several manufacturers and the inability to predict the time frame over which the various formulations would be available and in what quantities were extremely challenging for public health authorities and healthcare providers. 2009 H1N1 vaccine was produced by five manufacturers in four formulations (adult-dose prefilled syringes, pediatric-dose prefilled syringes, multidose vials, and prefilled single-dose intranasal sprayers), each with different age indications and labeling. Participants said it was particularly challenging when nearly all initial vaccine was live-attenuated vaccine, which was not indicated for many people in the target groups. Healthcare providers reported not being able to vaccinate their highest-risk patients until later

in the campaign because they initially received primarily or only live-attenuated vaccine. This issue was more complicated for pediatric practices, compared with vaccinating adults, because of the many age indications among products. This complicated efforts to schedule patients for vaccinations and added challenges in communicating with parents about whether vaccine was available for their children.

Acceptance of LAIV

Many organizations that received LAIV in their first deliveries decided to offer the LAIV nasal spray to healthcare workers who were not contraindicated for this formulation. However, uptake of live-attenuated vaccine was low among eligible healthcare providers and the public, often because of unfounded concerns about transmission to patients in healthcare settings and vaccine efficacy. "A lot of people had a lot of concerns," said Salyer-Caldwell of Texas. "They desperately wanted some vaccine. They did not want the live virus [formulation]," despite education about the safety and efficacy of the vaccine. "We found early on that a crisis probably wasn't a good time to explain to someone that a nasal vaccination was a safe and effective way to be vaccinated," said J. Michael Muhm, associate technical fellow at The Boeing Company.

By contrast, some pediatric practices that had used FluMist™ in the past had substantial uptake of LAIV. Those practices were strong promoters of the formulation, and their patients were already comfortable with the process. Texas pediatrician Terk noted that patients and parents responded to the comfort level and information capacity of their medical professional. If the practitioner was comfortable with LAIV and led by example, patients accepted it much more readily.

Other jurisdictions were able to increase the uptake of LAIV by systematizing its use. West Virginia did not have much success in vaccinating healthcare workers with LAIV, so instead offered it to EMS workers, who often work with the targeted population groups. By Thanksgiving workers realized they would have a substantial LAIV surplus, so they offered it to college clinics. In Massachusetts there was an emphasis on providing LAIV to elementary and school-age populations, and it was given at school-based clinics. Positive feedback indicated that both patients and healthcare providers found nasal administration easier than giving injections. In Wake County, NC, instructions were sent to all clinics that if someone was not contraindicated for LAIV, only LAIV should

be offered unless a patient insisted on a different formulation. This strategy was also used in other jurisdictions, with varying levels of success.

Opportunities in Using Priority Groups

Numerous individual suggestions were made for addressing challenges related to using priority groups to help improve future emergency vaccination campaigns. These suggestions are compiled here as part of the factual summary of the workshops and should not be construed as reflecting consensus or endorsement by the workshops, the Preparedness Forum, or The National Academies. They are as follows:

- **Assess the optimal balance of flexibility and standardization (proscription) in the ACIP guidelines, including consideration of whether/how this balance should shift according to the characteristics of the situation.** This would include assessing where flexibility is or is not warranted and considering processes that could be used to begin to weed out unwarranted flexibility.
- **Review the prioritization decision-making process to identify any areas where potential improvements could be identified to help in future prioritization situations.** This would include consideration about the impact of changing priority groups during a public health emergency.
- **Federal authorities and vaccine producers should ensure that the formulations and indications of the vaccine produced match the targeted groups to the greatest extent possible.**
- **Where possible, harmonize age indications for comparable products (especially when licensed elsewhere) when there are multiple formulations with different age indications available.**
- **Tribal clinics should have flexibility to vaccinate elders in future programs if they think it would improve vaccination rates throughout their communities.**
- **Increase acceptance of live-attenuated nasal spray vaccine.** Uptake of live-attenuated vaccine was low among eligible healthcare providers and the public, often because of unfounded concerns about transmission to patients in healthcare settings and vaccine efficacy.

- **Engage the manufacturer to create public education campaigns for LAIV.**
- **Educate healthcare providers and the public about the safety of the nasal spray vaccine.**
- **Clinics and healthcare providers should consider (in a shortage situation) how nasal spray vaccine will be given unless contraindicated.**
- **Refer to "nasal spray vaccine" instead of "live attenuated."**

5

Vaccine Administration Methods and Partners

In each workshop, in every session, partnerships were mentioned as essential in the vaccination campaign. Lisa Koonin, senior advisor in the CDC's Influenza Coordination Unit, emphasized, "We learned through this response that public health cannot do this alone. The private sector can't do this alone. Government cannot do this alone. It really is necessary to leverage the unique talents and capabilities of a wide variety of partners, essentially at a community level, to make this work." Public health authorities relied on relationships and partnerships that existed before the event as well as on new partnerships that developed during the 2009 H1N1 response. Box 5-1 shows some of the many partners involved in the 2009 H1N1 vaccination campaign.

BOX 5-1
Stakeholders Involved in the 2009 H1N1 Vaccination Campaign

- Public health authorities–federal, state, tribal, territorial, and local
- Other government agencies and offices, including Department of Defense, Veterans Administration, Department of Homeland Security, and Indian Health Service
- Hospitals and large health systems
- National and local disease organizations or support groups
- Association of State and Territorial Health Officials
- National Association of County and City Health Officials
- Emergency medical service providers

- Private healthcare providers
- Pharmacies and retail clinics
- Health insurers
- Community groups
- Mass immunizers
- Schools
- Grassroots immunization groups (e.g., Action for Community Enrichment)
- Federally qualified health centers
- State pharmacy associations
- Sports teams
- Faith-based organizations
- Medical Reserve Corps
- Colleges and universities
- State medical associations and specialty associations

Mass Vaccination Clinics

Many public health authorities used mass vaccination clinics to administer 2009 H1N1 vaccine. Although mass clinics are an efficient way to vaccinate large numbers of people, in the case of 2009 H1N1, there were also some challenges, particularly about the use of ACIP recommendations to prioritize vaccine for the target groups.

In most places, people were asked to self-assert their eligibility for priority vaccination; public health officials did not ask for verification of a person's high-risk status. This meant people could "game the system" and receive vaccine even if they were not in the targeted groups. However, the positive aspect of self-identification of eligibility was that it was easier for those administering the clinics. "You have to rely on people being honest," explained Plough of LA County. "You will vaccinate a few people who are not high risk, but you will get a number of people who are uninsured—marginalized, and advance some of your equity principles." Some participants were fine with this risk, and others had mechanisms in place (e.g., questionnaires, people walking the line) to reduce the risk of vaccinating people who were not in the prioritized groups. However, this concern of eligibility may change in the face of a more severe pandemic or public health emergency, given an adequate amount of vaccine.

Contract Immunizers

Large numbers of staff were required for the mass vaccination clinics. "Had we more vaccine, I am not sure that we would have been able to give it to all the people that wanted it, because we just did not have the manpower to do it," said Chicago's Morita. To increase staffing, some jurisdictions hired temporary workers who served as mass immunizers. They stressed the importance of paying mass immunizers by the hour and not by the shot. This ensured that the appropriate populations were vaccinated. They also urged that volunteer immunizers be screened outside the clinics and actually be observed giving shots. This is not a just-in-time hiring process that can happen the day of a clinic, they said, but something that needs to be planned and organized.

Participants noted one question regarding contract immunizers that should be investigated further: Will they be available in a much more severe epidemic or during a time with ample vaccine supply but sustained high demand? If plans call for their use, alternate backups should be investigated in case those vaccinators are not available.

Emergency Medical Service Providers

To ease the staffing shortage, Ohio activated rules from 2004 that allowed EMS personnel to function as vaccinators so long as the governor had declared a public health emergency, the personnel had been trained, and all vaccinators were under the direction of a physician. Ohio also created an online training session for vaccinators.

Austin, Texas, used off-duty firefighters organized in strike teams as vaccinators for city employees. This worked well, several participants said, because of the ample flexibility. Teams could go out any time of day or night and meet city employees who needed vaccination at their job sites. Even with the cost of paying the off-duty firefighters to perform this service, this model was more efficient than a contractor approach, the competing alternative. Because of the success, the Austin Fire Department is proposing to use this strategy for the city's annual flu vaccinations, which will allow it to have a mass exercise once a year on pandemic response.

Creative Locations for Mass Vaccination Sites

Beyond traditional mass vaccination sites, workshop participants shared some unique operational ideas and novel clinic sites. In West Virginia, a vaccination clinic at the Bass Pro Shop one Saturday was able to give 1,000 vaccinations in just 4 hours. In Alaska, a ski-up clinic was held at the U.S. Cross-Country Olympic trials in Anchorage, and another was held during former Governor Sarah Palin's book signing. Champaign–Urbana, Illinois, Public Health coordinated with the Muscular Dystrophy Association to offer a call-ahead, curbside vaccine service for patients and their family members in order to decrease the risk of disease transmission to vulnerable patients.

School Vaccination Programs

Many jurisdictions used school-based or school-located vaccination clinics. The Baltimore program relied on an immunization team that had been meeting monthly for more than 10 years, said Anne Bailowitz, acting chief medical officer for the Baltimore City Health Department. To prepare for the 2009 H1N1 vaccination campaign, the team started planning 4 months in advance and continued to meet with the city school system for 4 months after clinics began. "Reach out early and often to your school system," Bailowitz advised. In Baltimore, 18,500 of 30,000 doses went to school-age children.

West Virginia scheduled school clinics as vaccine became available and used county and city paramedics as vaccinators in the middle and high schools. They were careful to schedule clinics at a wide mix of schools: public and private, urban and rural. Washington, DC, began school clinics in October by vaccinating public schoolchildren. However, because a relatively high proportion of the city's children and youth attend private and charter schools instead of public schools, there were concerns about equity. In the end, clinics were opened for everyone in the priority groups and did not focus exclusively on children attending public schools. Massachusetts started school clinics in November with some school-based and some school-located clinics (the difference was who ran the program). Some were held during the school day and others after school.

Not all jurisdictions used school vaccination programs. Chicago, for example, did not hold school-based clinics because of a poor history of success in previous campaigns. The big stumbling block was lack of return of consent forms. Morita reported that in previous campaigns, fewer than 30 percent of consent forms were returned. Baltimore had difficulties getting consent forms back from parents as well, and on those forms that were returned, inadequate history was sometimes a problem. Additionally, some second doses were given that may not have been needed, an error that is less likely to occur when a parent or caregiver accompanies a child to a vaccination site.

In the Houston area, schools requested that clinics be held on the weekend to avoid disrupting the school day. The benefit of weekend clinics was that consent was in person—the parents were present. The schools' automated phone systems were used to send out reminders on the day of the clinics.

School clinics were effective in reaching large numbers, West Virginia's Slemp noted, but repeating that success is an ongoing challenge because of vaccine financing. The 2009 H1N1 vaccine was free, which helped in running the school clinics. Slemp wondered if pilot programs could be chartered to look at how to sustain school vaccination programs. She shared an example in which one community is looking at—and having some preliminary success with—partnering with businesses. The businesses donated seasonal flu vaccine for the health department to use in schools. This is good public relations for the businesses and good for the businesses because it keeps their workforce at work, not home with sick children.

David Lakey, commissioner of the Texas Department of State Health Services, noted that school-based clinics need to be analyzed and the following questions asked: Were the right individuals reached? Should school-based clinics be used in more states? Do they need to be used in seasonal flu efforts?

Don Williamson, state health officer for the Alabama Department of Public Health, also raised interesting questions: Would uptake have been better in schools and would we have made any difference in disease burden if the vaccine had been hoarded, then given to schools in December? What would have been the impact of delaying the start of school? In Alabama, where school started on August 10, disease rates increased within a week of school starting. What if school had been delayed a month? Would the disease curve have shifted enough so that vaccine

demand would have lined up more closely to when more vaccine was available?

College Student Health Clinics

Student health clinics located on college and university campuses faced unique challenges. Even though the college-age student population was part of the ACIP recommendations, most student health clinics were erroneously identified as regular physician offices, said James Turner, president of the American College Health Association. This misidentification meant that vaccines were shipped in small amounts of approximately 100 doses at a time without considering the size of the student population. He also noted that shipments to colleges were often unannounced, sporadic, and unpredictable. Unfortunately, the timing of vaccine manufacture and delivery meant that most students were taking exams when vaccine was distributed to colleges. Then they went home for the holidays. This contributed to lower than ideal vaccination rates in many areas. Students may or may not have received vaccinations during the winter holiday break, but student health offices had no way to gather that information.

Healthcare Providers

Healthcare providers played an integral role in the distribution and administration plans, particularly for vaccination of pregnant women and other high-risk adults, as well as children. Workshop participants included pediatricians, OB/GYNs, family practice physicians, nurses, and other healthcare providers. This section describes how healthcare providers were recruited to participate in the 2009 H1N1 vaccination campaign, the challenges they encountered while administering vaccine, and some individual suggestions for addressing these challenges.

Recruiting Healthcare Providers

For healthcare providers to take part in the 2009 H1N1 vaccination campaign, they needed to be enrolled in a system that tracks and man-

ages allocations. Many states used existing VFC provider registries as a starting point for enrolling vaccinators, but the majority of those already in the program were pediatricians. Neil Kaneshiro, past president of the Washington State chapter of the American Academy of Pediatrics, noted, "The use of our established state vaccine network as our base was really critical to getting most of the providers who were familiar with the system instantly on board." Workshop participants noted, however, that it was important to reach physicians that care for other high-risk patient populations, such as OB/GYNs. It is also important to remember that family practitioners often see all types of patients, including those in the targeted groups.

Jeanne Sheffield, director of the Maternal–Fetal Medicine Fellowship at the University of Texas Southwestern Medical Center, said the OB/GYNs around Dallas, as well as in the rest of Texas, did not readily understand how to vaccinate, how to request vaccine, or what the process was. She worked with the Texas Association of Obstetrics and Gynecologists and the American College of Obstetricians and Gynecologists (ACOG) to disseminate information through faxes and e-mails. She even called some large provider groups to make sure they had the information. Additionally, the Society of Maternal–Fetal Medicine provided links to the CDC website and listed protocols on its own website. Many workshop participants emphasized that this kind of direct outreach to provider groups and associations was critical to engaging physicians in the vaccination campaign.

Administering Vaccine

Once they had registered and received vaccine, healthcare providers faced more logistical challenges: vaccine storage, staff training and time for data entry and/or registry requirements, and decisions on who would administer vaccinations. Even pediatricians accustomed to providing routine and seasonal vaccinations to their patients had to develop plans for administering the 2009 H1N1 vaccine. Would they require appointments or hold open clinics for patients? These and other planning measures had to be completed before vaccine was delivered. The CDC developed, through a contractor, a tool kit for primary care provider offices to assist in their planning efforts (ORISE, 2009).

For healthcare providers who did not routinely offer vaccinations to their patients, this was a completely new system to implement. "Individual offices had to come up with a way in setting up who was going to provide the vaccines [and] how they were going to store it," Sheffield said. She noted this was also a learning opportunity for OB/GYN practices because in theory OB/GYNs should be doing seasonal flu, hepatitis B, and tetanus-diptheria-pertussis (Tdap) vaccinations and should be a primary vaccine delivery source for pregnant women.

The lack of predictable vaccine delivery or advance notification of shipments was frustrating for healthcare providers. Terk, a pediatrician with Cook Children's Physician Network in Keller, Texas, spoke of a 3-week delay in receiving requested vaccine and of being limited to 80 doses. During those 3 intervening weeks, he was dealing with a huge wave of influenza, at one point treating 208 patients in 4.5 days. For a new provider this situation was surprising, but for those who are regularly part of the immunization process, it is an unfortunate status quo. Kaneshiro noted, "Providers who do vaccines routinely have a very acute awareness of dealing with shortage. We have dealt with vaccine shortages off and on for many years." He noted that as long as clear directions were given from "the powers that be," shortages were dealt with successfully. But transparency and communication are critical.

Physicians with private practices noted that several financial concerns arose from participation in the 2009 H1N1 vaccination campaign. These are discussed in more detail in the section below on funding and payment issues.

Pharmacies

Independent and large chain pharmacies and retail clinics are involved extensively in seasonal influenza vaccination campaigns, and many were ready to assist in the 2009 H1N1 vaccination effort. The extent to which pharmacies were used to administer 2009 H1N1 varied widely across the nation. Participants discussed some of the issues and concerns that were considered when deciding when it was most appropriate for pharmacies to begin administering vaccine and under what guidelines.

Many arguments can be given for the use of retail pharmacies in administering vaccine, but the most compelling is availability: Large num-

bers of immunizers are ready and available to administer vaccine. For example, Walgreens, as of the time of the workshops, had trained 85 percent of its pharmacists as immunizers, with a goal to increase that to 100 percent. Pharmacies know their markets; they are in the community and have established relationships with local, state, and national public health. Distribution networks are already in place and easily accessed by high-risk individuals. Also, pharmacies are open during evening, weekend, and holiday hours, when public health clinics and doctors' offices may be closed. Retail clinics located inside pharmacies also provided 2009 H1N1 vaccinations. The United States has about 1,200 of these clinics, usually staffed by nurse practitioners (Merchant Medicine, 2010). Opening up vaccination through retail pharmacies increases the number of access points the population has to receive vaccine.

Additionally, noted Jay Bueche, director of pharmacy compliance at H-E-B, a large grocery chain in Texas, consumers tend to look to the familiar. They tend to go back to where they get their seasonal vaccinations, a trend that should be kept in mind when planning for future events such as a pandemic or other emergency.

When vaccine was given to Chicago pharmacies, Morita noted that they heavily promoted it and used their retail presence to spread the word in the community about vaccination at a time when demand for vaccine had fallen.

There was also discussion about the most appropriate role, timing, and remaining challenges for integrating pharmacies into the vaccine distribution system. These issues were in the areas of implementation of priority groups, equitability, scope of practice, and data reporting and are discussed in more detail below.

Priority Groups

Much of the discussion about the use of pharmacies concerned timing: When is it appropriate to use retail pharmacies to administer vaccine, especially during a pandemic when resources are scarce? Participants discussed various scenarios based on vaccine supply levels. When ample supply of vaccine is available, participants seemed to generally acknowledge that using retail pharmacies is appropriate to increase vaccine accessibility, as in the case for the administration of seasonal influenza vaccine. When supplies are scarce, the issue is less clear.

Many participants believed that if priority groups are set based on objective criteria—age, pregnancy status, etc.—then the use of pharmacies would be appropriate. More debate took place about whether to use pharmacies when priority groups are set based on medical conditions. Pharmacists attending the workshops noted that they do know who their high-risk patients are because they are filling their prescriptions on a regular basis. "While [pharmacies] may not be the primary medical home for many . . . they are the second medical home," said James Blumenstock of the Association of State and Territorial Health Officials (ASTHO). "We need to realize that, and utilize them. Plus, they do have quite an enviable infrastructure with regard to materials, management, and data management."

Another concern was that retail pharmacists would not adhere to the prioritization groups because of the potential negative impact on business. Alabama's Williamson explained, "Our pharmacy association specifically asked us not to ship them any vaccine if they had to prioritize. They only wanted it once you could open it up to everybody." In other states, pharmacies were used earlier, and adhering to the guidelines was not a problem. Cooper of Tennessee noted that pharmacies in her state were probably more stringent in adhering to the guidelines than some other providers in the system. In North Carolina, there was a misperception that pharmacies were vaccinating anyone who came in if supplies were available, but public health was able to distribute the pharmacies' screening criteria to counteract the misinformation.

As discussed above, large chain pharmacies with locations in multiple jurisdictions encountered challenges because of cross-jurisdictional variations in vaccine distribution plans and differences in the implementation of priority groups. There was some discussion at the workshops about whether pharmacies in this situation should have flexibility in implementing the priority groups, although several pharmacy representatives noted their preference for stricter national guidelines.

Equitability Issues

Although pharmacies are good at reaching their markets, it was acknowledged that they might be missing uninsured, low-income, and other vulnerable populations because of the cost associated with receiving vaccine at a pharmacy. Public health may be better able to reach un-

insured and low-income vulnerable populations, and by using pharmacies, public health can focus on underserved populations. Vaccine administration should take place within a larger coordinated public health strategy, in which retail pharmacies are one component. Participants also noted that the decision to begin distributing vaccine through pharmacies may depend on whether there is a shortage or an ample supply of vaccine.

Scope of Practice

Another issue raised during the workshop was related to the licensure of pharmacists as vaccinators. Every state and Washington, DC, has authorized trained pharmacists to administer vaccine (APhA, 2009). However, not all pharmacists are trained as immunizers. Furthermore, there are state variations in vaccination scope of practice laws and regulations for pharmacists, particularly with regard to the limits on the age of patient they can immunize. In some states, pharmacists are only authorized to immunize adults; this is particularly disadvantageous in campaigns in which children and teenagers are prioritized for vaccination. It was challenging for pharmacy chains to deal directly with a large number of state and local public health departments, as well as with state variations in vaccination scope of practice laws and pharmacist regulations. Participants suggested that it would be useful to examine whether a national standardized age should be set.

Data Reporting

Another challenge highlighted by the 2009 H1N1 vaccination campaign is that reporting was a significant problem for pharmacies. Each jurisdiction had different reporting requirements, adding huge administrative challenges for the pharmacy chains that had to report to multiple health departments in a variety of formats. Also, not all retail pharmacies have convenient Internet access, so multiple reporting pathways were needed, such as fax or paper forms.

Health Plans

Several health plan representatives participated in the regional workshop series, including Eduardo Sanchez, vice president and chief medical officer of Blue Cross Blue Shield of Texas; Richard Justman, national medical director for UnitedHealth Group; and Grossman of Group Health Cooperative, a large nonprofit healthcare system based in Seattle. These speakers noted that health plans were very involved in the 2009 H1N1 response and that this model of engagement should be further leveraged to address other public health priorities. "Health plans want to be at the table. We want to be collaborators before, during, and after public health emergencies and feel that we have resources that can be part of an integrated response, not only data and policy, but also communication," Sanchez said.

Health plans can communicate with their covered patients, physicians, and other healthcare providers as well as employer groups they serve, providing a way to dispense information and education where needed. They can also provide data and other information to health departments. A specific area where health plans can be used is to provide information to their pregnant population. Many health plans already do outreach to this population through healthy pregnancy programs. Although used by some health plans, these programs were an underused resource that could have been used to actively disseminate information to pregnant women about the need for 2009 H1N1 vaccinations.

Of the challenges health plans faced during the 2009 H1N1 vaccination campaigns, many were related to payment—perhaps not surprising given their role in the health system. These challenges are discussed below in the section on funding and payment issues.

Occupational Health Clinics

Many large companies have occupational health clinics appropriate for vaccine administration programs. Participants noted that it is important to integrate the private sector in vaccine administration plans because they have access to thousands of employees and family members. In addition, private-sector contributions provide a benefit to the community in terms of public health and sustaining the economy, and lessen the burden on a public health system that is already stretched thin.

However, during the 2009 H1N1 vaccination campaign, a number of challenges had to be addressed. First, large companies often operate in multiple jurisdictions—The Boeing Company, for example, is a multistate, multinational company that had to work with 300 U.S. counties, each with potentially different administration plans and different interpretations of the ACIP recommendations.

Second, there is a delicate line to walk when a scarce resource like 2009 H1N1 vaccine is given to a big company to give to its employees. Public health has to be open and stress to the public that the vaccine is being distributed and administered according to the same guidelines as everywhere else and that the private sector is just one of many administration systems that is being used to reach the target populations. Many participants cited the story circulating in the media in early November 2009 that accused Wall Street of receiving vaccine before hospitals or those in high-risk groups. They noted that this kind of story is likely to discourage companies from participating or keep them from being allowed to participate. Blumenstock of ASTHO noted that it is important to resist the temptation to overcompensate when things go wrong, pointing out that after the poor publicity about the use of occupational health clinics at Goldman Sachs for vaccine distribution, the opportunity was lost in some areas to open work site vaccination programs, even after vaccine supply levels had risen.

Opportunities for Improving Vaccine Administration and Enhancing Partners' Roles in Future Campaigns

Numerous individual suggestions were made about opportunities to improve vaccine administration methods and to further enhance the role of partners in future emergency vaccination campaigns. These suggestions are compiled here as part of the factual summary of the workshops and should not be construed as reflecting consensus or endorsement by the workshops, the Preparedness Forum, or The National Academies.

Vaccine Administration and Mass Clinics

There were several suggestions for public health authorities related to vaccine administration generally as well as more specifically related to the organization of mass clinics. These included

- **Continue to cultivate and enhance partnerships with a wide variety of stakeholders, including healthcare providers; the private sector, including pharmacies and other businesses; DoD, Department of Veterans Affairs, IHS, and other relevant federal agencies; community and faith-based organizations; EMS; school systems, colleges, and universities; contract nurses; national and state medical associations and specialty societies; and health insurers, among many others.** Look for ongoing opportunities for partners to work together on public health initiatives to build and sustain partnerships during the times between public health emergencies.
- **Simplify systems where possible.** The city of Boston was able to simplify parts of the administration process by minimizing the lot numbers used during mass clinics and color coding vaccines and all supplies related to each vaccine. For example, the Sanofi Pasteur vaccine came in a green box, so all syringes, once drawn, went into a green box; guidance documentation was on green paper; vaccine information was on green stickers; the scanner that read that specific dose was green, and so on.
- **Different formulations, including formulations of seasonal flu vaccine, should all look different to help prevent medical errors.** Pamela Falk, director of healthcare epidemiology at the University of Texas Medical Branch (UTMB) at Galveston, raised the issue of similarities between the labeling of the 2009 H1N1 vaccine and the seasonal vaccine, noting how easy they could be confused.
- **Use school-located clinics.** Work with school systems in advance to increase the likelihood that they might allow the use of instructional time.
- **Consider college censuses when distributing vaccine rather than treating student health centers as regular provider offices.**

Healthcare Providers

There were several individual suggestions related to healthcare providers for public health authorities to consider. These included

- **Simplify the provider registration process to increase participation in vaccination campaigns.** Use web-based systems. Explore methods of prepopulating and/or registering healthcare providers in advance—for example, using information from existing immunization registries.
- **Recognize and address the time and financial costs for private practitioners.**
- **Look for innovative ways to reach out to healthcare providers and build relationships.** Participants noted disparities in how private healthcare providers engaged with public health, depending on their relationship prior to the 2009 H1N1 vaccination campaign. Public health officials have knowledge and skills that may help private-provider offices plan for mass vaccinations and maintain business continuity during a public health emergency. Public health can also train office staff in tasks such as the proper use of vaccine preparations and N95 masks, a practice common in Virginia, for example. This is valuable for both the physicians and their staff, and it also builds relationships between public health and private healthcare providers.
- **Investigate an alternative to the 100-dose minimums, which created a barrier for some healthcare providers, including some tribes and rural area providers, during the 2009 H1N1 response.**
- **Facilitate the development of mechanisms by which private healthcare providers could share best practices on how to manage communications with clients.**
- **Cultivate partnerships with state medical associations and specialty societies as partners to reach healthcare providers who treat high-risk patients.**

Pharmacies

There were several individual suggestions related to pharmacies for public health authorities to consider. These included

- **Continue to engage with pharmacies and integrate them into vaccine and other countermeasure distribution and administration systems.** Efforts should continue to address issues such as payment, legal and regulatory barriers, standardized reporting requirements, and interstate variability in age restrictions on who a pharmacist can vaccinate.
- **Examine the possibility of harmonizing vaccination age limits in scope of practice laws for pharmacists.**
- **Analyze data from the 2009 H1N1 response to determine when pharmacies can be used most effectively as part of the distribution and administration system, while ensuring equitability and fairness.** Public health may be better able to reach uninsured and low-income populations, whereas pharmacies may be well suited to reaching insured populations. Public health authorities should explore how best to incorporate pharmacies in providing vaccines during a public health emergency, even when there is a shortage of vaccine.
- **Develop distribution plans that integrate large pharmacy chains' central distribution systems.** Pharmacy chains found challenges in dealing directly with a large number of state and local public health departments. However, pharmacies were able to distribute hundreds of thousands of doses of 2009 H1N1 vaccine as part of the federal direct-ship initiative.
- **Consider engaging wholesale pharmacy distributors to reach independent and chain pharmacies.**

Health Plans

There were several individual suggestions related to health plans for public health authorities to consider. These included

- **Engage and use health plans before, during, and after public health emergencies.**
- **Convene a national meeting for large health plans to discuss lessons learned during the 2009 H1N1 response; the role of health plans in future emergency responses; and how to address issues such as reimbursement, funding, and information sharing so that health plans can be more fully integrated into the response system.**

Occupational Health Clinics

There were several individual suggestions related to occupational health clinics for public health authorities to consider. These included

- **Continue to explore partnerships with private-sector companies with occupational health clinics; such companies have the potential to play an important role in future emergency vaccination campaigns.**
- **Improve communications with the public and media about why vaccine is being provided to companies.** For example, public health authorities should explain that vaccine will be distributed in a variety of settings to be able to immunize as many people as possible in a community and ensure that vaccine will be offered only to employees in the priority groups during a vaccine shortage.

As discussed above, many representatives from multijurisdictional healthcare systems, large chain pharmacies, large companies with occupational health programs, and tribal authorities whose reservations crossed multiple state boundaries said that having different strategies in different jurisdictions was problematic for them. Several participants suggested that stricter national guidelines for vaccine distribution and administration would be useful, although as was also noted above, many of the public health authorities emphasized the value of flexibility to tailor plans to their specific populations. Many workshop participants noted that further consideration of this issue would be useful.

6

Vaccination Rates in Certain Populations

Although increasing vaccination rates across the board is important, workshop participants said several population groups were of particular concern. They suggested that special attention be given to increasing vaccination rates in these groups in future emergency vaccination campaigns. These groups included pregnant women, healthcare workers, and members of racial and ethnic minorities. Pregnant women emerged as one of the groups at highest risk of developing serious complications (Jamieson et al., 2009). Despite this risk, workshop participants reported low percentages of vaccination among pregnant women. Participants noted that it is important to consider how to address barriers to vaccination and to increase rates of acceptance of vaccine in this population before another public health emergency occurs that similarly affects pregnant women. Participants also suggested that efforts focus on increasing vaccination among healthcare workers, not only because they are at higher risk of contracting disease from contact with patients, but also because their attitude toward vaccination may heavily impact whether or not their patients decide to be vaccinated. Finally, participants noted that vaccination rates were lowest in some racial and ethnic minorities, including African Americans. They noted that this is not particular to 2009 H1N1—this effect is also found for seasonal influenza vaccine—but emphasized that this broader issue should be addressed before the next public health emergency. Issues pertaining to these population groups are discussed in more detail in this section.

Pregnant Women

Pregnant women were at high risk for developing complications from 2009 H1N1 and were disproportionately represented among hospital and intensive care unit cases and mortality related to 2009 H1N1. They were also one of the ACIP target groups, yet vaccine uptake in this group varied across the nation. Pregnant women and their physicians had many questions and concerns about vaccine safety during pregnancy. "Even with all the information out there about how it was so important and it was safe during pregnancy, and how it was made in the same fashion as a seasonal vaccine, some of the private practitioners had a lot of issues getting their pregnant women to take it," said Sheffield of the Maternal–Fetal Medicine Fellowship at the University of Texas. Complicating matters, many OB/GYNs referred patients to their primary-care physicians because they do not routinely give seasonal flu vaccinations, but primary-care physicians referred women back to the OB/GYNs because they were unsure about vaccinating pregnant women.

Public health authorities, medical associations, and the OB/GYN provider community should work together, participants said, to improve vaccination rates for pregnant women by ensuring that influenza vaccine is routinely recommended for pregnant women and "institutionalizing" access to vaccine where obstetrical care is provided. Three concrete suggestions were made: (1) Use electronic standing orders ("opt out") and automatic "best practice" alerts in electronic medical records for pregnant women; (2) educate healthcare providers about the safety and importance of vaccinating pregnant women so that they are more likely to encourage their patients to be vaccinated; and (3) increase the number of OB/GYNs who provide seasonal influenza vaccine to their patients and make vaccination a regular part of their practice.

To increase vaccine uptake in its pregnant population, the University of Texas Southwestern Medical Center developed a best practice alert within its electronic medical record system. Each time a healthcare provider opened the patient's chart, he or she received an alert asking, "Have you offered H1N1 vaccine?" The provider was required to answer yes or no. If no was checked, the provider had to enter an explanation. This questioning enabled the organization to track the percentage of patients vaccinated and the reasons why vaccinations did not occur. The same system was used for the seasonal influenza vaccine. A benefit of the best practice alert was increased awareness among healthcare providers. Kim Boggess, assistant professor of obstetrics and gynecology at the

University of North Carolina at Chapel Hill, also reported success using electronic standing orders for vaccination.

Setting up rules and alerts in electronic medical records based on age and pregnancy status allows physicians to be proactive in reaching patients. Some systems are set up to allow physicians to e-mail their patients directly to notify them to come in for vaccinations or reach them with educational materials.

In California, Sutter of the California Department of Health reported working with ACOG to bring OB/GYNs on board. The department used CDC focus group data to address challenges associated with vaccine safety perceptions. In West Virginia, concerns about poor vaccine uptake in pregnant women led the state to change its media campaign to focus in part on that population. Additionally, a special clinic for pregnant women and children with chronic medical conditions ran weekly.

Panel participants found that individuals weighed the perceived risk of the pathogen against the perceived risk of the vaccine. "One of the lessons that we took from that was that there is not really an absolute rejection of vaccine for most patients. It is simply a balance between what they perceive as the threat of the pathogen itself, and potential dangers of the vaccine. When that tips in favor of the threat being more harmful, then people will be accepting of the vaccine," said Leonardo Pereira, division director of maternal–fetal medicine and director of obstetrics at Oregon Health and Science University.

Healthcare Workers

Only 37 percent of healthcare workers were vaccinated as of January 2010 (CDC, 2010g). This undervaccination is problematic, said many workshop participants, because healthcare provider support is critical in increasing vaccine uptake. If providers do not accept vaccination for themselves, convincing the general public to be vaccinated is more difficult. Although there is general agreement about the importance of making vaccine available to healthcare workers and encouraging them to be vaccinated, there is less agreement about whether vaccination should be required for healthcare workers by state or local laws or by hospitals and other employers. When this issue arose during the 2009 H1N1 campaign, some healthcare workers and unions argued that vaccination should not be mandatory because individuals should be free to choose whether to be vaccinated without fear of termination. Those favoring mandatory vacci-

nation emphasized the traditionally low vaccination rate among healthcare workers and associated concerns that healthcare workers could infect their patients before symptoms are detectable and that many healthcare workers could become infected, resulting in a shortage of healthcare workers at the peak of a pandemic.

To increase healthcare worker uptake, a number of strategies were tried in different areas. In Massachusetts, emergency regulations were passed requiring hospitals to offer immunization to employees. "We did not go so far as to require that employees be immunized," said Smith of Massachusetts, "but hospitals had to offer it, and then there needed to be an active declination and documentation of that by the healthcare provider."

Falk, UTMB's director of health epidemiology, described the approach UTMB used. An interdisciplinary committee composed of physicians (including pediatricians and a vaccine specialist), administration, employee health, and public affairs created a strong vaccine campaign, part of which required any employee who had not been vaccinated to wear a mask for every patient interaction. Not only did this decrease transmission rates, but it also increased awareness. Ninety-six percent of hospital staff members were immunized. But even with this requirement and increased vaccination awareness, gaps remained: Only 70 percent of resident physicians were immunized, and only 48 percent of attending OB/GYNs were immunized, which was problematic because they were dealing with a high-risk patient population.

Some areas of vaccine uptake among healthcare providers were high. Turner of the American College Health Association noted that 75 percent of college healthcare professionals were vaccinated, double the rate for healthcare workers across the nation. This happened without any specific campaign aimed at increasing participation, although college healthcare workers typically see a large volume of contagious-disease cases and thus may embrace vaccination.

Racial Disparities in Vaccine Uptake

Vaccine uptake was not constant across racial and ethnic lines. In Washington, DC, where African Americans are the majority, public health officials noticed the large racial disparities early. A similar situation was found in jurisdictions surrounding Atlanta, Georgia. Pamela Blackwell, director of the Center for Emergency Preparedness and Response for Cobb & Douglas Public Health in Georgia, said, "It was very,

very obvious in our mass clinics that we had not somehow targeted the African American population well at all."

In Chicago, the turnout at neighborhood clinics demonstrated significant differences in demand for vaccine based on race and ethnicity. Clinics located in primarily African American communities received much lower turnout than those in primarily Latino or white communities. This was not a new phenomenon. "We knew from seasonal flu and from pneumococcal vaccine as well," said Morita of Chicago Public Health. "It played out as it had in previous seasons."

LA County also had disproportionate utilization among racial groups. Nine percent of the county population is African American, yet this group received less than 3 percent of the vaccine from points of dispensing (PODs). By contrast, the Latino population was represented about equal to their share of the population, and Asian/Pacific Islanders were represented in PODs at about double the percentage of their population in the county.

Participants emphasized the need to understand the ethnic variations inherent in their communities and develop strong partnerships before events in order to appropriately engage the community.

Opportunities for Improving Vaccination Rates in Certain Populations

Numerous individual suggestions were made about opportunities to improve vaccination rates in certain populations, including pregnant women and healthcare workers. Suggestions were also made about addressing health disparities among racial and ethnic groups. These suggestions are compiled here as part of the factual summary of the workshops and should not be construed as reflecting consensus or endorsement by the workshops, the Preparedness Forum, or The National Academies.

Pregnant Women

There were several individual suggestions about improving vaccination rates among pregnant women for consideration by public health authorities and health systems, among others. These included

- **Public health authorities, medical associations, and the OB/GYN provider community should routinely recommend influenza vaccination for pregnant women and "institutionalize" access to vaccine where obstetrical care is provided.**
- **Use electronic standing orders ("opt out") or automatic "best practices" alerts in electronic medical records to increase vaccination among pregnant women and other patients for whom vaccination is recommended.**
- **Increase education for healthcare workers regarding the safety and importance of vaccinating pregnant women so that workers will be more likely to encourage their patients to be vaccinated.** "The tangible low-hanging fruit seems to be things like how we better reach our pregnant women," said Slemp of West Virginia. "There is lots of room there to work with provider communities and networks that work with our pregnant women, to increase the understanding that not only is this safe and effective vaccine, but they are really at increased risk."

Healthcare Workers

There were several individual suggestions about improving vaccination rates among healthcare workers for consideration by public health authorities and health systems, among others. These included

- **Examine ways to increase healthcare provider participation in vaccine campaigns.** Should vaccinations be required for healthcare workers? Or would a model similar to that in Massachusetts, which required that healthcare workers be offered vaccination, be enough to increase participation?
- **Consider incentives for healthcare provider immunizations.**
- **Educate healthcare providers about the safety of vaccines and their importance so they will be more likely to be vaccinated themselves and advise patients to be vaccinated.**

Racial Disparities

There were several individual suggestions for addressing health disparities among racial and ethnic groups for consideration by public health authorities and health systems, among others. These included

- **Evaluate, plan around, and identify best practices for interventions to address racial/ethnic health disparities now in order to improve vaccination rates.** Participants stressed that "this can't be done on game day."

7

Data Collection, Monitoring, Evaluation, and Use

Data collection and analysis have critical roles in shaping programs, tracking progress, evaluating results, demonstrating accountability, and informing policies that will improve plans for future events. However, participants noted that it is extremely challenging to develop feasible methods for collecting accurate, reliable, and meaningful data during a public health emergency. Several participants noted that data collection is always secondary to the on-the-ground provision of care. During the 2009 H1N1 pandemic, "In terms of vaccination, we were not really there to collect data," explained Megan Davies, state epidemiologist in North Carolina. "Data were very secondary to me in the vaccination effort. The one thing we don't want to do is come out with some recommendation that puts big obstacles in the way of getting vaccine into human beings." For this reason, it is important to consider data collection and analysis needs during a pandemic as preparedness plans are developed and revised so they can be fully integrated into the plans and included in exercises and drills.

In general, data tracking of vaccine administration was considered poor in most jurisdictions, making it difficult for public health authorities and healthcare providers to determine in real time, or near real time, whether their efforts were successful.

Many workshop participants discussed how their organizations struggled with the issue of mandatory data entry to track vaccine administration because of fears that this would become an obstacle to vaccination. West Virginia's Slemp noted, "We knew that if our private providers were going to get engaged in this system, we had to minimize the amount of data we wanted." There was concern that healthcare providers would not order vaccine if data entry into a registry was required.

"As much as from a data [collection] standpoint I hated that it wasn't required . . . we needed everybody administering as much as possible," said Angie Hagy, infectious disease epidemiologist for the City of Milwaukee Health Department's Division of Disease Control and Environmental Health.

At a national level, the CDC developed a project with the University of Michigan to conduct regular surveys with immunization program managers via phone calls or e-mail (Clark et al., 2010). The surveys were designed to provide the CDC with real-time information about how states were implementing their vaccine distribution and administration plans. They also gave the CDC feedback on their communications as well as information about needs that could be addressed. In the early weeks, the surveys looked at which target groups the states were prioritizing for vaccine. In the later weeks, the surveys asked which states were doing school vaccinations, whether vaccine had been distributed to retail pharmacies, and what plans were made for coming weeks. Pascale Wortley, chief of the Health Services Research and Evaluation Branch of the CDC's Immunization Services Division, noted that careful measures were needed to set up the survey project successfully and ensure that busy immunization program managers would be willing to invest the significant time needed to participate. She said the CDC worked through the Association of Immunization Managers (AIM) and ASTHO to develop buy-in, and also noted that the surveys were done by a team whom the immunization program managers already knew and had worked with before. The information was shared through AIM and ASTHO so states could learn what other states were doing. Although it was clear that data collection requirements should not become a burden to the public health and healthcare provider community, workshop participants also discussed how the absence of certain kinds of data had a negative impact on the vaccination campaign. Such data would have enabled them to adjust plans throughout the campaign and improve plans for the next public health emergency. Participants identified a number of datasets that were not available but that would have been valuable in informing their campaigns (Box 7-1). Therefore, as West Virginia's Slemp highlighted, there is a need to develop and integrate standardized data collection systems into all pandemic plans and exercise these plans to ensure they will not be a burden during a response. Furthermore, several participants noted, more resources are needed to facilitate the collection and analysis of the data.

BOX 7-1
Important Data That Were Largely Unavailable

Workshop participants highlighted the following information as often unavailable, but highly relevant to managing a response:

- Accurate data on doses administered (especially to target groups),
- Disease incidence by target group,
- Prior immunity in target group,
- Rapid assessment of reasons why people are or are not being vaccinated by risk group,
- Demographic information,
- Data on the impact and effectiveness of messaging campaigns, and
- Clear and early determination of severity of illness.

State and Local Public Health Data Collection Models

Each jurisdiction made different decisions based on their data collection systems and provider feedback. Jurisdictions required varying levels of data collection. Many data collection methods were used, including electronic data collection via batch downloads, direct interfaces, data entry, and paper and pen.

Some of the data collection models used by state, city, and county public health authorities are described below. They give an overview of the variety of approaches used and highlight aspects of approaches that participants identified as being especially successful. This section is not intended to be a comprehensive review of state and local data collection models, but rather to highlight some models presented during the workshop series.

Data Collection at Mass Vaccination Clinics

In Boston, a patient tracking system designed to rapidly collect information using personal digital assistant (PDA) devices scanned each patient's driver's license upon entry into a mass clinic, if the patient was willing to provide one. The license was scanned again upon exit, and the type of medication received was entered into the system. This provided real-time information on what was happening in the clinics. Laura Williams, deputy chief of staff with Boston EMS, said approximately 60 percent of

people going through the clinics provided their license. For the administration sites that did not have electronic data collection capabilities, either an Excel spreadsheet or paper forms were used and the data were incorporated later.

This was the first time that Boston Public Health had fully used electronic data collection for a public health emergency response, and they found it to be a success. The data collected included the patient's name, address, phone number, age, and gender; clinic location; date; medication information; and relevant information regarding a second dose, as applicable. "The benefit of having an electronic, condensed spreadsheet was that we could provide real-time reports to the executive director—real-time flexibility with rapid feedback," Williams said. "If there was a reaction, [we could] quickly search and provide the person with specific medication they received, when, and any other information they requested."

Using a similar strategy, Indiana was able to work with its Bureau of Motor Vehicles and download all driver's licenses into their registry. Although there was a lot of duplication, the patient's name, address, and age were already present at the mass clinics and could be cross-correlated. These data are likely to provide a wealth of information to Indiana as the state assesses and updates its pandemic plan.

Immunization Registries

The use of immunization information systems—commonly known as immunization registries—varied widely by state. There were anecdotes of healthcare providers not vaccinating because of a registry reporting requirement. For example, Slemp heard that one major medical center in West Virginia did not vaccinate its in-patient population because it could not readily export the data. In Texas, Jennifer Jackson, R.N., of the Williamson County and Cities Health District in Georgetown, Texas, noted that some healthcare providers decided not to order 2009 H1N1 vaccine when the state required doctors to use the ImmTrac registration system. Once the state relaxed the requirement, more providers ordered vaccine. Although co-occurring factors may have also led to increased provider orders, this highlights the need to take into account the needs of practitioners, especially those with smaller practices, when developing collection and reporting requirements.

Because use of registries can potentially decrease participation by healthcare providers, the benefits of getting data and tracking vaccine had to be weighed against a reduction in administration of vaccine, the context of the actual event, the amount of vaccine available, the speed of vaccine production, the severity of the disease, and the importance of vaccinating target groups. "Ultimately, only a quarter of the states required patient-level reporting through immunization registries," said Beth Rowe-West, head of the Immunization Branch of the North Carolina Department of Health and Human Services.

In states that did require reporting through registries, if electronic data transfer was not available, the states had to rely on manual data entry, which was arduous and costly, especially if healthcare providers saw no direct benefit to entering the information. Furthermore, training new practitioners on data collection for a registry takes time and resources, which could strain already busy private practices.

Virginia provided a $1,000 grant to new registry users to encourage use of the registry. This grant helped offset healthcare providers' costs in training staff on the system or connecting their existing electronic medical system to the registry.

Washington State used billing data and an interface with the CHILD profile, its health promotion and immunization registry, to obtain data from private healthcare providers, noting that few private providers such as pediatricians or family practice doctors have the staff, time, and money required to keep up with the data entry requirements. "It [takes] basically an FTE [a full-time equivalent employee] to do that when you are doing immunizations on a daily basis," noted Kaneshiro, past president of the state's chapter of the American Academy of Pediatrics.

Using registries during the 2009 H1N1 vaccination campaign had short- and long-term benefits. A short-term benefit of having more data available earlier was the ability to modify plans and improve efficiency and effectiveness during implementation of the vaccination campaign. In the long term, participants noted, requiring healthcare providers to become familiar with using the registry built up awareness and infrastructure, which could be leveraged in future routine activities and public health emergencies. The challenge now is working with clinicians to ensure they continue to use the registry, not only to enter the information, but to be able to use that information and see the value in the system.

Registries have the potential to increase the ability to track countermeasure distribution, making them a more holistic point-to-point response management system, although such an expansion would require

significant investments. One issue raised in making such changes to registries is the legal implication of going beyond a registry's stated purpose. But this legal change would also arise if registries were used to target vaccine administration to certain groups based on health status. Registries are good at telling who needs vaccinations and doing basic reporting, noted Milwaukee's Hagy. "But it is definitely not set up as an electronic health record. You can't go into the Wisconsin Immunization Registry and find out who is pregnant, who has underlying medical conditions, [and] who is a healthcare worker, so that we could answer the questions that everybody wanted to know: What percentage of shots were going into people of different risk groups? Were the shots equally distributed? Were we impacting racial and ethnic minorities the same?" Without that type of information, this type of query had to be answered based on zip codes and limited racial and ethnic data. Additional information regarding states' experience with using registries is described in Box 7-2.

BOX 7-2
Case Studies of Immunization Registry Use

West Virginia

Although controversial, West Virginia required reporting using their existing West Virginia Statewide Immunization Information System registry, to which they had just added a mass immunization module. They aimed to use these data to track vaccine distribution and transfers within the state, track progress of the campaign, guide program implementation including filling providers' reorders, and provide accountability for the use of a free resource. Another aim was to get more healthcare providers enrolled and familiar with the registry as the state moved into providing more adult immunizations. Training for healthcare providers was held via web-based conferencing. Cathy Slemp, acting state health officer and director of the Division of Threat Preparedness for the Bureau of Public Health in the West Virginia Department of Health and Human Resources, said the system provided a reasonably good picture of where vaccine was and who was getting vaccinated and was a useful tool for identifying counties that had weaknesses in reporting and using that information to investigate whether that area was encountering particular challenges with the vaccination program.

Wisconsin

Wisconsin had a reporting requirement in its provider-use agreement that had to be completed to receive vaccine. The immunization registry contains childhood, adolescent, and adult tracking schedules, as well as Advisory Commit-

tee on Immunization Practices recommendations. For 2009 H1N1, a mass vaccination screen was developed for use during mass vaccination clinics, and ad hoc reporting was added. The software and hardware capacity of the system had to be increased because of the rise in the number of healthcare providers using the system. Tech-support hours also needed to be increased to cover late-night clinics. Large medical centers interacted with the registry either through batch downloads or electronic interfaces. "We think we had pretty good compliance, but we can't measure that with absolute certainty," said Daniel Hopfensperger of the Wisconsin Department of Health Services. The key to working with private healthcare providers, he noted, is to work with electronic medical record systems and try to establish real-time, bilateral transfer of data.

Data Collection Challenges

Cross-Jurisdictional Variability

The information management systems showed a high level of variability in tracking administration of vaccine across state and local public health systems. This caused problems particularly for partners who had to interact with multiple public health jurisdictions and/or also report to their own internal systems, such as the Department of Veterans Affairs and large pharmacy chains. Several participants suggested it would be useful to explore standardization of information management systems and data reporting requirements and to analyze current immunization registries and other systems to assess where variability is not warranted.

Obtaining Real-Time Data

In LA County, the service planning areas with the highest number of flu outbreaks also had the highest number of vaccine doses administered. Mascola, of the county's Department of Public Health, hypothesized that this was because if people see sick people around them, they are more likely to get a vaccine. However, the PODs did not have good situational awareness because of the lack of access to real-time data about disease outbreak or vaccine administration. Thus, like most jurisdictions, it was not possible to modify plans and respond to what was happening out in the field. LA County did use Scantron optical forms, which allowed it to look at the hourly flow of people in each POD. This helped inform staffing ratios for PODs used later in the campaign.

Mascola commented that the analysis of the datasets showed that "it was the ethnic minority groups, the Latinos and African Americans, who had the highest [2009 H1N1] flu death rates in LA County per 100,000." Unfortunately, the communication strategies they used were not developed in a manner that would allow for real-time updates based on the changing situation. As new plans are developed based on lessons learned during the 2009 H1N1 vaccination campaign, it will be important to develop communication campaigns with greater dynamic flexibility.

Without access to real-time data, it was difficult to determine during the event if particular strategies were effective or if particular areas within a jurisdiction were more or less crowded. However, even with improved situational awareness, metrics still need to be established to determine what a success is.

Availability of Technology

Even now, many community health centers and pharmacies lack information technology, such as computers or Internet access for direct data entry, or Internet connectivity or computers at the point of sale or clinic location. During the 2009 H1N1 pandemic, this meant that alternative data entry systems had to be created, such as Excel spreadsheets for those with computers but no Internet, and paper forms for those without computers. This resulted in an even greater lack of conformity in the data collected, making large-scale analysis more difficult. Furthermore, these alternative systems also created additional staffing demands because the data had to be entered and integrated into the primary data collection system.

Staffing for Data Entry

Many participants noted that data collection required significant staff time and associated costs in public health departments, pharmacies, private practices, and other locations used to administer vaccine. For example, the Boston Public Health Commission hired a part-time intern and three temporary employees to compile and enter into the database all the information from clinics and other locations that used Excel spreadsheets and paper forms.

Jurisdictions that were not able to hire additional staff or receive forms on a daily basis experienced huge backlogs in data entry—even if

optical-scan forms were used. Once backlogged, catching up became difficult and much staff time and effort went toward data entry. Hagy of Milwaukee noted that if the vaccine supply had been as large during the initial months as was originally expected, the time lag for data entry would have grown exponentially. Therefore, although there is a tremendous need for real-time data collection to improve situational awareness, strategies need to be developed and used minimize staff and cost burdens.

In some areas, few data were received from private healthcare providers. In LA County, where 80 percent of the vaccine was administered by private providers, few data were returned. Public health, which administered the other 20 percent of vaccine, collected data via forms that could be scanned. However, not all locations had good experiences with such forms; the City of Milwaukee Health Department ran into many problems with the optical character recognition software due to variations in handwriting. This highlights the need to establish policies that create push-or-pull incentives to ensure that data are collected and returned to the appropriate authorities.

Opportunities for Improving Data Collection, Monitoring, Evaluation, and Use

Numerous individual suggestions were made about opportunities to improve data collection, monitoring, evaluation, and use. These suggestions are compiled here as part of the factual summary of the workshops and should not be construed as reflecting consensus or endorsement by the workshops, the Preparedness Forum, or The National Academies. They are as follows:

- **Develop technologies that facilitate real-time data collection and reporting to improve situational awareness and guide program implementation during a public health emergency.**
- **Explore standardization of information management systems and data reporting requirements.** Analyze current immunization registries and other systems to assess where variability is not warranted.
- **Develop and enhance systems that automatically share information from electronic medical records and practice management systems with systems that track vaccine administration.**

- **Simplify data collection and reporting requirements.** Determine the most important data elements to collect during a public health emergency. Some information may be critical to the mission and associated data should be collected in all types of events, but other information may be able to be prioritized according to severity of incident and availability of resources.
- **Establish data collection forms for use in everyday practice that can also be used during public health emergencies.**
- **Use seasonal influenza vaccination data from previous years to inform vaccination plans and help determine where additional outreach may be necessary.** For example, LA County's data showed that one area with a large African American population had the lowest number of seasonal flu immunizations, and this low rate was also found in the 2009 H1N1 vaccination campaign.
- **Establish common performance metrics.** "We need to know what we are striving for and how to measure that and how to know whether we are being successful," said Jack Herrmann, senior advisor, Public Health Preparedness with the National Association of County and City Health Officials (NACCHO). Consider nonempirical measures of success if prior data measures are unavailable.
- **Direct grantees (e.g., Chicago) should have access to data on their own area of control, rather than being aggregated with state data.**
- **Bar code and color code vaccine to reduce time and potential for errors in vaccine administration and data entry.**

8

Communications and Media

Communications and messaging efforts during the response to 2009 H1N1 focused initially on minimizing transmission of the 2009 H1N1 virus, including measures such as hand-washing technique, proper cough etiquette, and staying home when sick. Once the vaccination campaign launched, efforts shifted toward communications about the availability and prioritization of getting vaccinated. This section will focus primarily on the opportunities and challenges associated with communicating during the vaccination campaigns and not the earlier efforts focused on minimizing transmission.

Communication Challenges During the 2009 H1N1 Vaccination Campaign

Communication during the 2009 H1N1 vaccination campaign was extremely challenging. Public health authorities had to develop and convey messages about several topics, including availability, vaccine recommendations and target groups, benefits and risks, and vaccine recalls. They also had to communicate with each other and with several target groups, including healthcare providers, and separately, to members of the public. Additionally, because vaccine administration plans varied across the nation, much time was spent clarifying information to ensure local accuracy. "Accurate communication is probably one of the big struggles from last year," noted Greg Primuth from Walgreens.

Many participants noted that federal messaging encouraging vaccination during fall 2009 increased public demand while vaccine was in short supply and was profoundly challenging for state and local health officials

and healthcare providers. As a result, private healthcare providers, healthcare systems, and public health authorities reported that they received high volumes of calls from anxious patients trying to locate vaccine for themselves or their family members.

The availability of multiple vaccine formulations with varying contraindications interacted with the use of priority groups to create complicated vaccine administration plans, which in turn had to be shared with the public. For example, if only LAIV was available at a given time in a certain location, only some members of target groups could be vaccinated there. This issue was particularly challenging for pediatricians because of the variations in ages for each formulation; this is discussed in more detail below.

With vaccine trickling out, there was a public perception in some jurisdictions that vaccine was being distributed unequally, even though it was taking place on a pro rata basis. For example, LA County has a population of about 10 million, while other counties, especially in northern California, are much smaller and therefore received many fewer doses of vaccine. Some people in the smaller counties thought that LA County was receiving a disproportionately larger share because it received such a large quantity of vaccine, despite the pro rata distribution scheme used. A similar perception occurred in Alaska because the majority of the population is centered around Anchorage. To counteract the perception, public health messaging began using the words, "your fair share" to emphasize that everyone was being treated equally. Participants emphasized the need to be honest and transparent about the situation when vaccine supplies were lower than demand.

Communication Among Public Health Authorities

Many mechanisms were used to help maintain communications among public health authorities at federal, state, tribal, territorial, and local levels, especially during the initial months when the situation, available information, and guidance were frequently changing. These mechanisms included regular conference calls with officials from the CDC, ASTHO, NACCHO, and the National Public Health Information Coalition. These efforts were intended to disseminate information from the federal level and to share practices at each level, to gather feedback regarding what was happening in the field, and to learn about different

stakeholders' needs. More details about CDC efforts to ensure effective communication among public health entities are available on the CDC website (CDC, 2010c).

ASTHO and NACCHO developed resources and tools to help state and local health departments and partner organizations address issues related to pandemic flu response. Listservs were also used to provide an ongoing dialogue in which members could ask questions and discuss suggestions. "It was phenomenal to be able to go to [NACCHO's] website and see best practices and to see what other people are doing and to not reinvent the wheel," said Georgia's Blackwell.

Communication and coordination among health authorities at the federal, state, and local levels regarding the timing and content of communications campaigns for the public was sometimes challenging, noted some workshop participants. Some state and local public health officials expected a national 2009 H1N1 communications campaign from the beginning of the response and planned to provide only information particular to their community. "We really thought that we were going to see all of the prevention materials come out of CDC or HHS," said Greg Wilkinson of Alaska Health and Social Services. "It meant for a lot of shifting of gears real quick at the very beginning, and we kind of missed out on a chance to nationalize a message and really drive it home." However, as discussed below, developing tailored messages to fit community needs was very important. In addition, there were also concerns that a national communications campaign would only exacerbate difficulties related to low vaccine supply. As a result, although the CDC encouraged vaccination among the priority groups as soon as vaccine became available, it delayed promoting vaccination more aggressively through traditional media campaign strategies until December, when supply was more plentiful. However, some workshop participants said that advanced information about the design and contents of the federal vaccination communications campaign would have allowed states to align their own campaigns and improve message consistency.

Communicating with Healthcare Providers

Many healthcare providers feel overwhelmed by information on a regular basis. This was particularly true during the 2009 H1N1 vaccination campaign with its multiple formulations, priority groups, and often-

changing information about upcoming vaccine supply. Local public health authorities appreciated the CDC's efforts to help them understand what was happening on a national level so that they could, in turn, explain what was going on to their local physicians and other healthcare providers. "Without that informed decision making, it would have made it a lot more difficult for us, and I think that helps in providing that transparency," said Diane Yu, public health officer for Washington's Thurston and Mason counties.

But ensuring healthcare providers got the information they needed was difficult. Delaware reported that most Health Alert Notices did not reach most physicians and that blast faxes were sometimes thrown away by staff before they reached physicians. Zach Moore from the North Carolina Division of Public Health noted, "We never got out of the single digits with the percentage of providers reached with any given message." North Carolina did not have the capability to directly e-mail healthcare providers in the state. Instead, many physicians received information the same way the public did—through the evening news. Box 8-1 shows examples of mechanisms used by public health authorities to communicate with healthcare providers.

Many jurisdictions partnered with medical societies and associations to get the messages out to physicians and other healthcare providers—with mixed results. NACCHO's Herrmann said, "What we learned from our membership was that those who had preexisting relationships with those associations probably did better—at least anecdotally—than those who did not." Those who did report success credited the societies and associations as being vital in reaching certain populations and their healthcare providers, such as OB/GYNs and pediatricians.

BOX 8-1
Examples of Tools Used to Communicate with Healthcare Providers

- Faxes
- E-mails
- Websites
- Health Alert Notices
- Medical and professional societies
- Conference calls/video conferences
- Hotlines/call centers
- Hospital seminars

One successful model for communicating to healthcare providers was suggested by Karen Remley, Virginia's state health commissioner. The state can communicate with anyone licensed through the Department of Health Professions during a public health emergency, she said. The contact list includes not only physicians and nurses, but also funeral directors and pharmacists and other healthcare providers. The state declared a public health emergency in part to activate this capability. Every Friday, a summary of one to two pages went out to about 250,000 practitioners, providing an update on the pandemic and vaccinations. Practitioners, in turn, often shared this information with their patients, helping to ensure that everyone had the most updated information. Other states, such as Indiana, also have the capability to directly e-mail all physicians in the state. Some other states, including Texas, that did not have the capability at the beginning of the pandemic are updating legislation and regulations to provide the capability.

Communicating with the Public

Public health authorities developed multifaceted strategies to convey messages to the public. Healthcare providers also developed means to communicate relevant information to their patients. Workshop participants discussed the importance of tailoring messages to intended audiences. These topics are all discussed below.

Although many communications challenges arose during the 2009 H1N1 response, particularly relating to the vaccination campaign, many participants said the CDC's 2009 H1N1 communications campaign used good practices that should be continued for future emergency responses. The CDC focused its messages on articulating the CDC's goals and actions, acknowledging what was known and what was not, and setting the expectation that the information and advice would change as the situation evolved. The CDC campaign also focused on providing frequent updates, using a consistent set of spokespeople, and conducting ongoing research on public understanding and attitudes about 2009 H1N1–related topics so that messages could be revised for greatest effectiveness. Additional details about the CDC's communications approach are available on the website (CDC, 2010e).

Tools and Mechanisms

Public health authorities reached out to their communities using numerous tools (Box 8-2). Although not a comprehensive review of state and local public health communications campaigns, this section discusses some of the mechanisms used by public health authorities to communicate with the public, particularly those mechanisms deemed by participants to have been successful.

In some public health jurisdictions, live call-in radio and television shows featuring physicians and health educators were an effective vehicle for connecting with the public. Besides allaying some fears, it was a good way to educate the public about the risks they could be facing and highlight prevention and vaccination campaigns. In Arkansas, a live call-in television show with medical experts was credited as a turning point for vaccinations of pregnant women because the OB/GYN on the show revealed that six pregnant women were on ventilators due to 2009 H1N1. After the program, increased demand for vaccine was seen among pregnant women.

Many public health authorities, healthcare providers, and other entities used websites to communicate with the public during the vaccination campaign. Katterman's Pharmacy in Seattle used a Twitter feed on its website to update the public on when vaccine was expected and when it was available. Other healthcare providers posted availability on their website

BOX 8-2
Examples of Tools Used to Communicate with the Public

- Cable television stations
- Radio
- Websites
- Public service announcements in multiple languages
- Media stories and press releases
- Newspaper inserts
- Posters
- Billboards and bus ads
- Movie theater advertisements
- Internet advertisements
- Hotlines and call centers
- Social media: Facebook, MySpace, Twitter
- Reverse 9-1-1 calls
- Automated school call systems
- Text messaging
- Signs in physicians' offices

to alleviate the workload of their front-desk staff. For example, Kaneshiro's pediatric office created a traffic-light system on its website that allowed parents to see when vaccine was available based on a child's age and health status.

Call centers, such as the Colorado Health Emergency Line (CoHELP), were used to provide and collect information during the 2009 H1N1 event. CoHELP provided information from state health to the public and assisted the public and healthcare providers who called in to make informed decisions about treatment options and self-care. Additionally, the call center spent much time clarifying, refining, and correcting messages received through the media. Greg Bogdan, research director and medical toxicology coordinator with the Rocky Mountain Poison & Drug Center at Denver Health, which runs CoHELP, reported that CoHELP's biggest challenge was helping residents understand the situation and how it differed from national messages. Others reported that their biggest challenge in running hotlines was keeping everyone on the hotline updated with the most current, accurate information because it frequently changed. "It is really important to have a system and have it established before an event because it does take a lot of time to put it together," Bogdan noted.

Targeting Messages to Audiences

Participants pointed out that messages and delivery methods should be targeted for their intended audiences to be effective. For example, Selena Manychildren, public information officer for the Navajo Division of Health, noted the first step of the division's communications campaign was gathering health representatives together to choose a name for 2009 H1N1 in Navajo. They relied heavily on radio in both Navajo and English to reach their community, she said.

The African American community was underrepresented in mass vaccination clinics, and the lack of appropriately targeted messaging was noted as one potential contributing factor. Benjamin Rackley, executive director of the Tuskegee Area Health Education Center, Inc., said that faith-based organizations, usually a good partner in spreading messages in the community, were not generally effective this time. "They didn't believe in this vaccine," Rackley said. "This is why they didn't promote it. They weren't sure it was safe." This was a clear breakdown in communications—the vaccine safety message was not reaching the target

audience appropriately. Rackley said his group had success with peer-to-peer educators for high school students and sororities and fraternities for college students, as well as social networks such as Twitter. To reach senior citizens, face-to-face conversations were used to convey the message.

Immigrants and refugees were also challenging to reach. Not only are the messages hard to spread—the population may not read or speak English—but the population is continually growing and shifting. Mohamed Sheikh Hassan, executive director for the Afrique Service Center, which serves primarily East African community members in the Seattle area, noted that the refugee population is growing. "In the future," he stated, "if we don't change the way we are doing messaging, we may not be [as] lucky as we've been." He also noted a real need for a holistic approach because many in this population have complicating factors such as diabetes, hypertension, HIV, and post-traumatic stress syndrome. Showing up once a year for flu vaccinations, or during an emergency that may or may not affect them, is not the way to reach them. "I think it doesn't resonate with them," Hassan said, adding that a year-round approach is needed.

In Chicago an ethnic media roundtable was held that included state and local public health officials, clinicians, CDC representatives, and a number of different ethnic-media reporters. Discussions were held about disease, the impact on minorities, immunization coverage, the benefits of vaccine, safety issues, and disparity issues. Chicago Department of Public Health's Morita told workshop participants to engage the ethnic media now—make them well informed and better prepared so they can communicate those messages to their communities.

Media Relations

Participants noted that navigating their relationships with the media was challenging at times and time-consuming. They noted that when done effectively, it involved public health officials being available and responsive to media members, helping reporters understand the science and the details of the vaccination campaign, and building relationships between public health and the media.

Maggie Fox, health and science editor at Reuters, noted that one of the primary challenges for news organizations covering 2009 H1N1 was that it was not the flu they had prepared to cover. Like public health offi-

cials, she had prepared for H5N1 influenza, including developing a system of reporters, located primarily in Indonesia, who were knowledgeable about H5N1. She had not been working with the reporters based in Mexico, where many of the early cases of H1N1 were found, to educate them on influenza issues and science, so the initial learning curve was steep.

Several participants noted that broad news coverage can sometimes be used to convey important information to the public. Alaska's Wilkinson noted, "The agencies that were able to use that media interest to get their message out were able to communicate to the public, I think, in as effective a way as they could just by buying media or ad time." But media capabilities varied from region to region. In areas such as Atlanta, with four large media outlets, partnerships created and maintained over the past decade paid off tremendously in spreading the news.

Despite helpfulness in some circumstances, the media are not a venue to accomplish all the goals of a public health communications campaign. First, many areas of the country do not have ready access to large media outlets. Some jurisdictions, such as Delaware, have no television stations of their own and few or no local newspapers. Others have imbalances between urban and rural areas. In Utah, the single communication outlet is located in Salt Lake City, where the population is the most dense, which means that it became a challenge to share information relevant to remote parts of the state. Second, reporters and other members of the media have their own goals and agendas that do not always align with those of public health authorities, who often had to rely on paid advertising and other communications to ensure that they reached the right audiences and conveyed the information they believed was most important.

Over the course of the workshops, several participants expressed concern that the press tends to focus on deficiencies, inadequacies, and problems, rather than what is being done right. David Brown of *The Washington Post* explained that that is where the stories are. He added, though, that proactively engaging reporters and explaining the situation, the difficult decisions, and the factors that impacted the decisions may help. Delaware and Boston invited a few reporters to come behind the scenes and see how vaccine allocation was handled. The resulting stories were informative and highlighted the complex nature of distributing vaccine, including the complicating factor of different formulations and their indications (e.g., Smith, 2009). Karyl Rattay from the Delaware Department of Health and Social Services noted that too many reporters from

other outlets also wanted the same kind of access as the few reporters invited behind the scenes, which was just not possible.

Opportunities for Improving Communications During Future Emergency Vaccination Programs

Numerous individual suggestions were made about opportunities to improve communications during future emergency vaccination programs. These suggestions are compiled here as part of the factual summary of the workshops and should not be construed as reflecting consensus or endorsement by the workshops, the Preparedness Forum, or The National Academies.

Communication and Coordination Within Public Health

There were many individual suggestions for enhancing communication and coordination within public health for consideration by public health authorities. These included

- **Coordinate among stakeholders to ensure better alignment of messaging, particularly among federal, state, and local public health agencies.**
- **The National Public Health Information Coalition should develop a mechanism to enable rapid sharing of focus group results and other communication materials so that public health departments can benefit from the information and avoid unnecessarily duplicating efforts.**
- **Ensure messaging at the national level is consistent with the level of vaccine supply.** This will ease the volume of calls to healthcare providers' offices and better manage expectations. Participants noted that message timing and content would be improved by using more situational awareness and real-time data gained from a stronger relationship between federal authorities and vaccine producers and the development of better systems for tracking distribution and allocation, as discussed in the relevant sections above.

Communicating with Healthcare Providers

There were many individual suggestions for enhancing communication with healthcare providers for consideration by public health authorities. These included

- **For physicians who do not receive vaccine, provide their office managers with information about where people can get vaccinated so they can give that information to patients who call the office.**
- **Leverage existing call systems (e.g., VFC and West Nile Virus and health plan hotlines) to provide hotlines for the public and healthcare providers.**
- **Work with medical societies and associations to educate healthcare providers and communicate with them about logistics.**

Communicating with the Public

There were many individual suggestions for enhancing communication with the public for consideration by public health authorities, health systems, and healthcare providers, among others. These included

- **Use electronic medical records to identify priority group patients and provide targeted communications to them.**
- **Use school systems' automated phone networks to reach parents.**
- **Capitalize on parents' influence over college students by reaching out to them to encourage their children to be vaccinated.**
- **Use text messages: People text in their zip code and get back clinic locations and a text message 1 week later reminding them to be vaccinated.**
- **Investigate partnering with health plans' existing call centers, integrating that capacity into the public health response.** The extra capacity will help keep public health from becoming

overwhelmed, and callers can be given information and instructions specific to their individual insurance carrier.

- **Think outside the box for opportunities to create new partnerships.** For example, public health departments in Oregon worked with the Portland Trailblazers to create a public service announcement. "It allowed us to reach different segments of the population that may not necessarily hear us, and hear us in a different way," said Bill Beamer of Portland's Multnomah County Health Department.
- **Educate faith leaders and other trusted community leaders regarding the importance of vaccination and safety.**
- **Communicate with vulnerable populations, refugees, and minority communities before events and in partnership with the community.** The messenger and message need to be culturally appropriate to the community. That message should be targeted to specific populations in understandable language, words, and pictures.
- **Research effective methodologies for reaching different populations with risk communications and vaccine messaging.** This would include both a retrospective evaluation of the effectiveness of communications efforts during the 2009 H1N1 response and research to develop and test new messaging strategies.

Media Relations

There were several individual suggestions for enhancing communication with the media for consideration by public health authorities. These included

- **Proactively engage media (e.g., by inviting them to observe decision-making meetings or vaccine clinics) to provide journalists with accurate information and an understanding of the situation, be ready for any developing stories, and build trust.** This strategy can be risky, but it can also help journalists be prepared for story. Brown of *The Washington Post* noted that difficult decisions, contradictions, and differences of opinion and approach cannot be avoided, but those difficulties should not be finessed or explained after the fact.

9

Funding and Payment Issues

The federal government purchased the vaccine from manufacturers so it could be provided to the public free of cost. Federal funding also paid for the vaccine distribution. Despite this investment, all the stakeholders involved in the vaccination campaign encountered additional costs associated with planning, vaccine storage and administration, communications, data collection, and associated staffing needs. Some funding and payment issues raised by workshop participants are discussed in this section.

Sanchez of Blue Cross Blue Shield noted that although each stakeholder group knows about its own costs and funding requirements, there is a gap when it comes to the overall picture of the cost of the 2009 H1N1 response. He suggested that evaluating the 2009 H1N1 response is important to better understand the full cost of the response and what portion each stakeholder bore (e.g., taxpayers, physicians, patients, health plans, employers).

Public Health

Public health participants at the workshops noted that the free vaccine allowed jurisdictions to focus resources on distribution and administration. Nevertheless, distribution and administration still had a substantial cost—for staff, facilities, supplies, and communications, among other things. Many jurisdictions were able to use federal grant money to help fund their 2009 H1N1 vaccination campaigns, but participants noted the significant administrative process associated with the grants. Several participants also noted that the grant requirements did not

always line up with the specific needs of individual health departments. "One size does not fit all when you are pushing money down for grants," said Jackson of Georgetown, Texas. "Not every health department is the same." Several participants urged the development of a simpler, more effective way to get money quickly when needed for an emergency response, while still retaining the necessary transparency and accountability.

State and local public health authorities were highly concerned, however, about how to sustain and capitalize on the infrastructure improvements, partnerships, and other capacities built, once federal funding for the emergency response was no longer available, particularly in light of the erosion of funding for public health infrastructure (NACCHO, 2010a; Trust for America's Health, 2010). "How do you sustain the momentum and get people vaccinated, but do it in a system that you have been using all along?" asked Cooper of the Tennessee Department of Health.

Several participants said public health funding for emergency responses is a critical area for future work. As NACCHO's Herrmann noted, "We can't continue to rely on this big bolster of money [from the federal government] when an event happens in order to carry out our public health responsibilities and priorities. It is just a dangerous way to live, and we see that from event to event."

Healthcare Providers and Pharmacies

Healthcare providers and pharmacies also encountered costs during the vaccination campaign, but unlike public health authorities, they did not have access to federal grant money. Costs associated with vaccine administration included staff time to administer the shots and the administrative activities associated with large-scale vaccinations: scheduling, data entry, and managing supplies. Pharmacies incurred costs transporting vaccine from a central location to their stores. Some, but not all, healthcare providers and pharmacies required copayment or administration fees to help cover these costs.

Challenges also arose with claiming reimbursement from insurers, especially during the initial months of the vaccination campaign. In the beginning no Current Procedural Terminology (CPT) codes were available for 2009 H1N1 vaccine administration. By the end of the event, two 2009 H1N1 codes were available: a CPT code and a Centers for Medi-

care & Medicaid Services (CMS) Healthcare Common Procedure Coding System (HCPCS) code. This in itself caused some problems because physicians did not know which code to use. In addition, some health plans do not recognize pharmacists as immunizers and did not reimburse for administration fees.

Washington State's Yu noted that although community physicians had the resources to provide vaccination services, they incurred costs in terms of staff time and supplies. If public health is counting on the resources of community physicians being available in the future, then a way should be found to acknowledge the real costs associated with this type of event and provide a way of reimbursing and incentivizing participation. Scott Needle, a pediatrician from Florida and a representative of the American Academy of Pediatrics, noted, "Ninety percent of the health care in this country is delivered through private offices, and of those, many of them are small offices, with one, two, four doctors at a time. I think there does have to be some recognition that these practices are still small businesses." Needle also emphasized that funding would help offices engage in planning and preparedness activities.

Health Plans

Toby Merlin, deputy director of the CDC Influenza Coordination Unit, noted, "It is worth pursuing with insurers the issues of compensation and assuring that people who perform services are adequately compensated." Participants noted that health insurers had worked with other stakeholders to develop the CPT code for 2009 H1N1 vaccine administration. Health insurers also developed a roster billing system for use in mass vaccination clinics, through which lists of people receiving the vaccine and their insurance information were collected and submitted to the insurer. Several participants noted, however, that there were problems with getting reimbursement using this method because of the potential for errors when information is recorded. As discussed above in the section on vaccine methods and administration, Sanchez of Blue Cross Blue Shield of Texas urged public health authorities to convene a national meeting for large health plans that, among other topics, would address issues such as reimbursement, funding, and information sharing so that health plans can be more fully integrated into the response system during future public health emergencies.

Health plan representatives at the workshop also discussed challenges they faced in reimbursing administration of 2009 H1N1 vaccine. One of the major issues, noted UnitedHealth Group's Justman, revolved around employers that self-insure. Like most health insurers, he said, employers that offer health insurance to employees through UnitedHealth Group fall into two categories. In the first, UnitedHealth Group fully insures those employees. In the second, however, the employer self-insures, which means it insures its own employees but contracts with UnitedHealth Group to provide administration services. Justman noted that employers who self-insure decide what services are covered for their employees and what copays are required. This distinction caused confusion during the 2009 H1N1 campaign because UnitedHealth Group decided to cover 2009 H1N1 administration costs for all people insured through UnitedHealth Group. However, some self-insuring employers did not cover vaccine administration and refused to cover 2009 H1N1 vaccine administration because it created a benefit that would need to be negotiated with unions and employee groups. This resulted in the confusing situation where employees of employers fully insured through UnitedHealth Group were covered for 2009 H1N1 vaccine administration, whereas some employees of self-insuring employers administered through UnitedHealth Group were not covered. Similar situations occurred with other health plans, and because most people are unaware of the distinction between regular and self-insuring employer-based insurance, they did not understand why some were covered when others were not.

Several participants said public health authorities, medical associations and healthcare providers, pharmacies, the insurance industry, and other stakeholders should hold a broad conversation about funding and payment in a public health emergency response. This should involve a strategic conversation exploring all aspects of the response, they noted, not just looking for ways to cover existing practices and procedures.

Opportunities for Addressing Funding and Payment Issues

Numerous individual suggestions were made about opportunities to address funding and payment issues for future emergency vaccination programs. These suggestions are compiled here as part of the factual summary of the workshops and should not be construed as reflecting

consensus or endorsement by the workshops, the Preparedness Forum, or The National Academies. They are as follows:

- **Evaluate the 2009 H1N1 response to develop a better understanding of the full cost of the response and what portion is borne by each stakeholder (e.g., taxpayers, physicians, patients, health plans, pharmacies, employers).**
- **Public health authorities should recognize and address the time and financial costs for private practitioners.**
- **Public health authorities should engage with health systems, retail pharmacies, and healthcare insurers to address reimbursement issues.** What lessons were learned during this event, and what systems can be put in place to simplify and streamline reimbursement processes in the future?
- **The federal government should evaluate funding mechanisms that enable public health to respond to emergencies.** For example, can grant application processes be streamlined? Can funding requirements be more flexible to enable public health authorities to tailor funding to their areas of need?

10

Research and Planning

Despite the challenges associated with tracking vaccine administration, a tremendous amount of data was collected during the 2009 H1N1 response. Many noted that harvesting and evaluating these data would significantly expand the evidence base that could be used to improve future emergency vaccination campaigns. Participants suggested research questions across all the areas discussed so far in this summary, including distribution and administration, data collection, communications, and funding and payment.

Across all three workshops, many participants said that it would be extremely valuable to systematically evaluate state and county implementation processes and immunization infrastructures to understand associations between coverage rates and immunization policy, programs, and practices. Participants noted substantial variability by state in the percentages of the population vaccinated and the percentage of target group members vaccinated. Vaccination rates for ACIP target groups ranged from 19.4 to 57.5 percent (CDC, 2010a). Adults with high-risk conditions averaged 25.2 percent, but ranged from 10.4 to 47.2 percent across jurisdictions. Participants asked, given the per capita distribution of vaccine across the country, what the underlying reasons were behind the variability seen in vaccine uptake rates from region to region and among targeted groups. Workshop participants speculated that this could stem from many different factors, including differences in the state and local public health infrastructure and vaccination processes, differences in the healthcare providers who participated and their attitudes toward vaccination, varying attitudes toward vaccination by the public, communication methods, and disease burden when vaccine became available.

They noted that local circumstances, such as publicized deaths due to 2009 H1N1, tended to increase demand. Participants suggested that examining state-level data would be helpful in addressing these issues. In addition, although county-level data are not available for all counties, where available they should also be analyzed because the factors in question may vary significantly by county within a state. Several additional research questions are described below.

In addition to the research questions suggested, participants discussed two particular overarching areas where they said that research, combined with expert review and, potentially, modeling, could be used to develop useful planning tools and enhance processes and procedures in the future. These overarching planning areas were suggested in addition to the many other suggestions for improvements to programs, processes, and tools that run throughout this workshop summary.

First, as discussed in the section on vaccine supply above, participants noted that it was extremely challenging to switch from distribution and administration plans focused on rapidly distributing large quantities of vaccine to plans focused on equitably distributing a limited quantity of vaccine. Participants also said it was challenging to switch from plans that assumed a disease with slow transmission but high mortality, H5N1, to a disease with high transmission but lower severity, H1N1. Throughout the workshops, they discussed how different strategies may be most appropriate in different situations. Participants suggested that it would be valuable to harvest data from the 2009 H1N1 response and, in conjunction with expert review and, potentially, modeling, develop a planning tool that outlines which distribution and administration strategies best ensure equitability and fairness and provide the most effective use of resources according to the characteristics of the situation. In particular, they noted that the planning tool should contain considerations for situations of shortage versus ample vaccine supply, and also recommendations regarding effective strategies according to the severity of the disease.

A second recurring workshop theme was that many processes involved in the vaccination campaign could have been simplified, systematized, and automated. This would have made the campaign more efficient and reduced error rates, they said. Participants suggested that it would be useful to examine the entire response system for ways to simplify, systematize, and automate processes and develop practices that take into

account human factors in order to increase vaccination rates, reduce errors, and increase efficiency. Particular examples are given below.

Research Opportunities

Individual suggestions for research areas are compiled below as part of the factual summary of the workshops and should not be construed as reflecting consensus or endorsement by the workshops, the Preparedness Forum, or The National Academies. Investigating details about the feasibility and implementation of these ideas was beyond the scope of the workshops.

Vaccine Distribution and Administration

There were several individual suggestions for research related to vaccine distribution and administration. These included

- **Systematically evaluate state and county implementation processes and immunization infrastructures to understand associations between coverage rates and immunization policy, programs, and practices.**
- **Assess the optimal balance of flexibility and standardization (proscription) in the ACIP guidelines, including consideration of whether/how this balance should shift according to the situation.** This would include assessing where flexibility is or is not warranted and considering processes that could be put into place to begin to weed out flexibility where it is not beneficial to the overall response.
- **Examine the impact that the timing of vaccine distribution to the general public had on vaccine uptake and leftover vaccine.** What is the difference of vaccine uptake and leftover vaccine among states that opened vaccinations to the general public earlier, compared to those that opened later?
- **Explore data on school vaccination campaigns and second-dose rates.** In West Virginia, data on second-dose coverage show wide variations by county, ranging from 11 to 86 percent. One county enacted a second-dose campaign in schools, while

another did not. There were also variations in the number of healthcare providers and who were reporting.

Research on Data Collection Systems

There were several individual suggestions for research on data collection systems. These included

- **Examine differences in data collected between states that had registries and those that did not.** Did provider enrollment in the 2009 H1N1 vaccination campaign differ? Did coverage levels differ? Are there differences between states that required data entry in registries and those that had registries but did not require data entry?
- **Examine the VFC reporting systems in states that had good reporting rates using such systems to determine the underlying causes.** What are the operational systems that support healthcare providers in providing good data to the system? Can they be disseminated across the nation?
- **Examine the links among epidemiological data, disease, and vaccine program activity.** How were the data collected by the CDC shared? When were the data robust enough to share with partners, and when with the public? How should the data shape our vaccine programs, and at what point in vaccination campaigns?

Research on Communications

There were several individual suggestions for research on topics related to communications. These included

- **Research effective methodologies for reaching different populations with risk communications and vaccine messaging.** This would include both a retrospective evaluation of the effectiveness of communications efforts during the 2009 H1N1 response and research to develop and test new messaging strategies.

- **Explore the reasons why people choose to get vaccinated, why they choose not to get vaccinated, and how the messages they receive impact this decision.**

Research on Funding and Payment

There were several individual suggestions for research on issues related to funding and payment. These included

- **Evaluate the 2009 H1N1 response to develop a better understanding of the full cost of the response and what portion is borne by each stakeholder (e.g., taxpayers, physicians, patients, health plans, employers).**

Planning Opportunities

Individual suggestions for areas in which research, combined with expert review and, potentially, modeling, could be used to develop better planning tools and enhanced processes and procedures are compiled below as part of the factual summary of the workshops and should not be construed as reflecting consensus or endorsement by the workshops, the Preparedness Forum, or The National Academies. Investigating details about the feasibility and implementation of these ideas was beyond the scope of the workshops. They are as follows:

- **Harvest data from the 2009 H1N1 response (in conjunction with expert review and, potentially, modeling) to develop a planning tool that outlines which distribution and administration strategies best ensure equitability and fairness and provide the most effective use of resources according to the characteristics of the situation, including**
  - **Shortage versus ample vaccine supply.**
  - **Severity and timing of disease.**

  For example, when and how should different routes of vaccine administration be used (e.g., mass clinics, private healthcare providers, pharmacies), what messaging is most effective in each

situation, and when is it most effective to pursue herd immunity versus targeted protection of people with the highest risk?

- **Examine the entire response system for ways to simplify, systematize, and automate processes and develop practices that take into account human factors in order to increase vaccination rates, reduce errors, and increase efficiency.** Examples include
  - Simplify the provider registration system,
  - Reduce the complexity of the vaccine formulary,
  - Implement electronic standing orders and automatic "best practice" in electronic medical records,
  - Bar code and color code vaccine,
  - Develop systems so that information in electronic medical records and practice management systems can be automatically shared with systems for tracking vaccine administration, and
  - Simplify data collection and reporting requirements.

11

Final Remarks

The IOM Preparedness Forum's regional workshop series was one of several efforts to examine the 2009 H1N1 vaccination campaign, discuss lessons learned, and identify promising practices (e.g., ASTHO, 2010; NACCHO, 2010b). A particular contribution of these workshops was the special emphasis placed on including partners from across the vaccine distribution and administration system in all the workshops. The workshops provided an opportunity for federal, state, tribal, and local public health officials, healthcare providers, EMS providers, healthcare administrators, representatives from the private sector (including pharmacies and healthcare organizations), journalists, and community leaders, among others, to learn about each other's roles and experiences during the campaign. Most importantly, it was a venue for them to join together to discuss strategies to sustain and leverage progress made during the past year, identify opportunities and areas for further work, and continue to improve the nation's ability to respond to future public health threats. The challenge now, participants said, is to take the lessons that have been learned through this experience and move forward, improving the nation's emergency response system. One of the major themes that arose during the workshops is the ideal of flexible standardization or nimble uniformity—creating systems that find the sweet spot between consistent, standardized processes and highly fluid, reactive ones. As Georgia's Blackwell put it, "Public health agencies have to adapt and evolve quickly. We have to be much more nimble than we have ever been in the past to respond to an emerging situation."

Several participants emphasized that the annual seasonal flu vaccination campaign presents an excellent opportunity to integrate many of the lessons learned from the 2009 H1N1 response, continue to enhance vac-

cination systems and activities, strengthen relationships, obtain feedback on what works and what does not, and continue to refine practices from year to year. They suggested that providing additional attention and resources to the seasonal vaccination campaign would also be highly beneficial to future emergency vaccination campaigns.

To improve their ability to respond effectively to the next public health emergency, workshop participants spoke of the need to evaluate what worked and what did not, then systematize what worked and change what did not. They spoke of the need to capitalize on the momentum that had started and to reinforce the plans, policies, and procedures that worked, rather than letting time erode the collective memory of the event.

Many participants emphasized that the partnerships that were so valuable in the response need to be nurtured and further developed so that they can be relied on in the future. Communication strategies need to be refined, and work needs to be done at the community level to ensure that those who need to hear the messages have relationships with those who will be the messengers.

Processes, from manufacturing to distribution and administration, should be looked at with a critical eye to see how they can be simplified and made more transparent to improve the delivery not only of vaccine, but other countermeasures as well. As the CDC's Merlin said, "The lessons that we learn from stepping back and looking at this entire process and how time can be carved off of the process from detection to manufacturer to distribution to administration—that [saved] time actually translates into saved lives."

A

References

APhA (American Pharmacists Association). 2009. *States where pharmacists can immunize.* http://www.pharmacist.com/AM/Template.cfm?Section=pharmacist_Immunization_Center1&TEMPLATE=/CM/ContentDisplay.cfm&CONTENTID=21623 (accessed September 14, 2010).

ASPR (Office of the Assistant Secretary for Preparedness and Response, Department of Health and Human Services). 2010. *The Public Health Emergency Medical Countermeasures Enterprise review: Transforming the enterprise to meet long-range national needs*. https://www.medicalcountermeasures.gov/documents/MCMReviewFinalcover-508.pdf (accessed September 30, 2010).

ASTHO (Association of State and Territorial Health Officials). 2010. *Assessing policy barriers to effective public health response in the H1N1 influenza pandemic.* http://www.astho.org/Display/AssetDisplay.aspx?id=4933 (accessed September 10, 2010).

CDC (Centers for Disease Control and Prevention). 2009a. Novel influenza A (H5N1) virus infections in three pregnant women—United States, April–May 2009. *Morbidity and Mortality Weekly Report* 58(18):497–500. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5818a3.htm (accessed September 10, 2010).

CDC. 2009b. Deaths related to 2009 pandemic influenza A (H1N1) among American Indian/Alaska Natives—12 states, 2009. *Morbidity and Mortality Weekly Report* 58(48):1341–1344. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5848a1.htm (accessed September 13, 2010).

CDC. 2010a. Interim results: State-specific influenza A (H1N1) 2009 monovalent vaccination coverage—United States, October 2009–January 2010. *Morbidity and Mortality Weekly Report* 59(12):363–368. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5912a2.htm (accessed July 2, 2010).

CDC. 2010b. *Flu pandemics*. http://www.flu.gov/individualfamily/about/pandemic/index.html (accessed September 10, 2010).

CDC. 2010c. Estimates of deaths associated with seasonal influenza—United States, 1976–2007. *Morbidity and Mortality Weekly Report* 59(33):1057–1062. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5933a1.htm?s_cid=mm5933a1_w (accessed September 11, 2010).

CDC. 2010d. *History of flu pandemics*. http://www.flu.gov/individualfamily/about/pandemic/history.html (accessed September 10, 2010).

CDC. 2010e. *The 2009 H1N1 pandemic: Summary highlights, April 2009–April 2010.* http://www.cdc.gov/h1n1flu/cdcresponse.htm (accessed September 10, 2010).

CDC. 2010f. *H1N1: Meeting the challenge.* http://www.flu.gov/timeline/#event1 (accessed September 13, 2010).

CDC. 2010g. Interim results: Influenza A (H1N1) 2009 monovalent and seasonal influenza vaccination coverage among health-care personnel—United States, August 2009–January 2010. *Morbidity and Mortality Weekly Report* 59(12):357–362. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5912al.htm (accessed September 13, 2010).

CDC/ACIP (Centers for Disease Control and Prevention's Advisory Committee on Immunization Practices). 2009. Use of influenza A (2009) monovalent vaccine: Recommendations of the Advisory Committee on Immunization Practices. *Morbidity and Mortality Weekly Report* 58(RR10):1–8. http://www.cdc.gov/mmwr/preview/mmwrhtml/rr58e0821a1.htm (accessed September 30, 2010).

Clark, S., A. Cowan, B. Macilvain, C. Hannan, K. Wells, and G. Freed. 2010. *Tracking state-level implementation of 2009-H1N1 vaccination*. Paper presented at the 44th National Immunization Conference. http://cdc.confex.com/cdc/nic2010/webprogram/Session10711.html (accessed September 17, 2010).

Homeland Security Council. 2006. *National strategy for pandemic influenza implementation plan.* http://flu.gov/professional/federal/pandemic-influenza-implementation.pdf (accessed October 4, 2010).

Jamieson, D. J., M. A. Honein, S. A. Rasmussen, et al. 2009. H1N1 2009 influenza virus infection during pregnancy in the USA. *Lancet* 374:451–458.

Medlock, J., and A. P. Galvani. 2009. Optimizing influenza distribution. *Science* 325:1705–1708.

Merchant Medicine. 2010. *Insight: The retail clinic market in 2009.* http://www.merchantmedicine.com/News.cfm?view=74 (accessed September 14, 2010).

Moyer, C. S. 2010. H1N1 vaccine: What physicians can do with leftover doses. *American Medical News*. http://www.ama-assn.org/amednews/2010/07/19/.htm (accessed September 10, 2010).

NACCHO (National Association of County and City Health Officials). 2010a. *Local health department job losses and program cuts: Findings from January/February 2010 Survey*. http://www.naccho.org/topics/infrastructure/lhdbudget/upload/Job-Losses-and-Program-Cuts-5-10.pdf (accessed July 2, 2010).

NACCHO. 2010b. *NACCHO H1N1 policy workshop report*. http://www.naccho.org/topics/H1N1/upload/NACCHO-WORKSHOP-REPORT-IN-TEMPLATE with-chart.pdf (accessed June 10, 2010).

ORISE (Oak Ridge Institute for Science and Education). 2009. *Abbreviated pandemic influenza plan template for primary care provider offices: Guidance from stakeholders*. http://www.cdc.gov/h1n1flu/guidance/pdf/abb_pandemic_influenza_plan.pdf (accessed September 13, 2010).

Smith, S. 2009. A day in the life of a pandemic. *The Boston Globe*. http://www.boston.com/news/local/massachusetts/articles/2009/11/08/amid_clamor_officials_work_to_allocate_swine_flu_vaccine/ (accessed July 5, 2010).

Trust for America's Health. 2010. *Shortchanging America's health: A state-by-state look at how public health dollars are spent and key state health facts*. http://healthyamericans.org/assets/files/TFAH2010Shortchanging05.pdf (accessed July 2, 2010).

WHO (World Health Organization). 2006. *Avian influenza ("bird flu")*. http/www.who.int/mediacentre/factsheets/avian_influenza/en/index.html (accessed September 10, 2010).

WHO. 2009. *World now at the start of 2009 influenza pandemic. Statement by Dr. Margaret Chan, Director-General of the World Health Organization*. http://www.who.int/mediacentre/news/statements/2009/h1n1_pandemic_phase6_20090611/en/index.html (accessed September 10, 2010).

B

Workshop Agendas[1]

Raleigh Workshop
April 15, 2010
Renaissance Raleigh North Hills Hotel
Raleigh, North Carolina

Austin Workshop
April 27, 2010
AT&T Executive Education and Conference Center
Austin, Texas

Seattle Workshop
May 11, 2010
The Alexis Hotel Seattle
Seattle, Washington

Workshop Objectives
Following the recent, and ongoing, H1N1 vaccination campaigns, the objectives of this workshop are to

- Examine innovative efforts used to distribute and administer vaccine and discuss how they may inform future efforts.
- Examine how jurisdictions and providers interpreted and applied the CDC/ACIP recommendations for use of H1N1 vaccine.

[1]To save space, the individual agendas from each regional meeting have been compiled into a single document. Under each session, speakers have been identified based on the meeting location where they participated: Raleigh, Austin, and/or Seattle.

- Highlight successful approaches used by jurisdictions to develop and use innovative partnerships with traditional and non-traditional partners, such as community groups and the private sector, to enhance communication with the public and providers and to effectively distribute and administer vaccine.
- Discuss strategies used to collect, monitor, evaluate, and use data during the H1N1 vaccination campaigns.
- Discuss lessons learned and challenges that arose during the vaccination campaigns, and identify strategies to address these challenges for future emergency vaccination programs and other medical countermeasures dispensing campaigns.

Welcoming Remarks

Raleigh
JEFFREY ENGEL, North Carolina Department of Health and Human Services

Austin
DAVID LAKEY, Texas Department of State Health Services

Seattle
MARY SELECKY, Washington State Department of Health

Charge to Workshop Speakers and Participants

Raleigh, Seattle
JAY BUTLER, *Workshop Co-Chair*, Centers for Disease Control and Prevention

Austin, Seattle
JEFFREY DUCHIN, *Workshop Co-Chair*, Public Health–Seattle & King County, WA

SESSION I: DISTRIBUTION STRATEGIES

Session Objectives

- Provide an overview of strategies developed to receive, store, and distribute vaccine to participating H1N1 vaccine providers and administration sites in the community and strategies developed to administer vaccine:

  - How were providers and vaccinators recruited to participate in the H1N1 vaccination program? What partnerships were used? Did these partnerships rely on preexisting relationships and, if so, were they successful? Were new partnerships built?
  - What lessons were learned from the use of a centralized distribution mechanism?
  - Was vaccine distributed to administration sites through centralized healthcare system distribution sites or directly to administration sites?
  - How did the availability of specific vaccine formulations and indications impact distribution and administration strategies?
- Discuss the successes, lessons learned, and how challenges might be addressed to help improve future emergency vaccination programs and other medical countermeasure campaigns.

Overview and Panel Objectives

Raleigh, Seattle

JAY BUTLER, *Panel Chair,* Centers for Disease Control and Prevention

Austin

JEFFREY DUCHIN, *Panel Chair,* Public Health–Seattle & King County, WA

Panel Remarks

Raleigh

SUSAN COOPER, Tennessee Department of Health
ANNE BAILOWITZ, Baltimore City Health Department, MD
JAMES TURNER, American College Health Association
AMANDA FULLER, North Carolina Department of Health and Human Services
GREG PRIMUTH, Walgreens
KIM BOGGESS, University of North Carolina at Chapel Hill and the American College of Obstetricians and Gynecologists

Austin

DON WILLIAMSON, Alabama Department of Public Health
JOHN REDD, Indian Health Service
ANN SALYER-CALDWELL, Tarrant County Public Health, TX
JAY BUECHE, H-E-B
JEANNE SHEFFIELD, University of Texas Southwestern Medical Center and the American College of Obstetricians and Gynecologists
WAYNE HACHEY, Office of the Assistant Secretary of Defense (Health Affairs)

Seattle

MARK HORTON, California Department of Public Health
DAVID FLEMING, Public Health–Seattle & King County, WA
JENNIFER ARNOLD, Washington State Pharmacy Association
NEIL KANESHIRO, Woodinville Pediatrics, WA, and the Washington State Chapter of the American Academy of Pediatrics
J. MICHAEL MUHM, The Boeing Company
LEONARDO PEREIRA, Oregon Health and Science University

Discussion with Panelists and Attendees

SESSION II: PROGRAM IMPLEMENTATION AND VACCINE ADMINISTRATION

Session Objectives

- Examine how jurisdictions and providers interpreted and applied the CDC/ACIP guidance:
  - Was vaccine administered sequentially or simultaneously to groups within the target population?
  - Was vaccine restricted to subgroups within the target population?
  - Was vaccine administered to groups outside the target population? If so, how and why was that decision made?
  - How was demand among target populations assessed?
  - What criteria were used for expanding beyond initial target populations?
  - What challenges arose in the interpretation, implementation, and regional coordination of CDC/ACIP recommendations

for H1N1 vaccination? Would a more restrictive, uniform approach have been desirable, or was the flexibility of the CDC/ACIP guidance important?
    - How did local interpretation of CDC/ACIP guidance influence strategy for vaccine administration?
- Discuss lessons learned and how challenges might be addressed to help improve future emergency vaccination programs and other medical countermeasure campaigns.

Overview and Panel Objectives

Raleigh, Austin

DAVID LAKEY, *Panel Chair,* Texas Department of State Health Services

Seattle

JEFFREY DUCHIN, *Panel Chair,* Public Health–Seattle & King County, WA

Panel Remarks

Raleigh

LAUREN SMITH, Massachusetts Department of Public Health
RAHUL GUPTA, Kanawha–Charleston Health Department, WV
BEVERLY PRITCHETT, Washington, DC, Department of Health
SCOTT NEEDLE, Collier Health Services, Inc., FL, and the American Academy of Pediatrics
CAROL CUNNINGHAM, Ohio Department of Public Safety
JOHN CARSON ROUNDS, Village Family Care, NC, and the American Academy of Family Physicians

Austin

JULIE MORITA, Chicago Department of Public Health, IL
PERRY BYNUM, Haltom City Fire/Rescue, TX
STEPHEN BLAIR, American Academy of Family Physicians
JASON TERK, Cook Children's Physician Network, TX, and the Texas Pediatrics Society
TOM SHIMABUKURO, Centers for Disease Control and Prevention

Seattle

TERESA GARRETT, Utah Department of Health
KRISTEN EHRESMANN, Minnesota Department of Health
JOE FINKBONNER, Northwest Portland Area Indian Health Board

ALONZO PLOUGH, County of Los Angeles Department of Public Health, CA
DAVID GROSSMAN, Group Health Cooperative, WA

Discussion with Panelists and Attendees

SESSION III: COMMUNICATION STRATEGIES

Session Objectives

- Provide an overview of strategies used by communities to inform the general public, vulnerable populations, select target populations, and priority workforce (e.g., healthcare providers and first responders) about the threat of the pandemic and the availability of and eligibility for vaccine:
  - What strategies were successful and unsuccessful in developing and delivering communication messages for specific segments of the population?
  - What particular challenges were associated with different population groups?
  - Given the challenges of vaccine availability, what strategies were used to manage expectations of providers, target populations, and the public?
  - How were target populations informed about vaccine availability?
  - How were target populations assured about vaccine safety?
- Discuss lessons learned and how challenges might be addressed to help improve future emergency vaccination programs and other medical countermeasure campaigns.

Overview and Panel Objectives

Raleigh, Seattle
JACK HERRMANN, *Panel Chair,* National Association of County and City Health Officials

Austin
KRISTINE SHEEDY, *Panel Chair,* Centers for Disease Control and Prevention

Panel Remarks

Raleigh

KARYL RATTAY, Delaware Department of Health and Social Services
PAMELA BLACKWELL, Cobb & Douglas Public Health, GA
DAVID BROWN, *The Washington Post*
BENJAMIN RACKLEY, Tuskegee Area Health Education Center, Inc., AL
JULIE HENRY, North Carolina Department of Health and Human Services

Austin

PAUL HALVERSON, Arkansas Department of Health
LESLEA BENNETT-WEBB, Oklahoma State Department of Health
CANDACE CRAUSE, Champaign-Urbana Public Health District, IL
GREG BOGDAN, Rocky Mountain Poison & Drug Center at Denver Health, CO
MAGGIE FOX, Reuters

Seattle

SELENA MANYCHILDREN, Navajo Division of Health
MOHAMED SHEIKH HASSAN, Afrique Service Center, WA
TIFFANY SUTTER, California Department of Public Health
GREG WILKINSON, State of Alaska Health and Social Services

Discussion with Panelists and Attendees

SESSION IV: MONITORING, IMPACT, AND EVALUATION

Session Objectives

- Examine and discuss strategies that were used to collect, monitor, evaluate, and use data during the H1N1 vaccination campaign:
  - What data were used to ascertain the impact and reach of this immunization effort?
  - What data would have been especially helpful but were not available?

  - How can data be gathered and analyzed quickly during an event in order to drive policy immediately?
  - Was it possible to assess vaccine coverage? What levels of coverage were achieved among different populations, and did the H1N1 vaccination campaign adequately immunize persons in the ACIP target groups?
  - What data were used or would be most useful to improve immunization rates for persons in the target groups and in the general population?
- Discuss lessons learned and how monitoring, impact, and evaluation can be improved for future emergency vaccination programs and other medical countermeasure campaigns.

Overview and Panel Objectives

Raleigh

CATHY SLEMP, *Panel Chair,* West Virginia Department of Health and Human Resources

Austin

B. TILMAN JOLLY, *Panel Chair*, Department of Homeland Security

Seattle

BETH BELL, *Panel Chair*, Centers for Disease Control and Prevention

Panel Remarks

Raleigh

KAREN REMLEY, Virginia Department of Health
DAVID GRUBER, New Jersey Department of Health and Senior Services
BETH MALDIN MORGENTHAU, New York City Department of Health and Mental Hygiene, NY
LAURA WILLIAMS, Boston EMS, MA
PASCALE WORTLEY, Centers for Disease Control and Prevention
BETH ROWE-WEST, Association of Immunization Managers

Austin

DANIEL HOPFENSPERGER, Wisconsin Department of Health Services
EDUARDO SANCHEZ, Blue Cross and Blue Shield of Texas
ANGIE HAGY, City of Milwaukee Health Department, WI

PAMELA FALK, University of Texas Medical Branch at Galveston

Seattle

CATHY SLEMP, West Virginia Department of Health and Human Resources
ANTHONY L.-T. CHEN, Tacoma–Pierce County Health Department, WA
LAURENE MASCOLA, Los Angeles County Department of Public Health, CA
RICHARD JUSTMAN, UnitedHealth Group

Discussion with Panelists and Attendees

SESSION V: GENERAL DISCUSSION WITH WORKSHOP PARTICIPANTS AND ATTENDEES

Session Objectives

Discuss opportunities and constraints identified during the workshop that may help inform future efforts to administer vaccine and dispense medical countermeasures. As future campaigns are developed and time-dependent scenarios considered, what improvements are needed to ensure a safe, robust, and timely response?

Panel Discussion: Implementing the Lessons Learned

Raleigh

LISA KOONIN, *Panel Chair,* Centers for Disease Control and Prevention
CATHY SLEMP, West Virginia Department of Health and Human Resources
PAMELA BLACKWELL, Cobb & Douglas Public Health, GA
SCOTT NEEDLE, Collier Health Services Inc., FL, and the American Academy of Pediatrics

Austin

JEFFREY DUCHIN, *Panel Co-Chair,* Public Health–Seattle & King County, WA
LISA KOONIN, *Panel Co-Chair,* Centers for Disease Control and Prevention

TOBY MERLIN, Centers for Disease Control and Prevention
DAVID LAKEY, Texas Department of State Health Services

Seattle

TOBY MERLIN, *Panel Chair,* Centers for Disease Control and Prevention
JAMES BLUMENSTOCK, Association of State and Territorial Health Officials
CATHY SLEMP, West Virginia Department of Health and Human Resources
JACK HERRMANN, National Association of County and City Health Officials

Moderated Discussion with Panelists and Attendees

- What new ideas have surfaced in this meeting today that should be explored further?
- Were lessons learned during the pandemic response that could enhance efforts to reduce the burden of seasonal flu in future years?
- Were any examples discussed that could be implemented immediately to improve the efficiency and effectiveness of the vaccine administration system?
- What further evaluation questions remain?

Closing Remarks

Raleigh

JAY BUTLER, *Workshop Co-Chair*, Centers for Disease Control and Prevention

Austin, Seattle

JEFFREY DUCHIN, *Workshop Co-Chair,* Public Health–Seattle & King County, WA

C

Workshop Speakers and Registered Attendees

Federal Government (except IHS)

Raleigh—Speakers and Panelists

Jay Butler
Centers for Disease Control and Prevention

Lisa Koonin
Centers for Disease Control and Prevention

Pascale Wortley
Centers for Disease Control and Prevention

Austin—Speakers and Panelists

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B. Tilman Jolly
Department of Homeland Security

Lisa Koonin
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Toby Merlin
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Kristine Sheedy
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Tom Shimabukuro
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Richard Martinello
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Seattle—Speakers and Panelists

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Jay Butler
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Seattle—Registered Attendees

Richard Martinello
Department of Veterans Affairs

Eric Smith
Madigan Army Medical Center

Tribal Public Health and Indian Health Service

Austin—Speaker and Panelist

John Redd
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Seattle—Speakers and Panelists

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Raleigh—Speakers and Panelists

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Austin—Speakers and Panelists

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City of Milwaukee Health Department, WI

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Daniel Hopfensperger
Wisconsin Department of Health Services

David Lakey
Texas Department of State Health Services

Julie Morita
Chicago Department of Public Health, IL

Ann Salyer-Caldwell
Tarrant County Public Health, TX

Don Williamson
Alabama Department of Public Health

Austin—Registered Attendees

Kurt Becker
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Terri Black
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Shelley Buchman
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Seattle—Speakers and Panelists

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Tiffany Sutter
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Greg Wilkinson
State of Alaska Health and Social Services

Seattle—Registered Attendees

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Tracey Andrews
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Michelle Bilhimer
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Darren Blue
Coconino County Health Department, AZ

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Lydia Buchheit
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Harvey Crowder
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Lane County Public Health, OR

Cindy Gleason
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Lauren Greenfield
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Jessica Guidry
Kitsap County Health District, WA

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Betsy Hubbard
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Scott Jeffries
Oregon Immunization Program

Brian Johnson
Lane County Public Health, OR

Lilly Kan
National Association of County and City Health Departments

Kirby Kruger
North Dakota Department of Health

Gayle Lanier
Snohomish Health District, WA

Onora Lien
Public Health–Seattle & King County, WA

Kathy Lofy
Washington State Department of Health

Judith May
Washington State Department of Health

Rita Mell
Snohomish Health District, WA

Cindy Miron
Tacoma-Pierce County Health Department, WA

Astrid Newell
Whatcom County Health Department, WA

Brit Oiulfstad
County of Los Angeles Department of Public Health, CA

Libby Page
Public Health–Seattle & King County, WA

Joy Reese
Grant County Health District, WA

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Thurston County Public Health and Social Services, WA

Loren Robertson
Indiana State Department of Health

Molly Sander
North Dakota Department of Health

Allison Schletzbaum
King County Healthcare Coalition, WA

Linda Shih
Public Health–Seattle & King County, WA

James Spitzer
Multnomah County Health Department, OR

Bob Swanson
Michigan Department of Community Health

Kelly Sylliaasen
Snohomish Health District, WA

Amie Tidrington
Skagit County Public Health, WA

Doug Wangen
Lewis County Public Health, WA

Lin Watson
Washington Department of Health

Ruth Westergaard
Region 2 Public Health/Kitsap County Health District, WA

Andrew Willman
National Association of County and City Health Officials

Rachel Wood
Lewis County Public Health and Social Services, WA

Diana Yu
Thurston County Public Health & Social Services Department, WA

Emergency Management, EMS, and First Responders

Raleigh—Speaker and Panelist

Carol Cunningham
Ohio Department of Public Safety

Raleigh—Registered Attendees

Georgianne Mitchell
Mayor's Office of Emergency Management, Baltimore, MD

Joseph Zalkin
Wake County EMS, NC

Austin—Speaker and Panelist

Perry Bynum
The City of Haltom City, TX

Austin—Registered Attendees

Jana Browning
Austin Fire Department, TX

Bill Coll
Austin/Travis County EMS System, TX

Thomas Dodds
City of Austin Fire Department, TX

Jeff Hayes
Austin/Travis County EMS System, TX

Jerry Johnston
National Association of Emergency Medical Technicians

Sean Shepard
Austin Police Department, TX

Healthcare Providers, Associations, and Institutions

Raleigh—Speakers and Panelists

Kim Boggess
University of North Carolina

Scott Needle
Collier Health Services, Inc., Naples, FL

John Carson Rounds
Village Family Care, Wake Forest, NC

Raleigh—Registered Attendees

Michele Hensley
Raleigh, NC

Jason Stogner
Stokes Family Health Center, NC

Austin—Speakers and Panelists

Stephen Blair
American Academy of Family Physicians, Austin, TX

Pamela Falk
University of Texas Medical Branch at Galveston

Jeanne Sheffield
University of Texas Southwestern Medical Center

Jason Terk
Cook Children's Physician Network, Keller, TX

Austin—Registered Attendees

A. Nelson Avery
Texas A&M Health Science Center College of Medicine

Rachel Cunningham
Texas Children's Hospital

Courtney Dodge
Texas A&M Health Science Center College of Medicine

Priscilla Keith
Health and Hospital Corporation, IN

Connie Lackey
Providence Saint Joseph Medical Center, CA

Rose Mata
Texas Children's Hospital

Margaret Mendez
Texas Medical Association

Denise Rose
Texas Hospital Association

Seattle—Speakers and Panelists

Neil Kaneshiro
Woodinville Pediatrics, WA

Leonardo Pereira
Oregon Health and Science University

Seattle—Registered Attendees

Carden Johnston
American Academy of Pediatrics

Danica Mann
King County Healthcare Coalition, WA

Peggi Shapiro
Washington State Hospital Association

John Zarek
Swedish Medical Center, WA

Pharmacy

Raleigh—Speaker and Panelist

Greg Primuth
Walgreens

Raleigh—Registered Attendee

Alex Adams
National Association of Chain Drug Stores

Austin—Speaker and Panelist

Jay Bueche
H-E-B

Austin—Registered Attendees

Leslie Myers
Randalls/Tom Thumb, TX

Justen Noakes
H-E-B

Seattle—Speaker and Panelist

Jennifer Arnold
Washington State Pharmacy Association

Seattle—Registered Attendees

Beverly Schaefer
Katterman's Sand Point Pharmacy, WA

David Williams
Safeway Pharmacy

Health Insurers

Austin—Speaker and Panelist

Eduardo Sanchez
Blue Cross Blue Shield of Texas

Seattle—Speakers and Panelists

David Grossman
Group Health Cooperative

Richard Justman
UnitedHealth Group

Other Private Sector

Seattle—Speaker and Panelist

J. Michael Muhm
The Boeing Company

Seattle—Registered Attendees

Stephen Allred
GetAFluShot.com

Lisa Brooks
MedImmune

Other Nonprofit

Seattle—Registered Attendee

Harlan Patterson
Washington Vaccine Alliance

Media

Raleigh—Speaker and Panelist

David Brown
The Washington Post

Austin—Speaker and Panelist

Maggie Fox
Reuters

Community Organizations

Raleigh—Speaker and Panelist

Benjamin Rackley
Tuskegee Area Health Education Center, Inc., AL

Seattle—Speaker and Panelist

Mohamed Sheikh Hassan
Afrique Service Center, WA

Academics

Raleigh—Registered Attendees

Bill Jenkins
Institute for African American Research, University of North Carolina at Chapel Hill

Richard Rosselli
North Carolina Center for Public Health Preparedness

Austin—Registered Attendees

Allison Chamberlain
Emory University

Michele Mindlin
Emory University

Seattle—Registered Attendee

Allison Chamberlain
Emory University

College Health

Raleigh—Speaker and Panelist

James Turner
American College Health Association

Call Centers

Austin—Speaker and Panelist

Greg Bogdan
Rocky Mountain Poison & Drug Center at Denver Health, CO

Legislative Staff

Austin—Registered Attendee

Jordan Head
Senate Committee on Health and Human Services, TX