# Headaches for epistemologists

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# Introduction

 Consider someone who has achieved a high level of rational confidence about the meaning of life, and is in fact correct in their view. Like most people, they also have high rational confidences about a vast range of more mundane but still somewhat important truths – where their car keys are, what color their shirt is, whether it will rain tomorrow, etc. The devil gives them a choice: surrender their knowledge of the meaning of life, becoming fully uncertain about this topic forever, or instead give up a tiny bit of certainty about each of these mundane topics. Intuitively, they ought to choose the latter, no matter how many credences about mundane topics they have. We get the same intuition if we replace the belief about the meaning of life with a belief about some other extremely important-seeming topic, such as the existence of God, core moral truths, etc. But what if the devil had given them a choice between losing just a tiny bit of certainty about the meaning of life and losing everything they know about a large number, perhaps all, of the mundane topics? Now it is intuitive that the person ought to give up the confidence about the meaning of life. The first intuition suggests that accuracy or rational confidence in one’s belief about the meaning of life is sometimes more important than any amount of accuracy about more mundane topics. The second suggests that this is not always the case. These situations are both quite fanciful. But, as we will see, our intuitions about them are also reflected in much more familiar judgments, including those about the value of our own work as academic philosophers. In this paper, I will argue two things. First, our accounts of epistemic norms should accord with these sorts of judgments. Second, this poses an important challenge for formal epistemology.

 A similar challenge arises in ethics. Assume that a pediatrician has a *prima facie* duty to cure patients’ headaches. If the pediatrician could cure a vast number of headaches at once, but doing so would very likely kill an unrelated innocent person, it would be wrong for the pediatrician to cure these headaches, no matter how many headaches they could cure with the single risk of killing. On the other hand, if curing just a single headache required taking a tiny risk of killing an innocent – driving across town to pick up medicine, for example – then the pediatrician ought to cure the headache. There are a number of ethical theories that give explanations for the truth of these intuitions.[[1]](#footnote-1) But it is quite challenging to give a precise or formal account of this ethical phenomenon that does not have further implausible implications.[[2]](#footnote-2) Similarly, I expect that we can give an epistemic theory that fits the intuitions mentioned in the previous paragraph; the challenge is to give a formal model of the phenomenon that doesn’t have (too many) surprising additional implications. My thoughts about this challenge were initially inspired by work in this area of ethics, and so I call this the *epistemic headaches-for-lives challenge*, or sometimes just “headaches-for-lives.” Ultimately, however, my arguments about the epistemic headaches-for-lives challenge do not depend on any analogy to ethics – and, as we’ll see, the epistemic and ethical challenges are interestingly different – nor do you need to agree that there is an ethical version of the challenge to find the epistemic version interesting.

 In ethics, headaches-for-lives is sometimes seen as primarily a challenge for deontological, or at least non-consequentialist, theories. The epistemic challenge, however, is relevant to both consequentialist and non-consequentialist approaches to epistemology. In discussing it, I will try to state everything fairly neutrally in terms of reasons and what we ought to believe, as both consequentialist and non-consequentialist epistemic theories can be interested in both of these.

 Section 2 gives a clearer articulation of the epistemic headaches-for-lives phenomenon and argues that it is relevant to epistemic theories. Section 3 discuss some of the challenges for formally modeling epistemic headaches-for-lives.

# The ingredients of the headaches-for-lives challenge

 The headaches-for-lives challenge involves two features, which I call *priority* and *attenuation.*

 Let’s start with a general notion of priority:

*Priority:* Some *x* is prior to *y* if one ought to [choose] *x* over any amount of *y*.

We might see priority in morality, prudence, epistemology, and so forth, which would be about moral, prudential, or epistemic oughts respectively. I put “choose” in brackets because one might think that epistemic oughts do not concern choices; we can replace “choose” with whatever verb is appropriate to the relevant ought. For epistemic oughts, we might state priority in terms of adopting credences.

 Attenuation is understood in terms of priority:

*Attenuation:* A type of thing that sometimes has priority over another type of thing can lose that priority.

In ethics, it seems that avoiding risks of killing has priority over curing headaches if the risks are high enough, but can lose this priority if the risks are low enough. The latter is attenuation. Similarly, it seems like certainty about the meaning of life sometimes has priority over certainty about mundane things, but sometimes lacks this priority. The latter is attenuation.

 I am going to argue for priority and attenuation in epistemology by comparing two types of credences: *wise credences* and *mundane credences*. Wise credences are credences about the most important truths, whatever those are. The term “wise” is intended as a catchy name, not a precise description: if the category *the most important truths* is more (or less) expansive than the category *wisdom*, then read “wise” just as a name for that former category. Mundane credences are credences about ordinary, every-day topics that matter, but matter much less than wise truths – where the best nearby café is, how much gas costs, whether one’s shirt is clean, etc. I’m not going to try to explain what makes some credences wise and some mundane. I can’t, and that explanation is not needed for any of my arguments. It is enough for my purposes that this rough distinction is intuitively familiar to everyone reading this paper, and we can deploy it to some significant degree without fully understanding it.[[3]](#footnote-3) One of the upshots of this paper is that a complete epistemic theory will need an account of this distinction.

 The claim about priority in epistemology that I will argue for is:

*Epistemic Priority:* Avoidance of large losses of accuracy in a wise credence is epistemically prior to avoidance of very small losses of accuracy in mundane credences.

Putting this claim in other words: if we have to choose between giving up a large amount of accuracy in a wise credence or giving up very small amounts of accuracy in any number of mundane credences, we ought to choose to give up the accuracy in the mundane credences. Here is the claim about attenuation that I will argue for:

*Epistemic Attenuation:* Avoidance of small losses of accuracy in a wise credence is not epistemically prior to avoidance of some finite number of large losses of accuracy in mundane credences.

In other words, if we have to choose between giving up a small amount of accuracy in a wise credence or giving up some to-be-specified loss to some number of mundane credences, we ought to choose the former over the latter. Epistemic Priority and Epistemic Attenuation, or “Epistemic Priority and Attenuation” for short, together give us the epistemic headaches-for-lives challenge.

 Epistemic Priority and Attenuation are not precisely stated. That is as it should be at the moment. A formal model of headaches-for-lives would precisify Epistemic Priority and Attenuation. My goal is to argue that we should look for such a model and to show why this is challenging, not to actually defend my own model. I do need to unpack Epistemic Priority and Attenuation a bit before we go on, though.

 Epistemic Priority and Attenuation are stated in terms of *accuracy*. All my arguments require is that accuracy is something possessed by individual doxastic states (e.g. an individual belief or credence that *p*), that it comes in degrees, that it can come in quite small degrees, and that it is epistemically important. The accuracy of a credence could be how well it fits the evidence. It could be how close to the truth the content of the credence is. Either can fit with my arguments. To keep things simple, though, I will focus one particular notion of accuracy that has been widely discussed in formal epistemology (e.g. Joyce 1998, Pettigrew 2016). The literature using this notion models credences, or degrees of belief or confidence, using real numbers between 0 and 1. A 0 credence that *p* equates to complete confidence that *p* is not true; credence 1 that *p* equates to complete confidence that *p* is true; and credences between these extremes reflect greater and lesser confidence that *p*. A credence in a truth is more accurate the closer it is to 1, and a credence in a falsehood is more accurate the closer it is 0. That’s the notion of accuracy I’ll use in this paper.

 Epistemic Priority and Attenuation focus on accuracy losses to a single wise credence. We could instead state weaker versions of these, which would talk about losses to finite numbers of wise credences. Most of my arguments are compatible with these weaker versions; I say more about this in section 2.2.

 One might wonder why I state Epistemic Priority and Attenuation in terms of avoiding accuracy losses. Some epistemologists think that epistemic norms are not concerned with improving our doxastic state, but merely with not having bad doxastic states. I state Epistemic Priority and Attenuation in this way for them. You are welcome to think of Epistemic Priority and Attenuation in terms of changes in accuracy rather than losses, if that seems epistemically relevant to you.

 In the remainder of section 2, I will argue that our epistemic theories should reflect Epistemic Priority and Attenuation.

## The initial argument for Epistemic Priority and Attenuation

 Epistemic Priority and Attenuation are intuitive. We see that by considering the fanciful cases in the introduction to this paper, in which the devil forces us to give up accuracy in either wise credences (about the meaning of life) or mundane ones. But we also see evidence for Epistemic Priority and Attenuation in judgments about much less fanciful cases.

 Most philosophers think that the topics we work on are important. Some of us might be embarrassed to say we are pursuing wisdom, but many propositions in our areas of inquiry will count as *wise* for my purposes. Consider the amount of time it takes to substantially increase the accuracy of a credence about even one question we are interested in. This will often require a substantial part of a lifetime. Imagine spending that time instead as follows: you acquire information about mundane topics, and whenever you acquire enough information to slightly better your credence in one proposition, you turn immediately to researching another topic. Doing this, you could slightly increase your accuracy on a vast number of mundane topics. I suspect that we all agree that doing the philosophy instead is more worthwhile.[[4]](#footnote-4) There’s a slightly more upsetting variation of this example. It is quite likely that, as we work on our philosophical projects, the mundane credences we already have atrophy in some sense – we lose confidence over time in the truths we don’t think as much about. People tend to talk like this is true, and it also seems to fit with research on aging and memory. If this is the case, then pursing our philosophical projects can cost us little bits of accuracy in a vast range of mundane credences. Still, it seems like our philosophical pursuits justify these losses.

 These examples are about improving the accuracy of our wise credences, whereas Epistemic Priority is about avoiding losses to this accuracy. But our reactions to these examples are still good evidence for Epistemic Priority. For one, our reactions tell us what losses we would prefer to avoid – if it is worth gaining accuracy in these wise credences, it is presumably also worth avoiding losing this accuracy once we have it. Further, many philosophical questions seem to be *a priori*. In principle, we have all the evidence we need to know the truth on these questions, and so if we are currently not fully confident in these truths, we are missing out on accuracy that in some sense we should have. Improving these credences thus looks a lot like avoiding an accuracy loss. So, our own investigative priorities provide good evidence for Epistemic Priority (no pun intended).

 We can also support Epistemic Attenuation with (unfortunately) non-fanciful examples. Consider the stereotypical “bumbling academic.” This is a person who pursues their academic projects so much that they are very significantly out of touch with the mundane world – they incur large losses in accuracy in a great many mundane beliefs. Imagine a particular bumbling academic whose project can at most produce a marginal improvement in accuracy on their topic of choice. It seems like this person is making a terrible trade and has the wrong cognitive priorities. If accuracy losses in wise credences were always prior to accuracy losses in mundane credences, however, this would be a trade they ought to make. And so we have additional intuitive support for Epistemic Attenuation.

 We thus see evidence for both Epistemic Priority and Epistemic Attenuation in judgments about “fanciful” cases and about cases quite similar to those we encounter in our real lives. That gives us an initial argument for Epistemic Priority and Attenuation. Before I build on this initial argument, however, I must address two concerns about the evidence I’ve given. One might question whether the evidence is really about priority, and one might also question whether it is really about the epistemic. The next two sections will address those concerns.

## Is this really priority?

 In this section, I will try to defuse the worry that my evidence does not really support my claim about priority.

 Some may be inclined to dismiss intuitions in favor of priority. These intuitions don’t seem to be about *any number* of mundane credences, just about large numbers of them. Even if they were about *any number* of credences, one might be dubious of intuitions about arbitrarily large sets of things. These worries by themselves are not enough to dismiss these intuitions. Priority seems to be a widespread phenomenon in our non-epistemic lives, and we seem capable of recognizing it even when we cannot directly confront arbitrarily large sets of things. For example, my house has value to me. Cookies have value to me. But I think there is no number of cookies that would compensate me for the loss of my house (in principle I could sell the cookies and come out ahead, but I prefer to keep my house, stay in philosophy, and not have to become a cookie vendor). My house has priority over cookies, prudentially speaking, and I can see that this is so even if I can’t imagine an infinitely large set of cookies. Similar examples of prudential priority abound – I suspect that we all take a loved one’s life to have priority over cookies for us. Many, perhaps most, ethicists accept priority in some form, whether it is in headaches-for-lives cases, or in the context of the so-called Repugnant Conclusion (Parfit 1984). In the latter context, ethicists want to say that a decent number of excellent lives together has priority over slightly good lives. We take ourselves to have good evidence for ethical priority in these cases through much the same sorts of intuitions as I’m appealing to here. In fact, epistemologists have found forms of priority plausible in discussion of Epistemic Repugnant Conclusions (Pettigrew 2018a, Talbot 2019).[[5]](#footnote-5) Of course, all of this intuitive evidence is defeasible. We might be forced to deny Epistemic Priority if no way of modeling it is even slightly plausible. But we should not simply reject these intuitions out of hand.

 Another reason to be dubious of the evidence I’ve given is that any single wise truth will be logically connected to many other important truths. This means that, if we are coherent, changes to one wise credence will generate changes in credences about other important truths. Perhaps, one may worry, that’s what’s driving the judgments that seem to support Epistemic Priority: we aren’t judging that we ought to avoid large losses of accuracy about the meaning of life *by itself*, rather than any number of small losses in mundane credences. Rather, the objection goes, we are really judging that we ought to avoid the losses of accuracy in our credences about allthe interesting topics connected to the meaning of life.

 A quick point: I agree that changing one’s credence about a single wise truth will have implications for a huge, potentially infinite, set of other credences, such as credences about the disjunction of the wise truth and any arbitrary other proposition. But many of these logically related credences will barely matter, and can’t be what’s driving our intuitions about Epistemic Priority. So, in my responses to this objection, I will focus just on interesting, important, or wise credences.

 This objection raises the following question: can we elicit judgments that are clearly about accuracy gains and losses in a single wise credence? We can, by gathering judgments about non-ideal thinkers. And these judgments about non-ideal thinkers can be used as evidence for Epistemic Priority as a general claim, not just a claim about the non-ideal.

 I’ll use myself as an example of a non-ideal thinker. I am fascinated by the question of whether there is intelligent life on other planets. I would love to know even the bare “yes” or “no” answer to this question, even if I learned nothing else about that life. But I can’t see how knowing this answer either way would change any of my philosophical views. And, while I’m sure that the answer must have implications for science, I have no idea what these are and I’m confident that I will never work them out. So, as far as I can tell, learning whether or not there is intelligent life on other planets would leave all of my wise credences unchanged. Perhaps it should not, but I am flawed. I can give a similar example using an *a priori* truth. I’m fascinated by Goldbach’s Conjecture, and I’d love to know if it is true or not, but even if I did, I wouldn’t see the implications of this for any aspect of math, and I wouldn’t spend the time trying to work those implications out.

 I’m not claiming that my credences about alien intelligent life or Goldbach’s Conjecture count as wise credences (although I suspect they do). Rather, what this illustrates is that, for flawed thinkers like us, some extremely interesting propositions can be effectively disconnected from any other interesting propositions. They aren’t logically disconnected; rather, changes in the one credence will have no impact on the accuracy of any other credences. Or, at least, we can easily imagine this. And yet having accurate credences about these propositions still seems extremely valuable.

 In light of this, we can imagine thinkers for whom certain wise credences are effectively disconnected from other wise credences. In fact, it is even easier to imagine this disconnection if we focus on losses of accuracy. Let’s say I learn the meaning of life, and update my other wise credences in light of this. I can easily imagine losing my knowledge of the meaning of life without de-updating all of these other credences. And I can easily imagine not being able to recover my knowledge of the meaning of life from those previously updated, logically related, credences (especially if the devil prevents this). People like us often forget things, fail to update in light of this forgetting, and fail to recover the knowledge they’ve forgotten despite not having updated in light of the forgetting. It still seems like a tragedy for non-ideal thinkers like us to lose their knowledge of the meaning of life even if their other views are unaffected, and this tragedy still seems worse than losing a tiny bit of accuracy in any number of mundane credences. So, we really can imagine cases involving losses of accuracy in just a single wise credence, and we can compare these losses to losses in accuracy of mundane credences. While these cases involve non-ideal thinkers, they allow us to compare the relative importance of accuracy in wise and mundane credences, and I see no reason to think that the comparisons they support are only relevant to non-ideal thinkers. Thus, we can produce evidence that does support the priority of a large loss in accuracy in a single wise credence over small losses to mundane credences.

 Some may still be dubious. They may still worry that we do not have judgments that are *clearly* about losses to a single wise credence. Or they may worry that, when we really focus on losses to a single wise credence, these losses won’t clearly have priority over mundane losses. For those who still have these doubts, I won’t try to convince you further. Rather, I will point out that it is easy to think about the cases I’ve discussed as involving gains or losses to only *finite* numbers of wise credences (especially when we consider non-ideal thinkers). And when we do, it does seem clear that large losses to some finite set of wise credences will have priority over small losses to mundane credences. That does not support Epistemic Priority. But it does support a more moderate claim:

*Moderate Epistemic Priority:* Avoidance of large losses of accuracy in some finite *n* wise credences is epistemically prior to avoidance of very small losses in accuracy in mundane credences.

We can then give a moderate version of Epistemic Attenuation:

*Moderate Epistemic Attenuation:* Avoidance of small losses of accuracy in *n* wise credences is not epistemically prior to avoidance of some finite number of large losses in accuracy in mundane credences.

Moderate Epistemic Priority and Attenuation are compatible with my overall goals in this paper. The challenge of epistemic headaches-for-lives is that all the ways we know of of formally modeling Epistemic Priority and Attenuation have implausible implications. We need to either develop new models or figure out which of these implications is the least implausible. Moderate Epistemic Priority and Attenuation rule out *one* of the models I discuss: they rule out the lexicographic scoring rule model in section 3.1 (I explain why in footnote 20). But none of my discussion of other models in section 3.2 is changed by Moderate Epistemic Priority and Attenuation. Each model discussed in section 3.2 still has implausible consequences, and each still has different implausible consequences than the others. So, the main points in this paper only require Moderate Epistemic Priority and Attenuation. And that should be unsurprising to those familiar with *ethical* discussions of headaches-for-lives. While, intuitively, a single killing does have priority over headache curings, we don’t need that strong claim to generate most of the headaches-for-lives debate in ethics; it would be enough that some number of killings has this priority.[[6]](#footnote-6)

 To summarize: we can elicit judgments that do look like evidence for Epistemic Priority and Attenuation (in their strong form). Even if one is unconvinced, our judgments clearly support at least Moderate Epistemic Priority and Attenuation. Moderate Epistemic Priority and Attenuation are all I need for my main conclusions.

## Is this really epistemic?

 So, there is solid evidence for my claims about priority and attenuation. But some will suspect that this evidence is not really about the *epistemic*. They will worry that our judgments conflate epistemic importance with some other sort of importance, such as practical, moral, aesthetic, or spiritual. This section responds to that concern.

 How can we detect epistemic importance? One way to do so is to think about what actually elicits our curiosity. To some philosophers, curiosity is a source of epistemic normativity. For example, Alvin Goldman (1999) sees epistemic norms as based in the importance of truth and accuracy, and he says that this importance can come from either our curiosity or from our practical interests. Jon Kvanvig takes a similar approach to Goldman, saying, “In the epistemic domain, there are two fundamental sources of value: practical signiﬁcance and curiosity.” (Kvanvig 2013, 153). Like Goldman, Kvanvig thinks that curiosity can, by itself, confer epistemic significance. Other philosophers have seen curiosity not as a *source* of epistemic value or norms, but rather as a *sign* of epistemic value or importance: curiosity about *x* is evidence that learning about *x* is epistemically important (e.g. Lynch 2004, Brady 2009). On either view – if curiosity is a source or merely a sign of epistemic importance – greater curiosity about a topic reflects the greater epistemic significance of good beliefs about that topic.[[7]](#footnote-7) A range of philosophers have endorsed views along these lines (e.g. Hempel 1965, Foley 1987, Kitcher 2002,Whitcomb 2010,Inan 2014). In light of this, if the judgments that support Epistemic Priority and Attenuation are reflected in facts about our curiosity, this is good evidence that these judgments really are about epistemic considerations. That’s especially so if these judgments are not driven by practical value; I will argue that they are not after I discuss curiosity.

 First, a methodological question. Epistemic Priority and Attenuation are about changes in credences. Should we expect changes in credences to correspond to changes in curiosity? To see that we should, note that, even if we do not fully settle the question of whether God exists, becoming significantly more confident in the truth about this question will assuage our curiosity to some degree, and the more confidence we gain, the more it will be assuaged. Even if we do not become completely uncertain about the meaning of life, becoming less certain will typically make us more curious, and more uncertainty means more curiosity. So, changes in our credences should be reflected in satisfaction of or increases in curiosity (Goldman 1999, Inan 2014).[[8]](#footnote-8)

 What does curiosity tell us about wise and mundane credences? If I am wholly uncertain about the meaning of life, and also wholly uncertain about the location of my favorite pen, I am much more curious about the former than the latter. If I learn a bit about either topic, my curiosity about each topic will decrease somewhat. But, if I learn a bit about the meaning of life and nothing about the location of my pen, so that my credence about the former is now more accurate than my credence about the latter, I am still *much* more curious about the meaning of life than about the location of my pen. Even if I become moderately confident in the truth about the meaning of life, I may still be more curious about this topic than about the location of my pen (about which I am fully uncertain). So far this is what we should expect: wise credences seem epistemically more important than mundane ones, and we are more curious about them. The strength of our curiosity about different topics contributes to our *overall curiosity*, which is the sum of the strengths of the curiosity we have about every topic we are curious about. To verify Epistemic Priority and Attenuation, we must think about overall curiosity. Compare learning a great deal about a philosophically interesting claim to slightly increasing the accuracy of any number of mundane credences. The former would do more to satisfy our overall curiosity than the latter. If, on the other hand, we either lose a great deal of accuracy in our credence about the meaning of life, or lose a little accuracy in any number of mundane credences, the latter option would leave our curiosity overall more satisfied than the former. Similarly, losing a little bit of accuracy in our credence about a single wise topic would have much less impact on our curiosity than would becoming wholly uncertain about a decent number of mundane topics. This is all exactly what we would predict if Epistemic Priority and Attenuation reflect truly epistemic considerations.

 So, the judgments I cited earlier in support of Epistemic Priority and Attenuation dovetail with judgments about our curiosity. Curiosity is standardly taken as a indicating epistemic significance. But, curiosity *can* be driven by practical considerations. We still need to rule out practical considerations as driving judgments about Epistemic Priority and Attenuation.

 Many pieces of wisdom plausibly have no practical benefits, but still seem to have priority over practically useful mundane accuracy. For example, knowing the meaning of life might make one’s life overall slightly worse, and could even lead one to act somewhat morally worse. Certainly many existentialists seemed to find this plausible. Even so, it still seems like we ought to choose to retain most of our accuracy about the meaning of life even at the cost of small amounts of accuracy for all of our mundane credences, in some important sense of “ought.”[[9]](#footnote-9) Turning to the bumbling academic, it is unfortunately all too easy to imagine a case in which the academic’s spouse, or personal assistant, makes sure their life goes smoothly despite their massive disconnection from the everyday world. And we can further imagine that the academic is perfectly happy to be significantly epistemically disconnected from the every-day world in pursuit of marginal improvements in wise credences. Despite their happiness, their massive disconnection from the mundane seems to rob them of something that really matters, which is evidence that attenuation really is an epistemic phenomenon. This suggests that the intuitions supporting Epistemic Priority and Attenuation are not just intuitions about practical concerns.

 To buttress this, let’s consider how Epistemic Priority and Attenuation fit nicely with other work in epistemology. Since neither priority nor attenuation has been explicitly discussed by epistemologists, this has to be more suggestive than conclusive, but it does give additional support for my arguments.

 First, consider the distinction between full belief and credences. On one fairly standard conception, fully believing *p* is treating *p* as true in one’s reasoning – not treating it as probably true, or very likely to be true, but treating it as true (e.g. Clarke 2013, Buchak 2014, Easwaran & Fitelson 2015, Weisberg 2020). In essence, this involves treating *p* as 100% likely when one reasons about *p* (on this model, we may fully believe that *p* in some contexts but not in others). Julia Staffel (2019) has recently argued that fully believing, on this model, generates inaccuracies. That’s because we typically lack the evidence to support 100% certainty in our beliefs; when we reason with beliefs, we end up with conclusions that we are a little more confident in than is warranted. In the long run, this leads to inaccuracy. Ideal agents, on this conception, might never reason with full beliefs, except when reasoning about logical truths and the like. Agents like us have to, however, because of our cognitive limitations. And we do it very often, so in the long run we incur a great many small epistemic losses reasoning with beliefs. Most of our inaccuracy-producing reasoning with full beliefs will be about mundane topics, both because most of our reasoning is about mundane topics, and because agents typically do not need to, and should not, treat somewhat contentious philosophical/wise claims as established when thinking about them. The fact that we do (and must) regularly reason with full beliefs about mundane topics is sub-optimal. But it is clearly not an epistemic *tragedy*. That is, it is not terrible that we incur all these minor losses, but rather is just not as good as it could be. Similarly, forgetting to serve dessert after a tasty meal renders the meal not as good as it could be, but doesn’t make it terrible. I’d venture that that the non-tragic nature of full belief is not affected by the number of mundane full beliefs we use in our reasoning. That is, if we lived infinitely long lives, and thus incurred infinite numbers of small accuracy losses spread out over infinite numbers of mundane full beliefs, this still would not seem like an epistemic tragedy. If, on the other hand, we consider all the small inaccuracies we incur through our reasoning with full beliefs, and imagined that amount of inaccuracy concentrated instead in just a few wise credences, this would seem like an epistemic tragedy. This is exactly what we should see given Epistemic Priority. Note that one need not accept the account of full belief I’m employing to take my point: it’s enough that we can see that it would not be a tragedy if this account of full belief were true (it is hard to imagine someone saying, “I’m glad that conception of belief isn’t correct; imagine what a massive tragedy our reasoning would be if it were!”)

 Next, let’s consider pragmatic responses to external world skepticism. These responses concede to the skeptic that we cannot have justified beliefs about the external world, but say that that doesn’t matter because it makes no practical difference.[[10]](#footnote-10) Most types of external world skepticism pose little threat to our ability to have knowledge of many wise truths – all of *a priori* philosophy is still open to us. Even if we assumed that external world skepticism is practically irrelevant, pragmatic responses to skepticism are extremely unsatisfying to most of us. Most of us would see the truth of external world skepticism as a tragedy – not just sub-optimal, but terrible – even if it were practically irrelevant. If it is a tragedy, then, it’s an epistemic tragedy. And if it’s an epistemic tragedy, it’s because the complete inability to acquire knowledge, or justified credences, about the external world is extremely important. That is strong evidence that mundane credences can be of great epistemic importance. To be clear, this is not evidence directly about the importance of the *accuracy* of mundane credences, just about their justification. But it is good indirect evidence about the importance of accuracy, as it reveals something about how mundane credences matter to us. We see that a *complete* lack of epistemic justification with regards to mundane credences would be of great epistemic importance, even if (as we’ve just seen) *small* overconfidences to a great many mundane credences matter relatively little. This fits very nicely with the claims I’ve made in support of Epistemic Attenuation, and also undercuts the worry that the intuitions supporting attenuation are really just about practical importance.

 One may still worry: perhaps our curiosity about wise topics reflects non-epistemic *and* non-practical considerations, such as spiritual, religious, or aesthetic ones. Note, though, that everything we are significantly curious about has some connection to *something* that matters in a non-epistemic way. If we disqualify this curiosity as a sign of epistemic significance, then to determine epistemic significance we are left just with the curiosity we have about things that have no interesting connection to anything non-epistemic. That curiosity is extremely minimal at best, and this would suggest that epistemic norms matter little, if at all. If we think that epistemic norms do matter, then we must allow judgments of epistemic significance to also partly track non-epistemic significance.[[11]](#footnote-11)

 Before I conclude this section, I should note that the arguments I have given may not yet settle the relevant questions. Once we see the issues that arise when we try to formally model headaches-for-lives (in section 3), we may think that it is better to reject the judgments I’m relying on, or to reject the claim that they are about the epistemic, than it is to accept these issues. One anonymous reviewer suggested that, rather than accepting the potential upshots that I discuss later in the paper, they would prefer to say that no truth has more intrinsic epistemic importance than any other. One could read this paper, then, as giving reasons to *not* see some truths as more epistemically significant than others. These different ways of rejecting the epistemic headaches-for-lives challenge are open possibilities, but we should not leap to endorse them. First, before we rejected the headaches-for-lives challenge, we would need to show *why* denying Epistemic Priority and Attenuation is more plausible than accepting the problems they create. Second, we can’t yet be confident about what the consequences of Epistemic Priority and Attenuation really are. I show in section 3 that the models currently suggested in ethics for representing headaches-for-lives all have problematic consequences when applied to epistemology. However, that does not mean that all possible models of epistemic headaches-for-lives have such consequences. Formal epistemology needs to explore the alternatives. That’s part of why I describe headaches-for-lives as a challenge.

 Let’s summarize the discussion so far. I’ve claimed that avoidance of large accuracy losses to wise credences has priority over avoidance of small accuracy losses to mundane credences, but avoidance of small accuracy losses to wise credences does not have priority over avoidance of large losses to mundane credences. This is intuitively plausible. It is also reflected in judgments about what we are curious about, and curiosity is a sign of epistemic significance. Finally, these judgments are not driven by practical or moral considerations. In combination, this gives us good evidence for Epistemic Priority and Attenuation. But it does not settle the issue. Epistemic Priority and Attenuation are about epistemic *oughts*. If we have a sufficiently restrictive view of how epistemic oughts work, the evidence I’ve given will look irrelevant to those oughts. In the next section, I will argue that epistemic oughts really must reflect Epistemic Priority and Attenuation.

## Epistemic oughts and headaches-for-lives

 Paradigmatic epistemic oughts are about what we ought to believe, or what credences we ought to have. In arguing for Epistemic Priority and Attenuation, I’ve discussed what deals we ought to make with the devil, how we ought to structure our investigations, or what sort of life we ought to lead. Even if one accepted all of the ought claims I’ve made, one can still say that these tell us nothing about what we ought to believe. One might, on that grounds, deny Epistemic Priority and Attenuation.

 That denial is not as straightforward as it might initially look. The evidence I’ve given is evidence about what matters and how much it matters. The epistemic norms need not reflect *everything* that matters – my happiness matters, but perhaps epistemology need not be concerned with it. But the evidence I’ve given does speaks to what matters in an epistemically relevant sense (as I argued in the previous section). If we accept that epistemic oughts should reflect *some* of what matters, then this evidence seems to tell us something about epistemic oughts: intuitions about investigations or deals with the devil can tell us something about what credences to adopt. Both formal and traditional epistemologists do seem to think that the epistemic norms should reflect some of what matters – formal epistemologists often go out of their way to argue that conformity with epistemic norms is beneficial in some important sense (e.g. Joyce 1998, Pettigrew 2016, Pettigrew 2018b, Talbot 2019, Levinstein 2019, Staffel 2020). So, the evidence I’ve given is relevant to epistemic norms, even if it is not directly about them.

 Is there another way to deny that epistemic oughts need to reflect priority and attenuation? One might point out that all of the cases I’ve discussed involve agents who have to accept some accuracy loss or another. One might claim that the epistemic norms do not need to tell agents which accuracy losses they ought to accept; agents epistemically ought not to (knowingly) accept any accuracy losses. If that were so, then the epistemic norms need not reflect Epistemic Priority or attenuation.

 But the epistemic norms *do* need to tell agents which accuracy losses they ought to accept, and thus need to reflect Epistemic Priority and Attenuation. Beings like us cannot have it all, epistemically speaking. We have cognitive and resource *limitations*, and cognitive *flaws*, and these sometimes force us to make choices between sub-optimal outcomes, all of which involve some accuracy loss or another. The distinction between limitations and flaws is roughly this: we are not to blame for our limitations, but are to blame for our flaws. Our cognition takes time, attention, and effort, and we have limited amount of all of these through no fault of our own. That’s a limitation. Sometimes we are stubborn, gullible, or jump to hasty conclusions; these are flaws. Limitations and flaws can limit our options so that all of the options we can or will take involve accuracy losses to some credences or other. When that’s so, the epistemic norms need to tell us which of the losses we ought to incur.[[12]](#footnote-12) That’s straightforwardly true if we are consequentialists. Consequentialism ranks all options, and tells agents to take the best one available (roughly put). If what would be the best option is not actually available due to an agent’s limitations, then consequentialism does not recommend it. If the best option is available, but an agent is not going to take it due to their flaws, consequentialism says that, given that, they ought to take the next on the list. Deontological theories work in somewhat parallel ways. Agents with greater abilities will face more demanding duties. If an agent cannot do what an ideal agent ought to do, through no fault of their own, deontological theories don’t require them to do it (generally speaking). If an agent *won’t* do what an ideal agent ought to do, then they are violating a duty, but standardly we see them as then subject to a “contrary-to-duty” obligation: an obligation that arises because of their failure to live up to their ideal obligations. So, if agents cannot avoid incurring some accuracy loss or another because of their limitations, or will incur some accuracy loss or another because of their flaws, a good normative theory needs to tell them which of these losses they ought to take, whether this is a regular ought or a conditional ought or a contrary-to-duty ought. These oughts must reflect Epistemic Priority and Attenuation, if they reflect what matters epistemically speaking.

 It might be helpful to have somewhat concrete examples of how Epistemic Priority and Attenuation could be relevant to flawed or limited agents. Here are two. Any examples I give will be somewhat up for dispute, so feel free to modify these to suit your preferences.

 Blanche confidently believes that people *mostly* do what is morally right in high stakes situations. She either cannot or will not weaken her confidence in this belief (this may be due to limitations or flaws). Her belief, however, is false. This puts her credences about moral truths in tension with her descriptive credences about which actions people actually chose (the latter are descriptive because they aren’t about whether these actions are morally right, but just about what the action itself was). That is, the moral views she has the best evidence for say that *x* is right, but her evidence says people tend to not do *x* in high stakes situations. Let’s say Blanche currently has the moral and descriptive credences that her evidence supports. She is going to resolve this tension by adjusting either her moral or descriptive credences. That’s because she is unable or unwilling to give up her view that people mostly do what is right, and since she sincerely holds this view, she is going to bring her other views in line with it. Blanche can resolve this tension by adopting a moral view that is seriously out of line with her evidence. This is giving up a great deal of accuracy. Alternately, Blanche can resolve this tension by making small changes in credences about a great many actions. (She thinks that people *typically* do what is right in high stakes cases. For *most* specific agents and relevant actions that she has credences about, she is likely to have decent but not very strong evidence that the agent did the wrong thing they actually did. If, for each of these, she weakens her credence that the agent did what they actually did just a bit, and strengthens her credence that they did something else just a bit, this set of credences will together fit the claim that people mostly do what is right) This will involve a very large number of small losses in accuracy.

 Credences about which moral theory is correct are wise credences. Credences about which actions people have actually done in the past are mostly mundane. Blanche is faced with a conflict: she can lose a lot of accuracy in a few wise credences, or she can lose a small amount of accuracy in a large number of mundane credences. (She has other options, too. I’ll come back to that) Further, either option is going to involve clear epistemic duties, as either will involve respecting some evidence and believing against some other evidence. The epistemic norms must speak to her conflict.

 Now consider Jerome. He has a very high credence that *almost all* people will do what his evidence suggests is the right thing with regards to voting in local elections. Like Blanche, Jerome cannot, or will not, change this belief. Jerome’s evidence slightly favors the moral obligation to vote in local elections – it supports a .52 credence in this wise proposition. But (in the U.S.) only about 15% of eligible voters vote in local elections, and Jerome is aware of a great deal of data supporting this statistic. Coherence could be achieved by Jerome thinking that almost all people do vote in local elections, which would require ignoring a great deal of evidence about a great many mundane propositions. This would involve a large loss in accuracy for many mundane credences. Coherence could also be achieved by a small shift in credence on the proposition about the obligation to vote – from .52 to .49 – since that .49 credence would predict that almost no people vote. This would involve just a small loss in accuracy in this credence. So, Jerome is faced with a conflict that has to do with fitting his credences to his evidence. On one side of the conflict are small losses of accuracy for wise credences, and large losses of accuracy for mundane credences are on the other side.

 Given my claims about priority, the moral credences should win out in Blanche’s example, no matter how many mundane credences are at stake, and the mundane credences should win out in Jerome’s example. This seems intuitively right: it seems more important for Blanche to have the correct moral view that for her to be slightly less accurate with regards to any number of claims about what people are likely to have done in the past. I want to emphasize the “any number” part. We can imagine Blanche’s case with larger and larger populations of people she has credences about, but these numbers do not matter. We cannot imagine infinite populations, of course. But we can see that the size of the population she has credences about is not doing any interesting work; given the small size of each mundane accuracy loss, Blanche should favor her wise credences no matter what. On the other hand, it seems less important for Jerome to be slightly less accurate about one moral claim than that he be greatly less accurate for a great number of claims about what people are likely to have done. This illustrates what an epistemic version of the headaches-for-lives challenge could look like.

 In the examples I’ve just discussed, there really are a wide range of ways the agent can adjust their credences to deal with the incoherence, not just the ones I’ve focused on. But, to determine which of the possible alternatives the agents should take, we will need to compare all of the alternatives to all the alternatives. That requires a theory that can handle Epistemic Priority and Attenuation.

 There may be some readers who acknowledge the evidence I’ve given, agree that it is about epistemic rather than practical considerations, but remain unconvinced that epistemic oughts need to reflect either Priority or Attenuation. For those readers, I’ll point out the following: even if there is neither priority nor attenuation in the epistemic norms, my arguments can still show that there is priority and attenuation in norms that are epistemology adjacent. These may be, for example, the norms of rational beliefs We still want formal models of these norms. And so there is still an interesting version of the epistemic headaches-for-lives challenge to be addressed.

 In summary: we want theories that incorporate Epistemic Priority and Epistemic Attenuation. That is the foundation for the epistemic headaches-for-lives challenge. But now we should wonder: what’s the *challenge*? One challenge is to give a theory that explains why priority and attenuation are so. Another challenge – and the one I will be discussing in the remainder of this paper – is to give a formal theory that incorporates both Epistemic Priority and Attenuation.

# Formal models of headaches-for-lives

 We know that is possible to coherently model headaches-for-lives, since there are models of the ethical phenomenon that can be applied in epistemology. However, these models are not cost-free – they have various surprising implications. Many of these costs are already known in the ethics literature but I will point out some that I have not seen discussed. These costs are important to consider for several reasons. First, I doubt that ethicists have explored the space of all possible models, and these costs give epistemologists reasons to look for better approaches. Second, if all models turn out to have significant costs, we need to figure out which costs to accept (or if we should reject our intuitions about priority and attenuation). Finally, we’ll see that the costs of the models that currently exist are interestingly different when applied in epistemology than in ethics. This will suggest considerations to keep in mind when trying to develop new models of headaches-for-lives.

 What does a model of headaches-for-lives consist of? We want a function that outputs deontic judgments such as ought/not-ought, wrong/permissible, justified/unjustified, or rational/irrational (contrary-to-duty obligations are a species of these). The function takes inputs, such as the different credal states available to the agent. I’ll assume it at least takes accuracy losses as inputs. We can restate the discussion to follow in terms of other inputs, such as accuracy gains, expected accuracy losses, or deviations from the evidentially supported credence. This is important to note, because my discussion is going to look very consequentialist, but can be restated in ways that are deontology friendly. As long as the inputs to our models are based in features of credences, come in degrees, and come in arbitrarily small amounts, the choice of inputs should not affect my arguments. The deontic-output function evaluates different options and uses these evaluations to determine what credal state(s) ought to be adopted. I’ll talk as if it assigns these options *reasons*, since both consequentialists and deontologists seem comfortable talking about reasons. We could restate everything I’ll say in terms of value or other gradable notions. I’ll assume that we ought to avoid the option that the greater weight of reasons tells us to avoid.

 There are two families of models of ethical headaches-for-lives. One family explains priority by “going big:” it says that considerations with priority generate a different, higher-level kind of reason than those that lack priority. The other family of models explains priority by “going small:” it says that the considerations that don’t have priority lose importance as we get more of them, so that they can never give us more reasons than the considerations with priority.

## Going big

 One way to capture priority in a formal model is to say that the things with priority generate infinitely weighty reasons and those they have priority over generate finitely weighty reasons.[[13]](#footnote-13) A related approach is to use *lexicographic scoring rules* (Lee-Stronach 2018). Rather than giving some reasons infinite weight and some finite, these say that all reasons are finite, but some are *lexically superior* and others *lexically inferior*. To determine what one ought to do, we first look at only lexically superior reasons. If the lexically superior reasons for one option outweigh the lexically superior reasons for all other options, then this determines what we ought to do. But, if there is a tie in the lexically superior reasons, we turn to the lexically inferior reasons to break the tie. This is effectively equivalent to using infinitely weighted reasons: any difference in infinitely weighty reasons settles things, just as any does a difference in lexically superior reasons, and we only consider the finitely weighted reasons if the infinitely weighted are tied. I’m going to focus on lexicographic scoring rules rather than infinite values, because thinking about infinities makes it easy to get distracted by other issues (such as how we plug infinite values into expected utility calculations).[[14]](#footnote-14) I will show that modelling lexicographic scoring rules commit us to surprising views; my results apply to infinite weights as well.

 To illustrate one way lexicographic scoring rules can model both priority and attenuation, I’ll use Figure 1.

Figure : One way to use lexicographic scoring rules to model headaches-for-lives. Evaluate each loss (or credence) on its own. Losses above the Priority Line give lexically superior reasons.

Accuracy loss ->

Reasons ->

Wise

Mundane

Priority Line

Figure 1 assumes that lexical superiority is determined on a per-credence or per-loss basis, by looking at each loss to a distinct credence individually. Since these losses are to single credences, they are bounded: they range from no loss up to at most a total loss. To determine the reasons given by each accuracy loss, we look at either the Wise or Mundane line, depending on whether the relevant credence is wise or mundane. If the point on the line corresponding to the accuracy loss is above the Priority Line, then the loss generates lexically superior reasons. I’ve used straight lines in Figure 1 and distorted where the lines begin – both the Wise and Mundane line should really originate from the origin – but that’s just for ease of visualization.[[15]](#footnote-15)

 The type of approach represented in Figure 1 gives us priority and attenuation. Large wise losses are above the Priority Line, and small mundane losses are below it, giving us priority. Small wise losses are below the Priority Line, and there are some large mundane losses that can outweigh them, which gives us attenuation. We can somewhat modify Figure 1 and still get priority and attenuation. Imagine that we moved the Priority Line down, so that both the Wise and Mundane lines crossed it. Large wise losses would still be above the Line and small mundane losses below it, giving us priority. But large mundane losses would be above the Priority Line and small wise losses below it, so that small wise losses would not have priority over large mundane losses; that gives us attenuation. We can move the Priority Line down further, so that all Wise losses are above it, but some Mundane losses are below it. This would mean that large wise losses would still have priority over small mundane losses, and a sufficient number of large mundane losses could still outweigh a small wise loss. We can rule out one thing: it cannot be that neither the Wise nor the Mundane line crosses the Priority Line. That would require either that both are entirely above or entirely below the Priority Line, which would be inconsistent with Epistemic Priority, or that the Wise line is entirely above and the Mundane line entirely below the Priority line, which is inconsistent with Attenuation. So, Figure 1 can be modified, but either the Wise or the Mundane lines, or both, must cross the Priority Line.

 The assumption that we determine lexically superiority on a per-credence, or per-loss basis has a problematic implication no matter how we structure Figure 1.[[16]](#footnote-16) As we’ve just seen, either the Wise or the Mundane line or both must cross the Priority Line. Assume for illustration that the Wise line does. For the sake of illustration, let’s say the Wise line crosses the Priority Line at .3 on the *x* axis: less than .3 loss in accuracy to a wise credence generates lexically inferior reasons, and a loss greater than or equal to .3 generates lexically superior reasons. Imagine an agent has two options. One involves a loss of .299999 accuracy for each of any number of wise credences. The alterative involves a loss of .31 accuracy for a single wise credence. Our model says that an agent always ought to choose the former loss over the latter, even if the former involved a loss for every wise credence there is.[[17]](#footnote-17) We’d get a parallel problem if it were the Mundane line that crossed the Priority Line: a mundane loss just above the Priority Line ought to be avoided at the cost of any number of losses just below that Line.[[18]](#footnote-18)

 This is a surprising result. The intuitions I’ve used to argue for Epistemic Priority and Attenuation tell us that *large* differences in accuracy – large losses in accuracy vs. small ones – can make a big difference to which credences we should adopt. Here, though, our formal model commits us to saying that *tiny* differences can have a huge effect on what we should believe. Of course, we engage in formal epistemology because we expect our formal models to teach us something. So we should expect surprising results sometimes. But we do not want our formal models to force us into substantive and surprising commitments unless we are confident that we have chosen the correct model, or we can explain/justify the results non-formally. At this stage, we can’t be very confident that this approach is the right approach to modelling headaches-for-lives, and I can’t see any explanation for why this surprising result should be true.

 Can we avoid this result? The result is due to determining lexical superiority on a per-loss basis: since each loss below the Priority Line is lexically inferior on its own, their combination is also lexically inferior. To avoid this, we can first combine losses in an option and then see if the total is above the Priority Line. To illustrate, imagine the Wise line crosses the Priority line at .3. Option A contains a single wise loss of .31, and Option B contains a number of .29 wise losses. Both options would generate lexically superior reasons, because the aggregated wise loses for B would be greater than .3

 This avoids the problem I’ve just discussed. But it generates its own problems. To see why, assume that there is some amount of large mundane losses that, together, cross the Priority Line and generate lexically superior reasons. There should be some number of small mundane losses that together give us the same total accuracy loss. So, these small losses together must cross the Priority Line and generate lexically superior reasons. But then large wise losses would not be prior to these small mundane losses. That violates Epistemic Priority. To avoid this, we have to deny that any number of large mundane losses can together cross the Priority Line.[[19]](#footnote-19) This means, then, that large wise loses must be prior to large mundane losses: if we have to choose between losing our knowledge of the meaning of life and losing all of our mundane knowledge, we ought to choose the latter. In fact, it also means that a sufficiently large set of small losses to wise credences would also have priority over any amount of mundane accuracy losses. That’s because a sufficient number of small wise accuracy losses is equivalent to a large wise accuracy loss, and thus is above the Priority line. Both of these are surprising results that we should be reluctant to accept without knowing that we’ve used the correct formal model or without some independent argument.[[20]](#footnote-20)

 Modeling headaches-for-lives using lexicographic scoring rules or infinite values forces us into substantive and somewhat surprising commitments. One possible commitment is that there is a threshold such that accuracy losses just barely above it are more important to avoid than any number of losses just barely below it. Alternately, it forces us to say that large wise losses (and sets of small wise losses) are prior to large mundane losses. We should not accept either of these unless we can argue that these formal models are correct, or can justify these commitments non-formally.

## Going small

 An alternative approach to modeling headaches-versus-lives in ethics has been suggested by Eric Carlson (2000) and advocated more recently by Seth Lazar and Chad Lee-Stronach (2019).[[21]](#footnote-21)It involves something like diminishing marginal utility. Roughly put, we say that the more headaches one can cure, the less important it is to cure each headache. This creates an upper bound on the reasons to cure a set of headaches, and the total reasons to cure headaches approaches but never cross this bound. If the reasons to avoid a high risk of killing are greater than this bound, we get priority. We then say that the reasons to not risk killing are a function of how high the risk is, and the reasons to not run a low enough risk of killing are below the upper bound on the reasons to cure headaches. This gives us attenuation.

Accuracy lost ->

Reasons ->

Wise

Mundane

Figure 2: How diminishing reasons can capture Epistemic Priority and Attenuation.

 We can apply this idea to the epistemic headaches for lives problem, as illustrated in Figure 2.At a first pass, we say that small losses of accuracy in mundane credences generate diminishing marginal reasons, and that the total reasons to avoid these losses approach but never cross some limit. The reasons to avoid losses in accuracy to wise credences are above this limit for large losses, which gives us priority, and below this limit for small losses, which gives us attenuation. (In Figure 2, the line for wise reasons does not start at the origin, but that’s just to make the diagram simple to look at) This model seems initially appealing. However, it too has surprising implications.

 This model is really a family of models, each of which has different implications. This is easier to explain if we start with illustrations of how diminishing marginal utility might work. Think about a person who becomes wealthier and wealthier as time goes on. It is natural to think that a dollar they acquire later, when they are already have quite a bit of money, contributes less to their well-being than a dollar they acquired earlier, when they did not have as much. That is, we can order the dollars they acquire into a series, and later dollars in the series have less utility than earlier dollars in the series. That’s not the only way diminishing utility can work. Imagine that Enrique and Francisco each inherit a huge pile of shoes, with Francisco inheriting more shoes than Enrique. Since Francisco has more shoes, he may as a result value each of them less than Enrique values each of his shoes. We can’t put the shoes into any non-arbitrary series and say that later shoes in the series are less valuable than earlier shoes as a result of coming later. In this case, the shoes diminish in utility not as a function of their place in some series, but rather as a function of the size of the set they belong to.

 This gives us two ways that accuracy losses to mundane credences can generate diminishing reasons:

1. Put the losses in an ordered series; the reasons to avoid each loss diminish as a function of the loss’s place in the series, with later losses diminishing more.
2. Consider the total relevant set of losses; the reasons to avoid each loss diminish as a function of the number of losses in the set, with the reasons generated by individuals in larger sized sets diminishing more.

There is a third way diminishing can work, although I don’t know of any natural illustration for it:

1. Consider the total amount of accuracy lost in an option; the reasons given by each unit of accuracy lost diminish as a function of the total amount of accuracy lost, regardless of how many individual credences generate this loss.

To make (iii) clearer, let’s contrast it with (ii), which says that reasons diminish as a function of the number of losses or credences. Contrast two options, both of which lose 20 accuracy. In one option, that loss is distributed over 10 mundane credences, and in the other it is distributed over 2 mundane credences. View (ii) would see the reasons as diminishing differently in each case, since they involve a different number of losses. View (iii) would see the reasons as diminishing in exactly the same way, since they each involve the same total loss. Now imagine two different options, each involving 5 mundane losses, where the first options loses 10 accuracy and the second loses 20 accuracy. View (ii) would see these as diminishing to the same proportions, since each has the same number of credences/losses (although we’d still get different total reasons, since the total losses are different). View (iii) would see these as diminishing to different proportions, since they involve different total losses.

 Views (i), (ii), and (iii) each have different surprising or problematic implications.

### Diminishing as a function of place in a series

 View (i) says reasons to avoid a loss diminish as a function of the loss’s place in some relevant series.

 Consider an infinite set of equally large mundane losses. These get put in a series somehow. Assume that the order of losses in the series is invariant. We get a problem which we can illustrate with Figure 3.

Number of losses ->

Reasons ->

All later losses

Early losses

Figure : A visual demonstration of a problem with view (i). The Early losses generate more reasons than an infinite number of later losses.

In Figure 3, the reasons to avoid the Early losses are greater than the total reasons to avoid all losses later in the series. This is so even though all of these losses are equal in size, and there are infinitely many of the later losses. For curves with this particular shape, the Early losses may be relatively few in number. But the general problem does not depend on the shape of the curve. To see why, say that the limit that the curve approaches is *L* on the *y*-axis (that is, the reasons to avoid mundane losses approaches limit *L*). There has to be some point on the diminishing reasons curve, no matter how it is shaped, that generates reasons greater than ½ *L*. The reasons given by all the remaining losses, no matter how many there are, cannot be greater than this. So, if we had to choose between fixing just the Early losses, or just the infinite set of all later losses, we ought to choose to fix the much smaller set losses.

 This *exact* problem can be avoided if the order of losses varies between options, and losses in an option are ordered from largest to smallest. Due to space limitations, I’ll let the reader figure out why that is. But we get a very similar problem if we allow order to vary in this way. To illustrate, start with a finite but extremely large set *F* of equally sized losses. Say each loss is .5. Compare two options, *A* and *B*. *A* adds one .51 loss to *F*. Since order varies from largest loss to smallest, that additional loss is put at the beginning of the series, where it has the highest weight. Option *B* adds some number of .49 losses to *F*. These get stuck at the end of the series, where they have close to no weight. If we construct the case correctly, adding the .51 loss to the series makes more difference to the reasons to avoid the option than adding any number of .49 losses. More generally, if losses are ordered by size, and diminish in order, adding losses to a series which come early in that series can have an implausibly outsized impact compared to adding huge numbers of almost-as-large losses later in the series. The details of my particular example assume that the diminishing-reasons curve has the shape depicted in Figure 3. But any diminishing-reasons curve has to at some points be steeper than at others. We can construct cases where we add losses that fit into the steep parts of the curve, and these losses will have an outsized impact on our reasons compared to almost-as-large losses added into the flatter parts of the curve.

 Note that, in some *non-epistemic* contexts, this “problem” is a feature of diminishing utility, not a bug. It is not at all implausible that wealth acquired earlier in a temporal series ismore important than all the wealth acquired later in the series combined. It would be unsurprising if well-being impact of going from $0 to $1 million is greater than the impact of going from $1 million to infinity, and I suspect that this is plausible for amounts of money much lower than $1 million. (Focus on “well-being impact,” because I am not making claims about the moral usefulness of having that money; the diminishing moral usefulness of money is not so clear)

### Diminishing as a function of the size of the set of losses

 View (ii) says that, as the number of individual losses in a set goes up, the contribution each loss makes to the reasons goes down (all else being equal). This view has a well-known problem, discussed in the literature on well-being. I’ll illustrate the problem with some simple numbers, and then I’ll explain how the problem generalizes.

 Here’s a simple instance of view (ii): Accuracy losses range from 0 to 1. The reasons to avoid mundane accuracy losses = (total accuracy lost / number of losses). That value never gets larger than 1. Let’s say that the reasons to avoid wise accuracy losses = 2 x (total accuracy lost). This allows small wise accuracy losses to be outweighed by large mundane losses, but no amount of small mundane losses outweigh a wise accuracy loss.

 Consider two options, *X* and *Y*. *X* involves nine accuracy losses of 1 each to mundane credences. *Y* has all of these loses, plus an additional loss of .9. The reasons to avoid *X* are 1. The reasons to avoid *Y* are .99. So, we ought to avoid *X* rather than *Y*, even though *Y* contains all the losses in *X* plus one additional loss. That’s a problem.

 Gustaf Arrhenius (2000) gives a proof that this type of result is unavoidable for views of diminishing well-being when well-being diminishes as a function of the size of the population. The proof can easily be carried over to apply to reasons to avoid accuracy losses. The general idea of the proof is simple; one can refer to Arrhenius’ paper for the details. Compare two options, one which contains all of the losses in the other plus an additional loss. The losses that the two options share contribute proportionately less to the larger set, since the larger set is larger and reasons diminish as a function of the size of the set. If the additional loss in the larger set is small enough, the reasons it adds won’t be able to outweigh the diminishment in the reasons due to the shared losses. And so, if we adopt view (ii), there will always be cases in which adding a loss to a set makes it less important to avoid that set.

### Diminishing as a function of total accuracy lost

 This brings us to the final way reasons can diminish: as we get larger and larger total losses of mundane accuracy, the reasons contributed by each unit of accuracy lost diminish. This diminishing is independent of how many individual losses to individual credences constitute the total loss. This allows us to avoid the problems associated with ordering losses or diminishing as a function of the number of individual losses. But it, too, has a surprising implication.[[22]](#footnote-22)

 Consider the relation between reasons and loss depicted in Figure 2. For mundane losses, we get a curve with some shape – which shape doesn’t matter – that approaches some limit *L* to the total reasons given. Pick any point on that curve. That point corresponds to some total loss and some reasons to avoid that loss. That total loss might be due to a million tiny losses, or to a small number of large losses, or anything in between; this view of diminishing is agnostic between these. The total losses generated by millions and millions – or any number – of tiny mundane losses can never give us reasons greater than *L.* But for any total loss generated by tiny *large* losses to mundane credences, we can generate that same total loss via some number of tiny losses. Since total losses due to tiny mundane losses can never give us more than *L* reasons, total losses due to large mundane losses can also never give us more than *L* reasons.

 For this reason, view (iii) entails that large losses to *wise* credences have priority over large losses to mundane credences: if we have to choose between forgetting the meaning of life and forgetting everything we know about the mundane world, we ought to choose the latter. It also entails that a sufficiently large set of small wise accuracy losses has priority over any amount of mundane accuracy losses. We saw above that one approach to lexicographic scoring rules gives us these same implications. It may be that they cannot be avoided (or that all ways of avoiding it are even less plausible). But we shouldn’t rush to accept them without exploring other options.

 To summarize: we can model headaches-for-lives by saying that the reasons to avoid (small) mundane accuracy losses diminish. Diminishing can be modeled in different ways, each of which seems somewhat problematic. The least problematic, in my opinion, is option (iii), that mundane accuracy losses diminish as a function of the total accuracy lost. But option (iii) does commit us to saying that large wise losses are prior to all mundane losses.

## Formal modeling in ethics versus epistemology

No approach to modeling *epistemic* headaches-for-lives that we know of is cost-free; all have surprising implications. We should expect parallel implications to arise when we model *ethical* headaches-for-lives. Some implications are more surprising in epistemology than in ethics, and some more surprising in ethics than epistemology. This shows us that we cannot straightforwardly apply models from one domain to the other. It teaches us some lessons about what is distinctive about the epistemic version of the challenge which may inform our search for better models. It may also suggest ways we could re-think norms in one area or another to better deal with headaches-for-lives. Due to space restrictions, I’ll just focus on a pair of implications that we can get using either lexicographic scoring rules or diminishing marginal reasons. These are

(a) large wise losses have priority over all mundane losses, and

(b) a sufficient number of small wise losses have priority over all mundane losses as well.

 The ethical parallel to (b) is that many small risks of killing, taken together, have priority over headache curing. This has received significant discussion (e.g. Scanlon 1998, Frick 2015, Otsuka 2015, Lazar 2018). This implication is *prima facie* plausible. After all, (with some qualifications) if we combine a small risk that Fred will be killed with a small risk that John will be killed with a small risk that Mary will be killed, and so forth, this eventually gives us a large risk that *someone* will be killed. The debate over (b) in ethics largely discusses whether (b) is implausible when applied to series of acts over time – does (b) mean, for example, that we cannot legalize headache medicines that have a tiny chance of being fatal – and it would be interesting to consider whether there are epistemic parallels to this concern. Setting this aside, the ethical version of (b) does seem almost obviously true, which is not the case for the epistemic version. Sets of small risks to different individuals together entail a large risk that some individual will be affected, but sets of small accuracy losses do not entail that any individual credence suffers a large loss. This makes it harder to accept formal models in epistemology that entail (b). Large losses seem somehow different than aggregated small losses, and we should try to better understand why this.

The ethical version of implication (a) would be that avoiding killing is prior to curing headaches, no matter how bad these headaches are. For fairly standard forms of ethical consequentialism, models that entail (a) are non-starters. Consider, for example, a simple form of hedonic utilitarianism. When comparing options, this just compares the total pleasure vs. pain in each, and the source of the hedons is immaterial. For such views, headaches and killings are both bad because they deprive one of well-being, and this is fundamentally the same type of well-being. This view has to accept that some headaches are as bad as death. Utilitarians of this variety cannot see avoiding killing as prior to curing these headaches, and so must deny (a). But (a) is not so off the table for epistemic consequentialists, even for epistemic consequentialists that seemto be monists about epistemic value. It is fairly standard for epistemic consequentialists to allow that, when calculating the total utility of an overall credal state, accuracy from some credences has greater weight than accuracy from other credences – that is, two credences with the same accuracy may have different epistemic utilities (e.g. Pettigrew 2016). So, while ethical utilitarians have to see individual headaches as potentially as bad as death, epistemic consequentialists can deny that the worst credence of one type is as bad as the worst credence of another type. This makes (a) a *possible* option for epistemic consequentialists, even if it is still a surprising and somewhat implausible option.

 If we prefer deontological approaches, however, (a) seems easier to accept in ethics than in epistemology. On its face, the ethical version of (a) is that avoiding killing is prior to curing headaches, no matter how bad those headaches are – even if they completely ruin lives. And this is what (a) does mean for utilitarians. But ethical deontology tends to be more pluralistic: while utilitarianism sees all duties as grounded in one thing (well-being), deontologists tend to posit a number of fundamentally different duties with fundamentally different grounds. It is independently plausible that the duty to cure “ordinary” headaches is a different duty than the duty to cure life-ruining headaches. After all, most of us don’t have a duty to cure others’ ordinary headaches – this is a special duty had just by people occupying certain roles, such as doctors – but it is plausible that we would have the duty to cure life-ruining headaches if we could. If the two headache-related duties are different types of duties, then the implications of our model for ordinary headaches are not relevant to life-ruining headaches. Our formal model can thus say that avoiding killing is prior to curing even the worst “ordinary” headaches, but this doesn’t mean that avoiding killing is prior to curing life-ruining headaches. In epistemology, however, the difference between large and small accuracy losses to mundane credences seems to just be a matter of degree, even if we are deontological epistemologists. The plausible differences in kind are just those between accuracy losses to different types of credences (wise vs. mundane). This makes the epistemic version of (a) easier to accept for epistemic consequentialists than ethical consequentialists, but harder to accept in deontological epistemology than deontological ethics.

 So, epistemology is distinctive in at least a few ways: large losses to wise credences are different than aggregated small losses, even though aggregated risks of killing seem very similar to large risks of killing; large and small accuracy losses are different in degree, not in kind, whereas in (deontological) ethics harms of different degrees can create duties that vary in kind; and in epistemology, some credences matter fundamentally differently than do others, whereas in ethics all people matter equally (and for utilitarians, all well-being matters equally). This shows that we cannot simply apply arguments or models from domain to the other, although I do have hopes that work in one domain will inform work in the other. Reflection on these differences may also inform our search for better models of Epistemic Priority and Attenuation.

# Conclusion

 If we had to choose between knowing the meaning of life and being very slightly less confident in all our credences about ordinary things, we ought to choose the former. If we had the choose between being very slightly less confident about the meaning of life and keeping all of our knowledge of ordinary things, we should choose the latter. This illustrates Epistemic Priority and Attenuation in epistemology. Likely no one will ever have to make a single choice with these exact stakes. But agents like us sometimes have to choose between losses to wise and mundane credences. Epistemic theories need to tell us which losses to accept. To reflect what seems to matter, what these theories say about this should reflect Epistemic Priority and Attenuation.

 This poses an interesting challenge for formal epistemology. The ways we know to model headaches-for-lives all have somewhat surprising or problematic implications. One component of the challenge is to try to find new models that have no, or different, surprising implications. If all models have some surprising implications, then the challenge is to determine what bullets to bite. We should of course be open to the possibility of rejecting the intuitions supporting priority and attenuation. We should do this if all models that capture these intuitions force us to say even more counter-intuitive things. But it’s far too early to draw any conclusions about that. Epistemic Priority and Attenuation also open up a host of important additional questions. What puts topics into the wise or mundane categories? What about middling changes in accuracy? Are there further categories of propositions other than wise and mundane, and what priority relationships do they stand in?

 Can we partly avoid the headaches-for-lives challenge by lowering our ambitions? A formal model can be useful even if it only captures part of a domain of interest.[[23]](#footnote-23) If there are contexts in which Epistemic Priority or Attenuation are irrelevant, we could use models of epistemic reasons or values in these contexts that can’t address the headaches-for-lives challenge. However, to determine exactly the contexts to which Priority or Attenuation are relevant, we need to figure out when priority relationships do and do not obtain. So, dodging the headaches-for-lives challenge still requires developing a view about priority. It may be that headaches-for-lives is irrelevant to epistemic norms in many day-to-day contexts. In those contexts, we might not be considering wise credences, or all relevant losses of accuracy would be small. But many of the really interesting contexts that formal epistemologists will want their theories to apply to do require models that can handle headaches-for-lives. Consider, for example, the epistemology of science. Presumably some but not all scientific claims are valuable in same way that wise credences are. And presumably there are scientific contexts in which both large and small amounts of accuracy can be at stake. If so, a formal epistemology that applies to scientific inquiry would have to respond to the headaches-for-lives challenge.

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1. For just a small sample, see Scanlon (1998), Kamm (2007), Dorsey (2009), Temkin (2012), Voorhoeve (2014), or Lazar (2018). [↑](#footnote-ref-1)
2. For attempts to give such accounts, see for example Carlson (2000), Lee-Stronach (2018), Lazar and Lee-Stronach (2019). For some of the challenges, see for example Norcross (1997 and 2009), Huemer (2010), or Frick (2015). [↑](#footnote-ref-2)
3. The notion that credences on some topics are much more important than credences on others is widely accepted: see (for example) Goldman (1999), Zagzebski (2003),Alston (2005), Grimm (2009), Friedman (2018). [↑](#footnote-ref-3)
4. The truth on one philosophical topic is going to imply a host of other truths, some wise, some mundane, and some that look pretty uninteresting. That doesn’t affect my ultimate point: intuitively, it is the gain or loss about the wise stuff that is driving which options are superior, not the gain or loss of accuracy in the host of less interesting things. See section 1.2 for more discussion. [↑](#footnote-ref-4)
5. Pettigrew ultimately rejects the form of priority he discusses, but only because he cannot find a workable formal account of it. Talbot (2019) gives one, though, and the model I discuss in section 2.2.3 might work as well. [↑](#footnote-ref-5)
6. The moderate view would change the debate a bit. For example, one response to headaches-for-lives is that ethical harms or wrongs to different persons do not aggregate (Taurek 1977), which does require the stronger claim. [↑](#footnote-ref-6)
7. Goldman (1999)has a variant of this view. He says that a *lack* of curiosity about *p* means that accurate credences about *p* have *no* epistemic significance, but once we have some curiosity, greater curiosity does not correspond to greater significance; all epistemically significant beliefs are equally significant. This seems unmotivated and surprising (see Kitcher 2002 for criticism). It is commonplace instead not to treat all significant propositions as equally significant, but rather to weight the value of accuracy about *p* by the significance of *p* (e.g. Pettigrew 2016, Levinstein 2019, Oddie 2019). [↑](#footnote-ref-7)
8. Inan (2014) explicitly argues for this. Goldman (1999) sees accuracy of credences as epistemically valuable, and ties epistemic value to curiosity, and so must think that changes in accuracy can partly satisfy curiosity. [↑](#footnote-ref-8)
9. I focus on the case where this has *some* overall practical and moral costs, but not *too many* such costs, because the latter muddies our intuitions. [↑](#footnote-ref-9)
10. See (arguably) Hume (2016) and James (1979), and (explicitly) Rinard (forthcoming). [↑](#footnote-ref-10)
11. For those still unconvinced: even if we thought the judgments I am discussing in this paper were not epistemically relevant, they reflect *some* ought that matters quite a bit. After all, when asked what we ought to believe in the relevant cases, we report this ought and not the epistemic one, suggesting that this ought takes precedence. We should want formal models of this ought, and my discussion in the second half of this paper will apply to those formal models. [↑](#footnote-ref-11)
12. The arguments here were heavily influenced by Staffel (2020). [↑](#footnote-ref-12)
13. This is often a background assumption in discussions of lexical priority. For explicit discussion, see for example Huemer (2010) or Peterson (2010). [↑](#footnote-ref-13)
14. Arguments against priority in formal ethics sometimes employ very simple understandings of infinite values. Work in formal ethics has explored ways of mathematically representing infinities, such as via hyperreal numbers, that avoid some of these problems, and that play nicely with expected utility theory (Vallentyne & Kagan 1997, Peterson 2010). [↑](#footnote-ref-14)
15. Figure 1 treats accuracy losses to a single credence as bounded, as they are according to e.g. quadratic scores of inaccuracy. If we instead use the logarithmic score as a measure of inaccuracy, inaccuracy (and thus accuracy losses) are not bounded. The unboundedness of the logarithmic score may require modifying Figure so that the Mundane line crosses the Priority line. That does not impact anything else in this section, as it is an instance of one of the general ways I discuss in the next paragraph to modify Figure 1. However, we might instead think that the Priority Line can be shaped so that the Mundane line never crosses it, despite the Mundane line being unbounded. I discuss that sort of idea later in this section, when I discuss using aggregated accuracy losses to determine lexical superiority (the aggregated accuracy losses approach gives us unbounded Mundane lines which must never cross the Priority line). [↑](#footnote-ref-15)
16. Let’s quickly address a different, well-known worry about lexicographic scoring rules and infinite values (e.g. Jackson & Smith 2006, Huemer 2010, Lazar & Lee-Stronach 2019). Consider a choice involving two outcomes, where the reasons relevant to the first outcome are lexically superior and the reasons relevant to the second are not. Give the first outcome any non-zero, non-infinitesimal probability. This outcome will always take precedence over the alternative, no matter how unlikely it is. This means that we should prefer guaranteed losses in vast sets of mundane credences over tiny, tiny possibilities of large losses in wise credences. That seems implausible. But we can avoid this problem. We might do so by seeing priority and attenuation as features of expected accuracy losses. In Figure 1, if the x-axis is expected accuracy losses, then low probabilities of large wise accuracy losses would be below the Priority Line. Or, ethical deontologists sometimes say that low probability outcomes can be ignored for the purposes of determining what we ought to do, which avoids this sort of issue (e.g. Aboodi et al 2008, Lee-Stronach 2018). Perhaps epistemic deontologists can do the same. [↑](#footnote-ref-16)
17. This point is made about ethical priority in Norcross (1997) and developed in Arrhenius (2005). [↑](#footnote-ref-17)
18. Can we avoid this problem by saying that losses above but too close to the Priority Line cannot be prior to losses below but too close to the Line? This requires denying transitivity of the “more reason than” relation (to see why, look at the literature on lexicographic semiorders, such as Luce 1956). It also allows very small differences in accuracy to make a big difference to epistemic oughts. Assume the Wise line crosses the Priority Line. Take a wise loss *x* that is above but just barely too close to the Priority Line. Compare it to a loss *y* which is just below the Line. We ought to avoid an infinite set of *y*-sized losses rather than a single *x*-sized loss. But there is an *x’* that’s just barely larger than *x*, and we ought to avoid it rather than an infinite set of *y-*sized losses*.* [↑](#footnote-ref-18)
19. Or we might partially deny additivity or transitivity about accuracy, so that there is no number of small mundane losses that can equal a large loss (see Temkin 2012). That’s also a surprising result. [↑](#footnote-ref-19)
20. We can apply the discussion in this paragraph to show that lexicographic scoring rules cannot model *Moderate* Epistemic Priority and Attenuation (which were discussed in section 2.2). According to Moderate Priority, it takes large losses to *multiple* wise credences to have priority. So, the accuracy of any single wise credence would never be above the Priority Line. Moderate Priority requires that some wise losses are above the Priority Line, though, so it requires that we aggregate wise accuracy losses before determining lexical superiority. Given this, we should also aggregate *mundane* accuracy losses before determining lexical inferiority. Aggregation of losses means that there is no upper bound on total mundane accuracy losses. So, we might expect that in some cases aggregated mundane losses can cross the Priority Line. That can’t be so, since if any aggregated mundane losses cross the Priority Line, then aggregated small mundane losses would be above that Line, which is incompatible with Moderate Epistemic Priority. So, if we model Moderate Epistemic Priority and Attenuation via lexicographic scoring rules, then we need to determine lexical superiority using aggregate losses, and must make it so that mundane losses are never above the Priority Line; these have the implications discussed in this paragraph in the main text. [↑](#footnote-ref-20)
21. Alastair Norcross (2009) raises some interesting objections to this view that I won’t discuss, as I think Lazar & Lee-Stronach (2019) show that these are not decisive. [↑](#footnote-ref-21)
22. I don’t know of any discussion of this specific form of diminishing in ethics. I suspect that that is because much of the work on diminishing in ethics comes in the context of the Repugnant Conclusion. There, people want to use diminishing to argue that large populations of people who lives are barely decent cannot have more total utility than smaller populations with excellent lives. View (iii), because it cannot distinguish between well-being distributed over many people and distributed over few people. So it would make sense for ethicists to largely ignore view (iii). [↑](#footnote-ref-22)
23. My thanks to [removed for blind review]. [↑](#footnote-ref-23)