DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION

Advisory Committee on Immunization Practices (ACIP)

Summary Report
December 19-20, 2020
Atlanta, Georgia

Final - December 18, 2020

MEETING OF THE ADVISORY COMMITTEE ON IMMUNIZATION PRACTICES (ACIP)
Centers for Disease Control and Prevention
Atlanta, Georgia 30329
December 19 and 20, 2020

	AGENDA ITEM	PRESIDER/PRESENTER(s)
Saturday, December 19, 2020		
11:00	**Welcome & Introductions**	Dr. José Romero (ACIP Chair) Dr. Amanda Cohn (ACIP Executive Secretary, CDC)
11:15	**Coronavirus Disease 2019 (COVID-19) Vaccines**	
	Introduction	Dr. Beth Bell (ACIP, WG Chair)
	mRNA-1273 Development Program	Dr. Jacqueline M. Miller (Moderna)
12:30	***Break***	
12:45	GRADE: Moderna COVID-19 vaccine	Dr. Julia Gargano (CDC/NCIRD)
	Evidence to Recommendation Framework: Moderna COVID-19 vaccine	Dr. Sara Oliver (CDC/NCIRD)
2:15	***Break***	
2:30	**Public Comment**	
3:00	Update on COVID-19 vaccines and Anaphylaxis	Dr. Tom Clark (CDC/NCIRD)
	Clinical Considerations for use of mRNA COVID-19 vaccines	Dr. Sarah Mbaeyi (CDC/NCIRD)
4:15	***Break***	
4:30	**VOTE**	
	Moderna COVID-19 Vaccine	Dr. Sara Oliver (CDC/NCIRD)
5:00	**Adjourn**	
Sunday, December 20, 2020		
11:00	**Welcome & Introductions**	Dr. José Romero (ACIP Chair) Dr. Amanda Cohn (ACIP Executive Secretary, CDC)
11:30	**Coronavirus Disease 2019 (COVID-19) Vaccines**	
	Introduction	Dr. Beth Bell (ACIP, WG Chair)
	Allocation of initial supplies of COVID-19 vaccine: Phase 1b and 1c Discussion	Dr. Kathleen Dooling (CDC/NCIRD)
2:45	***Break***	
3:00	**Public Comment**	
4:00	**VOTE**	
	Allocation of initial supplies of COVID-19 vaccine: Phase 1b and 1c	Dr. Kathleen Dooling (CDC/NCIRD)
4:30	**Adjourn**	

Acronyms

CDC	Centers for Disease Control and Prevention
CMS	Centers for Medicare and Medicaid Services
COVID-19	Coronavirus disease 2019
EtR	Evidence to Recommendations Framework
FDA	Food and Drug Administration
GRADE	Grading of Recommendations Assessment, Development and Evaluation
HRSA	Health Resources and Services Administration
IHS	Indian Health Service
NCHHSTP	National Center for HIV, Hepatitis, STD and TB Prevention [of CDC/OID]
NCIRD	National Center for Immunization & Respiratory Diseases [of CDC/OID]
NCEZID	National Center for Emerging and Zoonotic Diseases [of CDC/OID]
NIAID	National Institute of Allergy and Infectious Diseases
OIDP	Office of Infectious Disease and HIV/AIDS Policy
SARS-CoV-2	Severe acute respiratory syndrome coronavirus 2
WG	Work Group
WHO	World Health Organization
VE	Vaccine Effectiveness

Acronyms

AAFP	American Academy of Family Physicians
AAP	American Academy of Pediatrics
ACHA	American College Health Association
ACIP	Advisory Committee on Immunization Practices
ACOG	American College of Obstetricians and Gynecologists
ACP	American College of Physicians
ACS	American Community Survey
AE	Adverse Event
AECI	Adverse Events of Clinical Interest
AESI	Adverse Events of Special Interest
AGS	American Geriatric Society
AHIP	America's Health Insurance Plans
AI/AN	American Indian/Alaskan Native
AIM	Association of Immunization Managers
AIRA	American Immunization Registry Association
AMA	American Medical Association
AOA	American Osteopathic Association
APhA	American Pharmacists Association
APTR	Association for Prevention Teaching and Research
ARDS	Acute Respiratory Distress Syndrome
ASTHO	Association of State and Territorial Health Officers
BMI	Body Mass Index
BRFSS	Behavioral Risk Factor Surveillance System
CBER	Center for Biologics Evaluation and Research
CDC	Centers for Disease Control and Prevention
CISA	Clinical Immunization Safety Assessment
CISA	Cybersecurity and Infrastructure Security Agency
CKD	Chronic Kidney Disease
CLD	Chronic Liver Disease
CLL	Chronic Lymphocytic Leukemia
CMS	Center for Medicare and Medicaid Services
COI	Conflict of Interest
COP	Cryptogenic Organizing Pneumonia
COPD	Chronic Obstructive Pulmonary Disease
COU	Clinical Operations Unit
COVID-19	Coronavirus Disease 2019
CoVPN	COVID-19 Prevention Network
CSTE	Council of State and Territorial Epidemiologists
DART	Developmental and Reproductive Toxicology Study
DBP	Diastolic Blood Pressure
DNA	Deoxyribonucleic Acid
DoD	Department of Defense
DSMB	Data Safety Monitoring Board
DSPC	1,2-distearoyl-sn-glycero-3-phosphocholine
DSTDP	Division of STD Prevention
DVA	Department of Veterans Affairs

DVD	Division of Viral Diseases
ED	Emergency Department
EHR	Electronic Health Record
EIS	Epidemic Intelligence Service
ELISA	Enzyme-Linked Immunosorbent Assay
EMA	European Medicines Agency
EMR	Electronic Medical Record
EtR	Evidence to Recommendation
EU	European Union
EUA	Emergency Use Authorization
FDA	Food and Drug Administration
FQHC	Federally Qualified Health Center
FRN	Federal Register Notice
FY	Fiscal Year
GBS	Guillain-Barré Syndrome
GMT	Geometric Mean Titers
GRADE	Grading of Recommendation Assessment, Development and Evaluation
HCP	Health Care Personnel / Providers
HCW	Health Care Workers
HHS	(Department of) Health and Human Services
HIV	Human Immunodeficiency Virus
HR	Heart Rate
HRSA	Health Resources and Services Administration
IDCRC	Infectious Disease Clinical Research Consortium
IDSA	Infectious Disease Society of America
IHS	Indian Health Service
IIS	Immunization Information Systems
IM	Intramuscular
ISO	Immunization Safety Office
ISTM	International Society for Travel Medicine
LTCF	Long-Term Care Facilities
MAAE	Medically-Attended Adverse Event
MedDRA	Medical Dictionary for Regulatory Activities
mITT	Modified Intention to Treat
MMWR	*Morbidity and Mortality Weekly Report*
mRNA	Messenger Ribonucleic Acid
MIS-C	Multisystem Inflammatory Syndrome in Children
NACCHO	National Association of County and City Health Officials
NACI	National Advisory Committee on Immunization Canada
NAPNAP	National Association of Pediatric Nurse Practitioners
NAS	National Academy of Sciences
NASEM or the National Academies	National Academies of Sciences, Engineering, and Medicine
NCEZID	National Center for Emerging and Zoonotic Infectious Diseases
NCHHSTP	National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention
NCHS	National Center of Health Statistics
NCIRD	National Center for Immunization and Respiratory Diseases
NFID	National Foundation for Infectious Diseases

NHANES	National Health and Nutrition Examination Survey
NHIS	National Health Interview Survey
NHP	Non-Human Primates
NHSN	National Healthcare Safety Network
NIAID	National Institute of Allergy and Infectious Diseases
NIH	National Institutes of Health
NMA	National Medical Association
NPI	Non-Pharmaceutical Intervention
NVPO	National Vaccine Program Office
NVSN	New Vaccine Surveillance Network
NYC	New York City
OID	Office of Infectious Disease
OIDP	Office of Infectious Disease Policy and HIV/AIDS
OWS	Operation Warp Speed
PaO_2/FIO_2	Arterial Oxygen Partial Pressure
PBS	Phosphate-Buffered Saline
PCR	Polymerase Chain Reaction
PEG	Polyethylene Glycol
PEP	Post-Exposure Prophylaxis
PHAC	Public Health Agency Canada
PhRMA®	Pharmaceutical Research and Manufacturers of America®
PI	Principal Investigator
PICO	Population, Intervention, Comparison, Outcomes
PIDS	Pediatric Infectious Disease Society
PMR	Polymyalgia Rheumatica
POD	Point-of-Dispensing
PPE	Personal Protective Equipment
PT	Preferred Terms (MedDRA)
QI	Quality Improvement
RCT	Randomized Controlled Trial
RR	Respiratory Rate
RR	Relative Risk
rRT-PCR	Real-Time Reverse Transcription Polymerase Chain Reaction
RT-PCR	Reverse Transcriptase Polymerase Chain Reaction
SAB	Spontaneous Abortion
SAE	Serious Adverse Event
SAHM	Society for Adolescent Health and Medicine
SARS	Severe Acute Respiratory Syndrome
SARS-CoV-2	Severe Acute Respiratory Syndrome Coronavirus-2
SBP	Systolic Blood Pressure
SHEA	Society for Healthcare Epidemiology of America
SJS	Stevens-Johnson Syndrome
SLU	Saint Louis University
SpO_2	Oxygen Saturation
SVI	Social Vulnerability Index
UK	United Kingdom
US	United States
USG	US Government
USPHS	US Public Health Service

VA	(US Department of) Veteran's Affairs
VAERD	Vaccine-Associated Enhanced Respiratory Disease
VAERS	Vaccine Adverse Event Reporting System
VaST	ACIP COVID-19 Vaccine Safety Technical Subgroup
VE	Vaccine Efficacy
VE	Vaccine Effectiveness
VRBPAC	Vaccines and Related Biological Products Advisory Committee Meeting
VSD	Vaccine Safety Datalink
VTU	Vaccine Treatment Evaluation Unit
WG	Work Group

December 19, 2020: Opening Session

Call To Order, Welcome, Overview, Announcements, & Roll Call/Introductions

José Romero, MD, FAAP
ACIP Chair

Amanda Cohn, MD
Executive Secretary, ACIP / CDC

Dr. Romero called to order the December 19-20, 2020 emergency meeting of the Advisory Committee on Immunization Practices (ACIP), the purpose of which was to discuss and vote on the Moderna Coronavirus Disease 2019 (COVID)-19 vaccine.

Dr. Cohn welcomed everyone and noted that the final agenda and webcast link could be accessed on the ACIP website, and that copies of the slides for this meeting could be accessed at the following URL:

https://www.cdc.gov/vaccines/acip/meetings/slides-2020-12-19-20.html

Additionally, the slides to be presented during this meeting were made available through a ShareFile link for ACIP Voting, Liaison, and *Ex-Officio* members. The live webcast videos will be posted approximately 1 week following the meeting, and the meeting minutes also will be posted to the ACIP website.

In terms of meeting logistics, participants were instructed to raise their hands virtually when Dr. Romero opened the floor for discussion and to disable their video or mute their phone lines to reduce issues with the Zoom connection. Dr. Cohn explained that during the discussion period, the order in which Dr. Romero would take questions would be first from ACIP Voting Members, second from *Ex Officio* and Liaison member representatives, and then from the audience. The plan was to stay on schedule with the meeting agenda as much as possible.

The next regularly scheduled ACIP meeting will be convened on February 24-25, 2021. An emergency meeting will be scheduled and announced if data become available that ACIP needs to consider before that time.

Dr. Cohn explained that there would be an oral public comment session prior to each vote. Given that many more individuals registered to make oral public comments than could be accommodated, selection was made randomly via a lottery. Those individuals who were not selected and any other individuals wishing to make written public comments may submit them through https://www.regulations.gov using Docket Number CDC-2020-0124. Further information on the written public comment process can be found on the ACIP website.

ACIP members agree to forgo participation in certain activities related to vaccines during their tenure on the committee. For certain other interests that potentially enhance a member's expertise, CDC has issued limited conflict of interest (COI) waivers. Members who conduct vaccine clinical trials or serve on data safety monitoring boards (DSMBs) may present to the committee on matters related to those vaccines, but are prohibited from participating in

committee votes. Regarding other vaccines of the concerned company, a member may participate in discussions with the provision that he/she abstains on all votes related to that company. At the beginning of each meeting, ACIP members state any COIs. The first vote is a vaccine product-specific vote for which 3 ACIP members will abstain due to COIs or perceived COIs. The second vote is a general vote on prioritization for which no members will need to abstain.

Dr. Romero conducted a roll call of ACIP members, during which the following COIs were declared:

- ❑ Dr. Robert Atmar is serving as the Co-Director of the Clinical Operations Unit (COU) of the National Institutes of Health (NIH)-funded Infectious Diseases Clinical Research Consortium (IDCRC) that is working within the COVID-19 Prevention Network (CoVPN) to evaluate Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) vaccine candidates in Phase 3 clinical trials. She is the Site Principal Investigator (PI), including those produced by Moderna, AstraZeneca, Janssen, Novavax, and Sanofi.

- ❑ Dr. Sharon Frey is employed by Saint Louis University (SLU), which has a Vaccine Treatment Evaluation Unit (VTU) that is part of the IDCRC. She is currently serving as the Site PI for the Moderna and Janssen Phase III COVID-19 vaccine clinical trials.

- ❑ Dr. Paul Hunter owns a small amount of stock in Pfizer and has received a small grant from Pfizer to conduct a quality improvement (QI) project on pneumococcal vaccines.

A list of Members, *Ex Officio* Members, and Liaison Representatives is included in the appendixes at the end of the full minutes for the December 19-20, 2020 ACIP meeting.

Food and Drug Administration (FDA) Update

Doran Fink, MD, PhD
Deputy Director-Clinical
Division of Vaccines and Related Products Applications
Center for Biologics Evaluation and Research
Food and Drug Administration

Dr. Fink provided an overview of the Vaccines and Related Biological Products Advisory Committee (VRBPAC) meeting on December 17, 2020 and the Emergency Use Authorization (EUA) issued on December 18, 2020 for the Moderna COVID-19 vaccine. Like the Pfizer COVID-19 vaccine for which an EUA was issued the previous week, the Moderna product is an messenger ribonucleic acid (mRNA) and lipid particle vaccine. The Moderna vaccine is authorized for emergency use for active immunization for prevention of COVID-19 caused by the SARS-CoV-2 virus in individuals 18 years of age and older. This EUA followed a comprehensive FDA review of data submitted in support of the request, as well as a meeting of the VRBPAC. The outcome of the VRBPAC meeting was a nearly unanimous vote in favor of the benefits of the vaccine outweighing its risks for EUA, with 20 members voting in favor and 1 member abstaining. FDA continues to work very closely with its partners at CDC and the United Kingdom (UK) to investigate reports of suspected allergic reactions following use of the Pfizer vaccine in ongoing vaccination campaigns. Some of these reactions have been confirmed to be serious or anaphylactic reactions. FDA is working closely with the manufacturer to identify what the cause of these reactions might be. FDA will update the public in a timely manner if anything is found that would cause them to change the conditions of the EUA or if any additional

information needs to be provided to the public about the benefits and risks of the vaccine. Dr. Fink stressed that at this time, the totality of the data continues to support vaccination under the Pfizer EUA without any new restrictions. FDA thanks the public for remaining vigilant and reporting reactions to the vaccine using the established mechanisms.

Coronavirus Disease 2019 (COVID-19) Vaccines: Moderna mRNA Vaccine

Introduction

Beth Bell, MD, MPH
ACIP, COVID-19 Vaccine WG Chair
Clinical Professor, Department of Global Health
School of Public Health, University of Washington

Dr. Bell introduced the session indicating that the agenda for the December 19-20, 2020 meeting would include presentations on the following topics:

December 19, 2020
- ❑ mRNA-1273 Development Program
- ❑ Grading of Recommendation Assessment, Development and Evaluation (GRADE): Moderna COVID-19 Vaccine
- ❑ Evidence to Recommendation Framework (EtR): Moderna COVID-19 Vaccine
- ❑ Update on COVID-19 Vaccines and Anaphylaxis
- ❑ Clinical Considerations for use of mRNA COVID-19 vaccines
- ❑ Public Comment Prior to the Vote
- ❑ Vote on the Moderna COVID-19 Vaccine

December 20, 2020
- ❑ Allocation of Initial Supplies of COVID-19 Vaccine: Phases 1b and 1c
- ❑ Public Comment Prior to the Vote
- ❑ Vote on Allocation of Initial Supplies of COVID-19 Vaccine: Phases 1b and 1c

Overview of Moderna's COVID-19 Vaccine mRNA-1273

Jacqueline M. Miller, MD, FAAP
Senior Vice President
Infectious Disease Development
Moderna, Inc.

Dr. Miller said that on behalf of Moderna, it gave her great pleasure to present an overview of the Moderna COVID-19 vaccine and clinical development program. In terms of the mRNA platform, the Moderna vaccine is a single sequence of mRNA that encodes for the spike protein of SARS-CoV-2. The mRNA is synthesized from a deoxyribonucleic acid (DNA) template. The nucleotides present in mRNA are then enzymatically buffered with FDA-approved buffers. The mRNA is then protected from degradation by the body's natural lytic enzymes with a lipid nanoparticle (LNP). The LNP serves to both protect the mRNA and also target it via the lymphatic of the draining lymph nodes for antigen-presenting cells. Both dendritic cells and subcapsular macrophages take up the mRNA for further processing and expression. The final

drug product is a lipid product that will be presented in a 10-dose vial. The LNP targets the mRNA for delivery to the draining lymph nodes and once at the antigen-presenting cell, the mRNA is released into the cell cytosol where it is taken up by the ribosomes whose job it is to translate mRNA into protein. The spike protein amino acid is then synthesized and naturally assembles into its trimeric form and is expressed on the cell surface as through normal viral infection.

To give a brief overview of the pre-clinical and early clinical data, Moderna conducted a robust non-clinical program in 3 different animal models in order to demonstrate that the vaccine was immunogenic and that there were no safety concerns before taking it into human clinical development. The vaccine drives a robust SARS-CoV-2 specific antibody and Th1-directed CD4+ and CD8+ T-cell response in mice, Golden Syrian hamsters, and non-human primates (NHP). The NHPs and mice also were challenged with SARS-CoV-2 after vaccination. Even in those with lower doses than those administered to humans, challenge did not lead to vaccine-associated enhanced respiratory disease (VAERD). In addition, Moderna recently completed its Developmental and Reproductive Toxicology Study (DART) and has submitted it to the FDA. No safety concerns were identified.

Overall, Moderna has conducted a full development program, including a Phase 1, Phase 2, and Phase 3 study. The starts of those studies was staggered in order to enable the acquisition of safety data from one phase before moving on to initiate clinical trials in the next phase. A Phase 1 dose ranging study, Phase 2 safety and immunogenicity study, and Phase 3 safety and efficacy study have been conducted. In terms of the early phase studies, neutralizing antibody titers were observed in all participants following the second dose. The geometric mean titers (GMTs) across age strata are numerically higher than in a pool of convalescent sera. Neutralizing antibodies have persisted for at least 3 months after the second dose and still remain numerically higher than the panel of convalescent sera. A strong Th1 dominant, CD4+ T-cell response also has been observed. The results from the early phase studies were consistent with results from pre-clinical findings.

In Study 301, the Phase 3 safety and efficacy trial, 30,420 subjects were randomized 1:1 to receive either 2 doses of 100 µg of mRNA-1273 or a saline placebo. Over 15,000 subjects were randomized to each arm and participants received 2 doses separated by 29 days. Active COVID surveillance was performed throughout the course of the study. Doses were given at Day 1 and Day 29. Subjects received daily phone calls to solicit safety information each week for one month after vaccination. They reported their solicited symptoms on an eDiary card and serious adverse events (SAEs) and medically-attended adverse events (MAAEs) have been solicited throughout the study. Once subjects exited the vaccination phase, they continued to provide data through weekly eDiary prompts for COVID-19 symptoms and monthly safety calls to make sure safety information was captured. For primary disease, subjects had to have 2 systemic symptoms including fever, chills, myalgia, headache, sore throat, new olfactory and taste disorder(s) or at least 1 respiratory symptom, including cough, shortness of breath / difficulty breathing, clinical or radiographical evidence of pneumonia and a positive nasopharyngeal swab for SARS-CoV-2 virus. These cases have been adjudicated by an endpoint adjudication committee and they had to occur 2 weeks after the second dose.

To be considered in the secondary efficacy endpoint against severe COVID-19 disease, participants had to meet all of the characteristics of the primary case definition and at least one of the 4 following conditional criteria:

- ❑ Clinical signs indicative of severe systemic illness, respiratory rate (RR) ≥ 30 per minute, heart rate (HR) ≥ 125 BPM, oxygen saturation (SpO_2) ≤ 93% on room air at sea level or arterial oxygen partial pressure (PaO_2/FIO_2) < 300 mm Hg
- ❑ Respiratory failure or acute respiratory distress syndrome (ARDS), evidence of shock: systolic blood pressure (SBP) < 90 mm Hg, diastolic blood pressure (DBP) < 60 mm Hg or requiring vasopressors
- ❑ Significant acute renal, hepatic or neurologic dysfunction
- ❑ Admission to ICU or death

It was very important to Moderna from the start to include subjects at highest risk for severe complications of COVID-19, so they stratified enrollment to include at least 25% and up to 50% of participants who were either ≥ 65 years of age or between 18 to < 65 with at least one medical condition putting them at increased risk for severe COVID-19. Across the study, 42% of subjects were enrolled who fell into the high risk category. Moderna also wanted to enroll an inclusive clinical trial knowing that communities of color have been disproportionately impacted by COVID-19. Of the subjects enrolled, approximately 10% are African American, 5% are Asian American, and 20% are self-identified as Hispanic.

In terms of the comorbid conditions, between the 18 to < 65 and ≥ 65 years of age groups, 23% reported at least 1 pre-existing medical condition. Of the conditions specifically captured, 9% had diabetes, 7% had severe obesity defined by body mass index (BMI) of >40 kg/m^2, 5% had chronic lung disease, 5% had significant cardiac disease, less than 1% had liver disease, and less than 1% had human immunodeficiency virus (HIV). Individuals also were specifically sought out who were at increased risk of acquiring COVID-19 due to their occupation or living circumstances. Of the participants enrolled in the trial, 25% were healthcare workers and the essential workers that are part of Phase 1b of CDC's plan comprised an additional 25% of the trial.

The primary efficacy analysis defined per protocol had included at least 151 cases. Overall, the primary efficacy analysis was performed on 196 cases that met the case definition for the primary endpoint. There were 11 cases in the mRNA-1273 group and 185 cases in the placebo group for an overall vaccine efficacy of 94.1%. The lower limit of the 95% confidence interval was 89.3%, which exceeded the pre-specified statistical criterion of 30%. The p-value was highly significant at < 0.0001 and the impact of this efficacy can be seen in the difference in incidence rates, which were 3.3/1000 person years in the vaccine group as compared to 56.5/1000 person years in the placebo group. Various subgroup analyses also were performed on demographic characteristics to evaluate the consistency of this efficacy estimate. Across age demographics as well as gender and race, efficacy was consistent with the primary efficacy endpoint.

Vaccine efficacy against severe disease was analyzed as a secondary endpoint. There were 30 cases reported at the time of the analysis, all of which had occurred in the placebo group for an efficacy estimate of 100%. The occurrence of symptomatic COVID-19 disease after the first dose also was analyzed as a secondary endpoint. The point estimate of efficacy for cases which occurred 14 days after Dose 1 was 95.1%. This indicates a convergence of a cumulative distribution curve at approximately 10 days after the first dose.

Some additional analyses were performed to further evaluate the accumulation of cases after the first dose. In terms of the modified intention-to-treat (mITT) population and the accumulation of cases based on the CDC case definition, which is less restrictive than the primary endpoint and requires a single reported symptom on an expanded list of symptoms, there were overall 62 cases in the placebo group as compared to 8 cases in the mRNA-1273 group. The majority of cases were reported in the first 2 weeks after administration of Dose 1 I the 1273 group. These data suggest that protection may begin prior to Dose 2, although both doses should be given for full protection.

There also is a pre-specified secondary efficacy endpoint for asymptomatic disease. That efficacy endpoint relies on seroconversion to anti-nucleic acid antibody. At the time of Moderna's EUA submission, the serology data were not yet available for evaluation. Pre-vaccination nasal swabs against the SARS-CoV-2 virus were obtained and therefore, Moderna summarized the percentage of subjects who had positive nasal swabs prior to administration of Dose 1 and Dose 2. These data were used to look further into the question of asymptomatic infection. There were 38 positive swabs in the placebo group as compared to 14 positive swabs in the mRNA-1273 group, representing nearly a two-thirds reduction in positive swabs. Again, this suggests that there may be efficacy against asymptomatic infections. Further data will follow.

Transitioning to the safety analysis performed after a median duration of 9 weeks of safety follow-up, subjects were specifically queried about solicited adverse reactions on an electronic diary card. This information was captured in all 30,000 subjects enrolled. The reactions captured included injection site pain, erythema, swelling, and swelling or tenderness in the draining lymph nodes adjacent to the vaccinated arm. Overall, the most commonly reported symptom was injection site pain. This was more frequently reported in subjects 18 to 65 years of age as compared to those over 65 years of age. There was more frequent reporting in the mRNA-1273 group of injection site reactions after Dose 2 as compared to after Dose 1. The majority of symptoms were still mild to moderate in severity and had a median duration of 2 to 3 days.

After Dose 1 for the mRNA-1273 and placebo groups stratified by age, the older adults tended to report systemic adverse reactions less frequently than younger adults. Interestingly in the placebo group, close to 30% of subjects reported fatigue and headache in the group 18 to 55 years of age. Again, the majority of symptoms were mild to moderate in severity. There was an increase in the reported rates and severity of local solicited symptoms after the second dose. Again, there was more frequent reporting in the younger versus the older age cohorts. Over 96% of subjects were compliant with the 2-dose vaccination schedule. As with the local solicited symptoms, the general solicited symptoms had a median duration of 3 days or less.

In terms of solicited local reactions by patients who were found to be baseline positive for SARS-CoV-2, the subjects were excluded if they reported a known history of COVID-19 disease. Baseline screening was performed for serology against anti-nucleocapsid antibody indicating past infection and nasopharyngeal swabs for SARS-CoV-2 infection to indicate current infection. Those subjects were enrolled into the trial. Moderna wondered whether subjects would report an increased rate of adverse reaction if they had previously been exposed to the spike protein, which was not observed to the be the case.

Unsolicited adverse events were captured by subjects through a memory aid and interviews by site staff through the weekly phone calls at a month after vaccination and then monthly thereafter. Overall, the rates of AEs were comparable between the treatment groups, including MAAEs and SAEs. The excess of infections and infestations in the placebo group was primarily

due to COVID-19. The patterns were very similar for the rates of SAEs that were reported throughout the study. Again, rates were comparable between the two groups. Deaths were reported throughout the study. The only cause of death (COD) that was reported in more than one subject per group was myocardial infarction. The review of the CODs did not lead to any safety concerns. All of the deaths have been assessed as not related by the investigators.

Because of the recent discussion of anaphylaxis following vaccination with another mRNA vaccine, Dr. Miller described the cases observed in Study 301. Importantly, participants were not excluded if they had a general history of anaphylaxis, urticaria, or other significant hypersensitivity. Subjects were excluded if they had a known allergy or anaphylactic reaction to a component of the vaccine. At the time of the EUA submission, 2 anaphylactic reactions had been reported as unsolicited AEs. The first was in the placebo and occurred 10 days after the first dose in a subject who received radiocontrast dye, while the second was in the mRNA-1273 group and occurred 63 days after the second dose in a subject who reported a history of allergy to shellfish. There was another anaphylaxis the previous day in the placebo group, which is still under investigation. They also wanted to look at the reactions that could be classified as anaphylaxis within the 48 hours after vaccination. This was done through a Standardized MedDRA Query (SMQ). In the mRNA-1273 group, 4 cases were identified. None of them met the Brighton Collaboration definition for anaphylaxis. All of them were Grade 1 or 2 in severity, none of them was serious, and all recovered.

In terms of the safety surveillance that will continue as Moderna transitions to the continuation of the Phase 3 study and for individuals who will be vaccinated with mRNA-1273 moving forward, they recognize that vaccination of pediatric patients will be important. Moderna has an ongoing study in adolescents 12 to 18 years of age, which began earlier in December. Moderna is in discussion with the National Institutes of Health (NIH) and the IDCRD for a study design for a pediatric clinical trial in younger children ranging from 6 months of age to 12 years of age. Moderna will soon initiate a collaboration with the National Cancer Institute (NCI) to evaluate the safety and immunogenicity of the vaccine in patients with cancer. Moderna will also be actively participating in the post-authorization surveillance that will be conducted by the FDA and CDC. In addition, Moderna will be launching its own post-authorization safety study in a large insurance database to investigate reported AEs after vaccination. They are developing a global pregnancy registry. Now that the DART study results are available and there is a positive efficacy and a reassuring safety signal in non-pregnant adults, Moderna is ready to consider conducting clinical trials in pregnant women. Finally, Moderna will be conducting a post-authorization effectiveness study with Kaiser Southern California to look at the effectiveness of mRNA-1273 in the real-world use setting. Moderna also will continue to collaborate with NIH, FDA, CDC, and other government agencies in order to further investigate the efficacy and safety of the vaccine.

With regard to vaccine storage and handling, the mRNA-1273 vaccine is shipped at -20°C (-40°C to -15°C). The minimal shipment order is 100 doses and the vaccine is packaged in a 10-dose vial, with 10 vials to a carton. The vaccine can be stored at 2°C to 8°C in the refrigerator for 30 days. Once thawed for use, it can be held at room temperature for up to 12 hours. Once the multiple dose vial has been punctured, it needs to be used within 6 hours because the vaccine contains no preservatives. It is a liquid formulation, so no further dilution is required.

In summary, mRNA-1273 demonstrated 94.1% efficacy in the primary analysis based on 196 cases. The primary efficacy hypothesis was met with a lower limit of the 95% CI of 89.3%, exceeding pre-specified 30% margin. The vaccine was observed to reduce the incidence of severe COVID-19 disease, with 30 cases observed in the placebo group at the time of the

analyses. Other secondary, sensitivity, and subgroup analyses support the primary efficacy analysis results. An acceptable tolerability profile has been observed with >96% of subjects having received a second dose. More solicited AEs were reported after the second dose, but the majority of reported solicited AEs were mild-to-moderate in severity and short-lived in duration. The safety profile is overall clinically acceptable and therefore, mRNA-1273 has the potential to address the SARS-CoV-2 pandemic and has been authorized for emergency use.

Discussion Points

Referring to slide 30, Dr. Ault requested additional information about whether there were any Grade 4 reactions.

Dr. Miller indicated that there were a few Grade 4 reactions, but they occurred at a low percentage making it difficult to see on the slide. The Grade 4 reactions were only on the solicited general symptoms and were in the areas of fever, arthralgia, myalgia, and headache.

Dr. Frey inquired as to whether there were any autoimmune cases, unusual pneumonias, or other presentations discussed by safety monitors or safety committees in relation to a possible hyper-response or something that would be suggestive of a Th2-biased response in the first 28 days after vaccination. In addition, she wondered whether there were any unusual rashes or other skin conditions seen post-vaccination.

Dr. Miller indicated that the investigators looked at how many patients reported autoimmune conditions by medical history when entering the trial. There were approximately 1200 subjects in each group. Autoimmune conditions overall were assessed and no imbalances were seen between the groups. For example, there was one case of rheumatoid arthritis that occurred in the mRNA-1273 group and one case of polymyalgia rheumatica (PMR) occurred in the placebo group. One SAE was assessed by the investigator as potentially vaccine-related regarding a cryptogenic organizing pneumonia (COP). However, that subject had a number of samples for SARS-CoV-2 and none were ever identified as positive because of the COP. Therefore, the cause of the COP remains unknown. As with the local injection site reactions, there was an excess of cases of injection site rash and urticaria reported in the mRNA-1273 group. A small subset of subjects reported some delayed injection site reaction beyond the 8-day reporting period. Approximately 90 of these occurred after Dose 1 and fewer after Dose 2. Only 2 subjects had reactions after both Dose 1 and Dose 2. This topic was discussed by the DSMB and also was referred to a dermatopathology as these rashes tended to be erythematous with essential rigidity. The assessment of these rashes was that they were likely to be due to a localized immune reaction in the dermis and not a systemic reaction such as Stevens-Johnson Syndrome (SJS). The subjects were well during the events, were able to engage in normal activities, and the events have resolved.

Dr. Poehling asked how many people who were enrolled became pregnant during the trial and what the outcomes of those pregnancies have been to date. In addition, she inquired as to the experience with Bell's Palsy and when it occurred after vaccine or placebo.

Dr. Miller indicated that 13 pregnancies have been reported throughout the trial. Because the results of the DART study were not yet in, pregnancy tests were done upon enrollment and prior to each vaccination. Women were asked to continue to use contraception and refrain from becoming pregnant until 3 months after their second vaccination. Of those 13 pregnancies, 7 have occurred in the placebo group and 6 have occurred in the mRNA-1273 group. There are outcomes for 3 of the pregnancies. One of the placebo subjects has been lost to follow-up, 1 of

the placebo subjects underwent spontaneous abortion, and a third placebo subject underwent elective termination. The remaining pregnancies continue and will be followed for full outcome. There have been 4 cases of Bell's Palsy reported in the clinical trial thus far. Of these, 3 occurred in the mRNA-1273 group and 1 occurred in the placebo group. All cases occurred between 16 and 32 days after vaccination. The cases are all resolved or resolving at this point.

Dr. Romero asked what the constituents are of the excipients and of the LNP of the Moderna vaccine and if there are any similarities between the Moderna and Pfizer vaccines.

Dr. Moore indicated that the excipients in the Moderna product are sucrose and 2 pharmaceutical buffers, tris and acetate. Moderna's buffer system is different from Pfizer's in that Pfizer uses phosphate-buffered saline (PBS). Moderna's LNPs contain 4 constituents. One is an RNA-binding lipid that is a proprietary lipid developed by Moderna that breaks down rapidly in the body; one is 1,2-distearoyl-sn-glycero-3-phosphocholine (DSPC), which is a natural component of human lung surfactant; one is cholesterol; and one is polyethylene glycol (PEG) lipid to keep the LNPs from fusing in the vial. That is all that is in the vaccine in addition to the RNA. The difference in Moderna's product from Pfizer's is that Moderna uses different proprietary RNA-binding lipids.

Dr. Bernstein asked what mitigation recommendations were made to study participants such as wearing masks. He also noted that race and ethnicity on slide 21 looked encouraging in terms of communities of color benefiting from the vaccine. He was surprised that there were twice as many cases in the non-Hispanic whites than in the communities of color given that the epidemiology suggests that communities of color are more likely to get COVID-19. Relating to the potential allergic manifestations, Dr. Bernstein noticed in the Phase I trial there were 3 withdrawals for hives, a maculopapular rash, and a sore throat and Dr. Miller mentioned dermal hypersensitivity at the injection site that also included pruritus. He also noticed that under the SAEs reported by at least 2 subjects there was swelling of the face.

Dr. Miller indicated that the study investigators had a discussion during the investigator meeting pertaining to measures such as mask wearing. The reason people at highest risk for disease were enrolled was because they know that they need to be able to capture cases in order to assess vaccine efficacy. The subjects in the trial were at increased risk based on their geography, occupation, medical comorbidities, or age. They were encouraged to keep themselves safe. Regarding slide 21 and race and ethnicity, the study was designed to assess COVID-19 in the entire population. The subgroup analyses were done because it is critically important to make sure that efficacy is consistent. Nonetheless, the sample sizes become smaller when they split the groups. They expect that as they continue surveillance, they will start to see increased rates in all of the groups, or at least increased reported numbers of cases. What they can say from this subgroup analysis for which the study was not sufficiently powered is that the observed efficacy in the various groups was highly consistent with the primary efficacy analysis. In terms of the facial swelling, there were 3 cases that occurred in women who had previously had injections of hyaluronic acid for a plastic surgery procedure. Facial swelling was noted after vaccination, which resolved after treatment with Benadryl® and other supportive therapy.

Dr. Atmar asked whether any generalized skin reactions were observed other than the facial swelling and the localized reactions, how many participants had a history of anaphylaxis, how long protection after vaccination may last, and what Moderna's plans are for examining duration of protection and the need for a booster beyond the 2 to 3 months of information they have post-completion of the vaccine series.

Dr. Miller indicated that there were some reports of rash throughout the study in the unsolicited AEs. The rashes that were in balance between the vaccine and placebo groups were the injection site rashes that were noted in the week after vaccination or soon after vaccination. A standardized measure query was run on subjects 48 hours after vaccination and overall, no large imbalances were observed between the groups. In terms of the medical histories for anaphylaxis, in the overall category of anaphylaxis, allergic events, and autoimmune events, the subjects were well-balanced in their medical histories. For the chronic lung disease the investigators were specifically seeking, moderate to severe asthma was specifically highlighted in the protocol to be of interest. No imbalance was observed between the groups in those categories from medical history. In terms of how long protection lasts and future plans, Moderna anticipates in the next few weeks to have 6-month antibody persistence data from the Phase 1 study on which they collaborated with NIH. In both the Phase 2 and Phase 3 studies, there are planned antibody persistent time points at 3 months, 6 months, and 12 months after vaccination. That follow-up will continue for 2 years after vaccination in the Phase 3 study. They are currently discussing the potential for conducting 6-month boosters in the Phase 2 study, the rationale for which is to be able to vaccinate a naïve cohort and then assess the cohort that received the 100µg dose to determine whether they are able to boost to the vaccine. They also intend to examine antibody kinetics at approximately 1 week after vaccination in order to ensure that there is an immune memory response. Moderna should be able to provide more information about persistence and boosting in the coming months.

Dr. Sanchez asked whether Moderna is assessing women who are lactating/breastfeeding in terms of any effects on the neonate and infant pertaining to protection or abnormalities, how many individuals who experienced skin reactions or hypersensitivity required treatment within 15 to 30 minutes with Benadryl® or epinephrine, and whether individuals who were enrolled who had a past history of being seropositive developed another infection. One of the questions that keeps arising regards individuals who have had COVID-19 infection previously, the subsequent risk of having another possible significant infection, and the vaccination by groups being very important information.

Dr. Miller said that Moderna has heard very clearly from its stakeholders that the safety and immunogenicity of the vaccine in pregnant women is a topic of clear interest. Now that they have observed a positive efficacy signal and a reassuring safety profile in non-pregnant adults and the DART animal study has been completed, Moderna is ready to begin considering the clinical study design in pregnant women and their children. There are many important considerations including breastmilk and follow-up in the infants. From the DART study, the investigators observed a robust immune response in the mother rats. There also was transplacental transfer of antibodies to the pups. Therefore, Moderna would definitely be interested in looking at the antibody transfer to young infants. In the report that Dr. Miller read, no malformations or abnormalities were observed in the dams or pups. While she could not speak to the placenta, it was not highlighted in the findings of the report. Regarding the reactions that occurred within the first 30 minutes after vaccination, that was the population on which the standardized Medical Dictionary for Regulatory Activities (MedDRA) query was conducted for anaphylaxis. They found that symptoms were sometimes reported with other allergic reactions. All 4 reactions were non-serious Grade 1 to 2 in severity and they did receive Benadryl® or prednisone in some cases and all resolved. No epinephrine was administered and there were no hospitalizations. In terms of the injection site reactions, some occurred within the 7-day duration period and some outside of it. One individual developed a COVID-19 infection after participating in the trial who was randomized to the mRNA-1273 group but received placebo and unfortunately developed a second infection while on trial. An overall efficacy

analysis was performed and while it was on a relatively small proportion of the group, it was not inconsistent with the overall efficacy analysis. An analysis was done on the full analysis set that considered everybody at the time of randomization, did not consider whether they got their vaccination according to their assigned treatment group, and included the entire population not just the 2% who were seropositive. The overall efficacy was 93.6%.

Dr. Talbot inquired about the age range of the Bell's Palsy cases, noting that it is common for adults to have Bell's Palsy but that it would be very helpful to determine whether the age of Bell's Palsy was shifted lower in the trial.

Dr. Miller indicated that the cases of Bell's Palsy occurred in subjects 30, 52, 67, and 72 years of age.

Dr. Bernstein recalled hearing that pediatric studies would be going down to 6 months of age, and inquired as to when data would be available on individuals 12 to 17 years of age. He emphasized the importance of Moderna assessing this as the Pfizer product currently goes down to 16 years of age.

Dr. Miller indicated that they need to have discussions about how much data would be sufficient to evaluate the potential to lower the age indications of the vaccine, understanding that vaccinating children will be very important for getting them back to school and protecting educators. Given that Moderna has not yet had the opportunity to speak to the FDA about this, she said she would not be able to comment further at this time.

Ms. Bahta requested information about any impact from deviation from the 28 days between the 2 doses or delayed doses, and whether there are any details about the rates of AEs by race and ethnicity.

Dr. Miller indicated that protocol allowed subjects to come in between Days 26 to Day 36. Likely due to disruptions from COVID-19, they found a relatively significant number of individuals who came in as early as 1 week prior or 3 weeks after Dose 1 and as much as 2 weeks after Dose 2 or 6 weeks out from the final dose. That 3 week span formed the basis of the per protocol analysis. They have not analyzed specifically by when cases may have occurred based on when people may have been vaccinated. Referring to Slide 56, she indicated that there are some details of rates of AEs by race and ethnicity. Overall in this subgroup analysis, the estimates of efficacy were consistent with the primary analysis though the sample size is small. They did not observe that one racial group had a particularly higher reported incidence of AEs than other racial groups. The pattern of reporting was consistent as well.

Dr. Goldman (ACP) reported that with the Pfizer vaccine, they are seeing that there is some overfill of the multi-dose vial, which potentially results in the ability to get 1 to 2 more doses out of the vial. He wondered whether this would be the same with the Moderna vials and what the recommendations would be if there is overfill and potential extra doses in the vial in terms of whether the extra could be used or should be wasted.

Dr. Miller responded that with every liquid vaccine, there is always overfill because there is always extra material in the vial in the stopper and the needle of the syringe.

Dr. Altaris added that each container of injectable product is filled with a volume that slightly exceeds the content indicated in the labeling. The Moderna product labeling states 10 doses and the excess volume is really meant to be sufficient to permit withdrawal and administration of

the labeled volume. Several studies were conducted to define the most appropriate fill volume for the Moderna product to allow the 10 doses to be withdrawn. They do not anticipate that most users will be able to withdraw more than 10 doses using typical syringes and needles. Occasionally, there might be some very skilled individuals who might be able to withdraw an 11th dose if they withdraw doses very carefully. However, this is not anticipated to be common given the fill volume that was optimized. In the EUA fact sheet, there is no claim of how many doses an individual can actually remove. FDA has advised previously that all doses could be utilized.

Dr. Cohn indicated that this would be a further discussion on the second day of the ACIP meeting as well.

Dr. Fryhofer (AMA) observed that VE on Slide 21 of 94.1% overall is fabulous but VE for patients ≥ 65 years of age with or without comorbidities was 86.4% and for those 65 to < 70 years of age with or without comorbidities was 82.4%. She asked about the timing between patients receiving dermal fillers and vaccine injections, inquired about the theoretical reason that patients previously having COVID-19 reacting less to the vaccine, and wondered whether the mRNA crossed the placenta in the DART study.

Dr. Miller said she was not aware that the DART study specifically looked for the mRNA to cross the placenta. The reason for that is that mRNA is naturally broken down. The data investigating the platform suggests that after 2 days, the mRNA is completely degraded.

Dr. Martin indicated that 4 AEs were reported in mRNA-1273 participants who received filler injections between 13 days and more than 6 months prior to vaccine, with 1 dermal filler of unknown duration before vaccination. All resolved except 1 Grade 1 AE that was resolving last they heard.

Dr. Rockwell (AAFP) asked whether any of the study participants had comorbidities with cancer and treatment for cancer such as chemotherapy and if so, whether Moderna has any data on that.

Dr. Miller indicated that subjects in this trial were excluded if they had a known cause of immunosuppression. That said, a few subjects were enrolled who had baseline stable conditions such as chronic lymphocytic leukemia (CLL). To her knowledge, none were on active chemotherapy. The reason for engaging in the NCI collaborative study is to assess the vaccine in those subjects.

Ms. Stinchfield (NAPNAP) asked what the recommendation would be for repeating that injection if there is a mishap at the time of injection and some of the product is lost and if so, whether it should be at the same site or at a different site.

Dr. Miller indicated that the vaccine has been studied in a 2-dose schedule. Other than in 15 subjects in the NIH study, they have not studied doses higher than 100µg. In the absence of those data, she suggested deferring that question to CDC and perhaps discussing later in the afternoon.

In terms of asymptomatic carriage, Dr. Sanchez asked whether the 14 subjects who were positive before Dose 2 from routine screening were associated with any decreased antibody responses and if this had been correlated with other markers that could help determine which individuals actually may be carriers.

Dr. Miller said that they have not yet received and fully analyzed their immunogenicity data, but that certainly would be an interesting additional analysis for Moderna to conduct.

Dr. Poehling requested additional information about the number of cases of appendicitis in the vaccine and placebo groups, when they occurred, and whether any differences were observed.

Dr. Miller indicated that there were 2 cases of appendicitis reported as an SAE in the vaccine group and 3 cases in the placebo group.

Dr. Whitley-Williams (NMA) pointed out that sometimes rashes may not be that evident on people of darker skin color and she urged Moderna to pay close attention to this symptom as more doses are dispensed. She also applauded them for assessing the occurrence of SAEs and any AEs and requested that any disproportionate occurrence of any AE be brought to light, particularly as it affects people of color. The message is getting out and people of color are increasingly expressing interest in getting the vaccine. One way to stay on the right path is to ensure that monitoring continues for AEs. Obviously, 10% enrollment in the trials is better than 1%. However, the numbers are still small so some events may not be seen until 10,000 to 20,000 people of color are immunized.

Dr. Miller completely agreed that this is a place to start and is a platform upon which they can improve, and said that she was thrilled to hear that people from communities of color are interested in being vaccinated.

Observing that there are reports from public health agencies in the United Kingdom (UK), South Africa, and a Canadian province that a new strain has emerged, Dr. Shah (ASTHO) inquired as to whether there was any sense about, or at least a theoretical approach for, how the mRNA-1273 vaccine's efficacy might be evaluated against the possibility of a new strain and how the vaccine may behave in such situations.

Dr. Miller emphasized that this is a constantly changing pandemic that has kept everyone "on their toes" throughout the entire process. Moderna has been looking into this question and has evaluated the ability of sera to neutralize some of those mutant strains. She invited Dr. Moore to share more details about those experiments.

Dr. Moore added that Moderna is actively looking at all of the mutant strains that are emerging. They have sera from the rodents and NHPs that were immunized in the animal studies that is being tested against the emerging strains. So far, they have found that the animal sera neutralized all of the emergent strains they have tested. They also will be testing for neutralization using the human sera being collected as part of the trial. Deep sequencing will be done for any breakthrough cases in the clinical trial to assess the mutation status of those viruses.

Referring to Slide 25 looking at the asymptomatic infection, Dr. Howell (AIM) asked whether Moderna has cycle thresholds on those individuals and whether there was any difference between the vaccine versus the placebo groups.

Dr. Miller indicated that she did not have the cycle threshold data readily available, but would report that information back to the group later.

GRADE: Moderna COVID-19 Vaccine

Julia Gargano, PhD, MS
Epidemiologist
National Center for Immunization and Respiratory Diseases
Centers for Disease Control and Prevention

Dr. Gargano presented the GRADE evaluation of the Moderna COVID-19 vaccine. The policy question under consideration is, "Should vaccination with Moderna COVID-19 vaccine be recommended for persons 18 years of age and older under an Emergency Use Authorization?" The components of the Population, Intervention, Comparison, Outcomes (PICO) question include a population under consideration of persons aged ≥18 years, an intervention of 2 doses of the Moderna COVID-19 vaccine given intramuscularly (IM) at 28 days apart, a comparison of no COVID-19 vaccine, and the 7 outcomes identified by the WG as the most important for the policy question are listed here:

- ❑ Symptomatic laboratory-confirmed COVID-19
- ❑ Hospitalization due to COVID-19
- ❑ All-cause death
- ❑ SARS-CoV-2 seroconversion to a non-spike protein
- ❑ Asymptomatic SARS-CoV-2 infection
- ❑ Serious adverse events
- ❑ Reactogenicity Grade ≥3

The potential benefits include prevention of symptomatic COVID-19 and hospitalization due to COVID-19, which both were considered critical outcomes; and all-cause death, SARS-CoV-2 seroconversion, and asymptomatic infection is identified as important. The 2 harms identified were SAEs as a critical outcome and reactogenicity Grade 3 or 4 as an important outcome. Of note, in the case of current COVID-19 Phase 3 vaccine trials, hospitalization due to COVID-19 and deaths are less common and the trials may not be designed or powered to evaluate differences between treatment groups. The WG did not necessarily expect to have robust direct evidence for these outcomes at this point, and to some degree could infer that decreases in symptomatic COVID also would translate to decreases in hospitalizations and deaths, as has been observed for other vaccines. For the outcome of asymptomatic infection assessed using serial polymerase chain reaction (PCR) testing, data from one time point were assessed and these were included in the evidence profile as preliminary evidence. Finally, for the outcome of seroconversion, no data are currently available, so this could not be included in the evidence profile Dr. Gargano presented. Data on seroconversion eventually will be available in an ongoing Phase 3 trial.

A systematic review was conducted to identify evidence related to the policy question. Published articles were identified using the databases and search terms listed here to identify relevant published literature: coronavirus, COVID-19, SARS-CoV-2, respiratory (symptom, disease, illness, condition), vaccine, immunization, trial, double blind, single blind, placebo, comparative study, Phase 3, immunogenicity, efficacy, effective, adverse, evidence, and variations on these terms. Additional resources were sought, including obtaining unpublished data from vaccine manufacturers. Briefly, over 2800 records were identified through database searching and records for two studies were obtained directly from the trial sponsor. Ultimately, 4 studies were included in the evidence synthesis. Additional information on the identified studies was included from FDA materials prepared for the VRBPAC.

GRADE evidence type assesses the certainty of the estimates from the available data and are as follows:

- **Type 1 (high certainty):** Very confident that the true effect lies close to that of the estimate of the effect.
- **Type 2 (moderate certainty):** Moderately confident in the effect estimate. The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
- **Type 3 (low certainty):** Confidence in the effect estimate is limited. The true effect may be substantially different from the estimate of the effect.
- **Type 4 (very low certainty):** Very little confidence in the effect estimate. The true effect is likely to be substantially different from the estimate of effect.

It is important to note that the evidence type is not measuring the quality of individual studies, but instead is measuring how much certainty there is in the quantitative estimates of effect across each outcome. The initial evidence type is determined by the study design. A body of evidence from randomized controlled trials (RCTs) starts with an initial evidence type of 1, indicating high certainty. A body of evidence from observational studies starts with an evidence type of 3, indicating low certainty. The evidence type can be downgraded due to risk of bias, inconsistency, indirectness, or imprecision. Other considerations could downgrade or upgrade the evidence type.

To review the evidence for the benefits, for the critical outcome of symptomatic COVID-19, one study provided data. This was the Moderna Phase 3 RCT. Data were obtained directly from the sponsor and from FDA briefing documents. The primary data cutoff date was November 25, 2020, but some analyses were only available from the planned interim analysis conducted using the November 11, 2020 cut-off date. A total of 30,351 adults were randomized 1:1 to receive either the vaccine or a saline placebo. Analyses were performed using different data sets. The full analysis set included all randomized participants who received at least one dose, analyzed according to the group to which they were randomized. The mITT set excluded persons with immunologic or virologic evidence of prior SARS-CoV-2 infection at day 1 before the first dose. The per protocol set included persons from the mITT set who received both planned doses according to schedule and had no major protocol deviations. The sponsor used this per protocol set for primary efficacy analyses.

Using the per protocol population, for all persons aged at least 18 years, there were 11 cases among 14,134 persons in the vaccine arm and 185 cases among 14,073 persons in the placebo arm. This resulted in a VE estimate of 94.1% and a 95% confidence interval of 89.3% to 96.8%. This is the outcome that was used for GRADE. VE also was at least 86% in various subgroups, including those aged 65 and older, 75 and older, and those “at risk” due to presence of a comorbidity including severe obesity. Comparing the primary outcome with some secondary outcomes, efficacy remained high when persons with evidence of prior infection were included and when a broader list of symptoms was used to define COVID-19. In terms of a few post-hoc interim analyses, in the mITT in an analysis that was restricted to persons who received only 1 dose of vaccine or placebo and had no evidence of prior SARS-CoV-2 infection, there were 7 cases reported among 996 persons who received 1 dose of the vaccine and 39 cases among 1079 persons who received one dose of the placebo, for a 1-dose short-term VE estimate of 80.2% and a 95% confidence interval of 55.2% to 92.5%. In the full analysis set, which did not exclude people with evidence of prior infection and included everyone who received at least 1 dose, the efficacy point estimate was 87.9% using all available follow-up post-dose 1. However, it must be recognized that the vast majority received the second dose. Censoring the analysis at

dose 2, the 1-dose efficacy estimate using the full analysis set with 28 days of follow-up was 69.5%.

In terms of the GRADE evidence table for the outcome of symptomatic COVID-19, because the data were from an RCT, the evidence type started at 1. Regarding risk of bias, there was some concern related to blinding. Participants and study staff were blinded to assignments, but they may have inferred receipt of vaccine or placebo based on reactogenicity. This was deemed unlikely to overestimate the efficacy results. Therefore the risk of bias was considered to be "Not Serious" for this and subsequent outcomes. Some concern for indirectness to the outcome was noted due to the short duration of observation in the available body of evidence. The VE observed at a median 2-month follow-up may differ from the efficacy observed with ongoing follow-up. However, in consideration of the strength of association and precision observed for this outcome in particular, it is unlikely that the efficacy estimate for symptomatic COVID-19 would change substantially enough to fall below the FDA-defined efficacy threshold for licensure under an EUA to <50% efficacy. The WG also acknowledged some concern for indirectness to population because of exclusions from the clinical trial. This was judged to be "Not Serious" in part because all available subgroup evaluations were consistently quite high. The relative risk of 0.06 with a 95% confidence interval of 0.03 to 0.11 indicated a strong and precise estimate. There were no other serious concerns affecting the certainty assessment. The level of certainty was assessed as high, or type 1, for this critical outcome.

The second outcome for consideration was hospitalization for COVID-19. The protocol included a definition of severe COVID-19 per FDA guidance of a COVID-19 case with ≥1 of following:

- ❑ Clinical signs at rest indicative of severe systemic illness a
- ❑ Respiratory failure a
- ❑ Evidence of shock a
- ❑ Significant acute renal, hepatic, or neurologic dysfunction
- ❑ Admission to an intensive care unit
- ❑ Death

This did not require hospitalization. Additional data on severe cases, including hospitalizations, was obtained from FDA documents. Of note, one severe case leading to hospitalization in a vaccine recipient was included in the analysis that was adjudicated after the November 25, 2020 data cutoff date. The sponsor indicated that hospitalization due to COVID-19 was not specifically ascertained for all cases, and it is possible that hospitalizations for COVID-19 in cases that did not meet the FDA's definition occurred and were not captured.

In terms of the analyses of both severe COVID-19 using the protocol definition and hospitalization for COVID-19, about two-thirds of persons meeting the severe COVID-19 definition were not hospitalized. For severe COVID-19, there was 1 severe case in the vaccinated group and 30 in the placebo group. The efficacy estimate was 97%, with a 95% confidence interval of 76% to 100%. For hospitalization due to COVID-19, there was 1 case in the vaccine group and 9 in the placebo group. The efficacy estimate was 89%, with a 95% confidence interval of 13% to 99%. This wider confidence interval reflects the smaller number of events, but is still statistically significant. The analysis of hospitalizations due to severe COVID-19 is the one used in GRADE as it aligns with the PICO-specified outcome. Regarding the GRADE evidence table for hospitalization for COVID-19, the initial evidence type of 1 was downgraded 1 point due to serious concern over indirectness of outcome because of use of a subset of cases defined as severe using a set of protocol criteria which may miss some hospitalized cases, and the short duration of follow-up. COVID-19 leading to hospitalization

measured in such a short time frame is an indirect measure. Some hospitalizations may not have occurred yet for some cases included in the analysis, and the WG ideally would like to observe efficacy for preventing over a longer follow-up period. The final certainty estimate for the outcome of hospitalization for COVID-19 is Type 2.

The next outcome of interest was all-cause death, which the sponsor regarded as descriptive only. All-cause death was not an efficacy endpoint in the trial protocol, although death due to COVID-19 was. There were few deaths among trial participants, including 6 among vaccinated persons and 7 among placebo recipients. No person-time analysis of deaths for all-cause death was provided, and the denominators are based on the safety population of persons who received at least one dose. The available data indicates a relative risk of death of 0.86, with a 95% confidence interval of 0.29 to 2.55. Of note, there was 1 death attributed to COVID-19 during the available follow-up and it was in a placebo recipient. Regarding the GRADE evidence table for all-cause death, no serious risk of bias was identified and there was no serious concern of inconsistency. There was serious concern for indirectness due to the short duration of follow-up. Deaths due to COVID-19 may not have had time to occur during the follow-up period. There was very serious concern of imprecision. The relative risk of 0.86 favored vaccination, but the very wide 95% confidence interval did not rule out harms. The certainty estimate was Type 4.

The Phase 3 trial provided some preliminary data regarding the outcome asymptomatic SARS-CoV-2 infection. The WG intended this outcome to be assessed longitudinally through serial PCR testing or other repeated laboratory assessment. As part of the trial protocol, a nasopharyngeal swab was collected for PCR testing for SARS-CoV-2 DNA at each vaccination visit. In the per protocol analysis, these were used along with serology data to exclude persons with evidence of prior SARS-CoV-2 infection from the primary efficacy analyses. The sponsor used data on results of the dose 1 and dose 2 PCR tests, along with symptom data collected between doses 1 and 2, to construct a measure of asymptomatic infection on the day of the second vaccine dose. Using the data this way was not a pre-defined protocol objective.

Regarding the data on the outcome of asymptomatic SARS-CoV-2 infection at dose 2, defined as a PCR-positive nasal swab at dose 2 and no symptoms of COVID-19 during the interval between doses 1 and 2, there were 14 asymptomatic infections in the vaccine group and 38 asymptomatic infections in the placebo group for a relative risk of 0.37 and a 95% confidence interval of 0.20 to 0.68. This provides preliminary evidence that the vaccine may prevent asymptomatic infections after the first dose. While encouraging, there are limitations to this analysis. This is a snapshot of one day, it is not clear from the available data whether persons who tested positive without symptoms might have subsequently developed COVID-19 symptoms, and may have been “pre-symptomatic” rather than truly asymptomatic. Also, this only shows the effect of the first vaccine dose. Regarding the GRADE evidence table for asymptomatic infection, the certainty of the estimate was graded down one point due to serious risk of bias due to selective outcome reporting. Certainty was downgraded a further two points due to very serious concern for indirectness. The relative risk of 0.37 favored vaccination. The certainty estimate was Type 4.

Turning to the data on GRADE for harms, there were 3 studies in addition to the RCT already described that provided data on harms. These include an unpublished Phase 2 RCT and 2 published Phase 1 dose-escalation, open-label studies. First, safety data were included from the Moderna Phase 3 RCT. The safety set included all randomized participants who received at least one dose of vaccine or placebo and contributed any solicited adverse reaction data. The analysis was done according to the intervention actually received. The Phase 2 trial included 200 persons vaccinated with 2 doses of Moderna vaccine and 200 persons who received 2

doses of the placebo. The Phase 1 study by Jackson included data on adults aged 18-55, including 15 who were vaccinated with the relevant dose. Finally, the Phase 1 study by Anderson included data on adults aged >55 years, including 20 who were vaccinated with the relevant dose.

In terms of the raw data on the critical outcome of SAEs, no SAEs were identified from the Phase 1 and Phase 2 trials. In the Phase 3 trial, there were 147 events among the vaccine group and 153 among the placebo group. Of note, the GRADE analysis relied on a pooled analysis of the 2 placebo-controlled studies. Regarding the GRADE evidence table for SAEs, there was a balance of SAEs reported among vaccinated and placebo, with a relative risk of 0.96 and a 95% confidence interval of 0.77 to 1.20. The certainty assessment was reduced 1 point due to serious concern of indirectness of outcome because the body of evidence does not provide certainty that rare SAEs were captured due to the short follow-up and sample size, so the final certainty was Type 2.

Reactogenicity was evaluated using the same 4 studies. Both RCTs used the same events and grading scales shown here:

- Local reactions (pain at injection site, redness, swelling, axillary swelling/tenderness):
  - Grade 3: pain at injection site or axillary swelling/tenderness that prevents daily activity or use of prescription pain reliever; redness > 10 cm; and swelling > 10 cm
  - Grade 4: emergency room visit or hospitalization for severe pain at the injection site or axillary swelling/tenderness, necrosis (redness and swelling categories) or exfoliative dermatitis (redness category only).

- Systemic events (fever, nausea/vomiting, headache, fatigue, chills, muscle pain, joint pain):
  - Grade 3: fever >38.9°C to 40.0°C , vomiting that requires IV hydration; fatigue, headache, chills muscle pain, or joint pain that prevents daily activity.
  - Grade 4: fever >40.0°C, fatigue, headache, muscle pain, joint pain, diarrhea, or vomiting that require an emergency room visit or hospitalization.

The local reactions solicited for the 7 days following vaccination were injection site pain, redness, swelling, and axillary swelling or tenderness. The systemic events solicited were fever, nausea and vomiting, headache, fatigue, chills, muscle pain, and joint pain. Grade 3 or 4 local reactions or systemic events were reported in 5% and 6.7% of vaccinated subjects in the Phase 1 studies. For the Phase 2 study, reactions were reported in 16% of vaccinated and 3% of the placebo group. In the Phase 3 study, Grade 3 or 4 reactions were reported by 21.6% of vaccinated and 4.4% of the placebo group. Again, GRADE was conducted using a pooled analysis of the Phase 2 and 3 studies. The pooled relative risk for any Grade 3 or 4 event was of 4.93 with a 95% confidence interval from 4.55 to 5.34. There was no serious concern for risk of bias, inconsistency, indirectness, or imprecision for this outcome. The final certainty was type 1.

To summarize the WG's current GRADE assessment for the Moderna COVID-19 vaccine. In terms of benefits, the available data indicate that the vaccine prevents symptomatic COVID-19, with an evidence type of 1. The vaccine also prevents COVID-19 resulting in hospitalization. For this outcome, certainty was reduced due to indirectness and the evidence type was 2. For all-cause death, the available evidence slightly favored the intervention, but certainty was reduced for indirectness and imprecision and the evidence type was 4. No data were available to assess seroconversion. The available data was consistent with a lower incidence of asymptomatic SARS-CoV-2 infection in the vaccinated group, but certainty was reduced for risk of bias and

indirectness, and certainty was type 4. In terms of harms, the available data indicate that SAEs were balanced between the vaccine and placebo arms, and 3 SAEs were judged to be related to vaccination among over 15,000 persons vaccinated. Severe reactions were more common in vaccinated persons, and about 22% of vaccine recipients vs. 4% of placebo recipients reported Grade 3 or 4 reactions. The evidence type was type 1, indicating high certainty in the estimate.

To conclude, Dr. Gargano put the GRADE into the context of the policy question, which focuses on an interim recommendation issued under an EUA. Regarding benefits, the Phase 3 trial is ongoing and effect estimates may change with additional follow-up. This raised concern for indirectness of outcome, as ideally the WG would like to observe efficacy over a longer period than 2 months median. They judged that it is unlikely that the efficacy estimate for symptomatic COVID-19 would change substantially enough in the months following vaccination to fall below the FDA-defined efficacy threshold for an EUA, but indirectness remained a serious concern for some other outcomes. Direct evidence of efficacy for hospitalization and deaths is limited at this time due the small number of events that had been observed through the cutoff date. From the efficacy against symptomatic disease, the WG inferred that vaccination also would reduce hospitalizations and deaths. Preliminary data were consistent with an effect the vaccine preventing asymptomatic infections. Regarding harms, Grade 3 reactions were not uncommon in vaccinated persons. SAEs occurred at a similar frequency in vaccine and placebo groups, but only 3 SAEs were associated with vaccination.

EtR Framework: Moderna COVID-19 Vaccine

Sara Oliver MD, MSPH
National Center for Immunization and Respiratory Diseases
Centers for Disease Control and Prevention

Dr. Oliver reminded everyone that the EtR framework provides structure that moves ACIP from evidence to ACIP vaccine recommendations and highlighted updates based on the Moderna COVID-19 vaccine. The policy question being addressed was, “Should vaccination with the Moderna COVID-19 vaccine (2-doses, IM) be recommended for persons 18 years of age and older under an Emergency Use Authorization?” She reviewed the PICO question detailed in the GRADE presentation and shared a table to remind everyone of the EtR domains (Public Health Problem, Benefits and Harms, Values, Acceptability, Feasibility, Resource Use, and Equity) and put each one into the context of the Moderna vaccine and COVID-19 disease.

The public health problem domain addressed the primary question of, “Is COVID-19 disease of public health importance?” Every time the WG has presented these data, the report on overall and daily case count becomes more somber. As of December 17th, there had been nearly 17 million cases with a 7-day moving average of over 215,000 cases a day. As of December 17th, nearly 310,000 COVID-19 deaths reported to CDC with a 7-day moving average of 2,600 deaths per day. The cumulative hospitalization rate between March and December 12th, was 295 per 100,000 population. Among those hospitalized, nearly 1/3 required intensive care and 15% died. The case fatality range is from 0.5 to 1.4%. The WG judgment is that yes, COVID-19 disease is of public health importance.

The benefits and harms domain addressed the primary questions of, “How substantial are the desirable anticipated effects?” “How substantial are the undesirable anticipated effects?” and “Do the desirable effects outweigh the undesirable effects?” The detailed review of the benefits and harms through GRADE were just presented. Dr. Oliver walked through highlights and some additional information. The clinical trial demonstrated high efficacy against the primary endpoint of symptomatic laboratory-confirmed COVID-19 with an efficacy of 94.1%. This was determined to have a high certainty related to the policy question under an EUA. For hospitalizations, 10 events occurred. Of those, 9 were in the placebo group and 1 was in the vaccine group. VE against hospitalizations was estimated at 89%. Given the low numbers and short time of follow-up, there was moderate certainty in this assessment. For all-cause mortality, deaths were uncommon overall, with 6 in the vaccine group and 7 in the placebo group. Given the low numbers, there was uncertainty in the evidence for this outcome.

The ability of the vaccine to prevent asymptomatic SARS-CoV-2 infection has not been assessed to date in a large, prospective trial using serial PCRs. However, the ability of the vaccine to prevent asymptomatic infection could be informed by PCR screening among trial participants returning for a second dose. Four weeks after the first dose of the Moderna COVID-19 vaccine, 14 (0.1%) had a positive PCR without symptoms of COVID compared to 38 (0.3%) of those receiving placebo. Again, this one-time point prevalence does not follow people over time and it is only after the first dose. Protection against asymptomatic infection before or after this time point is unknown. Given all of these caveats, there was low certainty of the evidence. However, it is encouraging and the WG looks forward to additional data points to inform this outcome.

For a further summary of benefits, in addition to the efficacy of 94.1% for the primary endpoint, high efficacy was found for additional analyses across age, sex, race, and ethnicity categories and those with underlying medical conditions. Efficacy among adults 18 to 64 years was 95.6% and among adults ≥65 years of age was 86.4% with wide confidence intervals. To emphasize that these specific estimates are based on small numbers in the trials, there is some variation during the exact population or age cutoff. The efficacy among adults ≥75 years of age was 100%. Most recipients received 2 doses of the Moderna vaccine. That efficacy was estimated at 69.5% between Dose 1 and Dose 2. Thirty cases of severe disease were noted in the placebo group and 1 in the vaccine group yielding a VE estimate of 97%, The numbers of observed COVID-19-associated hospitalizations or deaths were low. However, the trend was consistent with 9 of 10 hospitalizations and the 1 COVID-associated death occurring in a placebo recipients.

To summarize possible harms, SAEs were reported in a similar proportion among recipients of vaccines and placebo. There was moderate certainty in this evidence. The reactogenicity outcome graded was severe or Grade 3 or more reaction. Overall, a Grade 3 or higher reaction was reported by 21.5% of those receiving the vaccine versus 4.4% of the placebo group. This was graded with a high certainty of evidence. Local reactions occurring within 7 days were common. Pain at the injection site was the most common. Systemic reactions within 7 days were common as well with fatigue, headache, and myalgias as the most common. Symptom onset was usually 1 to 2 days post-vaccination and most symptoms resolved in a median of 2 to 3 days.

To highlight the select local reactions by dose in 2 populations of persons aged 18 to 64 years of age and person ≥65 years, the proportion of participants who received the Moderna vaccine who reported any local reaction was 75% or over. However, 15% to 20% of those receiving placebo reported a local reaction as well. For any systemic reactions and report of fever in the younger and older population, around half of vaccine recipients reported any systemic reaction after the first dose and 70% to 80% percent reported a systemic reaction after the second dose. However, 30% to 45% of recipients who received the saline placebo also reported a systemic reaction after the first or second dose. Reports of Grade 3 or Grade 4 fever were rare. As was done after the prior EUA, there will be a website summarizing this reactogenicity data after each dose on the CDC and ACIP websites to help inform providers and patients about possible expected symptoms post-vaccination.

Lymphadenopathy was also noted in the clinical trials. Ipsilateral, or the same side of the vaccine, axillary swelling and tenderness was a solicited AE in the trials, which differs from what was discussed last week. This ipsilateral axillary lymphadenopathy was more common among vaccine recipients less than 65 years of age occurring among 21% of participants. Grade 3 axillary lymphadenopathy was rare but slightly more common after the second dose. Adenopathy was noted to last a median of 1 day after the first dose and 2 days after the second dose. As localized lymph nodes are involved in the vaccine response, it is plausible that this could be related to the vaccine.

Regarding Bell's Palsy, there was a small imbalance between the vaccine group with 3 reports compared to 1 in the placebo group. Currently available information is insufficient to determine a causal relationship with the vaccine. Post-authorization surveillance will be important to help determine any possible causal relationship moving forward. As has been highlighted previously, SAEs were similar between vaccine and placebo groups, with no meaningful imbalance between the groups for any specific conditions.

Overall, the WG felt that the desirable anticipated effects were large and that the undesirable anticipated effects were small. Based on this, the WG felt that considering how the desirable effects balance with the undesirable effects, it favors the intervention of the Moderna COVID-19 vaccine.

The values domain addressed the primary questions of, "Does the target population feel that the desirable effects are large relative to the undesirable effects?" and "Is there important uncertainty about, or variability in, how much people value the main outcomes?" In terms of the details of the methods, which have been presented before, the search was updated through December 18, 2020. The proportion intending to receive the vaccine ranged from 40% to 86%. In a recent survey, 40% reported that they would receive the vaccine as soon as possible, 44% plan to receive the vaccine but wanted to wait a bit, and 15% said they would not receive the vaccine. Taking into account people willing to receive the vaccine now and after a brief wait, 84% were willing to take a COVID-19 vaccine. Combining the data from 33 surveys, the surveys in December reported a broad range of vaccine acceptance.

To summarize the available evidence for values, many adults report intentions to receive a COVID-19 vaccine with increasing willingness over the past several weeks. Intentions varied substantially by race or ethnicity and socioeconomic status. The WG interpretation of the first question regarding whether the target population feels that the desirable effects are large, the WG felt that the answer was probably yes, but likely would vary by population and over time. The WG also felt that there was probably important uncertainty or variability in how people value the main outcomes.

The main question for the domain of acceptability is, "Is the Moderna COVID-19 vaccine acceptable to key stakeholders?" A review of the literature was conducted and this information has all been presented previously. There has been no new published information since last week; however, the media reports over the last week have highlighted numerous HCP receiving their COVID-19 vaccine. One news report showed that at that hospital, only 2 had declined or deferred vaccination. Acceptability generally focuses on vaccination stakeholders, the persons providing the vaccines. However, in this instance, the stakeholders, HCP, are also the patients and vaccine recipients. While it was previously highlighted that jurisdiction had submitted implementation plans, jurisdictions are now implementing vaccination plans. Pharmacy chains are working to launch the COVID-19 vaccine program in long-term care facilities (LTCF). The WG felt that the Moderna COVID-19 vaccine was probably acceptable to key stakeholders.

The feasibility domain asks, "Is the Moderna COVID-19 vaccine feasible to implement?" The barriers to implementation discussed by the WG included financial barriers, complexity of recommendations, and vaccine storage and handling requirements. For financial barriers, COVID vaccines will be provided free of charge. However, health systems or health departments could incur costs for vaccine implementation or clinics. For complexity of recommendations, 2 mRNA vaccines under an EUA with different dosing intervals as well as different storage and handling requirements may make vaccine recommendations more complex. For vaccine storage and handling requirements, the vaccine must be maintained at standard freezer temperatures for shipping and long-term storage. However, it is stable for up to 30 days at refrigerated temperatures. The minimum size of orders is currently 100 doses. Both of these specifications will have a positive impact on feasibility. However, the requirements of the 2-dose series still remain and could impact feasibility for series completion. Overall, the WG felt that the Moderna COVID-19 vaccine was feasible to implement.

The primary question for the resource use domain is, "Is the Moderna vaccine a reasonable and efficient allocation of resources." There are no new data on the estimated costs associated with COVID-19 disease, but the estimates remain at hundreds of billions or trillions of dollars. The government already has provided billions for the development and manufacturing of vaccines, and vaccine doses purchased with US taxpayer dollars will be given to American people at no cost. The WG will have more information eventually to conduct the full cost-effective analysis. However, the WG felt that cost-effectiveness is not a primary driver for decision-making during the pandemic. This is an aspect of the EtR that will be re-evaluated with additional data and future recommendations. Based on the current situation, the WG felt that yes, the Moderna COVID-19 vaccine is a reasonable and efficient allocation of resources.

The primary question for the equity domain is, "What would be the impact of the COVID-19 vaccine on health equity?" Through systematic process and using the idea of COVID-19, the WG identified groups that might be disadvantaged in relation to COVID-19 disease burden or receipt of a COVID-19 vaccine. The following populations have been identified and discussed in detail at previous ACIP meeting:

- ❑ Racial and ethnic minority populations
- ❑ People living in poverty or with high social vulnerability
- ❑ Essential workers:
    - ➢ Some racial/ethnic minority populations disproportionately represented in subsets of essential workers, e.g., public transit, building cleaning services, construction, food and agriculture
    - ➢ Almost one quarter live in low-income families

- ❑ Residents in congregate settings, such as long-term care facilities, prisons, homeless shelters, and group homes for people with intellectual/developmental disabilities
- ❑ People with substance abuse disorders
- ❑ Sexual and gender minorities, who may face social or structural inequities that can lead to health disparities

There are specific characteristics of the Moderna COVID-19 vaccines that could impact health equity. There are storage, handling, and administration requirements. This vaccine is refrigerator-stable, which will facilitate the ability of the vaccine into more community settings once supply allows. The need for 2 doses remains a challenge and follow-up will be challenging for some disadvantaged groups. Although COVID-19 vaccines will be provided at no cost, a personal investment in time and travel to obtain the vaccine may be a barrier for some groups. Equity and vaccination program implementation are closely linked. Advancing health equity will require efforts to identify and reduce access-related barriers to vaccination among groups to experience disproportionate COVID-19-related morbidity and mortality. The WG felt that the impact of the COVID-19 vaccine would be to probably increase health equity, especially with easier cold chain requirements allowing for broader availability once supply allows.

After reviewing the data, the WG provides a judgment on the balance of consequences selected from the following options:

- ❑ Undesirable consequences *clearly outweigh* desirable consequences in most settings
- ❑ Undesirable consequences *probably outweigh* desirable consequences in most settings
- ❑ The balance between desirable and undesirable consequences is *closely balanced or uncertain*
- ❑ Desirable consequences *probably outweigh* undesirable consequences in most settings
- ❑ Desirable consequences *clearly outweigh* undesirable consequences in most settings
- ❑ There is insufficient evidence to determine the balance of consequences

The WG felt that the desirable consequences *clearly outweigh* undesirable consequences in most settings. In addition, after reviewing the totality of information presented in the EtR framework, the WG discussed the type of recommendation proposed to ACIP among the options of: 1) Do not recommend the intervention, 2) Recommend the intervention for individuals based on shared clinical decision-making, or 3) Recommend the intervention. The WG was in agreement based on the data presented that the type of recommendation proposed is a full recommendation of the intervention.

The WG proposed the following interim recommendation language for an ACIP vote:

> "The Moderna COVID-19 vaccine is recommended for persons 18 years of age and older in the US population under the FDA's Emergency Use Authorization."

Discussion Points

Dr. Poehling requested specific details about distribution of the vote within the WG.

Dr. Oliver indicated that in terms of the balance of consequences, the overwhelming majority said that the desirable consequences clearly outweigh the undesirable consequences in most settings. A very small minority felt that the desirable consequences probably outweigh the undesirable consequences. The WG was in an agreement based on the type of recommendation.

Ms. Bahta made a motion that ACIP recommend the Moderna COVID-19 vaccine for persons 18 years of age and older under the FDA's EUA. Dr. Szilagyi seconded the motion. Drs. Atmar, Frey, and Hunter were reminded to recuse themselves from any discussion, motion, or vote due to their previously stated COIs.

Dr. Romero indicated that a vote would be taken on this motion following the public comment session following the presentations by Drs. Clark and Mbaeyi.

Anaphylaxis Following m-RNA COVID-19 Vaccine Receipt

Thomas Clark, MD, MPH
National Center for Immunization and Respiratory Diseases
Centers for Disease Control and Prevention

Dr. Clark reviewed clinical considerations for the use of mRNA COVID-19 vaccines in the US. On December 8, 2020, the UK initiated its vaccination program with the Pfizer-BioNTech COVID-19 vaccine. The following day, UK authorities confirmed 2 cases of anaphylaxis after vaccination. As with other vaccines, prescribing information for both Pfizer-BioNTech and Moderna COVID-19 vaccines contains information on anaphylaxis, namely that severe allergic reaction (e.g., anaphylaxis) to any component of the vaccine is a contraindication to vaccination and that appropriate medical treatment used to manage immediate allergic reactions must be immediately available and used in the event of anaphylaxis.

ACIP considered this prescribing information and the UK reports of anaphylaxis during its deliberations on Pfizer-BioNTech COVID-19 vaccine during December 11-12, 2020 meeting. On December 12, 2020, CDC published clinical considerations for use of Pfizer-BioNTech COVID-19 vaccine that included guidance on contraindications and precautions. As of December 18, 2020, CDC has identified 6 case reports of anaphylaxis following Pfizer-BioNTech vaccine and meeting the Brighton Collaboration criteria for anaphylaxis. The cases were Brighton Collaboration Levels 1 or 2. Additional case reports have been reviewed and were determined not to be anaphylaxis. These cases occurred within the recommended observation window post-vaccination and were promptly treated. Investigations are ongoing, but it is known that one case had a history of anaphylaxis following rabies vaccination. All suspect cases were notified through the VAERS or CDC notification processes and in most cases, through multiple channels. These case reports are undergoing or will undergo clinical case review by the Clinical Immunization Safety Assessment (CISA) project. As of December 19, 2020, a total of 272,001 doses of vaccine had been reported as administered. Dr. Clark encouraged interpretation of this number with caution as it is probably a minimal estimate. Providers are requested to report administration within 72 hours to jurisdictions and jurisdictions are to report this within 24 hours to CDC.

Since notification of these cases and during the investigation, CDC has been in close coordination with FDA and has held discussions with CISA investigators, NIH, the Medicine and Healthcare products Regulatory Agency (MHRA) in the UK, allergy and immunology experts, and other partners. On December 16, 2020, CDC published "Interim Considerations: Preparing for the Potential Management of Anaphylaxis at COVID-19 Vaccination Sites."

To provide an update on CDC's V-Safe active surveillance project, as of December 18, 2020, a total of 112,807 people had registered and reported receipt of 1 dose of vaccine. Of those, 3150 reported an AE that had an impact on their health of either limitation on the performance of normal daily activities, going to work, or for which they sought medical attention. Of the total, 514 recipients reported pregnancy. CDC has mechanisms in place to follow-up medically attended reported AEs and extensive follow-up of vaccinated pregnant women.

In summary of CDC assessment and further actions, post-authorization pharmacovigilance systems have detected and confirmed 6 anaphylaxis cases following vaccination. These notifications received have been timely, mostly within a few hours. Several notifications have been ruled, indicating that the systems are sensitive to identifying anaphylaxis. CDC will continue to reinforce measures to recognize, respond to, and report anaphylaxis. Persons with anaphylaxis following COVID-19 vaccination should not receive additional doses of COVID-19 vaccine. CDC is working in consultation with allergy and immunology experts to provide further guidance on the evaluation of persons following anaphylaxis to COVID-19 vaccine.

Discussion Points

Ms. Bahta asked whether individuals who have reported health impact events are being followed and if so, what is being learned from them.

Dr. Clark indicated that CDC is following up on those. The number has been quite substantial, so the focus is on those with medically attended AEs since those are of the most interest. He did not think they had anything systematically to share yet in terms of results.

Dr. Bernstein asked whether they are able to separate out those that required medical care versus those that are just impacting daily activities or the ability to go to work. Dr. Clark clarified that they are able to do so.

Dr. Bell inquired as to whether there is any clustering, especially geographically, among these cases and any if there are any other aspects that these cases share in order to get a sense of what kinds of things might explain this phenomenon.

Dr. Clark said while it is early to share data from ongoing investigations, the persons with anaphylaxis have received vaccine from more than one production lot. Multiple lots have been distributed and are being used, thought probably not equally. Reports from Alaska have been in the news, but CDC has had reports from other jurisdictions so there is no obvious clustering geographically.

Dr. Atmar asked whether Dr. Clark could provide an idea about what percentage of the health impact events were actually medically attended events and when they might get a more detailed report to offer the public.

Dr. Clark said that while he did not have the exact number with him, it is the minority of the 3150 reports. CDC is working diligently to summarize its data and put it out quickly as possible.

Dr. Poehling asked how many of the 6 cases with anaphylaxis were hospitalized and whether others had a history of anaphylaxis to things other than rabies vaccine.

Dr. Clark indicated that no others had confirmed anaphylaxis with other medications, foods, or other exposures. Investigations are ongoing. Most were hospitalized, treated, and observed.

They are careful not to describe individual cases. Most vaccination is going on still in hospital settings, so people are often being vaccinated in the places they work. All of the individuals are adults under the age of 65 years.

Dr. Lee appreciated that the systems that are in place are both sensitive and timely. It is only the first week of the vaccination program and CDC is already bringing information to the group. She recognized that there is still more work to do in terms of estimating and understanding the risks, but to her it does seem qualitatively higher than for most typical vaccines. That does not necessarily change the benefit/risk balance of the COVID-19 vaccines at this time for her. It is really important to rapidly understand and manage all of the risks that come with vaccinations and still make sure that they are providing access to the vaccine to the population. She acknowledged that they would learn more as they go and would adapt recommendations and/or clinical guidance as needed, and reiterated that this is exactly what is supposed to happen in terms of vaccine safety surveillance, making sure that ACIP and the public are aware that all of this is continuing to be under investigation and being done in real-time.

Dr. Kimberlin (AAP Red Book) noted that per the reports in the newspapers, several of these cases of anaphylaxis occurred at the same hospital while other hospitals had no cases and he wondered whether this is unusual.

Dr. Clark emphasized that it is early and they are more sensitive to this potential risk associated with vaccination. Investigation does not always confirm multiple cases at the same facility. They certainly have heard of some cases that have been ruled out at the same facility. True clustering of anaphylaxis would be concerning, but is very unlikely. There is no indication of clustering, even if there are 2 cases.

Ms. McNally indicated that she is the consumer representative on the ACIP. Because it is a new system, she asked whether V-SAFE is performing as anticipated.

Dr. Clark said that while he was not sure how everyone anticipated it would perform, they have been very pleased with how it is performing in terms of the number of persons enrolled and in the events being reported. He did a quick calculation and determined that the number of enrollees was approximately two-thirds of the number of doses administered around the same time. Therefore, uptake seems good. There have been minor tweaks to the system, but overall it is performing well and allows CDC to trigger further investigation within the system and with in-person phone follow-up.

Use of mRNA COVID-19 Vaccines: Interim Clinical Considerations

Sarah Mbaeyi, MD, MPH
National Center for Immunization and Respiratory Diseases
Centers for Disease Control and Prevention

Dr. Mbaeyi reviewed clinical considerations for the use of mRNA COVID-19 vaccines in the US. As a reminder, proposed clinical considerations for the use of Pfizer-BioNTech COVID-19 vaccine were presented to ACIP on December 12, 2020 and the final considerations were published to the CDC website. These clinical considerations will be updated to include information on both authorized mRNA vaccine products, Pfizer-BioNTech and Moderna COVID-19 vaccines. The guidance has been harmonized across products with few differences, including differing age indications and dosing schedules. In this presentation, Dr. Mbaeyi focused on considerations around contraindications and precautions to vaccination.

For both of the currently authorized mRNA COVID-19 vaccines, severe allergic reaction (e.g., anaphylaxis) to any component of the vaccine is a contraindication to vaccination listed in the prescribing information. The prescribing information also stipulates that appropriate medical treatment used to manage immediate allergic reactions must be immediately available in the event that an acute anaphylactic reaction occurs following administration of the vaccine. This table shows the ingredients included in the mRNA vaccines, as reported in the prescribing information:

Ingredients* included in mRNA COVID-19 vaccines

Description	Pfizer-BioNTech	Moderna
mRNA	Nucleoside-modified mRNA encoding the viral spike (S) glycoprotein of SARS-CoV-2	Nucleoside-modified mRNA encoding the viral spike (S) glycoprotein of SARS-CoV-2
Lipids	2[(polyethylene glycol)-2000]-N,N-ditetradecylacetamide	Polyethylene glycol (PEG) 2000 dimyristoyl glycerol (DMG)
	1,2-distearoyl-sn-glycero-3-phosphocholine	1,2-distearoyl-sn-glycero-3-phosphocholine
	Cholesterol	Cholesterol
	(4-hydroxybutyl)azanediyl)bis(hexane-6,1-diyl)bis(2-hexyldecanoate)	SM-102
Salts, sugars, buffers	Potassium chloride	Tromethamine
	Monobasic potassium phosphate	Tromethamine hydrochloride
	Sodium chloride	Acetic acid
	Dibasic sodium phosphate dihydrate	Sodium acetate
	Sucrose	sucrose

*As reported in the prescribing information

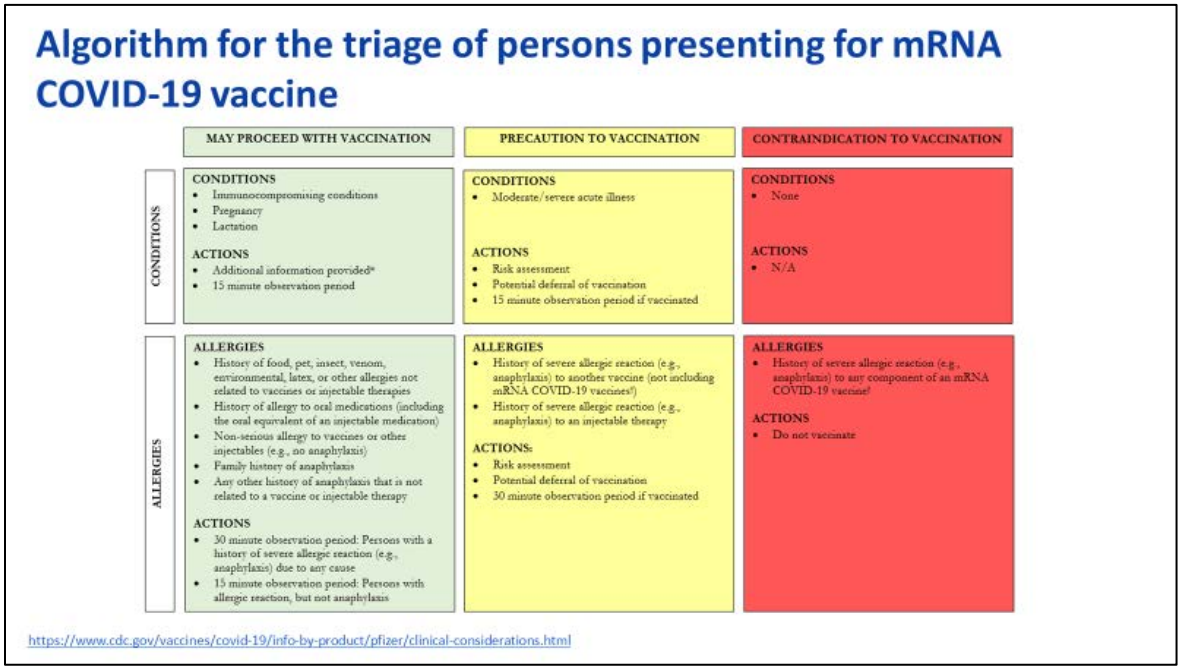
Both vaccines consist of nucleoside-modified mRNA encoding the viral spike glycoprotein of SARS-CoV2. In addition, both contain 4 different lipids, some of which are common between the two vaccines, as well as salts, sugars, and buffering agents. Neither vaccine contains preservatives or latex. Polyethylene glycol (PEG) is a component of both vaccines. PEG is a primary ingredient in osmotic laxatives and oral bowel preparations for colonoscopy procedures and is also found as an inactive ingredient or excipient in other medications and is used in a process called PEGylation to improve the therapeutic activity of some medications, including certain chemotherapeutics.

While the reports of anaphylaxis in persons who received the Pfizer-BioNTech COVID-19 vaccine are further investigated, CDC considers a history of severe allergic reaction (e.g., anaphylaxis) to any other vaccine or injectable therapy (e.g., intramuscular, intravenous, or subcutaneous) as a precaution but not a contraindication to vaccination to both the Pfizer-BioNTech and Moderna COVID-19 vaccines as these vaccines contain some ingredients in common. A risk assessment should be conducted in persons who report history of severe allergic reaction, such as whether the reaction required use of epinephrine or resulted in hospitalization. These persons may still receive vaccination, but they should be counseled about the unknown risks of developing a severe allergic reaction and balance these risks against the benefits of vaccination.

Persons with a history of other types of allergies do not have a contraindication or precaution to vaccination, such as those with:

- ❑ History of food, pet, insect, venom, environmental, latex, or other allergies not related to vaccines or injectable therapies
- ❑ History of allergy to oral medications (including the oral equivalent of an injectable medication)
- ❑ Non-serious allergy to vaccines or other injectables (as in did not have anaphylaxis)
- ❑ Family history of anaphylaxis but no personal history
- ❑ Or any other history of anaphylaxis that is not related to a vaccine or injectable therapy

CDC recommends that vaccine providers observe all persons after vaccination. Those with a history of anaphylaxis due to any cause should be observed for 30 minutes. All other persons should be observed for at least 15 minutes after vaccination to monitor for the occurrence of immediate adverse reactions. This figure is included in the clinical considerations document and is intended to assist vaccine providers to better determine which patients may proceed with vaccination, which have precautions to vaccination, and which have contraindications to vaccination:



The figure includes information on how to approach patients with medical conditions, as well as a history of allergic reactions. In green are patients with a history of allergies in whom there is no precaution or contraindication to vaccination. As mentioned earlier, those with a history of anaphylaxis should be observed for 30 minutes, whereas all other persons should be observed for 15 minutes. In the next column in yellow are persons with a history of anaphylaxis to another vaccine or an injectable therapy. A risk assessment should be conducted in these patients and if vaccinated, they should be observed for 30 minutes. In red are patients with a history of severe allergic reaction to any component of the Pfizer-BioNTech COVID-19 vaccine. These people should not be vaccinated.

In addition, CDC has developed tools that providers can use at the vaccination site to help identify persons with contraindications or precautions to vaccination, including a pre-vaccination form and further additional information in a fact sheet. CDC also has developed interim considerations for preparing for the potential management of anaphylaxis at COVID-19 vaccination sites. These considerations include information on early recognition of anaphylaxis, medications and supplies needed for the assessment and management of anaphylaxis, how to manage anaphylaxis at the vaccination site, patient counseling, and reporting of anaphylaxis. Fact sheets are under development, including one tailored to LTCFs, given some unique challenges that may be encountered, such as recognizing anaphylaxis in persons with impaired cognition or who cannot communicate symptoms following vaccination. The key take-home messages from CDC's anaphylaxis guidance include early recognition of anaphylaxis symptoms, prompt treatment with epinephrine, and immediate activation of emergency medical services.

COVID-19 vaccines likely will be administered in a wide variety of clinical settings, including hospitals, LTCFs, outpatient medical offices, pharmacies, mass vaccination sites, and curbside or drive-through sites. These settings differ in terms of usual on-hand human and material resources to manage anaphylaxis. CDC's guidance includes a list of medications and supplies that are important for evaluating and managing anaphylaxis and are recommended for COVID-19 vaccination sites. These are divided into supplies/medications that should be available at all sites as the minimum requirements to assess and manage anaphylaxis, as well as other medications/supplies that are helpful to include where feasible:

Recommended medications and supplies for the management of anaphylaxis at COVID-19 vaccination sties

Should be available at all sites	Include at sites where feasible
Epinephrine prefilled syringe or autoinjector*	Pulse oximeter
H1 antihistamine (e.g., diphenhydramine)†	Oxygen
Blood pressure cuff	Bronchodilator (e.g., albuterol)
Stethoscope	H2 antihistamine (e.g., famotidine, cimetidine)
Timing device to assess pulse	Intravenous fluids
	Intubation kit
	Adult-sized pocket mask with one-way valve (also known as cardiopulmonary resuscitation (CPR) mask)

*COVID-19 vaccination sites should have at least 3 doses of epinephrine on hand at any given time.
†Antihistamines may be given as adjunctive treatment and should not be used as initial or sole treatment for anaphylaxis. Additionally, caution should be used if oral medications are administered to persons with impending airway obstruction.

In closing, Dr. Mbaeyi posed the following questions for ACIP discussion: 1) Does ACIP agree with the proposed contraindications and precautions to vaccination?; and 2) Are there any other sections of the clinical considerations that ACIP would like to discuss?

Discussion Points

Dr. Talbot indicated that she likes and appreciates the layout. The only thing she found to be missing was a brief description of anaphylaxis and the different types of anaphylaxis. She thinks there is a misconception in the community and the healthcare field that there must be wheezing for anaphylaxis to be occurring, which is not the case. Therefore, a description of how anaphylaxis presents should be included so that everyone can recognize it.

Dr. Mbaeyi indicated that the guidance and fact sheets include some of the characteristics of the signs and symptoms of anaphylaxis to help make that information accessible and understandable to all types of providers.

Ms. Stinchfield (NAPNAP) asked what considerations and advice are included for repeat doses at the time of vaccination if there is a malfunction with the needle and some of the dose is lost.

Dr. Mbaeyi indicated that the general advice is that if there is an issue with administration of the vaccine in which someone did not receive a dose, the person is considered not to have received a vaccine. If someone received a partial vaccine, additional dosing is not recommended at this time.

Dr. Hunter strongly supported this very helpful information and commented that this is just another example of how everyone at CDC cares about patients, people, and populations and converting scientific information into showing that they care by making it detailed enough to be useable by clinicians and public health practitioners. He looks forward to helping disseminate this information in the community.

Dr. Fryhofer (AMA) found this to be a fabulous presentation that is so helpful to clinicians. She is very encouraged that so many people have signed up for V-Safe. Though there are media reports that cyber-attacks could somehow make that information less clear, she hopes that will not happen. She greatly appreciated the comments from members of ACIP, particularly the comment to actually describe what anaphylaxis is so that everyone is on the same page. Regarding Slide 6, she thought it was fabulous that CDC clearly listed the ingredients in these 2 vaccines. She noted that in Moderna's presentation, they said that their LNP is comprised of 4 different lipids, one of which is proprietary. She assumed that to be SM-102. Pfizer is very transparent as to the ingredients. She encouraged Moderna to do the same. People who have allergic reactions sometimes know what they are allergic to. The amount does not have to be given, but providing patients with a little more information as to what the secret is might be important, because it is essential to determine what might be triggering these anaphylactic reactions. That is definitely going to affect vaccine implementation.

Dr. Bell stressed that the evidence of the work that has been done about clinical considerations shows how the system is working. She also emphasized the importance of thinking of these as interim clinical considerations. While the instructions for anaphylaxis may work well in the current vaccination settings, this will need to be evaluated when there is more information and when vaccinations are being administered in other settings where the general calculus may differ.

Dr. Sanchez suggested that some mention should be made in the algorithm for triage of persons with precautions and indications in terms of subsequent doses. If someone has had a reaction that is not considered anaphylactic, there still needs to be discussion about individuals who experience some reaction and whether there should be additional monitoring for subsequent doses.

Dr. Bernstein said he was not aware how often there is PEG associated anaphylaxis with bowel preparation for colonoscopy and wondered whether information about that would be helpful to adult clinicians. In addition, he thought it would be valuable to include the concept about the number of doses that can be obtained from a particular vial since there is no preservative in the COVID-19 vaccines. With the multi-dose Fluzone® only 10 doses are to be removed and the rest is supposed to be discarded. An explanation regarding squeezing out extra doses of COVID-19 vaccine would be helpful in the clinical considerations. He also wondered if there is a requirement to offer information about V-SAFE at places where the vaccine is distributed. He is aware of a couple of states that received the vaccine but V-SAFE was not even mentioned. A lot of people are likely to take a “wait and see” perspective, so the more information that V-SAFE provides, the better.

Dr. Mbaeyi said that based on the literature, it appears to be relatively uncommon, but there has been speculation that perhaps it is under-recognized. While difficult to quantify, it is generally thought to be somewhat rare.

Dr. Messonnier said that CDC recognizes the importance of the topic of extra doses and agrees with the framing that in this time of public health crisis, no one wants to squander a single dose of a vaccine that is potentially life-saving. There is a plan to have a short discussion on the second day of the meeting, recognizing that information is important to incorporate into the clinical guidance. In terms of V-SAFE, she expressed hope that those listening are working to ensure that their administration sites are providing information about V-SAFE. There also is information on the CDC website. CDC’s perception based on the number of people who have enrolled in V-SAFE is that the message is getting out to many places, but even one site not having this information is something they want to correct. Given how complicated this has been, she offered a large shout out to the large number of people in jurisdictions who have been helping to get this program launched during the first week of vaccine distribution. It has been incredibly gratifying to see how smoothly this has gone despite some challenges. CDC will continue to work to correct it.

Ms. Bahta said that in the field, they are hearing of difficulty getting doses of epinephrine in the vial or autoinjector presentations and wondered what CDC knows about this. She also expressed concern about some newer vaccinators and their potential lack of consideration for having epinephrine on hand. Perhaps some guidance should be included about this and about whether to hold clinics without epinephrine.

Dr. Mbaeyi indicated that CDC would get back to ACIP with some additional information on the issues pertaining to epinephrine.

Motion/Vote: Moderna COVID-19 Vaccine

Ms. Bahta made a motion that ACIP recommend the Moderna COVID-19 vaccine for persons 18 years of age and older under the FDA's Emergency Use Authorization (EUA). Dr. Szilagyi seconded the motion. Drs. Atmar, Frey, and Hunter recused themselves from the discussion, motion, and vote due to their previously stated COIs. The motion carried with 11 affirmative votes, 0 negative votes, and 3 abstentions. The disposition of the vote was as follows:

11 Favored:	Ault, Bahta, Bell, Bernstein, Lee, McNally, Poehling, Romero, Sanchez, Szilagyi, Talbot
0 Opposed:	N/A
3 Abstained:	Atmar, Frey, Hunter

Dr. Romero called upon ACIP members interested in sharing their thoughts about why they voted as they did to make comments.

Ms. Bahta said that she was very eager to support this vote for a second vaccine that could be lifesaving, especially in light of the fact that there are 2600 deaths per day on average. This is horrendous and she hopes that this can be reduced greatly, despite the fact that there is still much to learn about the disease and the vaccine.

Dr. Talbot expressed gratitude to the CDC and the FDA. This has been a momentous amount of work with very little credit given to them, and she appreciates every moment of it. These vaccines are going to change everything and she is very thankful.

Dr. Szilagyi emphasized that he voted for the vaccine because in his opinion, given the pandemic, the benefits far, far outweigh any risks. He emphasized that the ACIP's process has been rigorous, fair, and transparent. He is very impressed with CDC's safety monitoring system that is being rolled out. He thought the discussion about V-SAFE and the rapid guidance that CDC has prepared demonstrate the importance and value of the safety monitoring systems. He is confident that the ACIP's recommendation is important and will bring the coronavirus pandemic to an end.

Dr. Bell said that to her, this is another step forward. There is still a lot to learn and there are likely going to be many bumps in the road, but ACIP has used a process that is science-based, fair, and transparent. All systems so far appear to be doing what they are supposed to do. This represents progress toward ending this horrific pandemic. She thanked all of the people who have come forward to be vaccinated and expressed her hope that continuing to share information as they learn it will make people feel more comfortable with the risk/benefit before them.

Dr. Lee emphasized that she voted "yes" for the interim recommendation under the EUA because of the incredible need for additional vaccine doses to be able to protect individuals and communities. She also called out that the implementation considerations for this vaccine mean that it will be possible to extend use into communities that have been more difficult to reach with the currently available Pfizer vaccine. Both vaccines are outstanding in terms of benefit/risk balance, but she does think additional options will need to be available to ensure that as much of the population as possible is captured and covered.

Dr. Romero reiterated to the public that safety has been a paramount focus of the CDC, ACIP, FDA, VRBPAC, and the pharmaceutical industry. These vaccines were found to be safe in clinical trials and safety nets are now identifying unusual events. The public needs to understand that safety has been stressed throughout the entire process. The inclusion of minority groups and persons of color by the pharmaceutical industry is extremely important. Concern has been expressed that there would not be a sufficient number of persons of color. As a person of color, Dr. Romero said he feels that this has been and will continue to be properly addressed going forward. He thanked all of the voting members who have spent so much time, including weekends, this year to come to these votes; the liaison members who have actively contributed throughout the entire process; and the CDC staff and leaders for all that they have done.

Dr. Cohn expressed CDC's gratitude to Dr. Romero as Chair and all of the 14 voting ACIP members that CDC is incredibly grateful for the amount of thought, input, and expertise they all have provided to this effort—especially in terms of spending the entire weekend with them before the holidays to ensure that they can get these vaccines out to the American people.

December 20, 2020: Opening Session

Call to Order / Roll Call / Announcements

José Romero, MD, FAAP
ACIP Chair

Amanda Cohn, MD
Executive Secretary, ACIP / CDC

Dr. Romero called to order the second day of the December 19-20, 2020 emergency meeting of the Advisory Committee on Immunization Practices (ACIP). He indicated that the purpose of the December 20, 2020 session was to discuss and vote on allocation of the Moderna Coronavirus Disease 2019 (COVID)-19 vaccine for Phases 1b and 1c. He conducted a roll call of ACIP voting members. The following COIs were declared during the first day of the meeting and were determined during this roll not to be relevant to the discussion, motion, or vote on Phases 1b and 1c allocation of vaccine supplies. Drs. Atmar, Frey, and Hunter were permitted to participate.

- Dr. Robert Atmar is serving as the Co-Director of the Clinical Operations Unit (COU) of the National Institutes of Health (NIH)-funded Infectious Diseases Clinical Research Consortium (IDCRC) that is working within the COVID-19 Prevention Network (CoVPN) to evaluate Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) vaccine candidates in Phase 3 clinical trials. She is the Site Principal Investigator (PI), including those produced by Moderna, AstraZeneca, Janssen, Novavax, and Sanofi.

- Dr. Sharon Frey is employed by Saint Louis University (SLU), which has a Vaccine Treatment Evaluation Unit (VTU) that is part of the IDCRC. She is currently serving as the Site PI for the Moderna and Janssen Phase III COVID-19 vaccine clinical trials.

- ❑ Dr. Paul Hunter owns a small amount of stock in Pfizer and has received a small grant from Pfizer to conduct a quality improvement (QI) project on pneumococcal vaccines.

Dr. Cohn encouraged everyone to review the public docket. The comments submitted are incredibly informative and demonstrate the huge amount of interest that everyone feels about these vaccines and set up the discussion for the day. These are available under Docket Number CDC-2020-0124 at https://www.regulations.gov.

The slides to be presented during this session were made accessible to the public via https://www.cdc.gov/vaccines/acip/meetings/slides-2020-12-19-20.html.

Guidance on Vaccine Doses

Doran Fink, MD, PhD
Deputy Director-Clinical
Division of Vaccines and Related Products Applications
Center for Biologics Evaluation and Research
Food and Drug Administration

Dr. Fink acknowledged that as most people have heard from the news, through discussions at ACIP, or from information provided by FDA Commissioner Hahn that the Pfizer CVOID-19 vaccine was authorized for used based on an intended number of doses of 5 within the multi-dose vials. However, it turns out that more than 5 doses routinely can be obtained from the 5-dose vials adhering to the dose preparation instructions outlined in the prescribing information and the fact sheet for healthcare providers (HCP). Based on the volume that is achieved on dilution of the vaccine that is provided in the vial, typically 6 doses are obtainable. Sometimes with very skilled preparation, a 7th dose might be obtained as well. FDA has posted on its website, in the context of a Frequently Asked Question (FAQ) on the page for the Pfizer vaccine, advice that FDA is aware of this issue. FDA is working with Pfizer to update the prescribing information and fact sheets for HCP to reflect what is considered to be instructions for optimal use of the vaccine to address the pandemic by using every full dose that can be obtained from each vial while adhering to the instructions for dose preparation. This usually will result in 6 and possible 7 doses. FDA wants to make sure that HCP are aware that the vaccine is preservative-free and that any product left in a vial that is not enough to make a full dose should not be used or pooled with vaccine from other vials. In order to address the pandemic, FDA wants HCP to use every full dose that can be obtained from each vial while adhering to the instructions for preparation.

Vaccine Availability

Nancy Messonnier, MD
Director
National Center for Immunization and Respiratory Diseases
Centers for Disease Control and Prevention

Dr. Messonnier provided an update on the amount of vaccine anticipated to be available over the next couple of months. She emphasized that CDC's goal remains to have enough vaccine and the ability in the vaccine program to vaccinate everybody in every corner of every one of the US's communities as possible. However, there will be a limited supply of vaccine at least in the short-term. What that means is that there will be difficult choices about who gets that vaccine first. This is just one of the many difficult choices that society has faced this year. The goal of

the ACIP is to provide guidance for vaccine prioritization, with the understanding that such guidance will then need to be translated to a local context. To provide some framing around how much vaccine CDC anticipates being available, she shared some estimates as described by Secretary Azar earlier in the week that there should be enough vaccine to vaccinate 20 million people in December, 30 million people in January, and 50 million people in February. Dr. Messonnier emphasized that these are projections based on the current understanding of vaccine availability. Certainly, the hope is that more vaccine will be available. As is true with all vaccines, however, it is important to understand the possibility that there will be less vaccine. Hopefully, these numbers will help ACIP with the difficult discussions to be had during this session. She thanked the ACIP members for their difficult deliberations as they have thought about prioritization and anticipating this moment since beginning discussions pertaining to COVID vaccines. She said she knew as always that ACIP would think about the science framed around ethics and the need to be practical in terms of implementation.

Allocation of Initial Supplies of COVID-19 Vaccines: Phases 1b & 1c

Introduction

Beth Bell, MD, MPH
ACIP, COVID-19 Vaccine WG Chair
Clinical Professor, Department of Global Health
School of Public Health, University of Washington

Dr. Bell introduced the session, reminding everyone that the agenda for the day would include presentations on the following topics:

December 20, 2020
- ❑ Allocation of Initial Supplies of COVID-19 Vaccine: Phases 1b and 1c
- ❑ Considerations for Populations Included in Phases 1b and 1c
- ❑ Public Comment Prior to the Vote
- ❑ Vote on Allocation of Initial Supplies of COVID-19 Vaccine: Phases 1b and 1c

Allocation of Initial Supplies of COVID-19 Vaccine: Phases 1b and 1c

Kathleen Dooling, MD MPH
Co-Lead ACIP COVID-19 Vaccine WG
Medical Officer, National Center for Immunization and Respiratory Diseases
Centers for Disease Control and Prevention

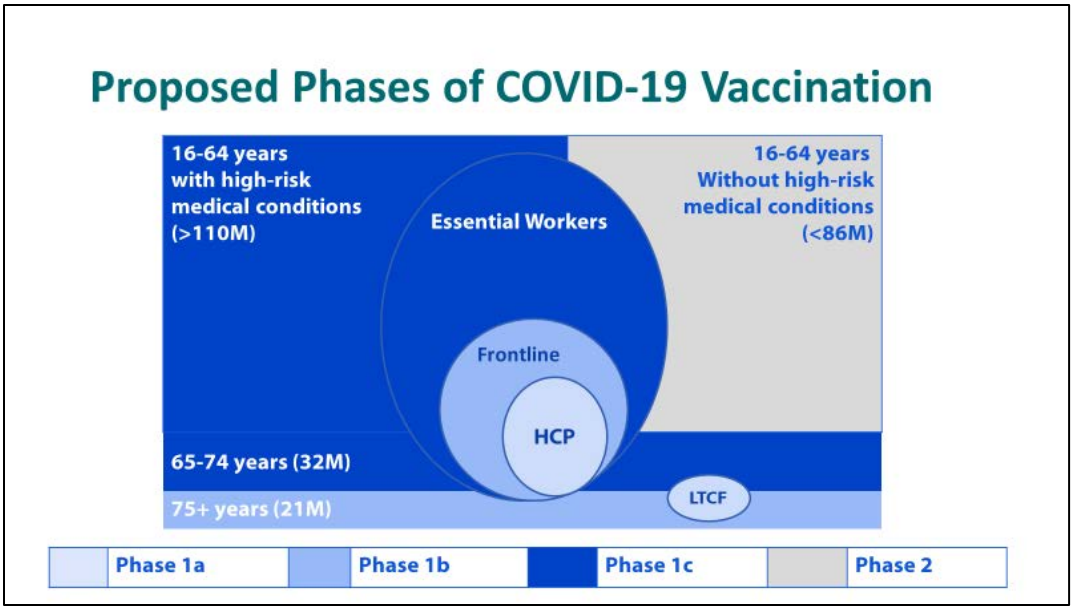
Dr. Dooling presented on phased allocation of COVID-19 vaccines on behalf of the ACIP COVID-19 WG. The policy question under consideration is, “Which groups should be offered COVID-19 vaccination in Phase 1b & 1c?” Dr. Dooling began by reviewing the goals of the COVID-19 Vaccine Program that have been guiding the ACIP COVID-19 WG discussions, which are to: 1) ensure safety and effectiveness of COVID-19 vaccines; 2) reduce transmission, morbidity, and mortality of COVID-19 disease; 3) help minimize disruption to society and the economy, including maintaining healthcare capacity; and 4) ensure equity in vaccine allocation and distribution.

Anticipating that demand for COVID-19 vaccine will exceed supply for the first months of a national vaccination program, the WG has endeavored to balance the goals of prevention of morbidity and mortality along with the preservation of societal functioning, including maintaining healthcare capacity. In this setting, difficult choices have to be made and the WG has learned, listened, and debated how to achieve that balance. Members of the WG strongly support vaccination being offered to every person in the US as soon as possible. The following presentation offers a roadmap for how to get there together.

In efforts to achieve the goals of the program, on December 1, 2020 ACIP recommended that residents of long-term care facilities (LTCF) as well as healthcare personnel (HCP) be offered vaccination first in Phase 1a. In deliberation of those recommendations and for the remaining vaccine allocation, ACIP has held 10 public ACIP meetings and there have been 28 COVID-19 WG meetings. The WG has examined a broad range of evidence from scientific, implementation, and ethical fields. The WG also considered external expert advice from the National Academies of Science, Engineering, and Medicine (NASEM) who provided a timely framework for the equitable allocation of COVID-19 vaccine to inform ACIP and CDC. The WG also took into account academic reports and allocation recommendations from other countries and organizations. Importantly, the WG deliberations have been informed by public input. These have come in the form of focus groups involving hundreds of people, population surveys, previous work on pandemic preparedness, and of course ACIP public comment and *Federal Registry* submissions. These inputs have informed the WG's understanding of public values and have helped shape the evolution of the proposed phased allocation.

As mentioned, residents of LTCF as well as HCP will be offered vaccination first in Phase 1a. The WG proposes that in Phase 1b, person 75 years and older and frontline essential workers be offered COVID-19 vaccination. All persons 65 to 74 years of age, persons 16 to 64 years of age with high-risk medical conditions, and all other essential workers not previously recommended should be offered vaccines in Phase 1c. Essential workers have been categorized by the WG group as either "frontline" or "other" essential workers. The WG categorization of frontline workers was informed by the NASEM. Their framework for equitable allocation of vaccine indicates that in the first 2 phases the following workers should be offered vaccination first: first responders, teachers, school staff, childcare workers, critical workers in high-risk settings, and staff working in congregate settings.

Similarly, the ACIP WG has defined frontline essential workers as "workers who are in sectors essential to the functioning of society and are at substantially higher risk of exposure to SARS-CoV-2," the virus that causes COVID-19 disease. Specifically, these include first responders (firefighters and police); people in the education sectors (teachers, support staff, daycare workers); and those who work in food and agriculture, manufacturing sectors, corrections workers, US Postal Service workers, public transit workers, and grocery store workers. Other essential workers include those who work in transportation and logistics, food service, shelter & housing (construction), finance, information technology (IT) & communication, energy, media, legal, public safety (engineers), and water & wastewater. The description of all essential workers can be found at the Cybersecurity and Infrastructure Security Agency (CISA) website. To put that all together, here are the proposed phases for COVID-19 vaccination as well as their intersections:



The large square is the US population 16 and older separated out by people 75+, 65 to 74, and 16 to 64 with and without high-risk medical conditions. In the light blue are Phase 1a, HCP and LTCF residents. In the slightly darker blue are the proposed Phase 1b frontline essential workers and persons 75 and older. In the darkest blue are the groups proposed for Phase 1c, persons 65 to 74, essential workers not previously recommended, and persons 16 to 64 with high-risk medical condition.

Proceeding to the highlights of the evidence that the WG considered, to examine the policy question of which group should be recommended to receive COVID-19 vaccines in Phases 1b and 1c, the WG considered information in the 3 pillars of science, implementation, and ethics. In terms of the science pertaining to the epidemiology of COVID-19 disease burden and the potential impact of vaccine, national estimates of COVID-19 confirmed cases by age group show that COVID-19 incidence is highest among young adults. On the other hand, COVID-19 mortality rates are highest in older adults. The national estimates of death per 100,000 population rises steeply after age 65. Death from all causes increases with age. However, the proportion of deaths associated with COVID-19 is actually similar across middle-aged and older adults.

Over the course of this year, adults 75 years and older have accounted for 25% of COVID-19-associated hospitalizations despite making up approximately 8% of the population. In terms of hospitalization trends over time, the rates for 75 to 84 years of age and 85 years of age and older in particular have risen sharply over the past couple of months far exceeding those of younger adults. A published paper featuring COVID-Net data shows that compared to people without underlying medical conditions, adults with one or more conditions were significantly more likely to be hospitalized for COVID-19. That risk increased if a person had multiple conditions. Older adults living in the community also were more likely to be hospitalized for COVID compared to younger adults. However, in this adjusted analysis, the magnitude of the association was smaller compared to having comorbidities. It should be noted that persons living in LTCF were excluded from the analysis [Ko, Sept 2020, doi: 10.1093/cid/ciaa1419]. In contrast, among persons hospitalized for COVID-19, another paper showed that risk of in-hospital death increased dramatically with age with adjusted rate ratios ranging from 6 to 11 in age groups 65 and older.

Shifting the focus to essential workers, a manuscript in preparation by Sami et al shows high seroprevalence among many frontline essential worker groups following the first wave of pandemic in New York City (NYC). Since these data reflect exposures that occurred before July 2020, it is unknown to what extent these workers are still protected. To illustrate the age distribution of essential workers and the intersection between the proposed groups, data from the American Community Survey (ACS) 2019 and the 2019 Behavioral Risk Factor Surveillance System (BRFSS) show that while approximately half of essential workers are older than 40 years old, 8% to 11% are actually older than 65. Also, it is known that among adults 18 to 64 years of age, 56% have a medical condition or behavioral risk factor that is associated with increased risk of severe COVID.

To summarize the modeling work that was done and previously presented to the ACIP, in the scenarios that were considered, differences between strategies is minimal. Vaccinating older adults first averts slightly more deaths, while vaccinating younger adults first (essential workers and younger adults with high-risk conditions) averts slightly more infection. The WG concluded that ethical principles and implementation considerations also should contribute to the optimal sequence in Phase 1b and 1c. The largest driver of impact for averting deaths and infections is actually the timing of the vaccine introduction related to increases in COVID-19 cases. This really emphasizes the need to continue non-pharmaceutical interventions such as wearing a mask and social distancing to prevent cases so that the vaccine can have its maximum impact. The vaccine's ability to prevent transmission will further inform modeling analysis and interpretation. As seen in the previous day's presentation on the Moderna vaccine, preliminary data indicate that the vaccine may reduce transmission; however, more study is needed to be certain.

There are many impacts of COVID-19 that were not included in modeling because there simply is not enough known yet about this disease to include them. One major issue is late sequelae of COVID-19, colloquially referred to as "long-haul COVID." Some of the more commonly long-lasting symptoms include fatigue, dyspnea or shortness of breath, cough, arthralgia, and chest pain. More serious complications appear to be less common, but long lasting medical problems may result, such as myocardial inflammation, ventricular dysfunction, lost pulmonary function, acute kidney injury, rash, alopecia, olfactory and gustatory dysfunction, sleep dysregulation, altered cognition, memory impairment, depression, anxiety, and/or changes in mood. Ultimately, even COVID-19 cases that may not result in hospitalization or death can still have important health consequences and need to be prevented.

Turning to implementation, the WG proposed guiding principles in June 2020 of which 2 pertain to implementation: efficient distribution and flexibility. During a pandemic, efficient, expeditious and equitable distribution of, and administration of authorized vaccines is critical. With respect to flexibility, within national guidelines, state and local jurisdictions should have flexibility to administer vaccine based on local epidemiology and demand. Dr. Dooling indicated that Dr. Sara Oliver would speak to the details of operationalizing these principles in the next presentation.

When considering feasibility of vaccinating adults 65 and older, a potential challenge early in the program is potentially the long distances needed to drive to central clinics and the high throughput needed for these clinics. On the positive side, older adults report high intent to receive COVID-19 vaccine. There is a wide network of physician offices, pharmacies, and public health clinics that are established providers of adult vaccination. Surveys indicate that 73% to 82% of respondents supported priority vaccination of persons 65 and older [1, 2AP-NORC Center

for Public Affairs Research. Many remain doubtful about getting COVID-19 vaccine. December 2020. https://apnorc.org/projects/many-remain-doubtful-about-getting-covid-19-vaccine. [3]ABC/ IPSOS poll. December 14, 2020[2,3]. https://www.ipsos.com/en-us/news-polls/abc-news-coronavirus-poll].

When considering the implementation of COVID-19 vaccination for essential workers, a potential challenge is reaching workers in rural locations, shift workers, and those working multiple jobs or working in small cohorts. To overcome this, jurisdictions are working on solutions such as on-site occupational clinics, pharmacies, or a health department point-of-dispensing (POD) strike team. Surveys indicate that 68% to 87% of respondents supported priority vaccination of essential workers such as police, fire, rescue, and teachers. For adults with medical conditions that put them at increased risk of severe COVID, a potential challenge is determining eligibility in this very large group. Again, there is the benefit of a wide vaccination provider network and healthcare homes such as physician offices or pharmacies could be better suited to verify underlying medical conditions. Surveys indicate that 68% to 84% of respondents supported priority vaccination of persons who are at high risk because of medical problems [1. The Harris Poll: https://www.axios.com/who-gets-coronavirus-vaccine-first-4ff87ff8-39d7-49d6-8d25-fa2307119235.html. 2. AP-NORC Center for Public Affairs Research. Many remain hesitant about getting COVID-19 vaccine. December 2020. https://apnorc.org/projects/many-remain-doubtful-about-getting-covid-19-vaccine. 3. ABC/IPSOS poll. December 14, 2020. https://www.ipsos.com/en-us/news-polls/abc-news-coronavirus-poll].

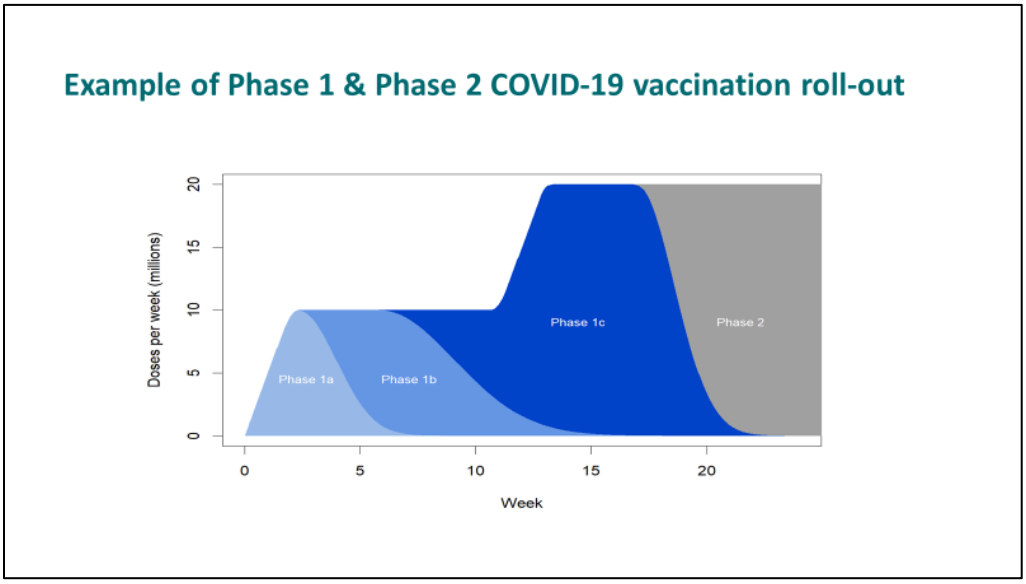
Now to consider ethics. Vaccinating older adults maximizes benefits and minimizes harms by reducing directly the morbidity and mortality in persons with higher burden of COVID-19 hospitalizations and death. Promotion of justice while vaccinating this group will require focused outreach to those who experience barriers to accessing healthcare. It also was noted that persons living in multi-generational households may be at greater risk of exposure. With respect to mitigating health inequities, racial and ethnic minority groups are under-represented among older adults. However, minorities within this group have experienced disproportionate COVID-19-related hospitalizations and deaths.

Essential workers are at high risk because of exposure by virtue of being in contact with others in performing their duties. Prevention of disease in essential workers may reduce transmission to others. This preserves work essential to the COVID-19 response and overall functioning of society, which is referred to as the “multiplier effect.” In terms of promoting justice, it was noted that frontline workers in particular are unable to work from home and have a high level of interaction with the public or others in the workplace. In fact, in some instances, they may not be able to control social distancing. This approach mitigates health inequities as racial and ethnic minorities groups are disproportionately represented in many essential industries, and approximately one-quarter of essential workers live in low-income families.

Vaccinating persons 16 to 64 years of age reduces morbidity and mortality in persons with moderate to high burden of COVID-19-associated hospitalization and death. Focused outreach to those with limited or no access to healthcare will be needed to promote justice in a rollout. In terms of mitigation of health inequities, while there is an increased prevalence of some medical conditions in racial or ethnic minority groups and persons in rural areas, diagnosis of these conditions may require access to healthcare.

In summary of the WG's considerations, scientific, implementation, and ethical considerations support inclusion of groups in Phase 1b and 1c as a balance of prevention of morbidity and mortality and preservation of societal functions. This represents an interim Phase 1 sequence. Allocation policy will need to be dynamic and adapt as new information becomes clear, such as vaccine performance and supply and demand. Gating criteria will be necessary to move expeditiously from one phase to the next, if supply exceeds demand. Following vaccination, measures to stop the possible spread of SARS-CoV-2, such as masks and social distancing, will still be needed. The US Government (USG) is committed to making COVID-19 vaccines available to all residents as soon as possible.

For the proposed Phase 1 and 2 allocation, Phase 1b includes frontline essential workers and persons 75 and older for a total of approximately 49 million unique persons. Phase 1c comprises persons age 65 to 74 years old, persons age 16 to 64 years with high-risk medical conditions, and essential workers not recommended in Phase 1b. Once overlap among the groups is accounted for, this will include approximately 129 million unique persons. Phase 2 consists of all peoples 16 years and older who were not recommended in Phase 1. Given the size of the proposed groups, this is an example of Phase 1 and Phase 2 COVID-19 vaccine roll-out over time:



The following is the proposed interim recommendation:

> As an update to ACIP recommendations for vaccination in Phase 1a (health care personnel and long-term care facility residents) if COVID-19 vaccine supply is limited, the following groups should be offered vaccination:
>
> Phase 1b: persons ≥75 years and older and frontline essential workers
> Phase 1c: persons aged 65 to 74 years, persons aged 16 to 64 years with high-risk medical conditions, and other essential workers

Considerations for Populations Included in Phases 1b and 1c

Sara Oliver MD, MSPH
Co-Lead ACIP COVID-19 Vaccine WG
National Center for Immunization and Respiratory Diseases
Centers for Disease Control and Prevention

Dr. Oliver briefly covered considerations for Phases 1b and 1c, including transitioning between phases, sub-prioritization considerations, and other considerations for populations in Phases 1b and 1C.

A strategy for transitioning between phases will be necessary to move to the next phase as supply increases and may exceed demand for the current phase. However, vaccination within the phases may, and likely will, overlap. It is not necessary to fully complete vaccination in one phase before moving to the next phase. Decisions on moving to the next phase will be made and detailed at a state or local level. There are suggested strategies for this transition between phases. When demand in the current phase is less than the vaccination capacity, this can be determined using local metrics. An example would be if appointments to be vaccinated are less than 80% filled for several days. Another reason to move into the next phase would be if supply increases significantly either due to more doses available of the current vaccine or if a new vaccine is authorized. Finally, considerations to move into the next phase would include if or when most persons within the current phase are vaccinated. This will obviously depend on vaccine uptake within various populations and will be informed based on the state and local situation.

As has been done for HCP and LTCFs, the WG wanted to provide some consideration for sub-prioritization. The goal is for all frontline workers to receive the vaccine. However, where sub-prioritization of these frontline workers is needed due to limited vaccine supply initially, jurisdictions could consider workers in locations where high rates of transmission and/or outbreaks have occurred and also workers who are at increased risk for severe illness based on age or underlying medical conditions. However, a worker's privacy should be considered with the situation. Some workers may not want to disclose a full medical history to an employer. Because of that, using self-identified medical condition status may be best. As was done for HCP, considerations also could include workers who do not have a history of documented acute SARS-CoV-2 infection in the prior 90 days. The goal is for the COVID vaccination program to extend to every corner of every community in the US so that everyone has the opportunity to receive a COVID vaccine. However, during this brief time period of constrained supply, state and local jurisdictions may have to make decisions around how the initial supplies of COVID vaccine will be distributed. The *MMWR* describing the ethical principles used as a component for these decisions includes a table with very practical questions that state and local jurisdictions can use to make decisions around this planning.

For other considerations for Phases 1b and 1c, mRNA vaccines are currently not recommended for outbreak management or for post-exposure prophylaxis (PEP), which is vaccination to prevent the development of SARS-CoV-2 infection in a person with a specific known exposure. Both available mRNA vaccines are a 2-dose series. Protection from these vaccines is not immediate. It takes 1 to 2 weeks following the second dose before a person is considered fully vaccinated. With a median incubation period of 4 to 5 days, it is unlikely that vaccination would prevent disease from a singular specific exposure. However, based on local epidemiology and implementation considerations, jurisdictions may choose to vaccinate frontline essential workers and persons who reside at congregate living facilities, such as prisons, jails, or homeless

shelters at the same time. The epidemiology of COVID-19 is constantly evolving. Knowledge of the currently available vaccines will increase. Additional vaccine may be authorized, or authorization may expand to other populations or ages over time. These considerations and additional guidance for Phases 1b and 1c and Phase 2 will be updated as more is known about COVID-19 epidemiology and vaccines.

Discussion Points

Dr. Romero noted that over the last two months, there has been introduction of monoclonal antibodies that are designed to be used in an outpatient setting and may impact hospitalization and mortality. He wondered if those were factored into this in any way and/or whether they would have an impact on the projections over time.

Dr. Dooling indicated that the WG did not specifically consider the use of monoclonal antibodies either as an adjunct or another strategy for the prevention of COVID.

Dr. Bell added that the WG has not yet considered monoclonal antibodies and given the extent of use of monoclonal antibodies right now, it is not likely to have an impact for the moment. It is another factor that the WG will need to consider and monitor over time as one of the many considerations that might change over time that could affect how the WG assesses allocation in the future.

Dr. Szilagyi agreed with this modification of the WG's prioritization and thought it more clearly aligned with the NASEM framework. He liked the concept of self-prioritizing with essential workers to frontline and other essential workers. Los Angeles County has been working very diligently on allocating and deciding what to do with the 10.5 million residents. There has been a lot of interest there in sub-prioritizing essential workers. This issue of the frontline workers goes very much along with what the county would want. He has also been worried about individuals 75 years of age and older. One of the reasons he was favoring essential workers is because of the disproportionate number of individuals who are minorities in the overall group of essential workers. He assumed the same would be true in terms of a disproportionate number of minority individuals among frontline essential workers, but wondered whether there were any data about that. He agreed with the concept of some flexibility within local regions and counties. As part of flexibility, he emphasized that at-risk individuals who live in very vulnerable, primarily low income communities need special outreach and additional efforts to reach those individuals because of the access barriers to vaccination.

Dr. Dooling indicated that there are data about this from the ACS. Frontline essential workers more closely model the racial makeup of the total US population, while there is a disproportionate representation of minorities among the other essential workers.

Dr. Hunter very strongly agreed with the specifics of how the policy question was written. He thought there was enough specificity, along with general principles, such that states and local health departments could use both the specifics and the principles to further define this for their states. Those principles and specifics can even be used by employers and employee groups to come up with specifics of how vaccine should be implemented in their area. He thought there was a good balance between what the traditional role has been of federal public health guidelines that state and local jurisdictions implement. In terms of the algorithm, he noted that the three criteria he is used to working with are age, a supervisor's description of the employee's job duties, and CDC's Social Vulnerability Index (SVI), which he assumed would map the employee's residence onto the Census tract and based on the 15 criteria developed on

that. He wondered if anything was missing from that. He expressed appreciation for how much CDC cares about them in the real world and the people they serve.

Dr. Dooling indicated that the 3 elements are all things that the WG has spoken about and can be found in different ways in the clinical considerations that will accompany the recommendation. All are important and can be used in sub-prioritization. In terms of whether anything was missing, the flexibility to implement in every location would be a little bit different. As mentioned, there will be a lot more detail coming in the clinical considerations document that will accompany the recommendation.

Dr. Duchin (NACCHO) emphasized the importance of program implementation, which is critical. ACIP's recommendation the previous day for use of the second safe and effective COVID-19 vaccine in as many weeks is another crucial milestone for eventually ending this terrible pandemic that continues to rule the country in so many ways. However, it is important to remember that a COVID-19 vaccination program is not just about vaccines, but about vaccination—getting those vaccines to the people who need them. At this point, state and local public health departments are on life support. They are hamstrung and stymied by the lack of necessary federal funding to allow them to take advantage of these newly available vaccines. For example, resources are needed for public health vaccination clinics to ensure equitable access to vaccines across communities and populations, for coordination and enrollment of provisions and provision of support and technical assistance to healthcare providers around clinical guidance and vaccine allocation, and for the critical work of public engagement and communications. Operation Warp Speed (OWS) has delivered two "Cadillac" vaccines, but they have come with empty gas tanks. There is a long and difficult road ahead. There is a critical and immediate need for adequate funding and resources for vaccine program implementation so that as many people across the nation as possible are able to realize the full potential of these highly effective COVID-19 vaccines and realize the commitment they heard during the day that the federal government would make them available as quickly, efficiently, expeditiously, and equitably as possible.

Dr. Zahn (NACCHO) said the algorithm for Phases 1b and 1c made sense to him and he thought it would be very useful for local public health to prioritize who receives limited vaccines initially. He congratulated and expressed appreciation for all the work the WG and CDC have been doing. This framework will be very helpful as described to help local public health and local government and industry understand who is prioritized, but it also is going to be extremely important to make sure that the community individuals understand where they fit into it. It has to be translated to some relatively simple bullet points so that people can understand it and self-identify so that they can understand exactly where they fit into it and seek vaccination. While everybody could guess, it is worth saying out loud that local public health has little enthusiasm for eventually being a traffic cop so to speak for every individual who may or may not get vaccinated. HCP likely feel the same way. There must be reliance on the people for appropriate outreach. Focused outreach is public health's job, particularly in terms of outreach to essential workers. This is a very important and noble goal, but it remains just a sentiment unless there is federal funding to make that come alive—make that live and breathe on a local level. Federal funding is terribly important. It cannot be emphasized enough that preparations are weeks and months behind to really do this right.

Dr. Frey thanked Drs. Dooling and Oliver for excellent presentations, the WG, CDC, and everybody involved in this effort for the thoughtfulness and the amount of work that they have done on behalf of multiple communities within this country and others. Regarding the example of vaccinating correctional officers as essential workers and the residents of shelters, she

requested clarity on whether this meant the ability to vaccinate both groups at the same time as part of the Phase 1b effort, and how prioritization of the residents in 1c would occur since some people would be very elderly, some would have a certain amount of comorbidities, and all groups within the various facilities are very vulnerable for multiple reasons.

Dr. Oliver clarified that Dr. Frey interpreted the intent correctly. They wanted to emphasize that they were not recommending the mRNA vaccine as a tool for a singular point source outbreak, but instead it is based on local epidemiology at the local or states jurisdiction. There was a decision that based on outbreaks or rates of transmission broadly that the implementation and current status of disease would facilitate having broader access and vaccinating both prisoners and/or people residing in homeless shelters at the same time could be done. That absolutely would be based on the local epidemiology and local decisions made.

Dr. Cohn added that this is the exact reason they want to have flexibility, so that no one has to split up residents in a homeless shelter into Phases 1b and 1c. Depending on how many doses are available, a choice could be made to vaccinate staff and also residents at the same time or, if necessary, separate it out and vaccinate staff in 1b and older adults in 1b and then hold out the rest of the facility as 1c. This would give local jurisdictions the option to go either way depending on all of the different variables.

Dr. Sanchez found it difficult to choose because he certainly wants to vaccinate all Phase 1a, 1b, and 1c as all of them are high risk. He also agreed that self-prioritization among essential workers and among those in 1c would be important depending on the vaccine supply. He was glad that this could be worked through at local and state levels, because some of the persons who are aged 65 to 74 years and those with high risk medical conditions are having to work in a crowded workplace compared to those who can work from home. Some of that thinking will need to be taken into consideration. The risk certainly would be less for someone who could work at home and quarantine as much as possible versus those who may not be essential but do have to go to the workplace. Some people over 65 years are retired. Those are going to be difficult to sort through. This is going to be a difficult process and everyone will need as much direction as possible. One thing is severity and the other is the exposure. Those with less exposure may not be relegated to the front of the line either.

Dr. Goldman (ACP) echoed what Dr. Duchin had so eloquently stated on implementation. Based on lessons learned from the initial phase and rollout, he pointed out that initial sub-prioritization can become a double-edged sword as a path of least resistance, making the allocation and equitable distribution even more inequitable as some localities are using it to vaccinate those using the easiest method possible but not necessarily those at highest risk. He stressed the importance of the frontline workers in outpatient medical centers and physician offices, including medical assistants, front desk, and clerical staff, who do not have access to personal protective equipment (PPE) and are on the front lines being exposed to the patients. In many localities, there does not seem to be outreach, education, or the ability to get vaccines to those who need it the most. In addition to the importance of federal support and federal funding is the importance of oversight. This remarkable feat of science has been created to get this vaccine out as quickly as possible, but it does not help if it does not get to the people it needs to get to as quickly as possible. There is concern that many localities are not truly following these guidelines in the way they were intended, to make sure that those most at risk and most vulnerable get the vaccines. That said, with this phased allocation, he applauded and stressed the work of the COVID-19 WG and thought it was a very balanced approach for Phase 1b and was the path for balancing the needs of society versus those most at risk for a bad outcome from disease. In summary, he stressed the importance of making sure these guidelines are

really looked at by localities so that the vaccine gets to where it is needed most and that those most at risk are not forgotten, especially the essential workers, the front desk workers, medical staff, medical clinics, and physician offices and the need to vaccinate everyone.

Mrs. McNally asked if the WG considered whether the clinical considerations would address both state and federal workers in the appropriate categories, such as the legal category in terms of the difference between state and federal court judges.

Dr. Dooling indicated that the CISA list of essential and critical infrastructure does not distinguish between state, federal, or local.

Dr. Lee acknowledged that this has been a complex set of discussions with multiple considerations. As mentioned earlier, she truly believes the goal is to make sure that everyone who wants a vaccine can get one. This is hopefully a path to get there that she hopes is a short-term situation. Reflecting on the importance of the balance considerations for Phase 1b, she said she does feel that they are in a different place in the pandemic than a month or two ago and she is very worried about health care capacity. In her mind, the approach of making sure that they are simultaneously considering risk of infection and risk of hospitalization and death in a balanced manner, and also agrees with the very excellent point that they have not yet seen enough data on long-term sequelae. She believes that there is more to come for understanding the morbidity associated with infection that may not always be reflected in the hospitalization or death rates. Including those 75 years of age and older in Phase 1b makes a lot of sense given the data presented on risk of hospitalizations and risk of death by age. In a sense, not only is this ensuring that they are maximizing the benefits for an incredibly high-risk population, but in her mind, that also potentially has a multiplier effect in that if they are at the tipping point in some healthcare systems with regard to capacity, those death rates get multiplied because of issues with health care capacity. They will have to pay close attention to where things are with capacity as the pandemic evolves and may need to be flexible going forward. With regard to essential workers, she highlighted the key points that are important from her perspective. She feels that it is incredibly important to focus in on the frontline health essential workers, those who need to get their jobs done and cannot do it without interacting with the public or with other staff, and industries that may not have sufficient resources in place for mitigation. The risk of infection does remain high for frontline workers. She also thinks it is important to call out that where health and economic disparities are prominent, they also need to remain focused on addressing those disparities. She is hopeful that by focusing in on these frontline essential workers in particular, they can ensure that efficient and equitable allocation remains at the forefront in this category. As mentioned before, if sub-prioritization is necessary, frontline essential workers come to mind as where to emphasize implementation. She is hoping that by the time Phases 1c and 2 come along that there will be enough doses. If for some reason there are not enough doses at the time those Phases are ready to roll out, 1c may still be too large. Just as they had to reconsider Phase 1a and 1b in the context of the current pandemic, she thinks they have to be prepared to adapt in future phases because it is unknown where they will be in another month as those phases roll out. Therefore, they should continuously incorporate the data that they are seeing so that they can adapt the recommendations as needed.

Dr. Atmar added his congratulations to Dr. Dooling, Dr. Oliver, and the WG for providing a framework to address a very difficult question and problem. As he listened to the discussion, one of the things that he became concerned about was that based on the different groups that will be included in 1b, there will need to be different strategies to reach out to those groups to get them vaccinated. They also heard that the resources available to many of the public health entities across the nation are already quite stressed and the ability to reach out to a large

number of different target groups is potentially problematic. While he understood that the solutions need to be local, there also is the potential for local abuse that as schedules are not filled based on ACIP's guidance, it is reasonable to move to other groups. He could see that in one community with a given vaccine supply, groups 1b and 1c could be moved through very quickly and the remaining individuals could begin being vaccinated, while another community might continue to vaccinate persons in group 1b. He asked whether the WG had considered this and if they had solutions for monitoring this.

Dr. Talbot emphasized that she is ever thankful for essential workers. She has a teenage boy who drinks a gallon of milk per day. Without front-facing critical workers who are still on farms, still processing the milk, and getting it into the grocery stores, it would be difficult in her home. It is not just the milk—it's all of it. She feels very strongly that there is a balance of saving lives and keeping the infrastructure in place. As Dr. Duchin pointed out, it is easy to give vaccine in clinics. It is not easy to give vaccines to the people who are on the frontlines for multiple reasons. One is that they have to take off time from work to do that. That is unpaid time that most of them cannot afford because they are not able to pay their bills. Second is if they do have fever post-vaccination, they have to take more time off work. She said she was really speaking to Senators and Congressmen and expressed hope that if they are not listening, their staffs were listening. It is critical to work with the White House to fund state health departments to get vaccine out so that everyone can continue to get their milk and eggs and move that forward. She has been very impressed with many of the private groups that have come forward and offered to help states. Where they are going to shine as Americans is through a lot of public-private partnerships to make this happen. Companies are going to have to open their doors to immunizers. It is going to take funding of states for them to be able to supply staff to do this kind of immunization. She implored Senators and Congressmen who were listening to please pay attention to this and please realize that funding is needed to move America past this outbreak. They love the vaccines that were funded, both of which are phenomenal, but funding is needed in the communities.

Ms. Bahta echoed gratitude for the work of Drs. Oliver and Dooling in articulating the WG's sentiments. Looking at the various groups and examples, it was not clear to her where congregate settings fit in.

Dr. Dooling indicated that congregate settings fit in a number of ways. Corrections officers and workers were specifically called out as frontline essential workers. Other workers in congregate settings may be included as essential workers in Phase 1c. Dr. Oliver then presented that based on local decision-making, if the epidemiology and implementation factors both favor vaccinating workers and residents within a given congregate setting (be that prison, jail, or a homeless shelter) that this would be possible under the clinical considerations and general flexibility of recommendation.

Dr. Bernstein pointed out that the task of creating a plan is much more difficult than critiquing a plan, so he gave kudos and sincere gratitude for the wonderful work of Drs. Dooling and Oliver and the additional talented, bright, and insightful CDC folks and the entire COVID-19 Vaccine WG. He said he was struggling with the numbers. They heard from Dr. Messonnier earlier that basically 100 million doses would be available in December, January, and February that in turn will accommodate 50 million individuals assuming they all accept it. The number of HCP, LTCFs residents, and frontline essential workers is 54 million. Then 3 million individuals are 75 years of age and older and then 65 to 74 years of age. He wondered how moving from one group to another was factored in or modeled as far as acceptance of the vaccine by these various groups.

Dr. Cohn clarified that Dr. Messonnier's comments were related to the number of individuals for whom a 2-dose series would be available by the end of each month. It did not mean that this would be the number of individuals who would be vaccinated in that month. By the end of December, there will be enough doses to vaccinate nearly 20 million people. By the end of January, there will be enough doses to vaccinate nearly 30 million additional people, and by the end of February, there will be enough doses to vaccinate 50 million additional people. That will help to better understand these numbers more, but uptake in these populations has not been modeled into the size of the groups. It is more related to the gating criteria and how quickly areas are able to move through these groups. Obviously, the hope is that uptake will be very high. However, it may not be very high immediately. For example, a huge number of individuals 75 years of age and older might get vaccinated immediately, but then demand in that age group may decrease. Though people in that category may still come in to get vaccinated, a location may still have enough doses to move down to 65 years of age. They knew there would be variation and did not want to overwhelm demand based on the number of doses that will be available over January and February. They are hopeful that there will be enough doses to vaccinate through these groups sometime by the end of January or early February for the Phase 1b individuals.

Dr. Bernstein said he was just trying to do this as a balance sheet because he was separating it out be 75 plus versus the 65 to 74 year olds as their mortality is notably higher. The HCP, LTCF residents, essential workers, and those 65 and older essentially would be that 100 million individuals who could be covered in the next 3 months if there was 100% acceptance. He clarified that he was suggesting that ACIP consider adding persons aged 65 plus into Phase 1b.

Dr. Poehling express her thanks to Dr. Oliver, Dr. Dooling, and the entire WG for these very clear presentations and thinking about the path to vaccinating all who want to be vaccinated. Everyone hopes that the vaccine supply will increase faster than expected because these decisions are really wrenching right now. She agreed with the balance of morbidity, mortality, and preservation of societal function. If she understood correctly, the 75 years and older group represents 8% of the population, 25% of the hospitalizations, and have the highest death rate. Frontline essential workers have the highest exposure and it is known that racial and ethnic disparities are attributable to increased exposure and prevalence of high-risk conditions. To get to what many have reiterated and what Dr. Cohn just said, to have 2 doses of vaccine for 50 million people by the end of January and 100 million doses by the end of February, there is going to need to be an incredible amount of support to the public health infrastructure to be able to meet this opportunity. The faster they meet this opportunity, the healthier the US will be.

Dr. Gluckman (AHIP) added his gratitude to Dr. Dooling, Dr. Oliver, the WG, and the voting members of ACIP who have a difficult responsibility. Regarding the definition of essential workers not recommended in Phase 1b, the other essential workers, from an equity perspective, in some of those professions many of people work completely in a remote setting. He wondered whether they should call out remote workers who do not meet other criteria for high-risk conditions to be considered in Phase 2 because he would have concern that people who are in low-income areas, minorities, and high-risk racial groups might be at higher risk than people who can protect themselves by the nature of their profession by being completely removed. He has been asked about the definition of "high-risk conditions" and asked if ACIP can be more explicit as they get closer to Phase 1c about medical risks for high-risk conditions. He was specifically asking if adults with developmental delay are considered to be high-risk. If they are living in a congregate setting, that is clearly specified. However, it was not clear to him whether

young people with developmental delay are considered to be in a high-risk condition simply because of the nature of that condition.

Dr. Dooling said that how to handle workers who can do their job either entirely or mostly from home definitely was a topic the WG struggled with, and she welcomed input from other ACIP voting members and liaisons about clear direction on that point. Regarding high-risk conditions, they have relied on the ongoing review of the literature that CDC does to determine which conditions are associated with increased risk of COVID severity. At this time, there are 11 of these. CDC is constantly reviewing the literature to assess which conditions meet that bar of evidence.

Dr. Weiser (IHS) indicated that the Indian Health Service is the federal agency that is charged with upholding the federal trust responsibility to Tribal Nations across the country. Data from 14 states were recently published in the *MMWR* on December 11, 2020 that demonstrated age-adjusted COVID-19-associated mortality among American Indians and Alaska Natives was 1.8 times that of non-Hispanic whites. The risk of hospitalization and deaths associated with COVID-19 increased with age for both races and was higher for American Indians and Alaska Natives compared to whites. The relative disparity in mortality though was greatest for those who are aged 20 to 49 years. Among those in the 20 to 29 year age group, 30 to 39 year age group, and 40 to 49 year age group, the COVID-19 mortality rates among American Indians and Alaska Natives were 10.5, 11.6, and 8.2 times respectively than rates among white persons. The burden of underlying diseases such as diabetes, obesity, heart disease, and chronic lung disease occurs in American Indians and Alaska Natives at much younger ages and is likely to be a major contributing factor to this disparity. Through Operation Warp Speed, the US government has considered IHS as a jurisdiction like states and has provided Tribes the option to receive COVID-19 vaccinations through either IHS or their states. Given the severity and rates of infection, hospitalization, and death experienced by American Indians and Alaska Natives and a unique government-to-government relationship between the federal government and Indian Tribes, consideration should be given to prioritize vaccines for American Indian and Alaska Native people when supplies are scarce. Recognizing that the ACIP is reluctant to make a race-based preference, it is important to note that the Indian Tribes have a political, not a racial, status and there is an existing healthcare infrastructure specifically for American Indian and Alaska Native people that can be leveraged. With these considerations in mind, every effort must be made to ensure that not only the vaccines but the resources to distribute and administer vaccines for American Indians and Alaska Native people are provided to address these important disparities regardless of which jurisdiction, IHS or the state, is supplying vaccines for American Indian and Alaska Native people.

Dr. Cohn expressed appreciation for Dr. Weiser's comment and the challenges of American Indian and Alaska Native populations. She clarified that allocations are different than how they are setting up prioritization. The prioritizations that ACIP will be voting on is meant to provide high-level recommendations for where states and jurisdictions should allocate their doses of vaccine, knowing that there is flexibility with different circumstances in different communities. However, allocation decisions are being made by Operation Warp Speed. While CDC understands the concern, ACIP does not impact the allocation of doses to jurisdictions.

Dr. Howell (AIM) express gratitude on behalf of AIM for this additional guidance and consideration. She provided some context for what the 64 awardees are currently facing in terms of prioritizing vaccine at local and state levels. They are receiving multiple emails and phone calls from different employer groups and high-risk individuals wanting to be a priority for vaccination. It is refreshing to see the interest in vaccination, but it does place them in a very

difficult position. They surveyed their 64 members regarding Phases 1b and 1c and received 25 responses. The survey was done prior to the information presented during this session, but 59% of members preferred vaccinating 65 and older and those with underlying health conditions first, 41% said essential workers, and in the comments many did say they planned on doing a combination of the two. At the November ACIP meeting, results from a Harris Poll were presented showing public support for prioritizing healthcare workers, seniors, and immunocompromised individuals. She does think some very clear communication and talking points will be needed as to why frontline essential workers, who may be younger and healthier, are being vaccinated over older individuals and those with multiple underlying health conditions. Of their membership, 68% reported being concerned about communications around that. The considerations presented during this session will be helpful in making decisions around prioritization of limited vaccine, and 76% of members said they wanted guidance regarding further prioritization of essential workers. More guidance regarding other congregate settings, including homeless shelters, drug treatment centers, and corrections facilities would be appreciated. If staff choose not to be vaccinated, that leaves residents vulnerable to COVID-19, many of whom have underlying health conditions. Logistically, it is much easier to vaccinate staff and residents at the same time. Many awardees have already started creating their own priorities. It is very likely that states may differ in their prioritization, which will make communicating with the public difficult and confusing. Based on another comment, a priority group is not something that is documented at the time of vaccination or generally documented in Immunization Information Systems (IIS). Therefore, it will not be possible to enforce prioritization and it will be difficult to determine uptake amongst these priority groups if they are not age-based. For planning purposes, she encouraged the committee to vote on both 1b and 1c so vaccination can be prioritized into the future, and she thanked them for the additional sub-prioritization and the considerations that were presented earlier.

Dr. Arthur (BIO) acknowledged that this is an amazingly complicated set of issues and expressed appreciation for the thoughtful approach of CDC and the WG. Regarding the manufacturing category in the frontline essential workers, BIO represents companies that are making key medicines as well as food and agriculture products. Obviously, many of their workers are part of the Homeland Security essential critical infrastructure workers. She asked that they clarify for states those workers within manufacturing who are key to infrastructure, making medicines, making food and agriculture products, and making PPE so that Governors and states can allocate doses to those populations as well who are manufacturing products that are needed for healthcare and other places. BIO also submitted a comment to the docket, but she wanted to make that case to the group as well.

Dr. DePalma (AAPA) thanked the committee members and everyone behind the scenes supporting those members for this important work and for the opportunity to be on these calls and speak. AAPA has heard from many Physician Assistant (PA) schools that thousands of PA students are having their education delayed because health systems are afraid of exposing students to COVID and also of exposing patients to students who may be infected. There are thousands of PAs who, like physicians and Nurse Practitioners (NPs), will go on to work in hospitals, emergency departments (EDs), primary care, and other specialties who will be delayed in entering the health care workforce. Many of these students are young and healthy and would fall into Group 2 for vaccines. As important as it is to get the vaccines to older persons and frontline workers, she expressed her hope that ACIP would consider adding PA and other healthcare students to 1b or 1c so they can graduate and help with the current health crisis. A lot of health systems are not making vaccines available to students.

Dr. Cohn clarified that in Phase 1a, the definition of HCP does include paid and unpaid HCP, which would include students. While there may be some confusion about that, those groups would be included in Phase 1a.

Dr. Hahn (CSTE) said that as a state health representative, what she fears the most is paralysis by analysis. That is, as they worry so much, and rightly so, about equity and fairness, they will be afraid to move forward or on to another group, even if vaccination is slowing down, because they are worried about creating a sense of inequity. She proposed that there is no way that everyone is going to be able to all stay lockstep. There need to be clear messages that there are going to be local decisions and local control. The worst thing that can happen is leaving those vaccines in the freezer because of being afraid to move into the next group. They must have faith that local and state public health officials will do the right thing. She heard a comment about abuse of the vaccine. Clearly, there needs to be oversight as best as can be dome, but the locals need to be able to do what they think is right in their circumstances so that doses are not wasted. The number one goal is to get that vaccine out there and get folks vaccinated.

Dr. Kimberlin (AAP Redbook) requested that Slide 10 of Dr. Dooling's presentation be put back up. While they had continued to talk over the last couple hours about frontline essential workers, to his understanding, this was the only slide that actually lists them out. He wanted to confirm that when they talked about frontline essential workers, this referred to the bulleted group on the left-hand portion of this slide and that the same would be true all the way through the vote. Dr. Cohn confirmed this to be correct. Dr. Kimberlin emphasized the importance of this slide and requested that it be left up for as long as possible so that everyone would know what they were talking about. Obviously, he is representing the AAP and children are not part of this for reasons that are rather apparent. However, he did think that they would be supporting children by having educators in the frontline essential (e.g., teachers, daycare staff, support staff, and so forth) and he commended the inclusion of them as frontline essential workers.

Dr. Drees (SHEA) returned to the comment about remote workers because certainly within the healthcare workforce, there is a substantial proportion of people who are able to work remotely and are still essential. A hospital or clinic cannot function without its IT infrastructure working correctly or without the bills being submitted. They have observed that a lot of the COVID-positive health care workforce is not necessarily from direct patient care. It is largely community exposure, which anyone is at risk of regardless of their actual job duties. There are also healthcare worker-to-healthcare worker exposures from an asymptomatic or pre-symptomatic healthcare worker, which would put remote workers at somewhat less risk if they are working remotely. She expressed appreciation for the criteria for moving from Phase 1a to Phase 1b, but if the expectation is to have all of the remote health care workers vaccinated first, that would delay deployment to the 75 year old and older patient group, as well as the essential workers patient group. Some additional clarification around having a dual stream to capture remote workers but not hold off before starting on patients would perhaps be helpful.

Dr. Lee appreciated Dr. Kimberlin asking for the slide to put up as it was incredibly helpful. She also recognized that at a national level, ACIP will make some recommendations about prioritization which they hope will translate into allocation, recognizing that it might not be perfectly aligned at a local and state level. But these recommendations are going to be imperfect. The group on the left of the slide provide a gestalt about the industries believed to be predominately frontline, but obviously as with health care workers and as Dr. Drees just mentioned, there are people in healthcare who are able to work remotely. The WG specifically tried to focus those doses on people who are actually on the frontlines. The same goes for each of these categories in that there are probably individuals in each of these groups who are

actually able to work remotely, whereas the majority will be on the frontline. She struggles somewhat with making these recommendations as firm and as clear as possible. Even though communication strategies should do that, it is really challenging to implement something like this. She wanted to make sure is that there is clarity around the recommendations and the intent. Thinking about Dr. Oliver's slide around the ethics and questions that are being asked in the *MMWR* article, she strongly endorsed that each industry go back to those recommendations because those questions will get to the intent of what is meant by essential workers functionally. She 100% agreed that vaccines cannot be left sitting on the shelves. She recognized that there are huge implementation challenges with this and she does not think they should be policing who actually qualifies and who does not. The hope is that they could come together as communities, that each of these communities individually will be able to articulate who is truly frontline and who is not, and to partner with public health and healthcare delivery systems on that. There is going to have to be some level of trust without being the police on this, but Dr. Lee also feels strongly that they need to be accountable. While vaccine cannot be left sitting on shelves and she still feels like efficiency is important, equity is still incredibly important. Therefore, they are going to have to find ways to ensure that we are actually measuring in some way the equity of distribution of these vaccines, even if they are not easy to do and without asking people to be the police. If they cannot do that, her worry is that, for example in Phase 1c, it is going to be very easy for there to be insufficient doses. They cannot abandon equity just because it is hard to measure and hard to do.

Dr. Cohn indicated that CDC is working with local and state health departments as well as some of these industries to be able to measure and account for how many doses are being given to these different groups. There will be some way to measure the effectiveness of reaching different groups who are prioritized for vaccination. She also mentioned to ACIP members that while these bullet points represent a high level list of employment groups that they recommend be included in the frontline essential workers, they are asking ACIP to vote on language that says, "frontline essential workers." This is not black and white and it absolutely will vary by local context. Even employment groups in some localities may consider frontline workers that would not make sense for other localities based on, for example, urban versus rural and different types of communities.

Ms. Stinchfield (NAPNAP) said she could not thank the WG enough for their great work, especially since they had triple the meetings that ACIP did. She agreed with the recommendations, and especially has appreciated the paradigm of science, ethics, and practical implementation. She wanted to give voice, for a moment, from a person from hospitals and clinics who is responsible to implement and vaccinate Children's Hospitals and Clinics of Minnesota, a large healthcare system where vaccine was due to arrive the next day. She emphasized that the image they see of the joyful shot in the arm really belies the work behind it. Hospitals and clinics are both elated and exhausted. The enormous heavy lift of operationalizing vaccinations in healthcare is not easy. Even though they do vaccinations, this is not easy. Extensive resources are needed for an overstressed, understaffed healthcare system that she would say is also on life support. Every hospital in the US has greatly appreciated the standard tools that CDC has provided (e.g., standing orders, screening tools, education). That is exactly what they needed so that every hospital is not trying to figure out the same process. This is saving resources and getting more around standard work. Significant help is needed for Phase 1b folks who will really need significant help and will benefit from more tools, such as tools to help think through prioritization and even some mathematical considerations such as weighting at the local level, scheduling tools, and a state dashboard so that people know where they are in this process. Every state or every local level does not need to have to figure out a dashboard. Everyone should share resources and they should be pooled together in a centralized place

where they can learn from each other. For example, scheduling seems straightforward with Dose 1 followed by Dose 2 at 21 days later. However, implementing that with rolling clinics and different cohorts is a daunting task. Hospitals are short-staffed. People are out sick with COVID. They are out on quarantine. Many of them are the same nurses who are going to be vaccinating. Looking forward, logistical implementation tools and materials are needed in multiple languages to help those who are implementing category 1b and should be very important priorities.

Dr. Grogg (AOA) thanked everybody involved with the vaccines and recognized that this is a monumental task. He asked how HCP can get the vaccines for their offices and how individuals in different phases get notified from the state or know how to find vaccines.

Dr. Whitley-Williams (NMA) emphasized the importance supporting equitable access to particular communities of color as much as possible. While this is supported in words and she was very happy to hear Dr. Cohn say that there is going to be some monitoring throughout the administration of vaccinations, it was not clear whether that would be done on a national basis or would be something states would do. Assessing which groups are actually being vaccinated to determine whether those who are at highest risk are truly being reached is very important. She thanked the WG, CDC staff, and Drs. Romero, Bell, Dooling, and Oliver for a phenomenal amount of work. When she speaks to community persons, she tries to emphasize that some of the most caring people are working on this. She understands that the task is daunting, but moving forward it will be very helpful to be able to relay to the community that equity is being monitored in real-time as vaccine doses are administered.

Dr. Romero observed that there had been excellent comments on vaccine allocation, distribution, and administration. However, there also must be an educational component of this to the groups who are the frontline essential workers being prioritized in the Phases 1b and 1c categories. He is learning increasingly as he begins to offer education to the agricultural workers of the US that one size does not fit all. Methods must be developed that transmit to them their need for the vaccine and how to get the vaccine, reaching into those communities with culturally and linguistically appropriate educational measures.

Dr. Fryhofer (AMA) said that speaking as a practicing physician, she echoed the comments of Drs. Grogg and Goldman earlier pertaining to how HCP get vaccine for their offices. Physicians who are employed by the hospital are being taken care of, but she personally has received numerous emails from physicians wanting to know where to go. She received one email from a physician who is the Director of a Good Samaritan Clinic who was trying to figure out how to get vaccine for herself and her staff. This is a practice that takes care of people who do not have any other way of getting medical care—the most vulnerable. She has received emails from physicians who are doing locums. She was struck when Dr. Grogg asked that question that unlike the other questions that have been asked, there was silence and she realized that this is really not what ACIP can do. However, she thinks ACIP can raise awareness that this is a problem and that hospitals need to reach out past their walls to the community to make sure frontline HCP have access to vaccine so they can continue to take care of their patients.

Dr. McKinney (APTR) asked Dr. Dooling or Dr. Oliver to comment on the risk for hospitalization and death among persons at 65 to 74 years of age who have one or more comorbid conditions versus those 75 and over all-comers since they are presented as being in different priority groups, 1b and 1c.

Dr. Oliver said that she did not have those numbers readily available, but would see if they could get some information to share.

Dr. Shah (ASTHO) requested further information about the rationale for the inclusion of food service under the "other" category. By his reckoning, they are certainly essential but also are on the frontline. He understands that there will be nuances at the state level. He also was curious about how to let folks know when it is their time in line.

Dr. Zahn (NACCHO) appreciated that residents of homeless shelters and inmates/detainees of correctional facilities were included in the conversation of 1b and 1c. He recalled that there was some language about "depending on the local epidemiology and situation." In terms of vaccinating persons experiencing homelessness or in shelter situations, it is important to understand their social, economic, and physical situation along with their often difficult relationship with and distrust of government. Anybody who was worked with this population knows that it is a resource-intensive, long-term process to get them vaccinated. If he wanted to vaccinate that population locally, they would have to start doing it sooner rather than later. There is not really an epidemiologic or local reason that would make him change that.

Dr. Messonnier thanked the ACIP members and liaisons for their very helpful comments. They will try in the clinical considerations document to be more specific about the thinking of the WG regarding why certain groups fell into certain categories and what it is meant to convey, with the hope that at least being able to articulate their rationale may help those on the frontlines who are the ones who actually will be faced with making a list and deciding who gets pushed to the front and who gets pushed back. For example, regarding ethics and homeless shelters, language is included that reflects the WG's consideration that there have clearly been several large outbreaks in those populations and that this may mean that some jurisdictions will need to prioritize those groups over others. Broadly, these comments are especially helpful because it points out to the CDC areas that need to be made clearer about the rationale. The CDC staff and the WG have tried to walk a careful line in providing an approach to this and the thinking behind it, but also have tried not to over-engineer it. As Dr. Hahn said, CDC recognizes that those on the frontlines within jurisdictions will have to turn this into implementable guidance. They tried to strike the correct balance, but will definitely be listening carefully for places where additional clarity or additional precision would be helpful to those who are going to be faced with making these tough choices.

Dr. Szilagyi acknowledged the tremendous amount of angst people were feeling about who exactly goes into Phases 1b versus 1c and said he understood, as he had a lot of angst about it himself. He pointed out that the hope is that all individuals who are in these groups will accept the vaccine. However, there are a lot of data from a number of surveys that suggest that while a lot of individuals want the vaccine, many want to wait and see. It is possible that Phase 1b will be passed through extremely quickly within weeks or a month even if everybody does it the way they really want to and even with the substantial amount of flexibility being provided to localities. One of his biggest concerns has to do with the need to provide a significant amount of effort, resources, and outreach to enable vaccine confidence. This is especially true among communities of color and a lot of this is going to come at the local level.

Dr. Duchin (NACCHO) requested clarification about whether the nation's public health workers who are involved in activities other than clinical (e.g., surveillance, disease and COVID outbreak investigation response, and planning for these vaccination programs) fall in the prioritization. It would be nice to have a list if possible.

Dr. Dooling indicated that public health staff who have direct patient contact would be considered HCP under the current definition. Other public health workers are considered essential workers under the CISA definition and would fall under Phase 1c.

Dr. Poehling understood that there would be enough doses to vaccinate 30 million people in January and 50 million people in February. Recalling a comment from Dr. Bernstein earlier, she wondered whether 1b could include those 65 years of age and older and frontline essential workers.

Dr. Cohn said she thought one of the implementation considerations about sticking with the 75+ group as opposed to increasing is to allow for more targeted and focused vaccination, especially given that all of these doses are not all available at the beginning of the month. It would dilute things to add 32 million 65 to 74 year olds. She called on other ACIP members who have been involved in the WG discussions.

Dr. Bell said she thought the point being raised was very legitimate and reflected a lot of concern about balancing demand and supply and all of those considerations. Having the opportunity not to focus on an enormous group immediately has benefits. While the supply projections provided by HHS are greatly appreciated, they are only projections. Though she would love to believe that this is the way things are going to go, this is actually unknown. They certainly do not want supply to outstrip demand, but they also do not want to have to compromise. That is why the WG landed on this kind of balance for the moment. Being clear with suggestions about how to prioritize in Phase 1b, at least from the ACIP's perspective, will be something they need to get ahead of relatively quickly. Her preference would be to wait and see for another period three weeks or so and if it appears that they are reaching Phase 1c, the ACIP could provide some additional guidance in terms of how to approach the large group of people in Phase 1c. On the other hand, if the ACIP feels strongly that they should go down in the age recommendations for the current recommendations, they certainly could take that up.

Dr. Romero said that as he thought about prioritization of the over 65 year old group, it was the number of individuals in that group and the supply that were most concerning to him. Coming to the proposed recommendation identifies the highest risk group within that age group and addresses what they believe to be vaccine availability at this time. As Dr. Bell pointed out, if there is more vaccine than projected they can certainly open this up. However, including the entire group would prolong that phase significantly while waiting for more vaccine to become available. Given the two populations of essential workers and those individuals over 65 years of age, this is best way of melding the two groups together and giving an equitable and appropriate distribution of the vaccine to this group.

Dr. Lee agreed with Drs. Bell and Romero and felt comfortable that the WG had a chance to thoroughly deliberate and review the data at hand for the current Phase 1b recommendation. She personally did not feel comfortable expanding on the fly because they need to look at all of the data in totality. If they feel the need to expand, she would advocate for another emergency meeting at another time.

Dr. Dooling emphasized that the clinical considerations could be very clear about gating criteria and make those specific to age.

Dr. Sanchez said that while he was glad about the anticipation of being able to go through the phases quickly, he remained concerned about those 65 to 74 years of age and those with underlying medical conditions. Those groups can be sub-prioritized as well based on exposure risk. For instance, those who are retired should not fall into Phase 1b. However, some of the individuals in 1c who are older or have high-risk medical conditions and are still working, not working remotely, and are performing something important to society should be moved up versus those who are young and unlikely to have a more severe disease.

Dr. Talbot thought the WG referred to the long-term effects of COVID but were not very specific. She thought they probably should clarify what was meant by that for everyone listening. There are young adults who survive hospitalization but may not have a life as before because they have had strokes, heart failure, multiple amputations, et cetera. At this time, they do not have data on this. She thought they needed to be very cautious about saying that young adults would be fine. She spent the past week on back-up clinical call and read these charts and cried every day.

Dr. Szilagyi said he has agonized over the 65 and older age group as well. While he is not on the COVID Vaccine WG, he was concerned about making that decision at this time and suggested putting this into a sub-prioritization decision within 1c because it may end up being a combination of being between 65 and 75 *and* having one or more or multiple chronic conditions. Some individuals over 65 years of age are already in frontline workers or HCP, so they will already be covered. He suggested addressing this in a future meeting or try to get additional data to look at exactly who is high-risk. This would add another potential 20 million minus the overlap, so maybe 17 or 18 million of over 65 years old.

Dr. Romero added that the implementation of this, if sub-prioritized, puts a significant burden on health care and public health to identify individuals who have these comorbid conditions and may exacerbate the disparities because some individuals in this age group do not have access to medical care and cannot come up with a doctor's note that will confirm that they have diabetes, hypertension, et cetera.

Dr. Hunter supported the current policy suggestion that was proposed for an ACIP vote in terms of leaving things to the way they are, with individuals 75 and older and the narrowed frontline essential workers. Going through the groups quickly is not necessarily a problem because he thinks it will address the concerns raised that they would get to younger folks faster.

Dr. Cohn thanked the ACIP members for the incredible thought that had been put into this challenging question. From an implementation perspective, the way that CDC has thought about vaccinating persons with underlying illnesses is that one of the best ways to do so is to get vaccines into provider offices and pharmacies. In the near term, there will be the capacity to distribute vaccines more broadly to many more administration sites. The number of administration sites will likely increase with the Moderna vaccine being recommended and authorized. From an implementation perspective, it is easier identifying persons who have underlying health conditions when there is more vaccine to spread further. One thing they were hearing is some additional guidance around sub-prioritization within 1c may be helpful. For instance, prioritizing age or underlying medical conditions over some of the healthier non-frontline essential workers may ensure that those groups are right behind the current groups in the Phase 1b group. They could recommend the groups in 1c during this vote and then could come back with some more specific clinical considerations or recommendations for the sub-prioritization of 1c.

Dr. Bell indicated this had been a topic of discussion within the WG already and many of them are thinking about that as a next step.

Dr. Frey agreed with moving forward with the question and vote as it stood. She thinks they will move through these groups very quickly and they can only do so much at one time. She agreed with everything everyone was saying regarding their concerns, but they can only move so quickly and have a limited number of vaccines. More vaccines are forthcoming.

Dr. Atmar added his voice to the last few comments. When the WG went through the presentation initially, he wondered about the threshold at 75 years of age versus 65 years of age, but he was persuaded by the overall presentation, Dr. Bell's comments about the uncertainty of the projected supply, and the likelihood that in a matter of as few as 2 to 3 weeks, that they could move from 1b to 1c so that the delay will not be that much greater before they are able to vaccinate persons over 65 years of age. Based on Dr. Bell's comments, it sounded like the WG has already considered this. He requested that she and the other WG members take the concerns raised here back to the WG and if they feel there is a need for additional guidance to bring it back to Dr. Cohn and the CDC administration for consideration of additional ACIP meetings. Dr. Cohn's proposal of sub-prioritizing 1c was acceptable to him.

Dr. Bernstein expressed skepticism about the timeframe being weeks. While 2.9 million doses of the Pfizer vaccine have been delivered, only about 300,000 doses have actually gone into arms. The reason he brought up those 65 to 74 years of age is because he feels that based on the numbers, the science, the risk of in-hospital deaths, the mortality rates, the incidence of COVID-19, and the hospitalizations with underlying medical conditions are awfully similar between the 65 to 74 and the 75 and above. It sounded from the discussion that this would evolve rather rapidly such that it would be offered to those 65 to 74 years of age rather quickly. While he understood that, he thought the science suggested moving them into one big group.

Dr. Shah (ASTHO) expressed appreciation for the flexibility afforded the states with respect to vaccination of individuals living in congregate settings. At the same time having clear guidance to ensure uniformity across the country also would help achieve the goals of equity to ensure that some states are not making decisions that prioritize or de-prioritize those individuals. He urged ACIP and CDC staff working on these issues to recognize in the flexibility to make recommendations as to where such individuals should be placed.

Dr. Lee said she felt very comfortable with 1b as it was and that moving forward with that particular decision needs to happen in order to help states and jurisdictions with planning. In terms of another nuance with respect to the challenges they heard about regarding Phase 1c, she fully endorsed the list of high-risk conditions based on the evidence to date that is coming through on the CDC website around high-risk conditions. The CDC also has been updating that in real time, which she really appreciates because every time she goes back to the website, she can usually find new information. While she thinks that will be a source of important guidance regarding prioritization for high-risk medical conditions, that focuses only on prevalent high-risk medical conditions. There are many low, rare, or less common medical conditions that put individuals at high-risk that do not come through in the data that they are seeing nationally. However, it was not clear where to put those individuals. For example, there are individuals with neuromuscular conditions whose respiratory condition is impaired who may not be on the list because they do not have sufficient numbers to demonstrate evidence of negative effect. Therefore, she thought they needed to think through 1c more carefully in terms of exactly what is included there.

Dr. Cohn indicated that CDC would revise the clinical considerations document based on the input the voting and liaison members provided during this discussion, for which she expressed appreciation.

Dr. Dooling re-read the proposed recommendation. Dr. Szilagyi made a motion, which was seconded by Dr. Frey, that ACIP approved the interim recommendation for allocation of initial supplies of COVID-19 vaccine for Phases 1b & 1c as written.

Dr. Lee said that while she felt very comfortable moving forward with the recommendation for Phase 1b, she felt that Phase 1c needed further discussion and she recommended splitting the vote between Phase 1b and 1c. In terms of the rationale for this proposed amendment to the motion, they heard concerns that there are perhaps additional considerations for prioritization that should be brought forward for further discussion if sufficient doses are not available for the entirety of Phase 1c. Because they did not review the list of high-risk medical conditions during the discussion, she did not feel comfortable without clarification on what that list entails or moving forward with a vote on that.

Dr. Bell responded to Dr. Lee's point by saying that there is nothing that precludes the ACIP from further clarification of Phase 1c even if they approved it the way it was currently proposed. She agreed that there was a definition for the underlying conditions in the form of the CDC list, and that the WG should discuss the list. Her concern for not having a vote for both 1b and 1c at this time was that would mean that all of the discussions about gating and having some flexibility of moving from one phase to the other would be dependent upon the WG and the ACIP reconvening in what could be a very short period of time to make an additional vote on Phase 1c. While she was fully committed to doing that if necessary, she did not see a downside to making some general statements about the Phase 1c available for states and localities now, with the understanding that it will not be the final word of the ACIP on this process. She was concerned about having nothing on the table for the general direction of Phase 1c, which could be clarified by clinical considerations.

Dr. Messonnier reiterated and expanded on what Dr. Bell said. She was quite concerned at the idea of putting off a vote on getting beyond 1b. It is not clear how quickly they will make it through 1b to 1c and the jurisdictions are trying to plan out the next month or two of their work. Getting to some of these populations is quite difficult and requires a lot of on-ground logistics and planning. CDC is hoping that by getting through 1b and 1c, they can help them get started on that process. They heard from several of the state and local health departments leads who had spoken that the folks on the ground are already basically working their way through these different phases. Therefore, she was concerned about putting off another vote, especially since that would mean putting it off until after the holidays. However, she offered her commitment that CDC would use the clinical consideration language as was done for HCP to provide the additional sub-prioritization as heard during the day from the ACIP members and liaison. They clearly heard the need to sub-prioritize in 1b based on age groups and they understand the need to be clearer about the high-risk medical conditions. All of those things will be rapidly incorporated into the clinical considerations. CDC's desire is to at least get through both of these phases to avoid hampering CDC and the jurisdictions to do some more advanced planning.

Dr. Romero pointed out that there were now 2 motions on the table and either ACIP would have to vote on the first motion and then address Dr. Lee's amended motion, or Dr. Lee could withdraw her motion.

Dr. Sanchez said that as someone who raised the concern with Phase 1c in terms of the elderly and the high-risk medical conditions, his concern remained but he was very much satisfied with the comments from Drs. Messonnier and Cohn and saw the need to move forward with both Phases 1b and 1c recommendations. They have to provide guidance to the jurisdictions because this is rapidly evolving and they want to be able to ramp up all of the vaccination house programs. He was in agreement with moving forward with Phases 1b and 1c as presented, with the recognition that further sub-prioritization will be forthcoming very soon.

Dr. Poehling thanked Drs. Messonnier, Cohn, and Bell for their clarification and supported the recommendation as worded and recognized the importance of empowering public health in communities to prepare and the importance of educating. She requested that when working through the high-risk medical conditions that the WG consider whether the influenza high-risk medical conditions achieve the goal in trying to make it easier to implement.

Dr. Atmar called a point of order. There was a motion on the floor that was seconded and then Dr. Lee put forth a motion to amend the original motion. Before discussing this further, he thought there should be a second to Dr. Lee's motion or it should be withdrawn.

Dr. Lee withdrew the motion with a request that there needs to be more public discussion and transparency around the clinical considerations and the guidance. She otherwise was totally fine with the vote as originally recommended in order to support states and jurisdictions with planning. The Phase 1b and 1c discussion is on target. She has no concerns about 1b, but requested more open and transparent discussion about 1c, as she did not feel that they had fully and thoroughly addressed all of the considerations and rationale out into the open. Having the ability to do that would address her concerns.

Dr. Cohn made a process recommendation that they had a second of the original motion and Dr. Lee withdrew the proposal to amend the motion. Therefore, they had a motion on the table upon which to vote. She suggested that they take a break, move to public comment, and then revisit the question of the high-risk medical conditions. At that point, CDC could put up a couple of slides with some proposed critical considerations and would share the influenza high-risk conditions list, which would be consistent with additional high-risk conditions that are not on the COVID high-risk conditions, and get some feedback from the ACIP members before the vote.

Conditions Associated with Severe COVID-19

Kathleen Dooling, MD MPH
Co-Lead ACIP COVID-19 Vaccine WG
Medical Officer, National Center for Immunization and Respiratory Diseases
Centers for Disease Control and Prevention

Dr. Dooling presented additional information in response to some of the questions that were posed earlier by ACIP members and liaisons specifically to address the conditions associated with severe COVID or what are referred to as "high-risk medical conditions." CDC has identified a list of conditions that make an individual at increased risk of severe COVID disease. This list is not exhaustive and only includes conditions with sufficient evidence to draw those conclusions. High-risk medical conditions may include other individuals based on consultation with an HCP about personal risk factors. There is a constantly ongoing search of the literature that a team at CDC does. The conditions that have obtained the necessary evidence to be associated with severe disease are listed here and further information can be found on the CDC website:

- ❑ Obesity
- ❑ Severe Obesity
- ❑ Type 2 Diabetes
- ❑ Chronic Obstructive Pulmonary Disease (COPD)
- ❑ Heart Condition
- ❑ Chronic Kidney Disease (CKD)
- ❑ Cancer
- ❑ Immunocompromised State from Solid Organ Transplant
- ❑ Sickle Cell Disease
- ❑ Pregnancy
- ❑ Smoking (current or history)

Discussion Points

Dr. Poehling expressed appreciation to Dr. Dooling for pulling all of this information together so that ACIP could review it. It highlights the fact that enough people with a certain disease will be needed to be able to rise to this list. The complications associated with Type 1 and Type 2 diabetes are quite similar, with Type 1 being much less common. Therefore, she worries Type 1 is not showing up just because of the numbers.

Dr. Dooling emphasized that this list is not exhaustive. It is absolutely correct that enough literature needs to come to the fore for it to get on the list. It is really in consultation with the HCP that personal risk factors are best assessed.

Dr. Frey pointed out that while COPD is listed, there are a lot of other chronic lung diseases that also are incapacitating.

Dr. Dooling said that those may come to the fore as time goes on and more is learned about this condition. The conditions that already are listed are certainly extremely prevalent in the population. An analysis with the BRFSS demonstrated that at least 56% of the population among those 16 to 64 years of age has at least one of these conditions.

Dr. Lee appreciated that HCP could use their clinical judgment about the individual risk that any patient might have. This will be helpful because as was pointed out, there are many types of lung conditions that do not necessarily meet the definition of COPD but might be extremely relevant in terms of risk of severe disease to COVID-19 infection. She also highlighted that this list predominantly focuses on the adult population. Going forward, as vaccines become available for children, it might be helpful to further detail risk for pediatric populations because some of these conditions do translate over and others might be more objective in terms of whether that would be done through epidemiologic studies versus physician judgment.

Dr. Dooling indicated that a pediatric list is posted on the CDC website as well.

Dr. Bell thought it was useful to have this list for everyone to see and think through. She emphasized what Dr. Dooling said in terms of the list as currently configured including something more than half of the adult US population. In the context of limited supply, which is where things are and will be when they get to Phase 1c, this is one of the challenges and something that the committee will need to deliberate on further. This list is not ordered in terms of strength of association. It is simply a reflection of conditions that have been shown to confer increased risk in epidemiologic studies. While she certainly thinks the list is useful and is something for ACIP to work from, in the context of prioritization, which is presumably what they

will continue to need to be doing unfortunately for a little while, there are some further things that the committee will need to consider.

Dr. Atmar recalled that heart conditions, and more specifically hypertension, were on some of the early lists of more severe disease. He wondered whether in this list hypertension was contained within heart condition, which is a pretty generic category compared to COPD, which is a subset of lung condition.

Dr. Oliver indicated that the CDC website states, “heart conditions such as heart failure, coronary artery disease, or cardiomyopathies.” It appears to be highlighting those and does not say “pulmonary hypertension.” There is a list of “are at increased risk” and “might be at increased risk” and there is a note that having other cardiovascular disease such as hypertension or stroke might increase one’s risk of severe disease from COVID-19.

Following the public comments, Dr. Romero took the Chair’s prerogative to make the following statement: I would like to make certain comments that I believe are within my purview as the Chair of the ACIP. It has been brought to my attention that through various outlets, misinformation and statements made to impugn and undermine the work that the ACIP has carried out over these last 9 months, and more specifically over the last 2 months, has caused doubt among the American people as to our motives and decisions. It has been said that our recommendations are excluding specific racial groups. It is important that the public understand that throughout the long period of deliberation, the thoughtful discussion, and the careful evaluation of the data, the ACIP has struggled painfully to deal with distribution of a limited resource of vaccine. Our attempt has been always to achieve equitable, ethical, and fair distribution of that resource. We have never targeted a specific ethnic or racial group for receipt of the vaccine. Our decisions, recommendations better said, for the groups that are prioritized take into account the burden of disease within those groups. Within those groups, White/Caucasian individuals predominate. The statements being made and carried throughout various outlets undermine the careful work that we have provided and undermine the trust of the American public in our committee. I want to emphasize again that we have never focused on any particular ethnic or racial group in coming to our recommendations. Thank you for allowing me to address that.

Dr. Cohn announced that the *MMWR* Moderna COVID vaccine was now live thanks to many people who got that out rapidly. The clinical considerations will be live soon as well and is one document that addresses both of the mRNA vaccine products. If the ACIP approved the recommendation that was proposed and seconded and the CDC Director approved the decision, an *MMWR* would be published in the coming week to describe these interim prioritization recommendations along with another clinical or implementation guidance document to accompany that *MMWR*.

Dr. Romero said he thought that for those in the ACIP, the recommendations reflect the very careful deliberation that they have had and the careful examination of data and serve to address the current lack of vaccine supply and those individuals who have the highest risk for disease. The recommendation will minimize the disease itself and improve equitable distribution across all segments of society.

Motion/Vote: Allocation of Initial Supplies of COVID-19 Vaccine: Phases 1b & 1c

Dr. Szilagyi made a motion, which was seconded by Dr. Frey, that ACIP approve the following interim recommendation for allocation of initial supplies of COVID-19 vaccine for Phases 1b & 1c as written:

As an update to ACIP recommendations for vaccination in Phase 1a (health care personnel, and long-term care facility residents), if COVID-19 vaccine supply is limited, the following groups should be offered vaccination:

Phase 1b: persons aged ≥75 years and frontline essential workers
Phase 1c: persons aged 65–74 years, persons aged 16–64 years with high-risk medical conditions, and other essential workers

The motion carried with 13 affirmative votes, 1 negative vote, and 0 abstentions. The disposition of the vote was as follows:

13 Favored:	Atmar, Ault, Bahta, Bell, Frey, Hunter, Lee, McNally, Poehling, Romero, Sanchez, Szilagyi, Talbot
1 Opposed:	Bernstein
0 Abstained:	N/A

Dr. Romero invited ACIP members to share their thoughts about why they voted as they did or to make additional comments.

Dr. Ault expressed appreciation for the amount of work that has gone into the discussions in the WG. While he was relatively silent in all of the forethought that went into this, he thought that the public comment section did raise some points and he wanted to make sure there are no gaps. Reflecting the comments received, he wondered whether there was a way to mention in the clinical guidance that there may be persons under 75 years of age who are not at home with caregivers who should be vaccinated.

Dr. Oliver indicated that they would be happy to address this in the clinical considerations.

Dr. Poehling pointed out that with the approval of two COVID vaccines and more studies currently ongoing, there is hope for ending this pandemic. While the hope is to provide vaccine to all Americans who want to get it, the ACIP was asked to provide recommendations during a time of limited vaccine availability to ensure safety and effectiveness; minimize transmission, morbidity, mortality, and social disruption; and ensure equity in allocation distribution. This is why she voted for this prioritization schedule. She noted that persons 75 years and older represent 8% percent of the population, 25% of hospitalizations, and have a very high death rate. Frontline essential workers have high exposure. They include a disproportionate share of racial and ethnic persons who also have a disproportionate share of hospitalization. She also highlighted the need for federal support to move efficiently and effectively so that all Americans who want to be vaccinated can do so. Federal support is needed not only to develop the vaccine, but also to support the infrastructural needs of state and local public health and healthcare organizations to educate and administer vaccine to our communities.

Ms. Bahta emphasized Dr. Romero's comments prior to the vote and the need to ensure that as they consider these priority groups, they are examining how to reach those who do not access to healthcare readily or who may not have access to health care as much as possible in the guidance. It is critical to encourage state and local jurisdictions to plan out those groups that would not readily walk into a facility to get vaccinated.

Ms. McNally said that she voted affirmatively after hearing the data and the discussion. She made three points. First, she supports state flexibility to adapt the guidance as needed but recognizes that there may be challenges with this flexibility and hopes states will have as much support as necessary to successfully get people vaccinated. Second, she appreciates the WG's and CDC's ongoing consideration of the priority of issue in persons aged 65 to 74 that was raised by Dr. Bernstein and discussed by the ACIP during the day, as well as the issues raised by Dr. Lee and the additional clinical considerations around 1c. Finally, as the consumer representative, she places value on public input and very much appreciates the CDC's and WG's attention to the feedback provided via focus groups, surveys, and the public comment in the *Federal Register*.

Dr. Szilagyi said that he voted for this recommendation because in his opinion, it follows the evidence about the risks from coronavirus and the ethical principles that ACIP developed to maximize the benefits and minimize harms, promote justice, and mitigate health inequities. ACIP is trying to "thread the needle" here. This was a difficult decision for him—really difficult, because he truly wishes everyone could get the vaccine today and he knows high-risk individuals are not included in Phase 1b. However, over several months, as the vaccine supply ramps up, every American will have access to these safe and effective vaccines. There is now a need to devote sufficient resources to implement the vaccines, communicate the benefits and risks of the vaccines, and provide outreach to at-risk communities who are disproportionately affected by the pandemic. Finally, he thanked the scientists, CDC, ACIP, liaisons, and the public who have helped bring coronavirus vaccines to this nation. Before too long, vaccination and public health will triumph over this pandemic.

Dr. Sanchez reiterated his concern about, and hopefully the rapid introduction of, the vaccine into Phase 1c as it becomes available because he feels strongly that the elderly and those with high-risk medical conditions should be prioritized over some essential workers who may be younger. While he is not doubting that some of them may have severe disease, he thinks they have to protect the elderly and high-risk medical condition individuals. He voted "yes" because he knows that there will have to be a prioritization schedule laid out to try to implement vaccination in that group. He also echoed the public comments about elderly homebound individuals who are not in LTCF and are cared for by family members, and that there needs to be outreach to those families as this is an important group who needs to be vaccinated as well.

Dr. Bernstein said that he is in full support of persons age 75 and older and frontline essential workers being in Phase 1b. However, he voted "no" because he feels that the science regarding COVID-19 morbidity and mortality presented earlier in the day by Dr. Dooling supported notable similarity between the 65 to 74 year old group and the 75 year old and older group. Therefore, inclusion of the 65 to 74 year old group in Phase 1b made more sense to him. He also believes that overall implementation of this unprecedented, complex, and national vaccination program will be simplified by doing so.

Dr. Bell said she wished that they did not have to make allocation recommendations and that instead, there was enough vaccine to provide it to everybody in the country who wants it. However, in that they cannot, they are doing the best they can to make the best allocation recommendations under the circumstances. It has been said that emergencies bring out the best in people and it has been her experience that emergencies do bring out the best in people. This is an emergency in which everyone must do their part. They have to trust that everyone is doing their best and doing their part, and that they can all work together. She views the ACIP's job and her job as doing their best to create the conditions for success and to facilitate a feeling of trust and of everyone doing their part. She expressed her hope that this would be an additional step in them doing that and trying to bring people together. Part of facilitating people to do their part is providing the conditions which make that possible. In that regard, the fact that the state and local health departments have not been funded for a vaccination program, especially in the context of the billions of dollars that funded the extremely successful program to develop vaccines, is really appalling. While she is just one person, she emphasized her hope that the government would address this discrepancy. Without this, she thinks it will be very difficult to be successful.

Dr. Talbot thanked Dr. Bell for highlighting how difficult this has been for all of them. For every group added, it means that a group must be subtracted. This has been incredibly humbling and heartbreaking. She looks forward to everyone having this vaccine and hopes to have a good party. She thanked the CDC members who have helped the WG through this process. It has not been easy, they have worked tireless hours, and she cannot say enough to thank them. She emphasized that it is incredibly important that the White House, Senators, and Congressman hear this—fund the vaccine infrastructure to get this vaccine out. This needs to be done rapidly and it needs to take precedence.

Dr. Lee stressed that the goal of ACIP is to ensure that they are providing access to safe and effective vaccines for the entire US population regardless of age, gender, race, ethnicity, or even personal or political beliefs about vaccines. She sees vaccines as a tool for creating hope, unity, and a stronger community together. However, they have seen vaccines become used as a tool for misinformation, fears about allocation, and division within communities. In order to transparently explain her thinking about the vote, she wanted to emphasize that the ACIP is currently prioritizing vaccines to those at greatest risk for infection due to their occupation, such as frontline HCP and essential workers; and those at greatest risk for hospitalizations and death, such as LTCF residents, older adults, and those with high-risk medical conditions. These priorities reflect the racial, ethnic, and socioeconomic diversity of the US population, and also reflect that not all people in the US carry an equal share of the burden of COVID-19 infection and disease. Her hope is that these short-term recommendations will support efficiency and equity in every phase of vaccinations until the time when all individuals have access to safe and effective vaccines in the US and worldwide. Her hope is that despite the divisive voices they sometimes hear, all Americans can look to the ACIP; federal, state, and local public health leaders; and the provider communities to serve as trusted voices and partners in the effort to end the pandemic.

Dr. Atmar added his voice to how difficult a decision this was—probably the most difficult decision he has made during his term on the ACIP. Ultimately, he voted "yes" because he thought that the data Drs. Dooling and Oliver presented and the considerations from the WG supported the prioritization of individuals into groups 1b and 1c. He feels comforted by the ethical framework that has been provided and the flexibility that local jurisdictions will have to make these prioritization recommendations fit into their local needs. They already have heard through public comments and through discussion that there can be exceptions that are not

specifically considered in the groups identified here. He also added his voice to the call for funding of the public health infrastructure across the country. He is concerned that without this funding, the equitable distribution of vaccine to the groups identified as being at greatest risk could be jeopardized.

Dr. Frey said she was very much in favor of the language of the recommendation and the intent of the recommendation set by the WG to provide vaccines as quickly as possible to those at greatest risk of contracting disease and also those who will suffer the most severe outcomes. These were difficult decisions and there are no perfect recommendations. People will continue to become sick and die from this disease until there is adequate vaccine. She also pled for the leaders in government to move quickly on this and support this effort. The bottom line is that the decision-making will fall on the local government and those people tasked with making this happen. Her hope is to be able to provide them with significant and slightly more detailed guidance that they can use as the fluid parameters and conditions of deciding who needs to be vaccinated first.

Dr. Hunter said he strongly supports the recommendation and that it had been a privilege and an honor to work with the CDC staff and his fellow ACIP members over the past 4 years.

Dr. Romero emphasized that the group has deliberated very carefully on this. This is without doubt the hardest vote that he has taken in his six and a half years on the committee. He is confident that they arrived at this by examining the data thoroughly. While the ultimate decisions will be at a local level, ACIP is providing Governors and Health Officials with a framework which is supported by evidence, will address the limited supply of vaccine available at this time, and will maximize benefits and minimize harms.

Dr. Cohn thanked Dr. Romero and the ACIP members, pointing out that this would conclude the numerous meetings they have had over the last several months. The do anticipate having more meetings. The next scheduled meeting will be at the end of February 2021, but there likely will be one additional meeting before February. Some of the topics raised during this meeting will need further discussion and hopefully there will be further information about additional vaccine products. Within the last week, Pfizer vaccines started shipping. Over the last week, 2,838,225 have been distributed and 556,208 doses have been administered. This reflects an amazing amount of work that is happening at all of the administration sites and the amount of excitement and hope as many have seen from pictures that have been all over social media of HCP and soon LTCF residents as well. There will now be two products. While there was discussion throughout the day about limited supplies, she reminded everyone that it is an incredible feat to have vaccine so quickly, that there will be more doses, and that there is hope that there will continue to be increases in production as well as potentially new products early next year. These numbers will be updated on the ACIP site regularly. She thanked Dr. Romero for managing these meetings so seamlessly over the last couple of months; Drs. Dooling and Oliver and their entire team for the unquantifiable amount of work, thought, and effort that has gone into the last couple of meetings; and Stephanie Thomas, Chris Caraway, and Jessica MacNeil who always make sure ACIP meetings run smoothly even as they have transitioned to this virtual platform. She expressed her hope that she will get to see everyone soon because they will all be vaccinated and will be able to return to in-person ACIP meetings.

Dr. Romero thanked Dr. Cohn and everyone for all of the work that they have done. He pointed out that the next day would be Winter Solstice, during which he asked everyone to take a few moments to reflect on this and take care of themselves. He said he would see them all in the near future, wished everyone Happy Holidays a prosperous New Year, and gaveled the meeting to a close.

Certification

Upon reviewing the foregoing version of the December 19-20, 2020 ACIP meeting minutes, Dr. Jose Romero, ACIP Chair, certified that to the best of his knowledge, they are accurate and complete. His original, signed certification is on file with the Management Analysis and Services Office (MASO) of CDC.

ACIP Membership Roster

Department of Health and Human Services
Centers for Disease Control and Prevention
Advisory Committee on Immunization Practices
July 1, 2019 – December 31, 2020

CHAIR
ROMERO, José R., MD, FAAP
Professor of Pediatrics
Horace C. Cabe Endowed Chair in Infectious Diseases Director,
Pediatric Infectious Diseases Section
University of Arkansas for Medical Sciences and Arkansas Children's Hospital
Director, Clinical Trials Research
Arkansas Children's Hospital Research Institute
Little Rock, AR
Term: 10/30/2018-06/30/2021

EXECUTIVE SECRETARY
COHN, Amanda, MD
Senior Advisor for Vaccines
National Center for Immunization and Respiratory Diseases
Centers for Disease Control and Prevention
Atlanta, GA

MEMBERS
ATMAR, Robert L., MD
John S. Dunn Clinical Research Professor in Infectious Diseases
Departments of Medicine and Molecular Virology & Microbiology
Baylor College of Medicine
Chief, Infectious Diseases Service
Ben Taub General Hospital, Harris Health System
Houston, TX
Term: 7/1/2016 – 6/30/2020

AULT, Kevin A., MD, FACOG, FIDSA
Professor and Division Director
Department of Obstetrics and Gynecology
University of Kansas Medical Center
Kansas City, KS
Term: 10/26/2018 – 6/30/2022

BAHTA, Lynn, RN, MPH, CPH
Immunization Program Clinical Consultant
Infectious Disease, Epidemiology, Prevention & Control Division
Minnesota Department of Health
Saint Paul, Minnesota
Term: 7/1/2019 – 6/30/2023

BELL, Beth P., MD, MPH
Clinical Professor
Department of Global Health, School of Public Health
University of Washington
Seattle, WA
Term: 7/1/2019 – 6/30/2023

BERNSTEIN, Henry, DO, MHCM, FAAP
Professor of Pediatrics
Zucker School of Medicine at Hofstra/Northwell
Cohen Children's Medical Center
New Hyde Park, NY
Term: 11/27/2017-06/30/2021

FREY, Sharon E., M.D.
Professor and Associate Director of Clinical Research
Clinical Director, Center for Vaccine Development
Division of Infectious Diseases, Allergy and Immunology
Saint Louis University Medical School
Saint Louis, MO
Term: 11/27/2017-06/30/2021

HUNTER, Paul, MD
Associate Professor of Family Medicine and Community Health
University of Wisconsin School of Medicine and Public Health
Associate Medical Director
City of Milwaukee Health Department
Milwaukee, WI
Term: 7/1/2016 – 6/30/2020

LEE, Grace M., MD, MPH
Associate Chief Medical Officer for Practice Innovation
Lucile Packard Children's Hospital
Professor of Pediatrics, Stanford University School of Medicine
Stanford, CA
Term: 7/1/2016 – 6/30/2020

MCNALLY, Veronica V., JD
President and CEO
Franny Strong Foundation
West Bloomfield, Michigan
Term: 10/31/2018 – 6/30/2022

POEHLING, Katherine A., MD, MPH
Professor of Pediatrics and Epidemiology and Prevention Director,
Pediatric Population Health
Department of Pediatrics
Wake Forest School of Medicine
Winston-Salem, NC
Term: 7/1/2019 – 6/30/2023

SÁNCHEZ, Pablo J., M.D.
Professor of Pediatrics
The Ohio State University – Nationwide Children’s Hospital
Divisions of Neonatal-Perinatal Medicine and Pediatric Infectious Diseases
Director, Clinical & Translational Research (Neonatology)
Center for Perinatal Research
The Research Institute at Nationwide Children's Hospital
Columbus, Ohio
Term: 7/1/2019 – 6/30/2023

SZILAGYI, Peter, MD, MPH
Professor of Pediatrics
Executive Vice-Chair and Vice-Chair for Research
Department of Pediatrics
University of California, Los Angeles (UCLA)
Los Angeles, California
Term: 7/1/2016 – 6/30/2020

TALBOT, Helen Keipp, MD
Associate Professor of Medicine
Vanderbilt University
Nashville, TN
Term: 10/29/2018 – 6/30/2022

EX OFFICIO MEMBERS

Centers for Medicare and Medicaid Services (CMS)
HANCE, Mary Beth
Senior Policy Advisor
Division of Quality, Evaluations and Health Outcomes
Children and Adults Health Programs Group
Center for Medicaid, CHIP and Survey & Certification
Centers for Medicare and Medicaid Services
Baltimore, MD

Food and Drug Administration (FDA)
FINK, Doran, MD, PhD
Deputy Director, Clinical, Division of Vaccines and Related Products Applications Office of Vaccines Research and Review
Center for Biologics Evaluation and Research
Food and Drug Administration
Silver Spring, MD

Health Resources and Services Administration (HRSA)
RUBIN, Mary, MD
Chief Medical Officer
Division of Injury Compensation Programs
Rockville, MD

Indian Health Service (IHS)
WEISER, Thomas, MD, MPH
Medical Epidemiologist
Portland Area Indian Health Service
Portland, OR

Office of Infectious Disease and HIV/AIDS Policy (OIDP)
KIM, David, MD CAPT,
US Public Health Service Director Division of Vaccines
Washington, DC

National Institutes of Health (NIH)
BEIGEL, John, M.D.
Associate Director for Clinical Research
Division of Microbiology and Infectious Diseases
National Institute of Allergy and Infectious Diseases (NIAID) Bethesda, MD

LIAISON REPRESENTATIVES

American Academy of Family Physicians (AAFP)
ROCKWELL, Pamela G, DO
Associate Professor, Department of Family Medicine,
University of Michigan Medical School
Medical Director, Dominos Farms Family Medicine Ann
Arbor, MI

American Academy of Pediatrics (AAP)
MALDONADO, Yvonne, MD
Senior Associate Dean for Faculty Development and Diversity
Professor of Pediatrics and Health Research and Policy
Chief, Division of Pediatric Infectious Diseases
Stanford University School of Medicine
Stanford, CA

American Academy of Pediatrics (AAP)
Red Book Editor
KIMBERLIN, David, MD
Professor of Pediatrics
Division of Pediatric Infectious Diseases
The University of Alabama at Birmingham School of Medicine
Birmingham, AL

American Academy of Physician Assistants (AAPA)
LÉGER, Marie-Michèle, MPH, PA-C Senior
Director, Clinical and Health Affairs
American Academy of Physician Assistants
Alexandria, VA

American College Health Association (ACHA)
CHAI, Thevy S, MD
Director of Medical Services
Campus Health Services
University of North Carolina at Chapel Hill
Chapel Hill, NC

American College Health Association (ACHA) (alternate)
MCMULLEN, Sharon, RN, MPH, FACHA
Assistant Vice President of Student & Campus Life for Health and Wellbeing
Cornell Health
Ithaca, NY

American College of Nurse Midwives (ACNM)
HAYES, Carol E., CNM, MN, MPH Lead
Clinician
Clinical Quality Compliance and Management
Planned Parenthood Southeast
Atlanta, GA

American College of Nurse Midwives (ACNM) (alternate)
MEHARRY, Pamela M., PHD, CNM
Midwifery Educator, Human Resources for Health
In partnership with University of Rwanda and University of Illinois, Chicago

American College of Obstetricians and Gynecologists (ACOG)
ECKERT, Linda O., MD, FACOG
Professor, Department of Obstetrics & Gynecology
Adjunct Professor, Department of Global Health
University of Washington
Seattle, WA

American College of Physicians (ACP)
GOLDMAN, Jason M. MD, FACP
Affiliate Assistant Professor of Clinical Biomedical Science, Florida Atlantic University, Boca Raton, Florida
Private Practice
Coral Springs, FL

American Geriatrics Society (AGS)
SCHMADER, Kenneth, MD
Professor of Medicine-Geriatrics
Geriatrics Division Chief
Duke University and Durham VA Medical Centers
Durham, NC

America's Health Insurance Plans (AHIP)
GLUCKMAN, Robert A., MD, MACP
Chief Medical Officer, Providence Health Plans
Beaverton, OR

American Immunization Registry Association (AIRA)
COYLE, Rebecca, MSEd
Executive Director, AIRA
Washington, DC

American Medical Association (AMA)
FRYHOFER, Sandra Adamson, MD
Adjunct Associate Professor of Medicine
Emory University School of Medicine
Atlanta, GA

American Nurses Association (ANA)
RITTLE, Charles (Chad), DNP, MPH, RN

Assistant Professor, Nursing Faculty
Chatham University, School of Health Sciences
Pittsburgh, PA

American Osteopathic Association (AOA)
GROGG, Stanley E., DO
Associate Dean/Professor of Pediatrics
Oklahoma State University-Center for Health Sciences
Tulsa, OK

American Pharmacists Association (APhA)
FOSTER, Stephan L., PharmD CAPT (Ret)
U.S.P.H.S.
Professor, College of Pharmacy
University of Tennessee Health Sciences Center
Memphis, TN

Association of Immunization Managers (AIM)
HOWELL, Molly, MPH Immunization Program Manager
North Dakota Department of Health
Bismarck, ND

Association for Prevention Teaching and Research (APTR)
McKINNEY, W. Paul, MD
Professor and Associate Dean
University of Louisville School of Public Health and Information Sciences
Louisville, KY

Association of State and Territorial Health Officials (ASTHO)
SHAH, Nirav D, MD, JD
Director
Maine Center for Disease Control and Prevention
Augusta, ME

Biotechnology Industry Organization (BIO)
ARTHUR, Phyllis A., MBA
Senior Director, Vaccines, Immunotherapeutics and Diagnostics Policy
Washington, DC

Council of State and Territorial Epidemiologists (CSTE)
HAHN, Christine, MD State
Epidemiologist
Office of Epidemiology, Food Protection and Immunization Idaho
Department of Health and Welfare
Boise, ID

Council of State and Territorial Epidemiologists (CSTE) (alternate)
LETT, Susan, MD, MPH
Medical Director, Immunization Program
Division of Epidemiology and Immunization
Massachusetts Department of Public Health
Boston, MA

Canadian National Advisory Committee on Immunization (NACI)
QUACH, Caroline, MD, MSc
Pediatric Infectious Disease Specialist and Medical Microbiologist
Medical Lead, Infection Prevention and Control Unit
Medical Co-director – Laboratory Medicine, Optilab
Montreal-CHUM
Montreal, Québec, Canada

Infectious Diseases Society of America (IDSA)
BAKER, Carol J, MD
Professor of Pediatrics
Molecular Virology and Microbiology
Baylor College of Medicine
Houston, TX

International Society for Travel Medicine (ISTM)
BARNETT, Elizabeth D, MD
Professor of Pediatrics
Boston University School of Medicine
Boston, MA

National Association of County and City Health Officials (NACCHO)
ZAHN, Matthew, MD
Medical Director, Epidemiology
Orange County Health Care Agency
Santa Ana, CA

National Association of County and City Health Officials (NACCHO) (alternate)
DUCHIN, Jeffrey, MD
Health Officer and Chief, Communicable Disease Epidemiology and Immunization Section
Public Health - Seattle and King County
Professor in Medicine, Division of Allergy and Infectious Diseases
University of Washington School of Medicine and School of Public Health
Seattle, WA

National Association of Pediatric Nurse Practitioners (NAPNAP)
STINCHFIELD, Patricia A., RN, MS, CPNP
Director, Infectious Disease/Immunology/Infection Control
Children's Hospitals and Clinics of Minnesota
St. Paul, MN

National Foundation for Infectious Diseases (NFID)
SCHAFFNER, William, MD
Chairman, Department of Preventive Medicine
Vanderbilt University School of Medicine
Nashville, TN

National Foundation for Infectious Diseases (NFID) (alternate)
DALTON, Marla, PE, CAE
Executive Director & CEO
National Foundation for Infectious Diseases (NFID)
Bethesda, MD

National Medical Association (NMA)
WHITLEY-WILLIAMS, Patricia, MD
Professor and Chair
University of Medicine and Dentistry of New Jersey
Robert Wood Johnson Medical School
New Brunswick, NJ

Pediatric Infectious Diseases Society (PIDS)
O'LEARY, Sean, MD, MPH
Associate Professor of Pediatrics
Pediatric Infectious Diseases
General Academic Pediatrics
Children's Hospital Colorado
University of Colorado School of Medicine

Pediatric Infectious Diseases Society (PIDS) (alternate)
SAWYER, Mark H, MD
Professor of Clinical Pediatrics
University of California, San Diego School of Medicine
San Diego, CA

Pharmaceutical Research and Manufacturers of America (PhRMA)
ROBERTSON, Corey, MD, MPH
Senior Director, US Medical, Sanofi Pasteur
Swiftwater, PA

Society for Adolescent Health and Medicine (SAHM)
MIDDLEMAN, Amy B., MD, MSEd, MPH
Professor of Pediatrics
Chief, Section of Adolescent Medicine
University of Oklahoma Health Sciences Center
Oklahoma City, OK

Society for Healthcare Epidemiology of America (SHEA)
DREES, Marci, MD, MS
Chief Infection Prevention Officer & Hospital Epidemiologist
ChristianaCare
Wilmington, DE
Associate Professor of Medicine Sidney Kimmel Medical College at Thomas Jefferson University
Philadelphia, PA