Measuring the Potential for Mass Displacement in Menacing Contexts

JEFF COLLMANN
Georgetown University, Washington, DC, USA
JANE BLAKE
Booz Allen Hamilton, Arlington, VA, USA
DAVID BRIDGEFLAND
Georgetown University, Washington, DC, USA
LARA KINNE
Georgetown University, Washington, DC, USA
NILI SARIT YOSSINGER
Georgetown University, Washington, DC, USA
ROBIN DILLON
Georgetown University, Washington, DC, USA
SUSAN MARTIN
Georgetown University, Washington, DC, USA
KAI ZOU
Decision Information Resources, Inc., Houston, TX, USA

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A menacing context has emerged when a dread threat persists and requires a community to reorganize its life to help mitigate consequences of threat. This article explores how menacing context links drivers of forced migration, the perception of threat among local families and domestic decision-making about remaining in place, fleeing or combinations of both. Employing a coding scheme based on dread threat theory, this article illustrates through case studies of a cholera epidemic, total war setting and a complex situation with infectious disease, civil strife and drought threats how to transform qualitative data from ethnographic, autobiographical and journalistic sources into a quantitative measurement scale of local perception of threat for use in formal modelling, forecasting and potentially enhanced humanitarian responses to mass displacement.

Keywords: mass displacement, dread threat, refugees
Introduction

The conceptual framework of forced migration as presented in the Foresight Migration and Global Environmental Change Final Project Report (Government Office for Science 2011) identifies three levels of analysis (macro, meso and micro) that, taken in concert, describe conditions for the occurrence, extent and duration of forced migration in specific circumstances. At Georgetown University, we used these levels in exploring the utility of big data and computational tools such as ontologies, causal loop diagrams and simulations for understanding and forecasting forced migration. We employed the concept of menacing context to help link these levels of analysis from the perspective of local actors, specifically families. We suggest that a menacing context emerges when a dread threat persists and requires a community to reorganize its life to help mitigate consequences of threat. We begin this article with an appreciative reappraisal of dread threat theory—an established body of work primarily conducted from a psychometric paradigm that collects data using surveys. For our own analysis, however, we make two methodological changes in dread threat theory. First, we use case study data from anthropological, autobiographical and journalistic accounts rather than survey data. Second, we examine local perception of a threat as a changing, dynamic phenomenon over time rather than as a single static assessment. Through three case studies, we iteratively develop and employ the resulting coding paradigm to transform qualitative data of various types into a quantitative local perception of threat scale for use in formal modelling. We suggest that the concept of menacing context elucidates the relationship among the drivers of forced migration, the perception of threat among local families and domestic decision-making about remaining in place, fleeing or some other combination of strategies.

Measuring Common-Sense Threat Assessment as Dread and Uncertainty

The pioneering work of Fischhoff, Slovic and Lichtenstein (1978, 2000) and Lowrance (1976) underlies much of modern risk perception research. They employed questionnaires to characterize and quantify how ordinary people assess the risk of many hazardous activities and technologies ranging from riding bicycles to living near nuclear power plants. This research evolved into what is commonly referred to as dread threat theory (Starr 1969; Slovic 1987, 2000; Slovic et al. 2000a, 2000b; Furedi 2002). This research identified a heterogeneous list of ‘fright factors’, to measure people’s responses to safety questions. From this research, two broad factors emerged: dread (Factor 1) and unknown risk (Factor 2) composed of 15 risk characteristics (Slovic 1987) that proved to be most correlated to perceived risk. Dread (Factor 1) included 10 risk characteristics while unknown risk (Factor 2) included five risk characteristics. Hazards are then plotted on a two-dimensional graph based on their dread and unknown risk for comparison.
Technologies in the upper right-hand quadrant such as DNA technology, nuclear reactors and satellite crashes elicit the highest dread threat score. An activity’s placement on the dread and unknown risk factor space has been hypothesized to determine social reaction, media response, and demand for regulation (Fischhoff et al. 2000; Kasperson et al. 2000).

This article extends earlier efforts to measure local perception of threat in a general investigation of social disruption as an indirect indicator of emerging threats (Wilson et al. 2008) and furthers dread threat theory in two ways. First, this article uses case study data from ethnographic, autobiographical and journalistic accounts rather than survey data. Second, this article analyses local perception of a threat as a changing, dynamic phenomenon over time rather than with respect to a single static assessment. These shifts in approach, however, pose four methodological questions that we address in the case studies of this article, including:

1. Does evidence exist in real case studies of the parameters of dread threat affecting local perception of historically occurring threats such as the outbreak of an infectious disease or warfare?
2. How must we frame the parameters of dread threat in analysing case study data about local perceptions of threat?
3. Do additional parameters of uncertainty or dread exist that are necessary to cover the range of threats that people face in real case studies?
4. Can the parameters of dread threat be used to measure changing levels of local perception of threat over time?

In our case studies, we demonstrate evidence of the salience of the parameters of dread threat in common-sense assessment of historically occurring threat events. Ethnographic, journalistic and autobiographical accounts affirm the importance of uncertainty and dread in the local perception of and response to threatening events. To affirm our focus on local perception of threat, however, we reframe key parameter definitions of uncertainty and dread in a consistent terminology that emphasizes local perspectives. Uncertainty refers to local confidence regarding the identity and nature of an emerging threat, and is defined by five threat parameters: novel, unidentified, distrust of official sources, lack of consensus among experts and unobservable. Dread refers to local assessment of the impact of a threat on its victims. Dread is defined by 11 threat parameters: fatal, loss of livelihood, unpleasant death, involuntary, indiscriminate, uncontrollable, irreversible damage, future generations at risk, ecologically established and spreading. In our research, we discovered the need for an additional threat parameter under the dread variable—loss of livelihood—defined as ‘Locals perceive that threat has caused or can cause loss of individual livelihood’. We also discovered that the parameter indiscriminate could be perceived in a variety of ways. In most instances, a threat that indiscriminately affected everybody, such as an infectious disease epidemic, created more dread than a limited threat—a
result contrary to survey results which generally ranked inequitably distributed threats as more dreadful. But, from the perspective of a specific local group such as members of a clan undergoing focused assault on its members, inequitable threats also ranked highly on the dread scale. We expressed these adjustments in dread threat terminology and meaning in Table 1.

Our emphasis on local perceptions affirms the original intention of dread threat theory to highlight common-sense, local, particularistic perspectives rather than scientific, generalized and universalistic methods of risk assessment. In contrast to the body of dread threat theory, however, we take advantage of the fact that uncertainty and dread parameters may vary independently and dynamically over time to measure changing local

<table>
<thead>
<tr>
<th>Uncertainty</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Novel threat</td>
<td>Local population labels the threat as previously unknown in their region</td>
</tr>
<tr>
<td>Unidentified threat</td>
<td>Local population unable to name the threat</td>
</tr>
<tr>
<td>Distrust of official</td>
<td>Local population questions/doubts official accounts of the threat, such as diagnosis, case count, case rate</td>
</tr>
<tr>
<td>sources</td>
<td></td>
</tr>
<tr>
<td>Lack of consensus</td>
<td>Involved experts disagree on the nature of the threat</td>
</tr>
<tr>
<td>among experts</td>
<td></td>
</tr>
<tr>
<td>Unobservable threat</td>
<td>Local population unable to see the cause or symptoms of the threat</td>
</tr>
<tr>
<td>Dread</td>
<td>Definition</td>
</tr>
<tr>
<td>Fatal</td>
<td>Locals perceive that threat has killed or can kill at least one person</td>
</tr>
<tr>
<td>Loss of livelihood</td>
<td>Locals perceive that threat has caused or can cause loss of individual livelihood</td>
</tr>
<tr>
<td>Unpleasant death</td>
<td>Locals perceive the experience of death from the threat as gruesome or painful</td>
</tr>
<tr>
<td>Involuntary</td>
<td>Local population perceives encounter of the threat as independent of their will</td>
</tr>
<tr>
<td>Indiscriminate</td>
<td>Local population perceives the threat as potentially attacking or affecting everybody in community</td>
</tr>
<tr>
<td>Uncontrollable</td>
<td>Local population perceives the effects of the threat do not respond to countermeasures</td>
</tr>
<tr>
<td>Irreversible damage</td>
<td>Local population perceives damage from the threat as final or permanent</td>
</tr>
<tr>
<td>Future generations at risk</td>
<td>Local population perceives the hazard as posing a threat to the unborn or yet to be conceived</td>
</tr>
<tr>
<td>Ecologically established</td>
<td>Local population perceives that the threat has found a permanent niche in the local ecology</td>
</tr>
<tr>
<td>Spreading</td>
<td>Local population perceives the threat to be growing beyond its point of origin</td>
</tr>
</tbody>
</table>
perceptions of threat. We initially adopted a binary yes/no measurement scale that enabled us to measure increasing uncertainty and dread with an increasing overall total score. For example, we assigned the value of 1 in situations where a threatening infectious disease was novel—that is, previously unknown to a local population (see Case 1). If a local population was already familiar with the infectious disease threat, we assigned a 0. In some cases, this required that we rename specific parameters in order to achieve consistent meaning of yes/no. For example, we renamed the parameter ‘controllable’ to ‘uncontrollable’ because assigning the value of 1 (yes) to uncontrollable signified more dread. Summing the values for a specific period of measurement and plotting the set of values in a time series enabled us to document a local population’s increasing and decreasing perception of threat over time (see Case 2). For our current work, we are experimenting with assigning different scales to specific parameters to allow more refined coding. For example, in our work on Somalia (see Case 3 below), we assign a 0–6 scale to fatal, loss of livelihood and uncontrollable.

Assessing Menacing Context in Historical Situations

A menacing context emerges when a dread threat persists and requires a community to reorganize its life to mitigate consequences of threat. We applied the concept of menacing context to analyse three separate case studies in the literature. In Case 1 about a cholera outbreak among indigenous Venezuelans in the mid-1990s, we document the possibility of discovering data for measuring local perception of, and efforts to manage, dread threats in ethnographic accounts of a field setting. In Case 2, we analyse how residents of Ningbo, China, reorganized community life in response to multiple, persistent dread threats of living in a total war setting during the Second Sino-Japanese War, from 1937 to 1941. Case 3 explores a variety of stressors through open-source media and scholarly accounts, including clan cleansing, famine and infectious disease in Somalia, and demonstrates how we use the concept of menacing context to construct a simulation showing the dynamic relationship of local perception of threat and the stock of locally available threat management strategies over time, including the strategy of fleeing. In all three cases, we show how the concept of menacing context elucidates the relationship among the drivers of forced migration, local perception of threat and domestic decision-making about remaining in place, fleeing or a combination.

Case 1: Cholera Poses Dread Threat to Indigenous Venezuelans

Charles Briggs and Clara Mantini-Briggs (2004) document an epidemic of cholera in 1992 and 1993 that killed over 500 indigenous people in the Orinoco River delta of Venezuela and caused mass displacement, often of entire villages, to cities and towns of the interior (see the case of Mariusa.
below). From a macrosociological perspective, they emphasize two conditions that contributed to the tragedy: the spread of cholera and the inequality between the majority, Criollo populations and the minority, indigenous populations of Venezuela known locally as the ‘Warao’. Many exploited mixed subsistence livelihood in remote parts of Venezuela, particularly in the Orinoco River delta regions. The Warao rarely participated in the nation’s political processes. When living in regional and central urban areas, they lived on the economic and territorial periphery and, at times, faced forced deportation back to rural areas (see Briggs and Mantini-Briggs 2004: 163–178).

Indeed, the cholera outbreak became the occasion for exercising particularly coercive measures against fleeing indigenous Venezuelans—a circumstance leading the authors to develop the concept of ‘sanitary citizenship’ and observe that, from the perspective of Venezuelan public health officials, the indigenous people became ‘unsanitary citizens’ through a process of ‘medical profiling’ because of their alleged cultural vulnerability for contracting and transmitting cholera to the wider, Criollo population (Briggs and Mantini-Briggs 2004: 10).

Portrayal of indigenous Venezuelans as unsanitary citizens, however, represented a local manifestation of an international process—the portrayal of cholera as a disease of backward, underdeveloped countries, one of the original ‘Asiatic diseases’ that gave rise to the International Health Regulation, cholera spreads with the world’s trade (Fidler 2004). The cholera epidemic affecting Venezuela in 1992–93 affected people in most central and northern South American countries (see map from Briggs and Mantini-Briggs 2004: 279). In its efforts to appear internationally as a modern, developing country, Venezuela had an interest in suppressing news of cholera within its boundaries and finding scapegoats for outbreaks—a situation that placed institutions at the mesosociological level of Venezuelan society in the spotlight, primarily the Ministerio de Sanidad y Asistencia Social (MSAS), the Venezuelan public health department.

A disease generally prevented by modern sewage and water management systems and effectively treated with oral rehydration therapy, cholera disproportionately affects people without access to such resources, namely the urban and rural poor. The MSAS maintained no offices and offered few services below the level of the region. Thus, at the microsociological level of their own communities, indigenous Venezuelans lacked central sewage facilities, sources of potable water or ready access to medical care—a situation that left them at risk of the emerging cholera epidemic in 1992. Briggs and Mantini-Briggs provide vivid details of the indigenous Venezuelans’ reactions to the cholera outbreak, documenting their rapid assessment of the disease as a dread threat to their entire community.

When an itinerant fisherman first demonstrated symptoms of the disease in the village of Mariusa, the local leader and shaman attempted to treat him using customary healing techniques. After smoking a ritual cigar, the shaman massaged the sick fisherman, seeking evidence of specific hebu spirits that he
could banish and thus cure the patient. After the shaman uncharacteristically failed to identify any responsible hebu spirit, the fisherman left the village in a motorboat to return to the nearest urban area and modern health care. When the shaman soon developed symptoms of cholera, his family consulted another highly respected local healer who also failed to identify any hebu spirits. The shaman died after exhausting all known local healers and all conventional techniques. Within four days, eight people including the second healer died and the Mariusans abandoned their village for the outskirts of two regional cities. The son of the first shaman commented, ‘We don’t know what that disease is. We don’t know – it appeared so quickly. Look, we were eating well. We were just fine’. Briggs and Mantini-Briggs (2004) comment that, as a result of this episode, many Mariusans lost complete faith in their customary mode of healing.

This brief narrative documents multiple parameters of both uncertainty and dread in the Mariusan cholera outbreak. The Mariusans experienced two of five parameters of uncertainty, including novel and unidentified (see Table 2):

- **Novel:** 1, because, according to Briggs, cholera had last appeared in Venezuela in 1854–57. The Mariusans, thus, had no memory or knowledge

<table>
<thead>
<tr>
<th>Cholera in Mariusa</th>
<th>Initially</th>
<th>After one week</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unknown</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Novel threat</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Unidentified threat</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Distrust of official sources</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Lack of consensus among experts</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Unobservable threat</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td><strong>Dread</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fatal</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Loss of livelihood</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Unpleasent death</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Involuntary</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Indiscriminate</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Uncontrollable</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Irreversible damage</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Future generations at risk</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Ecologically established</td>
<td></td>
<td>NE</td>
</tr>
<tr>
<td>Spreading</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

Y = 1; N = 0; No Evidence = NE.
of its existence. When the fisherman appeared with diarrhoea and vomiting, common enough symptoms, the Mariusans attempted a diagnosis using their customary and usually successful approach. Its failure deeply troubled the shamans and the villagers.

- **Unidentified**: 1, because, with the failure of customary diagnostic methods and the death of two powerful healers, the Mariusans tried to formulate other explanations for the illness, including sorcery and malignant ghosts. Even months later, after learning of the official cholera diagnosis, the Mariusans remained profoundly puzzled by the sudden, virulent nature of the illness.
- **Distrust of local officials**: 0, because the Mariusans had no knowledge of official explanations or official efforts to counter cholera. They had complete trust in their traditional healers until they both died of the unknown disease.
- **Lack of consensus among experts**: 0, because the Mariusans also remained ignorant of disputes among Venezuelan public health officials about how to approach cholera. The consensus among their healers that the disease was unknown to their system alarmed them.
- **Unobservable**: 0, because, although the Mariusans could not observe the causes of the illness, they certainly observed its symptoms.

The Mariusans experienced eight of 10 parameters of dread, including fatal, unpleasant death, involuntary, indiscriminate, uncontrollable, irreversible damage, future generations at risk and spreading (see Table 2):

- **Fatal**: 1, because, in one week, the Mariusans watched eight people die in the village, including two healers.
- **Loss of livelihood**: 0, because cholera did not initially threaten the Mariusans’ livelihood, although leaving their village to escape the disease caused them to become indigent in the urban areas to which they fled.
- **Unpleasant death**: 1, because the voluminous diarrhoea and vomiting characteristic of uncontrolled cholera are unpleasant to experience and unpleasant to watch.
- **Involuntary**: 1, because no Mariusan chose to contract cholera.
- **Indiscriminate**: 1, because everybody seemed at risk.
- **Uncontrollable**: 1, because, when the two shaman and other healers failed to save ill Mariusans, the illness escaped their control and engendered desperation.
- **Irreversible damage**: 1, because the Mariusans commented upon no damage, reversible or irreversible, other than death from the disease.
- **Future generations at risk**: 1, because the Mariusans fully realized that the disease threatened to kill everybody in their village.
- **Ecologically established**: ‘No Evidence’, because Briggs’s data gives no direct evidence of how the Mariusans perceived the ecological status of the illness. They did not stay in the village long enough to find out.
- **Spreading**: 1, because it was clear to the Mariusans that, if they remained in the village, the disease would spread to all of its members.
The Venezuela Cholera case study vividly documents the availability of ethnographic data for uncertainty and dread as components of the local perception of threat. The cholera threat emerged abruptly, resisted diagnosis within the traditional disease lexicon, failed to respond to local measures of control and quickly killed several people with a promise to kill more. It also documents rapid emergence of a menacing context by showing reorganization of village life in the face of a persistent threat. After unsuccessfully employing the stock of illness threat management techniques available to them, the Mariusans evacuated the village—a clear case of forced migration driven by infectious disease. This cholera case bears comparison with the contemporary West African ebola situation which was unfolding as we completed this article.

Case 2: Total War Creates Sustained Menacing Context in Ningbo, China, 1937–41

The Sino-Japanese War began in July 1937. As Mitter states,

What began on July 7 1937 as an unplanned local conflict between Chinese and Japanese troops near Beijing, known as the ‘Marco Polo Bridge Incident’, escalated into an all out war between the two great nations of East Asia; it would not end until August 1945 (Mitter 2013: 5).

This total war established the macrosociological conditions for dread and provoked wholesale reorganization of life throughout China—a spectacular example of menacing context. With the conquest of Beijing and northern China in July 1937, the Japanese turned their attention to central China, beginning with the battle for Shanghai and continuing along the Yangtze River with assaults on Nanjing¹ and Chongqing.² These assaults included attacks by land, naval bombardment and, most critically, strategic bombing. Accounts exist of the impact of these strategic bombing attacks on the local populations all along the river (Han 1968). Many people evacuated their homes. Mitter states that, although the war prevented good record keeping, between 80 million and 100 million Chinese (approximately 15–20 per cent of the entire population) fled their homes (Mitter 2013: 117–118).

We focus in this case study on the port city of Ningbo, which, during a two-year period, experienced conventional bombings, bombing with biological agents (i.e. plague) and invasion. Archie Crouch, an American missionary, wrote a famous account of the assault on Ningbo, a port city across the Hangzho Bay south of Shanghai (Crouch n.d.).³ Crouch begins his diary in the fall of 1940 with descriptions of the daily Japanese bombing and strafing of the city with conventional weapons. He concludes it with his own flight from the city.

During the period of conventional bombing, the Ningbo residents altered their daily routine by scheduling activities such as attending school and...
grocery shopping to early and late in the day, since bombings occurred regularly from 10 a.m. to 2 p.m. Ningbo residents moved to the city’s periphery before they expected the bombing to begin in the morning and returned each evening after they expected it to end. This threat mitigation tactic usually helped minimize causalities until, on 12 September 1940, a single plane returned to the city and strafed the crowds as they were returning in the late afternoon. Crouch (n.d.) describes in graphic detail the population’s exposure to the deaths caused by the bombings, including deaths to children.

In terms of dread threat theory, the September 1940 time period of conventional bombing as described by Crouch show no characteristics of uncertainty and six characteristics of dread (see Table 2 for dread threat scores; see Appendix I for details of the scores).

The situation changed measurably on 27 October 1940, when an air raid siren sounded in Ningbo late in the afternoon. In addition to occurring at an unusual time, only one aeroplane, not squadrons, appeared low in the sky. Crouch describes the bombing:

As this lone plane circled slowly over the heart of the city a plume of what appeared to be dense smoke billowed out behind the fuselage. I thought it must be on fire, but then the cloud dispersed downward quickly, like rain from a thunderhead on a summer day, and the plane flew away. Puzzled, I went back into the house to report to Ellen, who was reading a story to Edward. A few minutes later the all-clear siren relieved the tension, and the life of that autumn afternoon and evening went on with its usual routine (Crouch, n.d., also quoted in Harris 2002: 101).

In terms of dread threat, as Crouch clearly explains, the identity and behaviour of the single bomber were initially problematic (see Table 3). By the time Crouch arrived at his school the next morning (28 October 1940), people were speculating about what had happened. Rumours were circulating that Ningbo had experienced an attack of biological warfare. On 1 November, Crouch reports hearing that 20 people had died from bubonic plague, followed by 16 more on 2 November. Although lab tests were not yet complete, doctors diagnosed the disease from its symptoms and asked the city authorities to cordon off a section of the central city for quarantine. Ningbo developed and, on 1 December, implemented a plan to build a wall around the affected areas, evacuate and quarantine all of the enclosed zone’s residents, and burn it to the ground to destroy rats and fleas. City authorities also adopted other measures such as closing day schools, limiting the flow of traffic, vigorously cleaning streets, posting giant public service announcements about rats and fleas, and, eventually, providing plague serum. With these measures, they hoped to contain the plague within its point of origin (see Harris 2002 for discussion of final impact on the city). On 3 December, a rumour spread through the city that a hospital worker had contracted pneumonic plague, a more lethal form of the disease.
Beginning in April 1941, the long-rumoured Japanese invasion of Ningbo began in earnest. As a consequence, food began to grow scarce. Although linked as part of this phase in the war, the invasion and starvation posed different types of management problems for Ningbo residents. The conquest of the city included dissolution of the city government that had tried so valiantly to protect Ningbo’s residents. With the emergence of widespread starvation and government collapse, looting began throughout the city. The Japanese Army gradually asserted its authority but, in the interregnum, local groups such as Crouch’s family and missionary cadre assumed responsibility for protecting themselves against all threats. In an attempt to protect female and infant refugees who had come to their compounds, the missionaries stored food supplies and fruitlessly approached the Japanese Army commanders for help. Evidence suggests that many Ningbo residents fled the city. Crouch ends his diary upon his departure from the city in June 1941.

Table 3

<table>
<thead>
<tr>
<th>Dread Threat in Ningbo Bombing Campaign</th>
<th>Ningbo Bombing 1940</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sep.¹</td>
</tr>
<tr>
<td>Unknown</td>
<td></td>
</tr>
<tr>
<td>Novel threat</td>
<td>0</td>
</tr>
<tr>
<td>Unidentified threat</td>
<td>0</td>
</tr>
<tr>
<td>Distrust of official sources</td>
<td>0</td>
</tr>
<tr>
<td>Lack of consensus among experts</td>
<td>0</td>
</tr>
<tr>
<td>Unobservable threat</td>
<td>0</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>0</strong></td>
</tr>
<tr>
<td>Dread</td>
<td></td>
</tr>
<tr>
<td>Fatal</td>
<td>1</td>
</tr>
<tr>
<td>Loss of livelihood</td>
<td>0</td>
</tr>
<tr>
<td>Unpleasant death</td>
<td>1</td>
</tr>
<tr>
<td>Involuntary</td>
<td>1</td>
</tr>
<tr>
<td>Indiscriminate</td>
<td>1</td>
</tr>
<tr>
<td>Uncontrollable</td>
<td>0</td>
</tr>
<tr>
<td>Irreversible damage</td>
<td>0</td>
</tr>
<tr>
<td>Future generations at risk</td>
<td>1</td>
</tr>
<tr>
<td>Ecologically established</td>
<td>1</td>
</tr>
<tr>
<td>Spreading</td>
<td>0</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>6</strong></td>
</tr>
<tr>
<td>Total</td>
<td><strong>6</strong></td>
</tr>
</tbody>
</table>

¹ Conventional bombing.
² Potential bioweapon/plague attack.
³ Deaths believed from plague.
⁴ Believed case of pneumonic plague.

Y = 1; N = 0; No Evidence = NE.
In terms of dread threat theory, the invasion as described by Crouch initially showed no characteristics of uncertainty and two characteristics of dread. With the conquest of Ningbo in June, the invasion showed one characteristic of uncertainty and seven for dread (see Table 4 for dread threat scores; see Appendix I for details of the scores).

The Japanese conquest of Ningbo ended the menacing context that started with the initial bombing in 1939 and persisted through biowarfare attacks, invasion and starvation. From Crouch’s diary, we find clear evidence of local perception of many (although not all) threats inflicted upon Ningbo thanks to the total war situation. Using the parameters of dread threat, we measured the rise and fall of perceived severity of each threat independently over time. Crouch also enables us to see how Ningbo residents and city authorities adapted and reorganized their lives to mitigate the consequences of each threat as it emerged and to the total war situation as it inevitably overtook them. They employed a mix of risk mitigation strategies that, in some cases, entailed reorganizing their ordinary activities and, in other cases, developing innovative activities. Crouch

| Table 4
| Dread Threat in Invasion |
|--------------------------|-----------------------------|
|                         | Invasion 1941                |
|                         | April | June |
| **Unknown**             |       |      |
| Novel threat            | 0     | 1    |
| Unidentified threat     | 0     | 0    |
| Distrust of official sources | 0   | NE   |
| Lack of consensus among experts | 0  | 0    |
| Unobservable threat     | 0     | 0    |
| **Subtotal**            | 0     | 1    |
| **Dread**               |       |      |
| Fatal                   | NE    | 1    |
| Loss of livelihood      | NE    | 1    |
| Unpleasant death        | NE    | 1    |
| Involuntary             | 1     | 1    |
| Indiscriminate          | 1     | 1    |
| Uncontrollable          | 0     | 1    |
| Irreversible damage     | 0     | 0    |
| Future generations at risk | NE  | NE   |
| Ecologically established| 0     | NE   |
| Spreading               | 0     | 1    |
| **Subtotal**            | 2     | 7    |
| **Total**               | 2     | 8    |

Y = 1; N = 0; No Evidence = NE.
enables us to see that, over time, as the war threats persisted and diversified, the city’s entire life became focused on threat management, an organizational process we designate as a menacing context. From the perspective of menacing context, evacuation remained one option among others that Crouch adopted only after all other efforts to mitigate the Japanese threat failed.

Modelling Menacing Context to Support Forecasting and Planning

We employed our dread threat coding scheme, theory of menacing context and a formal simulation application by Forio® to experimentally model menacing context based on data from an extensive archive of newspaper and online media articles about events in Somalia during 2006–07 retrieved from Georgetown’s open-source archive known as EOS. Decades of failing systems of governance and ineffectual central authority coupled with natural disasters contributed to an evolving humanitarian crisis in Somalia at the beginning of the twenty-first century. The conquest of the Barre government in 1990 created a long-term menacing context whose precise mechanisms and level of intensity have varied over time. Civil conflict in the form of clan cleansing, radical insurgencies, recurrent drought, flooding and famine, major epidemics such as polio as well as multiple invasions from foreign governments and international peace-keeping forces compelled Somalis to adopt a range of strategies to survive. These strategies included migrating for varying lengths of time to various places, mobilizing self-defence forces, adapting their means of local livelihood, receiving aid from kinsmen abroad, accepting relief from international agencies and sheltering in place (Little 2003; Horst 2008; Kapteijn 2013). In 2006–08, Somalia experienced insurgency, drought, international invasion and high rates of forced outmigration. The violence and political instability contributed to an environment of insecurity and fear for livelihood, which spurred the exodus of hundreds of thousands of Somalis from their homes. The United Nations Refugee Agency (UNHCR) figures recorded internal displacement reaching 180,000 people in April 2007 and 120,000 in November 2007 (Lindley 2010).

Given our overall emphasis on the interaction of the macro, meso and micro levels of complex crisis situations, we chose to build our initial simulation using a system dynamics model (Forrester 1997; Bridgeland and Zahavi 2008), rendered as mini-simulations that focus on families or households as the key sociological unit in forced migration. From a system dynamics perspective, the concept of menacing context synthesizes a family’s dynamic perception of threats with their varying response to threats. System dynamics is particularly useful for modelling soft variables like dread threat and menacing context, and for modelling the complex information feedbacks of forced migration (Sterman 1991).

The dread threat index measures their local perception of threat over time (see Figure 1). The stock of threat mitigation strategies identifies and enumerates options for managing threats over time (see Figure 2).
The underlying model enables mathematical representation of these relationships linked to a variety of variables such as perceived attractiveness of strategies (see Figure 3). From the perspective of forecasting, the variety of short-, medium- and long-term ways that people move in space to manage the threats to their lives and livelihood appear as options in the stock of threat mitigation strategies. Thus, while we initially posed our study with questions about forecasting forced migration, our inquiry and forecasting and planning requirements actually entail anticipating the range and proportional mix of actions in the entire stock of strategies for mitigating risks to life and livelihood, including access to humanitarian relief. It is important to note that this work forms a key element of our long-term goal of offering humanitarian relief agencies tools for improved forecasting of forced migration events and better planning of relief efforts. Thus, the simulation permits conducting scenario planning assessments as well as analyses of empirical situations.

Figure 1 portrays the relationship between the dread threat index and level of menacing context over time. The dread threat index scale (shown on the vertical axis) ranges from 0 to 30 to reflect the sum of dread threat scores on any given time interval. The graph emerges as dread threat index scores are plotted over time (horizontal axis). We model menacing context on the same 0–30 scale that we model dread threat. Menacing context is defined as the persistence over time of a dread threat in a community—a persistence that can ultimately lead the community to action. As commonly modelled by the system dynamics modelling community of situations involving decision makers experiencing information delay (Madachy 2008), we model the persistence as a third-order exponential smoothing of dread threat, with a delay time of 10 weeks. For setting the exponential smoothing duration, we relied on a combination of simulation experiments, and judgement by forced migration experts. Ten weeks resulted a responsiveness of menacing context that
looked about right to our experts. The effect of exponential smoothing is that a dread threat that does not persist has only a small effect on the level of menacing context, but a dread threat that persists has a large effect, particularly if it persists for at least 10 weeks. Figure 2 shows the dread threat time series and the corresponding menacing context derived from coding of events in Somalia during 2006–08.

Figure 2 shows how the simulation demonstrates families changing their strategies, attempting to mitigate the threats as the dread threat index increases from 0 to 30 over time. During weeks 0–12, some families collect relief (coloured orange in strategy graph) but most continue their normal activities, denoted as ‘status quo’ (dark blue in the strategy graph). In week 13, when the menacing context reaches 12, families pursue other modes of livelihood (dark green) and begin to execute planned migration from the area (beige). As the dread threat index increases and remains high over time, the strategy mix changes again with families increasingly fleeing without plans (purple) and mobilizing self-defence (light blue). The level of menacing context drives the pace at which the community changes risk-
management strategies. At low levels of menacing context, change is slow and gradual; at high levels of menacing context, change is quite rapid. We see evidence of this in the histories of forced migration: a very high level of menacing context provokes innovation and change in strategies. For example, when faced with the prospect of everybody dying from cholera, the Mariusans fled their village. Residents of Ningbo kept inventing new ways to counter the effects of Japanese bombing until finally the invasion starved them into submission and flight.

When a community changes its risk-management strategy, however, what new strategies does it adopt? We model both the current strategy mix—the mix of strategies that a community is employing today—and a goal strategy mix—the mix of strategies they are moving toward. Figure 3 shows both mixes at a particular time. On the bottom left is the current strategy mix, and on the bottom right is the goal strategy mix, with a greater share of standing up self-defence. The scale of strategy attractiveness is both relative and dimensionless. It is a relative scale in that, if status quo has an attractiveness of 500 and planned migration has an attractiveness of 100, then the strategy share of status quo will be five times the status share of planned migration (Sterman 2000). Attractiveness is a dimensionless scale in that neither the 500 nor the 100 has any inherent meaning. Instead, their meaning is only in the relative size of attractiveness of the strategies, and how that relative size drives share.

We model the attractiveness of a strategy using several criteria:

1. the perceived effectiveness of the strategy: how likely is the strategy to prove successful in managing the risk?
2. the perceived quality of life that the strategy would deliver: if the strategy is successful, how good is the quality of life at the end?
3. the effort to implement the strategy: easier strategies are better than more difficult strategies;
4. the implementation speed: how quickly can a strategy be implemented?
5. the risk of the strategy: how likely is the strategy to lead to loss of life or other undesirable outcomes?
6. the perception of availability of strategy: is the strategy currently available?

We modelled some of these criteria as static effects. For example, the perceived quality of life for each strategy does not change in our simulations. Of course, perceived quality of life does change in the world, both because quality of life changes and because the perception of that quality changes. But, for our purposes, we modelled this as a static effect.

We modelled other criteria as dynamic, changing over the course of a simulation. For example, the perceived effectiveness of each strategy varies, as the community tries strategies, and menacing context either increases or declines. (Of course, in the world, menacing context may change for reasons that are independent of the strategies employed to manage risk.)

In our model, sensitivity varies for some of the criteria. When menacing context is low, the effectiveness of a strategy does not matter too much. A strategy that has a 90 per cent effectiveness is better than a strategy that has only an 80 per cent chance of success, but perhaps not better to an enormous degree, compared to quality of life or effort or other criteria. But, when menacing context is high, the perceived effectiveness of a strategy is much more important. The sensitivity is then much greater.

The goal strategy mix changes over time, as the community’s perception of the attractiveness of each strategy changes. Figure 3 summarizes the relationships among the model variables described here that drive the changing strategy mix: how strategy share is determined by strategy share goal and strategy share change pace, how strategy share change pace is determined by the current level of menacing context, how menacing context is determined by the level of dread threat, and so on.

**Conclusion**

The concept of menacing context has evident value for forecasting forced migration because it links situational factors to decision-making as well as macro, meso and micro levels of analysis through local perceptions of, and responses to, dread threat. We based our dread threat coding protocol on 30 years of research in the social psychology of technological risk perception. We made adjustments to capture situational characteristics such as the loss of livelihood that were not pertinent to assessing technology-related risks but regularly appear in managing the threats of everyday life. The concept of
menacing context extends dread threat theory by including dynamic changes
in both local perception of, and responses to, emerging threat over time. In
developing the mini-simulation for our Somalia case, we defined terms and
articulated concepts for the stock of threat mitigation strategies, sometimes
with little precedent. We have begun addressing limitations in both computa-
tional and social science in our current research, including the availability
detailed data for measuring dread threat levels in specific situations, approp-
riate scaling of dread threat parameters, weighing of multiple, contempor-
aneous threats, assessing the value of additional variables such as
casualties, validating the empirical significance of specific model variables,
the role of sensitivity analysis in our model (Fischhoff et al. 2007).

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Appendix I

Dread Threat Scores for Ningbo, China, for Bombing Attacks, 1940

Uncertainty

• **Novel**: In September, 0, because bombing and strafing had become well
  known and routine. In October, 1, because locals were unused to bubonic
  plague in their area and added a new threat to menacing context.
• **Unidentified threat**: In September, 0, because Ningbo residents knew who,
  when and how the bombings occurred. In October, 1 to 0, because the plague
  threat was unidentified only at first. Rumours circulated labelling it as a
  biowarfare attack. As symptoms of bubonic plague developed, doctors diag-
  nosed the disease.
• **Distrust of official sources**: 0, because citizens follow the officially released
  alarms and followed their leadership in responding to the plague.
Lack of consensus among experts: 0, because Ningbo officials all agree the Japanese are attacking. 0, because the doctors and city officials agreed upon plague control measures.

Unobservable threat: 0, because planes, bombs and destruction well evident to all citizens of Ningbo. For plague bombing, fleas initially emerged as a problematic signifier, followed by rumours of biowarfare, then by outbreak that retrospectively confirmed fleas as source of plague.

Dread

Fatal: For conventional bombing, 1, because the text includes reference to people digging out bodies of dead from bomb craters. For plague, 1, because 20 people had died as of 1 November 1940 and 16 more by 2 November.

Loss of livelihood: 0, because the city attempted to maintain its commercial life in spite of the bombing.

Unpleasant death: 1, Crouch’s description of the strafing and other scenes includes graphic evidence of the bombings victims. For plague, Crouch describes passages from a guide to Asian diseases that characterizes the unpleasant symptoms and progression of bubonic plague.

Involuntary: 1, because the citizens of Ningbo cannot stop the bombing or strafing.

Indiscriminate: 1, because affects all demographic groups, i.e. all citizens of Ningbo but limited to certain times (10–2 in good weather) and places (business and commercial centre).

Uncontrollable: 0, because, by changing their daily routine to leave city during regular bombings, the Ningbo residents mitigated the threat to some extent; but, the Japanese can alter their tactics and expose the citizens to the threat again. For the plague, 0, because their organizational repertoire included plans to respond, including quarantine, containing wall and incineration of affected area to kill the rats.

Irreversible damage: 0, because they have reorganized but not yet abandoned their lives in Ningbo.

Future generations at risk: 1, because the children killed, symbolizes the war’s high stakes for Ningbo’s future.

Ecologically established: 1, because the bombing occurs every day. This is what established the menacing context.

Spreading: 0, because threat is not self-spreading; at this time, the time and targets of the bombing are well established and it is very context-specific and dependent. For the plague, the city’s efforts to contain spread substantially seemed to work even though residents remained vigilant in their personal anti-flea and rat tactics. Crouch’s diary does not extend very long after the flea bombing and focuses on the Japanese invasion of the city. Harris provides evidence of spread of the plague to surrounding counties and recurrence of plague in years after Crouch left (Harris 2002).
Dread Threat Scores for Ningbo, China, for Japanese Invasion, 1941

Uncertainty

- **Novel threat**: 0, because Ningbo citizens had heard about invasions of other parts of China and had previously taken preventive measures. Rumours of the invasion of Ningbo were always circulating. 1 by the end of the invasion, because food shortages and starvation emerged and spread widely for the first time since the war began.
- **Unidentified**: 0, because the Ningbo residents knew the Japanese.
- **Distrust of sources**: ‘No Evidence’, because no official sources cited in the text.
- **Lack of consensus**: 0, because both the army and the locals agreed that the invasion was happening.
- **Unobservable**: 0, because Ningbo residents could see planes and hear the gunfire.

Dread

- **Fatal**: Initially ‘No Evidence’, because the text mentions no deaths as a result of the invasion. 1 by the end of the invasion, because Crouch reports people dying of starvation.
- **Loss of livelihood**: 0 at the beginning of the invasion; but 1 by the end of the invasion, because it ended all forms of livelihood except looting and scavenging.
- **Unpleasant death**: Initially ‘No Evidence’, because the text mentions no deaths as a result of the invasion. 1 by the end of the invasion, because Crouch describes a beggar starving in the streets.
- **Involuntary**: 1, because locals perceive invasion as involuntary.
- **Indiscriminate**: 1, because everybody was affected in some form from the beginning of the attack on the city.
- **Uncontrollable**: Initially 0, because the Ningbo police and remnants of the Chinese Army launched a counterattack. 1 by the end of the invasion, because the resident Ningbo population had no success in deterring the invasion or its effects on them such as starvation.
- **Irreversible damage**: 0 at the beginning of the battle for Ningbo, because Ningbo police, residents and the Chinese Army fought to preserve the city. 1 by the end of the battle, because the Ningbo city government, police force and the Chinese Army withdrew effectively ending the life of the city as it was known.
- **Future generations**: ‘No Evidence’, because no discussion of the unborn in text.
- **Ecologically established**: 0 at the beginning of the battle, because Ningbo police and residents as well as the Chinese Army residents fought to preserve
the city. 1 at the end of the battle, because the Japanese Army took command of the city.

1. Chiang Kai-shek’s capital city until the 1937 assault.
2. Chiang’s capital after the 1937 assault.
3. Sheldon H. Harris cites Crouch’s diary and an interview with Crouch in his account of Japanese biological warfare (Harris 2002: 101, 111). Georgetown obtained a copy of the manuscript from the New York public library.


