

The Effects of Cognitive Biases on Early Warning

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Abstract

This paper reviews selected concepts and empirical evidence from psychology and cognitive science about limitations in the way that individuals process information and make decisions, and applies these to early warning and response. Cognitive biases can exert influence on early warning by affecting the warning analyst's judgments and/or the policymaker's evaluation of warnings and decision about a response. Taken together, literature on cognitive biases suggests that warning analysis will tend to overestimate risks and policymakers will tend to resist calls for preventive action, preferring to risk a greater loss in the future rather than accept a certain one now. The paper then discusses possible strategies to minimize and manage the negative effects of cognitive biases on early warning. These strategies have yet to prove fully their ability to address fundamental cognitive biases in applied settings. The author concludes that additional research into the effectiveness of these strategies is important for designing and implementing more effective early warning systems.

Introduction

Over the last few decades, a rich and growing literature has emerged about human cognition, information processing, and decision making. This literature dates back at least to Herbert Simon's work on "bounded rationality" (1957), and was further sparked and accelerated by the pioneering work by Daniel Kahneman and Amos Tversky. Their early work on "prospect theory" together with a rich set of theoretical and empirical findings that followed, have effectively destroyed the notion that humans process information and make decisions in purely rational fashion, particularly in situations that involve risk and uncertainty, are otherwise highly complex, or both (Larrick, 2004: 316).

Meanwhile, since at least the early 1990s, other scholars have been developing methods and systems for early warning of violent conflict, humanitarian emergencies, mass migrations, and other kinds of man-made disasters. This work has focused largely on identifying the most reliable and precise risk factors and indicators of warning of emerging crises before they become fully born. Early warning systems that are explicitly grounded in theory are the exception rather than the rule, but much of this work implicitly assumes a direct relationship between the accuracy of forecasts and the effectiveness of early warning systems in facilitating prompt and appropriate preventive actions.

Despite impressive progress in forecasting accuracy (e.g., Goldstone et al., 2005; O'Brien, 2001), scholars and developers of early warning systems continue to lament that decision makers do not make more use of early warning information and analysis. The "warning-response gap" (George & Holl, 1996) is accepted to be the heart of the problem in preventing conflict and other crises—i.e., finding ways to increase the likelihood that policymakers take

warnings seriously and respond with preventive measures. Two main types of approaches have been recommended and pursued to address this problem: (1) efforts to further improve on the models and systems of early warning to increase their accuracy and precision; and (2) efforts to make bureaucratic changes to more effectively channel warnings to policymakers in ways that make it harder for them to ignore.

Both of these approaches are valid and worthwhile. Even the best early warning models continue to have error rates in their forecasts that leave policymakers with difficult choices based on uncertainty and probabilities. Reducing the degree of uncertainty might reasonably be expected to affect policymakers' use of early warning information. Likewise, stories of warnings that never reached the intended audience for bureaucratic reasons are ample reason to continue to try to streamline and improve the channels for warning in governments and other large organizations.

These efforts, however, tend to pay little attention to evidence on the ways in which individuals and groups process information and make decisions, particularly about risk and uncertainty. Numerous scholars have sought to bring perspectives of cognitive biases to international relations theory, which has long been dominated by theories that assume rational behavior of states and those who run them. Robert Jervis has been probably the leading scholar to incorporate elements of prospect theory into international relations theory—e.g., in deterrence theory. In addition, a few scholars of intelligence analysis have systematically studied the psychological and cognitive dimensions of their work (e.g., Heuer).

Yet, little of this scholarship has focused on the specific challenges for early warning and preventive responses. Early warning developers and practitioners have remained largely

animated by implicit assumptions about information processing that fail to reflect findings from the scholarly literature. This paper aims to highlight some well established patterns and biases in human information processing and decision making that are relevant to designing and implementing effective systems for early warning and response. I focus on biases that result from limitations and/or regularities inherent in human cognition, excluding those based on personal motivation (e.g., wishful thinking) (Parker & Stern, 2002). First, I present a schematic depiction of early warning. Second, I review theoretical and empirical work on cognitive biases and discuss their potential effects on early warning analysts and audiences. Third, I consider the implications and discuss some strategies for minimizing the negative effects of cognitive biases on early warning.

Schematic depiction of early warning

Early warning is frequently likened to ringing an alarm bell before an impending disaster. This view is limited and unhelpful. Early warning is a broader process of collecting, analyzing and communicating information about situations of escalating risks to promote preventive and/or mitigating actions. In this view, EW has three principal components: (1) estimating the magnitude and timing of relative risks of emerging threats, (2) analyzing the nature of these threats and describing plausible scenarios, and (3) communicating warning analyses to decision makers.

The first component of early warning requires an analyst to scan the environment within his or her area of responsibility and make judgments about where and when risks are greatest. The domains of interest can include politics (i.e., which states post greatest risk), geography (i.e., where are threats most likely to gather storm), and time (i.e., when are risks likely to escalate most acutely). This first step falls short of highly detailed analysis of each situation, since this

would demand more resources or analytic capacity than is typically available in regional or global systems. In any case, the warning analyst must look across cases, conceive of plausible future scenarios, estimate probabilities (at least relative probabilities) of their occurrence, and assess the threat that each scenario poses to the interests of his or her organization.¹

Once this kind of macro-risk assessment has been completed, warning analysts must monitor high-risk situations closely, analyze the details of the dynamics of these conflicts and their principal actors, and identify potential accelerating or triggering events in the offing. This component is not always clearly distinct from broader risk assessment. In particular, conducting risk assessments should sensitize analysts and warning audiences to potential crises. Nevertheless, it is useful to distinguish these two components conceptually. The latter component relies on more context specific knowledge and analysis, and should provide policymakers sufficiently detailed analysis to identify promising preventive actions.

Lastly, early warning necessarily entails communication of analysis on emerging threats to persons who are in a position to take preventive and/or mitigating action. This step is “where the rubber meets the road,” so should not be neglected when thinking about strengthening early warning systems. For example, do warning analysts have direct access to key policymakers or must they channel their concerns through the bureaucracy? Are warning analysts expected to transmit regular “watch lists” or only ad hoc warnings of impending negative events?

With this basic framework of early warning, we are ready to consider scholarship on cognitive biases and how it can be applied to understanding challenges to effective early warning and response.

Review of cognitive biases and heuristics

The “rational actor” model has long dominated social sciences, including political science and international relations (Allison & Zelikow, 1999). In short, this model of decision making assumes that a person “chooses what options to pursue by assessing the probability of each possible outcome, discerning the utility to be derived from each, and combining these two assessments” (Gilovich & Griffin, 2002: 1). While extremely attractive in its simplicity, elegance, and explanatory power, empirical research has poked holes in this conception by demonstrating that individual’s decision making frequently fails to meet expectations of rational choice theory. In the 1970s, Daniel Kahneman and Amos Tversky made major strides in developing theoretical explanations for these frequent deviations from rationality. “The processes of intuitive judgment were not merely simpler than rational models demanded,” they argued, “but were categorically different in kind” (Gilovich & Griffin, 2002: 3). Their “prospect theory” spurred a major vein of new theoretical and empirical research on cognitive biases and heuristics. This research focuses on non-rational explanations of decision making, which Gigerenzer et al. (2001: 7) have argued “provide us with a more realistic picture of decision making when knowledge is scarce, deadlines are rapidly approaching, and the future is hard to predict.” These characteristics certainly hold for the context of early warning and response.

Cognitive biases are “mental errors caused by our simplified information processing strategies” (Heuer, 1999: 111). Cognitive biases are “consistent and predictable,” but it is important to note that “this does not mean that every judgment by every individual person will be biased. It means that in any group of people, the bias will exist to a greater or lesser degree in most judgments made by most of the group (Heuer, 1999: 112). Most cognitive biases are associated with “violations of basic laws of probability” (Gilovich & Griffin, 2002: 3): e.g.,

consistency of preferences, additive probabilities not exceeding 1.0. Kahneman and Tversky explained cognitive biases by positing a set of heuristics, or “simplifying strategies and rules of thumb to ease the burden of mentally processing information to make judgments and decisions” (Heuer, 1999: 111). Heuristics are typically associated with observable cognitive biases. Nevertheless, it should be noted, “Reliance on heuristics can produce both good and bad performance” (Fishchoff, 2002: 740).

A popular way to describe the complex realities of human information processing, drawing on this scholarship, is to conceive of two systems of thinking, “one variously labeled intuitive, automatic, natural, non-verbal, narrative, and experiential, and the other analytical, deliberative, verbal, and rational” (Epstein, 1994: 710; quoted in Slovic, 2007: 4). In spite of this evidence, early warning systems are overwhelmingly oriented toward “System II”—i.e., rational, deliberative analysis and decision making.

Collectively, cognitive biases can affect early warning by influencing the warning analyst’s judgments (e.g., evaluation of evidence, judgment about likelihood of impending crisis, and characterization of emerging threats) and/or the policymaker’s evaluation of warnings and decision about a response. It is important also to consider the possibility of differential effects of biases on analysts and policymakers, as this can affect the dynamics of the warning process. The following section is a brief and selective review of cognitive biases, attempting to highlight those likely to have the most direct effects on early warning.

[Insert Figure 1 about here]

Cognitive biases affecting judgments of risk

One of the principal tasks of warning analysts is to estimate the magnitude of risk posed by possible future events or contingencies. Risk is typically defined as probability multiplied by consequences. Thus, warning analysts must first estimate the likelihood or probability of a threatening future event or scenario.² Second, warning analysis requires an estimation of the extent of the negative consequences of various plausible scenarios or discrete future events. Evidence suggests that judgments of both probability and size of consequences are susceptible to cognitive biases.

The availability heuristic and associated biases

“The human mind has difficulty coping with complicated probabilistic relationships,” Heuer (1999) summarized, “so people tend to employ simple rules of thumb that reduce the burden of processing such information” (122). One of the simple rules hypothesized by Kahneman and Tversky is the availability heuristic, which posits that individuals estimate the likelihood or frequency of an event “by assessing the ease with which the relevant mental operation of retrieval, construction, or association can be carried out” (Tversky & Kahneman, 1982: 164) [in Kahneman, Slovic & Tversky, 1982]. Studies over the past three decades have generated a wealth of empirical evidence supporting the explanatory power of the availability heuristic. Yet, while this mental process can be extremely useful and adaptive in many situations, “the use of the availability heuristic leads to systematic biases” (Tversky & Kahneman, 1982: 164) posing risks to accurate warning analysis to the extent that analysts rely on it.

The availability heuristic should generate accurate probability estimates, according to Fischhoff (2002), to the extent that “three conditions are met: (1) the exposures are proportional to actual frequencies; (2) the events are equally memorable; and (3) people have reliable mental

mechanisms for converting the availability of instances into summary estimates” (736). Evidence indicates, however, that these conditions are not typically met.

Most strikingly, human memory is affected by various factors that are irrelevant to the frequency or probability of an event. For example, “people remember occurrences more readily than non-occurrences” (Heuer, 1999: 145). This is especially relevant to warning since it concerns estimating the likelihood of rare events such as coups, civil wars, genocides, or major terrorist attacks. People are more likely to remember the one coup that occurred than the twenty that might have but did not. Thus, the availability heuristic suggests that an intuitive judgment about the probability of a future coup might be biased upward. In addition, availability is affected by “how recently the event occurred, whether we were personally involved, whether there were vivid and memorable details associated with the event, and how important it seemed at the time” (Heuer, 1999: 148). These factors are unrelated to the true probability of a future event, and could systematically bias judgments, though in ways that would depend on the specific context (e.g., was the attack captured on video?).

Another way in which the availability heuristic can lead to bias in warning is by analysts’ description of possible future scenarios. As noted, early warning is less about prediction of future events than about description of plausible scenarios with analysis that promotes preventive action. But “the act of constructing a detailed scenario for a possible future event,” according to Heuer (1999), “makes that event more readily imaginable and, therefore, increases its perceived probability” (149). “Like the measured length of a coastline, which increases as the map becomes more specific,” wrote Tversky & Koehler (1994; quoted in Tetlock, 2005: 189), “the perceived likelihood of an event increases as its description becomes more specific.” Tetlock (2005) even found that scenario exercises can lead analysts to assign probabilities that sum to greater than 1.0—a violation of a basic tenet of probability—indicating that “‘merely imagining’

outcomes increases the perceived likelihood of those outcomes” (195). It is likely, moreover, that an analyst whose job is to look for warning signs of incipient civil wars, impending genocide, mass migrations, etc., will more easily construct hypothetical future scenarios resulting in these events. According to the availability heuristic, this would bias their probability estimates upwards.

On the other hand, some possible future events that are extremely relevant for early warning will be hard for analysts to imagine in detailed scenarios. Tversky and Kahneman (1982) assert, “If no reasonable scenario comes to mind, the event is deemed impossible or highly unlikely” (177). For example, many have commented on the “failure of imagination” prior to the 1994 genocide in Rwanda and the September 11, 2001 terrorist attacks: most people simply could not wrap their arms around the possibility of these events (e.g., Power, 2002; Parker & Stern, 2002). Even where the possibility of genocide or a major terrorist attack was foreseen, the analysts’ limited ability to describe plausible scenarios in rich enough detail may have contributed to underestimating the likelihood of these events. This issue is most acute for truly unprecedented events like a nuclear terrorist attack (Allison, 2005).

It seems likely that this is a bias that would have differential effects on analysts and policymakers. Heuers (1999) wrote:

Intelligence analysts may be less influenced than others by the availability bias. Analysts are evaluating all available information, not making quick and easy inferences. On the other hand, policymakers and journalists who lack the time or access to evidence to go into details must necessarily take shortcuts. (148-9)

In addition, political leaders are renowned to have short memories and, even more than the average person, to be deeply affected by events in which they were personally involved. The differential effects of biases on analysts and policymakers will be explored further below.

Base rate neglect

In estimating the likelihood of any future event that is part of a class or general category, people should take account of the baseline frequency of similar events as well as case specific information. Yet, experimental evidence has shown that individuals systematically neglect known base rates when trying to anticipate a new event (Heuer, 1999: 157).

For example, an unbiased analyst considering the likelihood of a specific dispute political escalating to war would take account of the occurrence of roughly two new major armed conflicts each year over the past several decades (Hewitt, Wilkenfeld & Gurr, 2008). But people tend to neglect these base rates when trying to estimate the likelihood of future events in a particular place and time. Base rate neglect could be especially problematic for country experts, who are frequently charged with warning, because more than the average person, they focus on case specific factors to the neglect of evidence from the general class of events in question. The direction of bias resulting from base rate neglect will depend on the actual base rate and the case specific evidence.

Anchoring

Anchoring denotes a cognitive process thought to be used in making estimates by which people start with a known or given reference point—an “anchor”—and adjust to the estimated value (Kahneman & Tversky, 1979). This heuristic could affect estimates of probability, but is more likely to influence analysts’ estimates of the size of consequences of a possible future event. In assessing the number of people that will be killed in a civil war, the number of refugees following a coup, the drop in GDP resulting from a war, etc., people tend to use numbers they have observed in connection with these kinds of events as anchors, then adjusting to reflect their assessment of the particular situation. This heuristic is extremely useful in many circumstances,

but can result in systematic biases. First, anchors are “sticky,” meaning analysts tend not to adjust enough from their starting point. This could manifest itself by analysts failing to account fully for situation specific factors that make the likely magnitude of an event distant from that of past cases (e.g., historical ethnic massacres on the order of a few thousands in Rwanda might have served as a biasing anchor on forecasts prior to the 1994 genocide that killed 800,000). Second, irrelevant anchors affect people’s estimates even where they know the anchor is not relevant. This could provide an avenue for manipulation by adversaries or advocates—e.g., even if it lacks any credibility, an official state news service report of the number of people killed in a clash between government and rebel forces could influence an analyst’s independent estimate.

Cognitive biases affecting assessments of the nature of threats

For warning analysis to be useful to policymakers, it must go beyond merely identifying a possible future event as plausible or even likely and threatening. Analytic products should consider the dynamics that are promoting escalation of the threat; the specific actors involved and their capabilities, interests and behaviors; and events in the offing that could trigger deterioration or create a window of opportunity for a more positive outcome. This kind of detailed analysis is also subject to cognitive biases. Specifically, I will consider biases in interpreting ambiguous information, in understanding the dynamics of events, and in attributing behavior to individuals or groups.

Confirmation bias

Psychologists have long observed that people interpret ambiguous information in ways that confirm their starting perceptions and judgments. Festinger (1957) famously described the concept of cognitive dissonance, which theorizes that intrapsychic contradictions (e.g., between two beliefs or between belief and behavior) create psychological tension, which people try to

avoid. This and other cognitive processes generate a “tendency for partisans to accept at face value arguments and evidence congruent with their interests and beliefs, while critically scrutinizing arguments and evidence that threaten those interests and beliefs” (Pronin, Puccio, and Ross, 2002: 637). This tendency is not limited to advocates and is not necessarily self-serving, but rather basic to the way humans process information.

This bias is crucially important in understanding warning-response. Analysts are processing ambiguous information constantly. It would be impossible for them to allow each new datum to call into question accepted premises about a political dispute, a leader’s desires, or a militia’s capabilities. But warning analysts need to be especially attentive to changing dynamics and circumstances, and nascent trends. The confirmation bias challenges one’s ability to see changes at early stages—a *sine qua non* of early warning—or signs that one’s previous conceptions were flawed.

Bias in relating to causal explanations and centralized direction

Cognitive processes also systematically affect the way analysts characterize evolving events, favoring cause-effect relationships and centralized direction. Human’s bias in favor of causal explanations is quite strong: “Events will almost never be perceived intuitively as being random; one can find an apparent pattern in almost any set of data or create a coherent narrative from any set of events” (Heuer, 1999: 130). Analysts commonly translate patterns into stories about one event causing another. But many events in international affairs result in significant part from random, unpredictable events, and thus, overemphasis on causal reasoning will lead to misinterpretation and mistakes.

In addition to the bias toward causal explanations, people tend to assume similarity between causes and effects: e.g., “that economic events have primarily economic causes, that big

events have important consequences, and that little events cannot affect the course of history” (Heuer, 1999: 133). This relates also to the “tendency to see the actions of other governments (or groups of any type) as the intentional result of centralized direction and planning” (Heuer, 1999: 131) rather than the result of horizontal cooperation, coincidence of action by autonomous individuals, or even mere accident. This view is deeply ingrained in political analysis, even in the language analysts use: e.g., Moscow decided to..., the FARC initiated..., the White House directed... (Allison & Zelikow, 1999).

These biases reduce analysts’ sensitivity to the effects of random events, the potential for small changes to have large impacts, and the prevalence of unintended consequences. This may be particularly problematic for early warning. Crises of the sort warning analysts look out for are frequently—perhaps usually—not the result of a causal chain with the major decision of a centralized actor as the first link.

Attribution errors

The most prominent cognitive bias related to attributing behavior is so pervasive that it has been termed the “fundamental attribution error” (Ross, 1977). In short, people attribute other’s actions to dispositional or personal characteristics more than is merited, and to contextual factors less than they should. Moreover, there is a systematic gap in the way individuals attribute their own and others’ behavior: they appreciate their own actions as having been largely explained by external factors, but are quick to attribute others’ actions to dispositional factors. This can be quite problematic for intelligence or political analysts, who are frequently required to assess the intentions of leaders. Empirical evidence, for example, suggests that they are likely to draw too close a connection between an aggressive action and aggressive intentions, underplaying the pressures a leader may be under. This kind of flawed reasoning can lead warning analysts to see

threats where none exist and overlook the potential for changed circumstances to change behavior.

Cognitive biases affecting policymakers' responses

In many ways, policymakers are required to make all of the judgments assigned to warning analysts—i.e., estimation of the magnitude of risk and the nature of the threat. Policymakers' judgments should be informed by warning analysis, but they cannot fundamentally avoid deciding to what extent they should trust the judgments of their advisors and analysts—in the same way that average citizens cannot avoid making their own judgments about the health risks of smoking, despite government and expert warnings and advice. In addition, policymakers are forced to make decisions about what, if any, response any given warning merits. This is a different kind of decision than judging the extent of a threat and therefore may relate to different cognitive processes. Prospect theory's concepts of loss aversion and aversion to certain losses are germane here, conspiring to produce "a willingness to take foolish risks in order to avoid certain losses and refusal to take sensible risks in order to achieve prospective gains" (Prinim, Puccio & Ross, 2002: 639). I also consider biases related to large numbers (extension neglect) and retrospection (hindsight bias).

Loss aversion and aversion to certain losses

One of Kahneman and Tversky's major breakthroughs was demonstrating that people "evaluate outcomes with respect to deviations from a reference point rather than with respect to net asset levels," as expected utility theory predicts (Levy, 1994: 7). Specifically, people tend to place a greater value on losses than they do gains; i.e., "loss aversion"—"people prefer the status quo (or another reference point) over a 50/50 chance for positive and negative alternatives with the same absolute value" (Levy, 1994: 11). In addition, people exhibit a "deep-seated aversion to cutting

our losses,” or more formally, “aversion to certain losses”—i.e., they “prefer to avoid a certain loss in favor of a potential loss, even if they risk losing significantly more” (Kahneman & Renshon, 2007). Together, these biases can lead to expression of contradictory preferences depending on whether an identical scenario is framed in terms of gains or losses. In short, “Prospect theory posits that individuals...give more weight to losses than to comparable gains, and that they are generally risk-averse with respect to gains and risk-acceptant with respect to losses” (Levy, 1994: 7).

The implications can be profound on international political behavior, when results are always uncertain, and a great deal of scholarship has examined the implications for international relations (e.g., Farnham, 1994). In the context of early warning and preventive action, proposals for preventive action could often be perceived as asking a policymaker to accept a small, certain loss now (in the form of resources dedicated to the preventive action) to avoid a large, but uncertain loss in the future (i.e., the event being warned about). Prospect theory and empirical evidence supporting it suggests that this framing works against our natural aversion to certain losses—policymakers are more willing to take the risk that the threatening event may never occur—making preventive action less likely. But once a small investment has been made in a particular place or project, decision makers should be quite reluctant to “cut their losses.” This has implications for the way warnings and proposals for prevention action should be framed to policymakers, to be discussed in the next section.

Extension neglect and “psychic numbing”

Another cognitive bias that affects policymakers’ response to warning is called extension neglect. This refers to the tendency for people to place the same value on an action with little regard for the number of units (e.g., people, animals, lakes, etc.) it will affect, unless specifically

drawn to focus on the numbers (Kahneman, 2002). This phenomenon seems to reflect human beings' facility with small numbers, but limited ability to grasp large ones. For example, a series of experiments tested how much subjects would be willing to pay to save a given number of birds from drowning in oil. Kahneman summarized: "It doesn't matter what the number of birds is. Two thousand birds, two hundred thousand, two million, they will pay exactly the same amount" (Edge.org, 2007).

A closely related problem for early warning of humanitarian catastrophes or any other situation in which large numbers of individuals are concerned is what Paul Slovic (2007) has called "psychic numbing"—"disregard of incremental loss of life against a background of a large tragedy" (8). Slovic marshals evidence from numerous laboratory experiments to argue that human cognitive processing is fundamentally limited in appreciating and responding in a calibrated way to harm affecting large numbers of people. Stories and images of a single individual suffering seem to spur the most robust response. Slovic reports that even coupling the story of an individual in need of assistance with statistics about a larger population of victims significantly *reduces* contributions, compared with the story alone.

These findings suggest that policymakers will have difficulty appreciating the true scope of crises that affect large numbers of people and will fail to dedicate resources in a way that matches the breadth of the problem—both potentially extremely troubling for early warning and response of large-scale humanitarian emergencies, man-made or otherwise.

Hindsight bias

Policymakers' response to any given warning from analysts will be informed heavily by their judgments about the past performance of the analysts and the outcomes of past episodes of

preventive action. In most cases, these assessments will not be based on systematic review of past cases, but on more intuitive judgments. These judgments are influenced by “hindsight bias,” a well established pattern indicating that, in retrospect, people overestimate what they knew at the time (Fischhoff, 1975). Heuers (1999) hypothesizes three manifestations of hindsight bias on intelligence organizations:

- “Analysts normally overestimate the accuracy of their past judgments.
- “Intelligence consumers normally underestimate how much they learned from intelligence reports.
- “Overseers of intelligence production who conduct postmortem analyses of an intelligence failure normally judge that events were more readily foreseeable than was in fact the case” (161).

In the context of early warning and response, it is further problematic that we observe “systematically stronger hindsight effects with occurrences than with non-occurrences (e.g., wars started versus wars averted)” (Fischhoff, 2002: 732). Policymakers in particular will tend to neglect the successful historical case of early warning and prevention, while believing that warning analysts failed to anticipate a foreseeable catastrophe.

Taken together, literature on cognitive biases suggests that warning analysis will tend to overestimate risks and policymakers will tend to resist calls for preventive action, preferring to risk a greater loss in the future rather than accept a certain one now. Unfortunately, hindsight biases tend to impede accurate retrospective understanding of warning-response, further complicating matters. This story, however, is far from definitive, not least because the directionality of some biases (e.g., base rate neglect) is ambiguous.

Discussion

Early warning is fundamentally a dynamic process involving analysts and policymakers. It is important, therefore, to consider how cognitive biases might affect these two types of people differently, and what cognitive processes related to their interaction suggests about how to design an effective system.

First, it is important to note that professional analysts probably do not suffer as much as most people from the cognitive biases identified above. After all, their job is to consider alternatives, question assumptions, seek multiple sources of data, etc. One would hope that the kinds of people drawn to professional analyst positions, not to mention those recruited for such roles, would be highly agile thinkers, yet also aware of their limitations. Jentleson and Bennet (2003) argue that policy planners, a somewhat different class than warning analysts, have “greater potential” to redress cognitive biases because “they may be freed from the pressing daily demands faced by both operational bureaus and top policymakers” (222). This suggests analysts’ judgments probably suffer less than others—including policymakers—from cognitive biases. But the prevalence of systematic biases on warning analysts cannot be assumed away, especially in light of Tetlock’s (2005) compelling results indicating that expert political judgment quite consistently suffers from these problems across a wide range of domains and disciplines.

One reaction to the recognition that analysts’ early warning judgments are subject to systematic biases is to place less emphasis on their judgments and more on the results of quantitative computer models.³ This is an understandable yet unsatisfactory strategy for a number of reasons. First, early warning is less about predicting specific events than describing plausible scenarios. Second, estimation of relative risks is only the first component of early warning. We have little choice but to turn to human experts to assess and describe the nature of

emerging threats. As we have seen, cognitive biases can affect the analyses required for this. Last and most fundamental, early warning is a dynamic process of interaction between analysts and policymakers. Regardless of how risk estimates are generated, these must be evaluated and acted on by a human being who is subject to potential flaws in reasoning and decision making in situations of risk and uncertainty described previously. Therefore, reliance on computer models may be one part of a strategy designed to minimize the effects of cognitive biases on early warning, but is clearly insufficient.

If one accepts that early warning systems are vulnerable to considerable systematic biasing due to cognitive issues, developers of these systems should look for strategies to reduce these vulnerabilities and “debias” specific judgments. Debiasing strategies could focus on: (1) the warning analyst, (2) the policymaker, and/or, (3) the organization and design of warning-response processes and mechanisms. I consider these in turn.

Strategies focused on the warning analyst

The most frequently discussed strategy for minimizing the negative effects of cognitive biases is education and training. To start, analysts could be informed of potential cognitive biases, especially those that are likely to impinge on their judgments of possible future events. But empirical evidence indicates, “Awareness of the bias, by itself, does not produce a more accurate perception. Cognitive biases, therefore, are, exceedingly difficult to overcome: (Heuer, 1999: 112).

More ambitious training courses, according to Fischhoff (2002), “represent complex debiasing interventions, with elements ranging from mere exhortation and warning to attempts to change how individuals approach tasks” (747). One example for the US intelligence community

is Rieber and Thomason's (2005) recommendation to create a "National Institute for Analytic Methods" modeled on the National Institutes of Health. This independent institute would sponsor research and "confront the equally important problems of developing, teaching, and promoting effective analytic methods." The logic for training is unimpeachable: "Training provides feedback that everyday life typically lacks, allowing people to test and refine judgmental skills" (Fichoff, 2002: 731). But more research is required to identify the most effective training methods for counteracting different biases in various populations.

One challenge is that debiasing methods used in training often leverage one cognitive bias in an effort to minimize another. For example, Tetlock (2005) explains, "We might say that scenario exercises check theory-driven biases by activating countervailing imagination-driven biases, the cognitive equivalent of fighting fire with fire" (214). Larrick (2004) refers to this using one bias to offset another "rebiasing." One can hardly imagine being able to employ this approach with great precision, so it seems most useful in situations when the costs of one bias in particular far exceed those of others.

Strategies focused on the policymaker

Kahneman and Tversky's research on the impact of framing on individual preferences might hold promise for strategies focused on the policymaker. The foregoing discussion suggested that loss aversion and aversion to certain losses will tend to inhibit policymakers from taking preventive action. But this assumes that policymakers will view these choices through a frame where preventive action is a certain loss. Warning analysts might be able to frame the same decisions to policymakers in ways that systematically increase their likelihood to choose early action.⁴

Cognitive bias scholarship suggests the following guidance for reframing to promote policy responses to early warnings:

- Try to characterize the decision to take preventive action as something other than a certain loss, perhaps by framing it as an investment or by identifying immediate gains that it will generate;
- Emphasize existing involvement and investments already made in a country or region, so that failure to take further action might be perceived as cutting one's losses;
- Emphasize the possibility of reducing risks toward zero, leveraging the fact that people tend to place greater value on reduction of risk at the low end of the scale (e.g., from 15% to 10% risk) than an equivalent reduction closer to the middle of the scale (e.g., from 45% to 40% risk).

Here again, though, is a strategy that relies on one set of biases to fight others. Framing warnings that strike the right balance between cognitive biases is an inescapable challenge.

Strategies focused on the warning-response system

Despite cognitive biases being about individual information processing, since their effects manifest themselves in and through a system, one approach to managing them is to focus on system design, both in terms of structure and process. In discussing lack of adequate response to genocide, Slovic (2007) argues for a structural approach: “we need to create laws and institutions that will *compel* appropriate action when information about genocide becomes known” (14, emphasis in original). While this might be justified, it is not within the realm of the politically feasible. In addition, this approach is complicated by the need for responses that are carefully

calibrated to the specific dynamics and actors involved in a particular incipient crisis. This means any approach that allows for the necessary calibration of response would fail to meet Slovic's desire to "compel" action and thereby leave room for cognitive biases to rear their head.

Kahneman seems more drawn to process-oriented strategies. In 2003, he expressed, "If I had one wish, it is to see organizations dedicating some effort to study their own decision processes and their own mistakes, and to keep track so as to learn from those mistakes. I think this isn't happening" (Schrage, 2003). In the US intelligence community, this kind of strategy appears to be represented in the creation of the Office of Analytic Integrity and Standards (AIS), which was created in response to legislation in 2004 mandating the Director of National Intelligence to seek best practices and use lessons learned from intelligence analysis. The Intelligence Community Analytic Standards, developed by AIS, appear to provide a framework for more systematic study and monitoring of common analytic errors, including those that result from cognitive biases. It remains too early to assess the impact of this effort, but it is encouraging.

Conclusions

This paper has attempted to apply scholarship on cognitive biases to a basic framework of early warning and response. It has argued that the judgments of warning analysts and policymakers are vulnerable to systematic biases because of limitations or other non-rational regularities of human cognition. Some possible strategies for managing and minimizing cognitive biases in early warning were discussed, as was the inherent difficulty in addressing these kinds of errors.

The final take-away of this discussion is a simple one: "thinking about thinking" is crucial but seriously undervalued in the context of early warning and response. "Considering

cognitive biases may be even more important,” according to Kerbel (2004), “as the context of international politics becomes increasingly complex and non-linear, and thus, more at odds with mental processes that have evolved to handle simpler kinds of analysis.” Daniel Kahneman provides an anecdote illuminating the challenges of promoting serious “thinking about thinking” in government bureaucracies:

I was approached by someone [from CIA] who said, will you come and help us out, we need help to improve our analysis. I said, I will come, but on one condition, and I know it will not be met. The condition is: if you can get a workshop where you get one of the ten top people in the organization to spend an entire day, I will come. If you can't, I won't. I never heard from them again. What you can do is have them organize a conference where some really important people will come for three-quarters of an hour and give a talk about how important it is to improve the analysis. But when it comes to, are you willing to invest time in doing this, the seriousness just vanishes. That's been my experience, and I'm puzzled by it. (Edge.org, 2007)

Beyond senior managers being constantly overscheduled, perhaps the CIA's lack of response to Kahneman partly reflects the extremely difficult challenges involved in promoting more effective thinking about threats that have yet to fully emerge in complex environments. The wealth of scholarly research on cognitive biases has made it hard to deny the influence cognitive biases can have on the most consequential decisions. What is needed now is a comparably productive and trenchant program of research on strategies for minimizing and counteracting the effects of cognitive biases in applications such as early warning and response.

¹ “Interests” is used broadly to include any perceived national interests by governments, institutional interests by a particular organization or bureaucracy, as well as humanitarian interests.

² Whereas analysts typically focus on assessing the most likely future scenario, warning requires a focus on less likely, but still seriously worrisome outcomes. Nevertheless, warning analysts must do more than identify future events or scenarios that are *possible*.

³ This move toward automation seems to be exemplified by DARPA's new program to create an Integrated Crisis Early Warning System (ICEWS).

⁴ The “Asian Disease Problem” described by Kahneman and Tversky is a brilliant example of how a substantial majority of people choose inaction when a problem is framed in terms of gains, and a substantial majority choose action when the identical problem is framed in terms of losses.

Figure 1

List of cognitive biases with direct relevance to early warning

Affecting judgments of risk:

- The availability heuristic and associated biases
- Base rate neglect
- Anchoring

Affecting assessments of the nature of threats:

- Confirmation bias
- Bias relating to causal explanations and centralized direction
- Attribution errors

Affecting policymakers' responses:

- Loss aversion and aversion to certain losses
- Extension neglect and "psychic numbing"
- Hindsight bias

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