

Proceedings of the 2022 Equitable PPE Protections Workshop

A National Strategy for Equitable PPE Protections for All U.S. Workers

November 8 and 9, 2022



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National Institute for Occupational
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Abstract

This document provides an overall summary and the salient points from the proceedings of the NIOSH 2022 Equitable Personal Protective Equipment (PPE) Protections Workshop (hereafter, “the Workshop”). The information can be used by PPE selectors, users, purchasers, and manufacturers as well as by organizations that provide training, knowledge development, or advocacy for these populations such as professional societies and unions. This information is valuable for advancing the knowledge needed to improve the safety and health of workers using PPE.

Key accomplishments raised by presenters, facilitators, and discussion participants during the Workshop follow.

- Advanced NIOSH’s diversity, equity, inclusion, accessibility, and belonging strategy by publicly announcing its “National Strategy for Equitable PPE Protections for all United States Workers” (hereafter, “the National Strategy”) and future partnership efforts, including collaboration with universities.
- Established a shared awareness that equitable PPE protections represents a multifaceted construct requiring collaboration with the larger community of organizations and individuals who use, or facilitate the use of, PPE.
- Furthered the identification of underserved PPE user populations and the associated gaps and challenges to equitable PPE protections across multiple industry sectors, including specialized needs for women, users with a diverse range of body sizes and shapes, and workers with religious or cultural practices that interfere with PPE use.
- Advanced the identification and understanding of the multiple factors driving PPE shortages, especially for frontline healthcare personnel.
- Furthered awareness and understanding of complex policy, market dynamics, and research gaps specific to equitable PPE protections for United States workers.

Introduction

In workplaces across the U.S., individuals wear PPE to minimize exposure to hazards when other controls in the [hierarchy of controls](#) are unavailable or do not adequately reduce exposure. To be effective for all U.S. workers, PPE designs must serve diverse worker populations in numerous occupations across sectors. Further, these PPE designs must address a broad diversity of hazards, ranging from chemical and biologic hazards in the ambient environment to physical hazards including struck-by and fall hazards. The complexity of occupational hazard exposures requires a broad range of PPE designed to protect body parts and systems from head to toe. In any given occupational scenario, all workers exposed to hazards not adequately controlled through other means need to wear PPE that protects them sufficiently from those hazards.

In light of the importance of PPE to U.S. workers as outlined above, in 2021, NIOSH launched an effort to develop the National Strategy. As a first component, NIOSH published a Federal Register Notice to obtain input from interested parties on “[Needs and Challenges in Personal Protective Equipment \(PPE\) Use for Underserved User Populations](#).” Following this effort, NIOSH held the Workshop over two days to create a forum where researchers, PPE manufacturers, practitioners, federal agencies, labor and worker groups, and all those interested in equitable PPE protections could participate. NIOSH’s National Personal Protective Technology Laboratory (NPPTL) hosted the Workshop.

The Workshop documented a comprehensive list of equitable PPE protection challenges and detailed the barriers and gaps that permit these challenges to exist. At the conclusion of the Workshop, NIOSH announced the formation of an Equitable PPE Protections Partnership (hereafter, “the Partnership”) that will bring together all those interested in contributing to the National Strategy to create opportunities for collaboration and connection.

For both the National Strategy and the Workshop, NIOSH chose the phrase “equitable PPE protections” to emphasize the principle that all workers requiring PPE deserve equitable protection from any identified hazards. To demonstrate, providing all workers with the same N95[®] respirator model may not afford those workers with equitable respiratory protection because the respirator may not fit all workers equally.

Over 700 attendees joined the Workshop on the first day and 1,000 on the second day. Presenters included representatives from NIOSH, academia, industry, and labor. The presenters provided insights on factors affecting equitable PPE protections ranging from standards development to perspectives on design approaches that ensure that PPE accommodate the size and shape of the diverse workforce. Feedback gathered from attendees and participants revealed four primary themes in relation to challenges, issues, and concerns for PPE developers, researchers, and end users moving forward:

- (1) size, shape, fit, functionality, and safety of PPE for end users;
- (2) the need for interdisciplinary collaborations and partnerships;
- (3) gaps and challenges related to PPE standards; and
- (4) limitations of PPE manufacturing.

Workshop activities included keynotes and presentations, facilitated larger panel discussions, follow-up Q&A sessions and discussions, and facilitated smaller breakout sessions, with

summaries from the most substantial breakout sessions presented here. Topics for these breakout sessions included the identification of challenges to equitable PPE protections in five categories (use, acceptability, access, availability, and knowledge) and the question of what drives the existence of these challenges. In the context of the Workshop, equitable PPE protections is the assurance that all five categories are addressed for each user of PPE.

The document summarizes the main points of the Workshop, which can be used to help build and carry out the National Strategy and Partnership. As a complement to this summary for those interested in a much fuller account of the points made by the presenters and the subsequent discussions, recordings of the Workshop are also available at the [Equitable Personal Protective Equipment \(PPE\) Protections Workshop webpage](#).

Keynote #1—NIOSH’s Commitment to Diversity, Equity, and Inclusion

Presenter: John Howard, NIOSH

Summary Points

Importantly, Workshop attendees need a shared understanding of diversity, equity, inclusion, accessibility, and belonging.

Diversity refers to counting some of the obvious ways we can differ from each other. Examples include political beliefs, religious beliefs and affiliation, race, ethnicity, culture, sexual orientation, socioeconomic class, gender identity, and different approaches to solving problems.

Equity does not mean the same thing as equality. Equality implies that all are treated the same regardless of their diverse backgrounds or characteristics. Advocates of equity point out that not everyone starts life or education with the same advantages. Therefore, equal treatment does not necessarily result in an equitable outcome. Equity seeks to provide equal opportunities as opposed to equal treatment.

Inclusion involves making all types of individuals count in the organization. Inclusion means fair treatment to all so that everyone can actively participate in the workplace culture. Inclusion requires engaging, empowering, and recognizing the special talents of each employee.

Accessibility provides the foundation on which every workforce must build diversity, equity, and inclusion for people with differing physical and mental capabilities in relation to the work environment.

Belonging constitutes an emotional state—the feeling that a person, a worker, customer, or manufacturer has value. Belonging in the workplace translates to an employee’s sense that the organization and the employee’s colleagues accept and even treasure uniqueness. Belonging is something that employees themselves feel, and it results naturally from an organization’s inclusion efforts.

Q&A and Discussion

NIOSH can play a big role in addressing challenges related to equitable PPE protections through more partnerships equipped to handle these challenges. NIOSH can identify and catalogue the challenges and gaps in order to determine how to develop a coordinated strategy to solve them.

Research conducted last year in the United Kingdom found that respiratory equipment poorly fit 16.7 percent of female health workers compared to 7.6 percent of men. Also, PPE designed for U.S. and European males are too large for many females and Asian healthcare personnel. NIOSH spent many years addressing this issue, often in collaboration with international partners. These partners included the International Labour Organization, the World Health Organization, and other national institutes throughout the world. NIOSH scientists participate in the setting of international standards and governmental standards, as well as in setting standards for the private sector.

Partnerships need to be started, continued, and supported to address gaps in equitable PPE protections and the related challenges, with partners who advocate for workers whose needs are

not being met. Important broad scope partnerships need to be developed with manufacturers, innovators, researchers, vendors, employers, and end users to achieve diversity of ideas and inclusiveness.

A growing interest exists for anthropometric studies to account for such things as long hair and facial hair in relation to PPE. A need also exists to encourage employers to provide more options that would result in equitable PPE protections. Effective communications between NIOSH and employers must continue in order to meet this challenge. Options for addressing equitable PPE protections requires a strategy that accounts for a diversity of occupational settings and a breaking down of barriers to identify actionable solutions.

Presentation #1—National Strategy on Equitable PPE Protection

Presenter: Susan Moore, NIOSH

Summary Points

NIOSH's NPPTL is developing and executing the National Strategy in coordination with the larger community of organizations and individuals who use or facilitate the use of PPE. NPPTL also administers the NIOSH Respirator Approval Program. NPPTL's mission is to prevent work-related injury and illness by advancing the state of knowledge and practice of PPE. This work holds importance because more than 20 million U.S. workers routinely rely on PPE.

Five PPE keywords apply to the Workshop: use, acceptability, access, availability, and knowledge:

- *PPE use*: protection from the intended hazard without creating other risks.
- *PPE acceptability*: PPE designed to be sensitive to social, cultural, comfort, and physiological considerations.
- *PPE access*: PPE located at the point of use—i.e., when and where needed.
- *PPE availability*: PPE being procurable without undue burden or challenge.
- *PPE knowledge*: PPE being correctly selected, used, and maintained, and employees understanding their rights in relation to PPE.

The Workshop represents just one singular activity within the larger National Strategy. The broader set of activities will identify existing equitable PPE protections challenges and detail the barriers and gaps that permit these challenges to exist. The NIOSH Equitable PPE Protection Partnership will be launched following the Workshop to identify and organize collaborators and partners across the broader PPE community. Those interested in becoming a member of the Partnership should email ODAdmin@cdc.gov.

Presentation #2—NIOSH Exploration into Underserved PPE Users

Presenter: Katherine Yoon, NIOSH

Summary Points

To begin promoting equitable PPE protections and seek public input, NIOSH published a Federal Register Notice and conducted several literature reviews to document and detail the challenges, gaps, and barriers that apply to underserved PPE user populations. The notice received 39 submissions from diverse individuals and organizations from June 2021 through October 2021. Comments submitted to the Federal Register Notice identified issues with size and fit; availability, accessibility, and acceptability of diverse PPE types and for diverse user populations; training and education; and language barriers.

NIOSH also undertook literature reviews to explore issues related to equitable PPE protections. In partnership with North Carolina State University, four researchers from the university and three NIOSH researchers analyzed both peer-reviewed and grey literature on PPE use in five subsectors of public safety: law enforcement, fire service, wildland firefighting, corrections, and emergency medical services. In partnership with Duquesne University, eight reviewers analyzed peer-reviewed and grey literature on equitable PPE protections in diverse, underserved PPE user populations or for specific PPE types.

Key takeaways from the literature reviews included that PPE needs and challenges vary across populations; that sizing and fit issues along with accessibility and availability play a prominent role in PPE use and represent opportunities for high impact; and that design, materials, knowledge, and the use of PPE need to be specific to occupational settings.

Presentation #3—NIOSH Protective Clothing Challenge

Presenters: Lynn Van Deventer, NASA; Adam Smith, NIOSH; Shahnaz Benner, University of Nebraska Medical Center; Susan Sokolowski, University of Oregon; Bill Kimball, Maine-Lee Technology Group; Fatma Baytar, Cornell University

Summary Points

As part of its expanding portfolio of health and safety solutions, NIOSH supports crowdsourcing—i.e., gathering information by enlisting the services of a group of people, usually via the internet and social media—as a potential pathway to help achieve equitable PPE protections for the full spectrum of U.S. workers. Protective clothing represents an important need in relation to use, acceptability, knowledge, availability, and access, and developing new concepts begins to address that need.

Presenter Lynn Van Deventer represented the Center of Excellence for Collaborative Innovation. The Center engages with the global solver community to transform problems into solutions for NASA and the federal government. The Center supported the [NIOSH Protective Clothing Challenge](#), using crowdsourcing to bring together large numbers of people from all over the world with varying skills and expertise. Van Deventer emphasized that among the more than 650 projects the Center completed in the last 10 years, 94 percent achieved success, with more than 70 million in cost savings for the U.S. government.

Presenter Adam Smith, representing NIOSH, discussed how the NIOSH Protective Clothing Challenge leveraged collaborative innovation to generate new ideas and examples of how diversity, equity, and inclusion can be incorporated into PPE. NIOSH contracted with HeroX through the NASA Tournament Lab to develop the challenge. The challenge process launched in April 2022 with the winners announced in September 2022. From the 37 eligible submissions, judges selected five winners. Representatives from four of the winning teams presented at the workshop about their concepts for PPE protective clothing, as follows:

- Shahnaz Benner: *Omni-Fit PPE Gown with Contamination Indicator*.
- Susan Sokolowski: *Apples-2-Apples Measures + Pattern Drafting Method*.
- Bill Kimball: *Bifunctional AAMI Surgical Sleeve*.
- Fatma Baytar: *Covering All by Improving Unisex Sizing*

Presenter Shahnaz Benner described the Omni-Fit PPE Gown with Contamination Indicator concept (hereafter, “Omni-Fit Gown”). The gown concept represents a self-conforming PPE that adapts to various ranges of body types with the use of an accordion-style adjustable waistband and length. The gown’s three key features would include an adjustable accordion trunk space, moisture-activated cooling material, and a biological contamination indicator. The developers will continue to explore materials for the fabric, chemical reagent, and costs, with a plan to only put a contamination indicator on the exterior of the gown.

The concept for the Apples-2-Apples Measures + Pattern Drafting Method (hereafter, “Apples-2-Apples”)—developed with research partner, Lindsey Griffin, from the University of Minnesota—proposed a new approach to anthropometry and pattern making for firefighter turnout gear. This approach would involve pooling anthropometric three-dimensional data for women and minority firefighters, collecting relevant pattern-making measures, and building and

wear testing new products for firefighter turnout gear. Presenter Susan Sokolowski discussed the disconnect between traditional anthropometric measures found in databases and how manufacturers apply them to create turnout gear. To address this disconnect, Apples-2-Apples would directly align body measurements to pattern development. In 2020, Sokolowski and Griffin proved this concept with gloves, using specific anthropometric measures to develop new glove patterns that fit the hand more accurately. The current process for translating anthropometric data into turnout gear needs improvement, and Apples-2-Apples can help with that translation.

Presenter Bill Kimball discussed the Bifunctional AAMI Surgical Sleeve concept (hereafter, “Surgical Sleeve”) for use in surgical gowns. Based on a proven fluid management system to interface between the sleeve, the protective gown, and the protective glove, the sleeve design prevents leaks of fluids that may cause a sterile breach during surgeries. This design would offer protection for the operating room doctors, their team, and the patient. To address the issue of fit, the sleeve fit would be matched to the gown size and the sleeve would be incorporated into the gown. Multiple gown sizes would need to be stocked in hospitals.

Presenter Fatma Baytar discussed the concept, Covering All by Improving Unisex Sizing (hereafter, “Unisex Sizing”). This concept built on results from existing studies showing that women report more fit issues with clothing compared to men. Due to disproportioned coverall designs used in the workplace, women frequently experience fit, comfort, and mobility problems, which leads to ripping in nonwoven fabrics and exposure to harmful chemicals or viruses. Coverall fit could be improved through unisex sizing, resulting in a reduced set of garment sizes that would accommodate a wide variety of body shapes and sizes.

Follow-on breakout sessions to discuss these winning concepts confirmed the value of the crowdsourcing approach to develop concepts that, if fully realized, can contribute to equitable PPE protections in the form of protective clothing.

Keynote #2—Design and Implementation Successes

Presenters: Susan Sokolowski, University of Oregon; Amber Izworski, DuPont
Facilitator: Patrick Dempsey, NIOSH

Summary Points

Presenter Susan Sokolowski’s remarks touched on many issues, and she spoke from the perspective of one who previously worked in the sports industry and how principles from that work could be applied to occupational safety and health. Examples included apparel design, knit fabric engineering, human factors engineering, and biomechanics. These examples represent the possibility of a wide variety of organizations championing product equity for underserved users. Sokolowski emphasized that manufacturers that create athletic products design and engineer these products based on benefits to the athlete. These benefits include thermoregulation, fit, support, cushioning, and impact protection. Sokolowski noted that PPE could be designed to improve user benefits, equity, and safety.

Presenter Amber Izworski’s remarks included thinking about PPE in industrially related jobs, where male workers have traditionally been at the forefront. While women continue to be underrepresented in traditionally male-dominated industries such as oil and gas, the number of women choosing to work in jobs focused on science, technology, engineering, and mathematics continues to increase. Despite the increasing number of women now working in these industries, access to PPE sized for women remains limited.

Importantly, employers can be in compliance with Occupational Safety and Health Administration regulations for PPE but still may not meet those specific sizing needs of its female workforce. Ill-fitting PPE can reduce mobility and impair physical dexterity, adversely affecting productivity, and pose safety risks such as tripping hazards or loose-fitting fabric getting caught in machinery. Solutions include PPE suppliers working with companies to expand PPE options created for female body measurements and making those options accessible for employees as well as customers.

Panel Discussion #1—Standards Representatives

Presenters: Jeff Stull, International Personnel Protection, Inc.; Meredith McQuerry, Florida State University; Dan Glucksman, International Safety Equipment Association

Facilitator: Jon Szalajda, NIOSH

Summary Points

During this discussion, panelists focused on two questions: (1) What are the issues that standards developers confront in relation to equitable PPE protections? (2) What key related research and standards gaps need further exploration?

Presenter Jeff Stull summarized how standards can affect equitable PPE protections. A wide range exists for PPE standards, including those established by ASTM International, the International Safety Equipment Association, the International Organization for Standardization, and the National Fire Protection Association. For these organizations, challenges in establishing effective standards include requiring PPE availability in sizes to accommodate the intended population, PPE functionality, providing sizing information that relates to easily accessed body dimensions, and encouraging the provision of easy-to-understand and comprehensive end user information on PPE. Finally, standards must address labeling and the ability of end users to understand that labeling as well as any user information or training materials provided with the PPE.

Presenter Meredith McQuerry identified equitable sizing standards for female firefighter PPE as an area that requires attention. Although over 90,000 career and volunteer female firefighters work in the U.S, a lack of PPE patterns designed for female bodies persists with female PPE clothing often being a simple downscaling of male patterns. Some PPE manufacturers promote what could be called customized sizing designs, but a focus on sizing alone is not effective in that women are not simply smaller versions of men, having very different overall proportions. Improvements needed in this area include pattern requirements that consider size and shape specific to the current female firefighter population.

Presenter Dan Glucksman discussed the International Safety Equipment Association—an accredited standards developing organization for respiratory protection, gloves, protective garments, and safety eyewear. Work by this Association includes standards for bioeyewear, industrial head protection, high-visibility safety apparel, and size and labeling requirements for limited-use and disposable coveralls. Glucksman pointed out that with established international standards associations such as this, the possibility exists to bring employers and distributors into the national discussion on equitable PPE protections. The opportunity also exists to create a public-private partnership where standards can be translated into the many languages spoken in the U.S. workforce, and to create more effective communications and training products related to equitable PPE protections.

Panel Discussion #2—Manufacturer Representatives

Presenters: Nikki McCullough, 3M; Nicolas Smit, American Medical Manufacturers Association; Joseph Przepiorka, Shawmut Corporation
Facilitator: John Powers, NIOSH

During this discussion, panelists focused on two questions: (1) What are the issues that PPE manufacturers confront in relation to equitable PPE protections? (2) What key related research and standards gaps need further exploration?

Presenter Nikki McCullough from 3M noted that while many people might recognize 3M and associate the brand with NIOSH Approved[®] N95 respirators, 3M also makes a wide variety of PPE. McCullough's points included the importance of recognizing the broad and diverse population of workers using PPE; the need for a robust product development process; the desirability of improved training and education, including digital training; and effective communication. McCullough acknowledged that budgetary limitations pose another challenge for occupational safety and health professionals. Anecdotal evidence suggests that even when PPE become available to fit diverse work populations, challenges remain for occupational health and safety professionals to source that PPE.

Presenter Nicolas Smit emphasized that one, but not the only, reason for the limited supply of N95 respirators during the COVID-19 pandemic included the time investment required to go through NIOSH's respirator approval process for manufacturers unfamiliar with the process but interested in entering the market. However, since the start of the pandemic, some manufacturers established fixes to supply chain issues and developed innovative solutions to help with accessibility and disability challenges faced by workers and the public. Manufacturers forged partnerships to improve access to a variety of options for consumers, but they struggled to reach consumers with these options. Some manufacturers that entered the market during the pandemic left the business due to their inability to deliver PPE to consumers or distributors and the gradually waning demand for PPE as urgency created by the pandemic lessened.

Presenter Joseph Przepiorka stressed that in the development process for PPE such as respirators, lab tools such as headforms and digital face data provide good starting points. However, these tools need to be supplemented and expanded with fit testing across a wide range of human test participants. The makeup of the U.S. workforce population has changed since the development, decades ago, of those lab tools intended to represent the workforce. Manufacturers use respiratory fit capability standards to test and develop new product lines, but such standards can be difficult to apply to individuals who have smaller or larger faces and heads, populations with facial hair, and face shapes atypical in the U.S. Because of the expense involved in developing more sizes and shapes of respirators to fit the diverse user population, manufacturers face a difficult challenge without a steady demand for these products from the standpoint of a return on their investment.

Q&A and Discussion

A need exists to expand or update understanding of the needs of today's diverse workforce. In relation to alternative respiratory protection for underserved communities, it could be beneficial to streamline the NIOSH respirator approval process so the products get to the market faster and

manufacturers new to the market more easily enter the market. Manufacturers, employers, and workers need help to understand the sizing and target audience of PPE products. Further, manufacturers require incentives and support to effectively address the challenges and gaps related to equitable PPE protections. Examples include more data about underserved populations (including anthropometric data), assistance with supporting production and development costs, and connecting the underserved communities directly with manufacturers for improved access to the product and educational initiatives.

Panel Discussion #3—Labor Representatives

Presenters: Rebecca Reindel, American Federation of Labor and Congress of Industrial Organizations; Chris Trahan Cain, North America’s Building Trades Unions; Patrick Morrison, International Association of Fire Fighters

Facilitator: Jonisha Pollard, NIOSH

During this discussion, panelists focused on two questions: (1) What are the key issues that workplaces experience in relation to equitable PPE protections? (2) What are the key related research and standards gaps?

Summary Points

Presenter Rebecca Reindel explored an important parameter of equity in PPE access and availability: how PPE do or do not function for their intended purpose—that is, to keep workers safe on the job. If the use of PPE inhibits production, many workers will remove their PPE to meet the work demands of their employers. Therefore, a need exists to understand how fit and function tie closely together.

Determining existing practical applications becomes critical to the process of designing some of this material and equipment—for example, looking at related industries for items adaptable to PPE design, such as the fashion industry and technology sector. Reindel pointed out that in some cases PPE are already available in different sizes but not necessarily accessible to workers, and thus the access issue becomes critical. Further, a distinction must be made between a shortage in the marketplace versus a perceived shortage due to distribution and procurement challenges. For example, where PPE did become available during COVID, many workers still did not get what they needed in terms of proper fit and level of protection. Flexible PPE purchasing options, including the ability to be supplied in small quantities, must exist so that employers are not dissuaded by needing to buy large amounts.

Finally, Reindel noted that training for workers must be focused not just on how to use PPE correctly, but on the hazards that PPE can protect workers from so that fit and function become integrated for the user. Employers and unions also require information on choosing PPE, focusing on the key issues of what, when, and how PPE can be used.

Presenter Chris Trahan Cain cited fit as the number one concern expressed by 3,300 tradeswomen in construction. Construction standards require that the employer provides PPE, but with no explicit requirement that the PPE fits workers. Cain noted that NIOSH must continue to partner with employers and employees to help close some of these equity gaps as well as engage further in research that includes worker representatives.

Presenter Patrick Morrison described a lack of PPE appropriately sized, fitted, and ergonomically designed for different body types. Morrison reinforced the need for research to ensure PPE designs for all body types and sizes, but stressed the timeliness for development and implementation of standard fit testing for PPE other than respiratory protective devices to ensure that the PPE provide an appropriate level of protection. Holistic approaches to evaluating the problem remain especially vital for the fire service, and Morrison specifically called for health hazard assessments as to the materials used in PPE, in particular related to the chemical treatments used for firefighter turnout gear.

Q&A and Discussion

During the Q&A session, panelists shared their thoughts on non-healthcare essential workers and the need for their inclusion in the PPE discussion. As one example, during the pandemic, workers in construction were typically deemed to be essential and were anecdotally encouraged to wear N95 respirators; however, enforcement of PPE usage was low. With no specific requirements issued on PPE or other protections for construction workers, both demand and supply remained low. This problem cascaded into access issues for employers in the construction industry.

Keynote #3—The Successful Journey of a National Strategy: Development to Impact

Presenter: Lisa Carnahan, Information Technology Laboratory, National Institute of Standards and Technology

Facilitator: Susan Moore, NIOSH

Summary Points

Presenter Lisa Carnahan discussed the use of measurement science, standards, and technology to support the execution of a National Strategy by a federal agency. While this presentation did not focus on equitable PPE protections, Carnahan described the development of a framework to reduce security risks related to extensive partnership. As an example, Carnahan pointed out that the National Institute of Standards and Technology holds a strong history of building frameworks and engaging partners.

Carnahan described five workshops offered by the Institute taking place around the U.S. to facilitate education and engagement, including research and a standardization strategy for local, national, and possibly international use. The workshops served as a critical part of educating and eliciting interest by potential partners. NIOSH could leverage the actions taken by the National Institute of Standards and Technology through the development of its framework as NIOSH develops its Partnership.

Breakout Session—Identify Challenges to Equitable PPE Protections not yet Discussed

As a way to reflect on the Workshop material and summarize the lessons learned, NIOSH facilitators held breakout sessions, with discussions organized around challenges to equitable PPE protections by sector. The following material briefly summarizes the salient points emerging from the discussions in these sessions.

Facilitators for Healthcare Sector: Selcen Kilinc-Balci and Crystal Forester, NIOSH

Facilitators for Public Safety Sector: Jonisha Pollard and Lee Greenawald, NIOSH

Facilitators for Manufacturing Sector: Jon Williams and Eileen Kiefer, NIOSH

Facilitators for Multisectors: Eddie Sinkule and Katherine Yoon, NIOSH

Facilitators for All Other Sectors: Patrick Dempsey and Emily Haas, NIOSH

Summary Points

For healthcare, the discussion focused on product availability issues, including speeding up the development of products, manufacturing, and distribution to consumers. Discussions also focused on the need for shields and goggles that do not fog up and the availability of products on the market. Participants expressed a need for clear requirements for employers to stock more sizes and shapes of PPE.

The public safety discussion focused on the challenges of equitable PPE protections, including acceptability and compatibility with religious practices, regulations, fit testing policies, and use by individuals with facial hair. Participants pointed out that PPE decontamination and reuse processes remain a concern, including access to reliable equipment when best practices for decontamination processes are not known or are still undergoing development.

For manufacturing, facilitators detailed a primary challenge of smaller manufacturers having the ability to quickly retool to meet the demands of the PPE market; however, the production costs may be higher for smaller manufacturers, especially when producing high-quality PPE. The discussion stressed that incentive structures for manufacturers to produce equipment that would address some of the sizing and other challenges need to be addressed, as demand for PPE falling outside of standard size ranges may be small.

For multisector issues, the discussion focused on the importance of a population- and community-based approach across sectors to protect the needs of people who require PPE. Participants also stressed the desirability of consistent messaging on PPE, citing mistakes deriving from inconsistent messaging during the early days of the pandemic.

In discussing all other sectors, facilitators focused on sectors with few employees who experience high risk of exposure. Thus, high-risk, low-probability scenarios may emerge, and exactly how to capture those scenarios to protect the workers becomes critical.

Breakout Session—What Drives the Existence of Challenges to Equitable PPE Protections?

Facilitators for Healthcare Sector: Selcen Kilinc-Balci and Crystal Forester, NIOSH

Facilitators for Public Safety Sector: Jonisha Pollard and Lee Greenawald, NIOSH

Facilitators for Manufacturing Sector: Jon Williams and Eileen Kiefer, NIOSH

Facilitators for Multisectors: Eddie Sinkule and Katherine Yoon, NIOSH

Summary Points

For the healthcare discussion, participants agreed that understanding the complexity of market dynamics remains key to solving many PPE issues from a big picture perspective, along with a lack of performance requirements, test methods, and safety standards for some PPE such as eyewear, footwear covers, and headwear. When government regulations apply to PPE as medical devices, the approval processes and clearance processes may take time and produce delays, and confusion may emerge due to the number of regulations and standards for various PPE types.

Public safety discussion participants noted that manufacturers may be interested in selling PPE that cater to underserved user populations, but incentives may be limited if few will purchase these products due to low demand. Participants argued that high-quality new data, both quantitative and qualitative, need to be collected to ground public safety PPE decisions in evidence-based approaches. Current recommendations may be based on older and outdated data sources, and new study designs need to ensure that the data represent the full diversity of the workforce to characterize their needs.

In manufacturing, the important consideration of PPE costs infiltrates multiple levels of this sector. Environmental costs, including time frames for PPE biodegradation, must be considered. Additional associated costs apply to stockpiling efficiency, in that PPE may need to be disposed of if they are expired. Stockpiling issues need to be addressed in general, especially in crisis situations. Additionally, older and outdated standards, as well as variability of standards across the world, represent barriers to the implementation of new standards.

For multisector issues, facilitators cited a lack of evidence-based formal research for various population groups across sectors, especially research focused on health disparities and health outcomes for those with access to PPE compared to those without access. Participants also discussed the need across all sectors for education and raising awareness on issues of equitable PPE protections at work. Participants agreed on the need for a “one stop shop” information center for PPE that considers such issues as fit, sizing, and the sharing of regulatory standards. A need exists for teaching and educating students at schools on PPE and greater availability of educational resources related to training and awareness.

Closing Remarks

Presenter: Maryann D'Alessandro, NIOSH

Summary Points

Presenter Maryann D'Alessandro expressed appreciation to the Workshop organizers and participants and noted that NIOSH would provide the Workshop information to interested parties by way of this published proceedings document, with that process of developing the document helping NIOSH to refine gaps in the standards. D'Alessandro explained that Workshop organizers would catalogue and prioritize the information gathered on equitable PPE protections, which will serve as a resource for standards setting organizations and the formation of the Partnership.

Following up on an earlier discussion about NIOSH supporting crowdsourcing as a pathway to help achieve equitable PPE protections for U.S. workers, D'Alessandro also described two additional crowdsourcing challenges led by NIOSH. The [NIOSH Respirator Fit Evaluation Challenge](#) identifies approaches for wearers of all facial dimension types to know they have obtained a respirator that fits or to know how to effectively and easily select a respirator that will fit them. The [NIOSH Counterfeit N95 Challenge](#) helps NIOSH and respirator users to identify counterfeit products.

D'Alessandro closed by stressing the importance of partnership in continuing the conversation on equitable PPE protections. D'Alessandro underscored that the Workshop represents just one activity to support the National Strategy and that NIOSH sees the value of current partnerships and looks forward to opportunities for expansion.

Parties interested in supporting equitable PPE protections were urged to email ODAdmin@CDC.Gov to collaborate with NIOSH on the Partnership.

Attribution

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