

Memory Overriding Statistics: The Behavioral Shaping Effect of the Availability Heuristic in Crises

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Abstract. This article explores how availability heuristics can lead people to rely on memory and emotions while neglecting statistical reasoning in crisis situations, thereby generating systematic biases. The article centers on two cases: the shift of American people to driving after the September 11 attacks in 2001, and the public's hesitation about vaccines during the COVID-19 pandemic. The results show that both cases reflect the public's overestimation of rare risks and underestimation of common risks, but there are differences in behavioral manifestations and time dimensions - the former is manifested as short-term substitution behavior, while the latter is manifested as long-term hesitation. Research shows that the media amplification effect and emotional response are also key factors driving this deviation. At the end of this article, policy implications are put forward: Crisis communication should not only rely on data, but also convey information in an intuitive, vivid and easy-to-remember way, while enhancing public trust to reduce the social costs caused by cognitive biases.

Keywords: availability heuristic, crisis behavior, risk perception, media amplification, vaccine hesitancy

1. Introduction

In crisis situations, people tend to make judgments based on intuition and vivid memory rather than scientific statistical results. This phenomenon is called "Availability Heuristic" in behavioral economics and was first proposed by Tversky and Kahneman [1]. It is that as people factor the probability of a situation happening, they prefer easy-to-remember cases, rather than relying on quantitative information that is drawn from real events. Availability heuristics that humans use to make quick decisions in daily life can lead us to bias in cases involving major risks and crises, which can ultimately cause harm. Previous research has revealed that if people encounter a crisis or emergency, they do not try to compute its likelihood, but rather are likely to be influenced by those vivid, fearful images lying in their memory. Slovic [2] pointed out that people are particularly sensitive to that kind of "terrifying risk", and this sensitivity is often not related to the actual occurrence rate of the risk, but rather to the rarity and impact of the event itself. That is to say, an event that occurs rarely but leaves a deep impression is more likely to influence people's judgment than those that occur frequently and are taken for granted. This phenomenon is particularly

prominent in times of crisis, as unexpected events are always accompanied by intense emotions such as fear and shock, making it easier for people to magnify their danger.

The media plays a significant role here. Lichtenstein et al. [3] found that if the news constantly reports on certain rare events, people will subconsciously think that the possibility of their occurrence is very high. Especially in times of crisis, in order to attract attention, the media often highlight the most terrifying and shocking details. The result is that the public is easily swayed by these images, overestimating the low-probability risks and paying less attention to the more common and truly more dangerous problems.

However, most of the existing studies are case analyses in a single field, such as nuclear energy accidents or food safety incidents [4,5], and the comparisons among different crisis scenarios are not sufficient. Especially since the 21st century, the global society has experienced major crises of various natures, ranging from terrorist attacks to public health challenges, all of which have provided us with new entry points for studying availability heuristics.

There are two key factors in choosing these two crises for discussion. Firstly, both the 9/11 terrorist attacks and the COVID-19 pandemic have had a profound impact on the global community, and there is a wealth of empirical data and extensive interdisciplinary research to support them, laying a solid foundation for comparative analysis. Secondly, the performance of the availability heuristic in these two crises was different. The 9/11 terrorist attacks triggered short-term behavioral substitution, while the COVID-19 pandemic led to long-term vaccine hesitancy. These markedly different behavioral outcomes make the underlying psychological mechanisms more clearly visible and have higher analytical value.

Based on this, this article will focus on two typical cases of different natures: the choice of transportation mode after the 9/11 terrorist attacks in 2001, and the hesitation about vaccines during the COVID-19 pandemic. By analyzing and comparing these two cases, this article will reveal the common mechanisms and differential paths of availability heuristics in crisis situations, and explore the implications of such deviations for individual behavior, public policies, and social governance.

2. Fear-driven substitution - traffic choice bias after 9/11

The September 11 terrorist attacks in 2001 were one of the most impactful events of the 21st century. As television and newspapers focused on the incident, the constantly broadcast shocking images of planes crashing into buildings were deeply imprinted in the public's mind. As a result, even though scientific statistics show that the safety factor of air travel is much higher than that of other modes of transportation, many people still have the impression that "the risk of flying is extremely high". This is precisely where the availability heuristic comes into play: when an event is extremely vivid in memory, people tend to overestimate its likelihood of occurrence [1].

Under the influence of this fear, many American residents have developed flight panic and are reluctant to take planes, thus choosing what seems to be a more "controllable" flight. The problem is that passenger air accidents are extremely rare, while road traffic accidents occur more frequently. Research has found that from September to December 2001, the number of road traffic deaths in the United States rose significantly, increasing by approximately over three hundred each month compared to the same period in previous years. When calculated cumulatively, the additional death toll due to the shift to road travel in just these few months could exceed two thousand [6]. That is to say, in order to avoid the low risk of flying, the public actually exposes themselves to a higher probability of road risks.

The reason behind this behavior is not that people deliberately pursue danger, but that the vivid memory of the impact scene makes it impossible for them to overcome the panic brought by the

disaster. Gigerenzer [7] pointed out that fear-driven travel choices have led to the "dread risk effect": people do not act merely based on rational probabilities, but are dominated by the fear brought about by terrorist events. It can be said that the fleeting impact scene on that day is more convincing than countless statistical data.

This case shows that when memory and emotions override rational judgment, individuals are prone to fall into the bias of risk assessment. On the surface, choosing to drive seems like a "safer" intuition, but in reality, this choice brings about consequences more serious than the original risks. This offers important implications for policymakers and the media that convey public information: in a crisis, relying solely on scientific statistics is not enough to pacify the public. Effective risk communication is necessary to enable people to understand which risks truly need attention [2].

3. Amplification of rare risks - COVID-19 vaccine hesitancy

During the COVID-19 pandemic, many people developed a fear of getting vaccinated. Some knew that vaccines could effectively combat the virus, but they still worried about various "heard but not actually happening" side effects. This is the work of the availability heuristic: When something is often brought up and terrifying, people instinctively think it happens a lot, even if it is very rare in reality [8].

For instance, some parents, upon seeing reports of a small number of children experiencing severe side effects after vaccination, began to doubt the safety of the vaccine for children, fearing that their own children would also suffer from such side effects after vaccination, even though the vast majority of those who received the vaccine, including the elderly and children, had no problems. Research indicates that such cases that are "easily recalled" in memory are more influential in judgment than piling up a large amount of statistical data [8]. In other words, a vivid report of side effects may be more influential than a thousand "safe and sound" conclusions.

Social media has further magnified this phenomenon. Studies show that negative and misleading content about vaccine safety on social media platforms, such as that vaccines can cause autism, allergies or affect children's development, is often more easily spread than positive information. Under this kind of "information bombardment", many people have developed a wrong perception: they perceive that vaccines have a high risk, although scientific research has proved that the risk is extremely low [9,10]. The stronger the impact of this kind of transmission, the more hesitant the public will be about vaccination, even if the statistics show that the vaccine is safe.

Similarly, behavioral economics research has also found that people with intuitive thinking are more likely to be deceived by such reports. Compared with those who repeatedly think about the data, they are more likely to choose to hesitate or refuse vaccination [11]. This indicates that when "quick response" prevails, risks are overly exaggerated and people overlook the true protective effect of vaccines.

Meanwhile, multiple global surveys have shown that vaccine hesitancy is closely related to the lack of trust in vaccine safety and efficacy [12]. In some countries, the public has a relatively low level of trust in the government and scientific institutions, which makes them more likely to remain at the level of "heard stories" rather than "real science". For instance, the vaccine hesitation rate in France was particularly high in the early stage of the epidemic. Larson et al. [12] pointed out that the French public has a relatively low level of trust in the government, and at the same time, the media and social platforms have magnified reports on vaccine side effects, which led to France once becoming one of the countries with the lowest vaccine acceptance in Europe.

In conclusion, this case reveals the powerful role of availability heuristics in public health crises - people are more likely to trust the impressive negative stories promoted by the media, even if they

are in the minority. From the perspective of public policy and communication strategies, relying solely on "data to speak" is not sufficient to build trust and correct misunderstandings. It is necessary to shape people's correct concepts by making reliable information the "easily recalled" part of memory, such as using real but common safety cases, medical expert accounts, and interactive popular science [10].

4. Common mechanisms and differential paths

By comparing the transportation choices after the September 11 terrorist attacks with the hesitation regarding the COVID-19 vaccine, it can be found that although the two occurred in different contexts, they both reflect the common mechanism of the availability heuristic. The core similarity between the two cases is that rare risks are placed in the public's memory, leading to the neglect of common risks that should be given more attention. In the "9/11" case, the public turned a blind eye out of fear of plane crashes, ignoring the fact that road traffic accidents were more common and fatal [6,7]. During the COVID-19 pandemic, people postponed or refused vaccination due to concerns about a few side effects, underestimating the high probability risk of virus infection and transmission to others [8,10]. In both of these cases, rational data analysis was replaced by memory and emotion, leading to people's behaviors running counter to the public interest.

This deviation is driven by two common factors. First is the amplification effect of the media: Whether it is the repeatedly broadcast images of plane crashes or the promotion of vaccine side effects on social media platforms, rare risks have been magnified in the public's mind [3,9]. Secondly, there is the role of emotions: fear and uncertainty weaken people's sensitivity to statistical data, making them more dependent on intuition to make decisions [2].

The differences between the two are also very obvious. In terms of behavior, behind the 9/11 incident was active substitution - people voluntarily gave up flying and turned to driving. In the case of COVID-19, it is negative hesitation - delaying or refusing to get vaccinated, which leads to a delay in herd immunity. In terms of the time dimension, fear of flying is short-term and will gradually subside over time. However, vaccine hesitation is more persistent and is influenced by long-term factors such as political stance and social trust [12].

Overall, this indicates that availability heuristics can both trigger short-term impulsive behaviors and lead to long-term delayed choices.

5. Conclusion

Through the analysis of transportation choices and hesitation regarding the COVID-19 vaccine after the September 11 terrorist attacks, it is clear that the availability heuristic has had a significant impact on public behavior in crisis situations. Whether that leads people to alternative more hazardous travel methods due to fear, or delays vaccination due to concerns over rare side effects, the mechanism is identical: rare, but vivid events will be highlighted in people's memory and scientific statistical probabilities will be ignored.

From the perspective of policy-making, how to reduce the negative effects brought about by availability heuristics is an important challenge. First of all, in crisis communication, the government and public institutions should not merely rely on cold, hard data, but rather convey scientific information in a more intuitive, understandable and memorable way. For instance, by using visual charts and story-telling narratives, the public can remember "the safety of vaccination" just as they remember "the scene of a plane crash". Secondly, attention must be paid to the

establishment of trust. Transparent information disclosure, direct dialogue between experts and the public, as well as the fight against false information, are all indispensable means.

For individuals, recognizing the existence of availability heuristics is an important first step in resisting the biases it brings. The public needs to learn to question the risks in their intuition and consciously refer to scientific statistics to calibrate their judgments. Educational and public communication media should publicize the universality of this cognitive bias and help people realize that memory and emotions often mislead decision-making.

In conclusion, in times of crisis, memory and emotions often override rational data statistics, leading individuals and society to make behaviors that deviate from the best choices. The influence of availability heuristics is significant, but adjustable. By improving risk communication methods, enhancing public trust and raising awareness, society can reduce the costs brought about by such deviations. Future research should further explore whether the role of availability heuristics in crisis behavior varies in different cultural and institutional environments, in order to help countries formulate public policies that are more in line with their local realities.

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