Catastrophic Risk: Waking Up to the Reality of a Pandemic?[#]

Jamison Pike,[1] Jason F. Shogren,[2]* David Aadland,[2]
W. Kip Viscusi,[3] David Finnoff,[2] , Alexandre Skiba[2], Peter Daszak[1]

20 November 2019

Abstract

Will a major shock awaken US citizens to the threat of catastrophic pandemic risk? Using a natural experiment administered both before and after the 2014 West African Ebola Outbreak, our evidence suggests "no". Our results show that prior to the Ebola scare, US citizens were relatively complacent and placed a low relative priority on public spending to prepare for a pandemic disease outbreak relative to an environmental disaster risk (e.g., Fukushima) or a terrorist attack (e.g., 9/11). After the Ebola scare, the average citizen did not over-react to the risk. This flat reaction was unexpected given the well-known availability heuristic—people tend to over-weigh judgments of events more heavily toward more recent information. In contrast, the average citizen continued to value pandemic risk less relative to terrorism or environmental risk.

[#]**Acknowledgments.** This study was made possible by the support of the United States Agency for International Development (USAID) Emerging Pandemic Threats PREDICT and by grant number 1R01-GM100471-01 from the National Institute of General Medical Sciences (NIGMS) at the National Institutes of Health. Contents are the responsibility of the authors and do not necessarily reflect the views of USAID, NIGMS, NIH, or the United States Government.

[1]Ecohealth Alliance, New York, NY 10001, USA. [2]University of Wyoming, Department of Economics & Finance, Laramie, WY 82071, USA. [3]Vanderbilt University Law School, Nashville, TN 37203, USA. [4]Ecohealth Alliance, New York, NY 10001, USA.
* Corresponding author at jramses@uwyo.edu

Catastrophic Risk: Waking Up to the Reality of a Pandemic?

Will a major shock awaken US citizens to the threat of catastrophic pandemic risk? We present evidence that suggests the answer might be "no". Using a natural experiment, we surveyed US citizens about their risk-risk tradeoffs before and immediately after the highly visible 2014 Ebola scare *(1,2)*. Using a unique survey administered both before and after the 2014 West African Ebola Outbreak, we ask US citizens to value fatalities from pandemic risks compared to deaths from environmental disaster risks (e.g., Bhopal, Exxon, Deepwater, Fukushima) and or a terrorist attack (e.g., 9/11)[*]. Our results show that prior to the Ebola scare, people were relatively complacent and placed a low relative priority on public spending to prepare for a pandemic disease outbreak. After the Ebola scare, US citizens did not over-react to the risk. This flat reaction to risk was unexpected given long-standing evidence on the pervasiveness of the availability heuristic (*3*). Recall the availability heuristic says a person weighs his or her judgments of events more heavily toward more recent information, implying preferences toward risk should be distorted toward the most recent news item. In contrast, the average citizen continued to value pandemic risk less relative to terrorism or environmental risk.

Evaluating Pandemic Risk before the West African Ebola Outbreak

We designed a stated preference survey to estimate two key measures of pandemic risk reduction based on how people trade-off lives saved from a pandemic policy relative to an environmental disaster (e.g., Bhopal, Exxon, Deepwater, Fukushima) or a terrorist attack[†]. Table

[*] Working with Wyoming Survey and Analysis Center (WYSAC), we administered a computer-based questionnaire. After a year of pretests, in July 2013 WYSAC implemented the survey instrument in a national study distributed across the United States. The sample was a nationally representative web-based panel recruited by the online market research company, uSamp, based out of Los Angeles, California. Participants took surveys by computer. WYSAC secured 321 surveys (pre-Ebola Outbreak); 18 months later (post-Ebola), the survey was re-administered, securing 357 surveys.

[†] Viscusi et al. (1991) developed a method to measure the value of morbidity risk reductions which has two advantages to address catastrophic events. First, catastrophic risks tend to involve small absolute probabilities,

1 summarizes our main results for both pre- and post-Ebola outbreak surveys. In 2013, we surveyed a nationally representative US web-based panel, and found respondents valued the prevention of terrorist attack deaths and environmental disasters significantly more than pandemic outbreak deaths. Like spread betting in gambling, the person gets "points" when trading off terrorism risk for pandemic risk. If she is going to give up 1 terrorism life saved, she has to get nearly 1.5 pandemic lives saved in return. Similarly, for an environmental disaster—for giving up 1 environmental life saved, she needs 2 pandemic lives in return.

How people valued pandemic risks varied across the population, often in expected ways. We investigated the geographic, socioeconomic, and demographic factors affecting the perceived risk of each catastrophic event. See Table 1. Our results illustrated that on average retired respondents, who might perceive themselves as being more vulnerable to pandemic risks, favor policies that reduce pandemic risk over policies that reduce environmental disaster risk or terrorism risk. Respondents in states on the Mexico border and those of Asian descent favored policies that reduce the risk of environmental disasters rather than pandemics. Respondents located on the west coast and are physically removed from the 9/11 attack and the Boston Marathon bombing, favored policies that reduce pandemic risk over policies that reduce terrorism risk, while respondents with income greater than $150,000 and living on the East Coast preferred policies that reduce terrorist attack risk over pandemic risk. Proximity to a catastrophic event affects value of policies to prevent that event from occurring. Further, groups who may feel more vulnerable to a particular catastrophic event will value lives saved in that scenario

which respondents find difficult to process. This method lets them focus on more readily processed comparisons such as whether preventing 100 deaths from a terrorist attack is valued more highly than preventing 100 traffic deaths. Second, "the comparisons involve a single dimension of choice—fatalities—so that respondents can focus on how fatalities are viewed without dealing with the less readily commensurable tradeoff between money and fatality risks. Eliminating money as an attribute of choice also eliminates the task of establishing a credible payment mechanism for the policy" (Viscusi, 2009).

greater. Both patterns of results lead us to believe that respondents will place higher value on lives saved the less abstract and more realistic the catastrophic event.

This complacency was unexpected but understandable given the abstract nature of a pandemic outbreak in 2013. These differences reflect differences in risk beliefs rather than the manner in which a life is saved. People do not value the expected deaths differently, rather they have different expectations of the likelihood of death from these different causes. Our estimates suggest that people find it more difficult to quantify the risks associated with events such as pandemic outbreaks for which they have less experience. This is in contrast to the tangible risks of terrorist attacks such as 9/11 and environmental disasters such as the 2008 Kingston Fossil Plant coal fly ash slurry spill, the 2010 Deepwater British Petroleum Inc. (BP) oil spill, or the 2011 Fukushima nuclear disaster[‡]. These differences in risk beliefs make risk communication and education of the public a prerequisite for establishing a constituency for responsible pandemic policies. Our estimates illustrate that respondents were undervaluing the risk of pandemic death, which in turn is contributing to our current lack of preparedness.

Evaluating Pandemic Risk after the West African Ebola Outbreak

After our initial survey, the world witnessed the largest epidemic of Ebola in history, which had a 71 percent case fatality rate in the affected West African countries. Global media coverage was extensive and focused on how ill prepared the US and other countries were for an Ebola outbreak (*4-6*). In early 2015, we re-administered our survey to a new representative US

[‡] People demand more lives for environmental disasters even though few people actually die from environmental disasters. In the domestic example given to respondents (Deepwater Horizon Oil Spill), no human lives were lost. Many examples exist of foreign environmental disasters (Fukushima Daiichi nuclear disaster, Chernobyl disaster) in which several thousand people died, that respondents could be referencing. Respondents may also be confusing environmental disasters (preventable) with natural disasters (non-preventable), such as Hurricane Katrina.

web-based panel adding the definition of Ebola and the phrase 'such as Ebola' or 'like Ebola' three times throughout the survey. Based on Bayesian learning models in which people update probabilities based on information they acquire, and the availability heuristic (*3*), we would expect higher valuations for avoiding pandemic risks. Table 1, however, shows that the relative valuations barely changed from the first survey in 2013.

The geographic, socioeconomic, and demographic factors affecting the perceived risk also stayed consistent, with a few exceptions. Disabled respondents now (following the outbreak) value policies that reduce the risk of environmental disasters rather than pandemics, and Asian respondents became indifferent between policies. (SI Materials and Methods). Those living on the west coast now favor policies that reduce the risk of terrorism rather than pandemics. Respondents with income greater than $150,000 and living on the East Coast were now indifferent between policies, but those respondents affiliated with the Republican Party and male respondents now prefer policies that reduce terrorist attack risk over pandemic risk. Again, these results illustrate that respondents place higher value on lives saved the less abstract and more realistic the catastrophic event. Republicans placing higher value on policies that reduce terrorism is consistent the prominence of combating terrorism in that political party's agenda.

Using estimates from (*2*), the value of statistical life (VSL) of $9.4 million (*7*), as reported by the US Department of Transportation for transportation related deaths, and applying the ratios computed in Table 1, we find an average VSL of approximately $4.0 million for a life saved in a pandemic outbreak prior to the 2014 West Ebola Outbreak (see SI for more details on the calculation). When applying the VSL method, our respondents valued a life saved in a more certain traffic accident more than twice as much as a life saved in an uncertain pandemic

outbreak. After the 2014 Outbreak, we find the average VSL increases to about $4.4 million for a life saved in a pandemic outbreak—only a 10 percent increase in VSL even after the Ebola scare.

Our results illustrate that people do not always use the most available information when evaluating relative risk. They still tend to undervalue risks believed to be remote and abstract, even after a scare like Ebola. Once Ebola reached the US and the media conveyed the possible outcomes of a global outbreak; a disease with no known cure and terrifying consequences for those infected (*6*), the reality of a pandemic outbreak did not significantly affect their views.

Our findings should matter to US policymakers who must allocate scarce resources to reduce catastrophic risk. As noted in a CNN editorial by former US Secretary of State John Kerry, "Infectious diseases – whether naturally occurring, deliberate or accidental – have the potential to cause enormous damage in terms of lives lost, economic impact and ability to recover, just as with nuclear, chemical, or cybersecurity attacks" (*8*). This point is emphasized by the final report released by the National Academy of Medicine's Global Health Risk Framework for the Future (GHRF) commission. According to a Washington Post editorial, the GHRF Commission warned: "the global community has massively underestimated the risks that pandemics present to human life and livelihoods…here are very few risks facing humankind that threaten loss of life on the scale of pandemics."(*9*)

In addition to Ebola, HIV/AIDS, severe acute respiratory syndrome (SARS), the H5N1 strain of avian influenza, and the 2009 pandemic H1N1 influenza virus are all reminders of how vulnerable we are to a pandemic that would cause serious public health, economic, and development implications. The US government has taken considerable steps since the 2014 Ebola outbreak to increase pandemic preparedness. The question is, is it enough? The present Ebola outbreak in Democratic Republic of the Congo (DRC) has now been classified by the

World Health Organization as a Public Health Emergency of International Concern highlighting the importance of our results. It is critical that, despite revealed compliance in the US public, policymakers continue strong investment in infectious disease preparedness.

References and Notes:

1. Viscusi, W. K., W. Magat and J. Huber (1991) Pricing Environmental Health Risks: Survey Assessments of risk-risk and Risk-dollar Trade-offs for Chronic Bronchitis. *Journal of Environmental Economics and Management* 21:32–51Tversky, A., and D Kahneman (1981). The framing of decisions and the psychology of choice. *Science*. 211(4481): 453-458.
2. Viscusi, W.K. (2009) Valuing Risks of Death from Terrorism and Natural Disasters. *Journal of Risk and Uncertainty* 38:191–213.
3. Tversky, A., and D Kahneman (1981). The framing of decisions and the psychology of choice. *Science*. 211(4481): 453-458.
4. Childress, S. 2015. "After Ebola: Are We Ready for the Next Epidemic?" *Frontline*. http://www.pbs.org/wgbh/pages/frontline/health-science-technology/outbreak/after-ebola-are-we-ready-for-the-next-epidemic/;
5. Ross, A.,R.M. Olveda, L. Yuesheng. 2014. "Are we ready for a global pandemic of Ebola virus?" *International Journal of Infectious Diseases*. 28: 217 – 218.
6. Harhi, Paul. 2014. "Media goes overtime on Ebola coverage, but not necessarily overboard." *The Washington Post*. http://www.washingtonpost.com/lifestyle/style/media-goes-overtime-on-ebola-coverage-but-not-necessarily-overboard/2014/10/06/d65e92fc-4d8a-11e4-8c24-487e92bc997b_story.html

7. U.S. Department of Transportation, Office of the Assistant Secretary for Transportation Policy, Memorandum: Treatment of the Economic Value of Statistical Life in Departmental Analyses, 2008.
8. Kerry, et al. (2014) Why global health security is a national priority. CNN. http://www.cnn.com/2014/02/12/opinion/kerry-sebelius-health-security/
9. Mundaca-Shah, et al. (2016). *The Neglected Dimension of Global Security: A Framework to Counter Infectious Disease Crises*. www.nam.edu/GHRF
10. The Washington Post editorial. (2016) More pandemics are inevitable, and the U.S. is grossly underprepared. https://www.washingtonpost.com/opinions/more-pandemics-are-inevitable-and-we-have-to-prepare-for-them/2016/01/21/0a77d3f8-bb0f-11e5-829c-26ffb874a18d_story.html

Table 1. Valuing Catastrophic Risks: Estimation Results Using the Pre- and Post-Ebola Outbreak Survey

Variable	Pandemic		Environmental Disaster		Terrorist Attack	
	Pre-Ebola	**Post-Ebola**	**Pre-Ebola**	**Post-Ebola**	**Pre-Ebola**	**Post-Ebola**
Catastrophic Risk Tradeoff Ratio: Number of pandemic lives that must be saved to be equivalent to one [environmental disaster/terrorist attack] life saved	--	--	1.82	1.72	1.51	1.33
Demographics Effects: Value of Lives Saved (Pandemic vs. Environmental Disaster)						
Retired	+	+				
Asian			+	N/S		
Disabled			N/S	+		
Region 1	N/S	N/S				
Region 3			+	+		
Demographics Effects: Value of Lives Saved (Pandemic vs. Terrorist Attack)						
Retired	+	+				
Male					N/S	+
Republican					N/S	+
Income > $150K					+	N/S
Region 1	+	-				
Region 2					+	N/S
Implied Value of Statistical Life (VSL)	**$4,006,372**	**$4,443,081**	**--**	**--**	**--**	**--**

N/S – non-significant. Estimation results are based on the conditional logit model with fixed effects and clustered standard errors. Region 1 = Mexico border, Region 2 = Canada border, Region 3 = Pacific Ocean border.