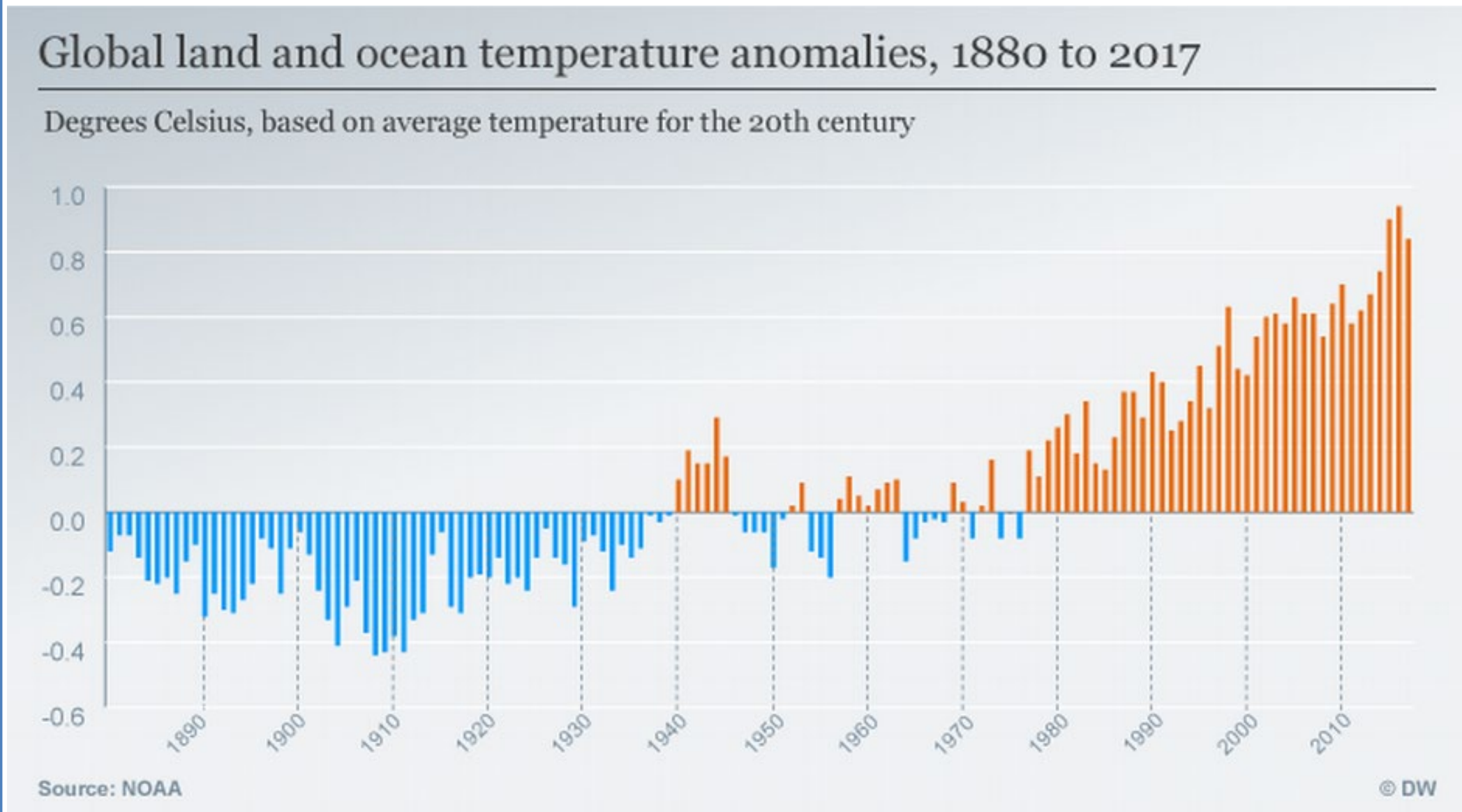
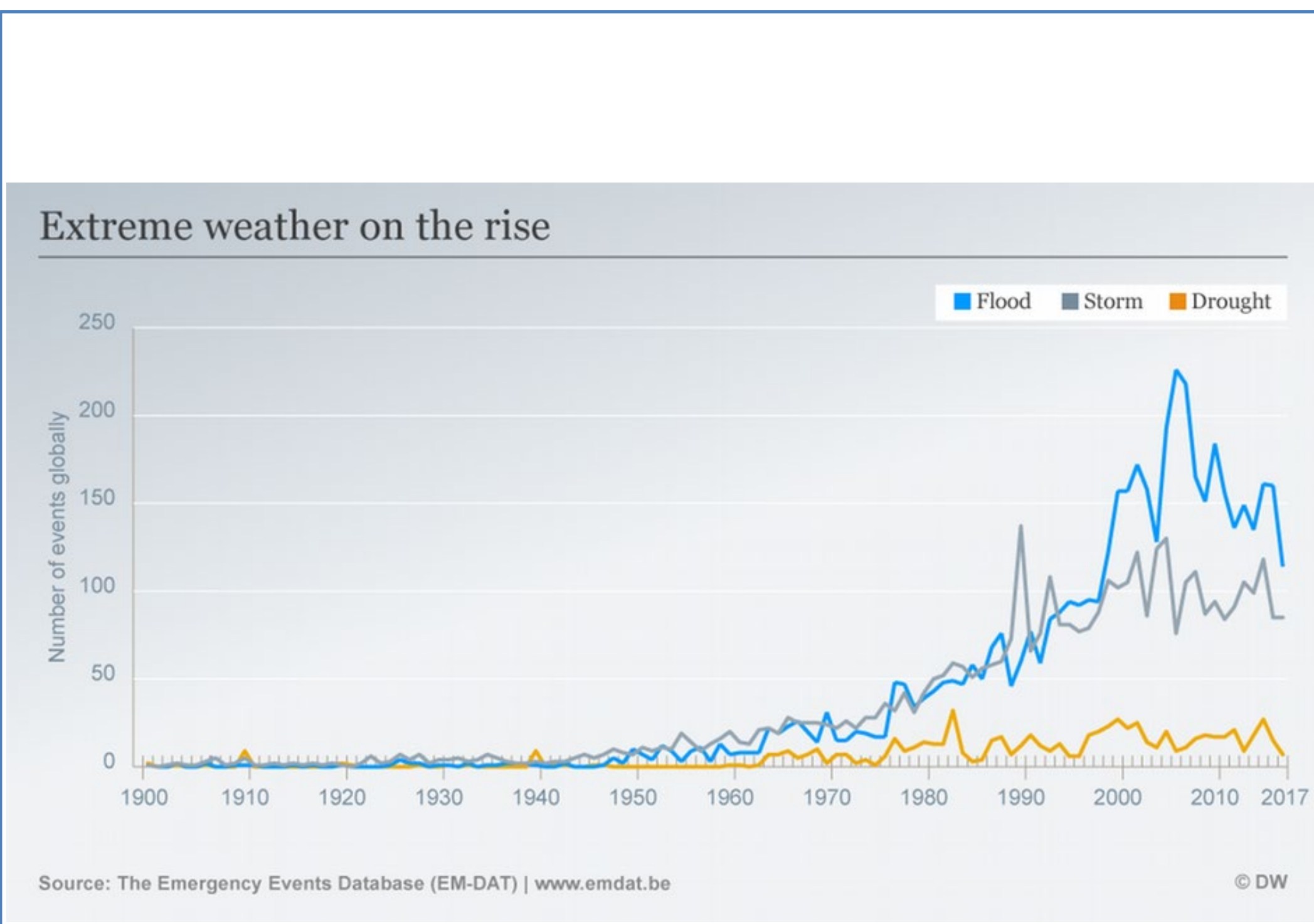


Regional Exposure to Climate Change Events and Conflict Development, a Systematic Review

Tyler Barnhart



Introduction

The future of a planet forever-altered due to warming, resulting in increased frequency of extreme weather events is now a present reality. This can result in a range of population exposures such as flooding, cyclonic systems, drought, desertification, food scarcity, and damaging changes to El Niño/La Niña. Not only are victims of this new reality affected by negative long-term health indicators such as high unemployment rates, but also victimized a range of conflictual outcomes. In this review a range of conflict definition is considered, from the typical definition – a violent event or series of events, to social unrest, organized political violence, or outright rebellion.

Methodology

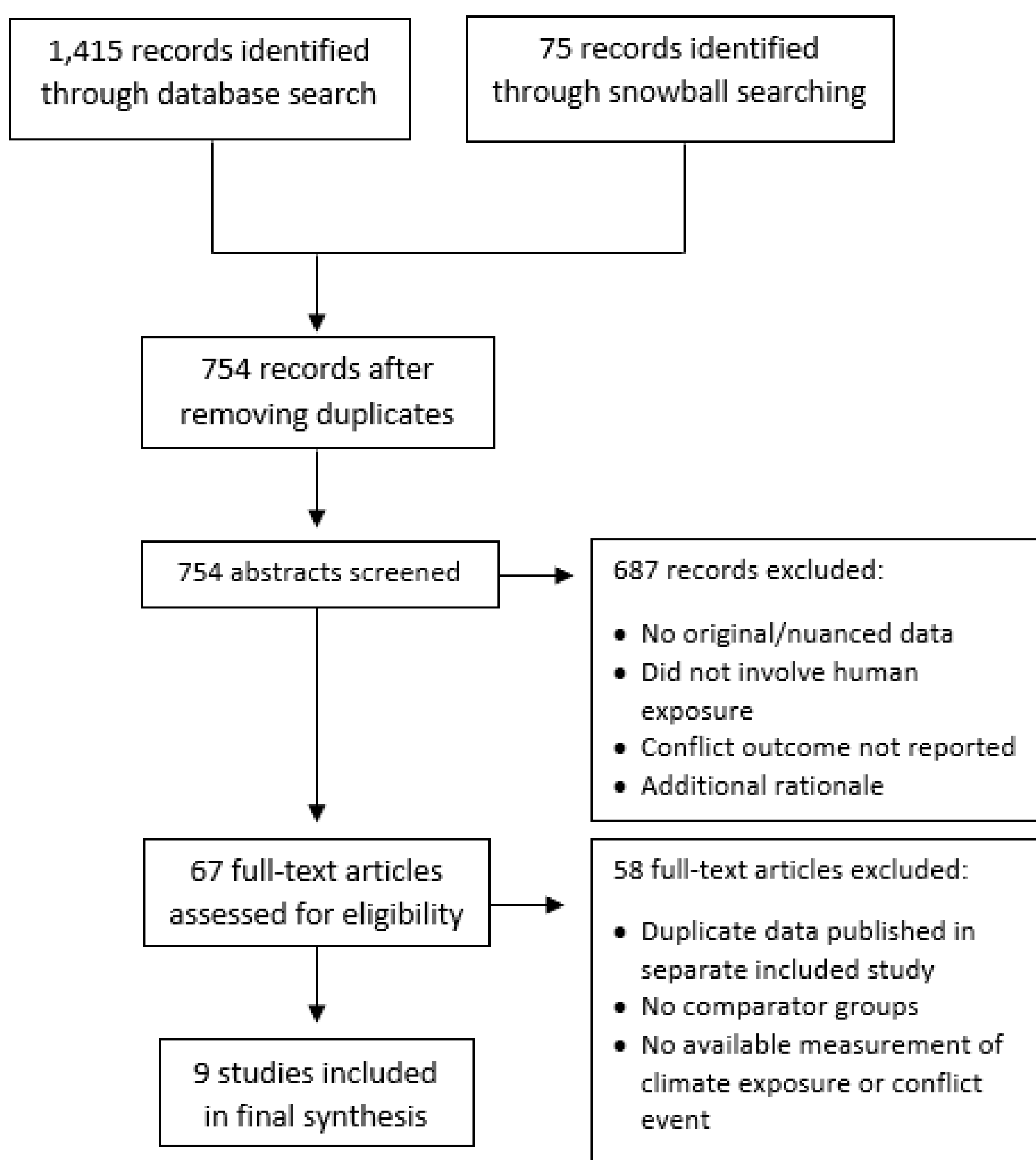


Figure 1. Literature search and screening process for studies relevant to climate factor exposure and conflict outcomes.

Results

The 9 included studies were published from 2011-2014 and included desired target populations from mostly Middle Eastern, African, and South Asian regions or countries. Each of the 9 studies included exposure to a climate factor in either a singular instance or over a period of time for a population, and 8 out of the 9 tracked a positive correlation with a conflictual outcome (Bhattacharyya & Werz did not).

Table 1. Summary of study characteristics evaluating exposure to climate change-related climate factors and conflict outcome in human observational and historical modeling studies.

Climate Factor Exposure	Period of Exposure	Region/Country	Conflict Outcome	Source
Flooding	2011-2012	Pakistan	Violent conflict over political power between migrants and non-migrants	Bhattacharyya & Werz, 2012
Drought	2006-2014	Syria	Violent conflict surrounding erosion of the economic health of the country	Gleick, 2014
Drought/water scarcity	2005-2011	Western Sahel	Violent conflict between pastoralists and farmers over resource scarcity	UNEP, 2011
Droughts	1996-2013	Peru & Bolivia	Violent conflict between farmers over resources and ethnic conflict between farmers and indigenous migrants	Hoffman & Grigera, 2013
Desertification	1993-2013	Nigeria	Ethnic conflict between farmers over rangeland	Werz & Conley, 2012
Food Scarcity (famine)	1500-1800	Europe	Economic distress → social unrest, war, and population decline	Zhang et al., 2011
Drought/rainfed agriculture	1989-2008	Sub-Saharan Africa	Rebellion in response to economic grievances or to obtain food	Uexkull, 2014
Severe El Niño vs La Niña	1950-2004	the tropics	Organized political violence	Hsiang et al., 2011
Cyclone (migration)	2009	Bangladesh	Male movement from rural to urban areas for economic opportunity results in interfamilial conflict	Bishawjit & Vogt, 2012

Table 2. Summary of the risk of bias judgements (low, probably low, probably high, and high risk) for each included study.

	Low risk	Probably low risk	Probably high risk	High Risk	
		Confounding	Exposure assessment	Outcome assessment	Selection bias
Bhattacharyya & Werz, 2012	Low risk	Probably low risk	Probably high risk	High Risk	Probably high risk
Gleick, 2014	Low risk	Probably low risk	Probably high risk	High Risk	Probably high risk
UNEP, 2011	Low risk	Probably low risk	Probably high risk	High Risk	Probably high risk
Hoffman & Grigera, 2013	Low risk	Probably low risk	Probably high risk	High Risk	Probably high risk
Werz & Conley, 2012	Low risk	Probably low risk	Probably high risk	High Risk	Probably high risk
Zhang et al., 2011	Low risk	Probably low risk	Probably high risk	High Risk	High Risk
Uexkull, 2014	Low risk	Probably low risk	Probably high risk	High Risk	Probably high risk
Hsiang et al., 2011	Low risk	Probably low risk	Probably high risk	High Risk	High Risk
Bishawjit & Vogt, 2012	Low risk	Probably low risk	Probably high risk	High Risk	Probably high risk

Conclusion

Weighing the considerations of a moderate quality of evidence, a positive direction of effect estimate – increasing conflict frequency with increasing exposure to climate event, and only a -1 downgrading for inconsistency, according to the Navigation Guide strength of evidence definitions, the exposure-outcome relationship being examined falls into the category of “sufficient evidence.” A positive relationship between exposure and outcome was observed where chance, bias, and confounding can be ruled out with reasonable confidence. That being said, the difference in scale and methodology of analysis between studies, as well as the lack of a robust body of evidence, is not enough to assume total generalizability, and future research must be conducted to standardize measurement of the exposure and outcome to achieve predictability.

Discussion/Future Implications

Public health, more specifically population and community health, is directly dependent on adjacent environmental factors, and an increasingly erratic climate is contributing to detriments in community health in ways not considered until relatively recently. Starting in the 1980s, research began to consider environmental degradation as a potential security concern. The difference of course between then and now being that temperatures are reaching record highs year after year, and visible events are now being attributed directly to the influence of climate change. It is my hope that producing this research will allow for a greater focus on preempting eventual conflict related to climate factor exposure, or at least increase preparedness to address the public health concerns of the populations under threat.

Acknowledgements

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