

## RESEARCH ARTICLE

# Does Security Imply Safety? On the (Lack of) Correlation Between Different Aspects of Security

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This paper investigates to what extent different aspects of security correlate. It distinguishes four concepts covered by the term 'security': technical safety, perceived safety, technical security and perceived security. It is shown that these concepts need not correlate conceptually. Furthermore, the paper shows empirically that these concepts correlate weakly in two cases. This has implications for policy and research. First, it leaves open the possibility that interventions targeting one aspect of security do not affect, or even adversely affect, another aspect of security: an expression of a security gap. Second, research is commonly motivated by individual-level arguments relating to safety, whilst relying on aggregate indicators more likely capturing security.

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## Introduction

'Security' is a multi-faceted term (see, for example, Buzan and Hansen 2009). Even if there is agreement on the threat from which some object ought to be secure (this paper focuses on physical violence by a political armed group – political violence for short), 'security' can mean many things. It can be an individual feeling, the probability of a particular threat occurring, a condition a group of individuals is in, or perceive themselves to be in. This is not a new argument; it is even clear from the dictionary definition of the term 'security.' However, it is tempting to assume that all the above aspects of security are closely related. In the case of research, this may

mean motivating research into the 'security' of a state by citing how destructive individual fear of threats is to the economy. In the case of policy, this may mean assuming that those interventions that are considered successful in improving one aspect of security also help, or at least do not hinder, others. If various aspects of security are indeed strongly correlated, this assumption may well be close to the truth. If they are not, there is scope for a mismatch between security interventions and certain aspects of security: an expression of the security gap.

This paper investigates the correlation between various aspects of security. It distinguishes four such aspects: technical safety, perceived safety, technical security and perceived security. It will show that, conceptually, there is no need for these aspects to be strongly related to each other. It will also illustrate that each aspect of security may be the target of a security intervention,

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depending on the rationale for intervening. This opens up the possibility of a security gap: a security intervention targeting one aspect of security using one rationale, whilst not affecting or adversely affecting another. Several cases illustrate a security gap of this kind in practice. Focussing on one particular threat, physical violence by a politically organised armed group, this paper will then consider the correlation between different aspects of security empirically. It illustrates how the attention of those producing indicators related to 'security' has shifted over time towards measuring different aspects of it. Using these various indicators, it then shows that indicators for different aspects of security are weakly correlated in two cases.

The remainder of this paper is organized in two sections: the first section breaks down the term 'security' before investigating the relationship between the various concepts covered by the term 'security' conceptually. The second section outlines which aspects of security are covered by empirical indicators and investigates whether these correlate empirically.

### **The security gap: when 'security' and security interventions do not align** ***Defining 'security'***

Security is a fast-moving and contested concept; the term has been redefined many times over the last decades and there is no consensus as to its meaning. The paper by Kaldor and Selchow in this special issue (2015) highlights this, and Buzan and Hansen (2009) provide a comprehensive overview (Buzan and Hansen 2009).

A look at the Oxford English Dictionary illustrates that the term 'security' is used, at least colloquially, to describe a number of distinct concepts: the state of *being* free from danger or threat, the state of *feeling* safe and free from fear and *procedures followed or measures taken* to ensure the security of a state or organisation. Hence, 'security' can describe an individual condition, the condition of some collective entity, a perception of either of these conditions and measures

taken to ensure a particular condition. In academic literature, we also find these distinct meanings of the term 'security.' Paris (2001), for example, defines human security as both 'safety from chronic threats' – a collective or individual condition – and 'protection from sudden and hurtful disruptions in [...] daily life' – a measure to ensure an individual condition – (Paris, 2001). Booth (2015) defines 'security' as 'the condition of *feeling or being* safe from threats (emphasis added)' – an individual or collective condition, or a perception of this condition (Booth 2014).

I argue that it is important to distinguish between these meanings of the term security. As will be illustrated below, whether we define security as a perception, collective condition or individual condition makes a difference for which measures we think are effective in achieving it. Furthermore, improved 'security' according to one definition may not mean improved security according to another. Calling distinct objectives and the measures to achieve them all 'security' can obscure this.

For the purpose of this paper, the overarching topic of interest is the condition of 'being free from threats.' This phrase is included in a great many definitions of the term 'security' (e.g. Booth 2014; Owen 2008; Paris 2001). This condition can apply to an individual or to some aggregation of individuals. To distinguish between the two, I call the former *safety* and the latter *security*. This is somewhat arbitrary: the terms are often used interchangeably, as Paris' (2001) definition of human security and the dictionary definitions outlined above illustrate. However, there is a sense that safety applies more strongly to the individual, whereas security applies more often to an aggregate entity. For instance, it seems more natural to speak of 'personal safety' and 'national security' than of 'national safety' and 'personal security'. Similarly, some authors in military circles make a distinction that between 'national security' and 'troop safety' (Glenn et al. 1998). I don't claim this use of the terms safety and

security is universal and I am aware that one could put forward many examples to the contrary. Nevertheless, in the interest of making a clear distinction, in this paper I use safety to refer to individual freedom from threats, and security to refer to freedom from threat of some group of individuals.

Secondly, I distinguish between *technical* and *perceived* freedom from threats. The former refers to the probability that an individual or group of individuals will be subject to a particular threat. The latter refers to how likely an individual thinks a particular threat is to happen and the resultant fear or anxiety. This definition leaves open the subject of the perceiving: there can be as many perceptions of the same condition as there are individuals.

These two distinctions, individual – aggregate and technical – perceived, lead to the  $2 \times 2$  matrix defining aspects of security

depicted in **Table 1**. Not represented in this figure, is the definition of ‘security’ as measures taken to ensure freedom from threats. I will call such measures *security interventions*. The objective of security interventions can be to promote any (combination) of the concepts making up security depicted in **Table 1**.

**Relationships between the different concepts making up security**

To explore the relationships between the four concepts making up security it is helpful to define how these can be expressed empirically. To do so, one should specify a particular threat an individual or group is free from, and do so consistently across the four concepts. It is not clear whether and how distinct threats, such as an earthquake and gun crime, could validly be aggregated or compared empirically. Which particular threat one identifies

		TECHNICAL	PERCEIVED
AGGREGATE	Term	<b>Technical security</b>	<b>Perceived security</b>
	Definition	Freedom from threats of some group of individuals	Perceived freedom from threats of a group of individuals / fear of threats to the aggregate entity
	Empirical representation	$\frac{1}{N} \sum_{i=1}^N t_i$	$f\left(\frac{1}{N} \sum_{i=1}^N t_i, \eta_j\right)$ e.g. $\frac{1}{N} \sum_{i=1}^N t_i * \eta_j$
	Indicator	Average probability an individual member of a group will be subjected to a particular threat	Perceived average probability an individual member of a group will be subjected to a particular threat/ perceived degree to which the aggregate entity is subjected to a particular threat
INDIVIDUAL	Term	<b>Technical safety</b>	<b>Perceived safety</b>
	Definition	Individual freedom from threats	Perceived individual freedom from threats / fear of threats to the individual
	Empirical representation	$t_i$	$f(t_i, \delta_j)$ e.g. $t_i \delta_j$
	Indicator	Probability an individual will be subjected to a particular threat	Perceived probability an individual will be subjected to a particular threat / degree of fear an individual will be subjected to a particular threat

**Table 1:** Aspects of security: four concepts.

already reveals a particular outlook on 'security': Kaldor and Selchow (2015) identify a number of 'security cultures' each with a distinct view on what are the most pertinent threats. This section highlights however that even for the same threat, the four concepts making up security may correlate imperfectly or may not be correlated at all.

Technical safety is denoted by  $t_i$ , the probability that individual  $i$  is subject to a particular threat. Empirically, the other four concepts making up security are derived from this.

Research suggests that perceived safety is influenced, but not fully determined, by technical safety (e.g. Slovic et al. 1985). Hence, I model perceived safety as some function of technical safety and another factor  $\delta_j$  specific to individual  $j$  doing the perceiving. The remainder of this paper mainly treats the case when  $i = j$ : a person's perception of their own safety. Brück et al (2014) call  $\delta_i$  a 'fear factor' and model perceived safety as the product of this 'fear factor' and effort devoted to terrorism. Hence, this fear factor either amplifies (when greater than 1) or tones down (when between 0 and 1) technical safety in the individual perception (Brück et al. 2014). A number of studies investigate what determines  $\delta_j$ . Kahneman and Tversky pioneered the idea people rely on mental short-cuts when estimating probabilities. For instance, we may judge the likelihood of an event by the ease with which similar instances come to mind (availability). Kahneman and Tversky show that this may lead to substantial differences between technical and perceived probability. (Kahneman and Tversky 1974). Slovic et al. (1985) coin the factors 'unknown' (the extent to which a threat is new, unfamiliar, involuntary or has delayed effects) and 'dread' (the extent to which a threat is fatal to large numbers) and show that these are systematically related to differences between people's perceptions and technical estimations of the probability of a threat (Slovic et al. 1985). Sandman suggests that people underestimate probability of threats when there is a sense they are encountered voluntarily (e.g.

a sporting accident versus a car crash), that they can exercise some control (e.g. driving versus flying), when the threat is familiar (e.g. smoking versus a newly discovered chemical in food) and when threats affect a population equally (e.g. air pollution versus living next to a nuclear plant) (Sandman 1987).

The larger  $\delta_i$  (for  $\delta_i > 1$ ) or the smaller  $\delta_i$  (for  $\delta_i$  between 0 and 1), the larger the difference between *a single individual's* technical safety and their perception of their own safety. The case is not quite as simple when we consider the strength of the correlation between technical safety and own perceived safety for *a sample of individuals*. If own perceived safety is  $t_i \delta_i$ , the impact of  $\delta_i$  on the correlation between technical and perceived safety is easiest seen when we consider the Spearman rank correlation coefficient. Consider ordering all individuals in the sample according to their decreasing technical safety. As long as multiplying technical safety with the 'fear factor' does not alter this ordering of individuals, technical safety and perceived safety will be perfectly correlated. When applying the 'fear factor' changes or even reverses this ordering, for example when those individual most technically safe perceived themselves to be the most unsafe, the correlation becomes weaker or negative.

Technical security, the freedom from threats of a particular group of individuals, is represented empirically by probability that an individual in this group is subject to a particular threat. A real world example might be the number of homicides per 100,000 inhabitants of a country; a common measure of insecurity due to crime. Technical security and technical safety are thus very directly related: technical security is simply the aggregation of technical safety, relative to the size of the group (denoted by  $N$ ). That does not necessarily imply that technical security and technical safety correlate strongly: this depends on how uniformly technical safety is distributed among the members of the group. If we take a sample of individuals from more than one different group, take their level of technical safety as

one variable, and the level of technical security of the group the individual belongs to as another, these two variables will correlate perfectly if all individuals in the group have the same level of technical safety (implying technical safety equals technical security for each individual). When some individuals in the group enjoy a higher level of technical safety than others, the strength of this correlation decreases.

This also illustrates that there need not be a close relationship between technical security and perceived safety. Although both are derived from technical safety, perceived safety is not necessarily correlated strongly to technical safety (due to the 'fear factor'), and technical safety is not necessarily correlated strongly to technical security (due to the aggregation effect). However, even if neither relationship is strong, it is possible that perceived safety and technical security correlate if the 'fear factor'  $\delta_j$  is somehow related to technical security. Gerbner et al. (1980) have suggested a similar effect termed *affinity*. This suggests that individuals fear a particular threat more if they receive information about someone similar to them experiencing this threat, as compared to when they receive information about a person they perceive as not in their group (Gerbner et al. 1980). However, empirical evidence for the affinity effect is scarce (Eschholz 1997).

Finally, perceived security is some function of technical security and some other factor  $\eta_r$ . This factor could represent a 'fear factor' as it was presented at the individual level. In addition, the group might represent something different in people's perceptions than the aggregation of the constituent individuals. To the extent that this amplifies or tones down perceived security relative to technical security, this is captured by  $\eta_j$ . For example, 'the State' might represent more than the sum of all its citizens. In this case the State could still be perceived to be under threat even if there is no direct threat to its citizens.

Drakos and Müller investigate the correlation between technical security in the case

of terrorism (measured by the average probability of a citizen to be subject to a terrorist attack) and perceived security (identifying terrorism as a major threat to the country). They conclude that technical security has a significant impact on perceived security. However, the  $R^2$  of their models, even when including time and country fixed effects and controlling for individual characteristics, is roughly around 0.2. Intuitively, this would indicate that technical security explains only a fifth of the variation in perceived security (Drakos and Mueller 2014).

As in the case of technical safety and perceived safety, technical security and perceived security may not be strongly (Spearman rank) correlated if applying  $\eta_j$  to the former to arrive at the latter changes the ordering of groups. The relationship between perceived security and technical safety is mediated by both the aggregation effect and  $\eta_j$  leaving open the possibility that the two are not strongly correlated. The relationship between perceived safety and perceived security is mediated by additional factor  $\delta_j$ , so these two concepts are possibly furthest removed from each other. However, we might imagine that their respective 'fear factors,'  $\eta_j$  and  $\delta_j$ , may be related if similar processes widening the gap between perception and technical assessment are at work at the individual and aggregate level. One should note however, that this does not guarantee that perceived security and perceived safety will be correlated.

So far, we have seen that the term security covers a number of concepts that may not be (strongly) correlated. But before investigating this correlation empirically, it is important to ask why it is important whether these concepts do or do not correlate. To see this, we turn to security interventions.

### **Which of the aspects of security to target? Rationales for security interventions**

Above, I have defined a security intervention as a measure taken to improve one or more of the four concepts making up security in

**Table 1.** I will argue that different rationales for undertaking a security intervention imply targeting different aspects of security and that security interventions targeting one aspect, even when doing so successfully, may adversely affect one or more other aspects of security.

Note that the definition of security interventions implies, at least to a certain extent, benign intentions on the part of the intervener. We may imagine interventions undertaken in the name of 'security' that in reality do not aim to improve any aspect of security outlined in **Table 1**. For example: a military intervention for geo-political reasons, creating a large security apparatus to satisfy a military industry lobby or to protect a dictator, or an intervention emphasizing a non-existent threat to create a 'rally-round-the-flag' effect. For the purpose of this paper, I will by definition exclude these actions from security interventions. Part of the argument put forward in this paper is that security interventions may in certain circumstances adversely affect some aspect of security. This would be an unremarkable conclusion indeed if the definition of security interventions included actions never aimed at improving any of these aspects in the first place.

Turning to possible rationales for undertaking a security intervention, one such rationale may be *humanitarian*, a concern for those individuals in immediate danger of harm (Barnett 2005). This implies a security intervention aimed at freeing individuals from these threats: providing technical safety.

Alternatively we may see security as a precondition for economic development and employ an *economic* rationale for a security intervention. Theory and empirical research suggests that production, and thus economic development is related to a number of aspects of security. First, it is straightforward to see that production is related to technical safety: if individuals are harmed and property destroyed, this affects labour and capital that form the main ingredients

in a production function. Second, perceived safety may affect investment decisions. If an individual perceives their future to be unsafe, this diminishes the incentive for investment. The impact of perceived safety on economic development may be as large as the impact of physical safety. In a study of the impact of insecurity on household welfare in Uganda for example, Rockmore (2011) concludes that roughly half the conflict-related losses were due to perceptions of risk, as opposed to physical violence. Third, economic development may be related to technical security, if the individuals making up the aggregate entity form a market for the goods produced, or if there are spill-overs between productive activities of members of the group (such as increasing returns to scale or innovation). Finally, economic development may be related to perceived security, if we consider the perceived security of the aggregate entity and the institutions that could come with it as an asset that can attract investment. For instance, just like countries may be perceived internationally as 'low corruption,' to be perceived internationally as 'high security' may be beneficial to economic development. In the case of corruption, it has been suggested that perceived corruption may be more strongly related to economic growth than the number of instances of corruption experienced (Toke 2009). Although perceived security may not trump technical security in its impact on economic development, it is clear that perceptions can play an important role. In sum, a security intervention with an economic rationale may target any or all four aspects making up security.

There may also be *political* rationales for security interventions: those with political power who are perceived to be providing safety and security may be regarded as more legitimate and may be more likely to hold on to power. Brück et al. (2014) for instance, model an incumbent government and opposition who promise and provide perceived protection from threats to increase their probability of (re-)election. In this model, only

the perception of being free from threats (as opposed to being technically free from them) is related to political popularity. Although this is, by necessity, a simplified view of reality, it is not difficult to imagine that an intervention which increases perceived (but not technical) safety or security benefits political popularity, whilst an intervention increasing technical (but not perceived) safety or security may not be attractive to a politician motivated by re-election. Hence, a security intervention with a political rationale may target perceived safety or perceived security.

**The security gap: when a security intervention targeting one aspect of security adversely affects another**

Using the arguments made so far, it is now possible to arrive at a characterization of the security gap. The security gap emerges when a security intervention, targeting a particular aspect of security, does not affect or adversely affects one or more of its other aspects. This is possible because different rationales for security interventions suggest targeting different aspects of security and because the four aspects of security do not necessarily correlate with each other. In fact, the weaker the correlation between the four concepts making up security presented in **Table 1**, the greater the scope for a security gap. This is why it is interesting to investigate empirically the extent to which different aspects of security correlate, which will be the subject of the next section.

Before doing this however, I present three illustrations of the security gap: one stemming from the theoretical model presented in Brück et al. (2014) which illustrates how security interventions with a political rationale may decrease technical safety or security, one case study from South Sudan which illustrates how a security intervention with a humanitarian rationale decreased perceived safety, and the case of the Democratic Republic of Congo (DRC) which illustrates that security interventions can be redesigned based on a change in perceived security,

whilst technical and perceived safety remain low.

The theoretical model by Brück et al. (2014) features a government that faces a trade-off between spending on welfare and spending on protection against terrorist threats. Potential terrorists in turn face a trade-off between putting their labour towards terrorist activity or peaceful activity. Benefits to the latter increase with government welfare spending and decrease when spending is diverted towards protection. The authors show that this model has two equilibria: one with high protection spending and high effort devoted to terrorism, one with low protection spending and low effort devoted to terrorism. To this model, they add a public, which can vote out the incumbent government, partially based on their *perception* of terrorist threat. This incentivizes the incumbent to devote more resources to protection spending than it would if it only cared about threats realized, potentially diverting so many resources away from welfare spending that returns to terrorist activity increase rather than decrease. This leads to the possibility that security interventions aiming to *increase* perceived safety lead to a higher number of threats realized, and thus a *decrease* in technical safety and security.

The second example is a case study examining the impact of a security intervention aiming to improve technical safety and security from the Lord's Resistance Army (LRA) in South Sudan (Rigterink and Schomerus 2015). The LRA is a rebel movement originally from Uganda, using abduction as a method of recruitment. A network of radio stations, with the support of various international organisations, broadcasts messages to LRA fighters encouraging them to defect (The Resolve 2013). This security intervention is clearly aimed at decreasing the number of LRA fighters able to stage attacks and thereby at increasing technical security and safety. Some of its supporters claim that this security intervention has been successful on this front (Invisible Children 2013). However,

these broadcasts mean that inhabitants of the area these radio stations cover have to listen to messages about the LRA on a weekly basis. It is shown in Rigterink and Schomerus (2015) that inhabitants of areas in South Sudan with better reception of a participating radio station, express *more* fear of an LRA attack, controlling for indicators of technical security, than inhabitants of areas with poor radio reception. In this case, a security intervention aimed at *increasing* technical safety and security has *decreased* perceived safety.

Finally, the case of the DRC illustrates how decisions on security interventions can be taken on the basis of perceived security, whereas lack of technical and perceived safety persist. After the signing of a peace agreement in 2003, the Second Congo War officially ended, the DRC was no longer perceived to be 'in conflict.' This gave the starting sign for post-conflict reconstruction programmes, including such security interventions as disarmament, demobilization and reintegration (DDR). However, a study by Dolan in 2010 reveals that at that point, in the perception of individuals 'war is not yet over' and warns that this implies that certain security interventions are not seen as appropriate (Dolan 2010). Furthermore, we shall see in a later section that according to some datasets, technical safety and technical security was not necessarily lower during years when the perceived security situation was 'post-conflict' compared to years 'in conflict.'

### **Investigating the scope for the security gap empirically: the correlation between concepts making up security**

#### ***Formulating indicators***

So far, I have argued that the scope for a security gap depends on the extent to which the four aspects of security correlate and that conceptually, there are conditions under which this correlation will be weak. However, the extent to which the four concepts making up security correlate in practice is a matter for empirical investigation. This will be the subject of the remainder of this paper.

To enable a valid comparison, I will focus on one specific threat: being subjected to physical violence by a politically organised armed group, or political violence for short. Note that this includes violence by a state army. Furthermore, I will focus on one specific group of individuals: the state. The four concepts shown in **Table 1** are redefined accordingly. Hence, from this point onward, technical safety is taken to mean the probability that an individual will be subjected to violence by a politically organised armed group, technical security is the average probability that the citizen of a state will be subjected to violence by a politically organised armed group, etc.

The choice for this particular threat and this particular group of individuals is partially motivated by availability of data. In addition, there has been a considerable amount of literature on the correlation between different datasets of political violence (Eck 2012; Restrepo et al. 2006; Sambanis 2004). But in marked contrast to, for instance, the study of terrorism, there has been little attention to the role of perceptions and aggregation in explaining these differences.

Empirically investigating the four aspects of security requires finding indicators for them. It is important to keep in mind that any indicator is by necessity an imperfect representation of the concept (Cartwright and Bradburn 2011). Thus, even if two concepts correlate perfectly, indicators for these concepts might not.

Definitions of each of the four aspects of security involve the word 'probability.' Probability is difficult to operationalize empirically as we can only observe past outcomes, not current likelihood. Therefore, I am forced to approximate the latter using the former in the case of technical security and technical safety. Hence, technical safety is measured by whether an individual has been subjected to physical violence by a politically organised armed group over a particular period, and technical security is the number of citizens of a state who have been subjected to physical violence by a

politically armed group relative to the size of the state's population. This is not without controversy. Brück (2013) for instance argues that tracking instances of violence by politically organised armed groups cannot help to measure security. Security should be measured, he argues, by threats realised relative to the inherent level of threat and the degree of protection (Brück 2013; Brück et al. 2014). It is clear that the measure I propose only reflects threats realised. However, since it is unlikely that we will ever be able to measure inherent threat, I argue that threats realised is the best available proxy for this aspect of security.

Individual perceptions of probability on the other hand, can be observed in the sense that it is possible to ask individuals to state their perceptions. In this paper, I will mostly focus on the degree of fear or concern expressed about physical violence by politically organised armed groups, as a measure of perceived safety and security. There is ample precedence for taking this as an indicator of perceptions (Drakos and Mueller 2014; Rockmore 2011; Slovic et al. 1985). In addition, certain terms may express a high or low degree of concern about political violence, such as 'at war' or 'at peace.'

### **A brief history of data on political violence and description data used**

A brief look at the history of data on political violence illustrates how, in this context, interest has shifted over time toward measuring different aspects of security. In addition, it describes the data used in the subsequent analysis.

Two of the earliest datasets on violence by politically organised groups are the Correlates of War dataset (COW – first version 1972) and the Armed Conflict Dataset by the Uppsala Conflict Data programme (UCDP – first version 2002). Both focus on aggregate aspects of security: the unit of analysis of both datasets is the state. Neither dataset explicitly aims to provide an indicator for security as such: COW aims to capture

war, and the dataset by UCDP aims to capture armed conflict. War and armed conflict are conceptualized as a condition that a state is either in or not in a given time period. Measuring the extent to which individuals are subject to political violence is a by-product of the definition of this state-level condition. Amongst other criteria, both datasets require political violence to cause a certain number of casualties before it is classified as a war or an armed conflict respectively. Hence, COW includes the number of combatant fatalities from battle. In a separate dataset, UCDP records battle-related deaths, including civilian casualties from battle, for all armed conflicts it identifies from the year 1989 onwards. Especially the last indicator, measuring the total number of citizens in a state subject to a particular threat, can be considered an indicator of technical security. COW requires political violence to cause more than one thousand battle-related combatant fatalities for it to be classified as 'war,' the UCDP Armed Conflict dataset requires one thousand battle-related fatalities for a major, and 25 for a minor armed conflict. The number of battle-related (combatant) fatalities is not included in either dataset for instances when political violence does not reach this threshold. To classify as 'battle,' one of the parties to an instance of violence should be a state army.

One interpretation of the COW and the UCDP Armed Conflict datasets is that they provide a measure of perceived security from political violence, based on technical security. In this case, perceived security is the perceived degree to which a state is subjected to political violence and there are only two such degrees: a condition of war (armed conflict) or the absence of this condition. In terms of the empirical representations presented in **Table 1**,  $\sum_{i=1}^N t_i$  is the total number of battle-related (combatant) fatalities in a country and perceived security is

$$\frac{1}{N} \sum_{i=1}^N t_i * \eta_j$$

where  $\eta_j = 0$  if  $\sum_{i=1}^N t_i$  is smaller than one thousand (smaller than 25 for minor armed conflict) and  $n_j = N / \sum_{i=1}^N (t_i)$  otherwise. Abstracting away from the division by  $N$ , this measure of perceived security and the measure of technical security  $\sum_{i=1}^N t_i$  can be perfectly (Spearman rank) correlated, as the specified transformation need not affect the ranking of observations.

Despite this, there is a possibility that perceived and technical security correlate less than perfectly in this case. This depends on whether other perceptions of the security of a country play a role in the process through which the database is constructed. The process of constructing such a database might be to continuously monitor battle-related (combatant) deaths in all the world's countries and flag instances where this rises over the specified threshold. In the case of COW however, this appears to not have been the case. Documentation for this project states that the first step towards constructing this dataset was to 'compile a list of all wars that could possibly be considered as [such]' and a later step was to eliminate those with fewer than one thousand battle related combatant fatalities (Singer 1972). It is unclear whether UCDP employs a similar process, but it does not publish battle-related death numbers for country-years not identified as in armed conflict. This leaves open the possibility that countries exist that experienced political violence causing more than one thousand battle-related deaths that never made it to the initial list of potential wars, because of some perception that these countries were not at war. Furthermore, if such a perception exists for a particular country, it is possible that this influences how a particular instance of violence is classified. Instances of violence in a country that is not perceived to be at war may be less likely to be classified as battle compared to similar instances in a country perceived to be at war. The extent to which this happens in reality is again a matter for empirical investigation.

One point of critique on the above datasets is that armed conflict consists of more than battle involving a state army, perhaps even increasingly so (Kaldor 2006). Possibly in response to this, UCDP has published two new datasets, constructed analogously to the Armed Conflict Dataset above. In 2007, a dataset on one-sided violence was introduced: amongst other criteria, a country is considered as experiencing one-sided violence if any armed actor perpetrates violence against civilians leading to more than 25 deaths (Eck and Hultman 2007). In 2012, a dataset on non-state conflict followed: amongst other criteria, a country is considered to be in non-state conflict if there are more than 25 deaths from battle between two or more non-state armed actors (Sundberg et al. 2012). Both datasets thus include an indicator for technical security, as a step towards creating an indicator measuring whether the state as a whole is in non-state conflict or in a situation of one-sided violence. It becomes increasingly doubtful whether it is useful to conceptualize non-state conflict or one-sided violence as a state-wide condition however, especially in the latter case. Whereas we may have a clear perception of what it means for a state to be 'in armed conflict,' this image is less strong for a state 'in one-sided violence.'

Some more recent datasets abandon the state as a unit of analysis, using instead the individual instance of violence by a politically organized armed group or the event. The Armed Conflict Location and Event Dataset (ACLED) is one of the first event based datasets, introduced in 2005 (Raleigh and Hegre 2005). It categorizes its events as battle (a violent interaction between two or more organized armed groups), violence against civilians and riots/protests, among other smaller categories. UCDP followed in 2011 with its own event-based dataset, including events in each of its three categories of violence: armed conflict, non-state violence and one-sided violence (see Sundberg and Melander 2013). It should be noted that Africa is the only continent comprehensively covered by both datasets.

Both datasets provide indicators of technical security: the total number of instances of political violence, or the total number of casualties from instances of political violence in a state. Although they do not provide data at the individual level, and hence do not provide an indicator of technical safety as such, event databases do herald a shift in interest towards a level of aggregation lower than the state. Event databases are constructed through a systematic count of all instances of political violence reported by certain sources and do not aim to translate this to a state-wide condition. As such, they may be less subject to the problem described earlier, where a country's perceived degree of security influences the measurement of its technical security. However, it is still possible that the sources from which event databases draw their data, usually media sources or expert reports, are similarly biased in their reporting. This would likely cause a discrepancy between technical safety and measured technical security.

In addition to the increasing number of event-based datasets, there has been a call to collect more data on political violence at the individual or household level. Brück et al. (2010) argue for the inclusion of a standardized module in existing household surveys containing questions that would provide indicators of technical safety, perceived security and perceived safety. These include questions on whether a member of the household has been subjected to different types of violence, and on the respondent's perception of the safety and security (e.g. how safe they feel their neighbourhood is, how often they fear that they or their family might be subject to particular forms of political violence). Although this module is not currently included as standard in a multi-country survey programme, it is clear that numerous individual surveys already include conflict-related questions (Brück et al. 2010).

This history of data collection on violence by politically organised armed groups illustrates how the focus of data collection efforts has shifted from providing a formalization

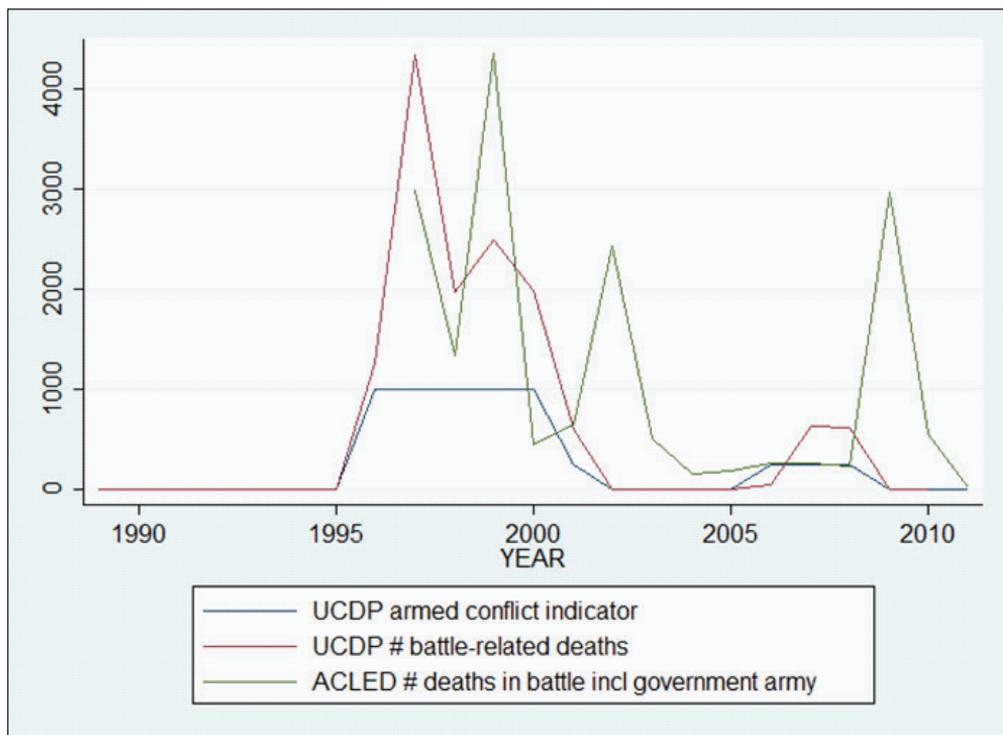
of perceived security, to technical security, to technical and perceived safety. It should be noted that these new fields of interest emerge *in addition* to ongoing work to update existing datasets. Hence, for some countries we now have indicators for each of the four aspects of security identified.

### **Results: technical security and perceived security in African countries**

This section empirically investigates the correlation between casualties from various forms of political violence according to ACLED and UCDP, and the correlation between ACLED casualties and the various UCDP conflict indicators. As explained before, this explores the correlation between two indicators of technical security – one gathered with the aim of formalizing a perception of security – and the correlation between an indicator of technical security and an indicator of perceived security.

The ACLED data is transformed so that it corresponds as close as possible to the UCDP categories. ACLED events classified as 'battle' and involving the 'Armed forces of [state]' are considered armed conflict events, events classified as 'battle' not involving armed forces of a state are considered non-state violence events, and events classified as 'violence against civilians' are classified as one-sided violence events. Riots and protests and a number of other minor categories of ACLED events are disregarded. Furthermore, Eck (2010) notes that UCDP requires the armed actors participating in 'battle' to be known, whereas ACLED also includes events in which the identity of participating actors is unknown (Eck 2012). Therefore, I exclude ACLED events for which a participating actor is coded as unidentified or is missing. The total number of casualties per year per country from each category of events is the variable used. Data covers African countries for the period 1989–2011 (UCDP) and 1997–2011 (ACLED).

**Figure 1** displays this data for armed conflict in the DRC. The UCDP indicator takes



**Figure 1:** Perceived security and technical security in the DRC.

a value of one thousand for major armed conflict and of 250 for minor armed conflict for ease of visibility. According to this indicator, the DRC is in major armed conflict from 1996 to 2000, which decreases to a minor armed conflict in 2001, after which the DRC is armed conflict free. Minor armed conflict renews in 2006 to 2008. In years when UCDP Armed Conflict indicates that the DRC is in major conflict, the UCDP battle-related deaths indicator and ACLED’s number of deaths from battles including a state army follow reasonably similar trajectories. Once UCDP records that major armed conflict is over, they do not. The number of deaths in ACLED displays two sharp peaks – with casualty numbers exceeding one thousand – that UCDP does not record. In this case, perceived security (the conflict indicator by UCDP) and technical security as measured by ACLED, do not appear to correlate strongly.

One possible explanation is that 2001 marks the years in which Rwanda, Uganda

and various non-stated armed parties agreed to withdraw forces from the DRC, under auspices of the UN, which had sent a peace mission to the DRC the year before. It is possible that this changed perceptions of security in the DRC and that these perceptions in turn influenced the measurement of battle-related deaths by UCDP to a greater degree than ACLED’s measurement.

**Table 2** depicts the results of a more systematic comparison between UCDP and ACLED data. It shows the correlation coefficients between the UCDP indicators of armed conflict, non-state conflict and one-sided violence and UCDP-recorded casualty numbers for each of these types of political violence on the one hand, and casualties from corresponding conflict events in ACLED on the other. It presents Spearman correlation coefficients for all pairs, point-biserial correlation coefficients when a dummy indicator is correlated to a continuous variable and Pearson correlation coefficients for two

UCDP data	ACLED data		
	Casualties from armed conflict events	Casualties from non-state conflict events	Casualties from one-sided violence events
Armed conflict indicator			
<i>Spearman correlation</i>	0.5151***		
<i>Point bi-serial correlation</i>	0.1215**		
Battle-related deaths			
<i>Spearman correlation</i>	0.5639***		
<i>Pearson correlation</i>	0.1757***		
Non-state conflict indicator			
<i>Spearman correlation</i>		0.5195***	
<i>Point bi-serial correlation</i>		0.2311***	
Battle-related deaths from non-state conflict			
<i>Spearman correlation</i>		0.5492***	
<i>Pearson correlation</i>		0.4764***	
One-sided violence indicator			
<i>Spearman correlation</i>			0.4501***
<i>Point bi-serial correlation</i>			0.1923***
Deaths from one-sided violence			
<i>Spearman correlation</i>			0.5292***
<i>Pearson correlation</i>			0.7469***

**Table 2:** Correlations between UCDP and ACLED conflict data. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

continuous variables. Correlations between the UCDP conflict indicator and UCDP casualty estimates cannot be presented, as UCDP only provides casualty estimates for those country-years when the indicator equals one.

We can see that the correlation between ACLED and UCDP data is generally fairly low. To provide a reference point, Sambanis (2004) investigates the correlation between several country level datasets on the prevalence of conflict. He finds (Pearson) correlation coefficients between 0.59 and 0.94, and concludes that the differences between various datasets are large enough to substantively impact analyses of conflict (Sambanis 2004). All but one of the correlation coefficients in **Table 2** are lower than the lowest correlation found

by Sambanis. However, all correlation coefficients but one are statistically significant at the 1 per cent level. Spearman correlation coefficients are generally higher than the other types of coefficients presented. It is known that the Spearman correlation coefficient can be substantially higher and may overstate the extent to which a correlation is significant compared to the Pearson correlation coefficient, when the data contains outliers and when the relationship is non-linear (Hauke and Kossowski 2001).

In sum, if we view the various UCDP conflict indicators as formalization of a perception of security, this section shows that the correlation between perceived security and one indicator of technical security is fairly

weak. In addition, the correlation between the UCDP and ACLED indicators of technical security is fairly weak.

### **Results: correlation between the four aspects of security in South Sudan**

This section continues to empirically compare indicators of the four aspects, now for the case of South Sudan. First, consider the correlation between perceived security and perceived safety.

A very brief history of perceived security in South Sudan could be the following. Sudan experienced a violent conflict from 1983–2005, between the central government of Sudan and the SPLA/M, over independence of South Sudan. This conflict was ended by a Comprehensive Peace Agreement (CPA) between both parties in 2005. This agreement was in force during an interim period, in which a referendum on independence of South Sudan was held, until the independence of South Sudan in 2011. Then, South Sudan enjoyed a period of peace, until violence renewed in December 2013.

Now consider an indicator of perceived safety, derived from a survey of individuals executed in spring 2013 (before the renewed outbreak of violence). This covered 433 randomly selected respondents the South-Sudanese county of Ezo and part of Tambura County. These counties are located in the south-west of South Sudan, and border the Democratic Republic of Congo (DRC) to the south, and the Central African Republic (CAR) to the east. Respondents to the survey were asked how often they feared for their safety, or that of their family, during three periods: during the war, during the CPA and in the last 12 months. For more details of this survey, see Rigterink et al. (2014).

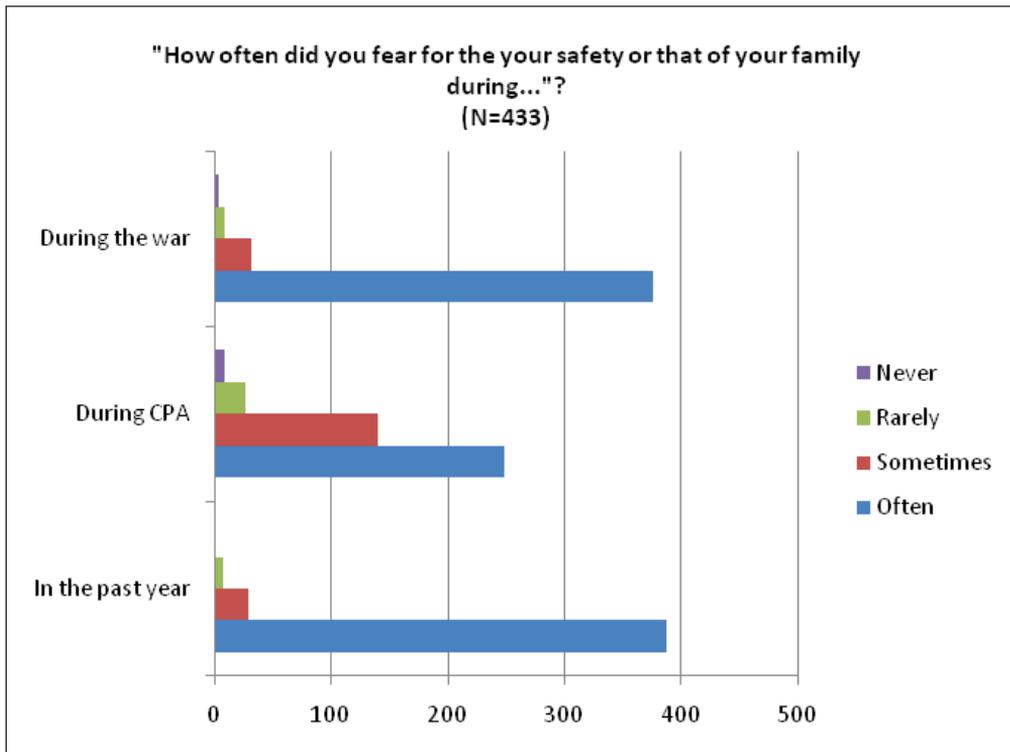
Judging by perceived security, we may expect people living in South Sudan to feel particularly unsafe during the civil war. We may furthermore expect perceived safety to increase during the CPA, and increase

further after independence. The indicator of perceived safety however, does not conform to this expectation, as is clear from **Figure 2**. Perceived safety appears no less prevalent in the 12 months preceding April 2013, compared to during ‘the war.’ A total of 376 respondents (79.3 per cent<sup>1</sup>) say that they have feared for their safety ‘often’ during the war, compared to 388 (85.9 per cent) in the last 12 months. Fear for safety appears to have been lowest during the CPA (248 respondents – 42.6 per cent – feared for their safety often).

These answers are subject to recall bias: it is possible that more recent threats to the respondents’ safety are still clearly on their minds, whilst threats further in the past are increasingly forgotten. This could explain the lack of perceived safety since the war, but not the increase in perceived safety during the CPA. In this case, perceived security and perceived safety do not seem to be strongly related.

A threat specific to this region of South Sudan is the Lord’s Resistance Army (LRA). Originally from Uganda, the LRA has drawn international attention partly through their method of recruiting new fighters through abduction. For this specific threat, indicators of technical security, technical safety and perceived safety are available.

Invisible Children and Resolve have constructed an event-based dataset on LRA activity. ‘Events’ recorded in this dataset include abductions, sightings of the LRA, clashes between the LRA and other armed groups, civilian deaths and injuries, displacement related to the LRA, and ‘returnees’ – fighters defecting from the LRA. For the purpose of this paper, I exclude ‘returnees,’ as these events do not clearly constitute a threat. The total number of remaining events can be considered an indicator of technical security: the total number of threats in an area. From the JSRP survey, I take the answers to the question ‘in the past 12 months, how often have you feared that the LRA would come and attack your village?’ as an indicator of



**Figure 2:** Perceived safety in South Sudan in May 2013.

perceived safety. Furthermore, respondents reported whether they, or a member of their close family experienced various types of violence by the LRA (a family member killed or abducted, being wounded, abducted or having one's house burned down or destroyed). This can be considered an indicator of technical safety.

**Figure 3** maps technical security, LRA 'events' in the 12 months preceding the JSRP survey, according to the LRA crisis tracker. It also shows the indicator of perceived safety, fear of the LRA, in the 10 villages covered by the JSRP survey.

**Figure 3** shows that, according to the event-based data, there have been no LRA related incidents in South Sudan in the 12 months preceding the JSRP survey in 2013. In addition (not shown), the LRA crisis tracker records no incidents involving the LRA in the calendar year 2012. However, this

level of technical security does not translate in individual perceptions of safety according to the survey data. On average across villages, 75 per cent of respondents indicate that they have feared often that the LRA would come and attack their village in the past year. An additional 19.5 per cent has feared for this to occur sometimes. Respondents Ezo and Tambura perceive themselves to have been profoundly unsafe in the preceding year, despite technical security in the sense of the absence of a single LRA event in South Sudan according to the event-based data.

Because there are no LRA events in South Sudan at all, it is impossible to calculate the correlation between this indicator of technical security and other indicators. Therefore, I construct an alternative measure: distance to the nearest LRA event. I experiment with different ways to calculate distance to the nearest LRA events: the distance to the

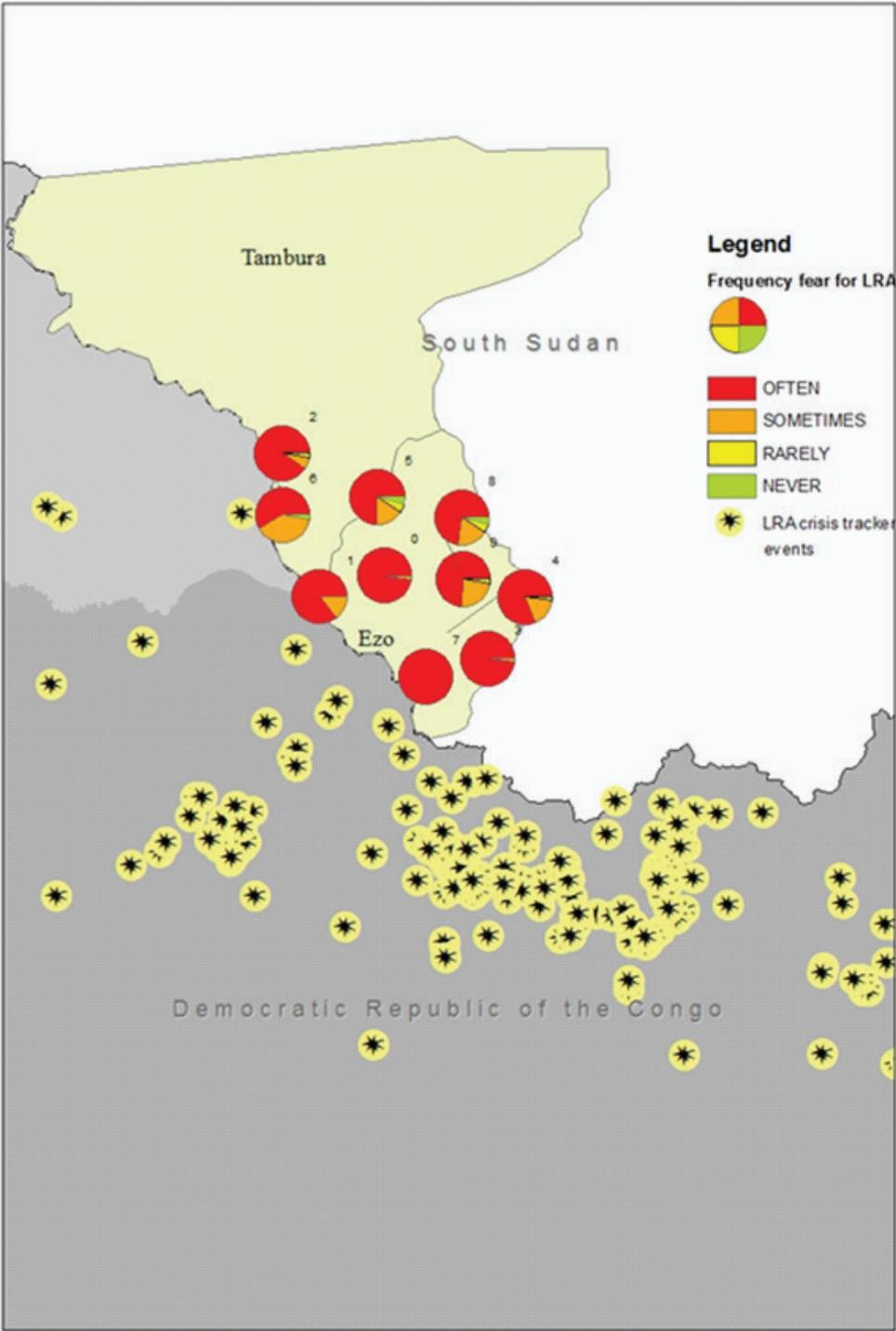


Figure 3: Technical security and perceived safety from the LRA in South Sudan.

single closest events in the last one, two and five years and the average distance to the ten closest LRA events in the same time periods. Furthermore, I distinguish between event types involve direct violence against civilians (abduction and violence against civilians) and those that do not (sightings, looting, displacement and clashes). For the indicator of technical safety, I also distinguish between being directly subjected to LRA violence (being wounded, abducted, having one's house burned down) and being indirectly subjected to LRA violence (having a family member killed or abducted). Only a small number of respondents have been directly (6) or indirectly (27) subjected to LRA violence.

**Table 3** displays the correlation between these indicators of technical security, technical safety and perceived security. First look at the correlation between fear of the LRA among respondents, and the straight-line distance from their village of residence to the nearest LRA event(s).<sup>2</sup> The correlation coefficients all have the expected sign: the further away the nearest LRA related incident, the lower the level of fear among the respondents. A substantial number of them are statistically significant. However, most correlation coefficients are small in size; in only a handful of cases does the coefficient exceed 0.2.

The correlation between distance to the nearest LRA event(s) and the indicators of

	Fear of LRA		Indicator directly subjected to LRA		Indicator indirectly subjected to LRA	
	<i>Spearman</i>	<i>Pearson</i>	<i>Spearman</i>	<i>Point bi-serial</i>	<i>Spearman</i>	<i>Point-biserial</i>
<b>Distance to closest LRA event:</b>						
In the last year	-0.0072	-0.0380	-0.0214	0.0070	-0.0469	-0.0534
In the last year, involving civilians	-0.1351***	-0.1873***	-0.0100	-0.0193	0.0675	0.0662
In the last 2 years	-0.0892*	-0.1141**	-0.0212	-0.0363	-0.0432	-0.0378
In the last 2 years involving civilians	-0.0937*	-0.1096**	-0.0230	-0.0341	-0.0023	-0.0159
In the last 5 years	0.0478	-0.0203	0.0217	0.0235	-0.0330	-0.0227
In the last 5 years involving civilians	0.0128	-0.0414	0.0639	0.0400	-0.0126	-0.0140
<b>Average distance to 10 closest LRA events:</b>						
In the last year	-0.1560***	-0.1886***	0.0266	-0.0060	0.0559	0.0356
In the last year, involving civilians	-0.1691***	-0.2048***	0.0227	-0.0165	0.0597	0.0667
In the last 2 years	-0.1761***	-0.2160***	-0.0083	-0.0083	0.0840*	0.0692
In the last 2 years involving civilians	-0.2001***	-0.2228***	0.0044	0.0051	0.1092**	0.0986*
In the last 5 years	-0.0251	-0.0815*	0.0498	0.0222	-0.0251	-0.0001
In the last 5 years involving civilians	-0.0487	-0.0923*	0.0498	0.0206	0.0140	0.0043
<b>Fear LRA</b>			0.0539	0.0487	0.0087	-0.0267

**Table 3:** Correlation distance to LRA-related events, fear and experience of LRA. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

being subjected to the LRA is even weaker: only in one case does the correlation coefficient exceed 0.1. Furthermore, the coefficients are seldom statistically significant and do not always carry the expected (negative) sign. The correlation between perceived safety (fear of the LRA) and technical safety (being subjected to LRA violence) is similarly weak: none of the correlation coefficients are statistically significant and they are small in size.

In this case, technical security and technical safety appear to correlate relatively weakly, whilst a correlation between technical security and perceived safety, or between technical safety and perceived safety, appears to be completely absent.

### **Conclusion and implications for research and policy**

This paper has distinguished four distinct concepts, all covered by the term 'security': technical safety, perceived safety, technical security and perceived security. It has shown that these four aspects of security conceptually need not correlate, and that in two cases, they indeed correlate weakly in practice. This is relevant because the weaker the relationship between the four concepts of security is, the larger the scope for a security gap. It is not obvious which sole aspect of security a security intervention should target; different rationales for interventions suggest targeting different aspects. When aspects of security do not correlate, this leaves open the possibility that a security intervention, while targeting one of the aspects of security successfully, does not affect or adversely affects another. This is one expression of a security gap.

Although this paper fails to find a strong correlation between various indicators of 'security,' this should not be construed as a critique on the quality of the data used. Assessing the data quality would require insight into the data gathering and quality control procedures that this paper lacks. As has been highlighted, indicators of 'security' may correlate weakly because they measure different concepts covered by the term.

The conclusions presented do have implications for research on 'security' using quantitative data. They imply that conclusions of research done on one concept making up security cannot necessarily be generalized to others. For example, if research concludes that absence of natural resources, high levels of GDP or 'peace-building' interventions are related to decreased armed conflict, possibly an indicator of perceived security, this does not necessarily imply that the same factors are systematically related to improved (perceptions of) safety at the individual level.

This is relevant because research on 'security' is often motivated at the individual level. A common motivation behind this research is that insecurity, conflict or violence are a human tragedy, making research on it intrinsically important. It is not uncommon for example, for the introduction to an article containing research on armed conflict, to start with a tally of the human costs that conflict has inflicted since the Second World War (see for example Brückner and Ciccone, 2010). This paper suggests that even if this research contributes to better knowledge on how to prevent or end armed conflict this may not translate one-on-one into improvements in technical security or individual (perceptions of) safety.

Alternatively, 'security' may be a subject meriting study because of its economic costs. It is widely accepted that perceptions of safety and security influence the value of the future relative to the past (intuitively, people become less forward-looking), which decreases investment and thereby income (see for example Eckstein and Tsiddon 2004; Abadie and Gardeazabal 2003; Rockmore, 2011). This paper has shown that individuals' perception of their own safety on the one hand, and their technical safety or aggregate aspects of security may only be loosely related. For example, if country-level or event data suggest the absence of violent conflict, it is not impossible that the economic costs of the lack of individual perception of safety are still severe.

Similar caveats apply to policy interventions aiming to achieve 'security': policies that 'work' on one aspect of security cannot be directly translated to another. In fact, possible adverse effects on other aspects of security probably merit some investigation. For example, international mediation during peace talks may create perceived security. But this does not necessarily translate directly into technical security or safety, and as such may not be a big first step towards economic development. Some policy documents do appear to make such direct connections. UN documentation containing guidance for mediators on conflict-related sexual violence in ceasefires and peace agreements states for example: '[Conflict-related sexual violence] instils fear, breaks identity and creates enduring ethnic, family and community divides. Yet, to date, [...] only three ceasefire agreements [...] specifically include sexual violence' (United Nations 2012). Although this is an example of an attempt to broaden the definition of 'security' to include previously ignored forms of violence, this particular formulation seems to suggest that when included in a peace agreement, fear of sexual violence and the resulting tensions will diminish. This paper suggests that one cannot uncritically make any such direct connection between security and safety.

### Competing Interests

The author declares that they have no competing interests.

### Author Information

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### Notes

- <sup>1</sup> All percentages are weighted percentages.
- <sup>2</sup> It should be noted that in calculating the Pearson correlation coefficient, I treat the variable representing fear of the LRA as continuous, whereas it is in fact ordinal. Although it has been shown that Pearson correlation is robust to similar violations of its assumptions (Norman 2010).

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