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Navigating Values in Scientific Recommendations

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Abstract

Values play important roles in science, yet their influence on ethical and scientific recommendations is overlooked. This paper examines how interactions between values complicate the uptake of recommendations. We discuss two challenges: (i) value trade-offs, where one value is pursued at the cost of another, and (ii) value synergies, where values reinforce each other. We argue that overlooking trade-offs leads to unrealistic recommendations, while oversimplifying synergies leads to ineffective ones. Both hinder the uptake of recommendations. We propose strategies to address these issues, illustrated by the 2023 National Academies of Sciences report on the use of population descriptors in genomics.

1. Introduction

The role of values in science has been the object of extensive scrutiny in the philosophy of science (Longino 1990; Elliott 2011, 2022; Douglas 2009; Ward 2021). One underexplored avenue is how values shape recommendations in science. By "recommendations" we mean a set of practical guidelines, or suggestions, for scientific decision-making. These guidelines are frequently proposed by scientific institutions and published as standalone reports or "commentaries" in scientific journals (Morales et al. 2018; National Academies of Science, Engineering and Medicine 2023, hereafter NASEM). Recommendations can have multiple goals and target audiences, but generally they aim to establish minimal standards of ethical and/or empirical soundness to be adopted by the broad scientific community (NASEM 2023). They are meant to shape one or many aspects of a research project, such as its conceptualization, methodological design, dissemination, and/or result implementations. For this reason, recommendations are designed to receive uptake by the scientific community and be applicable in actual scientific practice.

Recommendations are value-laden when they presuppose or explicitly advocate for certain epistemic and non-epistemic values. For example, recommendations might encourage greater precision or better alignment with democratic ideals. In this

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paper, we examine how interactions between values influence recommendations and pose challenges to their uptake. On the one hand, value-laden recommendations might be the subject of constant disagreement, as scientists and institutions might want to prioritize different values. This poses a first challenge to scientific recommendations: overlooking value trade-offs.[1] A trade-off occurs when prioritizing certain values necessarily comes at the cost of sacrificing others (Elliott and McKaughan 2014; Khosrowi 2019; Brown 2020; Biddle 2022). In the face of a trade-off, scientists might be required to agree on how the trade-off should be resolved. However, this requirement might be too demanding, and the recommendations might become unrealistic and fail to receive significant uptake. On the other hand, there are cases where a set of values can reinforce other (often unstated) values or goals. This poses a second challenge to recommendations: overlooking value synergies. In this case, recommendations advocate for certain values but fail to recognize that synergistically (indirectly) they might also promote other values. However, this second set of values might be undesirable or clash with the original goals of recommendations. These recommendations might become too ineffective to receive significant uptake. Hence, we argue that both challenges lead to the *problem of uptake*, namely: recommendations might fail to gain adherence in the scientific community.

Our discussion of trade-offs and synergies is not exhaustive, but it already paints a complex picture of the relationship between values and recommendations. Our central case study is the report from the National Academies of Science on the use of race, ethnicity, and ancestry as population descriptors in human genomics (NASEM 2023). The challenges highlighted in this paper are not unique to our case study and are likely to be symptomatic across the broader context of similar recommendations. After introducing this report (section 2), we describe trade-offs and synergies as two key challenges to its uptake. First, the report might put forward unfeasible recommendations because they overlook the trade-off between values, implicitly privileging the epistemic value of precision over other values (section 3). Second, the report might assume a synergy between the value of trustworthiness and certain epistemic values, wrongly suggesting that ethical science will result from doing "the best" science (section 4). Finally, we identify some potential ways to mitigate the two key challenges to uptake (section 5).

2. Case study: The National Academies of Science, Engineering, and Medicine report on the use of population descriptors in genomics

Race, ancestry, and ethnicity are contentious categories in human genomics (Caulfield et al. 2009; Bliss 2012; Yudell et al. 2016). These categories work as *population descriptors*, i.e., as different classification schemes that organize samples into groups as a way of studying patterns of genetic distribution. However, the use of these descriptors raises ethical and epistemic issues. Ethically, scientists and policymakers worry that human genomics might cause harm by reifying racial categories or by disguising racial assumptions with the new terminology of ancestry (Fullwiley 2008; Cerdeña et al. 2022; Lewis et al. 2022). Epistemically, the concern is that genetic

[1] Trade-offs and values have been extensively discussed by philosophers of science at least since Kuhn (1977). However, implications for scientific recommendations have not been considered.

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studies use those population descriptors irreflexively and inconsistently (Caulfield et al. 2009; Panofsky and Bliss 2017; Zhang and and Finkelstein 2019). It is common to find inconsistent use of racial, ancestry, and ethnicity categories in the same study (Caulfield et al. 2009), thus creating problems for the replicability and validity of such studies.

In this context, the National Institutes of Health (NIH) sponsored a consensus study conducted by the National Academies of Science, Engineering, and Medicine, gathering a committee of 17 members with expertise from various areas of the natural and social sciences, as well as stakeholders in genetics companies and members of the biomedical community. The result was a report titled "Using Population Descriptors in Genetics and Genomics Research: A New Framework for an Evolving Field" (NASEM 2023), whose goal was to review and assess existing methodologies, benefits, and challenges in using race, ancestry, and ethnicity in genomics research (2). Additionally, the document offers technical recommendations and best practices to guide future work in the field.

Recommendations and the suggested best practices are explicitly motivated by a set of "guiding principles" established by the committee (95). These principles are validity, reproducibility, replicability, transparency, respect, beneficence, equity, and justice. Noticeably, such principles correspond to epistemic and non-epistemic values, respectively (Elliott 2022; Elliott and Korf 2024). Some of them are meant to systematically indicate or promote empirically valid research, while others are associated with ethical and social standards and do not necessarily advance knowledge.[2] The combination of epistemic and non-epistemic values is key to the recommendations proposed by the National Academies of Sciences. Together, these values would ensure that research is both ethically conducted and empirically valid. They are supposed to make research on human genomics trustworthy, engaging both researchers and other stakeholders. The report nonetheless acknowledges the possibility of conflict among values, claiming that "tension between principles may arise when researchers prioritize competing interests" (99). One example would be choosing categories that maximize data aggregation and, thus, reproducibility, but do not respect how humans would like to be classified (Lee et al. 2019). We will come back to this point in the next section.

The brief discussion of "guiding principles" is followed by a set of recommendations and best practices that indicate which population descriptors should be adopted depending on the type of genomics research being conducted (121). While not always explicit, these recommendations and practices are supposed to result from applying the guiding principles to different research contexts. For example, the category "race" is only recommended if scientists use it as a proxy for how environmental factors (e.g., education, access to food, living conditions) impact health disparities in human populations. This category fails to meet several, if not most, principles and endangers both ethical and empirical dimensions of research. Meanwhile, the report proposes genetic similarity as a population descriptor that should be adopted in all but one type of genomic study (Coop 2023). Genetic similarity

[2] There are many relevant criticisms of this distinction (Longino 1990). However, the distinction still retains heuristic value at least, as suggested by the fact that it is still widely used in the values in science literature.

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is a quantitative measure of the genetic resemblance between individuals and can help scientists infer genetic ancestry, patterns of genetic and phenotypic diversity, among other things (NASEM 2023, 117). Hence, this descriptor can (and should) be widely used, serving as a proxy for both biological and environmental factors in medical and evolutionary contexts. Another advantage of this descriptor is avoiding the moral baggage of notions like race and ethnicity.

This case study exemplifies how values inform scientific recommendations. Scientists are aware of such values and the fundamental role they play in grounding best practices. Scholars even recognize that value trade-offs might be inevitable. However, values raise challenges for the development and the uptake of recommendations. Recommendations are meant to be applicable in concrete circumstances, and the National Academies of Science report takes several steps in this direction. For example, the report suggests actionable decision trees to guide adherence to the recommendations (191–97). Therefore, the first challenge is to develop realistic recommendations that sufficiently consider the relevant trade-offs involved. Ignoring contextual elements and the ensuing trade-offs may result in recommendations that are superfluous and unlikely to be incorporated into scientific work. In the following section we explain and illustrate this problem, showing how the report produced by the National Academies of Science falls prey to it.

3. Challenge I: Overlooking value trade-offs

Epistemic and non-epistemic values motivate the adoption of recommendations in the National Academies of Science report (2023). On the one hand, validity, reproducibility, transparency, and replicability are paradigmatic examples of epistemic values, as they are indicative of and conducive to knowledge (Elliott 2022, 4). On the other hand, respect, beneficence, equity, and justice correspond to moral and socio-political standards and are not *necessarily* associated with knowledge. While these eight values are emphasized in the report, they are not the only values that (should) influence the recommendations around population descriptors. In fact, the very discussion of recommendations in the report appeals to additional values such as precision and rigor.

Here we focus on one flagrant trade-off ensuing from the report's recommendations: the trade-off between precision and generality. While human genetic variation is continuous, population descriptors appeal to generalized, coarse-grained categories (Lewis et al. 2022; Gannett 2014). These categories abstract away fine-grained differences among samples, typically lumping them into a few groups to represent broad patterns of genetic variation. Hence, humans tend to differ gradually from each other based on factors such as geographical distance, but imprecise measurements and coarse-grained descriptors might hide this fact (Lewis et al. 2022, 251). Scientists generally agree that it is more precise and more accurate to represent and convey variation as fine-grained and as continuously as possible.

Precision, alongside accuracy, is a key aspect of the reliability of measurements in science (Tal 2020). Technically, precision can be understood as "the degree to which repeated measurements by the same procedure agree" (Isaac 2022, 1245). Take, for example, a person's ancestry estimation. Such an estimate will be deemed precise insofar as it accurately captures the closeness between the predicted ancestry and

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an individual's "actual" ancestry, assessed through their self-identification at the recruitment stage of a study. Therefore, to make a precise estimation of ancestry entails that the same procedure yields similar estimations for individuals who share the same or similar ancestry.

Precision is an epistemic value, i.e., it improves the overall quality of measurement in a specific scientific practice, thus allowing for better predictions and a better understanding of the phenomenon under inspection. Precision is supposed to increase the empirical adequacy and transparency of research methods and results, reducing the chances of misconceptions and erroneous interpretations of genomic research (NASEM 2023). Accordingly, in the context of predicting and discovering diseases, scientists should avoid "poor proxy" and use "reliable and precise measures" (123–28). An adequate proxy will offer precision, enabling a precise assessment of disease risk in terms of risk scores (Woodward and Kendler 2023; Cavazos and Witte 2021). Inadequate proxies due to too coarse-grained labels may lead to disrespect and injustice, for instance by exacerbating health disparities.

Unsurprisingly, the National Academies of Science's report implicitly sustains that precision fosters trusting relationships between scientists and the broader lay community. For instance, precision appears when suggesting that the descriptor "race" does not have the desirable characteristics of "precision, rigor, stability, and objectivity one might hope for in a population descriptor" (NASEM 2023, 75). The report explicitly calls for scientists to use measures that are more precise and accurate than racial labels (ibid.).

Emphasis on precision, however, implies a trade-off with another epistemic value: generality. Generality—broadly defined as "the property of applying widely"—also brings epistemic benefits to scientific practice (Lehtinen 2021, 10344), such as widespread sharing of results and broader extrapolation of research findings across other populations. Here, generality refers to the extent and degree to which samples fit a classification scheme. For instance, descriptors such as "ethnicity" and "ancestry" are relatively general because they can apply to a wide variety of samples in common categories. These are known as "group labels" and enhance generality, since they can be applied to several individuals in a group as they are coarse-grained. However, this means that group labels lack the precision of fine-grained labels. Generality thus comes at the cost of enabling precise comparisons and differentiations among samples, which can be done with more precise descriptors. For example, "relatedness" or "genetic similarity" (Coop 2023) can generate fine-grained classifications which are more precise but less general.

This trade-off creates a problem for the scientific community. On the one hand, scientists strive for as much precision as possible. The report suggests that precision contributes to the other epistemic values, leading to empirically valid and trustworthy research (NASDEM 2023, 95). On the other hand, generality is another key epistemic value in genomics. It facilitates data aggregation, data sharing, cross-study referencing, and other core aspects of data-centric biology (Leonelli 2019). Moreover, the generality of group labels facilitates collaborations within the scientific community as well as enrolment of participants in a study, since general labels result in individuals identifying more easily with the classification scheme employed at the recruitment stage. Finally, coarse-grained group labels also facilitate enrolment as

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they are less likely to hurt individual sensitivities that more precise labels might awaken (Panofsky and Bliss 2017).

Recommendations that focus on precision—such as those in the NASEM report—may naively ignore the trade-off with generality. They bias scientists toward the value of precision when it might be legitimate to privilege generality instead. There might be no simple solution to certain trade-offs, no "one size fits all." In these cases, recommendations biased toward one side of the trade-off will likely suffer the problem of uptake. The scientific community might adhere poorly to such recommendations because they do not capture what scientists might actually and legitimately value in their practices. In other words, recommendations might be too unrealistic if they are premised on the assumption that scientists will (and should) embrace certain values over others.

4. Challenge II: Oversimplifying value s ynergies

Value trade-offs happen when prioritizing certain values comes at the cost of other values, indicating a tension between pursuing different values at the same time. Besides trade-offs, there are also cases when there is a positive reinforcement among values, which we call value synergies[3] and are the object of this section. We consider how the oversimplification of value synergies can create a problem for the uptake of the recommendations.

The primary target of the proposals put forward by the National Academies of Sciences are researchers working in the field of human genomics who are expected to adhere to these recommendations (NASEM 2023, 3). An explicit goal is that these recommendations—if correctly adopted—"engender trust and drive trustworthiness of research" (5). Recommendations should therefore guide scientists in building trust with relevant stakeholders such as, for example, affected communities. The report recognizes that mistrust is a significant problem in the relationship between human geneticists and those communities (9). Among other issues, biases in data collection reinforce mistrust leading to the underrepresentation of these communities in research (Popejoy and Fullerton 2016). Hence, recommendations are both informed by values (e.g., "guiding principles") and meant to contribute to further values (i.e., trust and trustworthiness). The underlying idea is that the pursuit of epistemic values such as precision leads to the promotion of other values such as trust, thus illustrating what we call value synergies.

Specifically, there are three steps that illustrate the occurrence of value synergies. First, recommendations are based on a set of primary values that are openly endorsed as the "guiding principles" of the report. These values are validity, reproducibility, replicability, transparency, respect, beneficence, equity, and justice. Second, these values are endorsed because they promote an additional set of values: empirical soundness and ethical research conduct. Third, these values are positively related to trust and trustworthiness. The report explicitly describes those values as "aspects of trustworthiness" (NASEM 2023, 95). While there is no clarification of what exactly this means, one plausible interpretation is that trust and trustworthiness require

[3] Trade-offs and synergies can involve epistemic values, non-epistemic values, or both. The example of value trade-off (section 3) concerns two epistemic values, but in this section the example of synergy involves both epistemic and non-epistemic considerations.

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empirical soundness and ethical research conduct. Thus, trust and trustworthiness of research are *core* non-epistemic values (or goals) reinforced by the primary values ("guiding principles") embedded in the recommendations. In summary, the primary values are supposed to stand in synergy with the core values. Promoting the former supposedly contributes to promoting the latter.

Value synergies can be complex and opaque to scientists and other stakeholders. It is not always clear whether and when a certain value contributes to another. Additionally, synergies might vary according to context, and scientists might hold misleading assumptions about those synergies. For instance, the National Academies of Sciences' report assumes that precision stands in a synergistic relationship with trust. The idea is that precision might contribute to, "unlock," or "enhance" trust, even if it is not sufficient for it. This is a very plausible assumption in the context of using population descriptors. However, one must be careful when embracing this assumption because precision is not sufficient for trust. The emphasis on the precision–trust relationship might lead scientists to miss other synergies involving trust. In particular, trust might be promoted by values that stand in tension with precision, such as the value of generality. We explore this case below.

As indicated by the NASEM report, a population descriptor like "genetic similarity" is more precise than "ancestry" (section 3). The latter enables coarse-grained classifications, typically including continental-level categories such as "European," "African," and "Asian," while the former enables finer-grained classifications that consider highly specific genetic differentiation. These classifications might not even conform to geographical regions and, when conforming to them, they offer transparent and detailed descriptions of what is being measured (Coop 2023). For example, consider the ancestry-based claim "Graham has Northwestern European ancestry" (Coop 2023, 11). If scientists adopt genetic similarity instead of ancestry, this claim will turn into something like "Graham is more similar to the Great Britain sample from the 1000 Genomes Project relative to all the other samples in the same data bank." Given that precision is meant to foster trust and trustworthiness, the NASEM report suggests that genetic similarity (and its detailed claims about someone's origin) tends to promote trust and trustworthiness.

However, there are foreseeable situations in which more precise population descriptors do not enhance those core values, such as in historical examples of how genomics has been conducted in minority groups, leading to the erosion of trust between stakeholders. Examples include the ongoing misuse of racial categories (Kozlov 2024), the deliberate overlook of self-identification of certain groups (TallBear 2013), the extractivist culture in the use of genetic data (Reardon 2001), and the pernicious interpretation of findings to support scientific racism (Bolnick 2008; Gannett 2004). All these examples reinforce that trust and trustworthiness are delicate subjects in human genomics. Indeed, sampled subjects might prefer population descriptors that reflect generality rather than precision if the former better aligns with how those subjects self-identify. For instance, Panofsky and Bliss (2017, 72) note that over the past decades researchers have been increasingly dependent on the good will of study participants as they need to collect data from thousands of individuals. Ambiguous labelling schemes based on continental labels (which deliberately mix racial/ethnic categories) are attractive for scientists since they facilitate data acquisition and are less likely to hurt individual sensitivities with

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respect to classification (Panofsky and Bliss 2017). This is likely because study participants identify more easily with coarse-grained and less precise population descriptors. In situations like this, assuming a synergy between precision and trust is an oversimplification. Precision is not sufficient for trust. Furthermore, generality might be a more relevant contributor to trust than precision. The emphasis on the precision–trust relationship in the NASEM report misses that contribution.

The assumption of synergy between values has consequences for the effectiveness and uptake of recommendations. Value synergies are complex because they can be highly context sensitive, varying from situation to situation. Oversimplification happens when local variation is ignored, such as when there is a uniform treatment of study participants disregarding local and historical contexts. However, different contexts will influence how trust can and should be promoted. Some contexts might require emphasis on precision, while others might require emphasis on generality. The consequence is that, when recommendations are predicated on oversimplified value synergies, recommendations might be so oversimplified that they become ineffective even if adopted. For instance, it may be the case that enhancing precision simply makes no difference whatsoever to trust and trustworthiness of research being conducted in some historically marginalized communities. In fact, it may even be the case that recommendations aiming to promote trust might contribute to distrust. An example of this can be seen in the outcomes of the Human Genome Diversity Project, which sought to better represent human genetic diversity by including local indigenous populations (historically marginalized and under-represented in such studies). Despite good intentions, the study was stigmatized and eroded trust with such populations due to the lack of historical sensitivity. The project came across as a threat to the self-identity of those populations and failed to offer concrete benefits to them (Reardon 2001, 2005; Bliss 2012). Even though researchers sought more precision as a general value, it was not sufficient to enhance trust and trustworthiness of research (Reardon 2001).

In sum, recommendations that oversimplify value synergies will fail to foster the desired value (goal) because they may be based on a distorted understanding of how to achieve it. After all, as we have illustrated in the previous paragraph, even when precision is enhanced there are reasons to doubt the trustworthiness of research in genomics. It is very plausible to assume that precision is a contributor to trust, but this assumption should not come at the expense of acknowledging that generality can also be a contributor to trust. Contributions can be more or less relevant depending on the context. Failing to recognize the relevant contributors and synergies leads to ineffective recommendations.

5. Moving forward

So far, we have outlined two challenges to the uptake of value-laden recommendations: overlooking value trade-offs and oversimplifying value synergies. More needs to be said about each challenge and how values influence scientific recommendations. However, it is also important to consider potential strategies to overcome those challenges. In this section, we briefly assess some of these strategies.

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5.1. Identification of different stakeholders

A key aspect of formulating realistic and effective recommendations is acknowledging the different stakeholders involved, whose interests are often intertwined and conflicting. Brown (2020) defines legitimate stakeholders as those who have an *actual* stake in the question at hand. For instance, in the trade-off between precision and generality, one limitation of the report was its failure to consider scientists as de facto stakeholders. While precision is a legitimate epistemic value, scientists might favour generality for pragmatic reasons, particularly when scientists work across contexts. Existing research often relies on cross-referencing previous studies, which tend to favour coarse-grained group labels over more precise ones. As a result, scientists have a vested interest in maintaining established labels, even if they don't align with the most precise descriptions or current ethical standards. This is primarily because reusing widely accepted standards increases the likelihood of their work being recognized within the scientific community.

5.2. Approaching values trade-offs through social aims

In many cases, epistemic aims are insufficient to define the outcome of a trade-off. This is because these choices also reflect social preferences. As such, non-epistemic considerations of what a research program ought to accomplish play an important role in decision-making, alongside epistemic considerations. Such a view is also known as the "aims approach" to values. For example, Intemann (2015) suggests that an epistemic trade-off can be settled in terms of clear aims of what the policy aims are in a particular scenario. Thus, one can assess the trade-off between precision and generality by considering which one better advances the social aims of human genomics in specific contexts. In the same way, the aims approach to values in science might be useful when dealing with value synergies. The promotion of trust and trustworthiness can be understood as a social aim. Scientists are then invited to consider how the epistemic values of their work can stand (or fail to stand) in synergy with trust in different contexts. The aims approach can contribute to the design of recommendations that effectively gain uptake in two ways: by clearly identifying cases of value synergies and by resolving trade-offs appealing to specific aims. The relationship between the social aims approach and the effectiveness of recommendations is an area ripe for future work in the field.[4]

5.3. The real impact of institutional incentives

While recommendations are an important effort by the scientific community and broader stakeholders to propose guidelines for producing empirically rigorous and ethically sound science, it would be naïve to neglect the impact of institutional incentives and the reward structure of science (Heesen 2018). On the one hand, the NASEM report acknowledges that institutions such as journals, professional societies, and funding agencies can help facilitate change in several ways (2023, 150–56). On the

[4] The aims approach has its own challenges (Hillgardt 2023). For instance, how can we ensure that disadvantaged groups participate in determining social aims? To effectively use this approach in recommendation designs, it is important to engage with these questions.

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other hand, these suggestions focus mostly on how researchers should comply with institutional norms rather than how institutions should promote such changes.

In our case study, a key issue was the disproportionate burden placed on individual scientists to instigate change. This is particularly problematic when it comes to trade-offs since individuals are encouraged to implement changes but are rarely incentivized to follow recommendations. For instance, despite existing recommendations, prominent scientific outlets still publish research that conflates population descriptors and misuses ethnic, racial and ancestry labels (Bick et al. 2024; Kozlov 2024). One reason for the persistence of these problematic standards is the pressure individual scientists feel to conform to the norms established and reinforced by major publications. As a result, even when scientists recognize that these labels are imprecise, they may feel compelled to perpetuate practices that have been historically accepted in leading outlets. Thus, even when scientists agree with recommendations and are willing to follow them, the challenge of implementation remains unsolved.

6. Conclusion

Scientific committees and recommendation reports are important stages of iteration in the development of responsible and ethical science. Reports are often motivated by values (epistemic and non-epistemic) to be pursued to enhance the production of trust with stakeholders and trustworthy scientific knowledge. For this reason, recommendations are meant to receive uptake from researchers and have a practical impact on their work. In this paper, we have clarified two challenges related to the uptake of recommendations. The first challenge involves overlooking value trade-offs, while the second concerns oversimplifying value synergies. We illustrated these issues with recommendations about the use of population descriptors in human genomics (NASEM 2023). Finally, we have identified three potential ways in which to avoid unrealistic and ineffective recommendations by relying on different normative approaches. While the challenges and solutions identified here rely on the NASEM report, they may extrapolate to scientific reports in other fields.

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References

Bick, Alexander G., Ginger A. Metcalf, Kelsey R. Mayo, Lee Lichtenstein, Shimon Rura, Robert J. Carroll, Anjene Musick, et al. 2024. "Genomic Data in the All of Us Research Program." *Nature* 627: 340–46. https://doi.org/10.1038/s41586-023-06957-x.

Biddle, Justin B. 2022. "On Predicting Recidivism: Epistemic Risk, Tradeoffs, and Values in Machine Learning." *Canadian Journal of Philosophy* 52 (3): 321–41. https://doi.org/10.1017/can.2020.27.

Bliss, Catherine. 2012. *Race Decoded: The Genomic Fight for Social Justice*. Stanford, CA: Stanford University Press. https://doi.org/10.1515/9780804782050.

https://doi.org/10.1017/psa.2026.10252 Published online by Cambridge University Press

Bolnick, Deborah A. 2008. "Individual Ancestry Inference and the Reification of Race as a Biological Phenomenon." In *Revisiting Race in a Genomic Age*, edited by Barbara A. Koenig, Sandra Soo-Jin Lee, and Sarah S. Richardson. New Brunswick, NJ: Rutgers University Press.

Brown, Matthew J. 2020. *Science and Moral Imagination: A New Ideal for Values in Science*. Pittsburgh, PA: University of Pittsburgh Press.

Caulfield, Timothy, Stephanie M. Fullerton, Sarah E. Ali-Khan, Laura Arbour, Esteban G. Burchard, Richard S. Cooper, Billie-Jo Hardy, et al. 2009. "Race and Ancestry in Biomedical Research: Exploring the Challenges." *Genome Medicine* 1 (1): 8. https://doi.org/10.1186/gm8.

Cavazos, Taylor B., and John S. Witte. 2021. "Inclusion of Variants Discovered from Diverse Populations Improves Polygenic Risk Score Transferability." *Human Genetics and Genomics Advances* 2 (1): 100017. https://doi.org/10.1016/j.xhgg.2020.100017.

Cerdeña, Jessica P., Emmanuella Ngozi Asabor, Marie V. Plaisime, and Rachel R. Hardeman. 2022. "Race-Based Medicine in the Point-of-Care Clinical Resource UpToDate: A Systematic Content Analysis." *eClinicalMedicine* 52 (October):101581. https://doi.org/10.1016/j.eclinm.2022.101581.

Coop, Graham. 2023. "Genetic Similarity versus Genetic Ancestry Groups as Sample Descriptors in Human Genetics." arXiv. http://arxiv.org/abs/2207.11595.

Douglas, Heather E. 2009. *Science, Policy and the Value-Free Ideal*. Pittsburgh, PA: University of Pittsburgh Press.

Elliott, Kevin C. 2011. "Direct and Indirect Roles for Values in Science." *Philosophy of Science* 78 (2): 303–24. https://doi.org/10.1086/659222.

Elliott, Kevin C. 2022. *Values in Science*, 1st ed. Cambridge: Cambridge University Press. https://doi.org/10.1017/9781009052597.

Elliott, Kevin C., and Rebecca Korf. 2024. "Values in Science: What Are Values, Anyway?" *European Journal for Philosophy of Science* 14 (4): 53. https://doi.org/10.1007/s13194-024-00615-3.

Elliott, Kevin C., and Daniel J. McKaughan. 2014. "Nonepistemic Values and the Multiple Goals of Science." *Philosophy of Science* 81 (1): 1–21. https://doi.org/10.1086/674345.

Fullwiley, Duana. 2008. "The Biologistical Construction of Race: 'Admixture' Technology and the New Genetic Medicine." *Social Studies of Science* 38 (5): 695–735.

Gannett, Lisa. 2004. "The Biological Reification of Race." *The British Journal for the Philosophy of Science* 55 (2): 323–45. https://doi.org/10.1093/bjps/55.2.323.

Gannett, Lisa. 2014. "Biogeographical Ancestry and Race." *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences* 47 (September):173–84. https://doi.org/10.1016/j.shpsc.2014.05.017.

Heesen, Remco. 2018. "Why the Reward Structure of Science Makes Reproducibility Problems Inevitable." *The Journal of Philosophy* 115 (12): 661–74.

Hilligardt, Hannah. 2023. "Partisan Science and the Democratic Legitimacy Ideal." *Synthese* 202 (5): 135. https://doi.org/10.1007/s11229-023-04370-5.

Intemann, Kristen. 2015. "Distinguishing between Legitimate and Illegitimate Values in Climate Modeling." *European Journal for Philosophy of Science* 5 (2): 217–32. https://doi.org/10.1007/s13194-014-0105-6.

Isaac, Alistair M. C. 2022. "Escape from Zanzibar: The Epistemic Value of Precision in Measurement." *Philosophy of Science* 89 (5): 1243–54. https://doi.org/10.1017/psa.2022.67.

Khosrowi, Donal. 2019. "Trade-Offs Between Epistemic and Moral Values in Evidence-Based Policy." *Economics and Philosophy* 35 (1): 49–78. https://doi.org/10.1017/S0266267118000159.

Kozlov, Max. 2024. "'All of Us' Genetics Chart Stirs Unease over Controversial Depiction of Race." Nature, February. https://doi.org/10.1038/d41586-024-00568-w.

Kuhn, Thomas S. 1977. *The Essential Tension: Selected Studies in Scientific Tradition and Change*. Chicago, IL: University of Chicago Press.

Lee, Sandra S. J., Stephanie M. Fullerton, Aliya Saperstein, and Janet K. Shim. 2019. "Ethics of Inclusion: Cultivate Trust in Precision Medicine." *Science* 364 (6444): 941–42.

Lehtinen, Aki. 2021. "The Epistemic Benefits of Generalisation in Modelling I: Systems and Applicability." *Synthese* 199 (3–4): 10343–70. https://doi.org/10.1007/s11229-021-03250-0.

Leonelli, Sabina. 2019. "The Challenges of Big Data Biology." *eLife* 8 (April):e47381. https://doi.org/10.7554/eLife.47381.

https://doi.org/10.1017/psa.2026.10252 Published online by Cambridge University Press

Lewis, Anna C. F., Santiago J. Molina, Paul S. Appelbaum, Bege Dauda, Anna Di Rienzo, Agustin Fuentes, Stephanie M. Fullerton, et al. 2022. "Getting Genetic Ancestry Right for Science and Society." *Science* 376 (6590): 250–52. https://doi.org/10.1126/science.abm7530.

Longino, Helen E. 1990. *Science as Social Knowledge: Values and Objectivity in Scientific Inquiry*. Science as Social Knowledge. Princeton, NJ: Princeton University Press. https://doi.org/10.1515/9780691209753.

Morales, Joannella, Danielle Welter, Emily H. Bowler, Maria Cerezo, Laura W. Harris, Aoife C. McMahon, Peggy Hall, et al. 2018. "A Standardized Framework for Representation of Ancestry Data in Genomics Studies, with Application to the NHGRI-EBI GWAS Catalog." *Genome Biology* 19 (1): 21. https://doi.org/10.1186/s13059-018-1396-2.

National Academies of Science, Engineering, and Medicine. 2023. "*Using Population Descriptors in Genetics and Genomics Research: A New Framework for an Evolving Field*." Washington, D.C.: National Academies Press. https://doi.org/10.17226/26902.

Panofsky, Aaron, and Catherine Bliss. 2017. "Ambiguity and Scientific Authority: Population Classification in Genomic Science." *American Sociological Review* 82 (1): 59–87. https://doi.org/10.1177/0003122416685812.

Popejoy, Alice B., and Stephanie M. Fullerton. 2016. "Genomics Is Failing on Diversity." *Nature* 538 (7624): 161–64. https://doi.org/10.1038/538161a.

Reardon, Jenny. 2001. "The Human Genome Diversity Project: A Case Study in Coproduction." *Social Studies of Science* 31 (3): 357–88. https://doi.org/10.1177/030631201031003002.

Reardon, Jenny. 2005. *Race to the Finish: Identity and Governance in an Age of Genomics*. Princeton, NJ: Princeton University Press.

Tal, Eran. 2020. "Measurement in Science." In *The Stanford Encyclopedia of Philosophy*, edited by Edward N Zalta. Stanford, CA: Stanford University Press. https://plato.stanford.edu/archives/fall2020/entries/measurement-science/.

TallBear, Kim. 2013. "Genomic Articulations of Indigeneity." *Social Studies of Science* 43 (4): 509–33. https://doi.org/10.1177/0306312713483893.

Ward, Zina B. 2021. "On Value-Laden Science." *Studies in History and Philosophy of Science Part A* 85 (February):54–62. https://doi.org/10.1016/j.shpsa.2020.09.006.

Woodward, James, and Kenneth Kendler. 2023. "Polygene Risk Scores: A Philosophical Exploration." *Philosophy of Medicine* 4 (1). https://doi.org/10.5195/pom.2023.156.

Yudell, Michael, Dorothy Roberts, Rob DeSalle, and Sarah Tishkoff. 2016. "Taking Race out of Human Genetics." *Science* 351 (6273): 564–65.

Zhang, Frederick, and Joseph and Finkelstein. 2019. "Inconsistency in Race and Ethnic Classification in Pharmacogenetics Studies and Its Potential Clinical Implications." *Pharmacogenomics and Personalized Medicine* 12 (July):107–23. https://doi.org/10.2147/PGPM.S207449.

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