

PUBLIC HEALTH PRACTICE

Mobilizing Communities to Sustainably Produce Face Masks: Public Health Practice in the Time of COVID-19

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ABSTRACT

Background: Face mask shortages in health care and use recommendations and requirements in a variety of community and professional contexts associated with the coronavirus disease 2019 (COVID-19) pandemic in the United States created initial and ongoing demand for face masks. In March 2020, the US Centers for Disease Control and Prevention (CDC) provided guidelines for use of cotton masks for individuals in health care settings and in public. Community volunteers provide a potential workforce to rapidly and flexibly address critical needs in emergent circumstances.

Methods: People Protecting Each-other Sustainably (PPEs) was developed to recruit and manage over 100 Northeast Ohio volunteers. People Protecting Each-other Sustainably used the social media platform Facebook to facilitate material donations, volunteer recruitment and training, and to function as an ongoing central communications hub. Leaders used an assembly line process with zero contact pick up and drop off at multiple stages of production to allow safe assembly and distribution of face masks.

Results: A total of 7 695 handmade face masks were created to distribute to local frontline responders in 10 weeks. Use of up sourced and donated materials allowed this project to reduce potential landfill waste and made a zero cost project possible. Volunteers had positive responses to the project and reported benefits from their participation.

Conclusion: This model has been successfully recreated by a smaller group in Geauga County, Ohio, with similarly successful results. Clearly this model of community mobilization has the potential to be replicated in other state of emergency crises and emergency response situations to produce lifesaving or necessary equipment when industry standard equipment is not readily available.

Keywords: COVID-19; PPE; Community volunteers; Sustainability

INTRODUCTION

Emergent community volunteers potentially provide essential services during times of crisis. Although much prior research about community volunteers has considered their impact following natural disasters,¹⁻³ the circumstances following the emergence of the coronavirus disease 2019 (COVID-19) pandemic have provided unique opportunities for lay individuals as well as public health and health care professionals to contribute in multiple ways. In particular, initial shortages of N95 ventilator face masks,⁴ led to US Centers for Disease Control and Prevention (CDC) recom-

mendations for use of cotton face masks as a "last resort" for health care workers.⁵ Later CDC guidelines recommended use of cloth face coverings for any individual (other than children under 2 years of age or those for whom mask wearing presents special risk) going outside of their home.⁶ As a result of these recommendations, multiple grassroots and community-based efforts emerged to mobilize volunteers to contribute to construction and distribution of fabric face masks. The purpose of this report is to describe how a group of community leaders, People Protecting Each-other Sustainably (PPEs), collaborated to facilitate sustainable creation of 7 695 hand sewn masks in a period of 10 weeks,



beginning March 23, 2020, for the benefit of under-resourced first responders. This report aims to provide a model of community-based public health practice that might be applied in other contexts or toward other goals.

Face Masks for Infection Prevention

Face masks for protection against transmission of COVID-19 are, at present, broadly recommended by the CDC and also recommended for nonprofessionals in some instances by the World Health Organization (WHO).⁷ Masks are potentially beneficial for both source control (ie, preventing people who are infected from infecting others) and as a means of personal protection for those who are not infected.⁸ Although there have been no results of randomized controlled trials reported to date on use of various face masks in public settings to reduce spread of COVID-19, prior research on face masks indicates some protection in shared living situations such as households or university dorms.⁹ Research has suggested handmade 100% cotton masks with no filtering material offer about one-third as much protection as a medical grade N-95.⁷ However, in comparative assessments of filtration efficiency, a measure of the ability of a mask to block aerosol particles, higher thread count cottons and some fabric blends that included cotton had performance comparable to N-95 masks.¹⁰ Additional advantages of widespread mask use include reduction of stigma directed toward those wearing masks and additional protection provided in instances of individuals who are asymptomatic or have mild cases of COVID-19.^{7-9,11}

Emergent Volunteers

Community-based emergent volunteers have played a role in natural disasters and the aftermath of violence associated with terrorist attacks.^{1,12} Volunteers are often one of the true first responders in an emergency. Advantages that facilitate their quick response include residing in a locality, having local knowledge, and not needing to navigate organizational infrastructure prior to decision-making.^{1,3} Many volunteers find their experiences are empowering and rewarding and result in improvements in confidence and sense of self-worth^{2,13} and increase social capital.³ Difficulties can occur when formal aid organizations arrive after the initial efforts made by emergent community-based helpers.³ Fortunately in remote or home-based work, such as the project described here, there is substantial potential and need for volunteer contribution with minimal potential for conflicts to occur between professional and lay helpers.³ Even when not working in physical proximity, it is possible to retain a sense of group unity, another advantage of emergent volunteerism¹¹ that occurs when individuals are focused toward a common goal.

METHODS

Setting

This project, originally based in Kent, Ohio, aimed to address an identified shortage of face masks in the area with particular focus

on first responders. Due to its location in Portage County proximate to the Summit County line, both counties were included as the target geographic area. Because of the dual aims of providing personal protective equipment and using sustainable practices, the organization was titled: People Protecting Each-other Sustainably (PPEs). Three individuals, including the first and second author, had overall project leadership roles. From this leadership team, each county was assigned a leadership champion to coordinate the donations, volunteer recruitment and training, distribution of materials, and distribution of completed face masks to first responders, essential employees, nonprofit organizations, and local businesses. The third leadership champion was recruited as the project expanded to support each counties' designated leadership champion to alleviate strain and fatigue.

Volunteer Recruitment

A Facebook page was developed on March 23, 2020, and served as the central virtual hub for the project to coordinate volunteer recruitment, training, and communication beginning on March 25, 2020. Administrative access to the Facebook page was limited to the 3 leaders to ensure project needs and milestones were clearly disseminated to the entire group as production efforts increased. In addition to Facebook, collaborative partnerships with existing community groups such as a local time bank and a sustainable sewing group were established to increase volunteer participation.

Volunteers were organized into categories based on their skills/abilities and the amount of time and resources they could contribute to the project: material donors (n = 27), material cutters (n = 26), sewists who were required to have a sewing machine (n = 54), and/or distributors (n = 3). The majority of sewists were already members of the Socially Responsible Sweatshop of Kent (SRS) or experienced professional sewists. As the project gained momentum in the community, several additional sewists joined from outside these partnerships. Other volunteers, primarily members of the Kent Community Timebank, donated fabric, T-shirts, and thread; laundered fabric and T-shirts; cut fabric into rectangles and T-shirts into tarn (T shirt fabric cut to make a long, continuous strip that can be woven or used in place of stretch cord or elastic); and helped with deliveries as stay-at-home orders relaxed.

Procedures

Training. A handbook was developed in a publicly viewable Google document, based on a mask pattern identified by SRS for its simple and effective design 2 days after initiating the project on March 25, 2020. The hyperlink to this document is included in the Appendix. The handbook includes links to YouTube videos for the mask pattern and instructions to make tarn, which comprised the ear straps. The handbook was pinned in a post at the top of the PPEs Facebook page. Phone training by professional sewists was made available for any volunteers who had questions. Volunteers who had extra shears, needles, or thread donated those to volun-



teers who needed additional supplies. A Google sheet was created by leaders to track donors, volunteers, sewists, supplies, requests for masks, and distributions.

Production and Distribution. Volunteers laundered fabric donations which were delivered to cutters. When cutting was complete, cutters contacted project leaders via message, email, or text. Cut supplies were packaged into individual mask-making kits which included tann and fabric rectangles. Sewists received between 50 and 100 kits at a time. After masks were assembled, sewists contacted project leaders who then picked up completed masks, compiled totals, and determined delivery location for each batch. All transfer of supplies and products was conducted in a zero contact manner (ie, day and time was arranged and the leadership champion for that county would drop off materials or pick up finished masks from the volunteers' porches without coming into contact with each other directly). Following recommendations from local hospitals, only donations of 100% tightly woven cotton material without compromise to its integrity were used in the production of face masks. Unusable fabric/clothing donations were delivered to the Save the World yellow drop boxes as most brick and mortar donation centers were closed. Scraps from cutting were saved to be used in a special project by the SRS. Using this model, we were able to produce and deliver our first donation of 300 masks only 5 days after our recruitment efforts began.

As a preventative measure to detour material and resource waste, we gauged the skill level of all sewists with a small sample of 20 to 25 sewing material kits. Upon completion of the initial sample, sewists who produced quality masks were scaled up and those with skill levels that did not meet quality standards were deferred to other material preparation jobs such as laundering or cutting. All finished face masks were screened for quality prior to donation into the community. Very few masks were not able to be distributed because of this quality control protocol. Any masks found to be unusable were donated to the SRS to be repurposed in other projects.

Expansion. An overwhelming sense of need for personal protective equipment (PPE) was expressed by local first responders and other organizations responding to the threats of community spread. This, coupled with individual stressors and emotional impacts related to coping with the presence of a novel virus, comprised another factor which contributed to the need to expand the scale of the project. Encouraging volunteers not to overextend their individual contributions, investing in time to practice self-care, and continuously recruiting more volunteers to help bear the workload to accomplish the projects' objectives through expansion relieved not only the burden of workload but also reduced emotional distress for new and existing volunteers. Most volunteers reported a sense of empowerment and self-worth throughout and concluding the project.

As hospitals developed their own mask plans and patterns, and as more sewists joined our project, there were many suggestions of

alternate patterns. After review of alternatives, the leaders announced that sewists could select alternative patterns, and have their masks included in PPEs distribution, but these alternative designs could not be fully supported by the PPEs assembly line or supply chain. Several sewists agreed to supply their own materials and take advantage of PPEs's offer to distribute their masks.

The methods employed in the PPEs model including standardized production, zero contact pick up and drop off, and production tracking sheets were replicated with small changes by other community groups with similar goals. A group in Geauga County consisting of 16 volunteers (9 sewists and 7 material donors) followed the PPEs model with some adjustments. This group used a less structured production process which decreased the total number of masks they were able to produce, but still enabled them to achieve a meaningful impact on their local PPE shortage.

Measures/Outcomes

The primary measures of interest included total number of face masks produced and distributed, estimate of positive environmental impacts from sustainable production practices, and aspects of volunteer involvement including effort and perceptions of experience.

RESULTS

Initial multiple-delivery recipients included hospitals in Summit and Portage Counties and one-time recipients including senior centers, skilled nursing facilities, and social service providers. As availability and priorities shifted within Ohio, PPEs stopped delivering to hospitals and expanded to immigrant farm workers and meat packers, additional skilled nursing facilities, mental health facilities, friends and family, and others who lacked resources to procure face masks for personal or community use.

Donations made to the community were welcomed with much enthusiasm. People Protecting Each-other Sustainably was among many local efforts to address the shortage of PPE. We did not require those who accepted donations to track their use or reuse as we felt it would burden local responders as they struggled to meet the dynamic changes in service demands amid COVID-19 disruptions.

People Protecting Each-other Sustainably was able to detour approximately 570 yards of cotton material and 150 T-shirts from potentially ending up in landfills. This reduces municipality waste disposal needs, contributes to reductions in greenhouse gases, landfill space, insecticides and water usage.¹⁴ Another benefit of repurposing cotton material was improved comfort of masks. Health care workers praised the use of tann rather than elastic. According to individuals who had to wear masks for long periods of time, tann compared favorably to elastic; its softer texture was associated with decreased pulling, rubbing, or chaffing.

Volunteers appreciated having the opportunity to contribute to the health of others. One stated, "I was gratified to be part of a



project that was doing something so worthwhile to assist during the shutdown. At first, I felt I might not be of any use because I don't sew, but I soon found out there were other tasks that I could do." Another volunteer described, "Participation in this project has given us the opportunity to feel like we are helping others in this time of need. It's nice to be part of something that helps so many in our community and beyond."

Volunteers also found the work therapeutic. According to one volunteer, "There were days when the time I spent sewing was a mental health lifeline for me." This volunteer echoed key benefits of emergent volunteerism, "This project is a fantastic example of how communities can mobilize, organize, and help during times of need. It really warms my heart that we were able to help."

DISCUSSION

In this report, we described how community volunteers were rapidly mobilized to sustainably produce a large number of face masks provided to first responders and others during the early weeks of the COVID-19 pandemic in Ohio. Development of assembly line style supply preparation and distribution facilitated consistent and quick production. Zero contact supply and mask delivery decreased risk for volunteers, leaders, and recipients. As noted by other researchers,^{2,12} volunteers found having the opportunity to help others rewarding.

Given limited consensus in published literature for a standard mask pattern to inform an evidence-based decision in the selection of the face mask pattern at the time of production, we turned to our expert sewists in the SRS. We asked that they consider the recommendations of the local hospitals who had published patterns for individuals willing to sew face masks for donation, the skill level of community volunteer sewists, the ability to secure ample materials for production, as well as the limitations of the assembly line production methods the group planned to employ. Under the recommendation of the SRS, a face mask pattern was adapted from local hospital recommendations that would require minimal cutting, maintained two layers of cloth protection, and would be able to be replicated using up-sourced donated materials. The largest adaptation made from hospital recommendations was the choice not to use elastic for ear loops. This practice was not supported by our sustainable values and elastic was in low supply due to an increased demand. Elastic was, therefore, replaced with tann, an up-sourced material made from T-shirts.

One unanticipated consequence for project leaders was dealing with the emotional impact of requests for face masks from organizations outside of the original priority recipients (health care first responders). Due to widespread shortages of face masks, organizations employing essential workers, ie, those who continued to work regardless of government stay-at-home orders, struggled to ensure a safe environment for their employees. Balancing our project aim with desire to help others in need was challenging for the project leaders. Fortunately, over time, due to changing circum-

stances and availability, it became easier for PPEs to accommodate a larger range of organizations.

In addition, the initial leadership team consisted of just the first and second author of this article. At times, responding to organizational and logistical demands, while navigating personal challenges associated with COVID-19, was exhausting. Although burnout and frustration are noted as risks for emergent volunteers,^{2,11} it may be that those in coordinator or leadership positions are yet more vulnerable, as volunteers may rely on organizers as role models for stress management and a calm demeanor. To help alleviate leadership fatigue, as the project expanded, a third leadership position was created. Fortunately, as stay-at-home health orders began to relax, some tasks that were initially assigned to the leadership team were delegated to trusted volunteers to ensure the demands of the project and volunteers' needs could be efficiently met.

Given the first and second authors' experience, we recommend those who are motivated to take on volunteer leadership positions for crisis or disaster response, be self-aware about their own abilities and limitations, and ensure that leaders, as well as volunteers, have ample support to prevent burnout and emotional exhaustion.

PUBLIC HEALTH IMPLICATIONS

Emergent volunteerism is a practice that can provide rapid, beneficial assistance during disasters, or disruptions, including pandemic. Additionally, some emergent community volunteers find their initial experience is a gateway that leads to further social service endeavors,³ potentially increasing the pool of public health practitioners. Participating in a meaningful activity with overt goals and tangible outcomes may help counter social isolation associated with the COVID-19 pandemic, that for many resulted in loss of typical work and leisure opportunities. Although there can be challenges in collaborations between formal organizations and emergent volunteers, including those related to liability and risk management,¹⁵ public health practitioners stand to benefit from the contributions of motivated individuals with local knowledge. Organizations should consider ensuring processes and policies are flexible enough to accommodate emergent volunteers.

Practically speaking, during the remainder of 2020 it is likely there will be additional need for face masks as these are recommended and, at times, required for attendance or participation in some activities or events. It is essential that convenient, reusable, comfortable masks are made available to all individuals and, in particular, those at higher risk including older adults and those who have limited financial resources. The process used by PPEs to sustainably and safely produce and distribute face masks provides a model for other organizations and motivated individuals.

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Please contact Andrew Snyder (asnyde20@kent.edu) for information to facilitate adaptation of this process in your community.

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APPENDIX

People Protecting Each-other Sustainably- PPEs

Google Document Hyperlink:

https://drive.google.com/file/d/1DQSWJ0h0AbbeVU3cf1aXwz5tm1Dzj88U/view?fbclid=IwAR1_s8l7OVW9YYMhtDCFW9puYX_Tn0ZBFQ6YZUK_JGQfph12WuDjRx2Qg