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ARTICLE

Epistemic Deprivation

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Abstract
It is often claimed that gender data gaps (GDGs) are unjust, but the nature of the injustice has not been interrogated. We argue that injustices arising from such data gaps are not merely socio-political but also epistemic: they arbitrarily skew the epistemic landscape in favour of one group over another. GDGs place a greater epistemic burden on women and gender minorities; they have to do more to avoid error and the pay-off is worse: they have a smaller pool of true beliefs on which to act. We suggest that there are both pragmatic and conceptual reasons to differentiate the injustice arising from GDGs from other more familiar varieties (such as testimonial and hermeneutical injustice), and so we introduce the new concept of *epistemic deprivation* to capture this injustice.

1. Introduction

Gender data gaps (GDGs) are a ubiquitous phenomenon, occurring in all aspects of our lives. GDGs tend to arise either when data collection is limited to particular gender groups (by design or otherwise), or where data is not suitably disaggregated. We give detailed examples in section 2, but a common instance of the first variety is when a product, policy, or procedure is developed, licensed, and tested on the basis of a restricted group of test subjects or with input only from a restricted group. For instance, men (and often cis men specifically) are taken to be representative of humans generally in medicine, development of safety regulations, product design, and even town planning (Criado Perez 2019). Even in cases where data are collected more broadly, these are often not separated by gender or sex, thereby obfuscating relevant differences in how the product, policy, or procedure affects diverse groups. GDGs have generated significant attention in medical ethics and beyond, where they are regularly claimed to be unjust (Braveman et al 2011; Criado Perez 2019; Jaggar 2009; Hutchison et al. 2017; Silver et al. 2018). However, the nature of the injustice tends to be left unspecified. We argue that the relevant injustice is not limited to the socio-political but extends to the epistemic, when and because GDGs skew the epistemic landscape in favor of one group for morally arbitrary reasons. Not all GDGs are unjust, although in practice many are. For instance, if a medicine or safety-related technology only affected people of one gender group, we should not expect data on these to include people of other genders.

As is familiar, there is an ongoing debate in the metaphysics of gender about what gender is or consists in. Arguing for a particular account of gender or gender categories would be beyond the scope of this paper—and our account of epistemic deprivation is neutral with regards to the ontology of gender—but we nonetheless set out how we are using terminology in order to avoid reinforcing cissexism in philosophical theory.[1] We use "men" and "males" when reporting results of studies in line with the terms the authors are using.[2] We do not offer definitions of these because the studies in question usually do not offer definitions, and inevitably use the terms in different ways from each other; as we use them, the terms refer to those people who were designated that way in the context of the study. Otherwise—for example, when discussing impacts and injustices—we use "cis man" to mean people who were assigned male at birth and also identify as men, and "women and gender minorities" to mean anyone who was not assigned male at birth or who does not identify as a man (i.e., who is not a cis man).[3] We mean the latter to include (but not be limited to) people who think of themselves as cis women, trans women, trans men, and non-binary people. We mean to do this in line with ordinary language use, and without presupposing a particular metaphysics of gender. Gender data gaps (GDGs) are only one type of data gap—others affect the elderly, the ill, members of particular ethnic groups, and so on.[4] Additionally, data are rarely disaggregated to capture peoples' intersectional identities, for example, it is common in various studies to provide statistics for "women" and for "ethnic minorities," with data for minority ethnic women "lost within each larger group" (Criado Perez 2019, xiv). A single paper is insufficient to do justice to the many and varied kinds of data gap, so we are focusing specifically on gender. Nonetheless, we expect that much of what we say about GDGs will be transferable, and that other data gaps similarly skew the epistemic landscape.

In this paper we argue that the injustice at the heart of GDGs is not merely socio-political but also epistemic. Miranda Fricker first identified epistemic injustice as "a wrong done to someone specifically in their capacity as a knower" (2007, 1). As is familiar, she distinguishes between "testimonial" injustice—which occurs when prejudice causes a hearer to give a deflated level of credibility to a speaker's testimony—and "hermeneutical" injustice, when a gap in collective interpretive resources puts someone at an unfair disadvantage when it comes to making sense of their social experiences. Others have disambiguated further types of epistemic injustice, such as epistemic coercion (Dandelet 2021) or discursive participatory injustice (Hookway 2010).[5] Fricker writes that identifying "the many of various forms" of epistemic injustice is "how we will best continue the business of bringing to light the different ethical and political dimensions of our epistemic lives" (2017, 53). We argue that previously identified varieties of epistemic injustice do not fully capture the injustice at the heart of GDGs, and therefore propose an addition to the taxonomy: epistemic deprivation.

Epistemic deprivation occurs when an agent (or group) is lacking knowledge, or impeded in the acquisition of that knowledge, and two conditions are satisfied:

(1) the knowledge is valuable, and
(2) the agent (or group) lacks the knowledge for no good reason.

For the purposes of this paper, when we say "knowledge" we have in mind merely "true belief," following Goldman (1999) and Coady (2010). We unpack "valuable" in section 3, but take self-regarding, action-guiding knowledge about one's health and safety to be a paradigm case.

In each of the cases we consider, women and members of gender minorities are deprived of important, action-guiding knowledge relevant to their health and safety, because they are women and members of gender minorities. Our interest in GDGs is two-fold: first, we want to understand what is unjust about them. Second, we use GDGs to illustrate what epistemic deprivation looks like. While we focus on GDGs, we do not claim that epistemic deprivation is exclusive to them. There are other circumstances in which an epistemic agent is deprived of valuable knowledge for bad reasons—which may include but are not limited to prejudice, bias, unjustified exclusion, or elision of difference—and these may also be understood as instances of epistemic deprivation. We discuss these cases further in section 3. As with other epistemic injustices, belonging to more than one minority group—for example, being a woman of colour—makes one especially vulnerable to epistemic deprivation.

In what follows, we introduce three case studies (section 2), each instantiating a GDG, to illustrate ways in which such gaps arise. We use these examples to motivate our claim that the injustice of GDGs is not only socio-political but also epistemic in nature (2.4). We argue that epistemic deprivation (section 3) is not only conceptually distinct from other more familiar forms of epistemic injustice (4.1), such as testimonial and hermeneutical, but also remedied differently (4.2; section 5). So, we contend, there is—additionally—practical benefit to treating epistemic deprivation as a novel variety. Finally, an important implication of being epistemically deprived is one's increased vulnerability to other forms of epistemic injustice (4.3), thus identifying epistemic deprivation is an important part of tackling epistemic injustice more generally.

2. Case studies

Here we outline three case studies which we call "Generic drugs," "Implantable devices," and "Car safety", respectively.

2.1 Generic drugs

Generic drugs are pharmaceuticals with the same active ingredient (e.g. Mefenamic Acid) as the original brand-name drug (e.g., Ponstan), but often with different additives or fillers. As the UK's National Health Service (NHS) website tells us, "The generic versions will be the same as the branded medicine because they contain the same active ingredients. They are used more often by the NHS because they're just as effective but cost far less" (NHS 2020). Generic drugs make up the majority of prescriptions in the UK and over 80 percent of prescriptions in the USA (Oxera 2019; McGregor 2020). Because the active ingredient is the same and has already been approved for patient use, in the USA (and Europe[6]) generic drugs undergo "bioequivalence" testing rather than full trials:

> This means that they need to prove that their generic version of the drug exhibits similar peak concentration and other effects in the body. Generic companies also get a 20 percent "fudge factor", meaning that they need to prove between 80 to 120 percent bioequivalence to the brand-name drug in order to bring a generic to market. These studies are conducted almost exclusively in young, healthy males, often over a period of just a few weeks. (McGregor 2020, 87–88)

Women and gender minorities are frequently not included in these studies.[7] This omission results in a gender data gap, because the so-called "inactive" ingredients—colours, fillers, and preservatives, known collectively as "excipients"—can have a different effect on how the body absorbs and processes the medication. McGregor uses the example of polyethylene glycol (PEG) as a filler in generic ranitidine, which in initial bioequivalence studies was shown to "increase bioavailability" by 63 percent. On this basis, researchers concluded that the generic product could produce equivalent results to Zantac (the original brand-name drug) with less of the active ingredient. However, these studies didn't include women, for whom it was later found PEG *decreases* bioavailability by 24 percent: "So generic ranitidine produced with PEG was actually only about half as effective for women as it was for men at an equivalent dose" (McGregor 2020, 89). This isn't an isolated case (either with PEG or generic drugs more generally; see for instance Chen et al. 2000; Koren et al. 2013). Yet the standard model of young adult, healthy, usually male, volunteers is "regarded as adequate in most instances to detect formulation differences and to allow extrapolation of the results to populations for which the reference medicinal product is approved (the elderly, children, patients with renal or liver impairment, etc.)" (European Medicines Agency (EMEA) 2010).

2.2 Implantable devices

Surgery to replace worn or damaged human joints—such as hips and knees—with artificial joints is offered to patients to reduce pain and increase their range of movement, with artificial joints expected to last for "at least 15 years" (NHS 2019a). Advice to patients on the NHS website identifies a range of risks associated with surgeries, together with the probabilities of these risks occurring. This information is a crucial step in enabling patients to make informed choices about their surgeries. However, none of the risks is differentiated by gender.

Katrina Hutchison (2019) discusses a significant difference in outcome success of hip replacements between male and female patients. Metal-on-metal hip replacements, once popular for their longevity, had higher failure rates when implanted into women than men (Haughom et al. 2015). Complications from device failure included pain and inflammation, pseudo-tumours and raised metal-ion levels in blood, in turn leading to further risks to heart health, thyroid function and negative effects on both cognitive and nerve function (Hutchison 2019, 571–72). The devices had been tested and recommended by the manufacturer, DePuy Orthopaedics, as being more suitable for younger patients, on account of the anticipated longevity. What went wrong? Hutchison uses DePuy's metal-on-metal design to illustrate a wider problem within medical testing and research: "Gender biases can be built into devices when the possible impact of such differences is ignored in the design, benchtesting, clinical testing, and regulatory approval processes" (2019, 572). Put simply, the differences between how different people walk, sit, stand, and have sex are all relevant factors to consider in testing. The ways in which people do these things can be affected by their gender group membership in virtue of average anatomical differences, social norms, or both. Where implants are tested only on one gender group, a data gap results. The NHS website's section on risk has nothing to say about how sexual position, carrying an infant on one's hip, or wearing certain kinds of shoes might increase wear and tear on the device (NHS 2019a). Changes in hormone levels, for example through menstruation, pregnancy, or hormone therapy, may also affect joint stability. Data on the effects of hormone changes on the stability, success and longevity of devices are—perhaps unsurprisingly—not available.

2.3 Car safety

GDGs are not restricted to medical research; they are ubiquitous. Car safety tests, used as marketing tools and required for the protection of drivers and passengers alike, provide another instance (Criado Perez 2019). These GDGs occur because cis men are taken to be representative of humans in general. For example, as drivers, women on average tend to sit further forwards to reach the pedals than men do, making them more vulnerable to internal injury in head-on collisions (Gendered Innovations Research Group n.d.). Additionally, sitting in car seats which have been designed in reference to the spinal shape and muscle strength in the neck representative of a cis man results in many women being more likely to suffer whiplash in a rear end collision.

When first introduced, crash test dummies were based upon an average male body of 1.77m height and 76 kg weight. A call to model crash test dummies on females was ignored for decades (Criado Perez 2019, 187). When crash test dummies resembling female bodies were eventually introduced in Europe, the car safety rating agency EuroNCAP used sex disaggregated data “where data [wa]s available” (188). But since the data are frequently unavailable, the safety ratings awarded may completely ignore average anatomical differences.[8]

In some cases, EuroNCAP used “scaled down male dummies.” But females are not mini-males: many females have breasts and—as noted—differently shaped spines, different upper-body muscle strength, and different seating positions. Pregnancy is also ignored in standard seatbelt design (Criado Perez 2019, 188).

In other cases, where anthropometrically female crash test dummies were used, it was only in the passenger position, yet car safety ratings were based upon the outcomes for the crash test dummies in the driver’s position. This kind of research generates two data gaps for women by failing to *collect* data on women as drivers and by failing to *publish* data on women as passengers. When these data are published, the safety ratings for cars can drop dramatically (Criado Perez 2019, 189).

2.4 Identifying injustice

Common to each of the case studies is the presence of a gender data gap which hides certain important facts, for example that the risks and effectiveness of a product or procedure are not the same for cis men as for women and gender minorities.[9]

It is clear that something is going wrong as a result of GDGs. In *Generic drugs* and *Implantable devices,* women and gender minorities are vulnerable to unexpected and worse treatment outcomes; in *Car safety* women and gender minorities are likely to come off worse in an accident whether they are drivers or passengers.[10] Along with authors such as Criado Perez, Hutchison and McGregor, we think these GDGs lead to injustice. However, while those writing on GDGs have deemed the status quo and the resulting inequalities as unjust, there has been insufficient attention paid to the nature of the injustice.

Intuitively we might judge the injustice to be socio-political, particularly where it arises from subconscious biases, prioritizing ease or profit, legislative or regulatory oversight or omission, or similar. Furthermore, there might be many instances of GDGs which do not lead to actual harm. For example, some of the women and members of gender minorities using implantable devices might be sexually active in ways that do not lead to increased wear and tear. Many people will not be in motor accidents and so not be caused significant damage due to the seat design. Nonetheless, we recognise that exposing women and gender minorities to higher risks than cis men—and to potentially worse outcomes—without justification is a social injustice.

However, we shall show that, even where socio-political injustice results from GDGs, it does not exhaust the kinds of injustice present; data gaps such as those identified in our case studies also give rise to a form of injustice that is distinctly epistemic in nature. This epistemic injustice arises for agents (in our examples women and members of gender minorities, both individually and as a group) when they are denied important knowledge, relevant to the proper exercise of their epistemic agency, for bad reasons. As we shall argue, GDGs inhibit the formation of self-regarding action-guiding beliefs; to borrow a turn of phrase from Fricker (2017, 53), they represent a systemic rigging of the epistemic economy.

3. Epistemic deprivation

As noted above, we propose an addition to the taxonomy of epistemic injustice; a new way in which a wrong can be done to someone in their capacity as a knower (Fricker 2007). In this section we outline what we take this new form to be, and in section 4 consider its relationship to other forms of epistemic injustice. Finally, in section 5, we discuss how epistemic deprivation might be remedied.

GDGs like those discussed in section 2 disadvantage women and members of gender minorities by impeding their ability to form true beliefs, and to avoid false beliefs, in response to questions they have an interest in having answered. What car would be safest for me? What medication would be the best option for me? Would an implant improve my quality of life?[11] In other words, they make women and members of gender minorities worse knowers. This is the first feature of epistemic deprivation: it involves an impediment to knowledge acquisition.

Of course, lacking information or knowledge is not automatically unjust, and neither is an unequal distribution of an epistemic resource.[12] Indeed, as is familiar, ignorance can be an asset (Fricker 2016; Townley 2011). Some knowledge, though, is plausibly such that, if we are deprived of it (or the ability to access it), an injustice ensues.[13] This is the second feature of epistemic deprivation: the knowledge one is impeded in acquiring must be suitably valuable.

There are various ways one might spell this out. For instance:

> It seems clear that our ordinary thoughts about rights includes this concept [of the right to know], as when we say, for example, that a patient has a right to know his or her medical condition, that a soldier has the right to know the cause for which he is fighting, or that the public has the right to know about some of the activities of certain public figures. (Coady 2010,: 105–06)

Or:

> Intrinsically valuable true beliefs are the answers to the following kinds of questions: first, questions the agent happens to find interesting, second, questions the agent would find interesting if he or she had thought of them, and third, questions that the agent has an interest in having answered. (Goldman 1999, 95)

One needn't commit to rights talk or assent to Goldman's particular delineation of what is interesting to find plausible the claim that there is some knowledge that it is in our best interest to have. However one conceives of suitably valuable knowledge, true beliefs that are useful and action-guiding in matters of safety and wellbeing are likely to be paradigmatic instances.

But the lack of valuable knowledge need not be unjust. We take the difference between instances of epistemic deprivation and more benign cases to depend on the reasons for the impediment to knowledge acquisition. This is the third feature of epistemic deprivation. Bad reasons come in many varieties, from individual prejudice to systemic bias, elision of difference, negligence, and so on. Underpinning many GDGs, for instance, is the assumption of cis men as the default, which itself stems from pervasive, long-standing, systemic biases (Criado Perez 2019). As with the standards for valuable knowledge, there is room for disagreement on what counts as a good or bad reason, but our case studies are plausibly instances of injustice.[14]

Part of what makes the epistemic deprivation in GDGs so vivid is the comparative disadvantage they depict; answers to the same questions ("What car is safest for me?"; "Is this drug appropriate for me?") are available to some agents but not others. As evidenced in our case studies, a prototypical instance is when a data gap renders a woman or member of a gender minority less able than her counterpart man to form true beliefs about herself, or what is best for her, that would inform her subsequent action or decision-making. The deprivation is two-fold: women and gender minorities in our case studies have access to *fewer* and *worse* epistemic resources. Fewer, because lack of relevant data reduces available true beliefs, and worse, because ignorance of the existence of gaps leads to more false beliefs. In *Implantable devices*, for instance, a lack of data may prevent women and members of gender minorities from forming true beliefs as to the impact of the device on their sex lives; if they (and their doctors) are unaware that such a gap exists, they may also come to believe falsely that the device will allow them to resume their normal activity. Although unequal distribution of a given epistemic resource does make the injustice easier to spot, it is not a necessary condition for epistemic deprivation: what matters is not that someone else can acquire valuable knowledge that you cannot, just that you cannot acquire that knowledge, and for no good reason.[15]

From our consideration of GDGs we can extract a more general definition. Epistemic deprivation occurs when an agent (or group) is lacking knowledge, or impeded in the acquisition of that knowledge, and two conditions are satisfied:

(1) the knowledge is valuable, and
(2) the agent (or group) lacks the (ability to acquire the) knowledge for no good reason.

Generic drugs, *Implantable devices,* and *Car safety* meet both conditions. However, there are various scenarios that meet only one of the two conditions; while these might be unfortunate or even morally deficient, we do not count them as instances of epistemic deprivation. For instance, suppose that an agent is impeded in gaining knowledge of p, because it is not yet understood how we might come to know p. Even if p is valuable, this will not be a case of epistemic deprivation because (2) is not satisfied.[16] Another way in which a scenario might satisfy (1) but not (2) is where the risk associated with producing the valuable knowledge is too high. For instance, pregnancy might sometimes be a good reason to exclude a participant from research.[17]

We remain open to the possibility that we might lack or be impeded in acquiring some valuable knowledge without an injustice occurring; (1) alone is insufficient for epistemic deprivation. Alternatively, a case might satisfy (2) but not (1). Suppose, for instance, there is research undertaken on the impact of listening to Beethoven on hair growth. Suppose too that the researcher is prejudiced against women and gender minorities, and thus only undertakes the research on cis men. This is undoubtedly a bad reason on which to exclude participants, but it is not a case of epistemic deprivation (assuming the knowledge is not suitably valuable). Finally, there are scenarios in the neighbourhood, but which meet neither condition. For instance, there are cases of knowledge that is valuable to one group but not a second group and where we have good reason not to pursue it in relation to the second group (e.g., a study of the effectiveness of drugs against prostate cancer might reasonably be restricted to people with prostates).

A few more observations of epistemic deprivation and GDGs follow, before we turn to the relationship between the former and other varieties of epistemic injustice.

One effect of epistemic deprivation is that it undermines epistemic agency. As Grasswick argues, if our incapacity to acquire a particular piece of knowledge is

> either quite far-reaching (by blocking my access to large swaths of knowledge) or concerns understandings central to my self-understanding (blocking knowledge that is of crucial importance to my overall life and ability to continue as an active epistemic agent) at some point we can make sense of this blockage as actually threatening one's epistemic agency. (Grasswick 2018, 84)[18]

In each of our case studies, the ability of women and members of gender minorities to form valuable true beliefs—the kinds of beliefs that would guide their action in matters crucial to their health and wellbeing—is inhibited. Consider *Generic drugs*. Suppose a patient is prescribed a generic medication and forms the belief that it is an appropriate and safe treatment for them. They form this belief because they trust their doctor, are aware of the messaging that generic medications are as effective as brand-name medications, and have no reason to doubt. Based on this belief, they choose to fill the prescription and take the medication. If the patient is a cis woman and the medication is, for instance, generic ranitidine with PEG, this belief is likely to be false. Similarly, as discussed in *Car safety*, if a potential buyer considers widely available safety information and forms the action-guiding belief that a given model is the safest option for them, their belief might very well be incorrect if they are a woman or a member of a gender minority.

Importantly, these mistakes are not readily correctable on the part of the agent: no matter how much effort the potential knower expends, cis men in these (self-regarding-belief-forming) situations are in epistemically better positions than women and members of gender minorities, and the latter may be unable to rectify the imbalance. If a cis man reads the patient information leaflet included alongside a generic drug, he will be better situated to form true beliefs as to the risks and side effects applicable to him. If someone who is not a cis man goes beyond the standard leaflet and does additional research—for instance, if they check the FDA Drug Trials Snapshot website, or peruse Cochrane meta reviews—and determine that women and gender minorities weren't included in the relevant trials, they are still in a worse epistemic position: at best they are less likely than they were previously to form a false belief as to the safety or appropriateness of the medication, but no more likely to form a true one. The epistemic burden on women and gender minorities is greater—they have to do more to avoid error—and the payoff worse: they have a smaller pool of true beliefs on which to act with no good reason for this discrepancy.[19]

One might object that GDGs also affect cis men. That's true. As a result of GDGs, cis men may also lack the necessary information to make informed decisions; *ceteris paribus,* a father choosing between a generic or brand-name medication for his child will be in a better epistemic position with regards to his son than his daughter. Likewise, a cis man buying a car for himself and his partner will be better able to predict the safety of a given model if his partner is a cis man. We propose that women and members of gender minorities unable to make informed decisions about their *own* health and safety—where a cis man otherwise could—is a paradigmatic instance of epistemic deprivation. Whether other examples count as epistemic deprivation (i.e., as an injustice) will depend on what knowledge one thinks is sufficiently valuable (or that one has a right to, or that one ought to have). These questions are important but beyond the scope of what we can consider here.[20] Suffice to say, we find it plausible that some other-regarding decisions are relevant to epistemic agency, and that the knowledge required to make them is such that—if it were lacking for no good reason—agents would be epistemically deprived.

4. Other epistemic injustices

Having introduced epistemic deprivation, we now turn to exploring its relationship with other, more familiar kinds of epistemic injustice. This is not merely an exercise in taxonomy, but also important for understanding how epistemic deprivation makes one more vulnerable to other kinds of epistemic injustice (4.3) and how one might go about tackling it (4.2 and further in section 5). We begin by suggesting that epistemic deprivation is plausibly conceptually distinct from other varieties of epistemic injustice (4.1) and then argue that their remedies are different and so there is practical benefit to treating epistemic deprivation as a new variety of injustice, regardless of its conceptual distinctness.

4.1 Epistemic deprivation as conceptually distinct

Discussions of epistemic injustice often focus on the interpersonal. When Fricker and her interlocutors talk about the wrong done to someone in their capacity as a knower, there is a heavy focus on communication, and the challenges which members of marginalised groups face in contributing to, or acquiring, knowledge (e.g. Fricker 2007, 2010; Hookway 2010). Carel and Kidd (2014) offer particularly evocative examples of the epistemic injustice faced by ill people in the context of interactions between patients and medical professionals, such as the following conversation between a patient who has just given birth and their doctor: "That hurts. Are you using anaesthetic?" "No" the doctor replies calmly, "there is no need to. I'm nearly finished."

The paradigmatic cases of epistemic injustice are taken to be those where a person, or group of people, have knowledge to communicate but something–frequently prejudice against that group or a paucity of shared social concepts—prevents that communication. But, as has been well-demonstrated in recent years, such cases do not exhaust the injustice one can face in one's capacity as an epistemic subject. Indeed, communication isn't at the heart of any of *Generic drugs*, *Implantable devices,* or *Car safety*. Rather, our case studies reveal injustices related to self-regarding knowledge acquisition and decision-making, not interpersonal exchange.

We acknowledge that, at least sometimes, other forms of epistemic injustice are present in GDG cases; sometimes GDGs arise as the result of—or result in—these other varieties. Nonetheless we contend these other forms do not exhaust (or fully capture) what's going wrong in our case studies.

If some gender groups are excluded from participating in research because they are thought to be unreliable reporters (of, say, their experience of a drug), their exclusion would cause a GDG arising from testimonial injustice. However, testimonial injustice is not a good explanation for the injustice in our case studies. The GDGs in *Generic drugs*, *Implantable devices* and *Car safety* give rise to injustice even where there is no interlocutor and therefore no credibility deficit. Suppose a non-binary person were to look up car safety statistics online when choosing to buy a new car. Encountering data skewed by GDGs, the beliefs they form about the safety of particular vehicles for themself, as a driver, may be untrue. The same applies for women or members of gender minorities reading the patient information sheet accompanying generic drugs. Even in cases where testimonial injustice does cause a GDG, it may not fully explain the *resulting* injustice: women and gender minorities remain epistemically deprived as the result of their exclusion, because the requisite data was not gathered to enable them to form true beliefs or avoid false ones, for no good reason.

Likewise, some GDGs can be understood, at least in part, in hermeneutical terms. For example, it has become apparent that women's experiences of heart attacks can be quite different from men's experiences (Davidson 2017) and are often called "atypical."[21] However, prior to the recognition of these "atypical" symptoms (that is, prior to addressing the data gap), it's plausible that the women suffering them—and the doctors in a position to make a diagnosis—might have lacked the concept not of the experiences themselves, but of these experiences as *being symptomatic of a heart attack.* In other words, there was conceptual paucity around "heart attack." This is paradigmatic hermeneutical injustice: women suffering heart attacks were unable to understand their experience or make it intelligible to others.[22] Again, hermeneutical injustice does not fully explain what goes wrong in *Generic drugs*, *Implantable devices,* or *Car safety*; in these cases, the injustice does not stem from women failing to be understood or their perspectives not being considered; indeed, in order to tease out the distinction between hermeneutical injustice and epistemic deprivation we have deliberately chosen cases where people's perspectives are not the relevant (missing) data.[23]

It is common to characterise hermeneutical injustice as a lack of (access to) *concepts*, but the injustices encountered in our three case studies concern a lack of (access to) particularly valuable *facts*: facts that allow women and gender minorities to form self-regarding action-guiding true beliefs, and avoid false beliefs; facts that enable women and gender minorities to have the same degree of epistemic agency as cis men. What is missing in GDG cases is often not conceptual understanding to make sense of our lived experience, but factual information pertaining to risks and efficacy. Indeed, we frequently do have mutual understanding across genders of the relevant concepts: risk, effectiveness, pain, disaggregated data. In *Generic drugs*, for example, even if one did lack understanding of what it is for a drug to be effective, or what is meant by a side effect, this would not exhaust what is missing; women and gender minorities with the aforementioned concepts would still lack access to relevant information such as the degree of active ingredients their bodies would likely absorb. In *Car safety*, the injustice arises because of a lack of data regarding facts about the nature and chances of potentially harmful outcomes. Will someone other than a cis man survive a particular kind of crash? How is their body affected by the material a given car's seats are made of?

We also contrast epistemic deprivation with Sophia Dandelet's recent work on epistemic coercion, in which she discusses self-gaslighting as a form of injustice.

Dandelet makes space for the notion that an agent's higher-order epistemic decisions can be coerced when they decide how to structure their epistemic inquiries in response to threats that place unfair pressure on them (Dandelet 2021). As we note in section 4.3, epistemic deprivation may sometimes lead to epistemic coercion. However, one can conceive of cases of epistemic deprivation without coercion, and thus we consider them conceptually different.

Finally, we take epistemic deprivation to be distinct from epistemic exclusion, as introduced by Dotson (2014). Pohlhaus Jr notes that exclusion involves "pre-emptively regarding a person as unreliable or incapable of participating in particular epistemic systems" and so impedes "epistemic agency by barring them from full participation in those systems" (2020: 235). GDGs *may* arise when researchers or policymakers view women or gender minorities as unreliable or incapable of participating but that needn't be the case. GDGs can (and seem often to) arise because of an unquestioned assumption that women and gender minorities are *just like cis men* in ways relevant to that product, procedure, or policy. This assumption skews the epistemic landscape for women and gender minorities in two ways, as outlined in section 3: they are less able to avoid false beliefs, and to form true beliefs, about important self-related propositions. For example, the false belief that the effects and risks associated with generic drugs are identical for oneself to those associated with branded drugs, and the true beliefs concerning the risks and effectiveness of the generic drugs *simpliciter*. Similarly, women and members of gender minorities cannot accurately weigh up the risks and benefits of an implantable device without knowing how implants are likely to perform in a life like theirs. The epistemic agency of women and members of gender minorities is thus impeded in ways that cis men's epistemic agency is not. While there is a meaningful sense in which women and gender minorities have been excluded or their differences elided in research, we take the phenomenon we are focusing on to be importantly distinct from Dotson's sense of exclusion.

Some might worry about conceptual inflation, given that a thriving literature continues to explore the limits of Fricker's account and the conceptual possibilities of epistemic injustice. Some authors seek to extend Fricker's framework by, for example, extending the definitions of hermeneutical injustice (Simion 2019); others, like Dandelet, argue for new kinds of epistemic injustices. Bratu and Hänel (2021) claim that Fricker offers a *concept* of epistemic injustice and that additions to the framework can be understood as different *conceptions* of that concept. We think that, as the landscape currently stands, epistemic deprivation is plausibly conceptually distinct from other forms of epistemic injustice. However, should the future lead to a complete understanding of epistemic injustice, and hermeneutical injustice in particular, one might find that epistemic deprivation is best understood as a conception of hermeneutical injustice, or as a variety of a heretofore unrecognised form of epistemic injustice. Such a future may be unlikely, however, as Dotson notes:

> A catchall theory of epistemic injustice is an unrealistic expectation. Epistemic oppression is simply too pervasive … I have indicated that addressing and identifying epistemic injustice will be far more challenging than any one account can accommodate. (2012: 41)

However, regardless of its place in the ultimate conceptual topography of epistemic injustice, we propose that epistemic deprivation be treated as distinct on pragmatic grounds, as we go on to discuss below.

4.2 Epistemic deprivation as practically distinct

Dotson (2014) argues that different forms of epistemic exclusion can be identified by thinking about what would need to change for it to be remedied. While we focus on a different variety of epistemic injustice than Dotson, we follow her in distinguishing between varieties by focusing on what needs to change. In section 4.1 we considered the conceptual distinctness of epistemic deprivation, but we also think it's pragmatically distinct; it requires its own remedy. Here we discuss why remedies for other varieties won't be enough, and in section 5 make suggestions targeted specifically at GDGs and epistemic deprivation.

Testimonial injustice arises when prejudice causes a hearer to give a deflated level of credibility to a speaker's testimony. Fricker's (2007) solution naturally focuses on developing virtues to avoid listener prejudice. But as we have argued, there need not be a credibility deficit for GDGs to emerge. Furthermore, addressing listener prejudice will not on its own prevent epistemic deprivation. Suppose that a doctor prescribes generic medications as a matter of course for all patients, genuinely believing—and thus reporting to patients—that they work as effectively as brand-name medications. Suppose also that the doctor tends to disbelieve women, but not men, when they report experiencing negative side effects. The doctor coming to realize they are prejudiced, while beneficial, will not go all the way to improving the epistemic position of their women patients (as shown in *Generic drugs*).

To resolve hermeneutical injustices, Pohlhaus Jr (2020) considers the suggestion that a system of collective interpretive resources must be further—and more inclusively—developed so that all can make sense of their social experiences. It is likely that such development might help to resolve some GDGs, since some gaps could be the result of deficiencies in our collective hermeneutical resources that make it harder for women and members of gender minorities to articulate their experiences. However, these solutions would not eradicate epistemic deprivation in our case studies. Imagine that a car manufacturer ran focus groups to understand how women and gender minorities use their cars, and how they conceive of safety and risk in relation to driving and being a passenger, and then that the car manufacturer updated their working understandings of safety and risk accordingly. These findings would be insufficient for addressing epistemic deprivation without access to data as yet unproduced: data relating to how safe women and gender minorities *are* in cars.

Women and members of gender minorities could have maximal access to the data in circulation concerning car safety, drugs, and devices but would still lack epistemic agency; they would be disadvantaged when it comes to making choices, forming true beliefs, and avoiding false beliefs about matters of importance.

Resolving epistemic deprivation requires distinct remedies, which we discuss in section 5. First, however, we briefly discuss an important interaction between epistemic deprivation and other forms of epistemic injustice.

4.3 Vulnerability

Although we argue that epistemic deprivation is distinct from other forms of epistemic injustice, epistemic deprivation can make one more vulnerable to these other varieties. For instance, the untested and thus undocumented effects of *Generic drugs* on women and members of gender minorities can make them vulnerable to testimonial injustice when they report said effects. As McGregor writes:

> [W]hen a woman shares with her doctor that the generic version of her prescription isn't working as well, or is causing gastrointestinal distress, or is simply making her "feel funny", her complaint will often be brushed off, because the general consensus in the medical world is still that generics are equivalent to brand-name drugs in every way because their bioequivalence has been "proven" in clinical research. It's yet another manifestation of "it's all in her head." (2020, 90)

Similarly, women and gender minorities may be more prone to pernicious self-doubt, what Dandelet calls "self-gaslighting": "In cases of self-gaslighting, the subject worries that other people will be skeptical of one of her beliefs … Prompted by this worry, she scrutinizes her original belief and ultimately gives it up" (2021: 489). It's not difficult to imagine how epistemic deprivation might contribute to or exacerbate hermeneutical injustice either. For instance, in *Implantable devices*, we noted that women and gender minorities are epistemically deprived when choosing the implant that is right for them, due to the gap in relevant data. A woman or member of a gender minority might additionally suffer hermeneutical injustice when considering findings pertaining to how an implant performs in "normal life," if that conception of "normal life" fails to help them to make sense of their own experiences.

What is going wrong in GDG cases need not be a lack of credibility or faulty conceptual apparatus, but these hallmarks of more familiar varieties of epistemic injustice may nevertheless be the result of GDGs. This increased vulnerability provides additional motivation to address GDGs, over and above the injustice of epistemic deprivation.

5. Remedying epistemic deprivation

Addressing epistemic deprivation requires generating new and adequate resources, which would involve new research paradigms, revision to policy, and greater transparency with regards to the limitations of existing resources. We also advocate for education not only for individuals but also for experts to expose the fact that the data we have used to date is unreliable and potentially dangerous for over half the population. In other words, we need a sea change in attitude to what counts as reliable or sufficient data wherever and whenever such data is provided to help agents make important, valuable, self-regarding choices.[24]

Achieving these measures in full likely requires dismantling oppressive social structures.

However, there are more immediate, more concrete remedies that could go some way to reducing epistemic deprivation. Some of these are top-down, which will improve access to true beliefs, and others are bottom-up, which will help women and gender minorities avoid false beliefs. Our earlier case studies serve as illustrative examples of particular types of gender data gaps that could either be avoided, or their effects remedied.

In *Car safety*, gender data gaps could be filled if car companies tested their products with anthropometrically diverse crash-test dummies, in both the driver's and passenger's seats, and disaggregated the data accordingly. However, we need not solely rely on car manufacturers for relevant data; changes in data-entry practices for police crash reports, which tend to focus on drivers only, would also serve to fill in gaps regarding car safety. As Criado Perez (2019, 190) notes, quoting David Lawrence, in the USA, "[t]he federal government required that states provide police crash-report data to NHTSA (The National Highway Traffic Safety Administration) but set no standards for data quality nor penalty for sending junk data." Bottom-up efforts such as grassroots lobbying could be effective in encouraging political candidates to take on this issue, and voters to respond accordingly. Availability of disaggregated safety data could also be a buying criterion, with consumers encouraged to boycott car manufacturers who do not test their cars using a variety of crash-test dummies, or who fail to include safety data for passengers. Magazines, TV programmes, and social media channels that cater to an interest in cars and driving could promote the importance of activism and manufacturer accountability in this area.

For *Generic drugs*, changes in drug-testing protocols are required to fully eradicate GDGs: without this, the availability of true beliefs regarding drug efficacy and safety will remain unequal. Campaigning for such changes and voting for political candidates who prioritize this issue are important steps towards positive change. Healthcare professionals are also a vital part of this puzzle: they should seek out and engage in CPD on gender-based medicine; challenge healthcare bodies (such as the NHS) on their misleading messaging regarding generic drugs; clarify to patients where such gaps exist; recommend brand-name drugs where there is insufficient evidence to support generic prescriptions;[25] and encourage the educational institutions with which they are affiliated to include gender-based medicine in their curricula. Patients can also help to alleviate epistemic deprivation in this area by, for instance, reporting the effects of medications they are prescribed to national reporting schemes (in the UK, this is the NHS Yellow Card Scheme, in the USA, the FAERS Public Dashboard[26]). McGregor (2020, 92) also recommends that women advocate for themselves when speaking to healthcare professionals, providing a list of questions they should ask, including whether the medications they're being prescribed have "any special concerns, dosing guidelines, or contraindications for women."[27] Of course, these measures do not alleviate the undue burden placed on women and gender minorities as a result of GDGs; for this, top-down change is required.

For *Implantable devices*, we can take inspiration from Tuana's (2006) discussion of grassroots activism in the Women's Health Movement.[28] Women, members of gender minorities, and advocacy groups can encourage each other to share their diverse experiences, including what their lives are like, what shoes they wear, how they have sex, what duties they are required to engage in at work and home, and what activities they undertake for leisure. Campaigning on the basis of this diversity to dismantle the concept of "normal" (normal use, normal wear-and-tear, normal lives), employed by manufacturers and product testers, has considerable potential to close gender data gaps.

In summary, while remedies for epistemic deprivation are diverse, all are ultimately targeted at reversing epistemic injustice, ensuring that women and gender minorities are empowered with the same potential for knowledge that cis men have when making important self-regarding decisions. These remedies can be thought of in terms of resisting both ignorance and oppression. As Tuana notes: "the goal of feminist epistemologies is not simply to know differently, but to undermine oppressive practices, to enhance, and, in some instances, to make possible, epistemic responsibility" (2006: 13–14).

6. Conclusion

We've argued that the injustice resulting from gender data gaps (GDGs) is not merely socio-political but epistemic, when and because they arbitrarily skew the epistemic landscape in favour of one group over another. We presented three case studies to show how GDGs disadvantage women and gender minorities, and argued that the disadvantage is two-fold. First, women and members of gender minorities are in a worse position to form true beliefs and to avoid false beliefs about questions they have an interest in having answered. Thus, the epistemic burden on women and members of gender minorities is greater than on their counterpart cis men; they have to do more to avoid error. Second, the payoff is worse: they have a smaller pool of true beliefs on which to act. Considering GDGs led us to identify epistemic deprivation: an epistemic injustice that occurs when an agent is impeded in the acquisition of valuable knowledge for no good reason. Epistemic deprivation is a common way in which the epistemic economy can be systemically rigged.

There are consequences of being epistemically deprived that we did not have scope to explore in depth in this paper, but which are worth consideration. For instance, epistemic deprivation has serious implications for informed consent; where a GDG exists, the level of "informedness" a woman or a member of a gender minority can achieve will often be less than their counterpart cis man (e.g., with metal-on-metal hip replacements discussed in *Implantable devices*). According to the NHS, for a patient to be 'informed": "The person must be given all of the information about what the treatment involves, *including the benefits and risks*, whether there are reasonable alternative treatments, and what will happen if treatment does not go ahead" (NHS 2019b, emphasis added). And, to have the capacity to consent: "The person must be capable of giving consent, which means they understand the information given to them and *can use it to make an informed decision*" (NHS 2019b, emphasis added).

As shown in our case studies, there are important medical decisions where the information available relevant to the risks and benefits of a given treatment *for a woman or member of a gender minority* is less or worse than that available for a cis man. Even if the former have access to all of the available data, GDGs leave them less able to "use it to make an informed decision," because the beliefs they form on its basis are less likely to be true than they would be for a counterpart cis man.

There may be additional implications relating to trust (in, for instance, relationships with healthcare providers) and autonomy. Further work might also consider who bears the responsibility for the risks and harms associated with epistemic deprivation, and the best ways to intervene to remedy these.

Identifying the injustice at the heart of GDGs is the first, albeit important, step in a longer process. Understanding the injustice as (at least in part) epistemic—but requiring distinct remedies from more familiar varieties of epistemic injustice—is necessary both to understand what is going wrong with GDGs, and how this wrong might be remedied.

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Notes

[1] We are grateful to an anonymous reviewer for highlighting this issue and for the helpful suggestions from the editors.

[2] Misgendering may itself be understood as an epistemic injustice (e.g., Argyriou, 2021) but not one we have scope to engage with here.

[3] We take being a "minority" to be at least sometimes a consequence of social marginalization rather than a straightforward fact about the distribution of human difference; this is perhaps better thought of as "minoritization." Moreover, the "and" here should be read inclusively as allowing that someone can be both

a woman and a member of a gender minority, or indeed more than one gender minority. So by "women and gender minorities" we mean to refer to the group that includes everyone who is a woman *and/or* a member of one or more minority or minoritized gender groups. Similarly, by "someone who is a woman or a member of a gender minority" we more properly mean "someone who is a woman and/or a member of one or more minority or minoritized gender groups."

4 See for instance James et al.'s (2024) analysis of inadequately disaggregated migration data. The racial data gaps leave an open question about "who counts?" in official statistics, eliding racial differences.

5 Hookway doesn't give the phenomenon he discusses a name, but in her reply Fricker (2010, 175) calls the injustice he discusses "discursive epistemic injustice" and "discursive participation."

6 EU regulations require bioequivalence (within the 80–125% range) demonstrated in a study with no less than 12 evaluable subjects, who should be healthy, at least 18 years old, and within a certain weight range (EMEA 2010). See also Duerden and Hughes 2010.

7 And indeed, women and gender minorities may have not been included in the original trials for the brand-name drug: gender data gaps in medical trials are plentiful (McGregor 2020). The EU regulations note that, for bioequivalence studies, "Subjects could belong to either sex; however, the risk to women of childbearing potential should be considered" (EMEA 2010). Radi et al. (2022) highlight the potential for institutional erasure of trans people in medical and health research.

8 Criado Perez (2019, 188) quotes Astrid Linder, research director of traffic safety at the Swedish National Road and Transport Research Institute, as saying "To my knowledge, little or even no such data" has been applied to crash dummies.

9 These are not the only data gaps in our case studies—e.g., it is likely that the risks and effectiveness of at least some products or procedures are not the same for cis women as for trans women, or BAME women versus white women, or women or gender minorities engaging in different types of labour. In the parlance we introduce later, some people will have access to even fewer true beliefs, and be more vulnerable to forming false beliefs, than others, depending on the circumstances of the case.

10 Our point is not that every individual who is a woman or a member of a gender minority is likely to experience an unexpected or worse outcome, but that women and gender minorities are on the whole more likely than cis men to experience such outcomes.

11 It's likely that some products, policies, or procedures will have a similar impact on *some* people who are women or members of gender minorities as they would for cis men (e.g., a product might affect trans men in the same way it affects cis men), but this does not alleviate the effects of gender data gaps where there is—as there is often—inadequate information about how (or whether) gender difference was considered in study design, or how gender/sex terms were used in the research/testing. As a result, women and members of gender minorities may not be in a position to make the (in fact correct) inference that a product's being safe or appropriate for cis men, on average, means that it is safe or appropriate for them. As noted throughout, failure to collect data is not the only way a GDG can form—failure to disaggregate data or be transparent about study design can also result in epistemic deprivation.

12 Car purchasers might like to have data on crash-test dummy damage at more fine-grained speed intervals, but some distance between test speeds will not give rise to instances of injustice even though more epistemic goods could be generated. Cf. Grasswick 2018.

13 That ignorance can be harmful—or harmful to some groups while benefitting others—has been the subject of detailed treatment in the epistemic ignorance literature. For example, Mills's "white ignorance" shows how ignorance about an oppressed group's nature and experiences serve to materially benefit a dominant group while simultaneously harming the oppressed group (Mills 2007, 2013). Mills characterizes the disagreement between Medina (2013) and Fricker (2013) concerning the relationship between white ignorance and epistemic injustice as a question of scope and talking past each other. He plausibly demonstrates that epistemic injustice occurs where the dominated group internalizes the white ideology, to their detriment. See also Pohlhaus Jr's (2012), "willful hermeneutical ignorance," which occurs when dominantly situated knowers refuse to acknowledge epistemic tools developed by marginally situated knowers based on the latter's lived experience.

14 One might also cash out the injustice out in terms of unequal distribution of epistemic goods (see for instance Coady 2010 for an argument that distribution of such goods is distinctive and important; see also Fricker 2010, 53).

15 For instance, a government might invest in research generating knowledge about prostate cancer but not ovarian cancer. If there is no good reason for this choice (e.g., if both conditions affected the same number of

people, with the same outcomes, etc.), then the result would be epistemic deprivation for those with ovaries. But it is not the case that some people have access to the knowledge in question (about ovarian cancer) and others do not.

[16] This presumes that there are no hidden bad reasons, and there often might be. For example: if *p* is only valuable to a particular group—say black women—and the reason we don't know how to understand *p* is itself due to a bad reason/s (e.g., a research agency devoting all of their resources and attention to increasing knowledge valuable to white men, whether as the result of individual prejudice or systemic bias), this will still count as a case of epistemic deprivation. As with other kinds of injustice (epistemic or otherwise), we may need to look deeper to identify the wrong.

[17] Historically, this has been used as a carte blanche for researchers to exclude all cis women of childbearing age. If and when that happens, (2) *is* satisfied.

[18] Grasswick's focus is on epistemic trust injustices; epistemic deprivation is distinct but likewise results in a loss of epistemic agency.

[19] Intersecting identities can make the burden even greater and the payoff even worse.

[20] Our aim is to identify the injustice at the heart of a given phenomenon—gender data gaps—and, in doing so, show by example what epistemic deprivation is. If interlocutors identify further instances that's grist to our mill.

[21] Heart attack research is a reminder of the importance of understanding the interplay of gender, race, and socioeconomic class. All of these affect research into and treatment of heart failure. See, e.g., Davidson et al. (2016).

[22] And in particular, their "social" or "lived experiences" (see for instance Fricker 2013). Medina (2012) articulates hermeneutical injustice specifically in terms of communication and silencing.

[23] There are GDG cases where people's perspectives are relevant (and where women and gender minority perspectives are what's missing). See for instance Criado Perez (2019, 29–30) on ice road clearing in Sweden.

[24] Providing full and accurate data also enables people generally to make better choices should they have to act as deputies for women or members of gender minorities.

[25] McGregor (2020, 86) notes that when prescribing medication in the emergency department: "I ask, *Do the benefits outweigh the potential risks?* In other words, I need to do a woman-specific evaluation over and above our existing prescribing guidelines."

[26] The Food and Drug Administration's Adverse Event Reporting System.

[27] Plausibly, many GDGs are caused by implicit biases against women and gender minorities. But implicit biases—deep-rooted and subconscious—remain intractable, since the target audience of awareness-raising measures will assume that such measures do not apply to them (Greenwald et al., 2022). That is a further reason to encourage and enable self-advocacy. Of course, the problem of bias is not limited to the variety of epistemic injustice we discuss here.

[28] Furst 2023 also explores bottom-up remedies in the context of epistemic injustice, but her focus is on hermeneutical injustice.

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