



HHS Public Access

Author manuscript

Am J Bioeth. Author manuscript; available in PMC 2018 April 04.

Published in final edited form as:

Am J Bioeth. 2018 March ; 18(3): 29–41. doi:10.1080/15265161.2017.1418922.

Ethical Dilemmas in Protecting Susceptible Subpopulations From Environmental Health Risks: Liberty, Utility, Fairness, and Accountability for Reasonableness

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Abstract

Various U.S. laws, such as the Clean Air Act and the Food Quality Protection Act, require additional protections for susceptible subpopulations who face greater environmental health risks. The main ethical rationale for providing these protections is to ensure that environmental health risks are distributed fairly. In this article, we (1) consider how several influential theories of justice deal with issues related to the distribution of environmental health risks; (2) show that these theories often fail to provide specific guidance concerning policy choices; and (3) argue that an approach to public decision making known as accountability for reasonableness can complement theories of justice in establishing acceptable environmental health risks for the general population and susceptible subpopulations. Since accountability for reasonableness focuses on the fairness of the decision-making process, not the outcome, it does not guarantee that susceptible subpopulations will receive a maximum level of protection, regardless of costs or other morally relevant considerations.

Keywords

environmental health protection; susceptible subpopulations; justice; fairness; liberty; utility; pollution; accountability for reasonableness

Groups of individuals who face greater environmental health risks in certain circumstances¹ than members of the general population are known as susceptible subpopulations (Brulle and Pellow 2006; Environmental Protection Agency 2016a; Hines et al. 2010). Susceptibility may be due to intrinsic, biological factors, such as age and life stage, genetics, sex, or

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DISCLOSURES

The authors have no conflicts of interest to disclose.

¹Environmental health risks include risks resulting from exposures to dangerous agents or conditions that may be found in various environments, including homes, workplaces, schools, and commercial and recreation areas.

ethnicity; extrinsic, social factors, such as geographic proximity to exposure sources, occupation, lifestyle, nutrition, or socioeconomic status; or some combination of intrinsic and extrinsic factors (Environmental Protection Agency 2016a; Grandjean and Landrigan 2014; Hines et al. 2010; Pastino, Yap, and Carroquino 2000; Perera 1997; Sacks et al. 2010). For example:

- Children are more susceptible to the adverse effects of lead than adults (Centers for Disease Control and Prevention 2016a).
- Developing fetuses are highly sensitive to alcohol, medications, and toxic chemicals (Centers for Disease Control and Prevention 2016b; Grandjean and Landrigan 2014).
- Asthmatics have adverse reactions to air pollution and airborne allergens (Centers for Disease Control and Prevention 2016c);
- People with GSTM1, CYP1A1, CYP2E1, and CYP2D6 mutations are more likely to develop lung cancer when exposed to tobacco smoke than are individuals without those mutations (Li et al. 2012).
- Some children may have severe allergic reactions when exposed to peanuts (Centers for Disease Control and Prevention 2016d).
- People who live near hog farms have increased respiratory and gastrointestinal problems (Wing and Wolf 2000).
- Agricultural workers who are exposed to certain types of pesticides face a higher risk of Parkinson's disease (Allen and Levy 2013).

Several U.S. laws provide additional protections for susceptible subpopulations. For example, the Clean Air Act (1990) requires the U.S. Environmental Protection Agency (EPA) to provide additional protections for susceptible subpopulations, including children, asthmatics, and the elderly, when establishing ambient air quality standards (Marchant 2008). The EPA follows this law by establishing ambient air quality standards for ozone, particulate matter, nitrogen dioxide, sulfur dioxide, and carbon monoxide that incorporate protections for susceptible subpopulations (Environmental Protection Agency 2016b). The Food Quality Protection Act (1996) includes a 10-fold safety factor for acceptable pesticide residues on foods to provide additional protections for children (Resnik 2012). An amendment to the Toxic Substances Control Act (1976), the Frank R. Lautenberg Chemical Safety for the 21st Century Act (2016), includes additional safety protections for subpopulations that are susceptible to exposures to toxic chemicals, including children and pregnant women (Schmidt 2016). Aside from these legal mandates, the EPA has affirmed its commitment, as a matter of public policy, to drafting environmental regulations and guidelines with an eye toward protecting susceptible subpopulations (Environmental Protection Agency 2016a).

The main ethical rationale for protecting susceptible populations from environmental health risks is to promote distributive justice (Shrader-Frechette 2002; Cranor 2008a; 2008b; 2008c; Resnik 2012). Policies that deal with the distribution of environmental health risks

raise questions of justice because health affects opportunities, income, and other goods (Daniels 2008). Consider the following scenarios:

- Air pollution standards: A regulatory agency is attempting to determine whether to enhance air pollution protections. Lowering the current ozone standard by 25% will provide modest protections for the general population and substantial protections for people with respiratory diseases. However, a 25% reduction in the ozone standard will adversely affect the economy and lead to job losses.
- Placement of a waste site: a county is deciding where to place a new solid waste disposal facility. Expert consultants have nominated three sites: The first is located near a socioeconomically disadvantaged, minority community located in a rural part of the county; the second is near an elementary school; and the third is near a shopping mall. Placing the facility at any of these sites may have disparate impacts on the health, well-being, or income of different groups.
- Occupational health standards: A regulatory agency is attempting to determine whether to lower an acceptable level of workplace exposure to a toxic chemical involved in the manufacturing of semiconductors. Lowering the current acceptable exposure level by 50% will provide workers with substantial protection from health risks but will increase the costs of production, which could lead to job losses.
- Peanut allergies in schools: Five percent of the 500 children in an elementary school have known peanut allergies. One child's allergic response is so severe that he develops anaphylactic shock when he breathes in peanut dust or touches peanut oil. The school is considering a ban on all food products containing peanuts.

These situations raise difficult questions concerning the distribution of environmental health risks in different circumstances and involve competing values and interests.² In this article, we examine how three influential theories of justice—libertarianism, utilitarianism, and justice as fairness—deal with issues related to the distribution of environmental health risks. We argue that while these theories³ provide diverse perspectives about the values and interests relevant to justice, none of the theories offer the specific guidance required for environmental policy decisions involving trade-offs among the competing values and interests they themselves identify as justice relevant. To promote justice in the distribution of environmental health risks, it is therefore necessary to implement a decision-making procedure that balances competing values and interests fairly and legitimately (Cranor and Finkel 2016). We argue that an approach to public decision making known as accountability for reasonableness (AFR) can complement the theories we discuss and has considerable merit for establishing acceptable environmental health risks for the general population and susceptible subpopulations.

²We understand a “value” to be something good or worthwhile, such as life, health, happiness, wealth, freedom, or virtue. An “interest” is something good for or desired by a person, institution, organization, or larger group, such as a nation.

³Our objective is not to provide a thorough review of theories of justice but to consider some of the limitations of three influential theories for environmental health policymaking. We are confident, however, that the limitations that we discuss probably also apply to other theories not examined here.

LIBERTARIANISM

The first theory of justice we consider, libertarianism, emphasizes protection of individual rights and promotion of personal responsibility and opposes most forms of government taxation and regulation. Libertarians hold that the main purpose of government is to safeguard rights, not to redistribute wealth or promote public goods (Friedman 1962; Locke [1689] 1980 ; Nozick 1974).⁴ Libertarians usually believe government funds should be used to support services that protect people and property (e.g., the police, firefighters, and the military) but not services (such as education or health care) that go beyond this basic function. Libertarians usually accept laws and regulations that protect persons, property, and rights in transactions involving goods and services (e.g., rules pertaining to fraud and fair dealing), but not those designed to control the market or promote public goods (e.g., minimum wage laws or command and control environmental regulations).

How might libertarians think about protecting susceptible populations from environmental health risks? It might initially seem that libertarianism cannot adequately address the impact of environmental health risks on susceptible subpopulations. After all, libertarians generally accept large differences in income, wealth, education, and opportunities, as long as these arise by means of just processes that respect individual rights (Nozick 1974). Also, libertarianism generally opposes regulation of environmental health risks that individuals freely consent to, such as exposure to dangerous conditions in the workplace. And, as we have just stated, libertarianism does not usually support the use of state power for the promotion of public goods.

Initial appearances notwithstanding, libertarianism's emphasis on individual rights actually has much stronger implications for environmental health protections than is usually appreciated (sometimes by libertarians themselves, and frequently by their critics) (Dolan 2006; Shahar 2009). In fact, the priority that libertarianism places on individual rights suggests environmental health protections that are arguably too strong rather than too weak (Zwolinski 2014). Take, for example, Nozick's understanding of rights as side constraints (Nozick 1974). Side constraints are limitations on individual behaviors determined by the rights of others. If property rights generate side constraints on the actions of others, as many libertarians hold they do, then there is an absolute prohibition against interfering with or otherwise affecting another's property without consent. Similarly, because libertarians hold that rights pertaining to one's body (i.e., to be free of unwanted interference) are at least as strong as rights to private property, there would likewise be a side constraint prohibiting pollution that interferes with the bodies of nonconsenting others. The assumption that persons have such extensive rights would seem to bar any pollution that could affect nonconsenting others at all. Taken to its logical extreme, this approach to protecting individual rights could significantly impair economic activities that most libertarians value, such as agriculture, transportation, and industry (Zwolinski 2014).

⁴Libertarianism generally includes views that place a high value on liberty. The strain of libertarianism that we interact with most extensively here is the "rights-based" or deontological version of libertarianism, which is also currently the most prominent form of libertarianism. However, some libertarians ground their views in utility rather than rights, and these different motivations sometimes have significantly different implications for proposed laws and policies. Since we discuss utilitarianism later in the article, we do not give explicit consideration to utility-based libertarianism in this section.

Since unlimited protection of individual rights could lead to adverse consequences that most libertarians would wish to avoid, libertarians need some process for determining acceptable levels of environmental health risks that respect individual rights without impairing economic activity. Some argue that common law torts—such as trespass, nuisance, and negligence—constitute such a process, and can yield satisfactory answers about what levels of pollution are allowable and what levels would violate individuals' rights (Rothbard 1982; McGee and Block 1994). For example, if a farmer dumps solid waste on his property but pollutants leach out and contaminate a nearby farmer's water supply, the aggrieved farmer could sue the polluter for trespass. If a factory emits air pollution that damages the health of nearby residents, those residents could sue the factory for creating a private or public nuisance (Ferrey 2016). The tort system, in these cases, establishes what kinds of environment-affecting activities constitute "harm." It may also prevent future rights violations because people tend to modify their conduct to avoid legal liability.

However, those who propose the use of the common law to resolve all questions involving environmental risks often simultaneously recognize a need for tort reform, because existing case law does not contain the precedents needed for satisfactory protection of personal and property rights related to the environment (see Adler 2009; 2012). The limits of tort law for protecting individual rights to persons and property can be seen in the inability of tort law to effectively police emissions. It can be very difficult to win a tort lawsuit against someone who pollutes the air because of problems with demonstrating causal relationships between acts of pollution and subsequent harms. This difficulty is further exacerbated by the fact that poor air quality is in most cases the result of uncoordinated activities of millions of actors, rather than by a single major polluter. Even when it is possible to demonstrate a causal relationship, aggrieved parties may also lack the financial resources needed to successfully sue polluters. Libertarians who suggest relying solely on tort law to protect individual rights against air pollution have subsequently had to suggest major reformulations of tort law in order to accomplish this (see Rothbard 1982; McGee and Block 1994).

Since common law would need significant reform before it could satisfactorily settle the acceptable levels of environmental risks such as those caused by air pollution, other libertarians favor top-down policies that would settle such questions legislatively. For example, they may favor a system of tradeable emissions rights, otherwise known as cap and trade (see, e.g., Dolan 1990). Such a system can protect individuals' rights to relatively clean air and property, while still making possible some level of industry and other necessary daily activities that create pollution.

Under this type of system, the government creates private property in a feature of the environment that would otherwise be treated as a commons. For example, the government may treat the air as a private resource, and then sell a limited number of credits granting permission to pollute it. Such a system establishes an upper pollution limit (or cap) for a year, presumably one that guarantees some level that is compatible with acceptable levels of pollution experienced by nonconsenting individuals, and then distributes a limited number of pollution credits by auction or some other way. Companies owning such rights would not be permitted to pollute more than their allotted amount, unless they purchase rights from other companies. Cap and trade has been implemented for SO₂ emissions in the United States via

the Acid Rain Program, established by the Clean Air Act (1990). The EPA claims that SO₂ emissions have fallen significantly under this program (Environmental Protection Agency 2017). Similar schemes could be implemented for other pollutants.⁵ Cap and trade systems stand in sharp contrast, philosophically and practically, to command and control (CAC) regimes, which provide standards for concentrations of pollutants or ceilings for emissions from polluters (Ferrey 2016). Some examples of CAC systems include regulation of ozone levels in metropolitan areas, automobile emission standards, and coal-burning electric power plant regulations.

Cap and trade systems appeal to some libertarians, in part, because they apply a market-based approach to environmental policy that results in numerous advantages over CACs (see Anderson and Leal 2001; Dolan 1990). For example, because cap and trade systems force companies with high emissions to internalize what are currently negative externalities (i.e., costs imposed on others), they provide an ongoing incentive for companies to reduce pollution as much as possible, because the companies can always sell their unused credits or at least can avoid needing to purchase more credits. In contrast, CAC policies often simply require companies to meet specified emission reduction limits or adopt alternative technologies, and thus provide no continuous incentive for polluters to continue reducing emissions, absent new regulation.

Regardless of which approach libertarians favor for determining minimal levels of acceptable pollution (i.e., indirectly, through reformulation of tort law, or directly through legislation), some key questions concerning implementation are likely to arise. This is because successful implementation of a libertarian theory of justice requires determining what kinds and levels of pollution or other-affecting activities constitute rights violations and what kinds do not. To implement a cap and trade system for pollutants, for example, one must decide which types of pollutants and polluters should be subject to regulation, what levels of various kinds of pollutants are acceptable, and what levels infringe on individuals' rights to freedom in their persons and property. Even after these questions have been answered, a cap and trade system that enforces a reasonable upper limit for overall air quality may still not protect those who live in "hot spots" close to major polluters, so the rights of those living in hot spots may still be infringed despite the fact that the system respects rights generally. Moreover, a libertarian system must answer questions about what levels of pollutants violate rights to persons and property in light of the special susceptibility of vulnerable populations, for which the threshold for harm is much lower than for the majority of the population. Consequently, libertarian environmental health policy requires a fair and legitimate⁶ method of public decision making (beyond the court system, which libertarians have recognized does not presently fully protect rights) that can determine the levels of pollutants and environmental hazards that are compatible with rights to persons and property. Although the theory states general principles for protecting rights, it does not provide the specific guidance necessary for establishing acceptable levels of environmental health risks for the general population or susceptible subpopulations.

⁵The European Union has a carbon emissions cap and trade system, for example (European Commission 2017).

⁶We will say a bit more about fairness and legitimacy in the sixth section of this article.

UTILITARIANISM

The second theory we consider, utilitarianism, holds that actions are right insofar as they promote utility and wrong insofar as they promote the opposite, where “utility” is generally equated with happiness (Mill [1859, 1863] 2003). This long-standing theory founded by British philosophers Jeremy Bentham (1748–1832) and John Stuart Mill (1806–1873) has influenced many contemporary policy debates, including those dealing with the allocation of health care resources and the provision of public health (Goodin 1995; Powers and Faden 2011), and has served as the theoretical underpinning for wide-ranging environmental health policies (Ferrey 2016).

Contemporary utilitarians have refined and reinterpreted the theory in response to various criticisms. Some, such as Hare (1981) and Singer (1979), equate utility with the satisfaction of preferences. Others, such as Brink (1989), hold that a plurality of goods should be considered in the utility calculus. Many utilitarians, including Brandt (1998), Brink (1989), Hare (1981), and Hooker (2000), interpret the principle of utility as applying to a system of moral rules, and not to individual actions in response to objections that it neither provides sufficient protection for individual rights nor offers a satisfactory account of justice. For the purposes of this article, we consider utilitarianism to be a rule-based theory as we discuss the development of environmental issues at a policy level.⁷

A utilitarian approach to the distribution of environmental health risks would hold that policies that establish acceptable risk levels can be justified insofar as they promote the net good—for example, where their overall benefits for public health outweigh costs, such as impaired economic productivity. Protections for susceptible subpopulations could be justified to help maximize the overall ratio of good/bad consequences (Resnik 2012). For example, a utilitarian could argue that laws that protect children from exposure to lead can be justified because they help children to become healthy, productive adults who contribute to society. The economic costs of these laws would be offset by the gains in utility that would occur when children become adults. Utilitarian reasoning could support additional protections for fetuses/pregnant women, asthmatics, factory workers, and other susceptible groups (Cranor 1993; 2008a).

For an extended example of how utilitarians might think about environmental health protections for the general population and susceptible subpopulations, consider debates about ambient air quality standards for ozone, an oxygen compound that can impair respiratory function.⁸ In 2015, the EPA lowered air quality standards for ozone from 0.075 ppm to 0.070 ppm to promote public health and provide extra protection for children and asthmatics. The EPA also claimed that benefits of lowering the standard to 0.070 ppm would outweigh the costs, when one considers the reduced health care costs from better air quality (Environmental Protection Agency 2015b, 2016c). One could argue, on utilitarian grounds, that lowering the ozone standard to 0.070 ppm is justified to protect the health of the general population and susceptible subpopulations. Approximately 7.7% of the U.S. population has

⁷For more on arguments for and against utilitarianism and refinements of the theory, see Darwall (2002).

⁸Although ozone in the air we breathe can impair respiratory function, ozone in the stratosphere can benefit human health by blocking ultraviolet radiation.

asthma (Centers for Disease Control and Prevention 2016e), and 5% of asthmatics have a severe form of this illness that makes them much more sensitive to the effects of ozone than people with mild to moderate asthma (Asthma UK 2016). Reducing the ozone standard to 0.060 ppm would undoubtedly further benefit asthmatics, as well as other members of the population, but it could involve a significant increase in economic costs. The EPA (2009) estimates that lowering the ozone standard to 0.060 would cost businesses \$52 to 90 billion per year by 2020 but would also save 46 to 87 billion dollars per year in health care costs, using a 7% discount rate. Industry-sponsored studies estimate costs to businesses at \$1 trillion annually with losses of 7.3 million jobs. Industry critics of the 0.060 ppm standard also doubt that it will save as much money in health care costs as the EPA claims (Pyle 2011). A utilitarian who accepts the veracity of industry calculations could argue that the EPA should not lower its ozone standards to 0.060 ppm, since the economic costs of this policy would outweigh the public health benefits.⁹ Utilitarian arguments for or against environmental health protections thus depend on estimates of the likely costs and benefits of those protections, and different cost/benefit estimates will yield different policy recommendations.¹⁰

The differing cost and benefit estimates of lowering the ozone standard exemplify some of the key methodological questions faced by utilitarianism, such as how to define, measure, and weigh costs and benefits, and how to address uncertainties in the data and statistical frameworks used to predict the consequences of different choices or policies. While utilitarian theory provides general principles of guidance for policy proposals, it does not itself resolve these methodological controversies. Since the choices of assumptions, measurements, and statistical frameworks result in differing policy recommendations, and these recommendations have differential impacts on individuals and populations, we can expect that some proposals ostensibly based on utilitarian principles will be seen as unfair or biased by some adversely impacted stakeholders. Consequently, utilitarian environmental health policy also requires some fair and legitimate method of public decision making that balances competing values and interests. Thus, the theory does not provide the specific guidance necessary for establishing acceptable levels of environmental health risks for the general population or susceptible subpopulations.

JUSTICE AS FAIRNESS

The third approach to justice we consider is based on the idea that liberty and utility must coexist with equality to create just public institutions. John Rawls (1971; 2001) developed a highly influential theory of justice, known as justice as fairness, which addresses social obligations to promote the welfare of socioeconomically disadvantaged groups. Rawls argues that principles of justice are rules that would be chosen by hypothetical rational agents who are selecting policies to govern the arrangement of social institutions. These

⁹It is important to note that the EPA is not permitted to take economic impacts directly into account when developing its air quality standards. However, the agency can indirectly consider economic impacts when ascertaining how regulations are likely to impact public welfare, because economic values are included in the definition of public welfare (Environmental Protection Agency 2015b).

¹⁰Costs and benefits need not always be equated with economic costs and benefits, even though these could be a major part of utilitarian calculations. Costs and benefits could include other outcomes related social welfare, such as health or well-being (Brink 1989; Brandt 1998).

agents (or social contractors) are behind a veil of ignorance that prevents them from knowing who they are in that society. The purpose of the veil is to promote impartiality: The contractors do not know, for example, whether they are rich or poor, healthy or diseased, young or old, male or female, and so on. Because the contractors are impartial, they choose rules that promote the interests of all members of society (Rawls 1971, 2001).

Rawls asserts that the contractors would choose two principles of justice pertaining to the distribution of primary goods (i.e., things that any rational agent would need to participate in society): (1) the equality principle, which requires that fundamental rights and liberties be distributed equally; and (2) the difference principle, which allows for differences in other primary goods (e.g., education, wealth, or income) only if they benefit the least advantaged members of society and there is fair equality of opportunity (Rawls 1971). If conflicts occur between these two principles, the equality principle takes precedence over the difference principle (Rawls 1971). Although Rawls's theory has egalitarian characteristics, such as equality of opportunity, it does not require that income, wealth, or education be distributed equally. Socioeconomic inequalities can be justified in a society in which there is fair equality of opportunity if differences work to the advantage of the worst-off members of society. For example, inequalities in income or wealth resulting from talent, hard work, or ingenuity could benefit the worst-off members of society by stimulating economic productivity, job creation, and other consequences with significant societal benefits (Rawls 1971).¹¹

While Rawls's theory addresses many issues related to distributive justice, it has little to say about the distribution of health, because health is not on his list of primary goods (Rawls 2001). Daniels (1985; 2008) argues that Rawlsian principles should apply to the distribution of health because poor health can undermine equality of opportunity. A person with congestive heart failure, for example, may have fewer opportunities for employment, recreation, and travel than a healthy person. Daniels argues that social institutions that promote health, such as health care systems and government agencies, should seek to ensure that all members of society have the level of health needed to have a normal range of opportunities.¹² Daniels (1985) initially developed his theory to deal with the allocation of health care resources, but he later expanded it to address the distribution of health itself (Daniels 2008). Daniels argues that a theory of justice should address all factors that significantly impact the distribution of health, including access to health care, the social determinants of health (e.g., income, education, race) and environmental and public health policies, because these factors may impact the range of opportunities open to individuals, including members of susceptible subpopulations (Daniels 2008; Jardine et al. 2003).

For example, Daniels (2008) claims that laws that protect people from harmful occupational exposures or conditions can be justified to promote equality of opportunity. The Occupational Safety and Health Act (1970), for example, authorizes the Occupational Safety and Health Administration to establish acceptable levels of exposure to dangerous chemicals

¹¹For critical assessment of Rawls's theory of justice, see Daniels (1989) and Freeman (2002).

¹²Daniels (1985; 2008) defines the normal range of opportunities in terms of human biology; that is, the normal range of opportunities includes opportunities available to a normal member of the human species.

in the workplace and to set standards for workplace safety. Daniels recognizes, however, that there should be some limits on occupational health protections because some types of protections may interfere with equality of opportunity or economic freedom.¹³ Regulations that impose excessive costs on businesses and force them into bankruptcy could deny people the opportunity to work, and laws that bar susceptible individuals from certain types of risky occupations would interfere with their economic freedom.

Daniels (2008) understands that distributing health requires society to make difficult trade-offs, due to the scarcity of resources and other socioeconomic factors. Public funding of health care must compete with other important areas of expenditure, such as education, infrastructure, or criminal justice; within the health care budget, further difficult decisions must be made to allocate funds to various illnesses, such as cancer, depression, hypertension, and so on. While Daniels's interpretation of Rawlsian principles requires distributing health to achieve fair equality of opportunity for all people in society, including members of susceptible subpopulations, Daniels himself admits that justice principles alone offer limited guidance for the controversial task of priority setting related to decisions involving differential impacts on individuals and populations and tradeoffs among competing values and interests. Such decisions should therefore be made through a procedure that promotes fairness and legitimacy, which Daniels and Sabin describe as accountability for reasonableness (AFR) (Daniels and Sabin 2002).¹⁴

ACCOUNTABILITY FOR REASONABLENESS

Daniels and Sabin (1997; 2002) defend the AFR approach to public decision making by claiming that it promotes fairness and legitimacy.¹⁵ A fair decision, according to Daniels and Sabin, is justified by reasons that decision makers and affected parties recognize as good.¹⁶ For example, if a private health insurer refuses to pay for a treatment because it has not been proven effective, patients could view the decision as fair, even if they disagree with it, because the decision is based on reasons they recognize as good (Daniels and Sabin 1997). If the insurer denies coverage to enhance its profits, patients might not regard this decision as fair because they do not accept this as a good reason. A legitimate decision is based on an authority that decision makers and affected parties recognize as appropriate (Daniels and Sabin 1997). For example, if a low-level administrator in the insurance company makes a decision to deny coverage, this would not be legitimate because the administrator does not have the expertise or authority to make the decision. The decision would be more legitimate if it comes from an appropriate authority, such as a medical committee with the knowledge to determine adequate health care coverage policies.

¹³By "economic freedom" we mean the freedom to engage in the free market, including the freedom to buy or sell goods or services, start a business, or choose an occupation or profession.

¹⁴Although Daniels developed the AFR approach within a Rawlsian framework, in more recent work he has argued that its justification is independent of any general theory of justice (see Daniels 2008; Daniels and Sabin 1997).

¹⁵AFR has garnered considerable interest in helping to structure public debates involving the allocation of health care resources (Byskov et al. 2014; Ford 2015; Moosa et al. 2016). For example, the United Kingdom's National Institute for Health and Clinical Excellence (2008), which provides advice to the National Health Services concerning clinical guidelines and utilization of resources, has adopted the AFR framework. Canada, Norway, Uganda, Kenya, Tanzania, and Zambia have also used AFR to make health policy decisions (Byskov et al. 2014; Kipiriri, Norheim, and Martin 2007).

¹⁶Decision makers are those who participate in the decision-making process by voting, commenting at public meetings, or some other means; affected parties are people affected by the outcome of the decision. A person could be a decision maker and an affected party.

AFR consists of four conditions designed to promote fairness and legitimacy (Daniels 2008; Daniels and Sabin 1997; 2002):

1. Publicity (decisions are made in forums open to the public by means of publicly available arguments and evidence).
2. Relevancy (decisions should be justified by reasons that fair-minded people consider to be relevant, e.g., scientific data, expert opinion, moral argument).
3. Revisability (decisions can be appealed or revised based on new evidence or arguments).
4. Enforceability (decisions can be enforced by means of laws or regulations).

The publicity condition is important for establishing legitimacy in decision making. Affected parties may be suspicious of decisions made in secret, or decisions based on information they are not privy to. They may also be concerned that conflicts of interest, collusion, or corruption may skew decisions in a direction they find unacceptable (Moore et al. 2005). Publicity can help to address these concerns by promoting openness and transparency in decision making. The publicity condition can also promote fairness by providing decision makers with practical and contextual knowledge concerning affected parties (Daley 2012). Public meetings can serve as a form of community engagement in which decision makers learn more about the needs, interests, concerns, and personal experiences of affected parties from a diverse range of viewpoints (Williams-Jones and Burgess 2004).

The relevancy condition is important for promoting fairness in decision making. Decision makers and affected parties may regard a decision as unfair if it is based on reasons that they regard as arbitrary, biased, or irrational. It is worth noting that scientific uncertainties related to likely outcomes of different decisions may lead to disagreements about relevancy. It is necessary for decision makers and affected parties to recognize the reasons for a decision as relevant; they may regard it as fair even if it adversely impacts their interests. The relevancy condition is derived from Rawls's (1996) notion of public reason, which involves justifying a decision based on arguments or evidence that people from different moral or political views can accept.

The revisability condition helps to promote fairness and legitimacy. The appeals process promotes legitimacy by allowing parties who disagree with a decision to restate their case and bring up relevant reasons not fully considered in initial deliberations. Revisability promotes fairness by helping to ensure that decisions are based on the latest and best evidence, not on outdated information.

The enforceability condition helps to promote legitimacy. Affected parties who are inclined to obey a policy because they have been included in deliberations and have some ownership of it may regard the policy as illegitimate if it is not enforced. Enforcement may occur through various mechanisms, such as penalties for noncompliance, auditing, financial rewards for compliance, taxation, and government subsidies.

ACCOUNTABILITY FOR REASONABLENESS AND PROTECTING SUSCEPTIBLE POPULATIONS

How could one apply AFR to decisions concerning protecting susceptible subpopulations from environmental health risks? Let's consider AFR's four conditions in the context of public decision making concerning a hypothetical decision to lower ambient ozone standards to 0.060 ppm.¹⁷

Publicity

Government agencies with relevant authority and expertise should publicly announce proposed changes to ambient ozone standards and hold open meetings to solicit input from affected parties, including representatives from susceptible subpopulations, health care professionals, public health researchers, industry groups, and other members of the public. They should address public comments made at the meetings and through mail, e-mail, Internet forums, and other modes. All relevant rationales for different policy options should be made public, including data and statistical analyses concerning the public health and economic impacts of policy options for ozone standards.¹⁸

Relevancy

Relevant reasons considered by decision makers could include the health impacts of lowering the ozone standards to 0.060 ppm for the general population and susceptible subpopulations (e.g., asthmatics and children); the economic costs of the lowering the standards; and the effectiveness of options for protecting susceptible groups other than lowering the ozone standards (e.g., medication, protective masks, air purifiers, lifestyle changes).¹⁹ Although none of these considerations would uniquely determine outcomes, they would be important factors to address in policy formation (Cranor 2008a; 2011; Resnik 2012).

Revisability

Decision makers should consider new data and analyses with implications for ozone standards so that they can better understand the risks faced by susceptible subpopulations and how best to protect them (Brulle and Pellow 2006), as well as the implications of policy

¹⁷Although we discuss protections for asthmatics and children in this example, we hold that the AFR approach can also be applied to decisions concerning other susceptible populations, such as the elderly, factory workers, or people with increased sensitivity to industrial chemicals or certain types of allergens.

¹⁸It is worth noting that federal laws (such as the Administrative Procedure Act) and judicial decisions mandate that the EPA follow decision-making procedures that have much in common with the AFR approach. The laws and decisions are intended to ensure that federal agencies follow principles of procedural due process in rulemaking. The EPA implements these laws and decisions by making regulations based on scientific evidence, economic cost/benefit analysis, and expert opinion, as well as public comments it receives after it announces a proposed regulation (Environmental Protection Agency 2015a; 2016d; 2016e). The evidence, arguments, analyses, comments, and opinions that influence EPA decision making are available to the public. Although the two have some things in common, it is important to note that our analysis seeks to connect the AFR approach with theories of justice, and so goes beyond mere legal analysis. If our account suggests some processes similar to current legal procedures, it should be considered a partial justification of them. Because our account is a normative rather than legal account of fair process in decision making, it could also be extended to decisions that are not explicitly governed by laws and judicial decisions affecting federal administrative agencies. For example, a county planning board could follow the AFR approach when deciding where to place a landfill.

¹⁹It is worth noting that policies that make individuals responsible for protecting themselves from environmental risks raise issues of justice, since some people may not be able to afford such protections (Seltenrich 2017).

choices. New data and analyses could address changes in demographics, technological advances, and unintended adverse consequences.

Enforceability

Any policy that is adopted should have enforcement mechanisms, such as incentives for compliance and penalties for noncompliance. Agencies involved in decision making could discuss enforcement mechanisms during meetings and other interactions with the public, ensuring the policy's practical applicability and feasibility.

Using the AFR approach to make decisions concerning ozone standards may not necessarily result in a policy that provides maximum protection for asthmatics or children, since decision makers may decide that the economic costs of lowering the standards to 0.060 ppm are not worth the health benefits. However, AFR provides a method for taking the interests of these susceptible groups into account and ensuring that they receive a level of environmental health protection established by a fair and legitimate procedure. Realistically, it may not be feasible for severe asthmatics to always function normally, due to the nature of their illness, regardless of the level of environmental protection society extends to them.

PROBLEMS WITH ACCOUNTABILITY FOR REASONABLENESS

Before concluding our discussion, it is important to address some critiques of AFR. Numerous critics have argued that AFR may fail to address real-world power dynamics that can impair fairness and legitimacy in decision making. Politically or economically powerful individuals or groups may influence the process through lobbying, advertising, and donations to political campaigns to produce an outcome that favors their interests (Friedman 2008; Rid 2009). The voices of those representing susceptible subpopulations might be drowned out by influential industry representatives in any public debate concerning the regulation of ozone, for example. Environmental or disease advocacy groups may draw a disproportionate amount of attention that undermines the legitimate views of other of other participants or affected parties, especially when they are represented by celebrities. Institutional and group leaders may also misrepresent the views of their constituencies; for example, patients with a specific illness may not agree with regulations proposed by a representative at a health agency, even if the regulations aim to protect them from harm. These problems reflect systematic flaws in AFR because it does not provide detailed guidance concerning what constitutes a "relevant reason" or how reason givers should be represented fairly in deliberations.

To address these shortcomings, AFR should include steps to ensure that people impacted by the decision are adequately represented in the decision-making process (Friedman 2008; Rid 2009). One could adopt procedures, such as those articulated by Gutmann and Thompson (1998), for promoting fair decision making in pluralistic democracies. Gutmann and Thompson (1998) propose that democratic decision making should include procedures, such as town hall meetings, focus groups, and surveys, which are designed to solicit the views of affected parties (such as racial or ethnic minorities or people of low socioeconomic status) who may not be adequately represented in public deliberations. Government agencies charged with protecting public health and the environment could take steps to solicit the

views of groups who may not be effectively represented in its decision making (Brulle and Pellow 2006; Resnik 2012; Shrader-Frechette 2002).²⁰ A legitimate decision-making process does not strip away political or economic interests or power dynamics; rather, it allows affected parties to voice their diverging interests reasonably and fairly (Smith et al. 2014).

A more fundamental problem with AFR also arises in other procedural accounts of justice. Daniels (1994) has pointed out that because procedural accounts of justice focus on the fairness of the process of decision making, not the outcome itself, decision makers may make a choice that many—perhaps even most—would regard as unfair. For example, the state of Oregon engaged in a lengthy public consultation process when developing its health care plan (Garland 1992). The state asked citizens to prioritize coverage for various health care procedures, products, and services. To the surprise of many, citizens gave vasectomies a higher priority than hip replacements (Fleck 1994). The state rejected this ranking, given the importance of hip replacements for mobility, pain relief, and activities of daily life. The same sort of problem could occur in environmental health protection if, through a fair process, decision makers agree that it would be too expensive to protect a susceptible group from harmful environmental exposures but government agencies reject this decision itself as unfair.

These sorts of issues point to a conundrum inherent to AFR known as the democracy problem: Can the government legitimately reject the outcome of a fair democratic process? If so, on what basis—legal or ethical—can such a decision be made? AFR would seem to be superfluous if government agencies can always reject outcomes they deem to be unfair (Daniels 1994; Fleck 1994).

The democracy problem reflects a tension between procedural and outcome-based justice. Under procedural justice, an outcome is deemed to be just if it results from a just process, such as AFR. Libertarian theories are often also procedural in nature, because they designate outcomes as “just” if they result from just processes. Outcome-based justice, on the other hand, deems an outcome to be just if it achieves some desirable outcome, such as a fair distribution of benefits and burdens, or a maximal ratio of utility to disutility. As noted earlier, Daniels acknowledged that principles of justice often do not provide the specific guidance necessary for making difficult allocation decisions and in such cases an appeal to procedural justice is necessary. However, the outcome of this procedure may in some cases appear to be unfair to some.²¹

²⁰The EPA is in fact committed to a policy, known as environmental justice, that requires fair participation of affected parties, including racial or ethnic minorities and socioeconomically disadvantaged groups, in its decision making (Environmental Protection Agency 2016f). The environmental justice movement emerged in the 1980s when minority communities objected to the placement of waste sites in their vicinity. In the 1990s, the Clinton Administration established the Office of Environmental Justice at the EPA. The National Institute of Environmental Health Science sponsors research and community programs designed to promote environmental justice (Resnik 2012).

²¹Daniels does not say precisely how the different steps involved in AFR produce outcomes. Daniels focuses on the fairness of AFR at the macro level, as a type of procedural justice, but does not closely examine the internal workings of AFR at the micro level. To understand how AFR actually works in practice, one would need to conduct empirical research on attempts to implement AFR. See, for example, Byskov et al. (2014).

In thinking about the democracy problem, it is important to recognize the constraints constitutional democracies impose on the results delivered by AFR. Government institutions have the legal (and moral) authority to reject decisions that violate constitutionally protected fundamental rights. One could argue that the government should not reject priority-setting decisions that some affected parties regard as unfair, if these decisions result from a fair process that protects fundamental rights.

One way of responding to the democracy problem is to treat AFR as an iterative process in which decision makers can revisit and revise outcomes that do not accord with principles of justice they view as relevant. As noted in the preceding, AFR already includes a revisability condition, but the type of revision suggested here would go beyond this condition and apply revisability to the whole decision-making process. For example, a law could include an expiration clause requiring it to be reapproved at a later date. If unanticipated problems with the law emerge, decision makers could revise or reject it when it expires.

Another response would be to bite the philosophical bullet and assert that outcomes produced by a public decision-making process that conform to the standards of AFR are *ipso facto* fair, if they do not violate constitutionally protected rights. Asserting that an outcome is unfair even though it has resulted from a fair process misunderstands the point of the AFR process proposed by Daniels and Sabin (1997; 2002). The outcomes yielded by the AFR process should inform, rather than respond to, our beliefs about what is fair or unfair.

This response to the democracy problem leaves open the possibility that decision makers following the AFR approach may at times elect not to provide members of susceptible subpopulations with a level of protection necessary for optimal health. As we have illustrated in previous examples, decision makers may determine, after thoroughly considering relevant arguments, evidence, and diverse viewpoints, that certain types of environmental health protections for susceptible subpopulations are disproportionately costly, given the health benefits. Decision makers might decide that a population is too small to warrant environmental protections that could adversely impact businesses or the economy (Cranor 2008a). They could decide, for example, to endorse measures that protect the larger population of people with mild to moderate asthma, but not the smaller population of those with severe asthma. Decision makers could also decide that it is fair to allow individuals who work at certain types of occupations (such as coal mining) to face increased health risks because additional protections would be too costly and prohibiting workers from taking these risks would interfere with their opportunities and economic freedom. At some point, decision makers will need to decide which subpopulations warrant special protections in specific contexts and how much protection they deserve (Cranor 2008a). These are difficult choices to make, given the tradeoffs among competing values and interests (Viscusi 1992; Cranor and Finkel 2016). Members of susceptible groups who disagree with the outcomes of these deliberations may still regard them as fair and legitimate if they conform to AFR conditions.

CONCLUSION

In this article, we have examined how three influential theories of justice—libertarianism, utilitarianism, and justice as fairness—address questions related to the distribution of environmental health risks. We have argued that while these theories provide diverse perspectives on acceptable levels of environmental health risks for the general population and susceptible subpopulations, they do not provide the specific guidance necessary for making public policy choices involving trade-offs among competing values and interests. The theories require some method for making environmental health policy choices that promotes fairness and legitimacy in the decision-making process. We have argued that the AFR approach to public decision making can serve as a fair and legitimate method and we have shown how one can apply it to environmental health policy choices. While AFR is a viable option for enabling members of susceptible subpopulations (and their representatives or advocates) to participate in policy deliberations, it cannot guarantee that they will receive a maximum level of protection, because decision makers might decide that certain types of environmental health protections are too costly, given the health benefits, or that some protections are not required because members of these populations have freely chosen to expose themselves to these risks (e.g., workers in certain types of risky occupations). Members of susceptible groups who disagree with the outcomes of these deliberations may still regard them as fair and legitimate if they meet AFR conditions. Moreover, the AFR approach affords those affected by policy decisions the opportunity to bring their unique experiences, concerns, and interests to bear on public discourse related to environmental health. Additional empirical and conceptual research may help policymakers, government officials, and health care professionals understand better how to involve susceptible subpopulations in public deliberations related to protecting them from environmental health risks.²²

Acknowledgments

This research is funded, in part, by the Intramural Program of the National Institute of Environmental Health Science (NIEHS), National Institutes of Health (NIH), and the *Fonds de Recherche du Québec en Santé*. It does not represent the view of the NIEHS, NIH, NSF, or U.S. government.

FUNDING

National Institute of Environmental Health Sciences. ZIAES102646-08

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²²The National Institute of Environmental Health Sciences (2017) Program on Environmental Health Disparities and Environmental Justice, for example, addresses many of the policy issues related to protecting susceptible subpopulations.

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