

How violent was the pre-agricultural world?

Authors: Philip Thomson and John Halstead. Phil did 95% of the work.¹

Summary

Epistemic status

We think our estimates here move understanding of prehistoric violence forward by rigorously focussing on the pre-agricultural period and attempting to be as comprehensive as possible with the available evidence. However, data in the relevant fields of ethnography and archeology is unusually shaky, so we would not be surprised if it turned out that some of the underlying data turns out to be wrong. We are especially unsure about our method for estimating actual violent mortality rates from the measured, observable rates in the raw archeology data.

One of us (Phil) has a masters in anthropology. Neither of us have any expertise in archeology.

Guide for the reader

If you are interested in this study simply as a reference for likely rates/patterns of violence in the pre-agricultural world, all our main results and conclusions are presented in the Summary. The rest of the study explores the evidence in more depth and explains how we put our results together. We first cover the ethnographic evidence, then the archeological evidence. The study ends with a more speculative discussion of our findings and their possible implications.

Acknowledgments

We would like to thank the following expert reviewers for their extensive and insightful comments and suggestions, which have helped to make this report substantially better.

- Steven Pinker, Johnstone Family Professor in the Department of Psychology at Harvard University
- Robert Kelly, Professor of Archeology at the University of Wyoming
- Paul Roscoe, Professor of Anthropology at the University of Maine

Professor Pinker was happy to share the following comment on the report:

“Thomson and Halstead have provided an admirably thorough and fair assessment of this difficult and emotionally fraught empirical question. I don’t agree with all of

¹ If you have comments or criticisms, please contact [p.a.thomson118\[at\]gmail.com](mailto:p.a.thomson118@gmail.com)

their conclusions, but this will surely be the standard reference for this issue for years to come.”

Professor Roscoe shared the following comment on the report:

“This work uses an impressively comprehensive survey of ethnographic and archeological data on military mortality in historically and archeologically known small-scale societies in an effort to pin down the scale of the killing in the pre-agricultural world. This will be a useful addition to the literature. It is an admirably cautious assessment of the war mortality data, which are exceptionally fragile; and the conclusions it draws about killing rates prior to the Holocene are probably as good as we are likely to get for the time being.”

We would also like to thank Prof. Hisashi Nakao, Prof. Douglas Fry, Prof. Nelson Graburn, and Holden Karnofsky for commenting, responding to queries and sharing materials.

Around 11,000 years ago plants and animals began to be domesticated, a process which would completely transform the lifeways of our species. Human societies all over the world came to depend almost entirely on farming. Before this transformative period of history, everyone was a hunter-gatherer. For about 96% of the approximately 300,000 years since *Homo sapiens* evolved, we relied on wild plants and animals for food.

Our question is: what do we know about how violent these pre-agricultural people were?

In 2011 Steven Pinker published *The Better Angels of Our Nature*. According to Pinker, prehistoric small-scale societies were generally extremely violent by comparison with modern states. To argue this point, *Better Angels* drew on the work of a variety of anthropologists, archeologists and historians of violence, such as Stephen LeBlanc, Azar Gat, Richard Wrangham and Samuel Bowles. In particular, much of the prehistoric data came from Lawrence Keeley's widely cited 1996 book *War Before Civilization*.

The success of *Better Angels* has led to it becoming the go-to source for non-specialists for data on prehistoric violence (it is the principal source for the prehistoric violence section of [Our World in Data](#) for example).

Pinker's comparative and data-driven approach to the study of prehistoric violence is admirable. However, Pinker's main aim is to compare violence in non-state vs state societies, rather than to rigorously estimate rates of violence in the pre-agricultural period. As a source for likely rates of violence in the pre-agricultural period, the figures in *Better Angels* can now be improved upon, not least because some important studies on the topic, and new data, have come out since the book's publication

In order to understand what human society was like before agriculture we need to take into account the transformative effect the invention and adoption of farming had on human

societies everywhere. Most ethnographic and archeological studies of small-scale societies have little relevance to the question of pre-agricultural violence since most concern people who subsist mainly by farming. 96% of human history happened prior to the agricultural revolution; if we only focus on the last 4% of human history, we will get a distorted picture of patterns and long-term trends in human violence.

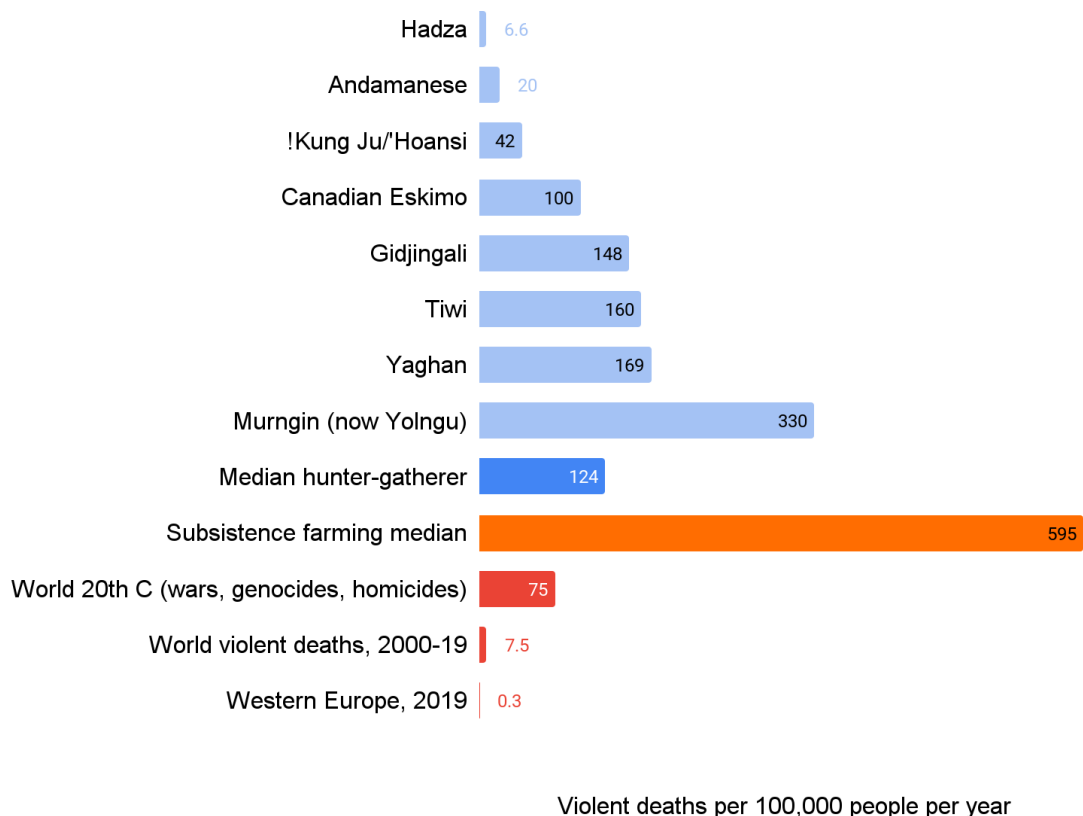
The main sources of evidence are ethnographies of recent hunter-gatherer societies, and archeology.

It is important to bear in mind that there are significant issues of reliability for both the ethnographic and archeological data. These reliability issues are discussed in detail later in this study, and have crucial implications for our recommended interpretations of the following data.

The chart below shows rates of lethal violence among those ethnographically observed hunter-gatherer groups who are most likely to be representative of our pre-agricultural ancestors:

Figure ES1.

Rates of violence in Late Pleistocene Appropriate hunter-gatherers, ethnographic data



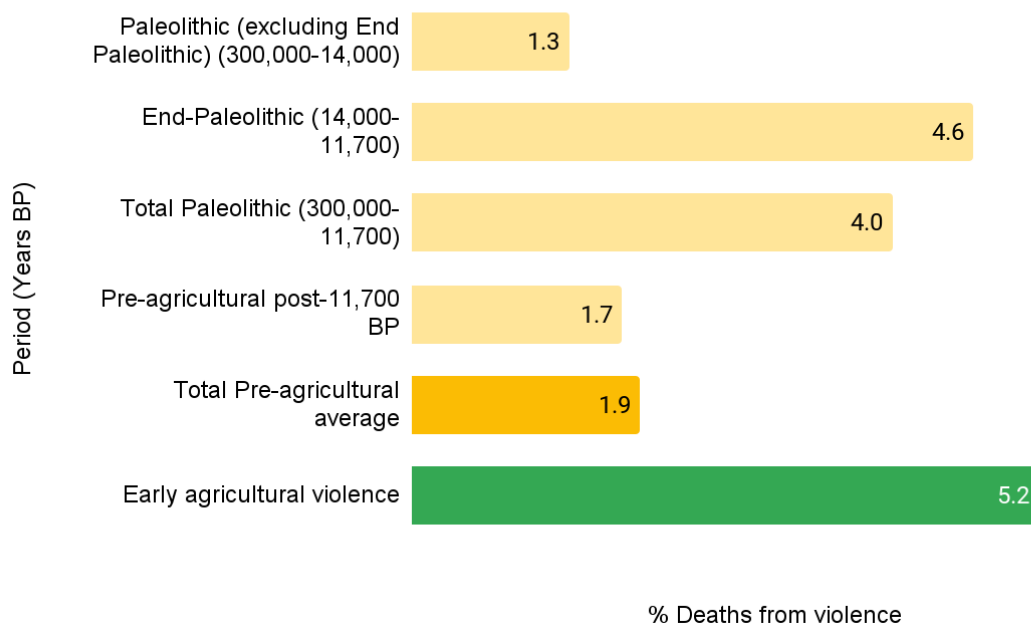
Source: [Hunter-gatherer data spreadsheet, 'Deaths/100k ethnographic'](#) tab

*The subsistence farming ethnographic dataset is for small-scale societies only and includes some groups often classed as ‘hunter-horticulturalists’, where hunting is combined with farming

Turning to the archeological data, the chart below shows the percentage of skeletons from each period exhibiting archeologically detectable signs of lethal violence. Note that this is a different measure to the one used above, of deaths per 100,000 people per year.²

Figure ES2.

Mortality due to violence, archeological data (detectable violence only)



Source: [Hunter-gatherer data spreadsheet, 'Adjusted archeology % deaths from violence' tab](#)

*The relatively high rates estimated for the End-Paleolithic and Total Paleolithic are almost entirely due to a single site, Jebel Sahaba

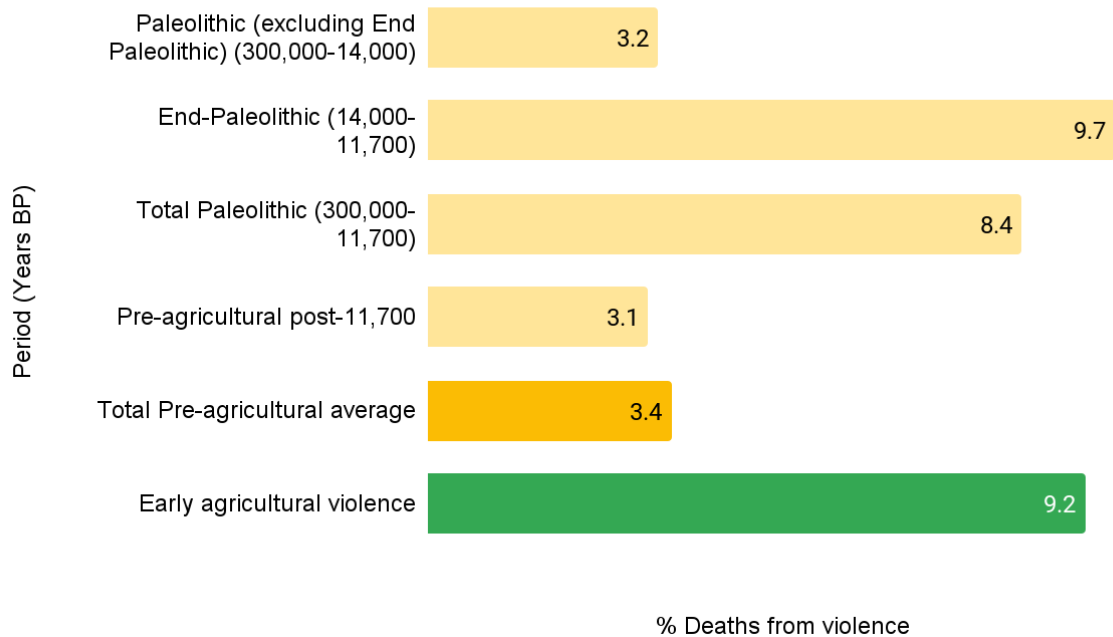
*The early agricultural archeological dataset consists of non-state agricultural societies from the early millennia following the adoption of agriculture; in a European context they would be described as ‘Neolithic’

However, the archeological evidence understates the *actual* level of violence in different periods because not all violent attacks would leave detectable marks on the skeleton and evidence of lethal violence can disappear due to issues of preservation. Below are our estimates for actual rates of lethal violence after attempting to adjust for these factors (our methodology for making these adjustments is explained in the archeology section):

² ‘% deaths from violence’ is affected by the overall mortality rate or life expectancy in a population. Consider two societies, one (1) with a high mortality rate and a life expectancy of 30, the other (2) with a low overall mortality rate and a life expectancy of 100. Both have a ‘% deaths from violence’ of 10%. But are they equally violent? No, you are actually considerably more likely to die violently in society 1 in any given year. This becomes important when comparing to periods in which the overall mortality rate is lower and life expectancies are higher, such as after the Industrial Revolution.

Figure ES3.

Adjusted mortality due to violence, archeological data (estimated actual rates)



Source: [Hunter-gatherer data spreadsheet, 'Adjusted archeology % deaths from violence'](#) tab

*The relatively high rates estimated for the End-Paleolithic and Total Paleolithic are almost entirely due to a single site, Jebel Sahaba

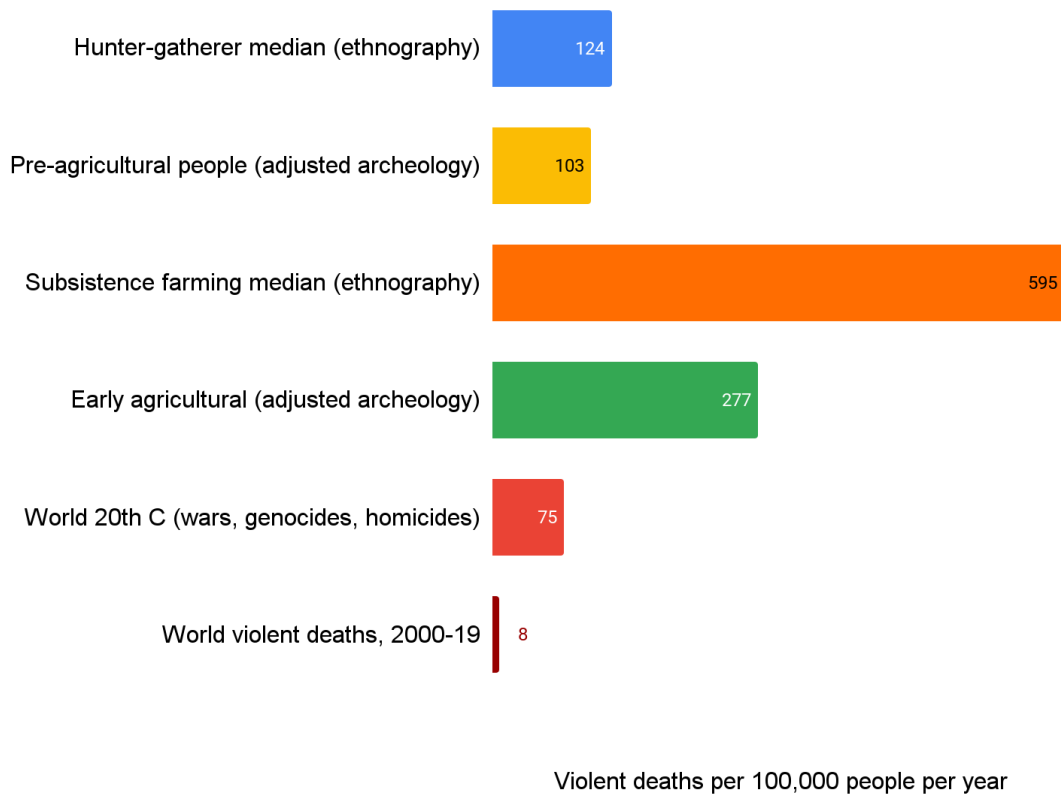
*The early agricultural archeological dataset consists of non-state agricultural societies from the early millennia following the adoption of agriculture; in a European context they would be described as 'Neolithic'

The methodology to adjust the figures above necessarily involved a good deal of guesswork and is admittedly non-standard. They should therefore be approached with a good deal of scepticism. Nevertheless we feel compelled to attempt these adjustments in order to make the archeological data more potentially useful and to make it comparable to the ethnographic data and data on violence from modern periods.

The chart below compares our archeological and ethnographic data using the common metric of 'violent deaths per 100,000 people per year' (which is preferable to '% deaths from violence' as an indication of how violent a population is). It also includes data on the modern world for comparative purposes.

Figure ES4.

Rates of violence among different groups



Source: [Hunter-gatherer data spreadsheet, 'Final simplified deaths/100k' tab](#)

*The subsistence farming ethnographic dataset is for small-scale societies only and includes some groups often classed as 'hunter-horticulturalists', where hunting is combined with farming

*The early agricultural archeological dataset consists of non-state agricultural societies from the millennia following the adoption of agriculture; in a European context they would be described as 'Neolithic'

*The early agricultural archeological dataset has been converted into 'violent deaths per 100,000' using the same methodology as the pre-agricultural dataset. This is problematic since this methodology assumes that early agriculturalists had the same mortality rate as pre-agricultural people. However, we are not currently aware of a more appropriate mortality rate estimate to use for this conversion

*The pre-agricultural archeological dataset combines data from both the Paleolithic and early Holocene

In order to make this comparison it was necessary to convert the archeological data from '% deaths from violence' into 'violent deaths per 100,000 people per year'. We did this by using an ethnographic study of average modern hunter-gatherer mortality rates. How accurate this methodology is therefore depends on how similar pre-agricultural mortality rates were to those of modern hunter-gatherers.

Our main conclusions are:

1. **High degree of uncertainty.** Both the ethnographic and archeological evidence should be considered very unreliable. The archeological evidence is sparse, fragmentary, lacks a global perspective and requires estimates involving a lot of guesswork to get figures for *actual* lethal violence rates. Good ethnographic data for rates of violence among hunter-gatherers is also very thin on the ground and extrapolating the behaviour of ethnographically documented hunter-gatherers into the prehistoric past is problematic in a number of ways. Confident estimates about average levels of violence in the pre-agricultural world therefore are misleading given the currently available evidence and should be avoided.
2. **Archeological evidence for the Paleolithic is particularly unreliable.** There are very few Paleolithic skeletons, particularly for the earlier Paleolithic: only 154 skeletons in our dataset predate 14,000 Before Present (BP) and just a handful predate 50,000 BP. Moreover, Paleolithic skeletons are poorly preserved. There are far more skeletons from pre-agricultural societies in the Holocene: in our sample, out of 13,732 skeletons from the pre-agricultural period, 12,877 date from the Holocene. However, Holocene hunter-gatherers may have differed from their Paleolithic forebears in systematic ways. Still, since the sample from the Holocene is much larger, we think that the total pre-agricultural average is probably more reliable than the Paleolithic average.
3. **Violence was highly variable.** It is likely that pre-agricultural patterns of violence varied dramatically by time and place, and levels/patterns of lethal violence may have differed between pre-agricultural populations by orders of magnitude. The behaviour of *Homo sapiens* is uniquely plastic and variable. Both the ethnographic record of modern hunter gatherers and the archeological evidence illustrate this variability among pre-agricultural populations.
4. **Estimates for pre-agricultural rates of violence in *Better Angels* are much too high.** In his widely cited study of violence *The Better Angels of Our Nature* Steven Pinker estimated that around 15% of deaths in pre-historic small-scale societies were due to violence. Both our ethnographic and archeological data indicate this estimate to likely be much too high for pre-agricultural populations. Our estimates are likely to be more accurate primarily because (a) our ethnographic evidence is restricted only to those hunter-gatherer groups who are the most likely analogues for pre-agricultural populations, and (b) our archeological datasets are much more comprehensive, exclude farming populations and are adjusted to reflect biases in the fossil record.
5. **Rates of violence for pre-agricultural *Homo sapiens* were high by comparison to most animal species.** Primates (like us) typically exhibit high rates of conspecific lethal violence by comparison to most other groups, and we seem on the high end of the primate spectrum. Gomez et al (2016) show that the phylogenetic tree of species would predict a rate of conspecific lethal violence among *Homo sapiens* of about 2%³. The ethnographic and archeological evidence indicates a significantly higher rate among pre-agricultural populations. We hypothesise that these relatively high rates

³ However, as noted above, annual violent deaths per 100,000 is a better measure of levels of violence in a population than % deaths from violence. It appears that Gomez et al did not take the relatively long life-expectancy of humans into account in their study, which may be a problematic confounding factor for this estimate

are due to an unusual suite of factors that make violent conflict among our species highly likely to result in a lethal outcome (rather than, for example, a high frequency of conflict or a particular proclivity for lethal violence).

6. **Agriculture significantly increased levels of lethal violence.** The ethnographic and archeological evidence suggests that early farmers typically exhibited significantly higher levels of lethal violence than pre-agricultural hunter-gatherer populations.
7. **The increase in lethal violence brought by the agricultural revolution was probably due to increased levels of intergroup conflict (warfare).** There are theoretical reasons to think that nomadic hunter-gatherers will engage in warfare less than farmers. For instance, nomadic hunter-gatherers do not store food, and do not have fixed settlements, which makes fleeing relatively easy. Both the ethnographic and archeological evidence bears this out. Ethnographically observed nomadic hunter-gatherers typically exhibit relatively low rates of warfare relative to other societies. The earliest clear archeological evidence of warfare comes from Jebel Sahaba around 14,000 BP, right at the end of the Paleolithic period, when populations were becoming more sedentary. However, the fossil record prior to 14,000 BP is very sparse, so it is hard to be very confident that warfare was indeed rare throughout the Paleolithic.
8. **The most common proximate motivations for violent conflict were probably disputes over women and desire for revenge.** These emerge consistently and cross-culturally as the most common motivations for both interpersonal and intergroup conflict in the ethnographic evidence. However it is likely that contextual factors such as resource stress and cultural differences were also important. Establishing the ultimate causes of violent conflict is complex because of the multilevel/multifactorial nature of motivations for violence.
9. **The evidence suggests that the 20th and 21st Centuries had lower rates of lethal violence than pre-agricultural times.** Despite its wars and genocides, the 20th Century has lower rates of lethal violence than ethnographically-observed and archeologically-observed hunter-gatherers: lethal violent mortality rates among the median hunter-gatherers in our sample are about 1.7x higher than the 20th Century, while the archeological data suggests that the difference is around 1.4x. Moreover, the pre-agricultural period had rates of lethal violence that were upwards of 13-fold higher than 2000-2019. It is reasonable to interpret this evidence as supporting one of Pinker's central theses in *Better Angels*. However, we think that there are two caveats to this, though Steven Pinker believes these points to be speculative.
 - a. Regarding the comparison with the 20th Century, one potentially confounding factor to consider is that people in the 20th Century had access to better medical care than hunter-gatherers. Once we adjust for better medical care, we think it is not obvious whether hunter-gatherer societies actually were more violent than the 20th Century (even though they had higher rates of *lethal* violence).
 - b. The 21st Century so far is only a small snapshot of time, and future catastrophes such as wars and genocides may drag up the rate of violence, as happened in the 20th Century. Indeed, future wars would be even more deadly than World Wars I and II due to nuclear weapons and other novel

destructive weapons. [Leading estimates](#) put the risk of a war between the Great Powers in the next 30 years at around 1 in 10. So, it is hard to say whether the 21st Century as a whole will be less violent than the hunter-gatherer period.

The relative strengths and weaknesses of ethnographic and archeological evidence are shown below:

Type of evidence	Strengths	Weaknesses
Modern Ethnography	<p>Ethnographic methods for measuring rates of violence are usually more precise than archeological methods.</p> <p>Data is relatively global and geographically diverse, though less regions are actually represented than in the archeological evidence and some regions are over-represented eg 3 of the 8 societies in the dataset are from Northern Australia</p>	<p>Modern hunter-gatherers are different from pre-agricultural people in systematic ways. It is hard to know which most closely resemble ancestral hunter-gatherers</p> <p>There is only lethal violence data on very few pre-agricultural appropriate societies. We've included just 8 in our dataset</p> <p>Data spans a short period of time - almost all the useful data is from the 20th century or thereabouts, a period where many hunter-gatherer societies underwent transformative change</p>
Archeology	<p>Violence in pre-agricultural populations can be directly measured whereas in ethnography, modern hunter-gatherers are problematically taken as a proxy for pre-agricultural populations</p> <p>Data spans an enormous breadth of time - approximately 120,000 years, although it is heavily concentrated in the last 14,000 years</p> <p>Many more distinct societies are represented in the archeological evidence than in the ethnographic evidence</p>	<p>Archeological methods for measuring violence are imprecise, particularly as archeologically detectable lethal violence represents merely minimum rates. Converting the data to represent <i>actual</i> rates involved a non-standard technique with a lot of guesswork</p> <p>There is limited archeological data for all pre-agricultural periods, in particular for earlier periods. There are 13,732 skeletons in our Total Pre-agricultural dataset of which just 154 predate 14,000BP</p> <p>Data is heavily biased towards particular regions, for example 52% of the Total Pre-agricultural dataset</p>

		skeletons are from California. However, more regions are actually represented than in the ethnographic evidence
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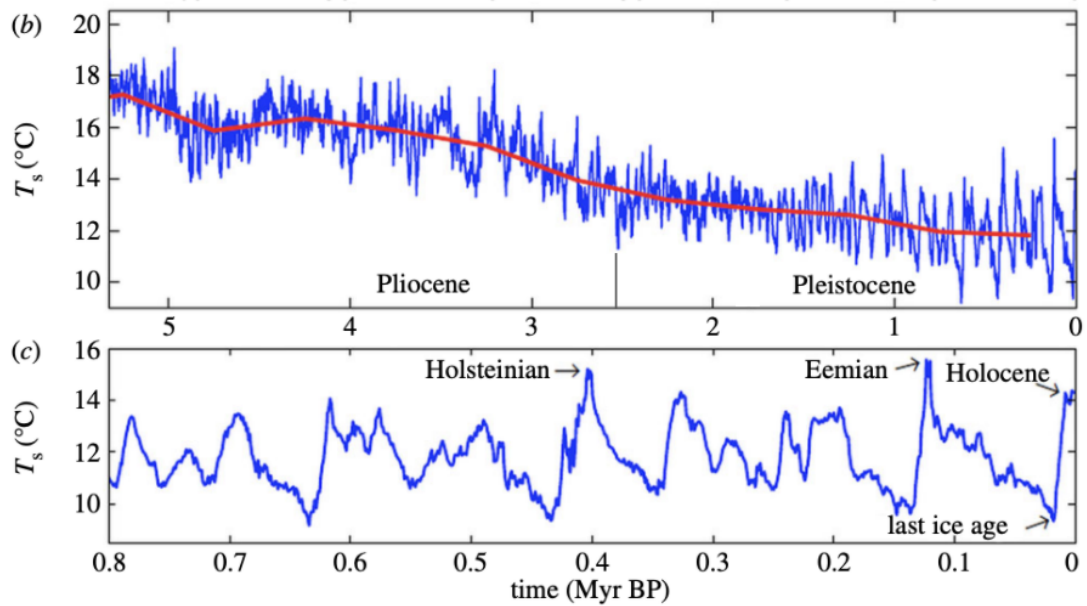
Human history and human climate

Before we proceed, it is useful to provide more background on the different geological epochs and their climates. Hominids first evolved in Africa around 6 million years ago, and anatomically modern humans first evolved 300,000 years ago in Africa in the middle of a geological epoch known as the Pleistocene. We are currently in a warmer interglacial epoch known as the Holocene, which started 11,700 years ago.

System/ Period	Series/ Epoch	Stage/ Age	millions of years ago
Quaternary ↑	Holocene	Upper	0.0117
			0.126
	Pleistocene	Middle	
			0.781
		Calabrian	
		1.806	
	Gelasian		2.588

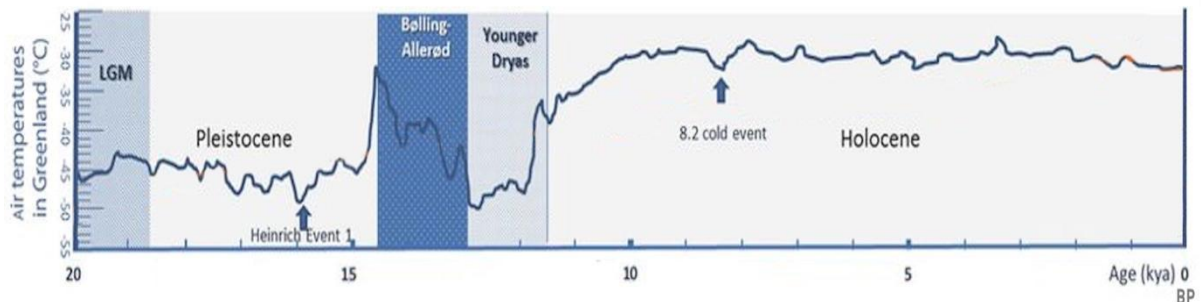
Source: [Britannica](#)

The chart below shows global surface temperature for the last 5 million years (top pane) and for the last 800,000 years (bottom pane)



Source: [Hansen et al. 2013](#), fig 4⁴

The chart below zooms in on the end-Pleistocene/early Holocene climate.



Whereas the Pleistocene had a highly variable, cold and low CO_2 climate, the Holocene was warmer, more stable and had higher CO_2 levels. It is due to these climatic factors that, according to Richerson et al (2001), agriculture was impossible during the Pleistocene but mandatory during the Holocene.⁵ In the Holocene, agriculture was invented independently multiple times in multiple different locations.

⁴ Note that the version of this chart in Hansen et al (2013) marks the start of the Pleistocene at 1.8 million years ago. The starting point of the Pleistocene has recently been changed to 2.6 million years ago.

⁵ Peter J. Richerson, Robert Boyd, and Robert L. Bettinger, 'Was Agriculture Impossible during the Pleistocene but Mandatory during the Holocene? A Climate Change Hypothesis', *American Antiquity* 66, no. 3 (2001): 387–411.

Part 1. Ethnography

What can ethnography tell us about violence before agriculture? We have divided this section on ethnography into two parts. The first part is devoted to establishing what ethnography can tell us about likely *rates* of lethal violence in ancient pre-agricultural societies. The second part explores what ethnography can tell us about the likely *character* of violence in those societies.

In part 1, which discusses *rates* of lethal violence, we will:

1. Explain why ethnographically observed hunter-gatherer societies can offer insight into likely patterns of pre-agricultural violence
2. Discuss the problems with using these societies as proxies for ancient pre-agricultural societies
3. Discuss the extent to which sedentary/semi-sedentary and Arctic hunter-gatherers are 'pre-agricultural appropriate'
4. Introduce Christophe Boehm's list of pre-agricultural appropriate societies, which we rely on to assemble our dataset
5. Discuss what ethnographic data on lethal violence is available from pre-agricultural appropriate societies and some specific limitations relating to that available data
6. Present our data on lethal violence in pre-agricultural appropriate societies and explain our methodology for converting it into the form of '% violent mortality'
7. Discuss some important issues of interpretation arising from these results

In part 2, which discusses the *character* of lethal violence, we will:

1. Present Bruce Knauft's summary of typical patterns of violence in hunter-gatherer societies
2. Discuss the evidence demonstrating how hunter-gatherers typically exhibit lower rates of warfare than other small-scale societies and present some theoretical reasons that might explain why this is the case
3. Discuss the potential counter-examples from Aboriginal Australia which problematize the above point
4. Present evidence from Walker and Bailey's 2013 study which demonstrates the great extent to which overall rates of lethal violence in a society are driven by rates of warfare
5. Discuss the 'interpersonal' nature of hunter-gatherer violence and the typical character that it takes
6. Discuss the great variability in patterns and rates of hunter-gatherer violence
7. Discuss the issue of infanticide and how it relates to our study
8. Present our overall conclusions from the ethnographic evidence

We know that pre-agricultural people were hunter-gatherers, so modern or historically observed hunter-gatherers might shed light on pre-agricultural hunter-gatherers.

Interestingly, despite their great diversity, observed hunter-gatherer societies do tend to share certain characteristics, such as egalitarianism, lack of wealth accumulation, sharing economy, flexible and fluid social organisation, 'present orientation' (an outlook which focuses on the here-and-now rather than the past or future), and a high degree of nomadism (with the exception of sedentary and equestrian hunter-gatherers).⁶ Certain patterns of violence are quite distinctive in observed hunter-gatherers by comparison to other types of societies. There is some reason to think that pre-agricultural societies shared these characteristics.

1.1. Limitations of ethnographic data

There are various problems with extrapolating pre-agricultural behaviour from the behaviour of observed hunter-gatherers because observed hunter-gatherer societies differ from pre-agricultural people in systematic ways. They are not 'living fossils'. While pre-agricultural people were hunter-gatherers in a world of hunter-gatherers, observed hunter-gatherers all live in a world shaped fundamentally by the agricultural revolution.

1. Many, perhaps all, observed hunter-gatherers draw their descent at least partially from farmers, with the exception of the Australian Aborigines.
2. They tend to live in marginal environments like deserts or rainforests, the more hospitable land having been taken by agriculturalists.
3. Some live in geographical areas that were not occupied for most of the pre-agricultural period eg the Americas.
4. Most of the large mammals on which many pre-agricultural people would have depended are now extinct or much reduced in number.
5. Observed hunter-gatherers live in a Holocene climate, warmer and wetter on average than the preceding Pleistocene in which most of human history took place.
6. They may live at very different population densities than most pre-agricultural people did: it's hard to know because pre-agricultural demography is poorly understood.
7. They tend to have significantly more advanced technology than most pre-agricultural people would have had. For example, bows and arrows were a relatively late addition to the pre-agricultural toolkit.
8. They live in (often close) contact with non-hunter-gatherers and, with few exceptions, they have done so for hundreds, even thousands, of years. The exception here would be most of pre-contact Australia and parts of North America, but unfortunately these places were not well recorded.

⁶ Woodburn, James. 1982 'Egalitarian Societies.' *Man*, the Journal of the Royal Anthropological Institute, 17, no. 3: 431-51; Lee, Richard B., Hunter-Gatherers and Human Evolution: New Light on Old Debates (October 2018). *Annual Review of Anthropology*, Vol. 47, pp. 513-531, 2018; [Explaining Human Culture](#); Marlowe, Frank. (2005). Hunter-Gatherers and Human Evolution. *Evolutionary Anthropology: Issues, News, and Reviews*. 14. 54 - 67. 10.1002/evan.20046. Lee, Richard B., Hunter-Gatherers and Human Evolution: New Light on Old Debates (October 2018). *Annual Review of Anthropology*, Vol. 47, pp. 513-531, 2018; Ember, Carol R. 2020. "Hunter-Gatherers" in C. R. Ember, ed. *Explaining Human Culture*. Human Relations Area Files, <http://hraf.yale.edu/ehc/summaries/hunter-gatherers>, accessed 15.2.2022.

As we might expect, there is a lack of consensus about which observed hunter-gatherer societies likely offer the best approximation of pre-agricultural societies.

1.2. Which hunter-gatherer societies are most relevant?

There is broad agreement that, of all small-scale-societies, observed hunter-gatherer societies offer the best available approximation of pre-agricultural people. As the hunter-gatherer specialist Frank Marlowe puts it:

“Although few hunter-gatherers or foragers exist today, they are well documented in the ethnographic record. Anthropologists have been eager to study them since they assumed foragers represented a lifestyle that existed everywhere before 10,000 years ago and characterized our ancestors into some ill-defined but remote past. In the past few decades, that assumption has been challenged on several grounds. Ethnographically described foragers may be a biased sample that only continued to exist because they occupied marginal habitats less coveted by agricultural people. In addition, many foragers have been greatly influenced by their association with more powerful agricultural societies. It has even been suggested that Holocene foragers represent a new niche that appeared only with the climatic changes and faunal depletion at the end of the last major glaciation. Despite these issues, the ethnographic record of foragers provides the only direct observations of human behavior in the absence of agriculture, and as such is invaluable for testing hypotheses about human behavioral evolution.”⁷

However, hunter-gatherer societies are highly diverse and there is a debate about which are the most ‘pre-agricultural appropriate’. It is broadly agreed that those that are less dependent on agriculture and nearby agricultural societies are more appropriate (although practically all are to some extent, certainly nowadays). For example, equestrian hunter-gatherers (like the Native American hunters of the Great Plains depicted in classic Hollywood Westerns) don’t count, as their societies were dependent on the horse, a domesticated animal which pre-agricultural hunter-gatherers lacked. Pygmy populations from the Congo rainforest aren’t ideal due to their dependence on neighbouring farmers for food. There is less agreement about:

1. Sedentary or semi-sedentary hunter-gatherers
2. Arctic hunter-gatherers

We will now discuss each of these in turn.

1.2.1. Should we exclude sedentary or semi-sedentary (complex) hunter-gatherers from consideration?

Most observed hunter-gatherer societies are highly nomadic and have very large territories. But there are sedentary hunter-gatherers. On the American North West Coast there were

⁷ Marlowe, Frank. (2005). Hunter-Gatherers and Human Evolution. *Evolutionary Anthropology: Issues, News, and Reviews*. 14. 54 - 67. 10.1002/evan.20046.

very well-documented hunter-gatherers, such as the Tlingit, who relied on marine resources. There are other examples such as the various semi-sedentary foragers who live in New Guinea and rely principally on the sago palm. The societies of these sedentary and semi-sedentary hunter-gatherers (sometimes termed 'complex' hunter-gatherers) are typically systematically different from nomadic hunter-gatherers. Apart from their fixed settlements, they bear many other characteristics more typical of agricultural societies than hunter-gatherer societies.

Variable	Simple Hunter-Gatherers	Complex Hunter-Gatherers
Primary food	Terrestrial game	Marine resources or plants
Food storage	Very rare	Typical
Mobility	Nomadic or semi-nomadic	Settled or mostly settled
Population	Low population densities	Higher population densities
Political system	Egalitarian	Hierarchical with classes based on wealth or heredity
Social structure	Absence of social heredity	Lineages in some cases
Slavery	Absent	Frequent
Competition	Not accepted	Encouraged
Warfare	Rare	Common

Figure 6.3 Contrasts Between Complex and Simple Hunter-Gatherers.

Source: Adapted from Robert Kelly, *The Foraging Spectrum: Diversity in Hunter-Gatherer Lifeways* (Washington, D.C.: Smithsonian Institution Press, 1995), 294, Table 8.1.

Source: Kelly, Robert L. (1995). *The foraging spectrum : diversity in hunter-gatherer lifeways*. Washington : Smithsonian Institution Press p. 294. See also [Explaining Human Culture](#)

Some anthropologists don't class these sedentary and semi-sedentary hunter-gatherers as 'pre-agricultural appropriate' because they argue that there is little archeological evidence that they existed prior to the Holocene (our current epoch in which the agricultural revolution happened). As Fry and Soderbergh put it:

“Nomadic foragers depend on hunting and gathering for their subsistence requirements and lack domestic animals including horses. They are socially egalitarian in ethos and practice. If compared with all other types of societies, the nomadic forager lifestyle most closely resembles the subsistence mode and social organization of the evolutionary past of the Pleistocene, as demonstrated archeologically”.⁸

However, some disagree. Most observed hunter-gatherer societies occupy marginal environments because their agricultural neighbours monopolize the more productive land. Yet pre-agricultural people did not have this problem and so may well have occupied

⁸ Fry, D.P., & Söderberg, P. (2014). Myths about hunter-gatherers redux: nomadic forager war and peace. *Journal of Aggression, Conflict and Peace Research*, 6, pp. 255-266.

significantly more resource-intensive land than observed nomadic hunter-gatherers. Consider also that many pre-agricultural people ate large prey animals that are now extinct and so are unavailable to observed hunter-gatherers.

Paul Roscoe, a hunter-gatherer specialist with an expertise in New Guinea, goes as far as to suggest that sedentary or semi-sedentary hunter-gatherers may actually offer a better approximation of pre-agricultural people for that reason.

“Things would have been different at the beginning of the Holocene. The typical forager group would have had access to subsistence resources that were more abundant and predictable than those of contemporary foragers in their marginal environments. Ancient foragers would likely therefore have existed at higher densities than those of today, bringing their bands closer to one another. In addition, bands in these richer environments would have been less dependent on their neighbors for subsistence buffering than ethnographically described foragers in marginal environments. With their bands closer to and less dependent on one another, ancient foragers would therefore have had more opportunities and greater incentives to deploy lethal violence than those of today. If, as higher-density groups, they also had more developed status competition and were marginally better organized, they might have had an even greater incentive and capacity for war. In sum, we might expect the social world of ancient foragers to be biased more toward lethal violence than that of recent foragers, with implications for the forms of lethal violence they deployed.”⁹

He identifies 10 New Guinean hunter gatherer societies who all lived in or on the margins of freshwater wetlands, the natural habitat of the sago palm and got >90% of their resources from wild products. Their population densities were more than six times higher (mean 0.8 people per sq km, median 0.5) than the average for the nomadic foragers cited in Fry’s research (mean 0.126, median 0.036).¹⁰ Sure enough, these groups seem to have been significantly more violent than most nomadic foragers.

In *The Oxford Handbook of the archeology and Anthropology of Hunter-gatherers* Brian Hayden states that “there is little or no evidence for any significant socio-economic complexity in the prehistoric record until the European Upper Palaeolithic (50,000-12,000 years BP)”.¹¹ He points out that none of the indicators for complex hunter-gatherers (such as high population densities, large settlements, sedentism, surpluses, food storage, pronounced inequalities, prestige objects, feasting, specialized art and aggrandizer

⁹ Roscoe, Paul. “Foragers and War in Contact-Era New Guinea”. In *Violence and Warfare Among Hunter Gatherers* edited by Mark W.Allen and Terry L.Jones, 223-40 Walnut Creek, CA: Left Coast Press, 2014, p. 227.

¹⁰ Roscoe, Paul. “Foragers and War in Contact-Era New Guinea”. In *Violence and Warfare Among Hunter Gatherers* edited by Mark W.Allen and Terry L.Jones, 223-40 Walnut Creek, CA: Left Coast Press, 2014 p. 228

¹¹ Hayden, Brian. (2014). Social Complexity. In Cummings, Vicki. & Jordan, Peter. & Zvelebil, Marek. *The Oxford handbook of the archeology and anthropology of hunter-gatherers*. Oxford : Oxford University Press, p. 658.

strategies) “occurs to any significant degree in the archeological record anywhere in the world prior to 40,000 years ago”.¹²

However, taking Roscoe’s line of argument, Hayden argues that

“with the advent of the Upper Paleolithic in Europe this situation changes perceptibly. Moreover these changes appear to occur as a specific constellation or package, in certain areas, indicating that at least in some locations complex hunters and gatherers had developed”.¹³

He shows that there is abundant evidence of prestige objects during this period, as well as evidence for food storage, seasonal sedentism and even full sedentism in some locations. For example, the three skeletons at Sungir (in Russia), dating from around 32,000 years BP, were found with 9000 ivory beads (which would each require 1 hour to carve) plus other prestige ornaments. “The magnitude of wealth accumulation by one family is nothing short of astounding at this time and seems more commensurate with chiefdom-level concentrations of power and social complexity”.¹⁴ Hayden proposes that the famous cave art that dates from the period is further evidence of complexity, bearing witness to “caves that were decorated by highly trained (and probably commissioned) artists, and probably used for some kind of secreted, prestige function”.¹⁵

Hayden concludes that

“These developments were typical of some of the most complex trans-egalitarian hunter-gatherer societies and constituted a new direction of cultural development dramatically different from simpler, more egalitarian bands based on sharing scarce resources that characterized earlier periods”.¹⁶

However, it should be noted that the possible existence of complex hunter-gatherers at this time likely represents the exception rather than the rule, and is currently found only in Europe. Also Hayden’s interpretation of the archeological evidence for increased complexity in the European Upper Paleolithic is disputed and the evidence for it is currently inconclusive.

The relative scarcity of clear archeological evidence for sedentary hunter-gatherers before the Neolithic might be because sedentary hunter-gatherers are more likely to reside on or near the coast, like the North West Coasters. So the archeology may have been lost to the sea.

¹² Hayden, Brian. (2014). Social Complexity. In Cummings, Vicki. & Jordan, Peter. & Zvelebil, Marek. The Oxford handbook of the archeology and anthropology of hunter-gatherers. Oxford : Oxford University Press, p. 645.

¹³ Ibid, p. 645.

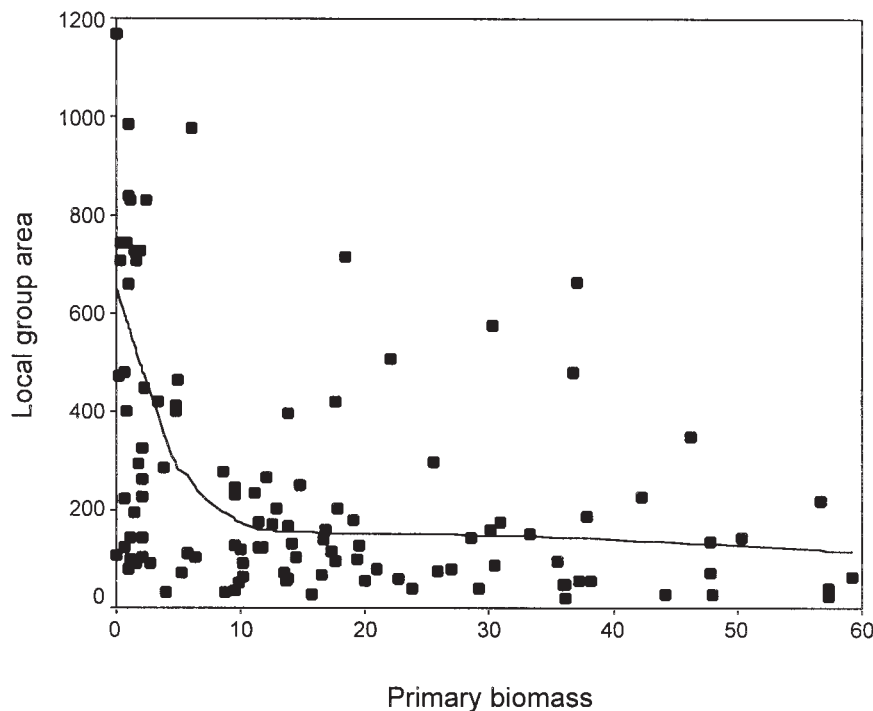
¹⁴ Ibid, p. 648.

¹⁵ Ibid, p. 649.

¹⁶ Ibid, p. 650.

However, given the 300,000 years of human history, the lack of archeological evidence for sedentary populations (at least outside of Europe and, in Europe, before the Upper Palaeolithic), who should otherwise leave a greater archeological footprint than nomads, does seem odd.

Marlowe provides the following graph showing that, beyond a threshold, increases in the resource abundance of an area do not significantly reduce the territory of residing hunter-gatherer societies.



Marlowe:

“Among warm climate foragers, local group area (home range) decreases as primary biomass increases, since resources are more concentrated. However, once primary biomass reaches about 10 kg/m², local group area does not continue to decrease. This implies that most warm-climate Late Pleistocene foragers, even in rich habitats, probably had very large home ranges of about 175 km². This is larger than the city limits of Washington D.C., too large an area to defend as an exclusive territory, given the population density (median 0.18 km²).”¹⁷

To conclude, it seems probable that most pre-agricultural people were nomadic, egalitarian foragers because of the scarcity of archeological evidence for ‘complex’ hunter-gatherer societies in most locations and periods. However, there is evidence for ‘complex’ hunter-gatherers in the European Upper Paleolithic. Whether they represent the exception or the rule for the period, and their degree of ‘complexity’, is currently hard to determine, though our best guess is that most pre-agricultural hunter-gatherers were nomadic.

¹⁷ Marlowe, Frank. (2005). Hunter-Gatherers and Human Evolution. *Evolutionary Anthropology: Issues, News, and Reviews*. 14. 54 - 67. 10.1002/evan.20046.

1.2.2. Should Arctic hunter-gatherers be considered 'pre-agricultural appropriate'?

Among anthropologists who take the view that nomadic hunter-gatherers are most appropriate, there is disagreement about the inclusion of Arctic hunter-gatherers, popularly known as Inuits or Eskimos. In assembling a list of Late Pleistocene Appropriate Hunter Gatherers, Christopher Boehm prioritized minimal contact with outsiders at the time of description. "[Late Pleistocene Appropriate] foragers, then, are pure foragers who are economically independent, politically egalitarian, and spatially mobile, and whose subsistence fits with what we know of *Homo sapiens* between 45,000 [Before Present] and 15,000 [Before Present]". His sample heavily represents the Arctic region, with 24 of his 49 sampled societies drawn from there.¹⁸

Frank Marlowe, however, points out that Arctic foragers should be excluded "if we are interested in the period before 30,000 years ago because it was only during the last 30,000 years that very cold areas were occupied by modern *sapiens*".¹⁹

You can see the problem, then. Are Arctic foragers 'pre-agricultural appropriate'? On the one hand, they had minimal contact with outsiders, but on the other they also live in an environment that is dramatically different to that of most pre-agricultural people. This draws attention to the broader issue of the diversity of pre-agricultural foragers and the difficulty of assembling representative samples of modern foragers.

Boehm's list of Late Pleistocene Appropriate hunter-gatherers

The anthropologist Christophe Boehm has assembled a list of hunter-gatherer societies that he classes as 'Late Pleistocene Appropriate'. Late Pleistocene Appropriate foragers are pure foragers who are economically independent, politically egalitarian, and spatially mobile, and whose subsistence fits with what we know of *Homo sapiens* between 45,000 BP and 15,000 BP' he writes.²⁰

Note: Interestingly, Boehm suggests that Late Pleistocene Appropriate foragers might not be representative of *Homo sapiens* before 45,000 BP because these older foragers may not have been 'culturally modern' (a contested issue in the study of human evolution; there appears to be a marked cultural change around this time. Some argue that this change was

¹⁸ Boehm, C. (2013). 'The biocultural evolution of conflict resolution between groups' In D. P. Fry (Ed.), *War, peace, and human nature: The convergence of evolutionary and cultural views* (pp. 315–340). Oxford University Press.

¹⁹ Marlowe, Frank. (2005). Hunter-Gatherers and Human Evolution. *Evolutionary Anthropology: Issues, News, and Reviews*. 14. 54 - 67. 10.1002/evan.20046.

²⁰ Boehm, C. (2013). 'The biocultural evolution of conflict resolution between groups' In D. P. Fry (Ed.), *War, peace, and human nature: The convergence of evolutionary and cultural views* (pp. 315–340). Oxford University Press.

driven purely by cultural factors²¹ while others have suggested that genetic changes may also have played a part²²).

Here, Boehm explains how he assembled his list:

The premise is that if we select just the types of extant hunter-gatherers that are qualified as being ‘Late-Pleistocene-appropriate’... and look either for socio-political ‘universals’ or for very widespread tendencies in the present, then similar central tendencies can be projected into the past. One begins by taking the 339 pure foragers identified by Lewis Binford (2001) and triaging them. For instance, in the Pleistocene, there was no domestication save for dogs, so people like the Comanche and many other mounted hunters of the American plains have to be eliminated. Likewise, hierarchical sedentary foragers like the Ainu in Japan or the Kwakiutl of the US Northwest Coast are not included, nor could long-term fur-trade forager-trappers like the boreal forest Cree have been present 45,000 years ago, in the absence of prehistoric trading posts. Nor were there people like the African Pygmies or the Philippine Agta, who symbiotically trade wild meat for the domesticated grain grown by their farming neighbours. Eliminate these and a few other inappropriate types, and the total corpus of useful societies shrinks to less than half. It is by sampling these remaining 150-plus Late Pleistocene Appropriate societies that central tendencies can be factored out and applied to prehistoric humans—as long as they were culturally modern.²³

In fact Boehm suggests a list of 49 societies as the most useful Late Pleistocene Appropriate. Boehm used the following criteria to choose his list:

1. Geographic representation.
2. Completeness of ethnographic description.
3. A bias in favor of societies that were studied at contact or soon after contact.”²⁴

Here is the list:²⁵

Africa	Arctic	Asia	Australian Aborigines	North America	South America
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²¹ Spikins, P., French, J.C., John-Wood, S. *et al.* (2021). Theoretical and Methodological Approaches to Ecological Changes, Social Behaviour and Human Intergroup Tolerance 300,000 to 30,000 BP. *Journal of archeological Method and Theory*, 28, 53–75 . <https://doi.org/10.1007/s10816-020-09503-5>

²² Klein, R. G. (2009). *The human career: Human biological and cultural origins*. Chicago: University of Chicago Press.

²³ Boehm , C. (2011). Retaliatory violence in human prehistory . *British Journal of Criminology* , 51 , 518–534.

²⁴ Boehm, C. (2013). ‘The biocultural evolution of conflict resolution between groups’ In D. P. Fry (Ed.), *War, peace, and human nature: The convergence of evolutionary and cultural views* (pp. 315–340). Oxford University Press, p. 336.

²⁵ Boehm, C. (2013). ‘The biocultural evolution of conflict resolution between groups’ In D. P. Fry (Ed.), *War, peace, and human nature: The convergence of evolutionary and cultural views* (pp. 315–340). Oxford University Press.

!Ko Bushmen	Gilyak	Arioto Andaman Islanders	Dieri	Plateau Yumans	Ona
!Kung Bushmen	Alaskan (North) Inuit	Jarawa Andaman Islanders	Euahlayi		Yahgan
G/wi Bushmen	Alaskan (NW) Inuit	Nicobar Andaman Islanders	Gidjingali		
Naron Bushmen	Alaskan (SW) Inuit	Onges Andaman Islanders	Murngin		
Dorobo	Asiatic Inuit	General Andaman Islanders	NW Aus		
Hadza	Baffin Island Inuit	Manus	Pintupi		
	Bering Strait Inuit		Tasmanians		
	Caribou Inuit		Tiwi		
	Copper Inuit		Walbiri		
	Coronation Gulf Inuit		Yiwara		
	Greenland Inuit				
	Greenland (East) Inuit				
	Greenland (West) Inuit				
	Iglulik Inuit				
	Ingalik Inuit				
	Labrador Inuit				
	Mackenzie Delta Inuit				
	Netsilik Inuit				
	Nunamiut Inuit				
	Nunivak Inuit				
	Pacific Inuit				
	Polar Inuit				
	Quebec Inuit				
	Utku Inuit				

We're going to use this list to assess rates of violence among Late Pleistocene Appropriate hunter-gatherers in what follows, so it's important to point out here some possible methodological problems with the list. As discussed above, it is possible that sedentary foragers were present in some regions and at some times in the Pleistocene, but Boehm's list excludes sedentary foragers. Also as discussed above, Arctic foragers live in particularly extreme environments that are dramatically different to the environments most pre-agricultural people would have lived in; yet they are heavily over-represented in this list.

This is not because Boehm thinks this type of forager is particularly Late Pleistocene Appropriate, rather it is largely because they are well-studied and remained relatively remote from close contact with agricultural societies later than most other modern hunter-gatherers.

Nevertheless, despite these issues, it does seem that nomadic egalitarian foragers are likely the best model for most pre-agricultural people so we're going to press ahead and use Boehm's list in the next section.

1.3. What data is available for rates of violence among hunter-gatherers?

Unfortunately the available data on rates of lethal violence in hunter-gatherer societies is limited. Ethnographic fieldwork presents many challenges at the best of times and the study of violence presents additional challenges.

- **Remote areas.** Most hunter-gatherer ethnographers work alone or sometimes in pairs in remote, environmentally challenging regions.
- **Bias to studyable societies.** Hunter-gatherer studies are also biased towards more 'studyable' societies; for example, there have been a number of studies of the Andaman islanders, but none of those come from the 'uncontacted' groups which remain hostile to outsiders. Even the most committed ethnographers only tend to spend a few years at a time in the field, so whatever results they obtain are usually a snapshot of a society at a specific moment in time, or maybe a decade or so either side.
- **Social acceptance is difficult.** Ethnographers often struggle against considerable language barriers and have to work hard to win social acceptance and gain the trust of their informants.
- **Violence is especially hard to study.** Violence can be a particularly sensitive and hard-to-study topic which occasionally puts the ethnographer themselves in danger. Hunter-gatherers obviously don't keep written records and acts of violence are rarely directly observed by ethnographers who instead rely on witness testimony which may be untrustworthy, biased or forgetful.
- **Old and limited source material.** Most of the sources for Late Pleistocene Appropriate societies are old, dating from a time when fieldwork methods were typically less developed and less data-oriented. Those data-oriented studies of lethal violence that do exist often do not use a standardized collection methodology and vary considerably in their reliability. Very few Late Pleistocene Appropriate societies still exist, as many hunter-gatherer societies have been transformed in fundamental ways by the forces of globalization, so it seems unlikely that we will be able to improve on this data much in the future.

In summary, handle with caution!

Nevertheless, there are some ethnographies which present data on lethal violence in hunter-gatherer societies. The data on violence in hunter-gatherer societies in Pinker's *Better Angels* comes from Bowles²⁶ and is shown below:

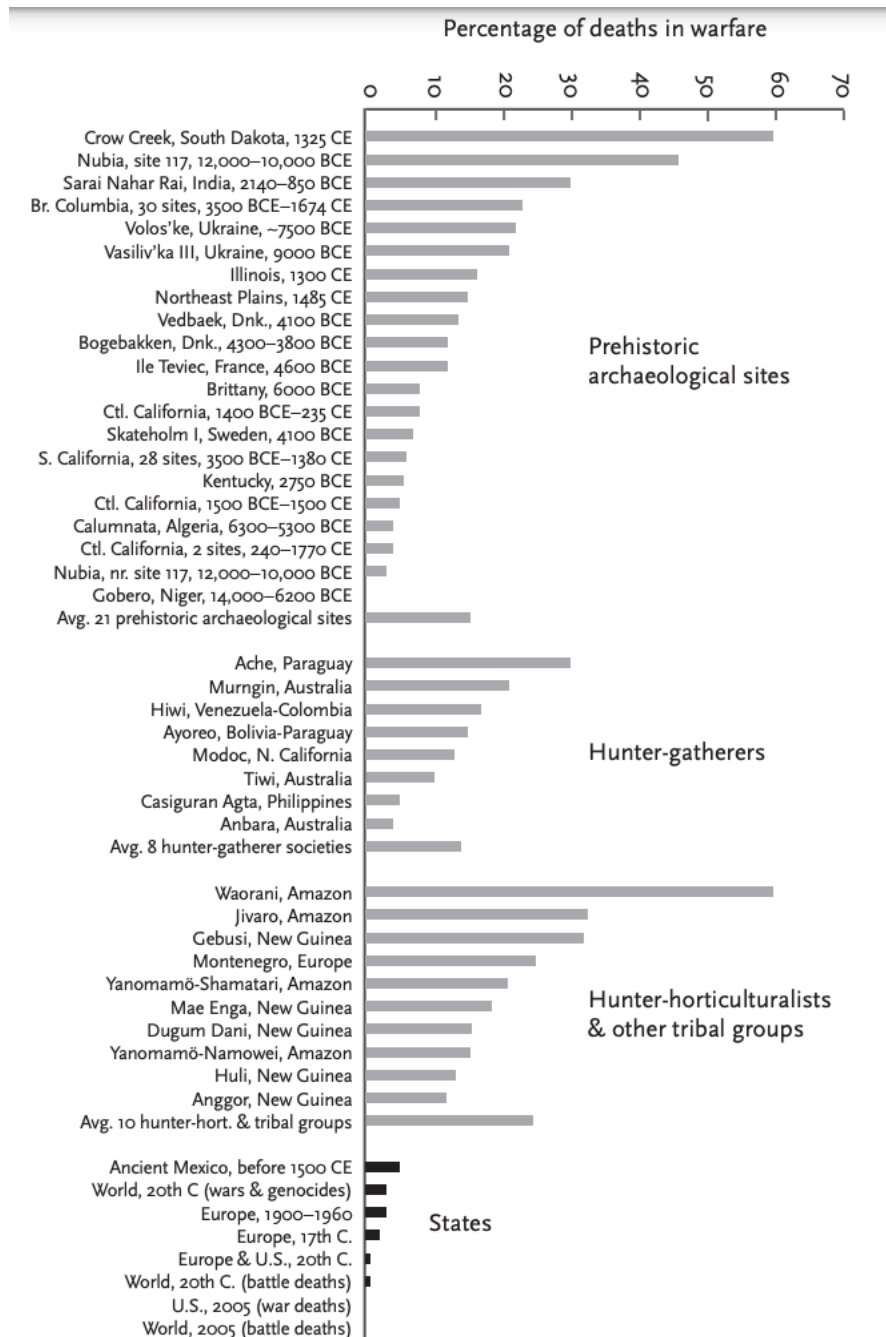


FIGURE 2–2. Percentage of deaths in warfare in nonstate and state societies

Sources: Prehistoric archaeological sites: Bowles, 2009; Keeley, 1996. Hunter-gatherers: Bowles, 2009. Hunter-horticulturalists and other tribal groups: Gat, 2006; Keeley, 1996. Ancient Mexico: Keeley, 1996. World, 20th-century wars & genocides (includes man-made famines): White, 2011. Europe, 1900–60: Keeley, 1996, from Wright, 1942, 1942/1964, 1942/1965; see note 52. Europe, 17th-century: Keeley, 1996. Europe and United States, 20th century: Keeley, 1996, from Harris, 1975. World, 20th-century battle deaths: Lacina & Gleditsch, 2005; Sarkees, 2000; see note 54. United States, 2005 war deaths: see text and note 57. World, 2005 battle deaths: see text and note 58.

Source: Pinker, S. (2012). *The Better Angels of Our Nature*. Penguin p. 49.

²⁶ Bowles, S. (2009). 'Did warfare among ancestral hunter-gatherers affect the evolution of human social behaviors?'. *Science*, 324(5932), 1293-1298.

The average for hunter-gatherer societies here is 14% deaths from warfare. Bowles does not explain the selection criteria for this list: his sample is exclusively drawn from South America and Australia, with the exception of the Agta (who live in the Philippines). Also the list claims to show only deaths from warfare (though other authors have disputed whether this is in fact the case), which is interesting but we'd also be interested to know about violent deaths of all types. Three of the societies in this list are classed as Late Pleistocene Appropriate by Boehm: the Murngin, the Anbara (a subset of Gidjingali) and the Tiwi (all Australian).

There are various reasons why the other societies on Bowles list are probably not good analogues for pre-agricultural populations. Take the Ache and Hiwi as an example. Most of the deaths from warfare in both these societies actually came in conflicts with people from state societies who were encroaching onto their land;²⁷ there weren't loggers with guns in the pre-agricultural period. Or, to take another example, the Agta obtain a substantial portion of their subsistence from trade with neighbouring agricultural societies.

Noticeably, the data in *Better Angels* suggests that hunter-gatherers have lower rates of violent death in warfare than other types of small-scale society, something that Pinker points out himself in the book. You can see above that Pinker's data on 'Hunter-horticulturalists and other tribal groups' (which comes from Keeley and Gat) indicates much higher rates of lethal violence in these societies. The average is 24.5%.

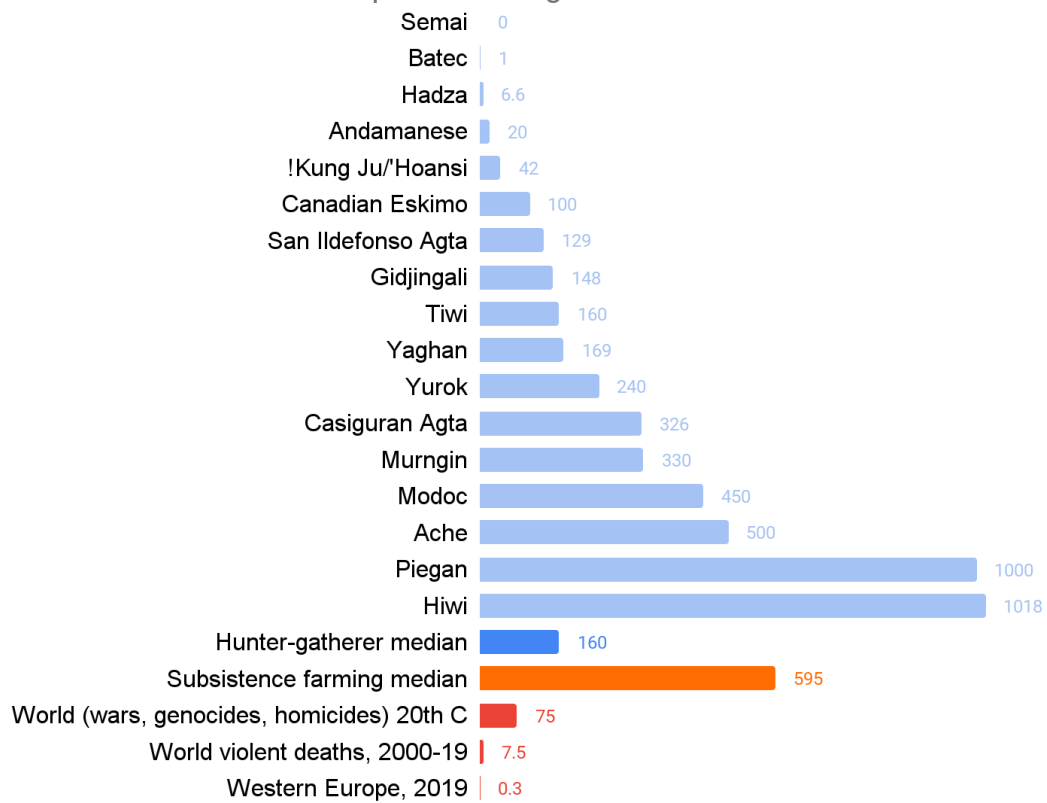
Robert Kelly, an anthropologist who compiles hunter-gatherer data of all kinds, also presents data on violence in hunter-gatherer societies in his book *Lifeways of Hunter-Gatherers*²⁸. Kelly's list is more useful for our purposes because it has more of Boehm's Late Pleistocene Appropriate societies on it and isn't restricted to only deaths from warfare. Further useful evidence is also provided in Wrangham et al (2006).²⁹ This data is presented below (note that this data is presented in the preferable form of 'annual deaths per 100,000' rather than in the form of '% deaths from violence'):

²⁷ As [Karnofsky](#) notes "For two of Pinker's cases, the Ache of Paraguay and the Hiwi of Venezuela/ Colombia, all of the so-called war deaths involved frontiersmen ranchers killing the indigenous people ... All 46 deaths used by Bowles (2009) to calculate so-called warfare mortality among the Ache are listed as "shot by Paraguayan" by Hill and Hurtado (1996, Table 5.1, pages 171–173).

²⁸ Kelly, R. L. (2013). *The Lifeways of Hunter-Gatherers: The Foraging Spectrum*. Cambridge: Cambridge University Press. p203

²⁹ Richard W. Wrangham; Michael L. Wilson; Martin N. Muller (2006). Comparative rates of violence in chimpanzees and humans. , 47(1), 14–26. doi:10.1007/s10329-005-0140-1

Rates of violence in one sample of hunter-gatherers

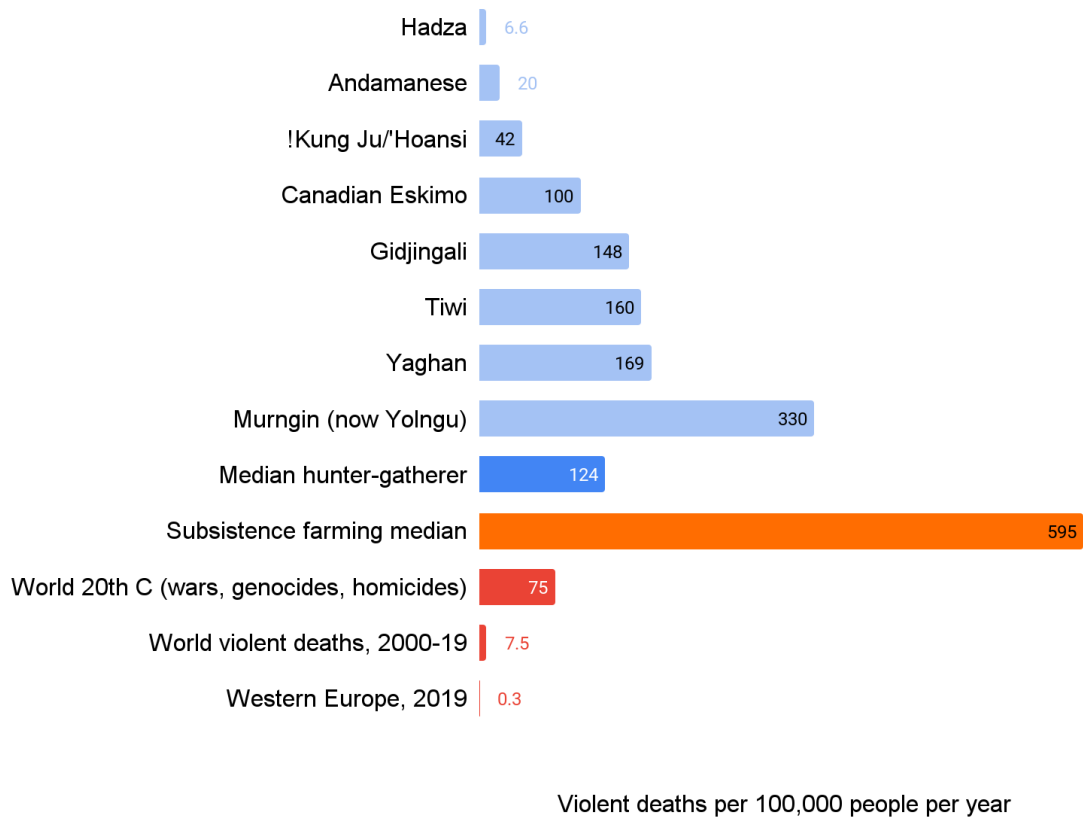


Violent death rate per 100,000 people per year

Source: [Hunter-gatherer spreadsheet, 'Kelly & Wrangham' tab](#)

However, more than half of the societies on this list are not classed as Late Pleistocene Appropriate by Boehm. If you remove these from the data the following societies remain:

Rates of violence in Late Pleistocene Appropriate hunter-gatherers, ethnographic data



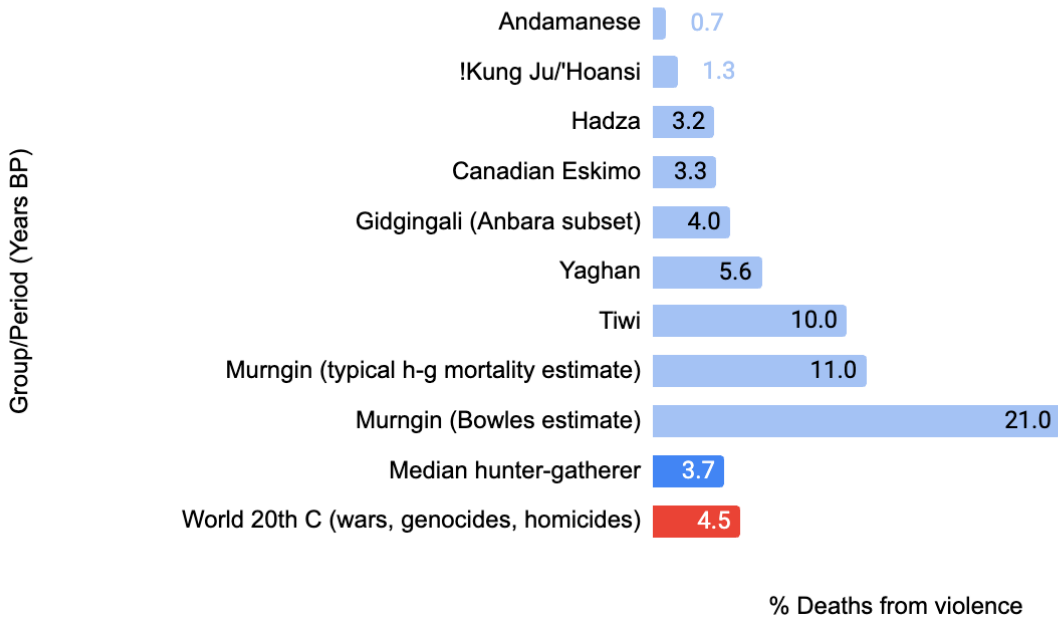
Source: [Hunter-gatherer spreadsheet, 'Deaths/100k ethnographic' tab](#)

The median here is 124 violent deaths per 100,000 per year.

The Kelly and Wragham et al (2006) data is presented in the form of annual violent deaths per 100,000 people (our preferred metric). However, it would also be useful to have this data presented in the form of % deaths due to violence, since many other sources use this metric. We've attempted to do this below, partly by using the data from Bowles (which is presented in this form), partly by revisiting the sources quoted in Kelly and Wragham et al to see if they present the data in this form, partly by checking other sources and, where all else fails, by crudely estimating the figure by using average hunter-gatherer mortality data.

The chart below shows the percentage deaths from violence among ethnographically-observed hunter-gatherers, and also the percentage deaths from violence in the 20th Century.

Violent death rates for Late Pleistocene Appropriate hunter-gatherers and for different time periods, ethnographic data



Source: [Hunter-gatherer data 'Ethno % deaths from violence'](#) tab

'% deaths from violence' is affected by the overall mortality rate/life expectancy in a population. Consider two societies, Society 1 has a high mortality rate and a life expectancy of 30, and Society 2 has a low overall mortality rate and a life expectancy of 100. Both have a '% deaths from violence' of 10%. But are they equally violent? No, you are actually considerably more likely to die violently in society 1.

This becomes important when comparing to periods in which the overall mortality rate is lower and life expectancies are higher, such as [after the Industrial Revolution](#). The fact that the 'violent deaths/total deaths' is higher in the 20th Century does *not* show that the 20th Century was more violent. Rather, it partly reflects the fact that overall life expectancies were higher in the 20th Century and so the overall mortality rate was lower.

It is possible to roughly calculate the percentage of deaths from violence in the 20th Century because we have data on the total number of births and deaths in the 20th Century, and on the violent death rate in the 20th Century. Our calculations are in the ['Adjusted archeology % deaths from violence'](#) tab in the google sheet.

The table below shows the sources and calculations for the hunter-gatherer figures.

Group	% of deaths from violence	Source
Andamanese	0.7%	Estimated from typical hunter-gatherer mortality rates*
!Kung Ju/'Hoansi	1.3%	Lee (2018)

Hadza	3.2%	Gurven & Kaplan 2007 ^{30**}
Canadian Eskimo	3.3%	Estimated from typical hunter-gatherer mortality rates ^{***}
Gidjingali (Anbara subset)	4%	Bowles (2009)
Yaghan	5.6%	Estimated from typical hunter-gatherer mortality rates
Tiwi	10%	Bowles (2009)
Murngin	11%	Estimated from typical hunter-gatherer mortality rates (preferred)
	21%	Bowles (2009) ^{****}
Median	3.7%	
Mean	4.9%	

*Gurven and Kaplan provide mortality rates for five hunter-gatherer societies (2007 Table 1). We've taken the society with the median rate of these five, which is 3,001 annual deaths per 100,000 as an estimate of a typical hunter-gatherer mortality rate. We've done this as we can't find annual mortality rates for the societies in question. Of course this method means that the data here for the Yaghan, Andamanese and Canadian Eskimo are very crude estimates

**The Hadza figure here comes from a different study to that which appears in the Kelly source, which explains the discrepancy between the Hadza data for deaths per 100,000 and % deaths from violence. We've chosen to use Kaplan and Gurven's figures as they state their data in the form % deaths from violence (the other source doesn't)

***We were unable to locate the original source for Canadian Eskimo so we're not sure if it's possible to provide a more accurate figure here using the original source

****We have doubts about the reliability of this figure. The source that Bowles states does not present data in the form of % deaths from violence and doesn't discuss total mortality so we're not sure how Bowles came up with this figure. If accurate, it suggests a total annual mortality rate of 1586/100,000 which seems very low, particularly given the high levels of violence in this society. This is significantly lower than the lowest hunter-gatherer society mortality rate in the Gurven and Kaplan study and would suggest a Murngin life expectancy of approximately 63 years. Therefore we find it preferable to use an adjusted figure estimated from typical hunter-gatherer mortality rates in calculating our mean value

These are the best estimates for rates of lethal violence in modern Late Pleistocene Appropriate hunter-gatherer societies that we know of. An obvious weakness regarding the reliability of this list is that only 8 societies are represented. Three of these societies are Australian; the Gidjingali, the Tiwi and the Murngin, so Australia is well represented here. One is South American, the Yahgan from the Southern tip of the continent, Tierra del Fuego. The Andamanese come from an island group in the Indian Ocean. There are two groups

³⁰ Gurven, Michael; Kaplan, Hillard (2007). *Longevity Among Hunter- Gatherers: A Cross-Cultural Examination.* , 33(2), 321–365. doi:10.1111/j.1728-4457.2007.00171.x

from Africa, the !Kung of the Kalahari desert and the Hadza from the Tanzanian savannah. The remaining group are the Canadian Eskimo from the Northern polar region.

It is notable that the Australian groups in the list have the 1st, 2nd and 4th highest lethal violence rates. This may be very significant because it is suggested that the Australian data is particularly valuable for reconstructing the pre-agricultural world due to the much shorter period of contact with agricultural societies at the time of study (Australia was pretty much a world of exclusively hunter-gatherers until contact with Europeans in recent centuries). Bear in mind, however, that all three Australian studies come from well after the initial contact period. Also it is problematic to have three Northern Australian societies represented in such a short list, creating a 'Galton's problem' - these three societies might share similar features because of cultural borrowing due to their geographical proximity (rather than revealing truths about typical hunter-gatherer lifestyles).

The geographic and ecological diversity here is broad considering how small the list is. This should be considered a strength of the list, because it is likely that pre-agricultural populations were extremely diverse in terms of their lifeways, geography and ecology given their 290,000 year history, geographical spread and the plasticity of human culture. The range in rates of lethal violence in modern Late Pleistocene Appropriate hunter-gatherers is considerable, ranging between 6.6 to 330 violent deaths per 100,000 people. Late Pleistocene Appropriate hunter-gatherer societies have the capacity to be extremely violent, extremely peaceful or somewhere in the middle. Therefore the ethnography indicates that there was probably great diversity in patterns of violence among pre-agricultural people.

We should emphasise that even though these societies have been classed as Late Pleistocene Appropriate, the methodological problems with extrapolating modern hunter-gatherer behaviour into the ancient past (discussed earlier) still apply to all these societies. None are 'living fossils'; all had complex histories involving varying degrees of contact with outside societies at the time of study, and they all live in a Holocene climate.

For example, having looked into the original source material a bit we found the following specific problems with the data presented above. This is by no means an exhaustive list, rather it is intended to demonstrate the types of methodological problems data like this presents.

1. The Yaghan data comes from a period of catastrophic population collapse; the population dwindled from around 3000 to about 400 around the period of study, likely as a result of contact.³¹
2. The Andaman data comes from a period of colonial influence by the British. Radcliffe-Brown explains that a man was imprisoned, then hanged for murder and that from that point forward no murders were committed.³² He also describes feuds

³¹ Cooper, JM (1917) .Analytical and critical biography of the tribes of Tierra del Fuego. Smithsonian Institute, Bureau of American Ethnology, Bulletin 63, US Government Printing Office, Washington DC p4

³² Radcliffe-Brown, A. R. (1922) The Andaman islanders. Cambridge, The University press, p. 49.

and raids that formerly occurred in the society but had largely disappeared by the time of the study period.³³

3. Lloyd Warner, who compiled the Murngin data, counted 100 deaths in warfare over a 20 year period but was sure he'd under-counted so he simply doubled the number to 200 in giving his final estimate.³⁴
4. The source for the Tiwi, which traces back to a quote from Arnold Pilling published in *Man the Hunter* refers to % deaths from warfare only among males in the 25-45 age group rather than in the population as a whole.³⁵
5. Frank Marlowe only included killings of Hadza by other Hadza, not by neighbouring groups, in his data on annual violent mortality.³⁶ The Hadza typically avoid conflict with the more powerful agricultural societies that surround them (this is also arguably the case for other groups in the sample eg !Kung). Obviously this does not reflect the situation in the pre-agricultural world, a world of only hunter-gatherers

Also included in the table above is data on rates of lethal violence in small-scale subsistence farming societies, which is taken from Wrangham et al, who use a larger dataset than the one Pinker used.³⁷ The median rate here is 595 violent deaths per 100,000 per year, which is 4.8 times higher than the Late Pleistocene Appropriate hunter-gatherer rate. This suggests that Pinker correctly identified a trend for higher rates of violence in other types of small-scale societies, though he underestimated the magnitude of the difference.

Violence in the 20th and 21st Century

The chart above includes the death rate in the 20th century from war, genocide and homicide. This overall estimate of 75 violent deaths per 100,000 people is a rough guesstimate. We have firmer data on the death rate from war and genocide, which accounts for 60 deaths per 100,000 people.³⁸ But we have been unable to find data on homicide deaths in the 20th Century. There is data for some Western European countries, where the rate was less than 10 per 100,000. The most violent countries in the world today, chiefly in

'This is in part due to the punishment with which they are now threatened by the Government but another cause is probably the breakdown of the old social organisation which has in this respect rather improved their morals than the opposite'.

³³ Ibid p85

³⁴ Warner, W. Lloyd (1931). Murngin Warfare. *Oceania*, 1(4), p482
.doi:10.1002/j.1834-4461.1931.tb00016.x

³⁵ Symposium on Man the Hunter, Lee, R. B., DeVore, I., & Wenner-Gren Foundation for Anthropological Research. (1966). *Man the hunter*. Chicago: Aldine Pub. Co. p158

³⁶ Marlowe, F. (2010). *The Hadza: Hunter-gatherers of Tanzania*. Berkeley: University of California Press. p141

³⁷ Wrangham, R.W., Wilson, M.L. & Muller, M.N. Comparative rates of violence in chimpanzees and humans. *Primates* 47, 14–26 (2006). <https://doi.org/10.1007/s10329-005-0140-1>. Wrangham says that his data only shows deaths from intergroup violence, but it seems to us that Wrangham is mistaken; for example, his !Kung data comes from Lee who explicitly attributes many of the deaths he recorded to intra-group murder. Kelly used the Standard Cross Cultural Sample to put the list together, but also includes other hunter-gatherer societies where good quality data exists (personal communication). Kelly, Robert L. (1995). *The foraging spectrum: diversity in hunter-gatherer lifeways*. Washington: Smithsonian Institution Press.

³⁸ Our World in Data, [Ethnographic and archaeological evidence on violent deaths](#) calculates this using Pinker's data.

Latin America, typically have rates around 30 homicides per 100,000 people.³⁹ So, we think it is unlikely that including data on homicides would increase global lethal violence rates by more than 30 per 100,000 people. We would guess that the true figure for the whole 20th Century is probably around 70 to 80 per 100,000 people.

The data that we have suggests that rates of lethal violence were lower in the 20th Century than among the hunter-gatherers in our sample.

However, there is one reason to think that this underestimates the true level of violence in the 20th Century: modern countries have much better medical treatment than hunter-gatherers. Harris et al (2002) argue that murder rates in the US would be three to five times higher if trauma care had stuck at 1960 levels.⁴⁰ We are not sure how much to rely on this study, but it is clear that pre-agricultural hunter-gatherers would have been much more likely to die from an episode of violence than people in industrial societies.

It seems plausible to us that if people in the 20th Century had pre-agricultural medical care, then the violent death rate would have been considerably higher. This confounding factor makes it difficult to establish which period was actually more violent.

The global death rate from lethal violence (including homicides and battle deaths) from 2000-2019 was markedly lower than the rate for all other groups and time periods studied. However, one caveat to this is that the 21st Century so far is only a small snapshot of time, and future catastrophes such as wars and genocides may drag up the rate of violence, as happened in the 20th Century. Indeed, future wars would be even more deadly than World Wars I and II due to nuclear weapons and other novel destructive weapons. [Leading estimates](#) put the risk of a war between the Great Powers in the next 30 years at around 1 in 10. So, it is hard to say whether the 21st Century as a whole will be less violent than ethnographically-observed hunter-gatherer.

1.4. The character of hunter-gatherer violence

Ethnography can also reveal useful insights about the typical character of hunter-gatherer violence. Typical patterns of violence among pre-agricultural appropriate hunter-gatherers show systematic differences from patterns of violence in other types of societies, mainly because of differences in their respective subsistence strategies, political organisation and demography. Therefore ethnography is useful in illuminating how patterns of pre-agricultural violence probably differed from agricultural societies.

³⁹ See Our World in Data, [Homicides](#).

⁴⁰ "Compared to 1960, the year our analysis begins, we estimate that without these developments in medical technology there would have been between 45,000 and 70,000 homicides annually the past 5 years instead of an actual 15,000 to 20,000." Anthony R. Harris et al., 'Murder and Medicine: The Lethality of Criminal Assault 1960-1999', *Homicide Studies* 6, no. 2 (1 May 2002): 130, <https://doi.org/10.1177/108876790200600203>.

Bruce Knauft here gives a summary of the typical character of violence in simple hunter-gatherer societies and how this contrasts with typical patterns of violence in other types of small-scale society (termed here 'middle-range' societies):

"In simple human societies, strong emphasis is placed on cooperative sociality both within and between flexibly constituted groups. Cultural values and behavior strongly indicate sharing of valuable food items and material property, flexible access to resources and extension of sociality through diffuse networks of classificatory kinship, namesake, totemic, and/or trade partnerships. Both within and between groups rates of aggression are low. The aggression that does occur however, has a relatively high probability of resulting in homicide, with dispute resolution measures other than dispersal undeveloped. Violence in simple human societies is generally unrelated to disputes over material property, territory, competitive leadership interests, status hierarchy or opposition between corporate or ethnic groups; it is often, if indirectly, related to sexual disputes. While adult male competition over sexual access to women is to a significant extent controlled by cultural rules of pair-bonded sexual union within extended multimale/multifemale social groups, disputes over sexuality, when they do erupt, often result in severe violence within the band or larger community. However the killings that result are often not an effective way to gain a new spouse or lover.

In middle-range societies, by contrast, violence is related to frequent disputes over male dominance and political status hierarchy and sometimes also to conflicts over property and territorial resources. Aggressively achieved male status domination is more likely to result in increased access to mates and/or polygyny. Middle-range societies also tend toward a strong ethic of competitive virility linked to positive evaluation of male assertiveness and aggression in gender relations, politics, and warfare. Violence between corporate or ethnic groups is more frequently collective, more often occurs between fraternal interest groups and is more frequently reciprocated in raiding or warfare than in simple societies. Ongoing blood feuds are relatively common.

All these features vary in complex ways and correlate with various social, structural and socialization factors."⁴¹

In the rest of this section we'll explore the evidence surrounding these claims and go into more detail about these characteristic features of simple hunter-gatherer violence.

A lot of the evidence here, like most ethnographic data, is based on qualitative observations by ethnographers rather than rigorous statistical methods (which are very difficult to implement in most ethnographic research contexts). Even things that look like proper statistics are often based on literature reviews of whatever ethnographers happened to write about. That's just the way it is. Ethnography is someone in a jungle desperately trying to be

⁴¹ Knauft, Bruce M. (1991). 'Violence and Sociality in Human Evolution' *Current Anthropology*, 32(4), 391–428. doi:10.1086/203975

everyone's friend in order to avoid starving to death or being eaten by a jaguar. It's a miracle there's any at all, in our opinion.

1.4.1. Relative lack of warfare compared to other small-scale societies

In 1996 Lawrence Keeley published *War before Civilization*, an investigation of warfare in small-scale societies. His conclusion that warfare was ubiquitous, endemic and very destructive in most of those societies reversed a trend in anthropology of ignoring the obvious evidence that war was not an invention of states. He found that only 12 of 90 sampled societies were found to engage in warfare 'rarely or never'. But, interesting for us, Keeley found that the real exceptions, representing only 5% of the sample, 'were some small bands of nomadic hunter gatherers and a few isolated horticultural tribes'.

"Truly peaceful agricultural societies appear to be somewhat less common than pacifistic hunter gatherers ... low density, nomadic hunter gatherers, with their few (and portable) possessions, large territories and few fixed resources or constructed facilities had the option of fleeing conflict or raiding parties... but with their small territories, relatively numerous possession, immobile and labour expensive houses, food stores and fields, sedentary farmers or hunter gatherers who attempted to flee trouble could lose everything and thereupon risk starvation."⁴²

Keeley's findings helped to spark a vigorous debate about the presence and extent of warfare among hunter-gatherers that is still ongoing. Some anthropologists, notably Douglas Fry and Richard Lee, take the view that warfare is actually quite rare among nomadic hunter-gatherers. Others like Steven LeBlanc argue otherwise. This is, in part, a semantic dispute about what should be termed 'warfare' in societies with very low populations, no official leaders and often fluid and changeable group affiliations. Nevertheless, the finding that a significant proportion of hunter-gatherer societies lack warfare as it is commonly understood, and that other types of small-scale societies are generally more warlike seems generally well-supported in the field of hunter-gatherer anthropology.

For example, Richard Lee, considered one of the founders of modern hunter-gatherer studies, writes that

"warfare, as commonly understood, is rare or uncommon in many hunting and gathering societies. Evidence for it and its dire effects becomes prevalent only with the dramatic changes brought about by the Neolithic Revolution ... living at very low densities, foragers had fewer things to fight over".⁴³

Fry (2006)

⁴² Keeley, Lawrence H. 1996. *War before civilization*. New York: Oxford University Press p31

⁴³ Lee, Richard B., Hunter-Gatherers and Human Evolution: New Light on Old Debates (October 2018). *Annual Review of Anthropology*, Vol. 47, pp. 513-531, 2018

Fry identified 28 nomadic hunter-gatherer societies and found that 20 of them (71%) did not have warfare, (though as mentioned above, his definition of warfare is heavily disputed).⁴⁴

Table 12.1 Fry's "simple" nomadic forager file

Group	Density per sq. km	Group Size	War?	Group	Density per sq. km	Group Size	War?
!Kung*	0.1–0.2	25	No	Siriono	0.41**	NA	No
Hadza*	0.15	18	No	Slave*	0.014	NA	No
Mbuti*	0.17	NA	No	N. Paiute*	0.013	NA	No
Semang*	0.05–0.19	20–30	No	Yahgan*	0.046	NA	No
Andamanese*	0.86	30–50	No	Yolngu/Murngin	0.05	NA	No
Veda*	NA	NA	No	Walbiri	0.01	NA	No
Tiwi*	NA	40–50	No	Gilyak*	0.192	NA	Yes
Aranda*	0.03	NA	No	Yukagir*	0.005	NA	Yes
Gugadja	0.057	NA	No	Ingalik*	0.025–0.040	50–100**	Yes
Copper Inuit*	0.012	15	No	Naskapi*	0.004	100–300**	Yes
Mardu	0.006	15–20	No	Micmac*	0.023	NA	Yes
Netsilik	0.005	24	No	Kaska*	0.001	NA	Yes
Paliyan	0.77	NA	No	Botocudo*	0.11	NA	Yes
N. Salteaux*	0.006	24	No	Aweikoma*	0.038	NA	Yes

*Cases also included in Fry and Söderberg (2013:271). NA indicates not available. Sources: Fry 2006: Chapters 8,12,16. Density values from Kelly (1995:222–6). **<http://dice.missouri.edu>. Group sizes from Kelly (1995:211; 2013:171).

Moreover, in a study of 148 lethal events distilled from 21 nomadic hunter-gatherer societies, Fry and Soderbergh found that 10 out of 21 societies in the sample had no cases that involved more than one killer.⁴⁵

Boehm (2013)

Using his list of Late Pleistocene Appropriate Societies, Boehm found a higher incidence of warfare than Fry and Soderbergh, with 59% of his societies having 'interband conflict', though he mentions that many of these were single acts of revenge rather than protracted warfare. This is still much lower compared to other small-scale societies.⁴⁶ Note that a number of societies that Fry/Soderbergh classed as not having warfare are classed as having warfare by Boehm, possibly due to differing definitions of 'warfare' in small-scale societies.

⁴⁴ Paul Roscoe has an updated version. Roscoe, Paul. "Foragers and War in Contact-Era New Guinea". In *Violence and Warfare Among Hunter Gatherers* edited by Mark W. Allen and Terry L. Jones, 223–40 Walnut Creek, CA: Left Coast Press, 2014

⁴⁵ Fry, D. P.; Soderberg, P. (2013). Lethal Aggression in Mobile Forager Bands and Implications for the Origins of War. *Science*, 341(6143), 270–273. doi:10.1126/science.1235675

⁴⁶ Boehm, C. (2013). The biocultural evolution of conflict resolution between groups. In D. P. Fry (Ed.), *War, peace, and human nature: The convergence of evolutionary and cultural views* (pp. 315–340). Oxford University Press

TABLE 16.1 Interband Conflict in 49 LPA Societies

Africa:	Dorobo, G/wi, Hadza, !Ko, !Kung, Naron
Arctic:	Copper, Coronation Gulf, Ingalik, MacKenzie Delta, Netsilik, Northwest Alaska, Nunamiut, Nunivak, Pacific, Polar, Quebec, Utku
Asia:	Jarawa, Manus
Australia:	Dieri, Euahlayi, Murngin, Pintupi, Tasmanians, Walbiri,
N. America:	Yumans
S. America:	Ona, Yahgan
Total = 29 (59%)	

However, Boehm also suggests that pre-agricultural hunter-gatherers probably experienced more inter-group conflict than modern ones:

“During that climatically unpredictable epoch our culturally-modern forbears probably would have been fighting more often as competing groups, especially at junctures when populations had had time to expand during good times and then rather quickly had to compete sharply for resources when drastically changing climates created abrupt down-turns in resources. Such junctures could have been fairly frequent, and, because at times they coincided with dangerous population bottlenecks, sporadically resource competition could have become seriously intensive ... it seems likely that well over half of all Late Pleistocene hunter-gatherers were to some degree fighting at the group level.”⁴⁷

He also points out that inter-group conflict among Late Pleistocene Appropriate foragers can sometimes be highly profitable for a winning group ‘in evolutionary terms of competition for individual (and group) reproductive success, in terms of both differential casualty rates and territorial/resource gains.’ p332 He finds that inter-group conflicts where a group ‘won’ are reported ethnographically in 8 of his 49 Late Pleistocene Appropriate societies (15%) p326.

Otterbein 1989

The study below from Otterbein attempts to quantify the relative lack of warfare among hunter-gatherers by comparison to other types of small-scale societies. Otterbein’s data on hunter-gatherers is not exclusively for pre-agricultural appropriate ones; one thing it does illustrate, though, is that hunter-gatherer societies that do engage in warfare typically do so less intensively than non-hunter-gatherer small-scale societies (Otterbein 1989).⁴⁸

⁴⁷ Boehm, C. (2013). The biocultural evolution of conflict resolution between groups. In D. P. Fry (Ed.), *War, peace, and human nature: The convergence of evolutionary and cultural views*. Oxford University Press (p326)

⁴⁸ Otterbein, K (1989), *The Evolution of War: a Cross-Cultural Study*, 3rd ed, New Haven, Conn: HRAF Press

Table 2.2 Subsistence Economy Versus Frequency of Warfare

<i>Economy</i>	<i>Warfare Frequency</i>			<i>Totals</i>
	<i>Continuous</i>	<i>Frequent</i>	<i>Rare/Never</i>	
Intensive agriculture	8 47.1%	8 47.1%	1 5.8%	17 100%
Shifting cultivation	12 85.7%	2 14.3%	0 —	14 100%
Animal husbandry	8 88.9%	0 —	1 11.1%	9 100%
Hunting-gathering	2 20.0%	5 50.0%	3 30.0%	10 100%
Total	30 60.0%	15 30.0%	5 10.0%	50 100%

Source: Otterbein 1989.

Ember and Ember 1997

Ember and Ember (1997) found that foragers in the ethnographic record had warfare fairly often on average but that they do seem to have had less than non-foragers.⁴⁹

Apostolou 2017

A more recent study by Apostolou echoed this finding, reporting that agricultural societies were 2.89 times more likely than hunter-gatherer societies to have ‘frequent or endemic’ warfare.⁵⁰

Warfare among sedentary hunter-gatherers

However, if sedentary hunter-gatherers are considered as pre-agricultural appropriate, the incidence of warfare among pre-agricultural appropriate societies would increase, because, as far as we are aware, all sedentary hunter-gatherers have warfare, as the table below shows.

⁴⁹ Ember, C.R. & Ember, M. (1997). Violence in the ethnographic record: Results of cross-cultural research on war and aggression. In: D.L. Martin & D.W. Frayer (eds.), *Troubled Times: Violence and Warfare in the Past*, pp. 1-19. London: Gordon & Breach.

⁵⁰ Apostolou, Menelaos. (2017). Implications of the Neolithic Revolution for Male-Male Competition and Violent Conflict. *The mankind quarterly*. 58. 10.46469/mq.2017.58.2.2.

TABLE 9.2 Societies listed in the Standard Cross-Cultural Sample by gross social type and presence/absence of warfare (from Fry, 2006, Table 8.3)

Foraging Social Type	Warfare Absent	Warfare Present
Egalitarian	Ju/'hoansi, Hadza, Aranda, Copper Inuit, Mbuti, Andamanese, Semang, Sauteaux, Vedda, Paiute, Tiwi, Yámana, Slave	Montagnais, Gilyak, Ingalik, Micmac, Botocudo, Kaska, Aweikoma, Yukaghir
Nonegalitarian		Bella Coola, Haida, Gros Ventre*, Yurok, Comanche*, Yokuts, Chiricahua*, Kootenai*, Tehuelche*, Twana, Klamath, Eyak, Eastern Pomo, Aleut

* = equestrian foragers.

Source: Kelly in Fry, war peace and human nature.

(In the table above all the nonegalitarian hunter-gatherers apart from the equestrian ones are sedentary or semi-sedentary).

Pre/early contact era Australian Aborigines – a convincing counter-example?

No hunter-gatherer society that has been properly studied ethnographically really lived completely untouched by the agricultural revolution. By definition, if you're watching them they are not 'hunter-gatherers in a world of hunter-gatherers'.

However, the pre-contact Australian aborigines are the closest thing you will get, although parts of the continent had been in contact with agricultural small-scale societies from New Guinea and elsewhere for at least hundreds of years. It is therefore arguable that evidence from pre/early contact Australia should supersede all other ethnographic evidence when it comes to extrapolating about pre-agricultural society.

The problem is that the limited number of accounts of these societies that do exist are arms-length observations from people who had no real knowledge of Aboriginal societies. By the time accounts from those with more first-hand experience of Aborigine society were being produced they had been in contact with Europeans for decades and their society was already going through a process of radical transformation (as an example, in these early years of contact Aborigines were often literally hunted like animals by Europeans, which must have had an effect on their relationships among themselves).

Nevertheless, these accounts are interesting, given that they date from, in some cases, only a few decades after the start of the colonial period in Australia and when European settlers were still confined only to certain parts of the continent. The anthropologist Mark Allen reports that a number of early contact sources record violence, early ethnographies record patterns of violence consistently and that important resources were owned by groups and defended by outsiders according to these accounts. The warfare was probably most intense

in the north of Australia, particularly in the Torres Strait area.⁵¹ Note that it often included hostilities against non-hunter gatherer groups from New Guinea.

A study by Colin Pardoe focuses on the Central Murray region towards the south of Australia, which is of particular interest for extrapolating to the pre-agricultural because it is a highly productive environment in contrast to the marginal environments observed hunter-gatherers typically occupy. According to Pardoe, early accounts report that

“battles between opposing groups ... were common ... Although fiercely fought, resulting in numerous injuries and an occasional death, the major purpose seems to have been conflict resolution to deal with any outstanding grievances between groups before ceremony and trade began ... Whereas public battles or the settlement of disputes by ordeal seldom resulted in death, secret revenge attacks and night raids by stealth were a major cause of death, both of individuals and groups.”⁵²

If this picture of pre-contact Australia is in fact accurate, it would constitute a strong challenge to the current consensus that hunter-gatherers are typically relatively unwarlike, since this would be an example of endemic warfare in a world dominated by hunter-gatherers. As noted previously, the three Australian societies in our ethnographic data sample (Gidjingali, Tiwi and Murngin) were the 1st, 2nd and 4th on the list for lethal violence rates, which possibly indicates that relatively high rates of warfare and violence in pre-contact Australia may have carried over deep into the contact era.

In fact Steven Le Blanc has argued that the evidence for significantly greater levels of pre-colonial/contact era violence and warfare among hunter-gatherers is not limited only to Australia but is actually a general rule for hunter-gatherers everywhere. His view is that more modern hunter-gatherers have lower rates of violence than their predecessors due to the influence of modern states on their lifeways⁵³.

As it stands, though, the evidence seems too patchy to be able to draw this conclusion with any degree of certainty. Note: even if the Australian evidence were to conclusively show that the pre-contact Aborigines regularly engaged in warfare this would not be necessarily inconsistent with the consensus that nomadic hunter-gatherers generally fight less than other small-scale societies. They might have fought more than most observed hunter-gatherers but still less than societies based on agriculture.

⁵¹ Allen, M. 2014. Hunter-Gatherer Violence and Warfare in Australia. In Allen, M.W., & Jones, T.L. (Eds.). *Violence and Warfare among Hunter-Gatherers* (1st ed.). Routledge. <https://doi.org/10.4324/9781315415970>

⁵² Pardoe, C. 2014. Conflict and Territoriality in Aboriginal Australia: Evidence from Biology and Ethnography. in Allen, M.W., & Jones, T.L. (Eds.). *Violence and Warfare among Hunter-Gatherers* (1st ed.). Routledge. <https://doi.org/10.4324/9781315415970>

⁵³ LeBlanc, Steven. 2014. Forager Warfare and Our Evolutionary Past. in Allen, M.W., & Jones, T.L. (Eds.). *Violence and Warfare among Hunter-Gatherers* (1st ed.). Routledge.

1.4.2. Why do nomadic hunter-gatherers have relatively low rates of warfare?

A number of factors likely explain the relatively low rates of warfare observed in nomadic hunter-gatherers (compared to other types of small-scale societies), which we've attempted to list below. In no particular order:⁵⁴

1. They rely on dispersed and (in the case of prey animals) moving resources which are difficult to monopolize through the use of force
2. They rely on a dispersed and diverse resource base which to some degree makes them less subject to sudden, intense resource shocks than farmers
3. They don't store much food or concentrate wealth and personal possessions so neighbouring groups have fewer incentives to attack them (whereas agriculturalists typically store food and build personal wealth)
4. They are nomadic so can avoid conflict through dispersal with relative ease (whereas sedentary populations are forced to 'stand and fight')
5. They benefit from a 'sharing economy' which often extends across large distances, meaning that it is economically advantageous to maintain relations with neighbours (whereas individual agriculturalists typically rely more on their own personal property/land for subsistence)
6. They live at low population densities so neighbouring groups are often distant, lessening opportunities for conflict (whereas agriculturalists often live very close or even border with neighbouring groups)
7. They generally exhibit weak and flexible group affiliations so collective group action is difficult to organize and transgressions are usually seen in individual rather than group terms (whereas agriculturalists typically exhibit strong group affiliations such as clans or descent groups)
8. They are usually 'acephalous' (leaders are absent or lacking in power) so collective group action is difficult to organize and they cannot be coerced to fight (whereas groups with dominant leaders can often be coerced to fight for the personal interests of the leader)
9. They are usually egalitarian so they don't have specialized 'warrior classes' or accord particularly high status to successful warriors (whereas agricultural societies often do)
10. Women have a relatively high degree of political influence and, being generally less aggressive, may exert their influence to reduce violence rates
11. Women have a relatively high degree of autonomy and freedom of movement reducing incentives for 'wife-capturing' (why bother to steal someone's wife if they can just walk home again the next day? Although it should be noted that the large distances between hunter-gatherer groups might offset this factor)

⁵⁴ Woodburn, James. 1982 'Egalitarian Societies.' *Man*, the Journal of the Royal Anthropological Institute, 17, no. 3: 431-51; Lee, Richard B., *Hunter-Gatherers and Human Evolution: New Light on Old Debates* (October 2018). *Annual Review of Anthropology*, Vol. 47, pp. 513-531, 2018; [Explaining Human Culture](#)

Note: we are not claiming that these factors consistently apply. For example, many nomadic hunter-gatherers do engage in wife-capturing and fight over resources. Rather, our claim is a relative one; these factors explain why warfare among nomadic hunter-gatherers is less than among farmers and sedentary hunter-gatherers

1.4.3. Implications of low rates of warfare for overall rates of violence

How, and to what degree, does a low incidence of warfare affect overall rates of lethal violence in small-scale societies? It seems obvious that a low incidence of warfare would correlate with relatively low rates of lethal violence overall. But is there actual evidence that this is the case?

In their study of 1,145 deaths across 44 lowland South American societies, Walker and Bailey attempt to address these questions. The study is not exclusively of hunter-gatherer societies, though several hunter-gatherer societies are included.⁵⁵ However, we're going to make do and assume the findings are relevant to hunter-gatherer societies. Walker and Bailey present data on the death rate from different types of conflict:

	# events	% events	Total deaths	% deaths	Median deaths	Mean deaths
Within village/community	51	21%	100	9%	1	2
Internal warfare (between communities in the same ethnolinguistic group)	131	55%	486	42%	2	3.7
External warfare (between ethnolinguistic groups)	56	24%	559	49%	2	10
Total	238		1145			

Source: adapted from Walker, R. S., & Bailey, D. H. (2013). Body counts in lowland South American violence. *Evolution and Human Behavior*, 34(1), Table 2. <https://doi.org/10.1016/j.evolhumbehav.2012.08.003>

As this shows, across all societies, the vast majority of violent deaths are caused by warfare. Warfare events are also much more lethal than 'within village' events. External warfare in particular has a heavy tail - most of the deaths are driven by a few particularly violent conflicts (which is why mean deaths per event are so much higher than median deaths per

⁵⁵ Walker, R. S., & Bailey, D. H. (2013). Body counts in lowland South American violence. *Evolution and Human Behavior*, 34(1), 29–34. <https://doi.org/10.1016/j.evolhumbehav.2012.08.003>. The very high rates of violent death you can see in Table 1 (avg. 30.4%) are not necessarily typical of small-scale societies globally. It is common for Amazonian societies (as most of these are) to have higher average rates of violence than other small-scale societies.

event). This likely understates the effect of warfare because the data only includes 'indigenous on indigenous' killings, meaning that many deaths resulting from conflict with non-indigenous groups (in other words many additional examples of External Warfare) were excluded.

Most lethal violence events in small-scale societies take the form of raids and sneak attacks (rather than, for example, pitched battles). Interestingly, the study showed that attackers were rarely killed; only 2% of the lethal events involved the death of an attacker. This demonstrates how skewed the advantage is to the offensive side in small-scale society conflicts, with crucial implications for human attitudes to violence.

The motives for killings were:

- Revenge for previous killings or other wrong-doings like adultery or sorcery (70% of responses).
- Jealousy over women (18% of responses).
- Gain of captive women and children (7% of responses).
- Fear or deterrence of an impending attack (3% of responses),
- Theft of material goods (2% of responses).

The only group in this sample that lacks warfare are the Tsimane. Notably, they exhibit by far the lowest overall rates of lethal violence, 6%; the next lowest rate is 16%. This suggests that we should expect overall lethal violence to be significantly lower in societies that lack warfare. If pre-agricultural societies indeed lack warfare, then we should expect them to have lower rates of violence overall, other things equal.

1.4.4. Summary of ethnographic findings on warfare

1. There are issues with how the term 'warfare' should be defined in the context of nomadic hunter-gatherer societies with small, dispersed populations and often fluid notions of group identity
2. The incidence of warfare among nomadic hunter-gatherers is highly variable; some never engage in warfare, some have endemic warfare and some have sporadic warfare
3. The evidence from contact-era Australia seems to suggest high rates of warfare by comparison with other nomadic foragers. This is significant as these were the closest ethnography gets to 'hunter-gatherers in a world of hunter-gatherers'; however there are issues with the reliability of these accounts
4. Nomadic hunter-gatherers generally have significantly lower rates of warfare than other types of small-scale society, such as sedentary hunter-gatherers and agriculturalists. There seem to be good, intuitive reasons to explain this based on the respective political and economic organisations of these societies
5. Small-scale societies without warfare tend to have significantly lower rates of overall lethal violence, primarily because warfare in small-scale societies is so destructive.

1.5. Most violence is very ‘personal’ in nature

If we accept the median view among anthropologists that hunter-gatherers are relatively unwarlike compared to other small-scale societies, this would lead us to conclude that most violence among hunter-gatherers is interpersonal (not intergroup). But what do we know about the nature of this interpersonal violence?

In their investigation of lethal events in nomadic hunter-gatherer societies, Fry and Soderberg found that 55 percent of lethal events involved only one perpetrator killing one victim. They catalogued the motivation for these 148 lethal events which are as follows (Fry & Soderberg 2013):⁵⁶

Table 1. Reasons for lethal aggression, from the personal to the communal. The atypical Tiwi findings are shown separately, followed by the other societies minus the Tiwi ($n = 20$), and the entire sample ($n = 21$), all in number of cases (with percentages in parentheses). A more detailed version of the table with case numbers for lethal aggression events is presented in table S3.

Reason	Tiwi only		All others		Total sample	
Interpersonal events	24	(34.8%)	50	(63.3%)	74	(50.0%)
Revenge against a particular killer(s)	9	(13.0%)	8	(10.1%)	17	(11.5%)
Over a particular woman	8	(11.6%)	6	(7.6%)	14	(9.5%)
Over a particular man	0	(0.0%)	1	(1.3%)	1	(0.7%)
Husband kills wife	2	(2.9%)	7	(8.9%)	9	(6.1%)
Wife kills husband	0	(0.0%)	0	(0.0%)	0	(0.0%)
Miscellaneous interpersonal disputes*	5	(7.2%)	28	(35.4%)	33	(22.3%)
Interfamilial feud	0	(0.0%)	6	(7.6%)	6	(4.1%)
Within-group execution	0	(0.0%)	3	(3.8%)	3	(2.0%)
Execution of outsiders	4	(5.8%)	3	(3.8%)	7	(4.7%)
Intergroup events	38	(55.1%)	12	(15.2%)	50	(33.8%)
Over borders/resources (e.g., fruit tree)	0	(0.0%)	2	(2.5%)	2	(1.4%)
Theft of women from another group	0	(0.0%)	2	(2.5%)	2	(1.4%)
Interclan revenge-seeking	17	(24.6%)	0	(0.0%)	17	(11.5%)
During a general fight	4	(5.8%)	0	(0.0%)	4	(2.7%)
Miscellaneous intergroup disputes*	17	(24.6%)	8	(10.1%)	25	(16.9%)
Accident	3	(4.3%)	3	(3.8%)	6	(4.1%)
Starvation cannibalism	0	(0.0%)	2	(2.5%)	2	(1.4%)
Grand total	69	(100%)	79	(100%)	148	(100%)

*For a listing of miscellaneous events, see table S3.

From this list they conclude that “most reasons for killing are very personal, involving sexual rivalries, jealousies, quarrels, and vengeance as well as in-group executions, accidents, wife-killings, and revenge-based feuding”. It is certainly true that the motives of fighting over women and revenge are regularly commented on by ethnographers of hunter-gatherer (and of course other) societies. For example, John and Christyann Darwent note that in Inuit

⁵⁶ Fry, D. P.; Soderberg, P. (2013). Lethal Aggression in Mobile Forager Bands and Implications for the Origins of War. *Science*, 341(6143), 270–273. doi:10.1126/science.1235675

societies murders were usually about revenge or, as the famous Inuit ethnographer Rasmussen put it, “were invariably about a woman”.⁵⁷ In a database of over 1000 military actions of small-scale societies in New Guinea, 61% were motivated by revenge.⁵⁸

The highly individualistic character of interpersonal violence in hunter-gatherer societies contrasts with other types of small-scale societies, where violence is typically more ‘collective’ in character (involving wider kin-groups for example). Ericksen and Horton looked at different responses to perceived transgressions in all the 186 societies in the Standard Cross-Cultural Sample. They classed responses into three categories; self-redress, kin-group based vengeance and formal adjudication mechanisms. They conclude that “individual self-redress is more typical of egalitarian hunter-gatherer political economies ... conflicts must be resolved by individuals themselves” calculating that this form of conflict resolution was nearly seven times more likely to be used in hunter-gatherer societies than in other types of societies.⁵⁹

This pattern of individualistic violence seems to be largely a consequence of the highly egalitarian political organisation of these societies, as Fry points out.

“In nomadic band society, each person exercises a high degree of personal autonomy. Authority is minimal and leadership is weak: no one has the authority to adjudicate disputes or hand down enforceable judgments, nor does anyone have the authority to order others into combat. A further ramification of high personal autonomy in band society is that each individual is largely left up to his or her own devices in pursuing personal grievances. Additionally, patrilineal and matrilineal kin segments usually are lacking, and this is one of several factors that works against the development of social substitutability and kin-based collective military action.”⁶⁰

Christophe Boehm argues that violence, particularly retaliatory violence, is actually crucial to preserving the political egalitarianism and personal autonomy that hunter-gatherers characteristically value so highly. With his theory of Reverse Dominance Hierarchy Boehm showed how hunter-gatherers (and other types of politically egalitarian society) form coalitions to actively suppress the power of domineering individuals, through both non-violent and violent methods⁶¹.

Late Pleistocene appropriate foragers live in small, multifamily egalitarian bands, and, although they certainly compete for mates and food, they are militant about not allowing male competition to develop into the kind of general dominance that is sought through alpha-male behavior in the two Pan species. This is because the type of antihierarchical subordinate coalition that is found in bonobos and chimpanzees

⁵⁷ Darwent, C & Darwent, J. 2014. Scales of Violence across the North American Arctic. In Allen, M.W., & Jones, T.L. (Eds.). *Violence and Warfare among Hunter-Gatherers* (1st ed.). Routledge. p186

⁵⁸ Paul Roscoe, Personal Communication.

⁵⁹ Ericksen, K. P.; Horton, H. (1992). "Blood Feuds": Cross-Cultural Variations in Kin Group Vengeance. *Cross-Cultural Research*, 26(1-4), 57–85 doi:10.1177/106939719202600103

⁶⁰ Fry, D. P. (2007). *Beyond war: The human potential for peace*. Oxford University Press p97

⁶¹ Boehm, C. (1993). Egalitarian behavior and reverse dominance hierarchy. *Current Anthropology*, 34(3), 227–254. <https://doi.org/10.1086/204166>

emerges much more definitively in human foragers, where it results in significant reproductive leveling. In these foragers, the virtual elimination of alpha-male behavior is possible because rebellious political coalitions are able to act efficiently on a moral basis, with a conscience-based sense of right and wrong as a political catalyst that intensifies negative group reactions against personal self-aggrandizement. In addition, both conflict and group-sponsored conflict management are vigilantly mediated by such moral concerns, which cannot be readily discerned in either chimpanzees or bonobos and therefore are likely not ancestral but derived.⁶²

Ethnographers often draw attention to a pervasive ethic of non-violence among hunter-gatherers. Richard Lee, for example, writes:

“with a few exceptions (for example, Ache´ and some Australian groups), nomadic foragers rarely glorify the warrior or confer any special status. On the contrary, the peacemakers are regarded as specially valued individuals. [Historically Nomadic Foragers] practice modes of conflict resolution, including song duels and other forms of ritualized combat, and especially group fission as a means of separating parties in conflict.”⁶³

This might seem suspiciously counter-intuitive given some of the high figures for homicide rates above. However, Boehm points out how the egalitarian political organisation of hunter-gatherers creates this dynamic:

Basically, no male intimidation or bossing of other males is countenanced and a striking personal benefit of living in an egalitarian society is very substantial and valued adult male (and often female) personal autonomy. For the group, a signal disadvantage is the absence of leaders strong enough to step in and damp conflicts—usually ones between males over women—before they get out of hand. Because these societies use avoidance to resolve this problem, if there is a homicide within a band, the usual practice is for the killer to quickly leave the band and to hopefully seek refuge with relatives in a faraway band. The alternative is to stay in place and likely suffer retaliatory killing by the victim’s relatives, which sometimes leads to further killing and to chains of homicide⁶⁴

Similarly in a 1987 article Knauft explains how societies with a strong ethic of anti-violence and social harmony can nevertheless be violent.

“Politically, there is a strong drive to preclude male status inequalities and a general absence of male status hierarchy. Because egalitarianism and communal cooperation are genuine and deeply valued, there are long periods of interpersonal harmony and communal good company ... on occasion however bald contention

⁶² Boehm , C. (2012a). Ancestral hierarchy and conflict . *Science* , 336 , 844–847 .

⁶³ Lee, Richard B., Hunter-Gatherers and Human Evolution: New Light on Old Debates (October 2018). *Annual Review of Anthropology*, Vol. 47, pp. 513-531, 2018

⁶⁴ Boehm , C. (2011). Retaliatory violence in human prehistory . *British Journal of Criminology* , 51 , 518–534.

arises unexpectedly, suddenly and/or over some delimited issue often out of proportion to the social event that triggered it. ... once this level of control is breached the engagement threatens lethal violence. This threat is exacerbated by the absence of political leaders or authority figures who might exercise control and of institutional or formal redress.⁶⁵

He says that this pattern of violence is quite different from that found in agropastoral societies. Small-scale farmer societies often exhibit a 'warrior culture'. Apostolou, measuring the 'prestige' of warriors, found the agropastoral societies were 5 times more likely to afford warriors 'middle to high prestige' rather than 'low prestige'.⁶⁶

We also think it is important to consider the role of outlier personality types in driving violence rates in these societies, particularly given the typically 'individualistic' nature of hunter-gatherer violence. While as far as we can see this is a topic that is somewhat under-explored in the literature so far on hunter-gatherers (and in small-scale societies more generally), Richard Lee's study of homicide among the !Kung is potentially illuminative. Lee documents 22 instances of homicide; of these, 6 were perpetrated by just two men, who were themselves killed in retaliation. In fact, 11 of the 22 homicides (50%) were either directly or indirectly related to these two individuals, who Lee variously describes as 'notorious,' 'dangerous,' and 'possibly psychotic.'⁶⁷

It seems evident from Lee's account that these individuals were anti-social and atypical. Of course, it may also be the case that many of the other, less prolific !Kung killers were also outlier personality types. Therefore, at least in this hunter-gatherer society, it looks like outlier personality types are driving the homicide rate to a considerable degree. If this pattern is also true of other hunter-gatherer societies (not sure as haven't found more on this subject) it has great implications for the question 'how violent are humans?', suggesting as it does that atypically violent individuals might be distorting our overall picture of the propensity of more typical individuals to violence.

As Boehm notes, such individuals usually don't go unpunished; many hunter-gatherer societies demonstrate 'the willingness to kill in the name of saving the group from a serious deviant'.⁶⁸ In other words they practice socially sanctioned capital punishment, as you can see in Fry and Soderberghs list of reasons for lethal events, where 6.7% of the events were executions. Boehm found reports of capital punishment from nearly 50% of his Late Pleistocene Appropriate societies⁶⁹.

⁶⁵ Knauff, B.. (1987). 'Reconsidering Violence in Simple Human Societies: Homicide among the Gebusi of New Guinea', *Current Anthropology*, 28(4), 457–500. <http://www.jstor.org/stable/2743485>

⁶⁶ Apostolou, Menelaos. (2017). Implications of the Neolithic Revolution for Male-Male Competition and Violent Conflict. *The mankind quarterly*. 58. 10.46469/mq.2017.58.2.2.

⁶⁷ Lee, Richard B. 1979. *The !Kung San: men, women, and work in a foraging society*. New York: Cambridge University Press p383

⁶⁸ Boehm, C. (2011). Retaliatory violence in human prehistory. *British Journal of Criminology*, 51, 518–534.

⁶⁹ Boehm, Christopher (2014). *The moral consequences of social selection*. *Behaviour*, 151(2-3), 167–183. doi:10.1163/1568539x-00003143

The parallels to homicide in our own society, where violence (not including warfare) is also highly individualistic and is similarly inflicted by sociopathic personality types at a rate vastly disproportionate to their prevalence in the population, is striking.

Another point about observed hunter-gatherer patterns of violence is that hunter-gatherers often use violent ritual contests to resolve disputes (agropastoralists also do this). This insight could well be useful in interpreting some pre-agricultural archeological data, as will be discussed later.

For example, Edward Curr a settler who spent almost 10 years in the Central Murray region of Australia in the late 19th century, wrote a detailed account of formal single combat between a young Bangerang (Yorta Yorta) warrior and a Ngooraialum man from a neighboring tribe who had insulted him.

“This took the form of a stylized duel, each combatant in turn throwing several reed spears or boomerangs until the old men in the camp intervened, inviting the combatants to conclude the business with shields and waddies (clubs). After an appropriate time had elapsed, friends on both sides intervened and stopped the fight, as both fighters had suffered blows to the head, and blood was flowing freely.”⁷⁰

To give a few more examples, among the Netsilik Inuit two competitors take turns hitting each other on the forehead or shoulders until one man gives up. The Waramanga of Australia have a fire ritual for settling disputes between two men; accompanied by several supporters, the opponents rush at each other with flaming torches, trying simultaneously to strike their adversaries and to ward off blows. And grievances between Siriono men of South America are often settled through wrestling matches.⁷¹ It is unusual for people to actually die in these socially sanctioned and mediated types of engagements, though it does happen.

1.6. The variability of violence among observed hunter-gatherers

In the previous sections we've attempted some generalizations about hunter-gatherer violence. However, while we think these are broadly valid, it is important that they don't mask the great diversity in patterns of violence among hunter-gatherer societies. This diversity is unsurprising; although we've drawn attention to some common features of nomadic hunter-gatherer societies, in reality they are very diverse in many ways, and violence is no exception⁷².

⁷⁰ Pardoe, C. 2014. Conflict and Territoriality in Aboriginal Australia. In Allen, M.W., & Jones, T.L. (Eds.). *Violence and Warfare among Hunter-Gatherers* (1st ed.). Routledge. (p117)

⁷¹ Fry, Douglas & Szala, Anna. (2013). The Evolution of Agonism: The Triumph of Restraint in Nonhuman and Human Primates. In D. P. Fry (Ed.), *War, peace, and human nature: The convergence of evolutionary and cultural views* (p 464). Oxford University Press

⁷² Kelly, R. L. (2013). *The Lifeways of Hunter-Gatherers: The Foraging Spectrum*. Cambridge: Cambridge University Press. p2

Take our sample of 8 foraging societies we used for our lethal violence data. This sample was assembled based on particular pre-agricultural appropriate features; it is a long way from representing the full diversity of ethnographically observed hunter-gatherers. Despite this, the range in the data we found was huge. The Hadza (Tanzania) have an annual violent mortality rate of 6.6, one fiftieth the Murngin (Australia) rate of 330. The other societies on the list are scattered across the range and it is hard to discern a clear pattern (although the Murngin are something of an outlier, their rate being almost double the next highest rate).

Regarding warfare, of the 8 societies considered in our data patterns of inter-group conflict are again very varied. Whereas some of them are often classed as not having warfare (Hadza, !Kung) some have sporadic inter-group conflict (Andamanese, Tiwi) while warfare among the Murngin was more endemic.

Writing of nomadic foragers more generally, Douglas Fry notes:

A point to highlight is the variability among simple nomadic foragers regarding aggressiveness. The Paliyan exhibit extremely low levels of physical aggression, the Montagnais-Naskapi and the Siriono are slightly more aggressive but still rather peaceful, and the Ju/'hoansi and the Netsilik, while not overly violent on a daily basis, nonetheless are markedly more prone to periodic lethal violence than are the first three societies.⁷³

The variation in patterns of violence between hunter-gatherer populations is well-illustrated in the work of Knud Rasmussen who travelled widely among the Inuit in North America in the early 20th century.

Rasmussen, in his travels across Arctic America, was particularly struck by the change he experienced from east to west in the level of trust and openness among Inuktitut-speaking peoples. There was much more distrust and propensity to warlike behavior in the west than the east, an observation that is supported by similar observations by Beechy (1831). What was striking to Rasmussen was the cultural emphasis on war in the west: young men were specifically trained to be warriors, and there was admiration for those who participated in larger-scale violence and were good killers. This was in contrast to the east, where there was no preparation or training for war among the young men; rather, skill as a hunter was revered above all and there was no exaltation of men who killed others.⁷⁴

Another example of variability comes from Australia. As we've noted, Australian hunter-gatherers generally seem to exhibit higher rates of violence than are found in hunter-gatherer societies elsewhere. However, Allen gives a counter-example:

⁷³ Fry, D. P. (2007). *Beyond war: The human potential for peace*. Oxford University Press. p165

⁷⁴ Darwent, C & Darwent, J. 2014. Scales of Violence across the North American Arctic. In Allen, M.W., & Jones, T.L. (Eds.). *Violence and Warfare among Hunter-Gatherers* (1st ed.). Routledge. p187

The Western Desert was an exception to the rule of endemic warfare. Territorial boundaries were permeable among groups speaking mutually intelligible dialects and linked closely to Dreamtime pathways.⁷⁵

The case of the Walbiri Australian aborigines offers another instructive example of variability in hunter-gatherer violence. Mervyn Meggitt explains how they are surrounded by various culturally distinct neighbours and describes how their relations with each group fall across a wide spectrum from friendship to enmity; 'some they regard as friends and relatives, some as traditional enemies and towards others they remain neutral.'⁷⁶

The character/form that violence takes also differs dramatically between hunter-gatherer societies; violence is always expressed in culturally specific ways. This often leads to patterns of violence that are very significant in one society yet are not commonly shared by hunter-gatherer societies as a rule.

To give a couple of examples; the Ache (Amazonia) have extremely high rates of child homicide (as distinct from infanticide). 14% of males and 23% of females are killed before the age of 10, most of them after infancy⁷⁷. This is partly because of their practising child sacrifice as part of mortuary rituals (warning: don't read Ache ethnographies if you have not got a strong stomach!) Yet this dramatic (and distressing) phenomenon is not evident to remotely the same degree in any other hunter-gatherer ethnography we've seen.

Meanwhile the Netsilik Inuit (Canadian Arctic) seem to exhibit high rates of murder associated with wife-capture (though the author doesn't give concrete figures). This is probably mainly because of a large sex imbalance (1.31 men for every 1 woman) leading to unusually intense competition over women⁷⁸. Yet although there are sex imbalances in other hunter-gatherer societies these very high gender imbalances are not typical of hunter-gatherers generally.

Or, moving to Australia, the Tiwi experience great inter-generational conflict because of a gerontocratic social organization that is highly atypical of hunter-gatherers generally. In this very polygynous society the older men are able to monopolize women to the point that almost no men are able to acquire wives before the age of 30 (consider that the average life expectancy in hunter-gatherer societies is often no higher than this and that only 29% of the men in the study were over this age)⁷⁹.

Also, we know that patterns of violence *within* hunter-gatherer societies fluctuate over time. For example, as we've noted the Western Arctic populations were described as very warlike

⁷⁵ Allen, Mark W. 2014. Hunter-Gatherer Violence and Warfare in Australia. In Allen, M.W., & Jones, T.L. (Eds.). *Violence and Warfare among Hunter-Gatherers* (1st ed.). Routledge. p105

⁷⁶ Meggitt, Mervyn J. (1962). *Desert people : a study of the Walbiri Aborigines of Central Australia*. Sydney : Angus and Robertson p35

⁷⁷ Hill, Kim, and A. Magdalena Hurtado. 1996. *Aché life history: the ecology and demography of a foraging people*. New York: Aldine de Gruyter. p437

⁷⁸ Balikci, Asen. & American Museum of Natural History. (1970). *The Netsilik Eskimo*. Garden City, N.Y : Natural History Press for the American Museum of Natural History p147

⁷⁹ Hart, C. W. M., & Pilling, A. R. (1960). *The Tiwi of North Australia*. New York : Holt, Rinehart and Winston p60

by Rasmussen. Yet apparently they transformed into a very peaceful society in the space of a few decades. Radcliffe-Brown also documented a drop in homicide rates over time among the Andaman Islanders⁸⁰. There seems to have been a similar drop among the !Kung⁸¹, Inuit and Ache⁸²; in fact this appears to be a common pattern among hunter-gatherers.

However, we haven't been able to find useful ethnographic examples of significant long term changes in violence patterns which might be relevant to the pre-agricultural; this is because any changes observed always seem to be associated with the abandonment of traditional lifeways and acculturation into state society (the fact that the typical pattern appears to be a *reduction* in violence following acculturation problematizes the finding from our pre-agricultural ethnographic sample that they may have been less violent than 20th century state societies globally).

Nevertheless, there is archeological evidence which indicates that violence within hunter-gatherer societies fluctuates over time even when states aren't getting involved. For example, consider this data from hunter-gatherers of California over the last 5,000 years, which shows different rates of trophy-taking, sharp-force and blunt force trauma during different time periods:⁸³

⁸⁰ Radcliffe-Brown, A. R. (1922) *The Andaman islanders*. Cambridge, The University press. p49

⁸¹ Kelly, R. L. (2013). *The Lifeways of Hunter-Gatherers: The Foraging Spectrum*. Cambridge: Cambridge University Press. p203

⁸² Hill, Kim, and A. Magdalena Hurtado. 1996. *Aché life history: the ecology and demography of a foraging people*. New York: Aldine de Gruyter. p168

⁸³ Schwitalla, Al W.; Jones, Terry L.; Pilloud, Marin A.; Codding, Brian F.; Wiberg, Randy S. (2014). Violence among foragers: The bioarcheological record from central California. *Journal of Anthropological archeology*, 33(), 66–83.doi:10.1016/j.jaa.2013.11.004

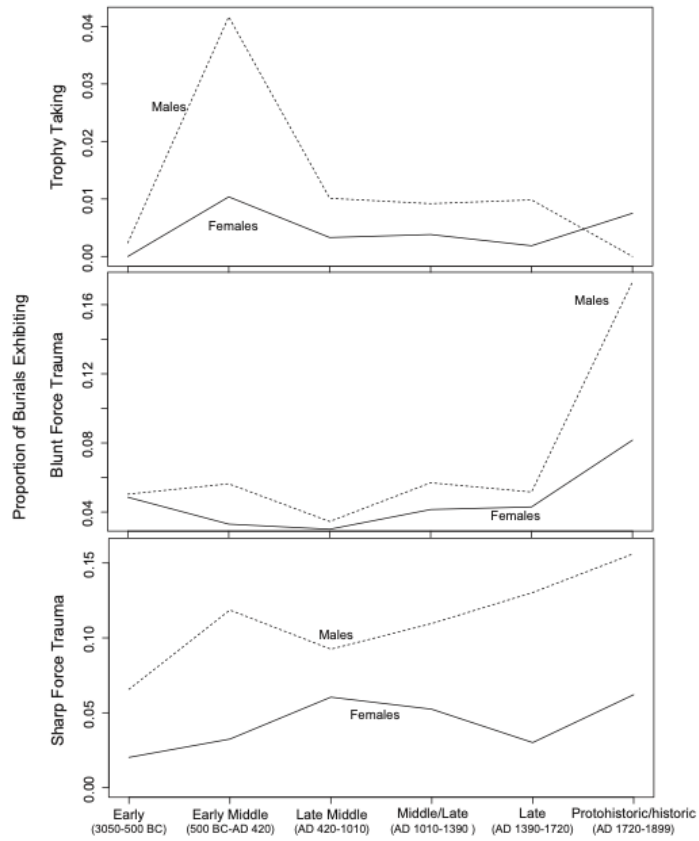


Fig. 8. Relative frequency of trophy-taking/dismemberment, blunt force trauma, and sharp force trauma through time for males and females in central California.

Or this showing projectile wounds over time among hunter-gatherers in the Santa Barbara channel:⁸⁴

⁸⁴ Brill, James M. 2014. The Technology of Violence and Cultural Evolution. In Allen, M.W., & Jones, T.L. (Eds.). Violence and Warfare among Hunter-Gatherers (1st ed.). Routledge. p329

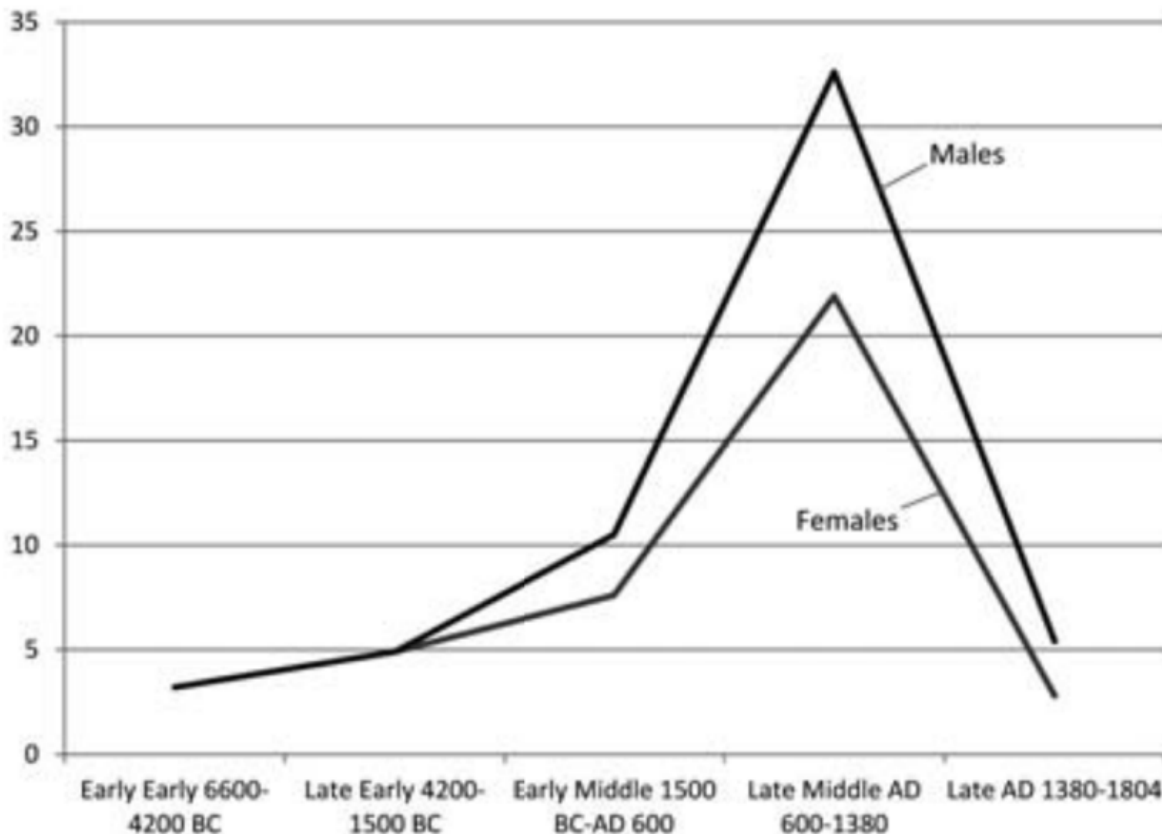


Figure 17.5 Sex distribution of people with projectile wounds (from Lambert 1994:137).

It is beyond the scope of this study to attempt to explain all this variation at all systematically by delving into the potential factors affecting rates of violence in hunter-gatherer societies. However, plausible important factors suggested by other authors are: degree of sedentism, climatic instability, resource stress, cultural diversity, population density, technological advances, degree of hierarchy, political role of women and ecological niche occupied.

While we're not going to comment on the likely importance of these factors, what seems certain is that all would have varied among pre-agricultural populations just as they do among ethnographically observed hunter-gatherers. In fact the Pleistocene was generally a time of greater climatic instability than the Holocene, biodiversity was greater (many animals on which pre-agricultural hunter-gatherers depended are now extinct) and hunter-gatherers were not confined to isolated regions by farmers so perhaps hunter-gatherer diversity was even greater then. Certainly, the expectation should be that, just as with ethnographically observed hunter-gatherers, rates of violence varied greatly in pre-agricultural populations.

1.7. Infanticide

One type of violence that is very difficult to quantify is infanticide. It is a difficult topic to study; it might possibly be dramatically under-reported in the literature (largely because informants usually don't talk about it) and may actually constitute the most significant form of lethal

violence in hunter-gatherer societies. Joseph Birdsell, for example, speculated that infanticide could have occurred at rates of between 15-50% in the Pleistocene⁸⁵

Hill and Hurtado made detailed investigations of the issue among the Amazonian Ache, where it is widespread; they calculated that 5% of children were killed in their first year of life.⁸⁶ Hill, Hurtado and Walker also found high rates among the Hiwi, where 40% of female and 14% of male infants died violently.⁸⁷ There is also interesting data on Canadian Eskimo infanticide, whose results are clearly visible because victims were mainly female, a practice that led to significant sex imbalances in the population of several groups. The Netsilik had a ratio of 1.38:1 men:women; the Copper 1.31:1. By contrast, the non-practicing Igiulik had a ratio of 0.9:1.⁸⁸

Infanticide varies dramatically across different hunter-gatherer societies and other hunter-gather specialists have retorted that the very high levels of infanticide exhibited by the Ache and Canadian Eskimo are atypical of hunter-gatherers. For example, Howell found a rate of 1.2% for the !Kung⁸⁹ and one sample of 34 foraging groups found that less than half practised infanticide.⁹⁰

The issue of infanticide problematizes our data. As far as we know, none of the studies we've used for our sample of lethal violence rates in pre-agricultural appropriate hunter-gatherers included infanticide in their data.

Theoretically though, should infanticide figures be grouped with the other types of lethal violence we're counting (if it were possible to do so)? There is an issue of interpretation here. Many hunter-gatherers essentially use infanticide as a form of birth control; the only one available to them. Many of these infants are killed because their parents lack the resources to take care of them so they might have died anyway. Infanticide seems categorically very distinct from the other forms of lethal violence we've discussed and could arguably be held separate from them (as it is by most anthropologists as far as we can see).

Fortunately we don't need to actually take a position on this issue here; even if we wanted to, we wouldn't be able to include infanticide in our data without just taking wild guesses as we don't have the figures we need. It is also worth noting that primatologists and other ethologists routinely distinguish infanticide from 'adulticide' on the basis that they have different evolutionary grounds.

⁸⁵ Birdsell, Joseph, B. (1986). "Some predictions for the Pleistocene based on equilibrium systems among recent hunter gatherers". In Lee, Richard & Irven DeVore (ed.). *Man the Hunter*. Aldine Publishing Co. p. 239.

⁸⁶ Hill, Kim, and A. Magdalena Hurtado. 1996. *Aché life history: the ecology and demography of a foraging people*. New York: Aldine de Gruyter. p437

⁸⁷ Kim Hill; A.M. Hurtado; R.S. Walker (2007). High adult mortality among Hiwi hunter-gatherers: Implications for human evolution. , 52(4), 443–454.doi:10.1016/j.jhevol.2006.11.003

⁸⁸ David Riches (1974). The Netsilik Eskimo: A Special Case of Selective Female Infanticide. *Ethnology*, 13(4), 351–361.doi:10.2307/3773051

⁸⁹ Howell, N. 1979. *Demography of the Dobe !Kung*. New York: Academic Press.

⁹⁰ Morales, T. 1987. An Examination of Infanticide Practices among Mobile and Sedentary Hunter-gatherers. *Haliksa'i: University of New Mexico Contributions to Anthropology* 6:1-19.

It should be noted that infanticide is also difficult to study and quantify in other types of society, including in state societies both historical and modern, where it is also under-reported though surely not to the same extent. Certainly infanticide would also have been practiced in early agricultural societies. If we were to adjust our lethal violence data by adding infanticide figures to it, for comparative purposes we would also have to consider how to make the same adjustment for our other time-periods.

1.8. Conclusion: ethnographic evidence

Extrapolating the behaviour of pre-agricultural hunter-gatherers from that of ethnographically observed hunter-gatherers is problematic. The last couple of hundred years are a period in which practically all societies globally have been transformed fundamentally; including hunter-gatherer societies. How likely is it, then, that the hunter-gatherer societies which happened to exist during this miniscule slice of human history in which statistically-minded ethnographers existed are fully representative of rates of violence over the 290,000 years of pre-agricultural history?

Nevertheless, there are some striking similarities in the social organisation of ethnographically observed nomadic hunter-gatherer societies despite their great geographical and ecological diversity. It is therefore plausible that pre-agricultural societies (probably largely, though not exclusively, nomadic hunter-gatherers) also shared some of these features and that by extension violence in these societies was to some extent comparable.

1. **The data is limited.** Unfortunately the available data on rates of violence among hunter-gatherers, whether lethal or non-lethal, is very patchy. A lot of the available evidence is qualitative. There are only a handful of reliable, quantitative studies of violence among pre-agricultural appropriate hunter-gatherers
2. **Levels of violence among ethnographically observed hunter-gatherer societies vary dramatically.** Some societies exhibit very high levels of violence whereas others seem to exhibit lower levels of violence than relatively peaceful modern states. Rates of violence can also change dramatically within the same society over relatively short periods of time. It seems wrong to say there is a 'typical' rate given the available evidence.
3. **Violence is usually interpersonal.** Among nomadic hunter-gatherers violence, including lethal violence, is usually interpersonal in character; directed against particular individuals for a specific reason, such as revenge, conflict over women and executions. There is evidence that atypically anti-social personality types drive rates of interpersonal violence to a significant degree, though this is hard to prove. Ritualized forms of violent dispute resolution are found in numerous hunter-gatherer societies.
4. **Interpersonal violence is often lethal.** Nomadic hunter-gatherers commonly exhibit an ethic of anti-violence. However, the egalitarian political organisation of nomadic hunter-gatherers means they lack authority figures to adjudicate disputes.

Consequently, interpersonal disputes can quickly spiral out of control and become lethal.

5. **Nomadic hunter-gatherers typically experience lower rates of intergroup conflict relative to sedentary hunter-gatherers and farmers.** In fact a significant proportion seem to lack intergroup conflict altogether (although there is debate about the appropriate definition of 'inter-group' conflict in these societies.). There are several factors relating to the respective political and economic organisation of nomadic hunter-gatherer vs sedentary hunter-gatherer/farming societies that seem to offer a good, intuitive explanation for this difference. The prevalence of sedentism in pre-agricultural populations is disputed, but it seems very likely that most pre-agricultural people were nomadic.
6. **Pre and early contact era Australian nomadic hunter-gatherers seem to have higher rates of inter-group conflict than other nomadic hunter-gatherers.** This is significant because these groups are the closest ethnography gets to 'hunter-gatherers in a world of hunter-gatherers'. However, there are issues with the reliability of the evidence for this.
7. **Rates of inter-group violence correlate strongly with overall rates of lethal violence in small-scale societies.** In other words, small-scale societies with high rates of warfare typically have significantly higher rates of overall lethal violence; inter-group conflict is very lethal and destructive in small-scale societies.
8. **It is hard to establish whether our sample of Late Pleistocene Appropriate hunter-gatherer societies was more or less violent than the 20th Century globally.** Although violent death rates are higher among hunter-gatherers in our sample, these are likely inflated relative to states in the 20th Century because people in the 20th Century had access to better medical care.
9. **Infanticide is not included in our data on rates of lethal violence.** This is a significant issue because it may plausibly be the most prevalent form of lethal violence among hunter-gatherers. However we don't have figures for it for our sampled societies so we couldn't include it even if we wanted to. There is also an important question of interpretation; arguably infanticide should be held categorically distinct from other forms of lethal violence.

The ethnographic data can also be useful as a tool to inform our discussion of the archeological data. For example, ethnography can be useful in areas where the archeological record is largely silent, such as in speculation about the likely motives or character of pre-agricultural violence.

2. Archeology

What can archeology tell us about violence before agriculture?

In this section we will:

1. Discuss what archeological evidence exists for violence before agriculture
2. Discuss the strengths and limitations of archeological evidence
3. Discuss why the archeological evidence presented by Pinker in *Better Angels* does not adequately address the specific topic of violence before agriculture
4. Discuss our preferred data source, Gomez et al (2016) and explain how we've adapted it to address our topic, violence before agriculture
5. Suggest how the archeological data can be adjusted to provide an estimate for actual rates of lethal violence (rather than just measured rates)
6. Present our results in both an unadjusted and adjusted form
7. Discuss some important issues of interpretation arising from these results
8. Summarise our conclusions from the archeological evidence

The main evidence we're using in this study is evidence of lethal violence on skeletons. This is because our primary aim is to determine likely rates of lethal violence before agriculture; the proportion of skeletons exhibiting signs of lethal violence allows for an estimation of lethal violence rates.

As Christopher Knusel and Martin Smith put it, in *The Routledge Handbook of the Bioarcheology of Human Conflict*:

'a trend that has been in effect in biological anthropology for some years has been the step change from individual case studies to population-based and diachronic considerations of data pertaining particularly to issues of past health and disease. The study of signs of violence in human remains has taken a similar path, with earlier publications focusing on individual identification of traumatic injuries, superseded by broader, assemblage-based studies ... the way is now open to take a more numerically based approach to the incidence, prevalence and demography of human aggression on a wider scale and with greater time-depth.'⁹¹

We acknowledge that other types of archeological evidence relevant to this topic exist, but they are not discussed in any depth here.

⁹¹ Knüsel, Christopher & Smith, Martin. (2013). The osteology of conflict: what does it all mean?. In: C Knüsel, MJ Smith, editors, *The Routledge Handbook of the Bioarcheology of Human Conflict*. Abingdon: Routledge. p690

2.1. The pre-agricultural world - a very brief overview

2.1.1. The Pleistocene

The Pleistocene epoch, popularly known as the Ice Age, dates to between 2.6 million BP (before present) and 11,700 years BP. Homo sapiens evolved during this time, approximately 200,000 -300,000 years ago. So this time period encompasses around 95% of human history. For this reason, human behaviour during this time is of paramount importance for anyone who wants to understand the path our species has taken through this world so far.

People who lived during the Pleistocene epoch are termed Paleolithic and they were all hunter-gatherers. It is generally accepted that most would have been highly nomadic; the prevalence of sedentism during this period is disputed.

The Paleolithic is subdivided into three chronological periods - Lower (3m-300,000BP), Middle (300,000-50,000BP) and Upper (50,000-11,700BP). Homo sapiens evolved sometime during the Middle and are thought to have begun migrating out of Africa around 125,000BP. The archeology of the Upper Paleolithic sees a marked increase in cultural complexity.

Some finds from around the end of the Upper Paleolithic are termed Epipaleolithic in some regions.

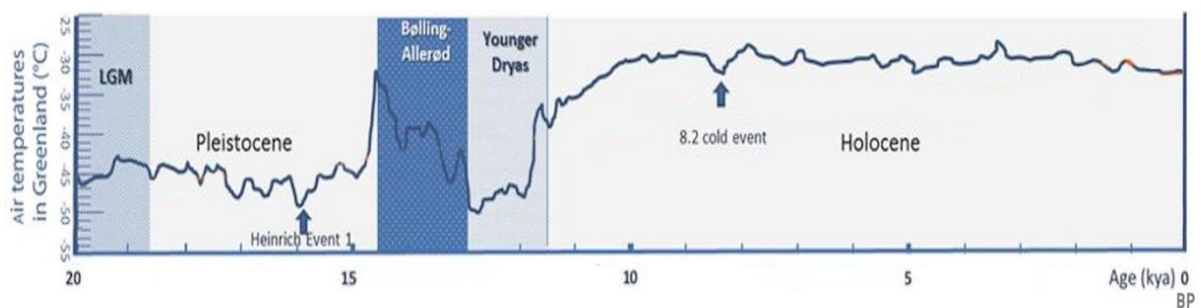
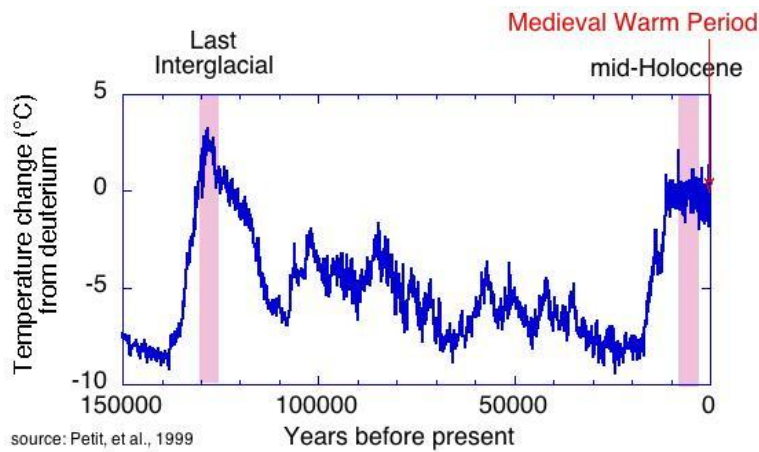
In terms of the archeology of the period, there are significantly fewer sites than for subsequent periods. Most of the finds are from the later stages of the Upper Paleolithic. A significant majority of sites are either single burials or burials of a few individuals. The skeletons are generally in a significantly poorer state of preservation than those from later periods, simply because of their age.

There are strong geographic biases in the available archeological data. Sites from Europe, North Africa and the Middle East dominate in the evidence. Sub-Saharan Africa is poorly represented, despite the fact that humans have lived there much longer than anywhere else.

2.1.2. The Holocene

The Pleistocene ended and the Holocene began about 11,700 years ago, bringing a generally warmer, wetter and more stable climate. By the beginning of the Holocene, nearly the entire world had been colonized by hunter-gatherers -- the only places still left uncolonized were Pacific Islands, Madagascar, New Zealand, the high Arctic in the New World, and Antarctica.

Here are two graphs showing the sudden, dramatic change in global temperatures:

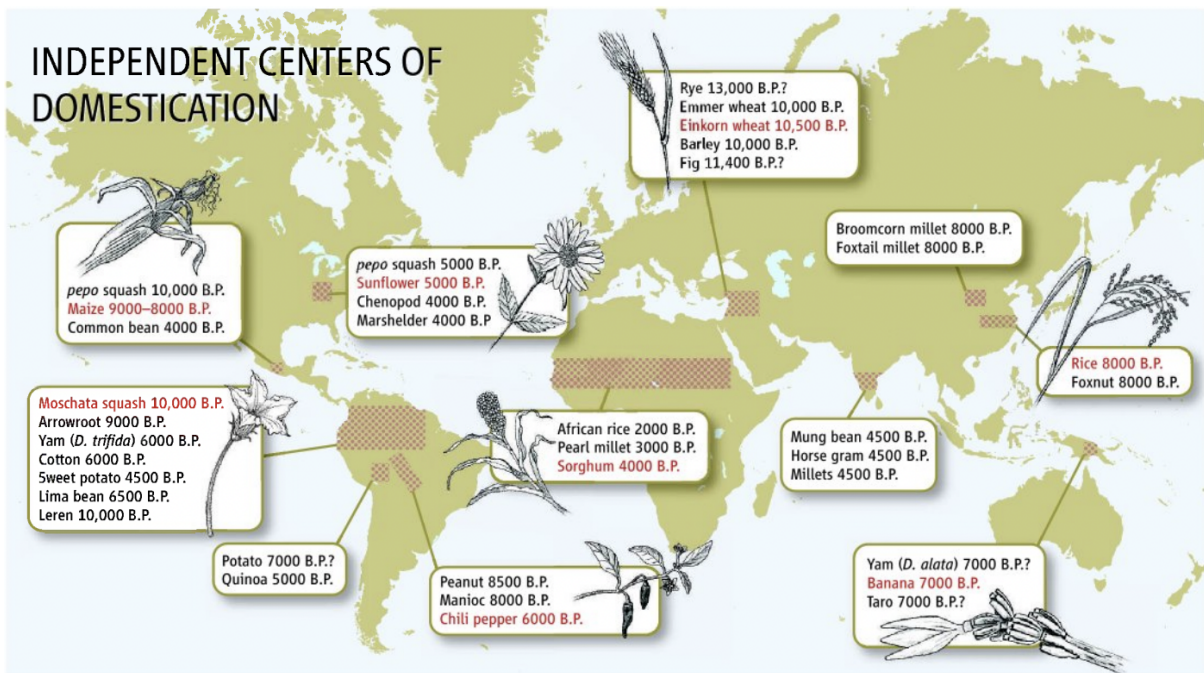


Hunter-gatherers from the early pre-agricultural period of the Holocene are often termed Mesolithic (in Europe) or Archaic (in the Americas). Terms can vary in other regions of the world.

The onset of the Holocene transformed human societies even before the spread of agriculture. People gradually began to shift towards a more sedentary lifestyle and experiment with cultivating plants and animals, a change which would ultimately lead to the agricultural revolutions that transformed the world.

Agriculture took thousands of years to develop and spread widely, although the first plant domestications were already occurring in the Middle East around 11,000 years ago.

Different parts of the world invented/adopted agriculture at different times. The map below shows the timings of the world's various agricultural revolutions:



Multiple birth. People in many different parts of the world independently began to cultivate and eventually domesticate plants.

Source: Michael Balter, 'Seeking Agriculture's Ancient Roots', *Science* 316, no. 5833 (2007): 1830–35.

However, the hunter-gatherer lifestyle endured deep into the Holocene in some parts of the world; notably in Australia (where agriculture never developed) and across much of North America hunting-and gathering was the predominant mode of production until colonial times.

There have been many more discoveries of skeletons from the early pre-agricultural Holocene than from the much longer Paleolithic period. This is mainly because skeletons from more recent time periods are generally better preserved and easier to find, although it could also be partly due to population growth during the period.

Geographically speaking, most of the skeletons that have been discovered from the early pre-agricultural Holocene are concentrated in the Americas, Europe and Japan. The small number of sites in North Africa and the Middle East (at least by comparison to the Paleolithic) is in large part due to the early adoption of agriculture in these regions.

2.2. What are the strengths and weaknesses of the archeological evidence?

Key strengths:

1. The archeological evidence directly measures violence in pre-agricultural populations

The most important advantage the archeological evidence has over the ethnographic evidence is surely that you at least know you're looking at the right thing! With the ethnographic evidence there is always the nagging suspicion that it's leading you in completely the wrong direction because modern hunter-gatherers may be wildly inappropriate proxies for the behaviour of earlier hunter-gatherers.

“Human remains are the most direct material link to the lives and experiences of past people. Accordingly, violence-related skeletal injuries constitute the most direct and unequivocal evidence for violence in past societies ... In striving to understand past social relations human remains are uniquely positioned to provide direct and unbiased evidence for human hostility where other sources are fraught with limitations.”⁹²

2. The archeological evidence spans an enormous breadth of time

In the dataset we've used the earliest site goes back to 120,000BP (although earlier time periods are dramatically under-represented). The latest site is 400BP so the range is basically 120,000 years. By contrast, almost all the usable ethnographic data is concentrated in an approximately 100 year period . This is a major limitation of the ethnographic data, since we expect that patterns in violence fluctuate over time, especially since the ethnographic data comes from a century where most hunter-gatherer societies underwent transformative change.

3. Many more societies are represented in the archeological data.

It's hard to say exactly how many societies are represented in our archeological datasets but it's clearly a great many more than the 8 societies represented in the ethnographic data. There are around 150 sites in our total pre-agricultural dataset and most of those come from distinct societies.

Limitations of the archeological evidence

Below, we have listed some of the problems with using archeological data to approach the question of pre-agricultural violence. Acknowledging these limitations should enable us to consider the data more critically.

1. There aren't enough pre-agricultural skeletons to draw reliable conclusions about patterns of violence

The further you go back in time the worse the problem becomes.

To illustrate this point, consider the following, which is based on the data from Gomez et al:⁹³

- For 300,000,000 to 14,000 BP: around **0.5** skeletons were found per 1,000 years.
- For 14,000 - 11,700 BP: around **300** skeletons per 1,000 years.

⁹² Knüsel, Christopher & Smith, Martin. (2013). Introduction. In: C Knüsel, MJ Smith, editors, *The Routledge Handbook of the Bioarcheology of Human Conflict*. Abingdon: Routledge. p6

⁹³ Gómez, J., Verdú, M., González-Megías, A. et al. The phylogenetic roots of human lethal violence. *Nature* 538, 233–237 (2016). <https://doi.org/10.1038/nature19758>

- For the pre-agricultural 11,700-400 BP: around **1000** skeletons per 1,000 years.

*it is not possible to be exact in the above figures because not all skeletons can be accurately dated

There are only 857 Paleolithic skeletons in our dataset for a period of human history that lasted around 300,000 years. Moreover, only 154 of those can be confirmed to predate 14,000BP. Nearly half (400) come from Epipaleolithic Natufian sites around Nahal Oren in Israel, dating from the very last years of the period. These low numbers mean that single sites can have enormous effects on the data; it is then difficult to know whether these sites are statistical outliers or reflect genuine trends. For example, 74% of the Paleolithic deaths in our dataset come from the two Jebel Sahaba sites, which both come right at the end of the Paleolithic period.

To put this problem in perspective; if we consider only the Paleolithic before 14,000BP there are just 2 lethal violence victims in the dataset for this period. Therefore a new discovery of just 2 more lethal violence victims here would double the number for the period; this would actually lead to a significantly greater-than-doubling effect on our estimates for lethal violence for the period after we take under-counting into account (see below).

Although there is more archeological evidence for later pre-agricultural periods, the problem remains; there still aren't enough skeletons to draw reliable conclusions. For example, Gomez et al count 59 lethal violence victims in their data for the Mesolithic, from 44 sites. Yet 35 of those (59%) come from just three sites. Similarly, in their American Archaic data they count 1973 skeletons, of which 880 (44%) come from Indian Knoll Kentucky; this site provides 48 (76%) of the total 63 lethal violence deaths for the period.

Clearly it is deeply problematic to be confident about patterns or averages when single sites dominate in the data to such an extent.

2. Lethal violence is often not archeologically detectable, leading to potential under-estimates of actual rates of lethal violence

The amount of skeletons exhibiting signs of lethal violence represents just the *minimum* number of deaths caused by lethal violence in a population. The real number of victims of lethal violence will likely be higher, because:

- **Not all acts of violence mark the skeleton (or leave otherwise detectable marks).** Maybe an arrow was lethal but didn't strike bone, maybe someone was strangled, poisoned etc etc. How would you know?
- **The skeletons are often partial and fragmented, and the further back in time you go the worse this problem gets.** This means that evidence of lethal violence on a skeleton may have been lost.

Unfortunately, it is very difficult to know how to estimate actual rates of lethal violence from archeologically visible rates; there doesn't seem to be much literature addressing this question as far as we're aware.

3. It is problematic to compare skeletons from different time periods

Earlier skeletons are generally speaking more degraded than later ones due to the passage of time. This is a particular issue for the Paleolithic remains, which can be vastly older than the Holocene era skeletons.

Another factor that makes comparisons between periods problematic is that methods of killing can differ systematically between periods and can also differ in the frequency with which they leave archeologically detectable signs.

For example, the bow and arrow was a late addition to the Paleolithic toolkit and likely leaves less archeologically detectable evidence than, for example, blunt force trauma.⁹⁴

3. Victims of lethal violence might be 'findable' at different rates than people who died in other ways

There are a number of possible mechanisms by which victims of violence might be deposited in ways that make them either more or less likely to be found by archeologists than people who died in other ways. For example there may be gender biases in the skeletons that we have (males are generally more likely to suffer a violent death). Or to give another example, victims of violence might be less likely to receive proper burials if their enemies dispose of them haphazardly.

4. Hunting accidents (and some other causes of death) might be misinterpreted as lethal violence

It can be difficult to know if trauma on a skeleton was the result of deliberate violence by another person or something else. Although, it is usually possible to identify wild animal attacks, or skeletal damage inflicted shortly after death in a mortuary practice, these methods are not foolproof.

More problematically, it is practically impossible to distinguish hunting accidents from acts of lethal violence; this is a significant issue since hunting accidents have been observed to be a significant cause of death among some hunter-gatherer groups.

5. Other types of archeological evidence for violence are largely absent for pre-agricultural populations

Pre-agricultural people were probably largely nomadic, with a pretty minimalist material culture. This means that a lot of the types of archeological evidence available for later populations is not present for most pre-agricultural populations, such as buildings, pottery and fortifications (sedentary populations generally leave more archeological evidence than nomadic populations).

It has been suggested that the absence of specialist weaponry or fortifications observed for most pre-agricultural populations is evidence for low rates of violence and warfare. However, although this is certainly an interesting and noteworthy point it is far from conclusive;

⁹⁴ Marlowe, Frank. (2005). Hunter-Gatherers and Human Evolution. *Evolutionary Anthropology: Issues, News, and Reviews*. 14. 54 - 67. 10.1002/evan.20046.

ethnographic observations indicate that hunter-gatherer populations can exhibit high rates of violence and warfare without having specially adapted weaponry or fortifications.

Perhaps more significant is the general absence of artwork representing warfare and human-human violence from most pre-agricultural populations. For example, there are no undisputed images of human-human violence from any of the extensive and famous rock art sites of the European Upper Paleolithic Magdalenian or Aurignacian periods.

Ethnographic and archeological evidence indicates that small-scale societies that experience high rates of warfare and violence often represent and glorify it in their artwork. However, we haven't explored this idea systematically in this study. Our main aim is to attempt to quantify violence as directly as possible and the evidence from art is more indirect.

6. There are geographical and temporal biases in the data. Ideally we'd want the data to accurately reflect the global distribution of humans across the pre-agricultural period. In reality this is far from the case, basically because some regions are more studied than others and because earlier skeletons are more poorly preserved.

The dataset for the Paleolithic period is dominated by European skeletons from the Upper Paleolithic period (which lasted approx. 45,000 – 11,700BP) and North African/Middle Eastern skeletons from the final few millennia of the Paleolithic. Skeletons from these regions account for 92% of the dataset. Around 80% of the skeletons in the Paleolithic dataset date from 14,000BP or later. Only 30 (3.5%) of the skeletons predate the Upper Paleolithic, and the oldest site is from approx. 120,000BP.

Yet homo sapiens likely evolved around 300,000 years ago and were mainly distributed in Sub-Saharan Africa for most of that time. But there is just one site from that region, Gobero in Niger, and it is the latest in the entire dataset. Therefore there is practically no representation in the dataset of humans for most of our earlier history, and Sub-Saharan Africa is dramatically under-represented.

Humans are thought to have occupied the Indian subcontinent and much of Southeast Asia since around 70,000BP (this is earlier than the spread into Europe), and Australia since 50,000BP. Yet there are just 21 skeletons in the dataset from Southeast Asia, 5 from the Indian subcontinent (all Sri Lankan) and 18 from Australia. Therefore all these regions seem under-represented.

The dataset for the early pre-agricultural Holocene does not have the same temporal bias towards later periods that we see in the Paleolithic dataset; this is because it is a much more recent and shorter period.

However, serious geographical biases remain. By the early Holocene nearly the entire world had been colonized by hunter-gatherers. Yet the dataset for the period is dominated by European (1835 skeletons), American (1973 Gomez et al categorization/9315 our adjusted categorization) and Japanese skeletons (91 Gomez et al categorization/1650 our adjusted categorization).

Only 168 of the skeletons in the dataset don't come from these three regions. Once again, Sub-Saharan Africa is severely under-represented with just one site; the Nataruk massacre site in Kenya (12 skeletons). Apart from the Japanese skeletons there is just one other East Asian skeleton, which comes from Thailand. There are 95 skeletons from India from 3 sites, and 60 from Algeria. That's it for the rest of the world!

7. There are consequential classification issues for a number of sites

It is often not possible to be exact about the age of sites. This may be because of imperfect dating methods or because the site spans a long time period, (perhaps overlapping a period boundary, for example some sites might span both the Pleistocene and Holocene).

For example the dating of the Jebel Sahaba site is inexact because the dating methods are disputed and because it covers a long time period which spans the boundary of the Pleistocene/Holocene. This is a very consequential issue, because the site accounts for 74% of the Paleolithic lethal violence deaths in the dataset, yet it is plausible that future investigations might place at least some of those in the Holocene period.

It is not always clear whether a site should be classed as pre-agricultural or agricultural. Some hunter-gatherers practiced incipient forms of cultivation before transitioning into an agricultural lifestyle (or not). This raises the question; when does incipient cultivation become agriculture (if at all)?

There are a number of these borderline cases in the data. An example is the Jomon culture from Japan, which spans the years 12,000-2800BP in the dataset and is divided into 5 chronological periods. Each period exhibits varying degrees of cultivation, culminating in some evidence of grain agriculture in the final period, but only in some places. It is hard to know how to classify such cases.

This is a very consequential issue; in total there are 2,582 Jomon skeletons in the Gomez et al dataset, with atypically low rates of violence by comparison to most of the other populations in the dataset. Gomez et al have only categorized 91 of these as pre-agricultural (these are grouped with the Mesolithic sites). If all the Jomon skeletons were recategorized as pre-agricultural and grouped with the Mesolithic (which they plausibly could be), it would more than double the number of Mesolithic skeletons and reduce the rate of skeletons with signs of lethal violence from 3% to 1.9% (this implies an even larger change if we are considering likely *actual* lethal violence rates rather than just observable evidence).

Other potentially problematic examples (that we're aware of) are the Central American Basketmakers and the Natufians from the Middle East.

8. There are cultural sensitivities over the excavation and analysis of indigenous human remains in some parts of the world

This can make archeological discoveries and investigations more difficult

2.2. Problems with using the data from Steven Pinker's *Better Angels* for pre-agricultural violence figures

In light of the limitations presented above, we'd like to point out why we don't think the archeological data presented in Steven Pinker's *The Better Angels of Our Nature* is the best guide when it comes to specifically *pre-agricultural* violence.

Before making this critique we'd first like to make it clear that we respect much of Pinker's work, including *Better Angels*. Many of the critiques of *Better Angels* seem somewhat overblown and unfair to us; we see our study as *building* on the work of people like Pinker and Lawrence Keeley (whose work was the basis for much of the prehistoric data in *Better Angels*) and others in striving towards a better, data-driven understanding of prehistoric violence.

Nevertheless, the following critique is necessary here because *Better Angels* is now so widely cited for its figures on prehistoric violence, particularly by non-specialists.

Yet the book does not specifically target the question of *pre-agricultural* violence (nor does it claim to - Pinker's main interest was in comparing state vs non-state societies). This is very important, because there was no agriculture for at least the first 95% of human history. Unfortunately non-specialists understandably aren't usually aware of the sound reasons we have to think that patterns of violence after the onset of agriculture may have been very different from patterns of violence beforehand.

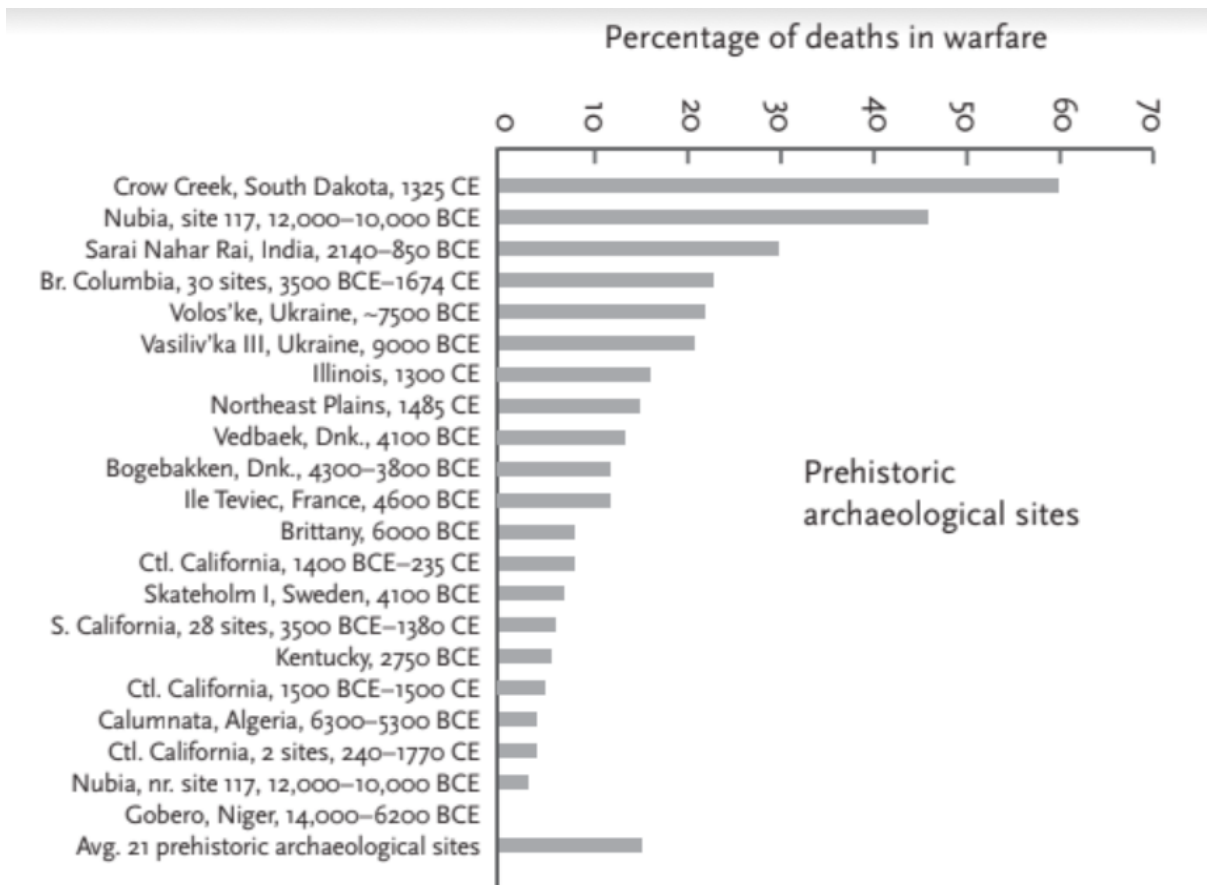
It is partly for this reason that specialists often complain about the way the figures in *Better Angels* are often used, as in this critique from *The Routledge Handbook of the Bioarcheology of Violence* which bemoans

“work that fails to seriously engage anthropological, especially archeological, data. A recent example is Pinker’s (2011) widely acclaimed book, where the portrayal of small-scale societies, especially those in prehistory, is such that one could reasonably conclude that all peoples everywhere did the same things at all times; that is, they existed in a Hobbesian state of perpetual war. If we are truly interested in a better understanding of intergroup conflict over much of human existence, we must work towards identifying temporal and geographical variation in the archeological evidence for warfare, and how it relates to cultural and environmental settings.”⁹⁵

Here is the archeological data Pinker presents in *Better Angels*, which comes from Samuel Bowles and Lawrence Keeley.⁹⁶

⁹⁵ Knüsel, C., & Smith, M. (Eds.). (2013). *The Routledge Handbook of the Bioarcheology of Human Conflict* (1st ed.). Routledge. Preface pg xlv <https://doi.org/10.4324/9781315883366>

⁹⁶ Pinker, S. (2012). *The better angels of our nature*. Penguin p49



The average for these prehistoric sites is 15% 'deaths in warfare.' While this figure is widely cited as showing 'the rate of lethal violence in prehistoric societies', in fact this figure is only for *archeologically observed* signs of violence. In reality, this figure implies an *actual* rate of violence that is significantly higher, possibly by several multiples, because a lot of lethal violence is not archeologically detectable.

By referring to the list of limitations we cite in the previous section, the problems with using Pinker's figure for pre-agricultural violence should be evident. Some of the key problems are listed below:

- There are only 21 sites on the list.
- All the sites are European, American or North African/Middle Eastern with the exception of Sub-Saharan Gobero and the single Indian site. There are no sites from, for example, East Asia, or Oceania
- The sites are not grouped by either time period or geography, so the data is insensitive to possible variation in violence rates across prehistory
- All the sites here are multiple burial sites. This is likely to bias the study towards massacres or other warfare events. However, many pre-agricultural burials were of single or just a few individuals
- The oldest of these sites is the Gobero site, which is 16,000-8000 years ago (the last 16,000 years constitutes perhaps 5-6% of human history). This only predates the Holocene (starting 11,700 years ago) by a few thousand years.

- Only three sites in the list are from the Paleolithic period. The Gobero site and two from Nubia (in fact these are the two Jebel Sahaba sites)
- At least one of these sites involves agriculturalists; the victims of the Crow Creek massacre (the most violent site on the list) were farmers

We don't wish to be unfair to Pinker. He basically relied on a respected and widely cited work to compile his list; Keeley's *War in Human Civilization* is a go-to source for prehistoric warfare studies and was yet to become outdated in obvious ways when *Better Angels* was written.

However, it would be preferable to use a more comprehensive source for our archeological data, and better sources are now available.

2.3. Our chosen dataset for archeological figures on pre-agricultural violence: Gomez et al. (2016)

The most comprehensive dataset that we've been able to find which has figures for lethal violence in pre-agricultural populations comes from a 2016 study by Gomez et al called 'The Phylogenetic Roots of Human Lethal Violence'.⁹⁷

In fact Pinker himself has acknowledged that this source is an improvement on the dataset he used, praising its 'precision, rigour and depth'.⁹⁸

We have come across other datasets but they aren't as comprehensive as the Gomez et al study. Another virtue of this study is that the data is presented clearly and is grouped in logical ways, the study gives all its sources and it is also free and relatively easy to access - the data can be found in Table III of the [supplementary information](#) (it is far too extensive to present in full within this study). At this point we would like to thank Gomez et al for this valuable work of scholarship.

The study is quite extraordinary in its scope; it attempts to present comprehensive archeological data for human lethal violence for all time periods up until the Modern Age. It also presents data on violence in different animal species.

Because of our interest in pre-agricultural violence our focus will be on the Paleolithic and early Holocene data, though we also want to discuss the data from early agricultural communities for comparative purposes.

2.3.1. The Paleolithic dataset in Gomez et al - an overview

In this Paleolithic dataset there are 857 skeletons from 77 sites (including 402 Epipaleolithic skeletons from right at the end of the period).

⁹⁷ Gómez, J., Verdú, M., González-Megías, A. et al. The phylogenetic roots of human lethal violence. *Nature* 538, 233–237 (2016). <https://doi.org/10.1038/nature19758>

⁹⁸ In [this 2016 Guardian article](#).

The earliest of these are the Mt Karmel-Skhul burials from Israel, dating from between 120,000-80,000 BP (Before Present).

Only a handful of skeletons (30) predate the Upper Paleolithic (approx. 45,000 – 11,700BP). 29 of those are from just two sites, both in Israel, (the other one is from China).

Of the Upper Paleolithic skeletons, the majority are concentrated at the end of the period – for example, around 80% of the 857 Paleolithic skeletons date from 14,000BP or later. However, it is not possible to be exact about this figure as not all the skeletons can be accurately dated.

Most of the sites are either single burials or burials of a few individuals.

25 of these come from a single site which comes right at the end of the Paleolithic period; the Jebel Sahaba site in Sudan (approx. 13700BP). The unusually (for the period) large number of skeletons found at Jebel Sahaba (98) and the high rate of lethal violence observed there makes this a particularly notable Paleolithic site.

Geographically speaking, 50 of the 77 sites are European Upper Paleolithic sites (122 skeletons – 14% of total), ranging from approximately 35,000BP to 11,700BP.

However, 671 skeletons (78% of total) come from North Africa and the Middle East (including 402 from the Epipaleolithic). This is due to a handful of very late Paleolithic sites with an unusually large number of burials for the period; there are 634 skeletons from just 7 sites in this region, all dating from 17,000BP or later. 400 of these come from a single Epipaleolithic site in Israel (Nahal-Oren, although other Natufian sites are also grouped here in the data).

There is one site from Sub-Saharan Africa (Gobero). There are a handful of sites from Australia, China and the Indian subcontinent. There are no sites from the Americas in this dataset.

2.3.2. The pre-agricultural Holocene dataset in Gomez et al - an overview

The Gomez et al data for early Holocene sites is separately presented for sites from the Americas and sites from the rest of the world.

Rest of the world (excluding the Americas)

The sites from the rest of the world are subdivided into Mesolithic (pre-agricultural) and Neolithic (agricultural) sites. In other words, the subdivision is based on subsistence method rather than chronology; many of the Neolithic sites are actually older than many of the Mesolithic sites. This suits our purposes perfectly.

However, we believe that a few of the sites in the Neolithic category should actually belong in the Mesolithic category because they are pre-agricultural (this is discussed in more detail later).

The dataset has 2003 skeletons classed as Mesolithic (of which 1835 are European - 92%). There are a couple of sites from India, one from Sub-Saharan Africa (Nataruk in Kenya), one from Thailand and one from Algeria (these sites put together total 168 skeletons).

We also think that 1559 Japanese Jomon skeletons categorised as Neolithic in the dataset actually belong in the Mesolithic category as they were pre-agricultural, bringing the total number of 'rest of the world' pre-agricultural skeletons to 3562.

The Americas

Conversely the early sites from all across the Americas are subdivided chronologically into stages in the dataset. The two earliest stages (which are our focus), are the Archaic (8000BP-3000BP) and the Formative (3000BP-1500BP). This is less convenient for our purposes because pre-agricultural sites are not separated from agricultural ones in the data.

As far as we're aware, all the Archaic sites in the dataset are pre-agricultural (though there seem to be question marks over a few, such as Indian Knoll). The Formative sites in the dataset are mainly agricultural but there are a few pre-agricultural sites.

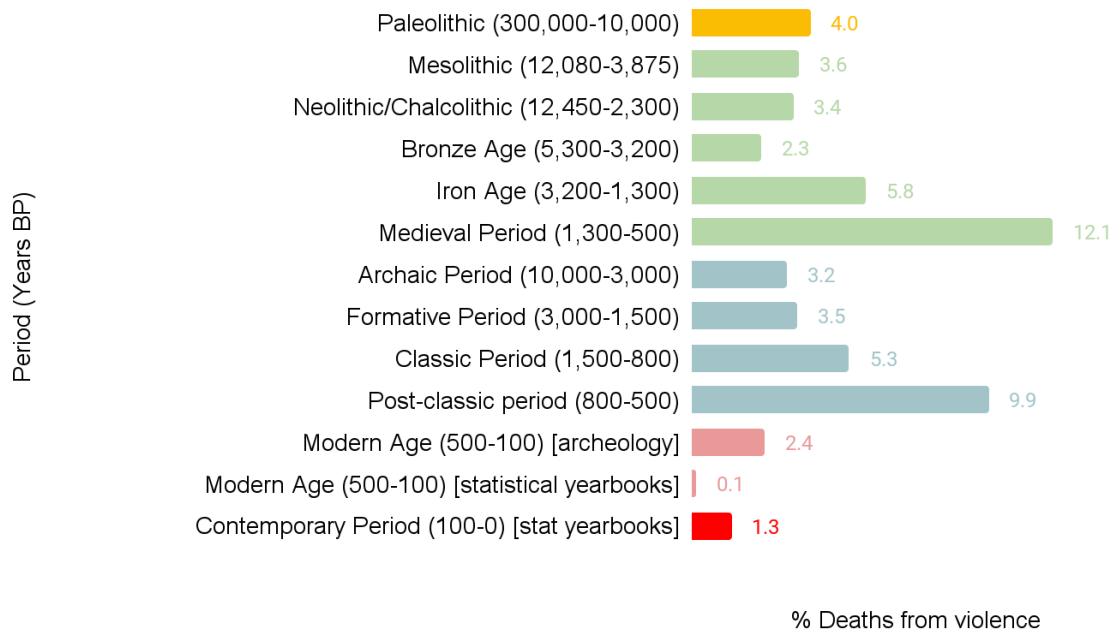
1973 skeletons are classed as Archaic (so, pre-agricultural). We also think that 7342 Formative skeletons (from California and from Inuit societies) were pre-agricultural, bringing the total number of American pre-agricultural skeletons to 9315.

Putting the pre-agricultural early Holocene skeletons from the Americas and the rest of the world together therefore results in 12,877 skeletons.

2.3.3. Results - rates of lethal violence from pre-agricultural sites in the Gomez et al dataset

Here are the results as presented by Gomez et al in their study. Note that although they label these figures as '% deaths from violence', they actually represent only *archeologically observable* lethal violence. They have not attempted to adjust the figures to represent *actual* rates of lethal violence.

Rates of violence in different time periods using archeological data



We do not believe the figures here for the Modern Age and for the Contemporary Period are accurate. The Contemporary Period estimate is from a non-systematic sample of death rates in different years and different periods.⁹⁹ The estimate does not include either of the World Wars or the other atrocities committed in the 20th Century, but instead relies on yearbook data for different regions in the years 2000, 2001 and 2012, as well as data from certain parts of Poland 100 years before the present. Similarly, the Modern Age data is also from non-systematic and non-representative datasets for 500-100 years before present. Thus, in what follows we do not use the Gomez et al (2016) estimates for the Modern Age or the Contemporary Period.

In addition to this, while we are admirers of this study, we also believe the figures can be better adapted to address our particular research question - pre-agricultural violence because:

- The Paleolithic figure is insensitive to changing trends in patterns of lethal violence over this vast time period
- The Paleolithic figure may be inappropriate as a guide to typical patterns of lethal violence in the period because there are 77 sites in the dataset yet, problematically, 71% of the violent deaths come from a single site, Jebel Sahaba 117 in the Nile Valley, North Africa
- The Neolithic figure includes some pre-agricultural sites; this may be because the Mesolithic/Neolithic classification is not uniformly applied in the literature for sites outside Europe, making it challenging to classify non-European sites

⁹⁹ This data is collected together in section C of the Gomez et al supplementary information, which is available at this [link](#).

- The early Holocene data from the Americas uses a chronological Archaic/Formative classification system, whereas we want to isolate pre-agricultural sites regardless of chronology
- There is no figure combining the data from all the early Holocene pre-agricultural sites together to give a global average for the period
- There is no figure combining the data for all pre-agricultural populations together (Paleolithic + early Holocene)

2.4. Adapting the data from Gomez et al with a focus on specifically pre-agricultural violence

We suggest the following adaptations to make the data fit our research question better:

1. We suggest subdividing the Paleolithic period in two; pre-14,000BP and 11,700-14,000BP (End Paleolithic)

In the Gomez et al study 4% of the Paleolithic skeletons show signs of lethal violence.

However, around 80% of the 857 Paleolithic skeletons date from 14,000BP or later. 31 (91%) of the 34 Paleolithic deaths can be confirmed to come from this End Paleolithic period, which taken separately has a lethal violence rate of 4.6%.

The 154 skeletons confirmed to be from pre-14,000BP include just 2 with signs of lethal violence - 1.3%.

This means that the data is being swamped by evidence from approximately the final 1% of the time period.

This is deeply problematic if we want to understand patterns of lethal violence across the Paleolithic. A number of the sites from 11,700-14,000BP seem highly atypical of the period as a whole, particularly some Middle Eastern and North African sites; notably this is the region where the first agricultural societies would emerge over the first few millennia of the Holocene.

Perhaps the climatic changes that would eventually stabilize with the official arrival of the Holocene epoch in 11,700BP were already transforming human society fundamentally in some regions in the final millennia of the Pleistocene.¹⁰⁰

For example, the 2 Jebel Sahaba sites in the dataset, where a radiocarbon dating suggests an approximate dating of 13,700BP (though the dating is inexact and the site could actually be either considerably older or somewhat younger), are graveyards with evidence for

¹⁰⁰ deMenocal P, Ortiz J, Guilderson T, Adkins J, Sarnthein M, Baker L, Yarusinsky M. Abrupt onset and termination of the African Humid Period: Rapid climate responses to gradual insolation forcing. *Quatern. Sci. Rev.* 2000;19:347–361. doi: 10.1016/S0277-3791(99)00081-5; Battarbee, R.W., Gasse, F. & Stickley, C.E. Past Climate Variability Through Europe and Africa. *Developments in Paleoenvironmental Research* 6, Springer, 638 p (2004).

continuous occupation over a long timeframe. They were semi-sedentary hunter-fisher-foragers. They used bows and arrows (a late addition to the Paleolithic tool-kit); over half of the traumas identified at the sites were caused by projectiles. There is clear evidence of inter-group warfare. Also the area shows high cultural diversity, with the attackers apparently coming from an identifiably different cultural group. All of this seems uncharacteristic of the earlier Paleolithic (though can be observed in many early Holocene pre-agricultural sites). In fact the Jebel Sahaba sites are associated with the Qadan culture, which is often classed as Mesolithic in the literature. There are 98 skeletons from these two sites - 25 (26%) show signs of lethal violence (74% of the total lethal violence deaths identified in the Paleolithic dataset).¹⁰¹

Another example are the three Epipaleolithic sites from Israel, which are dated from 15,100-11,600 BP. There are 402 skeletons (47% of total Paleolithic skeletons), of which 5 exhibit signs of lethal violence (1.2%). These sites are associated with the Natufian culture. This culture is often suggested as the ancestor of the world's first agricultural populations. Unusually for Paleolithic populations there is a high degree of sedentism and evidence for the cultivation of cereals in some places.

By contrast, almost all the pre-14000 BP Paleolithic sites are of single or a few individuals characterised by nomadism. Fishing/horticulture as a staple subsistence strategy seems to have been rare in earlier Paleolithic populations; big game hunting was a more common subsistence strategy. The bow and arrow was unknown to most Paleolithic populations, only appearing in the final few millennia of the period¹⁰²..

Here is what the *Cambridge History of Violence* has to say on the subject:

“Sites like Nataruk, at Lake Turkana, Kenya, and Jebel Sahaba in Sudan seem to indicate a new dimension in intra-human violence. These sites present the first conflicts of a larger scale at the end of the Palaeolithic.”¹⁰³

Obviously in an ideal world we would have loads of early Paleolithic skeletons from all over the place and this would allow us to track changes in patterns of violence throughout the period and also identify regional variety. But there simply aren't anywhere near enough skeletons to do that.

Therefore, we propose subdividing the Paleolithic period in two; pre-14,000 BP and 11,700-14,000 BP (which we will call the End Paleolithic). The choice of 14,000 BP as the

¹⁰¹ Crevecoeur, I., Dias-Meirinho, MH., Zazzo, A. et al. New insights on interpersonal violence in the Late Pleistocene based on the Nile valley cemetery of Jebel Sahaba. *Sci Rep* 11, 9991 (2021). <https://doi.org/10.1038/s41598-021-89386-y>

¹⁰² Marlowe, Frank. (2005). Hunter-Gatherers and Human Evolution. *Evolutionary Anthropology: Issues, News, and Reviews*. 14. 54 - 67. 10.1002/evan.20046.

¹⁰³ Orschiedt, J. (2020). Violence in Palaeolithic and Mesolithic Hunter-Gatherer Communities. In G. Fagan, L. Fibiger, M. Hudson, & M. Trundle (Eds.), *The Cambridge World History of Violence* (The Cambridge World History of Violence, p75). Cambridge: Cambridge University Press. doi:10.1017/9781316341247.004

cutoff period is somewhat arbitrary and has primarily been chosen in order to isolate the potentially atypical Epipaleolithic and Jebel Sahaba sites from the earlier Paleolithic data (which is hypothesized to be more likely representative of the majority of the Paleolithic period).

Some of the sites have wide dating ranges - we've classed any site encompassing a date later than 14,000BP as End Paleolithic (for example a site with dating range 18,000-13,000BP would be classed as End Paleolithic in our data).

This approach means that the entire pre-14,000 period is represented by just 154 skeletons. This is a major issue affecting the reliability of the data which is currently unavoidable given the available evidence.

35 Paleolithic skeletons in the Gomez study are undated. Therefore it was not possible to include these skeletons in either the pre-14000BP or End Paleolithic category, due to dating uncertainty. However, these undated skeletons are included in the Total Paleolithic category.

2. We have recategorized 1,559 Japanese skeletons as pre-agricultural

There are 2,582 skeletons from the Japanese Jomon period in the dataset. They are divided chronologically into five phases; the Initial (12,000-7000BP), Early (7000-5500BP), Middle (5500-4400BP), Late (4400-3250) and Final (3250-2800BP). In the data these populations are notably non-violent, with a combined total of 23 skeletons with signs of lethal violence (0.9%).

The Jomon period is normally characterised as a hunter-gatherer period in the archeological literature, which was then succeeded by the agricultural Yayoi culture which depended on rice farming for its subsistence. However, in the Gomez et al study only the Initial phase (91 skeletons) is classed as pre-agricultural (they have this in their Mesolithic category). All the rest of the phases are classed as Neolithic, implying that they were agricultural.

This seems like a classificatory mistake, perhaps caused by the application of European Mesolithic/Neolithic terminology outside of a European context where the terminology is not uniformly applied. However, the picture is complicated somewhat by the nature of Jomon culture and the breadth of the timespan it covers (about 9000 years). The Jomon are noted for exhibiting an unusually high degree of sedentism for a hunter-gatherer population, and for practising incipient forms of cultivation; the elaboration of these practises increases in the later phases. This raises the question; at what point should 'incipient cultivation' be instead classed as 'agriculture'?¹⁰⁴

To resolve this issue we contacted Hisashi Nakao, the leading co-author of the study from which Gomez et al took their Jomon data, (in which the Jomon subsistence strategy is

¹⁰⁴ Crawford, Gary (2011). *The Origins of Agriculture: New Data, New Ideas* || *Advances in Understanding Early Agriculture in Japan*. *Current Anthropology*, 52(S4), S331–S345. doi:10.1086/658369

described as 'basically hunting and gathering').¹⁰⁵ Based on his feedback (personal communication) we have recategorized the Early, Middle and Late Jomon phases as pre-agricultural. Hunting and gathering was the dominant mode of subsistence for these populations and the distinction between managed cultivation vs agriculture is significant. For our data this means moving 1559 skeletons from the Neolithic category into the Mesolithic category.

We have left the Final Phase in the Neolithic category, though we think this is problematic. Nakao suggested that some (not all) sites in this Final Phase show evidence of early forms of agriculture.

Adding the Early, Middle and Late Jomon skeletons to the 2003 skeletons in Gomez et al's Mesolithic category means there are 3562 skeletons in the category, of which 85 (2.4%) exhibit signs of lethal violence.

3. We have classified the data from the early Americas by subsistence rather than chronology: pre-agricultural/agricultural (rather than Archaic/Formative)

In the Gomez study the data from the early Americas is divided into the Archaic period (10,000BP-3000BP) and the Formative period (3000BP-1500BP). It is standard to use a chronological classification system in the Americas (rather than the Mesolithic/Neolithic classificatory system in Europe and some other regions which is based on subsistence strategy rather than chronology).

However, this doesn't suit our purposes because we want to focus on specifically pre-agricultural populations. We have therefore recategorized the sites in the dataset by subsistence strategy (pre-agricultural vs agricultural).

As far as we are aware, all the Archaic populations in the dataset belong in the pre-agricultural category. Most of the Formative populations are agricultural but some are pre-agricultural.

Based on suggestions from the archeologists Robert Kelly (personal communication) of the 21 Formative sites, 5 are pre-agricultural hunter-gatherers. These are; the 4 Central Californian sites and the Inuit Kachemak Period site.

The 3 Basketmaker sites from the American Southwest were considered as candidates for a pre-agricultural classification; the Basketmaker culture extends across an approximately 2000 year period, which saw a gradual change away from a hunter-gatherer subsistence strategy towards an agricultural subsistence strategy based on maize cultivation. However, the three sites in the dataset were classed as agricultural as they all come from populations with high maize dependence. This is a very important issue in the data, because these three sites have 199 skeletons of which 123 (62%) show evidence of lethal violence. Therefore the

¹⁰⁵ Nakao, Hisashi; Tamura, Kohei; Arimatsu, Yui; Nakagawa, Tomomi; Matsumoto, Naoko; Matsugi, Takehiko (2016). *Correction to: 'Violence in the prehistoric period of Japan: the spatio-temporal pattern of skeletal evidence for violence in the Jomon period'*. *Biology Letters*, 12(11), 20160847-. doi:10.1098/rsbl.2016.0847

way we classify these sites has significant implications for how we interpret the effect of agriculture on violence in early populations, since lethal violence deaths from these sites form a significant portion of the total from all of the early Holocene Americas.

Following these suggested classifications gives the following results for the early Holocene data (up until 1500BP) from the Americas:

Pre-agricultural populations: 9315 skeletons of which 139 (1.5%) show signs of lethal violence

Agricultural populations: 752 skeletons of which 209 (27.8%) show signs of lethal violence

4. We have combined the data from the Americas and the rest of the world to offer single global figures for the early Holocene

Combining the data for the Americas and the rest of the world means there are 12,877 pre-agricultural skeletons from the early Holocene, of which 231 (1.7%) show signs of lethal violence.

Though our focus is on violence among early pre-agricultural populations, we think it is also useful to consider rates of lethal violence among early farmers for comparative purposes and to see how the adoption of agriculture changed patterns of violence in the early Holocene.

Combining the data for the Americas and the rest of the world means there are 12,477 *agricultural* skeletons from the early Holocene in the dataset, of which 646 (5.2%) show signs of lethal violence.

5. We have combined the data for pre-agricultural populations from both the Paleolithic and the early Holocene together to compensate for the greater unreliability of the Paleolithic data

The Paleolithic data has a major problem with reliability, primarily because of the tiny number of skeletons the figures are based on. It is arguable that the results we have for the period are so unreliable as to not be useful; particularly for the pre-14000BP period for which the dataset has just 154 skeletons.

The pre-agricultural Holocene data also has issues of reliability, for various reasons. However it is much more reliable than the Paleolithic data; there are approximately 15x more skeletons in the dataset from this period than from the Paleolithic period.

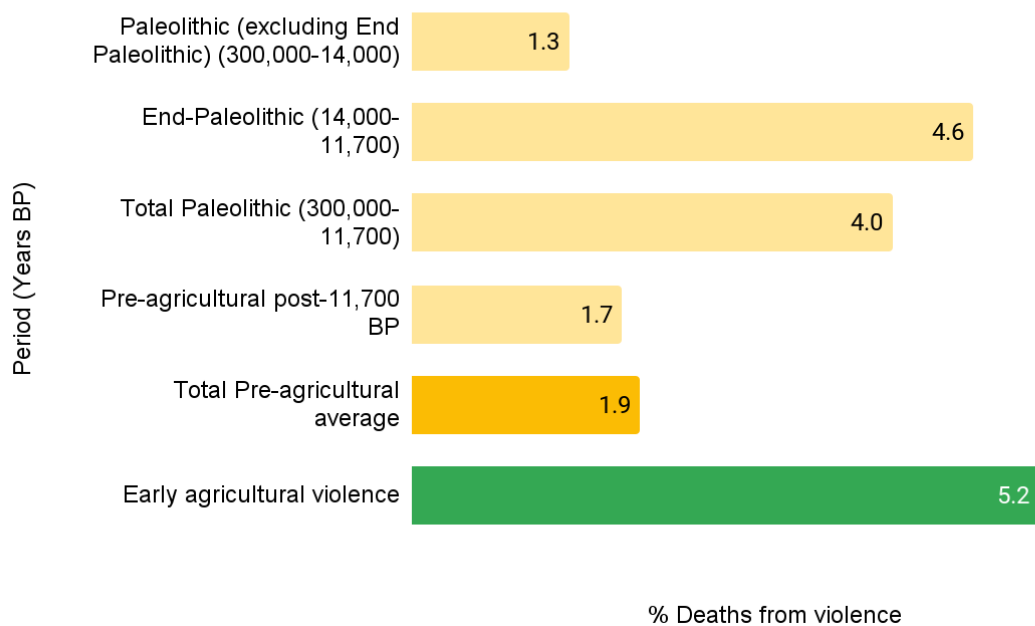
It is arguable that this data from the pre-agricultural Holocene might actually be the best evidence we have from which to estimate likely rates of lethal violence among ancestral humans in the Paleolithic, given our substantial doubts about the reliability of the Paleolithic data.

Partly for this reason we believe it is useful to provide a figure which combines all the data from the entire pre-agricultural period. The total combined number of skeletons in the dataset for the Paleolithic and pre-agricultural Holocene is 13,732, of which 265 show signs of lethal violence (1.9%).

2.4.1. Results after adapting the Gomez et al data to better suit our research question

Here is a graph of the Gomez dataset after all the adjustments described in the previous section are applied:

Mortality due to violence, archeological data (detectable violence only)



Source: [Hunter-gatherer data spreadsheet, 'Adjusted archeology % deaths from violence' tab](#)

*The relatively high rates estimated for the End-Paleolithic and Total Paleolithic are almost entirely due to a single site, Jebel Sahaba

2.4.2. Attempting to determine likely figures for *actual* lethal violence

The results in the graph above are useful for comparing levels of violence between periods (although it is important to note that it is problematic to compare the Paleolithic figures to later periods using these results because they are generally in a significantly worse state of preservation).

However, they do not represent *actual* rates of violence, just skeletons with *archeologically detectable signs* of lethal violence. The actual rates must have been higher, because not all lethal violence is archeologically detectable.

As a result they are of limited use, beyond establishing a minimum threshold for lethal violence in these periods. For example, do these results indicate higher or lower rates of *actual* lethal violence by comparison to the ethnographic figures? It is impossible to know

with the results in this form. They do not answer the basic question this study sets out to address; what is our best estimate for rates of violence in early pre-agricultural populations?

Therefore we feel compelled to suggest a method for converting these figures from *archeologically detectable rates* into *actual* rates so that we can provide estimates for likely rates of lethal violence from the archeological data and compare these to the ethnographic data.

Unfortunately we haven't been able to find a source that offers a systematic way to do this. Therefore, the following method is highly speculative; although we've tried to be logical in our approach, to be frank a lot of it is guesswork. In other words, treat with extreme caution.

(Also if anyone is aware of a better way to do this or has any pointers for how our method might be improved upon please don't hesitate to get in touch.)

Method for converting detectable rates of lethal violence into *actual* rates

Our suggested method is to identify the most important factors that might cause detectable rates to deviate from actual rates. Having identified key factors we can then estimate how much each one affects the data and in which direction, based on pointers in the archeological literature (for example we estimate this factor x causes a 10% under-count). With this estimate we can then compensate for each factor by adjusting the data accordingly.

We have identified three key factors to consider:

1. Lethal violence does not leave any detectable signs at the time of death (effect on data - lethal violence is under-counted)
2. Preservation issues after death mean that once-detectable signs of lethal violence are no longer detectable (effect on data - lethal violence is under-counted)
3. The skeletons found by archeologists might not be representative of their populations as a whole in terms of their manner of death (effect on data - lethal violence could be either under-counted or over-counted)

For each of these factors in turn we will now present a list of evidence we think is relevant and provide an estimate for the total effect it has on the data

1. Lethal violence does not leave any archeologically detectable signs at the time of death

Actually we think a good majority of lethal attacks would have left detectable signs at the time of death because:

- We think a majority of lethal attacks in pre-agricultural times would be caused by blunt force trauma which often targets the head and would reliably leave archeologically detectable signs. Estabrook's study of observed injuries in prehistoric European populations found that just 4.8% of Middle Paleolithic injuries were sharp force (vs 95.2% blunt force) - for the Upper Paleolithic 18.8% of injuries were sharp

force (vs 81.2% blunt force) - for the Mesolithic 22.1% of injuries were sharp force (vs 77.9% blunt force)¹⁰⁶

- Many victims of lethal violence suffered multiple wounds, for example due to being incapacitated then 'pin-cushioned' (lots of arrows fired into them) or repeatedly bludgeoned or stabbed. We would guess this would be the case for a majority of victims
- There are numerous prehistoric sites where all or almost all skeletons exhibit signs of lethal trauma (such as the Neolithic Talheim site where 100% (34/34) of victims exhibit lethal trauma, or the Mesolithic Nataruk site where 83% (10/12) do). This would seem statistically very improbable if lethal violence regularly fails to leave archeologically detectable signs.
- Sharp force trauma victims can often be identified by the presence of blades in skeletal cavities

However, some significant proportion of sharp force trauma victims likely died from single wounds, and may not have sustained any archeologically detectable signs at time of death because:

- The skeleton occupies 60% of the target area a body presents to an assailant¹⁰⁷
- Only about 1/3 arrow wounds damage bone according to a study of 19th century arrow wounds by George Milner¹⁰⁸ (note: perhaps strictly lethal wounds are more likely to damage bone than this)
- Ethnographic evidence indicates that sharp force trauma victims can die from single wounds due to infection, poisoning and blood loss (as well as fatal damage)

Also, some victims may have died in ways that don't involve either blunt or sharp force trauma and don't leave a trace, such as strangling or poisoning. However, ethnographic evidence seems to suggest that this is rare; an overwhelming majority of killing appears to be done by blunt force or sharp force trauma (although we're not aware of a source that proves this systematically).

Additionally we should consider that some small proportion of apparent victims of lethal violence will actually have died in accidents, particularly hunting accidents as this manner of death is clearly attested in ethnography. There may also have been some rare examples of 'mercy killings'.

We estimate that between 10-30% of lethal violence did not leave archeologically detectable signs at time of death, giving us a mid-point of 20%.

¹⁰⁶ Estabrook, Virginia.. 2014. Violence and Warfare in the European Mesolithic and Paleolithic. In Allen, M.W., & Jones, T.L. (Eds.). Violence and Warfare among Hunter-Gatherers (1st ed.). Routledge. p65

¹⁰⁷ Walker, Phillip L. (2001). A Bioarcheological Perspective on the History of Violence. Annual Review of Anthropology, 30(1), 573–596. doi:10.1146/annurev.anthro.30.1.573

¹⁰⁸ Milner, George. (2005). Nineteenth-Century Arrow Wounds and Perceptions of Prehistoric Warfare. American Antiquity. 70. 144. 10.2307/40035273.

2. Preservation issues after death mean that once-detectable signs of lethal violence are no longer detectable

We think this is probably the most significant factor which leads to lethal violence going unidentified, but we are highly uncertain about exactly how much of an effect it has.

There are many ways that the passage of time can erase evidence from human remains following death due to degradation and fragmentation. For example, damage caused during mortuary processes, weathering, chemical damage eg from soil, damage by wild animals, damage caused during excavation etc.

The difficulty comes with trying to come up with likely figures to compensate for this effect. We don't have a method to systematically do this; we lack comprehensive information about the state of preservation of the skeletons in the dataset and haven't been able to locate a source which addresses this question directly. Therefore a lot of guesswork will necessarily be involved in our estimate.

Additionally, the older a skeleton is, the more degraded and fragmented it is likely to be. In her study comparing European Mesolithic and Paleolithic remains, Virginia Estabrook cautions that 'the human skeletal remains from the Mesolithic period are much better preserved than most remains from the Middle Paleolithic and Upper Paleolithic and show much smaller levels of fragmentation, which may influence the number of perimortem injuries observed'.¹⁰⁹

Therefore we need to take the age of skeletons into account in our estimates. Here are some key points to consider in respect of this:

- The difference in average age between the End Paleolithic (11,700-14,000BP) and 14,000BP-300,000BP Paleolithic datasets is not as large as might be expected, because the majority of the 14,000BP-300,000BP skeletons are clustered at the end of the period.
- The pre-agricultural Holocene and early agriculture datasets overlap to a great extent in terms of age; in fact the pre-agricultural skeletons are actually slightly more recent, on average.

Evidence suggesting preservation issues have a larger effect

- The criteria Gomez et al used for including skeletons in their dataset is not explained in their study, but it is apparent from examining individual sources that they included many skeletons that are in a poor state of preservation. For example, some of them are just skulls, such as those from the famous Upper Paleolithic Cro Magnon cave site in France.
- At at least one of the sites in the study, Ofnet, a Mesolithic site in Germany, it seems very likely that lethal violence is significantly undercounted due to preservation

¹⁰⁹ Estabrook, Virginia.. 2014. Violence and Warfare in the European Mesolithic and Paleolithic. In Allen, M.W., & Jones, T.L. (Eds.). *Violence and Warfare among Hunter-Gatherers* (1st ed.). Routledge. P66

issues. 34 skulls were found, arranged together in a cave; 16 of these are identified as victims of lethal violence. However, given the context of discovery, it seems highly likely that all 34 died violently (the removal of the heads from the bodies happened post-mortem so is not counted as evidence of lethal violence). Another possible example is the Neolithic Herxheim site, which is often speculated to be evidence for mass killing but where only 9 of 459 skeletons in the dataset are identified as victims.

- There usually have to be visible signs of lethal violence for a victim to be classed as such in the literature; the context of discovery is not in itself usually deemed sufficient to make that classification. This means that there are some apparent massacre sites, such as Nataruk in Kenya, where it seems very likely that everyone died violently but not all the skeletons are actually classed as victims

Evidence suggesting that preservation issues have a smaller effect:

- Although we're not sure what criteria for inclusion Gomez et al used, we know that some poorly preserved remains are explicitly excluded from the dataset by the authors of the original sources. For example, at the Nataruk site in Kenya the remains of 27 people were discovered, yet only 12 were complete enough to examine for signs of lethal violence.
- We expect a publication bias effect; more complete remains are more likely to be studied and gain attention
- There are numerous prehistoric sites where all or almost all skeletons exhibit signs of lethal trauma (such as the Neolithic Talheim site where 100% (34/34) of victims exhibit lethal trauma, despite significant preservation issues of the skeletons). These sites demonstrate that preservation issues are site specific; they do not uniformly apply to all sites
- Many victims of lethal violence suffer multiple injuries around the time of death and only one such injury is required to identify a victim of lethal violence. This raises the likelihood of incomplete skeletons exhibiting signs of lethal violence
- The great majority of skeletons in the dataset are less than 10,000 years old. Writing of this time period, Estabrook states that 'there is generally a very high level of preservation in Mesolithic skeletal remains,' though she does express reservations about the inconsistent way they are often catalogued.¹¹⁰

We expect that preservation issues probably have a considerable but not a dramatic effect on under-counting. We propose the following estimates, which are adjusted for different time periods:

- Pre-14,000BP Paleolithic - 30-70% of once-archeologically-identifiable victims of lethal violence become subsequently unidentifiable due to preservation issues, giving us a midpoint of 50%
- End Paleolithic - 20-60% with a midpoint of 40%
- Pre-agricultural Holocene - 10-50% with a midpoint of 30%

¹¹⁰ Estabrook, Virginia.. 2014. Violence and Warfare in the European Mesolithic and Paleolithic. In Allen, M.W., & Jones, T.L. (Eds.). *Violence and Warfare among Hunter-Gatherers* (1st ed.). Routledge. p51

- Early agriculture - 10-50% with a midpoint of 30%

3. The skeletons found by archeologists might not be representative of their populations as a whole in terms of their manner of death

It might be the case that victims of lethal violence are not equally likely to be found by archeologists as people in the population as a whole. However, it is not clear in which direction this factor pulls. Perhaps victims of lethal violence are more likely to be found; perhaps they are less likely.

The following table shows potential factors to consider and the direction in which they probably act:

Lethal violence is underestimated	Lethal violence is overestimated
More female/child skeletons found (we've not been able to find out if this is generally the case or not, though we suspect there must be someone who knows the answer)	More male skeletons found (males are consistently more likely to be victims of violence)
Violence victims may have been less likely to be given proper burials eg because their enemies disposed of them haphazardly or because they died in a manner/place that made their body difficult to retrieve	Mass graves of battle/massacre sites might be more likely to be found and documented than individual burials
Perhaps violence was more prevalent near the coast (more complex hunter-gatherers often live in coastal areas), but fossils are less likely to be preserved in coastal locations	Pre-Neolithic societies may have ordinarily practiced cremation or other non-burial practices – found skeletons therefore indicate unusual manner of death
The skeletons of violence victims may be more fragmented/degraded than other skeletons due to damage suffered at time of death, causing them to either not be included in datasets or not be found at all	More 'complex' pre-Neolithic hunter-gatherers are more archeologically detectable and may have had higher rates of violence
	People who died violently may have been given special burials, to honour their bravery for example, making them more likely to be preserved and easier to find

While, at a push, we would guess that this factor probably causes lethal violence victims to be undercounted, on average, we are extremely uncertain about this. Therefore we are unable to provide an estimate for this factor.

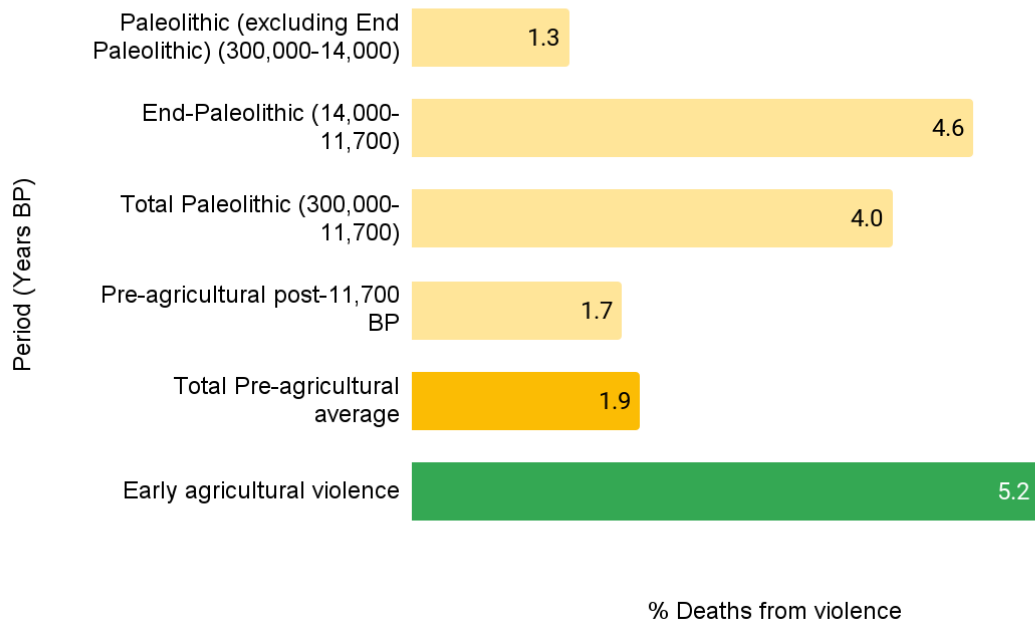
2.4.3. Results - estimates for actual rates of lethal violence

Here are the final estimates to adjust for undercounting of lethal violence in archeological data:

	% Lethal violence victims with no archeologically detectable trace of lethal violence left at time of death	% Lethal violence victims where all evidence of lethal violence is no longer archeologically detectable due to preservation issues
Paleolithic pre-14000BP	10-30%	30-70%
End Paleolithic 11700-14000BP	10-30%	20-60%
Pre-agricultural Holocene	10-30%	10-50%
Early agriculture	10-30%	10-50%

Here are the results (again) for measured rates of lethal violence before adjusting for under-counting:

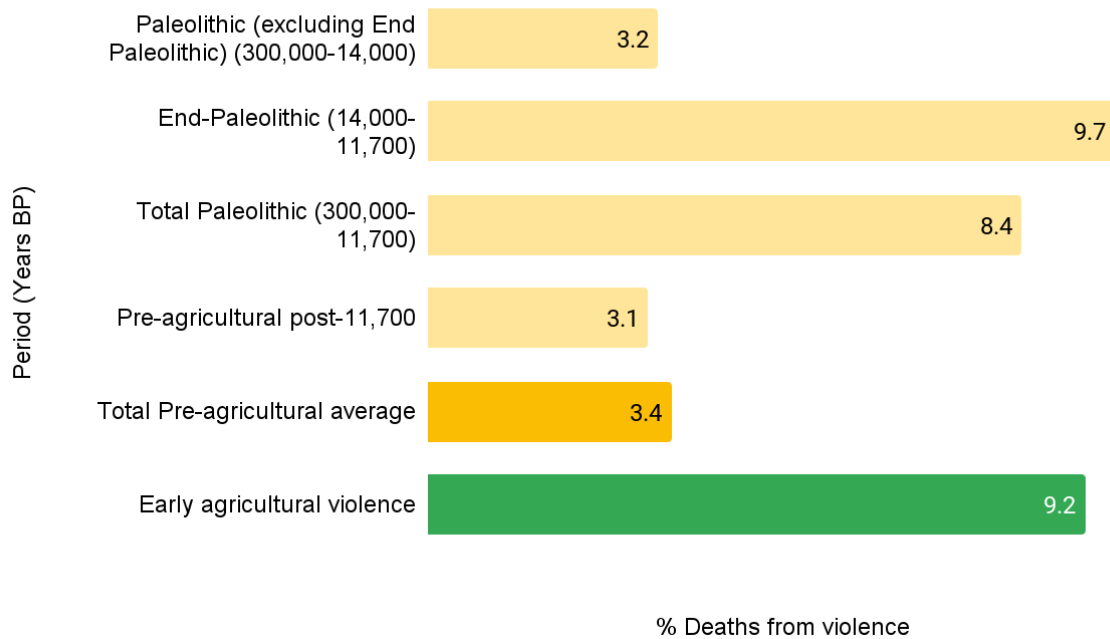
Mortality due to violence, archeological data (detectable violence only)



Source: [Hunter-gatherer data spreadsheet, 'Adjusted archeology % deaths from violence'](#) tab

Here are the estimates for actual rates of lethal violence after compensating for under-counting:

Adjusted mortality due to violence, archeological data (estimated actual rates)



Source: [Hunter-gatherer data spreadsheet, 'Adjusted archeology % deaths from violence'](#) tab

*The relatively high rates estimated for the End-Paleolithic and Total Paleolithic are almost entirely due to a single site, Jebel Sahaba

The figures above represent our 'best guess' estimates for each period, obtained by taking the mid-points of our adjustment ranges. However, as noted we are very uncertain about these estimates. The table below shows possible ranges by taking the minimum and maximum possible adjustments for each period - for example the minimum adjustments for the End Paleolithic are 10% (lethal violence doesn't leave signs) and 20% (preservation issues). The maximum adjustments for this period are 30% and 60% respectively.

	Minimum Violent Mortality	Maximum Violent Mortality
Paleolithic pre-14000BP	2.1%	6.2%
End Paleolithic 11700-14000BP	6.4%	16.6%
Total Paleolithic	5.6%	14.4%
Pre-agricultural Holocene	2.1%	5%
Total Pre-agricultural	2.4%	5.5%
Early agriculture	6.4%	14.8%

In our subsequent discussions of these results we will announce whenever we are referring to these rates that have been adjusted to estimate actual rates. If we don't announce that we are referring to these estimates, that means we're talking about the figures from the unadjusted raw data.

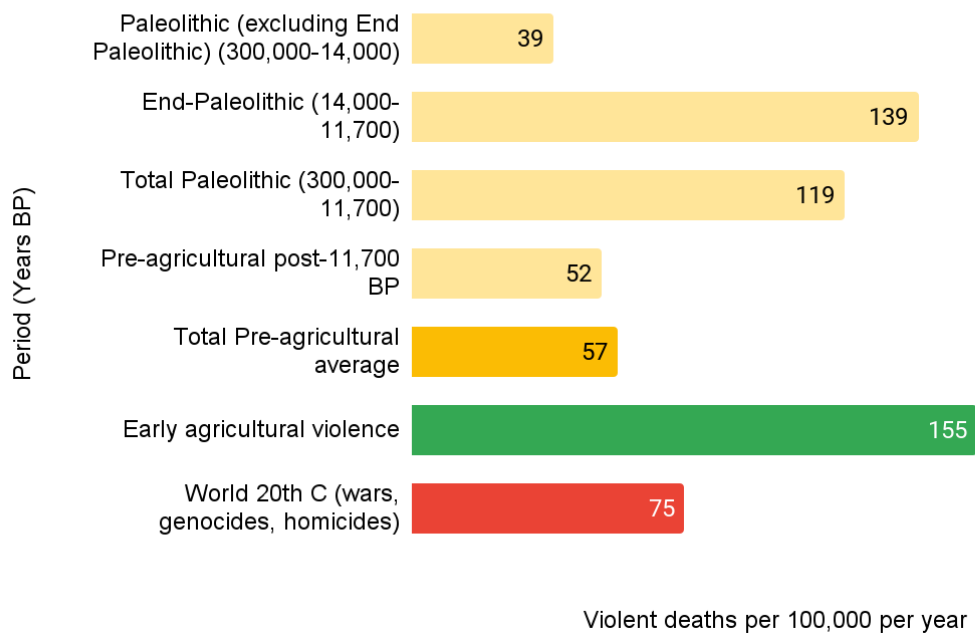
Converting the data from '% deaths from violence' into 'violent deaths per 100,000 per year'

The archeological data is measured in terms of '% deaths from violence'. However, as noted earlier in this study, 'Violent deaths per 100,000 per year' is a preferable metric for measuring rates of violence in a population. This is because '% deaths from violence' is affected by the overall mortality/life-expectancy in a population; two populations with the same '% deaths from violence' can nevertheless have very different 'Violent deaths per 100,000 per year' if they have very different overall mortality or life-expectancy.

Therefore, it is useful to convert the archeological data from ‘% deaths from violence’ to ‘Violent deaths per 100,000 per year’ so that it can be compared to data from populations with different mortality/life-expectancy, like, for example, populations in modern states.

It is possible to do this by estimating overall mortality in pre-agricultural populations. In order to do this we used Gurven and Kaplan’s ethnographic data on modern hunter-gatherer societies; the median mortality rate in their ethnographic sample was 3001/100,000.¹¹¹ Using this figure produces the following results:

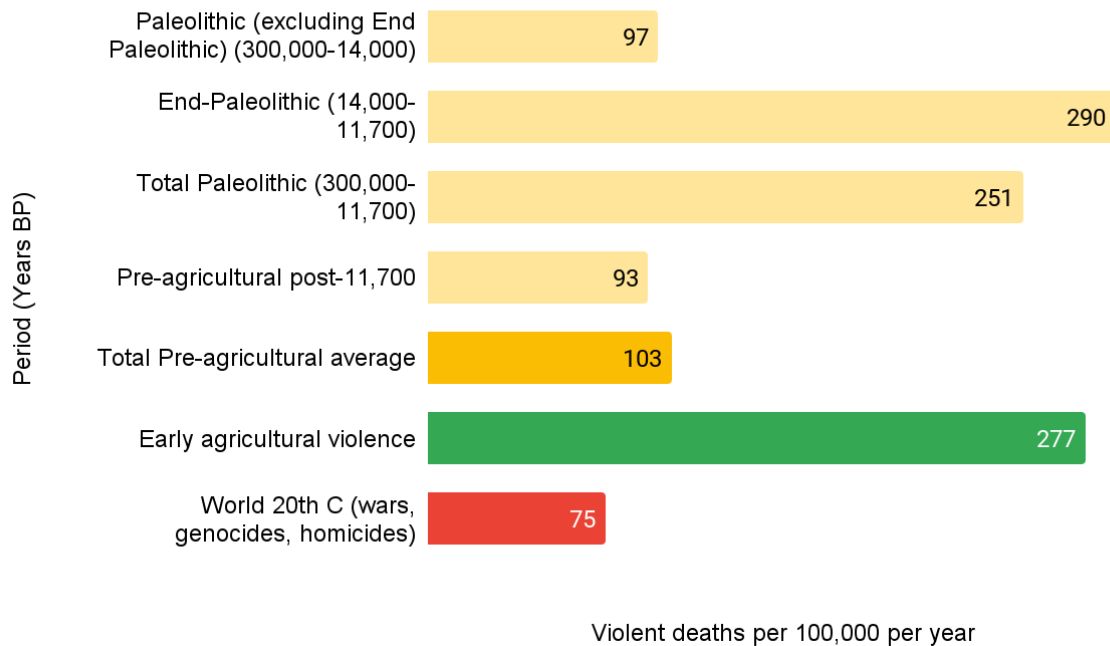
Mortality due to violence, archeological data (detectable violence only)



Source: [Hunter-gatherer data spreadsheet, 'Adjusted archeology deaths/100k' tab](#)

¹¹¹ Gurven, Michael; Kaplan, Hillard (2007) Longevity Among Hunter- Gatherers: A Cross-Cultural Examination 33(2), 321–365. doi:10.1111/j.1728-4457.2007.00171.x

Adjusted mortality due to violence, archeological data (estimated actual rates)



Source: [Hunter-gatherer data spreadsheet, 'Adjusted archeology deaths/100k' tab](#)

It is possible that pre-agricultural populations had significantly different overall mortality rates to ethnographically observed hunter-gatherers. This must necessarily affect the reliability of these results. However, we are not aware of a preferable method for estimating overall mortality rates in pre-agricultural populations.

We also used the Gurven and Kaplan hunter-gatherer mortality rate estimate to do the conversion for the 'Early Agricultural Violence' dataset. This is problematic; it is likely that overall mortality rates in early agricultural societies differed from that in hunter-gatherer societies. However, we are not aware of a better source which provides data on violent deaths per 100,000 people per year for these societies.

There is some evidence that over the very long-term of human history, life expectancy at birth hovered around 30. See Joao Fabiano's [spreadsheet on life expectancies](#) over the long term.

2.5. Key issues of interpretation to consider

Here are some of the key issues we think require interpretation or merit discussion after looking at these results:

1. Which dataset most accurately reflects the likely rate of lethal violence among humans for the majority of our early history?
2. Why was the End Paleolithic (14,000-11,700BP) such an apparent outlier when it comes to pre-agricultural lethal violence (aka is Jebel Sahaba a true outlier)?
3. Which was more violent: the Paleolithic or the pre-agricultural Holocene?

4. Is there a trend of increasing social complexity leading to increased lethal violence in pre-agricultural populations?
5. Why does lethal violence appear to increase significantly with the spread of agriculture?

Throughout the following discussion it is important to remember that we are deeply uncertain about our method for determining *actual* rates of lethal violence from archeological evidence. This clearly must affect the reliability of some of the conclusions we're drawing here

2.5.1. Which dataset most accurately reflects the likely rate of lethal violence among humans for the majority of our early history?

One of our main motivations for conducting this study was to attempt to establish typical patterns of lethal violence in *Homo sapiens* over the entirety of the Paleolithic period, which constitutes at least 95% of our species history. Such a figure could then be useful across a number of fields, particularly for those interested in human predispositions to violence; much of human nature, such as it is, must have been shaped over the course of this time period.

While it might seem obvious to those unfamiliar with the nature of our datasets to simply use an average for the entirety of the Paleolithic period for our magical figure, in fact we think it is not so simple.

Instead there appear to be three different candidates for the best dataset to use for a likely figure for lethal violence across most of human history, each with different strengths and weaknesses:

1. The average for the entire Paleolithic dataset
2. The average for the pre-14000BP Paleolithic dataset
3. The average for the entire pre-agricultural period

The average for the entire Paleolithic dataset (857 skeletons)

This is the most comprehensive Paleolithic dataset

Problems:

- There aren't very many skeletons
- The skeletons are more poorly preserved than those from later periods
- Around 80% of the skeletons (and 91-94% of the lethal violence victims) date from after 14000BP, a period which constitutes the final 1% of the Paleolithic period and during which the climate transformations that would be fully realized with the arrival of the Holocene period were already underway
- A single site from right at the end of the period, Jebel Sahaba, accounts for 74% of the total lethal violence deaths and there are multiple reasons to suspect it is not a typical Paleolithic site
- 78% of the skeletons come from North Africa or the Middle East

The average for the pre-14000BP Paleolithic dataset (154 skeletons)

The advantage of using this dataset instead of the total Paleolithic dataset is it is not swamped by data from the End Paleolithic which may not be representative of the period as a whole

Problems:

- The number of skeletons is tiny
- The skeletons are, on average, in an even worse state of preservation than those of the total Paleolithic dataset as they are, on average, older
- The End Paleolithic period may not actually be atypical for the Paleolithic as a whole - perhaps earlier sites with similarities to Jebel Sahaba (for example) have simply not been discovered yet
- The dataset is dominated by European sites

The average for the entire pre-agricultural period (including the Holocene) (13,732 skeletons)

The advantage of using this dataset is that there are many more skeletons than in the other dataset and the skeletons are in a better state of preservation generally

Problems:

- 94% of the skeletons from the dataset come from the Holocene period and it is likely that these populations were different to Paleolithic populations in systematic ways, for example they were probably significantly more likely to be sedentary, live at higher population densities and have a higher dependence on fishing/horticulture/gathering vs big game hunting.
- 68% of the skeletons come from the Americas (a region that was only populated right at the end of the Paleolithic period)

Conclusion

We think the most complete way to approach the question of likely patterns in lethal violence in our species for most of our early history is to consider the evidence from all three datasets as relevant and complementary.

However, if only one figure is to be given, we'd opt to use the figures from the entire pre-agricultural dataset. This is primarily because, regrettably, the small number of skeletons in the Paleolithic datasets make them wildly unreliable; they are too susceptible to the effects of potential outliers in the data.

It is certainly problematic to use Holocene era hunter-gatherers as a proxy for earlier populations. However, we are already doing this in our ethnographic data and we think that early Holocene hunter-gatherers are likely a much better proxy than modern

ethnographically observed hunter-gatherers mainly by virtue of being 'hunter-gatherers in a world of hunter-gatherers'; a world yet to be transformed by agriculture.

Also the data from pre-agricultural Holocene hunter-gatherers spans across an approximately 10,000 year timeframe, whereas the data from modern hunter-gatherers is all concentrated in an approximately 100 year-long period. Additionally far more societies are represented in the early Holocene hunter-gatherer data than in the ethnographic data where we were only able to use data from 8 societies in total.

2.5.2. Why was the End Paleolithic (14,000-11,700BP) apparently so violent?

The End Paleolithic stands out in the data with an observed lethal violence rate of 4.6% and an estimated actual rate of 9.7%. Both these figures are significantly higher than the corresponding figures for the preceding pre14000BP Paleolithic period and the succeeding pre-agricultural Holocene period.

This is entirely down to a single site; Jebel Sahaba (Sudan), which we've already discussed. It is a cemetery showing continual use over a period of time with clear evidence of endemic warfare. Actually there are two Jebel Sahaba sites, but one of them has 24 lethal violence victims (out of 59 skeletons - 41%). This is 71% of the total for the entire Paleolithic dataset.

Was Jebel Sahaba a true outlier?

Jebel Sahaba is clearly a unique outlier in both the Paleolithic and End Paleolithic *datasets* in our study. The big question is, to what extent was Jebel Sahaba truly an atypical outlier *in reality*, for both the Paleolithic and End Paleolithic respectively. In other words, perhaps Jebel Sahaba-like events occurred with some degree of frequency in these periods, but Jebel Sahaba is the only one that has been discovered (at least so far).

Regarding the earlier Paleolithic, there are good reasons to suspect that Jebel Sahaba is *not* typical of the period because there are a number of other ways in which the site is atypical of the earlier Paleolithic period: it shows evidence of sedentism, warfare (for which there is currently no clear evidence before Jebel Sahaba), high dependence on fishing, bows and arrows and cultural diversity. All these features are generally more typical of later periods rather than earlier ones. However there is simply no way to be sure about whether the patterns of violence observed there are truly atypical because there aren't enough skeletons from the earlier Paleolithic.

It also bears mentioning that there is good evidence of resource stress likely driven by climate change at the site. This is not necessarily atypical of earlier Paleolithic populations though, because there were a lot of dramatic episodes of climate change during the Pleistocene.

Regarding the End Paleolithic, there are several other sites that are similar to Jebel Sahaba in terms of the features described above, for example the Natufian sites such as Nahal Oren

(Israel) and the Wadi Halfa site (Sudan). Notably these sites are North African/Middle Eastern, suggesting that this phenomenon has a regional element to it.

However, no other End Paleolithic site is notably violent like Jebel Sahaba is. For example, the Nahal Oren site has 400 skeletons and only 5 lethal violence victims (1.25%). The Wadi Halfa site has 27 skeletons and 0 lethal violence victims. Therefore, while Jebel Sahaba seems similar to other End Paleolithic sites in some respects, it may be atypical in terms of patterns of violence, although again this is impossible to prove as there currently aren't enough skeletons.

Regarding the evidence from the succeeding pre-agricultural Holocene period, there are some cemeteries showing continual use with evidence of warfare (like Jebel Sahaba). However, none of these show rates of lethal violence approaching that seen at Jebel Sahaba. Perhaps the closest equivalent might be the cemeteries at Indian Knoll, Kentucky (6100-4500BP), where there are 880 skeletons with 48 lethal violence victims (5.5%).

It could very well be the case that the End Paleolithic was not notably more violent than preceding or succeeding periods. Without the violent Jebel Sahaba site the period would not look much different to the pre-14000BP Paleolithic period in the data. Obviously we should be deeply reticent to make global generalizations about trends in patterns of violence based on single sites.

2.5.3. Which was more violent: the Paleolithic or the pre-agricultural Holocene?

Simply put, we don't think that it is possible to tell with any degree of certainty whether the Paleolithic or pre-agricultural Holocene was more violent from our data. As *The Cambridge World History of Violence* puts it:

“the question of an intensification of violence in the Mesolithic compared to the Middle and Upper/Final Palaeolithic is difficult to prove based on the skeletal remains.”¹¹²

We agree because:

- There are so few Paleolithic skeletons, particularly earlier ones, which makes it difficult to establish patterns in violence in the Paleolithic
- It depends whether or not the Jebel Sahaba site should be considered to represent earlier Paleolithic patterns of violence, a hard question
- The datasets are regionally very different; Europe is hugely over-represented in the pre-14000BP Paleolithic dataset, North Africa and the Middle East are hugely

¹¹² Orschiedt, J. (2020). Violence in Palaeolithic and Mesolithic Hunter-Gatherer Communities. In G. Fagan, L. Fibiger, M. Hudson, & M. Trundle (Eds.), *The Cambridge World History of Violence* (The Cambridge World History of Violence, p67). Cambridge: Cambridge University Press.
doi:10.1017/9781316341247.004

over-represented in the End Paleolithic dataset and the Americas, particularly California, are over-represented in the pre-agricultural Holocene dataset

- The Paleolithic skeletons are much more poorly preserved so their archeologically detectable rates of lethal violence are non-comparable with the pre-agricultural Holocene dataset

Virginia Estabrook has directly addressed the question of whether the Paleolithic or Mesolithic was more violent in Europe, using a different methodology which attempts to sidestep the issue of non-comparability due to different degrees of preservation between periods:

“Because it is impossible to directly compare frequencies (number of injured skeletal elements/total number of elements in the sample) of trauma from the Mesolithic, Middle Paleolithic and Upper Paleolithic, I compared the admittedly novel measure of distribution of injuries by “degrees of severity” instead, so that is possible to meaningfully compare these three periods, specifically to determine if there are statistically significant differences in patterns of injury.¹¹³”

Here are the results:

Table 3.5 Distribution of instances of injury for known samples with trauma

Population	First Degree	Second Degree	Third Degree	Fourth Degree
Middle Paleolithic	4	10	5	2 – ($p=0.01$)
Upper Paleolithic	3	8	2	3
Mesolithic	14	19	7	37 + ($p=0.03$)

(1st degree injury = healed non-cranial injury, 2nd degree injury = minor cranial trauma, 3rd degree injury = serious cranial injury showing signs of healing, 4th degree injury = injury directly contributing to death)

Estabrook’s study shows that injuries sustained in the Middle Paleolithic (9%) and Upper Paleolithic (19%) were significantly less likely to be lethal than injuries in the Mesolithic (48%).

Although it is only based on one region, the finding is interesting, perhaps suggesting that conflict was more likely to be mediated in the Paleolithic, a hallmark of conflict *within* (rather than between) groups.

Estabrook’s method draws attention to the fact that many experts are reticent to compare Paleolithic datasets to later datasets in the way we have, due to the non-comparable state of the evidence. We acknowledge that her alternative methodology may be superior to ours by

¹¹³ Estabrook, V. 2014. ‘Violence and Warfare in the European Mesolithic and Paleolithic’. In Allen, M.W., & Jones, T.L. (Eds.). *Violence and Warfare among Hunter-Gatherers* (1st ed.). Routledge. p51

correcting for preservation issues without requiring estimates, (although it should be noted that her study is restricted to Europe only).

Estabrook's study therefore problematizes the estimates for actual rates of Paleolithic lethal violence in our study, suggesting that ours may be too high.

It is sometimes speculated that the earlier Paleolithic may have been a relatively peaceful period, because of the absence of clear evidence for inter-group conflict (until Jebel Sahaba), the tiny number of lethal injuries so far observed from the period and the expectation, partly founded in ethnographic evidence, that nomadic foragers are relatively peaceful¹¹⁴¹¹⁵.

However, we'd like to emphasize again the paucity of the available archeological evidence for the Paleolithic which makes it difficult to generalize about the period with much certainty.

2.5.4. Is there a trend of increasing social complexity leading to increased lethal violence in pre-agricultural populations?

Some modern hunter-gatherer societies are described as 'complex', in contrast to the egalitarian, nomadic band style organisation more typically seen in modern hunter-gatherer societies. The classic example of this are the Northwest Coast fishing societies in North America.

Here are some of the standard features characterising social complexity in hunter-gatherer societies (by comparison to nomadic, egalitarian hunter-gatherers):

1. Semi-sedentism or full sedentism
2. Higher population density
3. More advanced technology
4. Food storage
5. Greater management of natural resources eg horticulture
6. More social hierarchy

In the ethnographic literature, complex hunter-gatherers are usually characterised as being more violent than nomadic, egalitarian hunter-gatherers. While this generalisation is hard to prove statistically given the available evidence (in part because there aren't many complex hunter-gatherers to study), it is supported by the observation that the few complex hunter-gatherers that have been ethnographically observed seem to be significantly more warlike.

¹¹⁴ Kim, Nam C & Kissel, Marc. 2018. Emergent warfare in our evolutionary past. New York: Routledge p105

¹¹⁵ Haas, J, & D.Piscitelli. (2013). The Prehistory of Warfare: Misled by Ethnography. In D. P. Fry (Ed.), War, peace, and human nature: The convergence of evolutionary and cultural views (pp. 315–340). Oxford University Press

A priori, there are also apparently sound theoretical reasons to suspect that complex hunter-gatherers would be more violent. Many of the social features that differentiate complex hunter-gatherers from nomadic, egalitarian hunter gatherers are also shared by small-scale farmers, who can clearly be shown to be significantly more violent in the ethnographic data. In other words, the features that appear to incentivize violence among small-scale farmers (social hierarchy, denser populations, more stored wealth, sedentism, private property) are also present in complex hunter-gatherers.

This naturally poses the question of whether it is possible to establish a relationship between complexity and increased violence among prehistoric hunter-gatherers.

Although there is evidence of some of these features of social complexity from the Upper Paleolithic, it is generally thought that social complexity among hunter-gatherers became much more prevalent in the Holocene, facilitated by a warmer, wetter and therefore more hospitable climate.

This invites the question: did the complex hunter-gatherer societies in the Upper Paleolithic and the Holocene tend to be more violent than their less complex counterparts?

It is beyond the scope of this study to address this question in a systematic way and we haven't attempted to do so.

The Gomez et al dataset does attempt to categorize sites by whether they belonged to bands, tribes or chiefdoms but they don't appear to have explained their methodology for this classification and we know a number of experts have severe reservations about their classifications (we share these reservations).

Therefore we judge that we don't have a good dataset which allows us to systematically distinguish more from less complex societies in the Gomez et al dataset and we lack the expertise to construct one ourselves.

Nevertheless, we think that the data we have offers some interesting insights into the question of the relationship between violence and hunter-gatherer complexity.

The Paleolithic dataset indicates that there may be a positive relationship between complexity and lethal violence, but it is inconsistent

The pre-14000BP Paleolithic period, which is the period which likely had the lowest prevalence of complexity, is the least violent period according to the dataset. This is true both in terms of observed rates of lethal violence (1.3%) and in our estimate of actual rates (3.2%).

There are only two identified victims of lethal violence from the period. Interestingly, one of those, from the Sunghir site (Russia 28,000-30,000BP) comes from a site which shows evidence of a high degree of complexity by comparison to other Upper Paleolithic sites.

While the Paleolithic dataset as a whole shows a higher rate of lethal violence than the pre-agricultural Holocene dataset, this is entirely attributable to Jebel Sahaba, a site with clear evidence of complexity.

This evidence suggests that more complex hunter-gatherers may be generally more violent.

On the other hand the Natufian sites and some others in the Paleolithic dataset evidence a relatively low rate of lethal violence in a society with a high degree of complexity. For example, Nahal Oren has 400 skeletons and 5 lethal violence victims (1.25%).

However we must reiterate here how unreliable these Paleolithic figures are given the tiny number of skeletons.

The pre-agricultural Holocene dataset indicates that the relationship between complexity and violence appears inconsistent and complicated

If it is the case that there is a positive relationship between complexity and violence we'd expect to see a clear increase in violence in the Holocene dataset, by comparison to the pre-14,000 BP dataset.

This does not seem to be clearly evident in the data. The observed rate of lethal violence in the pre-14,000 BP dataset is 1.3%, in the pre-agricultural Holocene 1.7%. However, in our estimates for actual rates the gap disappears due to the worse level of preservation in older skeletons; in fact the pre-14,000 BP estimated actual rate is 3.2%, slightly higher than the 3.1% we estimated for the pre-agricultural Holocene.

Moreover, within the pre-agricultural Holocene dataset the existence of a positive relationship between complexity and lethal violence seems not to be clear-cut to say the least. In fact some of the evidence arguably points in the opposite direction.

Probably the three sites in the dataset that are most notable for exhibiting a high rate of lethal violence are Ofnet, Germany (16 of 34, 47%), Nataruk, Kenya (10 of 12, 83%) and Indian Knoll, Kentucky (48 of 880, 5.5%). Ofnet and Nataruk don't exhibit clear signs of complexity, whereas Indian Knoll does.

The Jomon data from Japan is notable for exhibiting a low rate of lethal violence in a society known for a particularly high level of complexity (23 of 2852, 0.9%). The data spans around 9000 years. This suggests that a complex hunter-gatherer society is capable of sustaining low levels of violence over extended periods of time. However, the Jomon data also shows evidence for increasing violence over time, broadly correlating with an increase in complexity; the Initial and Early phases together have a lethal violence rate of 0.3% whereas the later phases together have a rate of 1%.

Similarly the source for much of the data from Central California suggests that the data for the region (which actually contributes most of the skeletons in the dataset) shows a correlation between increasing violence and complexity over time. Yet, like the Jomon data, this region is not notably violent in relative terms (4 sites, 7152 skeletons, 88 lethal violence

victims, 1.2%) despite evidencing a relatively high degree of complexity. By comparison, the Paleoindian skeletons in the dataset, which are the oldest from the Americas and show no sign of complexity, have a much higher lethal violence rate (28 skeletons, 2 deaths, 7.1%).

Put together, these sources seem to suggest that the relationship between violence and complexity among hunter-gatherers is highly complicated and decidedly non-linear according to the archeological evidence.

2.5.5. Why does lethal violence appear to increase significantly with the spread of agriculture?

The data shows a clear and marked increase in rates of lethal violence in early agricultural populations by comparison to the hunter-gatherers who preceded them. The observed rate of lethal violence in the total pre-agricultural dataset is 1.9% vs 5.2% in the early agricultural dataset. In our adjusted figures to estimate *actual* rates the total pre-agricultural rate is 3.4% vs 9.2% in the early agricultural dataset. What explains this increase?

We have already shown that ethnographic evidence also indicates a clear and marked increase in lethal violence in small-scale agricultural societies vs hunter-gatherer societies. We argued that this is likely due to an increased rate of warfare. We pointed out that several features of agricultural societies predispose them to inter-group conflict by comparison with hunter-gatherer societies.

Does the archeological evidence reinforce our conclusion that warfare is driving the increase in lethal violence observed among small-scale agricultural populations vs hunter-gatherers? In short, we think it does.

Gomez et al present data on how many of the sites from each period of study are associated with signs of warfare (which can be inferred in a number of ways such as the presence of specialised weapons, fortifications, evidence of mutilation or trophy taking, multiple burials relating to the same event, haphazard burial, a high incidence of survived serious injuries indicating endemic warfare and certain types of injury such as pincushioning):

VIII. Proportion of studies collected in battlefields and graveyards

Table IV. Proportion of studies collected in battlefields and graveyards. The total number of studies of each temporal period and type of evidence is shown with the percentage of these studies that were related with wars, battles, massacres, mass graveyards, raids and inter-group organized violence.

Period	Evidence	Number of studies	Warfare studies (%)
New World Chronology			
Archaic	Archaeological	22	0.0
Formative	Archaeological	21	61.9
Classic	Archaeological	44	50.0
Post-Classic	Archaeological	23	43.5
Old World Chronology			
Palaeolithic	Archaeological	79	1.3
Mesolithic	Archaeological	41	7.3
Neolithic & Chalcolithic	Archaeological	98	17.3
Bronze Age	Archaeological	53	26.4
Iron Age	Archaeological	51	11.8
Middle Ages	Archaeological	66	22.7
The Whole World			
Modern Age	Archaeological	12	16.7
Modern Age	Ethnographic	47	14.9
Modern Age	Statistical Yearbooks	2	0.0
Contemporary Age	Statistical Yearbooks	6	0.0*
Contemporary Age	Verbal_Auptions	28	14.3

* Statistical Yearbooks of the Contemporary Age include both deaths by homicide and by wars

The Old World data shows a clear increase in warfare with the arrival of agriculture in the Neolithic. In the New World data all the Archaic sites are hunter-gatherers and the majority of the Formative sites are agricultural, so again this seems to show a clear increase in warfare with the coming of agriculture.

It is necessary to point out here that this is not as conclusive as it might appear at first glance. As with the ethnographic evidence, the archeological evidence is similarly plagued by issues of interpretation regarding what should be classed as 'warfare' in small scale-societies. Also inter-group conflicts between societies with larger numbers of participants are likely to be more readily identified as warfare events than inter-group conflicts involving smaller numbers in the archeological data.

However, there are some important clues in support of this evidence that warfare increased significantly with the arrival of agriculture.

As far as we're aware, the only readily identifiable massacre site in the entire pre-agricultural dataset (13,732 skeletons) is Nataruk (Kenya), where a band of people seem to have been killed in a single event. There are other candidates in the dataset for massacre events but they are not so clear-cut.

By contrast, the slightly smaller early agricultural dataset (12,477 skeletons) is replete with massacres, which contribute a substantial portion of the total violent deaths in the dataset. Some examples are Schoneck-Kilianstaden (26 deaths), Schletz-Asparn (66 deaths), Talheim (34 deaths), Bergheim (14 deaths), Eulau (13 deaths), Wassenaar (12 deaths), Battle Cave (11 deaths) and Wetherill's Cave (92 deaths) (note: some of these are disputed

as massacre events). Put together these 268 deaths account for 41% of all the violent deaths in the early agricultural dataset, and this list may not be exhaustive.

Looking elsewhere in the literature, there is also much more extensive evidence of fortifications from the agricultural period,¹¹⁶ ¹¹⁷ although weapons specialized for violence and material culture glorifying warriors and violence still appear to be largely absent (as they are for the pre-agricultural period generally).¹¹⁸

There also seems to be a pretty consistent consensus in the literature that inter-group conflict seems to have intensified among early agriculturalists. Of Neolithic violence, the *Cambridge History of Violence* has this to say:

“aspects of an increasing scale of conflict – involving larger numbers of participants, with apparently greater levels of organisation than previously seen – imply that something new had indeed happened to facilitate social strategies manifesting hostility in ways that some modern observers would characterise as warfare rather than simply homicide ... We would argue that the importance of the Neolithic in the development of organised violence is hard to overestimate ... The increasing mobilisation of large numbers of people in the Neolithic heralds a shift in scales of interaction, including cooperation and conflict, while at the same time greater specialisation and a more rigid division of labour signal a diversification leading to a less homogeneous and ultimately less equal society, another potential driver for conflict. With respect to the more martial aspects of society, this diversification and division of labour means that fighting and violent interaction – especially violent conflict between groups – gradually transformed from something that would be the task of many to that of the specially trained few. In other words, we are looking at the origins of professionalised fighting and warfare, the basis for many of the developments seen in successive periods.¹¹⁹

Writing of warfare in prehistoric Japan, Nakagawa et al endorse the apparently traditional view that warfare began with the agricultural Yayoi period that followed the Jomon period.¹²⁰

¹¹⁶ Fibiger, Linda; Hudson, Mark; Trundle, Matthew. (2020) Introduction to Volume I. In G. Fagan, L. Fibiger, M. Hudson, & M. Trundle (Eds.), *The Cambridge World History of Violence* (The Cambridge World History of Violence). Cambridge: Cambridge University Press. p25

¹¹⁷ Smith Martin J. 2014. The war to begin all wars? Contextualizing violence in Neolithic Britain. In: C Knüsel, MJ Smith, editors, *The Routledge Handbook of the Bioarcheology of Human Conflict*. Abingdon: Routledge. p119

¹¹⁸ Smith, Martin J; Schulting, Rick J; Fibiger, Linda. (2020). Settled Lives, Unsettled Times: Neolithic Violence in Europe. In G. Fagan, L. Fibiger, M. Hudson, & M. Trundle (Eds.), *The Cambridge World History of Violence* (The Cambridge World History of Violence). Cambridge: Cambridge University Press. p96

¹¹⁹ Smith, Martin J; Schulting, Rick J; Fibiger, Linda. (2020). Settled Lives, Unsettled Times: Neolithic Violence in Europe. In G. Fagan, L. Fibiger, M. Hudson, & M. Trundle (Eds.), *The Cambridge World History of Violence* (The Cambridge World History of Violence). Cambridge: Cambridge University Press. p87

¹²⁰ Nakagawa, Tomomi, Hisashi Nakao, Kohei Tamura, Yui Arimatsu, Naoko Matsumoto and Takehiko Matsugi. “Violence and warfare in prehistoric Japan.” *Letters on Evolutionary Behavioral Science* 8 (2017): 8-11.

Putting together all this evidence, it seems that there is a convincing case that there seems to have been a substantial increase in warfare among agricultural populations which seems sufficient to explain the overall increase in lethal violence that we see in our datasets.

2.6. Summary: what archeological evidence can tell us about pre-agricultural violence

- 1. The archeological evidence has both strengths and weaknesses in relation to the ethnographic evidence.**
 - Strengths:* you can directly measure violence in pre-agricultural populations rather than using modern hunter-gatherers as a proxy - the data covers a vast time period - the data encompasses a far greater number of societies
 - Weaknesses:* there are very few skeletons from earlier periods - you can't directly measure *actual* rates of lethal violence in a population
- 2. The low number of skeletons affects the reliability of the results.** Put simply, we don't have enough skeletons. This means that potential outliers and key classificatory decisions have large effects on our results. The Paleolithic data (857 skeletons) is significantly more unreliable here than the pre-agricultural Holocene data (12,877 skeletons). The earlier Paleolithic is particularly poorly represented in the data (154 skeletons).
- 3. Evidence for lethal violence on prehistoric skeletons represents only archeologically detectable lethal violence and undercounts actual rates, possibly to a significant degree.** It is very difficult to estimate *actual* rates from the available evidence and we were unable to find a standardised way of doing this. The method we have used is based on guesswork to a significant degree. Therefore our estimates for *actual* rates of lethal violence should be regarded with great scepticism. This uncertainty has implications for the reliability of several (but not all) of our conclusions.
- 4. It is likely that the archeologically detectable rate of lethal violence in the Paleolithic dataset is undercounted to a significantly greater degree than for later periods.** This is because of the generally worse state of preservation in Paleolithic skeletons, which is due to their greater age. This makes it difficult to compare the Paleolithic period to other time periods.
- 5. The Total Paleolithic dataset is swamped by evidence from the final years of the period.** Around 80% of the skeletons in the dataset come from 14,000BP or later. There are reasons to think that this End Paleolithic period might not be representative of likely rates of violence in the earlier Paleolithic. If you separate the End Paleolithic period data from the rest of the Paleolithic data, the End Paleolithic looks considerably more violent than the earlier Paleolithic. However, this is entirely due to a single site called Jebel Sahaba, which contributes 71% of the lethal violence victims in the Total Paleolithic dataset.
- 6. We can't establish whether the Paleolithic period was generally more violent than the pre-agricultural Holocene period.** The pre-14,000 BP dataset shows a very similar rate of violence to the pre-agricultural Holocene dataset. However, the End Paleolithic rate is notably higher due to Jebel Sahaba. Therefore, the contested

question of whether you consider Jebel Sahaba to be likely representative of earlier patterns of violence or not fundamentally affects comparisons between the Paleolithic and pre-agricultural Holocene period. Moreover, the relative unreliability of the Paleolithic data further undermines serious attempts at comparison between periods. Estabrook's alternative methodology, which compares the likelihood of a given injury being lethal, suggests that the European Mesolithic was more violent than the European Paleolithic.

- 7. If you are looking for a single figure estimate for likely rates of lethal violence across most of our species 300,000 year history we recommend using the figure for the total pre-agricultural dataset.** This includes the data from the pre-agricultural Holocene (rather than using the Total Paleolithic or pre-14,000 BP Paleolithic datasets). This is because the low number of skeletons, significantly poorer levels of preservation and inconsistencies in the Paleolithic datasets make them wildly unreliable. However, we acknowledge that it is problematic to use Holocene era pre-agricultural populations as a proxy for Paleolithic populations since they differed in systematic ways; nevertheless, we think it is likely that they were more similar to Paleolithic populations than modern hunter-gatherers by virtue of being hunter-gatherers in a world yet to be fundamentally transformed by agriculture. Our estimate for *actual* rates of lethal violence from the Total Pre-agricultural dataset is 3.4%. This is notably similar to the median figure from our ethnographic sample (3.7%).
- 8. There are severe regional biases in all the pre-agricultural datasets.** One consistent problem is the near-total absence of data from Sub-Saharan Africa, the region where our species has spent most of its history. European evidence is dramatically over-represented in the pre-14000BP dataset. North African and Middle Eastern evidence is dramatically over-represented in the End Paleolithic and Total Paleolithic datasets. Central Californian evidence is dramatically over-represented in the pre-agricultural Holocene dataset. As a consequence, 52% of the skeletons in the Total Pre-agricultural dataset come from sites in Central California.
- 9. The earliest undisputed archeological evidence for warfare is from the Jebel Sahaba site which is usually dated to approx 13,000-14,000BP (this is right at the end of the Paleolithic period).** There is no clear evidence for warfare before this, although this may be due to the general lack of archeological evidence from the earlier Paleolithic. This is inconsistent with the ethnographic evidence which indicates that warfare is present in many Late Pleistocene Appropriate societies, albeit at lower rates than in other types of small-scale society. Evidence for warfare in later pre-agricultural populations is sporadic but is definitely present at a number of sites, such as Nataruk and Indian Knoll, consistent with the ethnographic evidence on warfare.
- 10. All our datasets give figures for lethal violence much lower than the archeological dataset in Stephen Pinker's *The Better Angels of Our Nature*,** which gives a figure of 15% skeletons with archeologically detectable signs of lethal violence. We think our datasets address the specific question of pre-agricultural violence better because a) they are much more comprehensive b) they don't include any agricultural populations (unlike Pinker's dataset) and c) they are sensitive to possible variation across different time periods.

- 11. There was probably great variation in patterns of violence across the pre-agricultural period.** We are hesitant to say that it is possible to establish a 'typical' pattern of violence in any of the pre-agricultural periods we've considered. In this way the archeological evidence is consistent with the ethnographic evidence, which also shows enormous variation in patterns of violence among Late Pleistocene Appropriate societies. There are a number of sites where large numbers of skeletons have been recovered with little or no sign of lethal violence, such as at the Muge site in Mesolithic Portugal (308 skeletons, 0 lethal violence victims) or the Japanese Jomon period spanning approx 9000 years, with 23 identifiable lethal violence victims from 2852 (0.9%). Of the notably violent sites, Ofnet (16), Jebel Sahaba (25) Nataruk (10) and Indian Knoll (48) together constitute 37% of all the lethal violence victims in the Total Pre-agricultural dataset. This suggests a possible pattern whereby isolated incidents or periods of concentrated violence periodically interrupt more typical periods of relative peacefulness, but the small number of skeletons in the dataset make these types of conclusions problematic. Interestingly, these 4 notably violent sites are all totally different to each other; further illustrating the variability in patterns of violence.
- 12. The relationship between social complexity and lethal violence rates in pre-agricultural populations seems inconsistent and complicated.** We haven't systematically considered which were the key factors affecting lethal violence rates in pre-agricultural populations. The main aim of this study was to establish likely rates of pre-agricultural violence, not to establish what the key factors driving lethal violence rates were in pre-agricultural societies. However, we do think our archeological evidence problematizes the popular idea that sedentary, semi-sedentary or otherwise complex hunter-gatherers are notably more violent than nomadic hunter-gatherers. Our estimate for *actual* lethal violence in the pre-14000BP Paleolithic (largely nomadic) dataset is 3.2% which is slightly higher than the pre-agricultural Holocene (generally higher social complexity) figure of 3.1%. Some highly complex populations, such as the Japanese Jomon, exhibit low rates of lethal violence, whereas some nomadic populations, such as the Paleoindians, exhibit high rates of lethal violence (and vice versa). However, it does seem to be the case that clear evidence for warfare is rare among nomadic populations.
- 13. Early agricultural societies were generally significantly more violent than pre-agricultural societies.** It is possible to reliably compare the dataset for early agricultural societies to the dataset for the pre-agricultural Holocene because the datasets overlap considerably in terms of age; in fact the pre-agricultural Holocene skeletons are on-average *more recent* than the agricultural ones (because of the large number from the Americas where agriculture spread later). The Early Agricultural dataset has a 2.8 times higher lethal violence rate than the Pre-agricultural Holocene dataset. If you want to compare lethal violence rates in early agricultural populations to rates across most of our species' history, we recommend using the Total Pre-agricultural dataset, as noted above (rather than the highly unreliable Paleolithic datasets). The Early Agricultural dataset has a 2.7 times higher lethal violence rate than the Total Pre-agricultural dataset. This evidence for increased rates of lethal violence in agricultural populations is consistent with the ethnographic evidence, which indicated an even more pronounced increase. There is

good evidence for increased rates of warfare in early agricultural populations; notably community-scale massacres become much more common. We think this is sufficient to explain the difference and is also consistent with the ethnographic evidence. There are good theoretical reasons to think that agriculture incentivizes warfare.

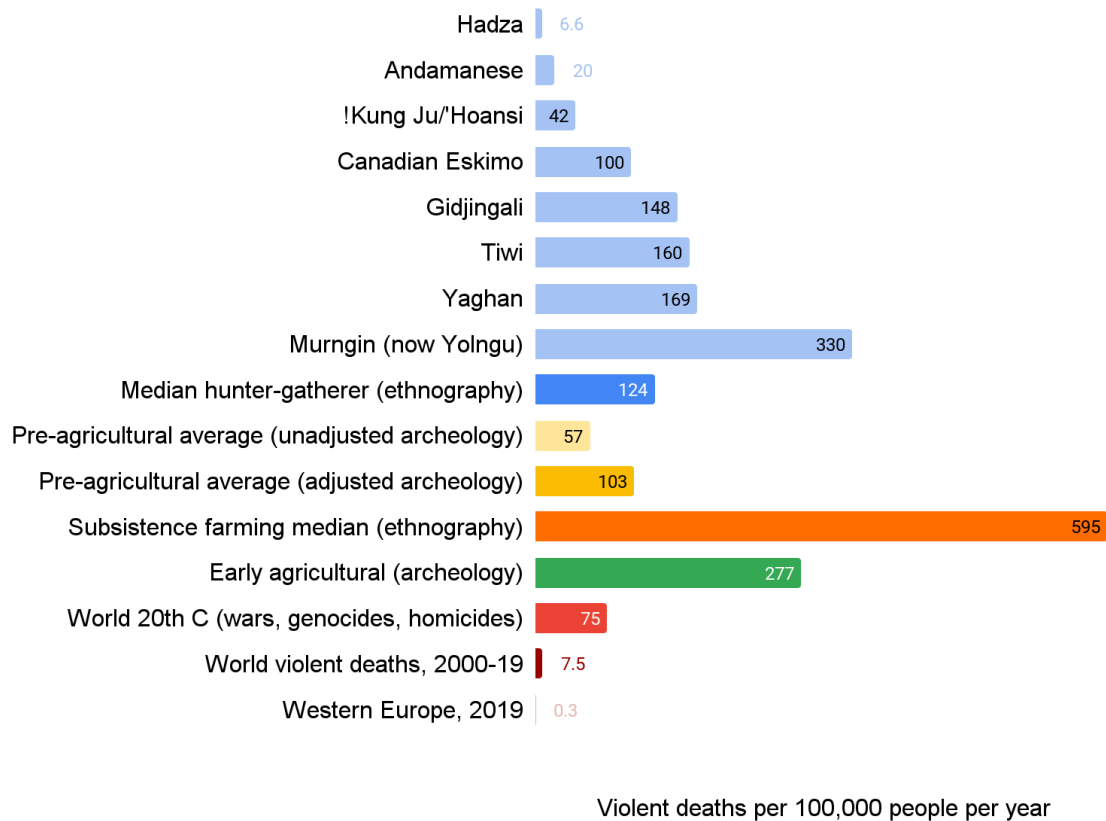
3. Discussion

To recap, our overall conclusions are:

1. There is a high degree of uncertainty about pre-agricultural violence due to problematic evidence. We are particularly uncertain about our method for converting archeological data to reflect *actual* lethal violence rates
2. The archeological evidence from our Paleolithic dataset is particularly unreliable and we recommend the Total Pre-agricultural dataset if a single archeologically derived figure is required to estimate violence in ancestral Homo sapiens
3. Violence was highly variable, varying dramatically by time and place across all our periods of study.
4. Estimates for pre-agricultural rates of violence in Steven Pinker's *Better Angels* are much too high.
5. Rates of violence for pre-agricultural Homo sapiens were high by comparison to most animal species.
6. The agricultural revolution significantly increased levels of lethal violence
7. This increase was probably mainly due to increasing levels of inter-group conflict (warfare), which may have been rare in the earlier Paleolithic although this is hard to determine
8. The prime proximate motivations for violent conflict were probably disputes over women and desire for revenge, although contextual factors like resource stress and cultural diversity are important but it is hard to determine their relative importance.
9. The evidence suggests that the 20th and 21st Centuries had lower rates of lethal violence than pre-agricultural times. But superior medical care in the 20th Century is a confounding factor, and it is unclear how violent the 21st Century will be overall. So

These conclusions are presented more fully in the summary at the start of this study. The chart below summarises our findings from ethnography, archeology and from the 20th and 21st Century.

Rates of violence in Late Pleistocene Appropriate hunter-gatherers, ethnographic data



Source: [Hunter-gatherer data spreadsheet, 'Deaths/100k ethno&arch'](#) tab

Our aim in this study was to give estimates of pre-agricultural rates of violence and descriptions of that violence that are as accurate as the available evidence allows. Our hope was that in doing so we could provide a better alternative source for pre-agricultural violence than Steven Pinker's widely cited *Better Angels*, which doesn't specifically target the pre-agricultural period. We believe that the estimates and descriptions in our study are more accurate as a source for understanding pre-agricultural violence because:

1. Our ethnographic evidence is taken exclusively from hunter-gatherer societies that are more likely to be good approximations for pre-agricultural populations and uses a greater breadth of ethnographic sources
2. Our archeological evidence is significantly more comprehensive, acknowledges potential differences in patterns of violence between different prehistoric time periods and has been adjusted to compensate for likely under-counting of lethal violence based on only archeologically observable signs

Nevertheless, we want to stress that our estimates are still highly uncertain. Throughout the study we've drawn attention to the problematic nature of the evidence that is currently available. We feel that acknowledging this uncertainty is important if we want to accurately represent the current state of knowledge in this field.

Having said that, we're confident in our conclusion that agriculture caused an increase in rates of violence. Firstly, there are numerous strong theoretical explanations for why farmers are more violent than hunter-gatherers. Secondly, the ethnographic evidence emphatically demonstrates this to be true among observed small-scale societies of recent historical times. Thirdly the archeological evidence also indicates a significant increase in violence from the pre-agricultural to the agricultural period, with the exception of the End Paleolithic period whose elevated rates of lethal violence are entirely due to a single site, Jebel Sahaba.

We haven't been able to confidently identify consistent and clear trends in patterns of violence over the course of the pre-agricultural time period itself. There are several issues which make this methodologically difficult. Archeological evidence is still very scarce, particularly for earlier periods, and is concentrated in particular regions or single sites which may not be representative of more global trends. Also, older archeological evidence is more poorly preserved and is hard to compare with newer evidence.

Perhaps, then, what really stands out in our study is the lack of clearly identifiable trends in violence in pre-agricultural populations over time and the great variability in patterns of violence in the populations we've considered. There does not appear to be a 'typical' rate of lethal violence in hunter-gatherer societies, whether you look at the archeological evidence of any period or the ethnographic evidence. Anthropology has shown that humans are extremely behaviourally diverse, and the study of violence bears this out. Rates of annual deaths from lethal violence in our sample of 8 pre-agricultural appropriate societies range from 6.6 to 330/100,000. Some of them don't engage in warfare at all, some engage in sporadic warfare, and for the Murngin warfare is endemic.

Jebel Sahaba is a unique site in pre-agricultural archeology; a graveyard quite unlike anything else found for the period. The skull nest at Ofnet has one or two vague parallels elsewhere in Mesolithic Europe but is dramatically different in scale and certainly does not typify the period. The Nataruk massacre site is the only clear evidence for a community-scale massacre in pre-agricultural archeology as far as we know. Set against these sites evidencing very high rates of possibly endemic violence are populations such as the Japanese Jomon or the Portuguese Muge site which appear to have been astonishingly peaceful by comparison. Or consider the pre-14000BP Paleolithic period, for which there is currently no clear-cut archeological evidence for inter-group violence whatsoever.

Notably, both our ethnographic and archeological evidence indicates that the pre-agricultural period was significantly less violent than the widely cited figures from *Better Angels* would suggest. Pinker estimates a violent mortality rate of 14-15%. This estimate does not consider the under-representation of lethal violence from observable archeological evidence. If Pinker had applied our suggested adjustments to his archeological data to reflect flaws in the fossil record, his estimate from archeology would have been even higher – more like 25%. In contrast, our ethnographic dataset produces a median violent mortality rate of 3.7% and our Total Pre-agricultural average archeological dataset gives a figure of 3.4%.

Naive Rousseauvian idealism?

Some authors from the ‘bellicose school’ of prehistoric violence studies sometimes give the impression that they see those who advocate for more modest estimates of prehistoric violence as naïve idealists. Therefore we feel that it is important to note here that our estimates for conspecific lethal violence among pre-agricultural *Homo sapiens* are relatively *very high* by comparison to most species.

Gomez et al report that the average conspecific lethal violence rate for all mammal species is 0.3%.¹²¹ They explain that primates typically exhibit much higher rates of conspecific lethal violence than the mammal average, partly because they are both territorial and highly social: both of these factors predict increased conspecific lethal violence rates. Even so, they posit that humans would be expected to exhibit conspecific lethal violence rates of around 2% given our phylogenetic position. Yet we estimate that in the pre-agricultural period, rates of violence were actually significantly higher than this.

These high rates of violent mortality are unusual for a species whose long reproductive lifespan means that lethal violence can be very costly from an evolutionary perspective.¹²² What is going on here? Richard Wrangham offers an explanation: *Homo sapiens* are a rare example of what he terms a ‘fission-fusion species’, along with wolves, lions, chimpanzees and a few other mammals.¹²³ These are social species that are able to form coalitions to out-number and overwhelm opponents, meaning that individuals are able to strategically participate in collective violent actions at little risk to themselves. ‘Fission-fusion species’ often (though not always) exhibit high rates of conspecific lethal violence as they compete for resources.

We agree that this is likely one factor incentivizing violence in humans but it fails to explain several of the likely features of pre-agricultural violence we’ve covered in this study:

- 1. Pre-agricultural violence would have often involved single killers or small groups of killers without significant numerical advantage.** This is well-attested in the ethnographic literature
- 2. Revenge attacks increase the cost of aggressive group actions in *Homo sapiens*.** The ethnographic literature indicates that revenge is a very common motive for hunter-gatherer violence. The propensity of *Homo sapiens* for revenge attacks means that even successful attackers might become tomorrow’s victims. There are many accounts of long, bloody cycles of tit-for-tat killings
- 3. Hunter-gatherers are generally characterized more by high rates of interpersonal violence (rather than inter-group violence).** This is well attested in the ethnographic

¹²¹ Gómez, J., Verdú, M., González-Megías, A. et al. The phylogenetic roots of human lethal violence. *Nature* 538, 233–237 (2016). <https://doi.org/10.1038/nature19758>

¹²² Enquist, M., & Leimar, O. (1990). The evolution of fatal fighting. *Animal Behaviour*, 39(1), 1–9. [https://doi.org/10.1016/S0003-3472\(05\)80721-3](https://doi.org/10.1016/S0003-3472(05)80721-3)

¹²³ Wrangham, R.W. (1999). Evolution of coalitionary killing. *American journal of physical anthropology*, Suppl 29, 1-30 .

literature and also is suggested by the archeological evidence, for example there is no clear evidence for warfare until the final millennia of the Paleolithic

4. **Hunter-gatherers often exhibit a moral ethic of non-violence and don't generally aggrandize violence.** This is well attested in the ethnographic literature, and there is no archeological evidence for a pre-agricultural 'warrior culture'.^{124 125}
5. **Ethnographers rarely characterise hunter-gatherer conflict as a struggle for resources, still less a successful one.** Wrangham's theory describes powerful groups overwhelming less powerful groups and taking their resources. Only a few ethnographically attested hunter-gatherer conflicts seem to clearly fit this description. On the contrary, most hunter-gatherer conflicts appear decidedly negative-sum to observers, at least at the group level.

In other words Wrangham's 'fission-fusion' coalitionary violence hypothesis can offer only a partial explanation for the relatively high rates of violent mortality exhibited by our species. Therefore, there must be some additional factors that offer a more complete explanation:

Collective action problem and sociopaths

Factors that make human violent conflict especially lethal by comparison to other animals:

1. **Humans are unusually physically vulnerable.** As large mammals go, we are pathetically fragile. Bad at escaping, slow, with big cumbersome heads, puny muscles and no body armour. For example there are numerous ethnographic accounts of bystanders to conflicts being accidentally killed, so delicate are we.
2. **We have extremely effective offensive weapons.** In fact we are such good predators that we appear to have caused several mass extinctions with our stone-tipped tools, poisons and projectile technology.
3. **We are uniquely good at complex planning and deception.** Many ethnographically documented killings involve bespoke sneak attacks, carefully engineered and timed to reduce the risk to the attacker and catch the victim unawares.
4. **We are a social 'fission-fusion' species, able to form coalitions in order to outnumber and overwhelm opponents.**

The suite of unusual traits listed above combine to make us perhaps uniquely vulnerable to conspecific violence. Conspecific human violence is characterised by its extreme lethality by comparison to other species. This explains why conflicts within groups are regularly fatal, why lone actors can sometimes be responsible for multiple killings, why hunter-gatherer societies typically develop non-violent ethics in an attempt to manage and avert disaster and why hunter-gatherer groups are generally wary of conflict with neighbours.

¹²⁴ Boehm, Christopher. (2012). *Moral origins: The evolution of virtue, altruism, and shame*. Basic Books.

¹²⁵ Fry, D. P. (Ed.). (2013). *War, peace, and human nature: The convergence of evolutionary and cultural views*. Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780199858996.001.0001>

The extreme lethality of human violence problematises the idea that the high rates of violent mortality seen in hunter-gatherer populations are primarily a consequence of human groups using violence strategically and rationally to gain resources. This theory depends on groups being able to do so *at low risk to themselves* (as is the case with other ‘fission-fusion’ species). But the lethality of human violence, coupled with the human propensity for revenge, means intergroup conflict is nearly always a high risk strategy for hunter-gatherers.

Indeed, in ethnographic accounts of lethal conflicts between hunter-gatherers (and in fact other types of small-scale society) it is often the case that (nearly) everyone seems to lose. Killings often set off a cycle of revenge murders (usually targeted at the murderer himself or at his relatives). Killers are often executed by their own community. Relationships of exchange and mutual dependence break down. Resources in contested areas become under-exploited no-man’s lands.¹²⁶ A state of conflict in a small-scale hunter-gatherer society is effortful and stressful for participants who must remain alert to potential threats in basically undefendable contexts while continuing to subsist.

This appears to be a key motivation which explains the voluntary acculturation and assimilation into state society observed among many hunter-gatherer and other small-scale groups over the last century or so. Groups such as the Ache¹²⁷ and Waorani explicitly welcome state intervention and acculturation as freeing them from the traditional patterns of violence they were stuck in, as described in the following account:

“Other means of attempting to stop the violence were exchange of spouses, fleeing, and grimly attempting to exterminate the other group altogether. None of the methods worked—fragile truces kept being broken, and it proved impossible to flee as far or to kill as many as would be necessary in order to end the violence ... In the case of the Waorani, peace came following the arrival of Protestant missionaries. The pacification of the Waorani was incredibly rapid—in a six-year period from 1967 to 1973, more than 500 Waorani came to escape the violence and to settle in Tewaeno, the Wao community of converts. The pacification and concentration of 85 percent of the population on less than a hundredth of a percent of the original territory accomplished several things simultaneously: It ended the feuding by offering a refuge area, it allowed kin to reunite with one another, it allowed many people to find spouses, and it gave the Waorani important access to trade goods. Thus, many of the problems caused by the endless violence were solved by conversion to Christianity and mass resettlement in a newly created Christian community.”¹²⁸

Peaceful relations between neighbours would therefore seem to be generally beneficial for human groups relative to other species, not just by sparing them these bloody cycles of

¹²⁶ Kelly R. C. (2005). The evolution of lethal intergroup violence. *Proceedings of the National Academy of Sciences of the United States of America*, 102(43), 15294–15298.
<https://doi.org/10.1073/pnas.0505955102>

¹²⁷ Hill, Kim, and A. Magdalena Hurtado. 1996. *Aché life history: the ecology and demography of a foraging people*. New York: Aldine de Gruyter. p168

¹²⁸ Professor James S. Boster; James Yost; Catherine Peeke (2003). *Rage, Revenge, and Religion: Honest Signaling of Aggression and Nonaggression in Waorani Coalitional Violence*. , 31(4), 471–494. doi:10.1525/eth.2003.31.4.471

destruction but also because of our ability to trade knowledge and resources; unlike most animals, we can benefit from the successes of our neighbours.

For this reason we think intergroup conflict among hunter-gatherers is generally best understood as a failure to solve a difficult collective action problem. The vulnerability of human groups to violent attack makes relations with neighbouring groups unstable. In fact this was also one of the main conclusions in *Better Angels*, where Pinker describes this situation as a ‘Hobbesian Dilemma’. Attackers nearly always have a decisive advantage over defenders (Walker and Bailey’s 2013 study of conflict in small-scale South American societies found that only 2% of the lethal events they documented involved the death of an attacker).¹²⁹ This imbalance of risk presents a prisoners’ dilemma for people in positions of potential conflict, whereby the only effective form of defence is to preemptively attack.

We accept that there would have been occasions where it became strategically advantageous for hunter-gatherers to use lethal violence; an ethnographic example would be the sometimes successful attempts at wife-capture among the Netsilik Eskimos.¹³⁰ However, we think that this would more typically pertain at the individual, rather than the group, level, i.e. this would involve individuals pursuing narrow gain at the expense of group harmony. We therefore speculate that cooperative relations between neighbouring hunter-gatherer groups would tend to be mutually beneficial but are tragically fragile; easily ruined by individual defectors whose actions precipitate conflicts which end up forcing everyone to adopt hostile attitudes for the purpose of self-preservation.

Given the important role this view of violence in hunter-gatherer societies affords to individual defectors, it is interesting to consider the extent to which atypical sociopathic personality types might have been key drivers behind this dynamic. Modern psychopath studies indicate that sociopathic personality types have reduced empathy, increased aggression, are amoral and have high tolerance for conflict and violence. In modern societies, such personality types are responsible for lethal violence to a degree that far outweighs their prevalence in the population. Maybe this was also true in the distant past. If so, there are further implications for our understanding of human nature vis a vis violence here. Perhaps we overestimate the capacity of psychologically more typical humans for lethal violence due to the distorting impact of people with sociopathic personality traits on rates of lethal violence.

If our interpretation is broadly accurate there is less reason to be pessimistic about human nature. Rather we should have compassion for the predicament of those who were (and still are) forced to confront the difficult collective action problem of human violence and stood (stand) to lose everything because of it.

¹²⁹ Walker, R. S., & Bailey, D. H. (2013). Body counts in lowland South American violence. *Evolution and Human Behavior*, 34(1), 29–34. <https://doi.org/10.1016/j.evolhumbehav.2012.08.003>

¹³⁰ Balikci, Asen. & American Museum of Natural History. (1970). *The Netsilik Eskimo*. Garden City, N.Y : Natural History Press for the American Museum of Natural History p155

Will our knowledge improve?

We think that the key future advances in this field will come from archeology rather than ethnography. There probably won't be any more studies of pre-agricultural appropriate hunter-gatherer societies. But hopefully there will be lots more discoveries of ancient skeletons which will broaden our understanding of all aspects of the pre-agricultural past, including violence. Another useful step would be to have more information about all the skeletons in our datasets, such as their state of preservation, age and gender for example. This would enable us to identify more detailed patterns in pre-agricultural violence. We also hope that our fumbling attempts to construct a method for estimating actual rates of lethal violence from limited skeletal evidence can be improved upon by someone much more informed and systematic in their approach than us.