

# Out of the Frying Pan into the Fire: Behavioral Reactions to Terrorist Attacks

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A low-probability, high-damage event in which many people are killed at one point of time is called a *dread risk*. Dread risks can cause direct damage and, in addition, indirect damage mediated through the minds of citizens. I analyze the behavioral reactions of Americans to the terrorist attacks on September 11, 2001, and provide evidence for the dread hypothesis: (i) Americans reduced their air travel after the attack; (ii) for a period of one year following the attacks, interstate highway travel increased, suggesting that a proportion of those who did not fly instead drove to their destination; and (iii) for the same period, in each month the number of fatal highway crashes exceeded the base line of the previous years. An estimated 1,500 Americans died on the road in the attempt to avoid the fate of the passengers who were killed in the four fatal flights.

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**KEY WORDS:** Dread risk; fear of flying; public reactions to terrorist attacks; September 11; traffic accidents

## 1. INTRODUCTION

The 9/11 Commission's report unfolded the chronology of the terrorist attacks on September 11, 2001, which cost the lives of some 3,000 people and billions of dollars in property damage.<sup>(1)</sup> It focused on how al-Qaeda terrorism evolved, the possible failures of intelligence agencies to detect and avoid the attack, and potential diplomatic, legal, and technological measures to prevent future attacks. The report concerned the origins and prevention of what I refer to as *direct damage*, that is, the immediate consequences of terrorist action. In this article, I deal with a second source of harm caused by terrorist action, which I refer to as *indirect damage*. Indirect damage is not under the control of terrorists; it is mediated through the minds of citizens. In the case of September 11, known indirect damages include the financial damages in the aviation industry fueled by many peo-

ple's anxiety about flying, the job loss in the tourism industry, as well as peculiar consequences such as the increase in criminal suspects being involuntarily examined for psychiatric hospitalization.<sup>(2,3)</sup> Note that these misfortunes are not a necessary consequence of terrorist action; they are of psychological origin, and could in principle be prevented, once individuals and institutions realize that terrorists target minds as well as bodies.

## 2. DREAD RISKS

Low-probability, high-damage events in which many people are killed at one point in time are called *dread risks*. As opposed to situations in which a similar number of people or more are killed over a longer period of time, people tend to react to dread risks with avoidance behavior.<sup>(4)</sup> The crash of the four planes in the terrorist attack on September 11 exemplifies such a catastrophic event. In contrast, the estimated 44,000 to 98,000 people who die every year in U.S. hospitals because of documented and preventable medical errors do not constitute a dread risk.<sup>(5)</sup> Even after

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learning about the dangers, few people would avoid hospitals. One potential evolutionary account of this specialized avoidance behavior is in terms of preparedness, that is, human minds are prepared to learn the association between dread risk and avoidance behavior in one trial. The suggested reason is that for our evolutionary ancestors, living in small bands of hunter-gatherers, the loss of many members at one point of time could have brought the group beyond a critical threshold that threatened their survival.<sup>(6)</sup> A further account is the lack of proper information about risks among the general public of many Western societies. For instance, few people are aware that the probability of losing one's life is about the same for driving 12 miles by car as for a nonstop flight, say, from Boston to Los Angeles.<sup>(7)</sup> That is, if one arrives safely by car at the airport, the most dangerous part of the trip may be over. A third account is in terms of control: people fear terrorist attacks because they have no control, whereas people believe to be in control while driving. While there is some truth in each of these accounts, none by itself seems to be sufficient (for instance, although the driver has some control, the person sitting next to the driver has little control, yet he or she typically also feels little fear). My point here is not to provide an explanation for the tendency to avoid dread risks, but rather to draw attention to avoidance behavior as a potential cause for the indirect damages of terrorism, mediated through our minds.

### **3. AVOIDANCE BEHAVIOR AFTER SEPTEMBER 11**

In this article, I investigate a possible mediated death toll of the attack on September 11. This possibility has gone virtually unnoticed, although it was hypothesized shortly after the attack.<sup>(8)</sup> In earlier research, I collected preliminary data limited to three months after the attack;<sup>(9)</sup> here, I provide a comprehensive analysis of the 18 months after the attack. My hypothesis is as follows: if (i) Americans reduced their air travel after the attack, and (ii) a proportion of those who did not fly instead drove to their destination, then (iii) a number of Americans died on the road in the attempt to avoid the fate of the passengers who were killed in the four fatal flights. I call this the *dread hypothesis* for short. Is there evidence for such a mediated toll of lives?

The first part of the dread hypothesis—the reduction in air travel following the attacks—is well documented. Millions of Americans reduced their air

travel, which left airlines and travel agencies flying into the red. For instance, the national revenue passenger miles decreased by 20%, 17%, and 12%, in October, November, and December 2001, respectively, compared with the same months in 2000.<sup>(10)</sup> Data for the second part of the dread hypothesis, in contrast, are difficult to obtain because there is no record of how many people decided not to fly and took their car instead. Indirect evidence can be obtained from the Office of Highway Policy Information, which reports the number of vehicle miles driven before and after the attack. To establish whether there was an increase in driving, three conditions must be met. First, there must be a sudden increase in the individual monthly miles traveled in the months following the attack compared to the monthly miles of the previous year. Second, this increase must not be observed in the months before the attack, and finally, the increase must fade away at some point, when the pictures of the attack fade out of people's minds.

In the eight months before the attack (January to August 2001), the individual monthly vehicle miles traveled in 2001 (all systems) were on average 0.9% higher than in 2000—which is normal given that miles traveled increase from year to year in the United States. Immediately after the attack and in the 12 months following, the miles traveled increased substantially. In the three months after the attack (October to December 2001), the increase tripled to 2.8%. In the first three months of 2002, the increase was 3.1%, and then 2.9% in the subsequent six months (April to September 2002), compared to the previous year. Thereafter, in the next six months (October 2002 to March 2003), this figure declined to 0.5%; that is, the increase in road traffic after September 11 diminished after one year.

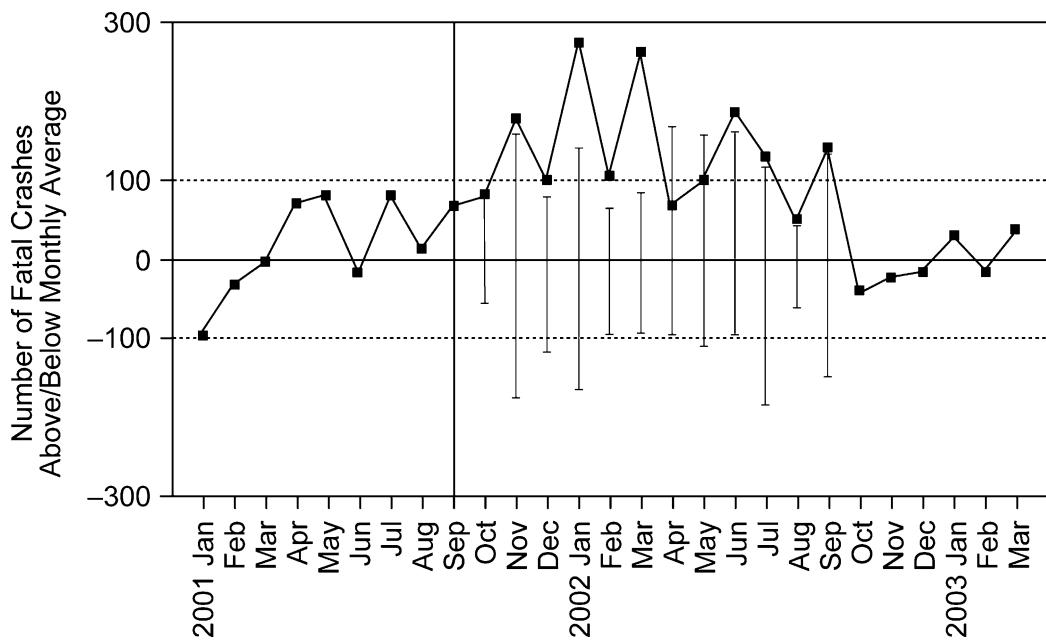
The hypothesis that more people chose to drive rather than fly after the attack has another testable implication. The increase in miles driven should be most pronounced on the rural interstate highways, where much of long-distance driving occurs, rather than in urban areas. Specifically, before the attack, the increase on the rural interstate highways should be similar to the 0.9% increase on all road systems, but thereafter rise above it. Consistent with this hypothesis, the increase in the eight months before the attack was similar to that for all traffic systems, 1%. In the three months following the attack, the vehicle miles increased by 5.2%. In the first three months of 2002, the increase (compared to the previous year) was 3.7%, and in the following six months, 2.2%. One year after the attack, the increase of miles driven on

rural interstate highways stopped and even reversed to a slight decrease of an average of  $-0.2\%$  in the six months following (October 2002 to March 2003). Thus, vehicle miles increased after September 11, most strongly on rural interstate highways, for a period of about 12 months.

Did this change in travel behavior go hand in hand with a surplus in fatal road accidents? To test the third part of the dread hypothesis, I compare the fatal road accidents after September 11 with two baselines: first, with the average number of fatal road accidents in the five years preceding the attack (1996–2000, the zero line in Fig. 1), and second, with the number of fatal crashes in 2001 before the attack. The first baseline is meaningful because the number of fatal traffic accidents had been very stable over those five years. The total monthly number of fatal traffic accidents varied between about 2,500 in February and 3,500 in August, while the maximum deviation from these figures during the five years was, averaged across all months, only about 115 accidents, which amounts to 3–4% of the monthly average. The second baseline, January

through August 2001, shows that in the months before the attack, the number of fatal accidents consistently followed the pattern of the preceding five years. On average, there were only nine (!) additional fatalities per month (out of some 2,500 to 3,500 each month), and the number of fatal accidents always remained within the minimum and maximum values of the five previous years.

This regularity broke down in the months following September 2001 (Fig. 1). For a period of 12 months, October 2001 to September 2002, the number of fatal accidents exceeded the five-year baseline every month, as well as the baseline adjusted by the average increase of nine fatal crashes in pre-September 2001. In the majority of months, the surplus exceeds the maximum value of the preceding five years, as shown by the bars in Fig. 1. This is exactly the same period in which the passenger miles showed a marked increase. The surplus death toll was highest in January and March of 2002. After one year, fatal crashes returned to the baseline before the attack, at the same point in time when the road traffic returned to normal



**Fig. 1.** The number of fatal traffic accidents in the United States increased after the terrorist attacks on September 11, 2001, for a period of 12 months. Numbers are expressed as deviations from the five-year base line 1996–2000 (the zero line). The error bars (shown for the 12 months following the terrorist attacks) specify the maximum and the minimum numbers for each month of the base line. Before September 11, the average of the monthly numbers of fatal traffic accidents for 2001 was close to the zero line, and the monthly values were always within the maximum and minimum of the previous five years. Yet in the 12 months following the terrorist attacks (October 2001 to September 2002), the number of fatal traffic accidents every month was higher than the zero line, and in most cases exceeded the maximum of the previous years. Data are taken from the U.S. Department of Transportation, Federal Highway Administration: <http://www-fars.nhtsa.dot.gov/FinalReport.cfm?stateid=0&title=crashes&title2=time&year=2002>; <http://www-fars.nhtsa.dot.gov/finalReport.cfm?stateid=0&year=2003&title=Crashes&title2=Time>.

(see above). This consistent pattern after the attacks provides support to the hypothesis that the terrorist attacks caused a mediated secondary death toll.

How many fatalities resulted from people's decrease in flying and increase in driving? To estimate this number, I will use the five-year baseline as the comparison standard, corrected by the average increase of nine fatalities per month. For the 12 months following the attack, one obtains a surplus of 317 fatal crashes for October through December 2001, and of an additional 1,188 for January through September 2002, which totals 1,505 fatal crashes. Given that the ratio between fatalities and fatal traffic accidents in 2001 and 2002 was consistently 1.06, the total estimated number of Americans who lost their lives on the road by trying to avoid the risk of flying is 1,595. I want to emphasize that this number is an estimate, since a nonexperimental study cannot control for all alternative explanations. This estimate is six times higher than the total number of passengers (256) who died in the four fatal flights.

#### 4. THE MADRID ATTACKS

Does the dread hypothesis generalize to other cultures? On March 11, 2004, exactly two and a half years after 9/11, the bombings of four commuter trains during the Madrid rush hour killed about 200 people and wounded 1,460. The evolutionary preparedness hypothesis would predict that Spaniards would then avoid riding trains. And indeed, Spaniards reduced their train travel after the bombing, although the effect was smaller and shorter (only two months) than the American reaction after September 11.<sup>(11)</sup> But there are two other parts to the dread hypothesis. The second, an increase in highway traffic, did not happen in Spain; in fact, there was a decrease. As a consequence, the fatal highway accidents also decreased rather than increased, and no secondary loss of lives mediated through Spaniards' minds was observed. Like Americans, the Spaniards avoided the dread risk, but unlike Americans, they did not take the next step and jump into their cars. Why is that? One possible factor is that there is less of a car culture in Spain than in the United States. A second is the availability of a better developed public transport system that allowed Spaniards to resume train travel quickly. A final possible reason is that Spain has been exposed to decades of terror attacks, so that one terror attack provides less of a dread risk and more of a calculated risk instead.

#### 5. COUNTERTERRORISM SHOULD ADDRESS REDUCTION OF MEDIATED DAMAGES

How to react to the emerging global terrorism? As a response, the 9/11 Report demands "the use of all elements of national power: diplomacy, intelligence, covert action, law enforcement, economic policy, foreign aid, public diplomacy, and homeland defense." (1, pp. ci–cii). A national counterterrorism center should coordinate these means and strive for defeating terrorism anywhere in the world. The present analysis indicates that there is a second goal, to defeat the effects of terrorism acting through our minds. Terrorist attacks are hard to prevent, even with costly diplomatic and military strategies and controversial surveillance systems. It would be comparatively easier and less expensive to invest at least part of the efforts in reducing the mediated death toll. The first measure to achieve this goal is to make the issue an issue. The psychological aspect has not yet entered public policy awareness to the same degree that the technological side of fighting terrorism has. Yet there are a number of measures that can be taken and tested, from making people aware of the fact that terrorists can strike a second time through their minds, to disseminating relevant information to the public, such as that a dozen miles of driving result in the same risk of dying as one nonstop flight. Factual information will not change everyone's behavior, but by knowing the facts, people can understand their immediate emotional reactions and better control them. Such an extended counterterrorism policy can save lives. Otherwise, history may repeat itself after the next attack, if another should happen.

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