Table 2. Antibody Levels in Mother Sera Samples

Clinical value	Reference range	Mother[a] 1	2	3	4	5	6
IgM, AU/mL	<10	83.97	236.6	5.58	33.26	15.61	1.39
IgG, AU/mL	<10	136.72	117.37	120.63	103.46	70.05	8.12

[a] Mothers and infants correspond by number between tables.

and 2 also had elevated IgM levels. Inflammatory cytokine IL-6 was significantly increased in all infants. None of the infants presented any symptoms as of March 8, 2020.

Discussion | Among 6 mothers with confirmed COVID-19, SARS-CoV-19 was not detected in the serum or throat swab by RT-PCR in any of their newborns. However, virus-specific antibodies were detected in neonatal blood sera samples. The IgG concentrations were elevated in 5 infants. IgG is passively transferred across the placenta from mother to fetus beginning at the end of the second trimester and reaches high levels at the time of birth.[5] However, IgM, which was detected in 2 infants, is not usually transferred from mother to fetus because of its larger macromolecular structure. In a study[6] of mothers with SARS, the placentas of 2 women who were convalescing from SARS-CoV infection in the third trimester of pregnancy had abnormal weights and pathology. Whether the placentas of women in this study were damaged and abnormal is unknown. Alternatively, IgM could have been produced by the infant if the virus crossed the placenta.

This study is limited by the small sample size, lack of cord blood, amniotic fluid, and breast milk and by incomplete information on the outcome of the infants. These findings are important for understanding the serological characteristics of infants whose mothers are infected with SARS-CoV-2 and further study is necessary.

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Training and Fit Testing of Health Care Personnel for Reusable Elastomeric Half-Mask Respirators Compared With Disposable N95 Respirators

The demand for disposable respiratory protective devices needed to protect health care personnel may exceed supply during large outbreaks of respiratory infectious diseases.[1,2] Concerns are growing over global shortages of respiratory protective devices during the novel coronavirus disease 2019 (COVID-19) pandemic.[3]

Supplemental content

A reusable alternative to N95 respirators for which health care personnel can be rapidly assessed for fit (fit testing) and trained for use is needed. Elastomeric half-mask respirators (EHMRs), which provide the same level of respiratory protection as N95 respirators, are one alternative[4] (eFigure in Supplement 1). These reusable respirators are used in construction and manufacturing, but not widely used in health care[4] because of uncertainty about disinfection methods and upfront costs.[5] The goal of this demonstration study was to test the feasibility of rapidly training and fit testing health care workers to EHMRs.

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Table 1. Participant Demographic Characteristics, Respirator Wear Experience, and Fit Assessments in a Study Comparing Elastomeric Half-Mask Respirator and N95 Respirators (N = 153)

	Participants, %	
	EHMR (n = 124)	N95 (n = 29)
Age, mean (SD), y	38.19 (11.19)	38.59 (10.65)
Sex		
Men	21.0	34.5
Women	79.0	65.5
Occupation		
Nurse	41.1	41.4
Physician/physician assistant/ nurse practitioner	16.1	13.8
Respiratory therapist	12.9	24.1
Nurses' aide/patient sitter	6.5	6.9
Social worker	7.3	0.0
Medical student	1.6	0.0
Other ancillary workers	14.5	13.8
Hospital unit		
Medical/surgical units	25.8	13.8
Emergency department	21.8	13.8
Intensive care unit	26.6	37.9
All units (float)	10.5	10.3
Other units	7.3	20.7
Administrative	8.1	3.4
Type of respirator previously used[a]		
None	9.7	27.6
EHMR	0.8	3.4
N95	88.7	69.0
PAPR	9.7	13.8
Years of experience wearing respirators		
0	9.7	27.6
1-5	33.9	20.7
6-10	25.8	10.3
11-20	16.9	24.1
>20	13.7	17.2
Qualitative fit testing attempts to pass[b,c]		
1	92.2	88.5
2	6.1	7.7
3	1.7	3.9
Time to complete qualitative fit testing, mean (95% CI)[c,d]	6 min 47 s (6 min 26 s to 7 min 8 s)	6 min 29 s (5 min 46 s to 7 min 13 s)

Abbreviations: EHMR, elastomeric half-mask respirator; PAPR, powered air-purifying respirator.

[a] Not mutually exclusive (could select more than 1 respirator type).

[b] Difference in number of attempts to pass fit testing in the EHMR vs N95 groups: *P* = .76. Fisher exact was used to test collapsed categories (1, >1); *P* = .54.

[c] Excluded 10 participants in the EHMR group and 3 in the N95 group because of missing time data.

[d] Mean difference in time between EHMR vs N95 group, 0 min 18 s (95% CI, −0 min 31 s to 1 min 6 s).

Methods | In 2019, 2 US health care organizations (Emory University and University of Texas Health [UTHealth] Science Center at Houston) conducted an outbreak simulation in which health care personnel, who were randomized to EHMR (80%) or N95 (20%) groups, were rapidly fit tested and trained. The institutional review boards at UTHealth, Baylor College of Medicine, and Emory University approved this study. Written informed consent was obtained at recruitment. Fit testing was performed to assess respirator fit to face, checking for leaks, using an Occupational Safety and Health Administration qualitative fit testing process.[6] The number of fit testing attempts and testing time were recorded. Both groups were trained using a 9-minute video. The EHMR group was assessed 3 times consecutively for 26 performance indicators in the following 6 key areas: (1) inspection, (2) donning, (3) positive-pressure user seal check, (4) negative-pressure user seal check, (5) doffing, and (6) disinfection. Trainers scored participants based on the degree of assistance needed to complete each step (1 indicated physical assistance; 2, verbal assistance; 3, no assistance). A total score for each area consisted of a sum of 4 or 6 individual performance indicators (3 points each) ranging from 12 or 18, with a possible overall score of 78 points. Mean differences for time to completion of fit testing between groups was calculated using *t* tests, differences in the number of attempts to achieve proper fit were calculated using χ^2 tests, and ANOVA with post hoc and 2-sided pairwise comparisons were used to compare EHMR performance scores by attempts with $\alpha = .05$. No sample size calculation was performed. Additional details are available in the protocol (Supplement 2). Analyses were conducted using SPSS, version 25.

Results | Of 193 health care personnel randomized, 153 (79%) participated in the study (124 in the EHMR group and 29 in the N95 group) (**Table 1**). The majority of participants were women (77%), with a mean age of 38 years. Overall, 87% of participants had at least 1 year of experience wearing a respiratory protective device; 9.7% of participants in the EHMR group vs 27.6% in the N95 group had no prior experience. Few participants (1.3%) had prior experience using an EHMR.

In the EHMR group, 92.2% passed fit testing during the first attempt compared with 88.5% in the N95 group (*P* = .76); all participants passed by the third attempt. The mean time to complete fit testing for the EHMR group, including total number of attempts (6 min 47 s), was not significantly different than the N95 group (6 min 29 s) (difference, 0 min 18 s [95% CI, −0 min 31 s to 1 min 6 s]; *P* = .48). Participants' performance scores for EHMR use significantly improved from the first to second attempts overall and in all areas, with a significant improvement from the second to third attempt in 1 area (**Table 2**).

Discussion | This study found that health care personnel can be rapidly fit tested and trained to use the reusable EHMR. Time to achieve fit with EHMRs was not significantly different than with N95 respirators. High EHMR performance was demonstrated. EHMR participants had prior experience using other forms of respiratory protection, which may have influenced their high performance. Limitations include the simulated emergency, small number of participants, and lack of data on

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Table 2. Mean Elastomeric Half-Mask Respirator Performance Scores for 6 Key Areas and 26 Individual Indicators (N = 124)

Performance area	Performance score[a,b]				
	Mean			Mean difference (95% CI)	
	1st attempt	2nd attempt	3rd attempt	1st vs 2nd attempt	2nd vs 3rd attempt
Total performance score	72.0	76.4	77.4	−4.34 (−5.33 to −3.35)[c]	−1.01 (−2.00 to −0.02)[c]
Inspecting respirator	11.26	11.81	11.92	−0.54 (−0.75 to −0.33)[c]	−0.12 (−0.34 to 0.09)
Face piece	2.78	2.96	2.97		
Head straps	2.89	2.98	2.98		
Exhalation valve	2.77	2.93	2.99		
Filters	2.82	2.94	2.98		
Donning respirator	11.75	11.93	11.97	−0.18 (−0.28 to −0.07)[c]	−0.04 (−0.14 to 0.06)
Face piece	2.93	2.99	2.98		
Head harness	2.98	3.00	3.00		
Neck strap	2.98	2.98	3.00		
Adjust straps	2.86	2.96	2.98		
Positive-pressure user seal check	11.43	11.82	11.96	−0.40 (−0.57 to −0.22)[c]	−0.14 (−0.31 to 0.04)
Cover exhalation valve and exhale	2.90	2.95	3.00		
Check for leaks	2.92	2.98	2.99		
Readjust respirator	2.88	2.99	3.00		
Repeat user seal check	2.73	2.90	2.97		
Negative-pressure user seal check	11.62	11.88	11.95	−0.26 (−0.40 to −0.12)[c]	−0.07 (−0.21 to 0.07)
Palms over filter intakes and inhale	2.94	2.97	2.99		
Check for slight face piece collapse	2.89	2.98	2.98		
Readjust respirator	2.92	2.99	3.00		
Repeat user seal check	2.87	2.94	2.98		
Doffing respirator	10.47	11.44	11.79	−0.98 (−1.24 to −0.72)[c]	−0.34 (−0.61 to −0.86)[c]
Hand hygiene and gloves	2.40	2.66	2.88		
Unhook neck strap	2.88	2.95	2.97		
Remove without touching respirator face piece	2.51	2.91	2.98		
Place on pad	2.69	2.92	2.97		
Cleaning/disinfecting respirator	15.45	17.49	17.80	−2.04 (−2.4 to −1.6)[c]	−0.30 (−0.70 to 0.09)
Hand hygiene and gloves	2.73	2.94	2.98		
Hold inside and wipe outside	2.44	2.91	2.98		
Prepare clean pad or surface	2.47	2.91	2.95		
Hand hygiene and gloves	2.67	2.91	2.95		
Wipe inside of respirator	2.72	2.96	3.00		
Remove gloves and hand hygiene	2.44	2.86	2.92		

[a] Key EHMR performance areas are the sum of individual indicators (3 points each), with total possible scores of 12 or 18.

[b] Individual indicator scores are degree of assistance needed to complete (1 indicates physical assistance; 2, verbal; 3, none).

[c] Mean differences (95% CI) between attempts ($P < .05$).

actual use of EHMRs. No information was available to inform sample size calculations; *P* values may not be meaningful. Better understanding about the efficacy and feasibility of disinfection methods are key. Combined with an Occupational Safety and Health Administration respiratory protection program,[6] the EHMR may serve as a suitable alternative to disposable N95 respirators during public health emergencies.

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Rural-Urban Differences in Cardiovascular Mortality in the US, 1999-2017

Wide variation in cardiovascular disease age-adjusted mortality rates (AAMRs) has been noted among counties in the US.[1] Rural residents experience higher death rates compared with residents of urban areas, particularly from potentially preventable causes.[2] We examined temporal trends in cardiovascular disease AAMRs overall and across subgroups stratified by rural-urban area designation in the US.

Methods | We used the US Centers for Disease Control and Prevention Wide-ranging Online Data for Epidemiologic Research (CDC WONDER) database from 1999 to 2017.[3] Based on a report showing that reductions in cardiovascular disease mortality slowed after 2011,[4] we also analyzed trends for 1999-2011 and 2011-2017. The underlying cause of death was determined using the *International Statistical Classification of Diseases and Related Health Problems, Tenth Revision* (codes I00-I99, disorders of the circulatory system) based on death certificate adjudication.

The AAMRs were calculated by multiplying the age-specific death rate for each age group by the corresponding weight from the 2000 standard US population, summing across all age groups, and then multiplying by 100 000.[4] The AAMR is expressed as per 100 000 population per year.

We divided our population using the National Center for Health Statistics urban-rural classification scheme into large metropolitan (≥1 million), medium and small metropolitan (50 000-999 999), and rural (<50 000) counties per the 2013 US Census classification.[5] Because data were publicly available and deidentified, ethics committee approval was not required.

Results were stratified by age (<25, 25-64, and ≥65 years),[6] sex, race, and ethnicity. We used Poisson regression with log link and robust standard errors to estimate annual percentage change (APC) in the AAMR and included an interaction term to test differences in trends over time by urban-rural classification in a second model. Analyses were performed using Stata version 16 (StataCorp). Two-tailed $P < .05$ was considered statistically significant.

Results | Between 1999 and 2017, there were 16 111 775 deaths attributed to cardiovascular disease, with most occurring in large metropolitan areas (n = 7 991 440 [49.6%]) followed

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