

COVID-19 ventilator rationing protocols: why we need to know more about the views of those with most to lose

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ABSTRACT

Withholding or withdrawing life-saving ventilators can become necessary when resources are insufficient. With rising cases in many countries, and likely further peaks in the coming colder seasons, ventilator triage guidance remains a central part of the COVID-19 policy response. The dominant model in ventilator triage guidelines prioritises the ethical principles of saving the most lives and saving the most life-years. We sought to ascertain to what extent this focus aligns, or conflicts, with the preferences of disadvantaged minority populations. We conducted a bibliographical search of PubMed and Google Scholar and reviewed all ventilator rationing guidelines included in major recent systematic reviews, yielding 589 studies before screening. Post screening, we found six studies comprising a total of 10 591 participants, with 1247 from disadvantaged populations. Three studies reported findings stratified by race and age, two of which stratified by income. Studies included two to seven principles; all included 'save the most lives'. Involvement of disadvantaged minority populations in eliciting preferences is very limited; few studies capture race and income. This is concerning, as despite relatively small numbers and framing effects there is an observable and plausible trend suggesting that disadvantaged groups worry that dominant principles reduce their chances of receiving a ventilator. To avoid compounding prior historical and structural disadvantage, policy makers need to engage more fully with these populations in designing and justifying ventilator rationing guidance and review their adequacy. Likewise, clinicians need to be aware that their implementation of dominant triage guidelines is viewed with higher levels of concern by minority populations.

INTRODUCTION

Rationing of resources becomes necessary when demand outstrips supply. In the wake of the initial US surge of the COVID-19 pandemic, numerous hospitals and states developed plans for how to allocate ventilators.^{1–4} We seek to determine what is known about the views of historically and structurally disadvantaged populations on guiding rationing principles. This analysis matters practically for designing and reviewing triage models in the ongoing epidemic, and conceptually for assessing their underlying values.

The dominant model in ventilator triage guidelines prioritises the principles of saving the most lives and/or life-years to maximise benefits.^{1 5–10} The main aim is to avoid wasting ventilators on people likely dying while being ventilated or likely dying soon after hospital discharge. By selecting

patients most likely to survive treatment, and to live sufficiently long afterwards, each ventilator generates more lives and life-years. These principles can be controversial due to their utilitarian underpinning, and because their ahistorical 'colorblind' perspective can compound further the disadvantage of already disadvantaged populations.¹⁰

In the US context, a particular concern is the impact of such principles on the chances of racial minority communities (black, brown, Indigenous) to receive life-saving treatment, who already experienced a disproportionate impact of COVID-19-related unemployment, hospitalisations, morbidity and mortality (with on average two and up to six times as many black, brown, and Indigenous residents dying from COVID-19 compared with whites).^{2 10–13} The effects of structural racism also surface in major discrepancies in US life expectancy, which matters for considering the remaining life expectancy after discharge.¹⁰ These discrepancies are largely due to circumstances of living, including limited access to public health goods and clinical services.^{10–13}

Guideline authors frequently emphasise drawing on both expert and community input in establishing the guiding principles of ventilator rationing guidelines. However, recent systematic reviews highlight significant variations in the manner and transparency of engagement efforts.^{1 2 4} Further, two commonly cited community projects report extensive community engagement, but do not provide quantitative data around community feedback and ultimately recommend a save-the-most-lives approach take priority.^{5 6} Given the high stakes, an important question is to what extent dominant ventilator allocation guidelines align, or stand in conflict with, the preferences of the disadvantaged communities.

METHODS

We conducted a bibliographical PubMed and Google Scholar search of studies on public attitudes towards rationing ventilators or other life-saving treatment in an influenza or respiratory illness pandemic, published between 1 January 2000 and 15 November 2020 (the search string is shown in [figure 1](#)). Using a snowball method, keyword searches were conducted in all journals where identified papers were published, complemented by a cited-works search of all identified studies. We reviewed all references to public engagement in recent systematic reviews of state-level guidance.^{1 2 4} We supplemented with a general internet



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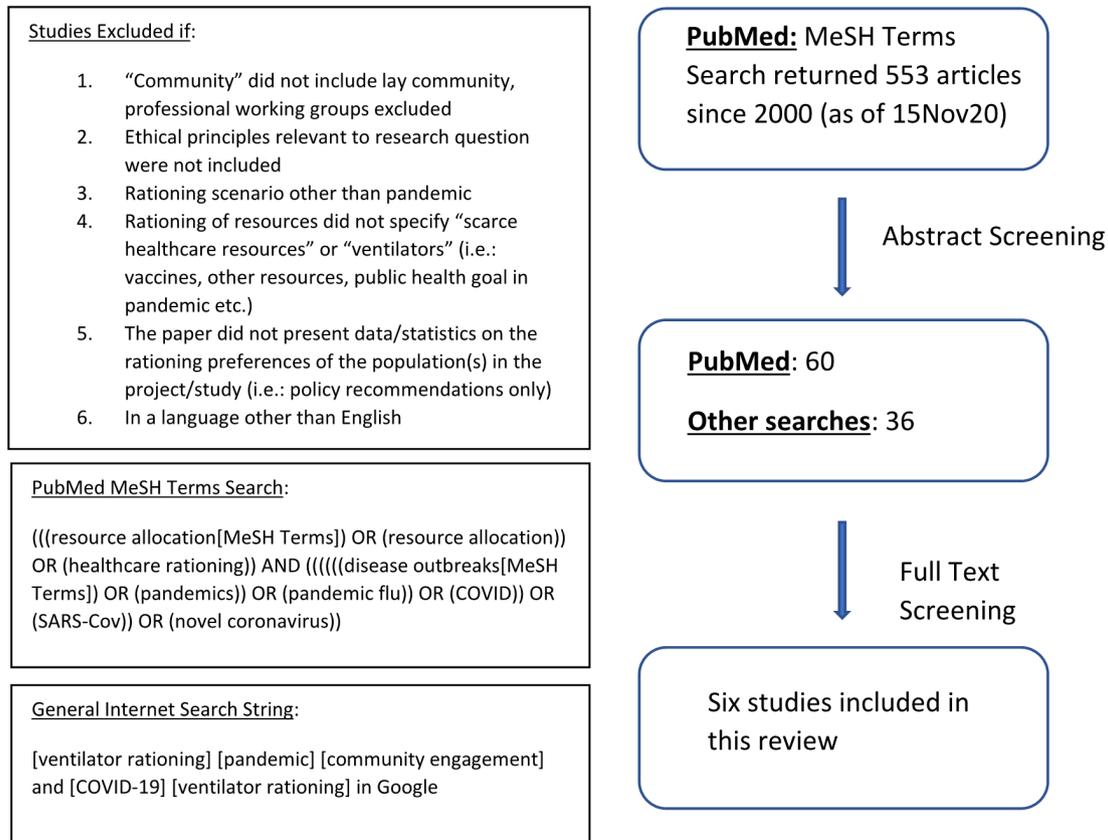


Figure 1 Search schematic. MeSH, medical subject headings.

search using the terms shown in [figure 1](#). As a result, a total of 589 studies were identified and 6 met the inclusion criteria ([figure 1](#)). As a pragmatic proxy we operationalised the concept of 'disadvantaged groups' as racial minorities and low-income groups. For quantitative analyses, where studies provided data on both, we included the group with the largest number to avoid undercounting involvement of 'disadvantaged population'.

RESULTS

Six identified studies comprised a total of 10 591 participants, with 1247 from disadvantaged populations ([figure 1](#) and [table 1](#)). Three studies reported findings stratified by race and age, with two of these three stratifying by income, or geographical locations serving as proxies for these demographics.^{8 14 15} Studies included as few as two principles to up to seven.^{8 14-18} All included save the most lives.^{8 14-18} Five included save the most life-years.^{8 14 16-18} Two studies directly included the principle of help the worst off (worded 'save those most likely to die if not treated' and 'to patients who are most at need in the moment, which may mean fewer people overall survive, but doctors do not deny treatment based on age or health status'); four had no equivalent.^{8 14-18} Findings are summarised chronologically in the following sections.

Race

In Biddison *et al*,⁸ 83% of white participants selected save the most lives for 'always or often use', with the highest approval across six principles. By contrast, only a third of black participants shared this preference. In a follow-up study entailing the same six principles, Biddison *et al*¹⁴ showed significantly lower odds among black participants to prefer 'always or often use' for saving the most life-years, compared with white participants

(OR 0.34; 95% CI 0.21 to 0.58, odds vs first come, first served). In Pew Research Center,¹⁵ comparing two principles, 60% of black respondents favoured helping the worst off versus saving the most lives, while white participants were evenly split.

Income

In Biddison *et al*⁸ race tracked income, and economically advantaged groups clearly preferred save the most lives, compared with economically disadvantaged groups. In Pew Research Center,¹⁵ upper income respondents slightly favoured save the most lives (52%), while participants in the low income category favoured help the worst off (56%).

Age

In Biddison *et al*⁸ the majority of older participants (83%) preferred save the most lives for 'always or often use' compared with 33% of younger participants. Additionally, 18% of younger adults preferred the life cycle principle for 'always or often use' compared with 3% of older participants. Biddison *et al*¹⁴ found slightly different results, stating that 'those younger than 60 were significantly more likely to object to the use of life cycle criterion'. Pew Research Center¹⁵ also found differing results, with 58% of participants under 30 preferring save the most lives and 57% of participants over 50 preferring help the worst off.

DISCUSSION

We highlight here three key findings. First, overall, we found few studies that examined community preferences for rationing principles. Of the six studies identified only half captured preferences by race, income and age, which matters when considering who is represented in community samples and assessing involvement of disadvantaged groups. Second, in the studies that do

Table 1 Summary of findings

Article	Community	Language used in the study*	Ethical principles†	Community preferences
Department of Health - Seattle & King County, 2009	123 adults (Seattle, Washington, USA)	'Hospitals should take into account the likelihood of the patient surviving to avoid using scarce resources on patients who are less likely to survive, even with treatment'. 'Hospitals should take into account the number of years a person would live if they survive when deciding who should get scarce resources'. 'Hospitals should provide lifesaving care on a first come, first served basis regardless of other considerations'. 'Hospitals should take into account the quality of life a person would have if they survive when deciding who should get scarce resources'.	Save the most lives. Save the most life-years. First come, first served. Quality of life.	(General preferences) After community forum participation (% agree to use): 84%—Save the most lives. 47%—Save the most life-years. 14%—First come, first served. 65%—Quality of life.
Bailey et al, 2011 ¹⁸	5225 students, staff and faculty (University of Alberta, Canada)	'Save the most lives possible, irrespective of differences'. 'Save people according to a priority group ranking system (age groups, healthcare workers, politicians)'. 'Save those most likely to die if not treated'. 'Save that group of people that will have that most years of life to live because of treatment'. 'First come, first served'. 'Save children first'. 'Save women and children first'.	Save the most lives. Priority group rank. Help the worst off. Save the most life-years. First come, first served. Children first. Women and children first.	(General preferences) Participants chose one: 39.9%—Save the most lives. 22.4%—Priority group rank. 20.4%—Help the worst off. 9.9%—Save the most life-years. 4.5%—Children first. 2%—Women and children first. 1%—First come, first served.
Biddison et al, 2014 ⁸	68 adults (Maryland, USA)‡	'First-come-first-served'. 'Lottery'. 'Prioritize those most likely to survive'. 'Prioritize those with the most years left (survive the most number of years, underlying illnesses the patient already has are considered)'. 'Life cycle of 'fair innings' principle'. 'Value to others in a pandemic'.	First come, first served. Lottery. Save the most lives. Save the most life-years. Life cycle. Instrumental value.	Always or often use in guidelines (% agree): Older participants: save the most lives (83%). Younger participants: save the most lives (33%). White participants: save the most lives (83%). Black participants: save the most lives (33%). High income: save the most lives (83%). Low income: save the most lives (33%).
Biddison et al, 2018 ¹⁴	228 adults (Maryland, USA)	'Prioritize those most likely to survive the current illness'. 'Prioritize those most likely to live the longest after recovery (considering comorbid conditions)'. 'Prioritize those who have lived fewer life stages'. 'Prioritize those who have particular instrumental value to others in the pandemic'. 'First come, first served'. 'Lottery'.	Save the most lives. Save the most life-years. Life cycle. Instrumental value. First come, first served. Lottery.	Always or often use in guidelines (% agree): Increasing age was a significant predictor of objecting to use of a lottery (OR 1.03; 95% CI 1.02 to 1.04). African Americans had lower odds of preferring 'save the most life years' (OR 0.34; 95% CI 0.21 to 0.58) and higher odds of preferring 'first come, first served' (OR 2.36; 95% CI 1.29 to 4.29).
Schoch-Spana et al, 2020 ¹⁶	30 adults (Texas, USA)	'Survive current illness'. 'Survive longest'. 'Fewest life stages'. 'Value to others'. 'First come, first served'. 'Lottery'.	Save the most lives. Save the most life-years. Life cycle. Instrumental value. First come, first served. Lottery.	(General preferences) Always or often use in guidelines (% agree): 86.7%—Save the most lives. 50%—Save the most life-years. 40%—Instrumental value. 33%—Life cycle.
Pew Research Center 2020 ¹⁵	4917 adults (USA)§	'to patients who are most at need in the moment, which may mean fewer people overall survive, but doctors do not deny treatment based on age or health status'. 'patients who are most likely to recover with treatment, which may mean more people survive, but that some patients don't receive treatment because they are older or sicker'.	Help the worst off. Save the most lives.	Participants chose one: Under 30 save the most lives (58%), 30–49 divided, over 50 help the worst off (57%). White divided (48%/47%), Hispanic divided (50%/45%), black help the worst off (60%). Upper income save the most lives (52%), mid-income divided (49%/47%), low income help the worst off (56%).

*Wording of concepts as presented to study respondents.

†Operant underlying ethical principle, standardised for purposes of comparison as not always stated verbatim as this wording.

‡The study conceptualised economically advantaged population from one county with a median income of \$105 692 and 4.5% of families living below the federal poverty line; and economically disadvantaged population from another county with a median income of \$18 522 and 28% of families living below the federal poverty line. Conceptualised older population from one county with a mean age of 55 years and younger population from another county with a mean age of 50 years.

§The study conceptualised low income as <\$40 100 annual income and upper income as >\$120 400 annual income.

examine between-group differences we found a trend, but also nuances, in preferences. Finally, framing effects in the number and wording of principles require attention.

The small number of studies, combined with the fact that only half reported on differences by race, income or age, limits

understanding of group-specific community preferences for guiding rationing principles. Yet between-group differences are important as economically disadvantaged, racial minorities experience structural racism and far higher incidences of comorbid conditions and poor health.^{2 3 10} Only 11.8% of the

10591 overall participants were from disadvantaged populations. Further, only one study presented a statistic quantifying the inclusion of Hispanic populations, and no studies included statistics on the inclusion of Indigenous communities.¹⁷

The existing data suggest that economically disadvantaged, minority populations more frequently prefer principles that offer them a better chance of receiving a ventilator, which stands in contrast to the common ‘colorblind’ emphasis on saving the most lives and life-years, which favours those with better baseline health.¹⁰ In addition to the data on preferences, Biddison *et al*⁸ highlight in their discussion qualitative themes that emerged from sessions that black participants’ concerns were largely focused on social justice in ventilator rationing scenarios.

However, this point appears not to have been sufficiently salient to be explored universally further in subsequent work. Schoch-Spana *et al*¹⁶ recreated the study design of Biddison *et al*⁸ using a different geographical population in two areas of Texas. Yet no results were presented stratified based on location, and by implication race and income.¹⁶

Finally, studies included different ranges of ethical principles (from 2 to 7) that were worded and characterised differently. Numeric and conceptual framing of principles directly influences their interpretation and appraisal by respondents, and complicates cross-study conclusions, constituting the most important limitation of this study. For example, Biddison *et al*¹⁴ framed the save the most lives principle as ‘Prioritize those most likely to survive the current illness’, while Pew Research Center¹⁵ stated ‘some patients don’t receive treatment because they are older or sicker’ (see [table 1](#) for further variations).

CONCLUSION

There is little research on community preferences for rationing principles in the setting of ventilator rationing in a respiratory illness pandemic, particularly when it comes to surfacing views of historically and structurally disadvantaged populations. Different methodologies complicate drawing conclusions across studies, although we observed a trend that historically disadvantaged groups are concerned that dominant principles may compound the experience of prior disadvantage by reducing chances for a ventilator. Approximately half of available state-level guidance (13 of 25) refers to community engagement having informed the guidance, citing three of the six studies included in this review, although the integration of social science evidence is incomplete and untransparent (findings are not publicly available and it is not clear to what extent views of minorities have contributed to their formulation).¹ Further study is needed to elucidate community preferences, especially preferences that may be influenced by systemic inequity. Citation of community support for a specific principle requires context on differing trends across groups, and policy makers should engage more fully with disadvantaged populations.

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