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Terrorism and counterterrorism in the US: the question of responsible policy-making

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Officials serving the public are tasked at the most fundamental level to spend funds in a manner that most effectively and efficiently keeps people safe. To do otherwise is irresponsible and, because human lives are at stake, immoral. In the case of counterterrorism policy-making, it is important to evaluate the degree to which any gains in security afforded by counterterrorism measures have been great enough to justify their cost. Risk analysis is an aid to responsible decision-making that does exactly that. We deal with four issues central to this approach, applying them to the hazard presented by terrorism: the cost per saved life, acceptable risk, cost–benefit analysis, and risk communication. We also assess the degree to which risk analysis has been coherently applied to counterterrorism efforts in the US in making or evaluating decisions that have cost taxpayers many hundreds of billions of dollars over the past dozen years.

Keywords: counterterrorism; terrorism; cost–benefit analysis; risk analysis; decision-making

Introduction

As declared in the first sentence of the American constitution and throughout the work of Thomas Hobbes, especially *Leviathan*, a key reason for founding governments is to 'ensure domestic Tranquility'. Accordingly officials serving the public are tasked at the most fundamental level to spend funds in a manner that most effectively and efficiently keeps people safe. Doing so is neither easy nor precise, and the funds available for this purpose are, of course, limited. Moreover, there are inevitably distortions stemming from public and personal emotion and from political pressures. But to the degree possible the task should be carried out systematically and professionally. To do otherwise is irresponsible, a profound betrayal of the public trust and, because human lives are at stake, immoral.

Terrorism is a hazard to human life, and it should be dealt with in a manner similar to that applied to other hazards – albeit with an appreciation for the fact that terrorism often evokes extraordinary fear and anxiety. While allowing emotion to overwhelm sensible analysis is both understandable and common among ordinary people, it is not appropriate for officials charged with – responsible for – keeping them safe. If such officials are

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incapable of carrying out their jobs in a manner that provides the most public safety for the money expended, they should frankly admit they are being irresponsible by elevating public satisfaction with their performance over public safety – or they should resign from their posts. People who join the army or become fire-fighters accept the possibility that at some point they may be put in a position in which they are shot at or required to enter a burning building. People who become decision-makers should in equal measure acknowledge that, in order to carry out their job properly and responsibly, they may be required on occasion to make some difficult, unpopular and even career-threatening decisions.

Risk analysis is an aid to responsible decision-making that has been developed, codified and applied over the past few decades – or in some respects centuries.[1] In this article we deal with four issues central to this approach and apply them to the hazard presented by terrorism: the cost per saved life, acceptable risk, cost–benefit analysis and risk communication. We conclude with an assessment of the degree to which risk analysis has been coherently applied to counterterrorism efforts by government – particularly by the US government – in making or evaluating decisions that have cost taxpayers hundreds of billions of dollars over the past dozen years.

Cost per saved life

When regulators propose a new rule or regulation to enhance safety, they are routinely required to estimate how much it will cost under their proposal to save a single life. Table 1 supplies information about how this calculation comes out for dozens of government rules and regulations in the US.

The results are anything but tidy, and they often reflect psychological and political aspects of risk perception or electoral and lobbyist pressure. However, some general tendencies and limits have been established over time. Thus, looking over such data, Elizabeth Paté-Cornell suggests that a ceiling of $3 million per life saved, inflation adjusted to 2010 dollars, seems roughly appropriate in current practice, although there are several entries in Table 1 that are substantially, even spectacularly, higher.[2] But, in general, regulators and administrators begin to become unwilling to spend more than $1 million to save a life, and they are extremely reluctant to spend over $10 million, preferring instead to expend funds on alternative measures that save lives at a lower cost.

This approach can be, and has been, expanded to embrace deaths by terrorism. Following the widely applied approach a study for the US government's Department of Homeland Security by Lisa Robinson and her colleagues concludes that the best estimate of a value of a saved human life for homeland security analysis would be about $7 million in 2013 dollars.[3] Most studies focus on relatively common risks, such as workplace or motor vehicle accidents, and the Robinson study goes on to suggest that 'more involuntary, uncontrollable, and dread risks may be assigned a value that is perhaps twice that of more familiar risks', or some $14 million. This approach essentially adds into the analysis of much of the substantial indirect and ancillary costs, including emotional ones, associated with a terrorist event.

The US spends about $100 billion per year on seeking to deter, disrupt or protect against domestic counterterrorism. If each saved life is valued at $14 million, it would be necessary for the counterterrorism measures to prevent or protect against between 6000 and 7000 terrorism deaths in the county each year or twice that if the lower figure of $7 million for a saved life is applied.

These figures seem very high. The total number of people killed by Islamist extremist terrorists within the US since 9/11 is 19, or fewer than two per year, a far cry, of course, from

Table 1. Regulatory expenditure per life saved

Regulation	Year	Agency	Cost per life saved in 2010 dollars
Steering column protection standards	1967	NHTSA	140,000
Unvented space heater ban	1980	CPSC	140,000
Seatbelt/air bag	1984	NHTSA	140,000
Aircraft cabin fire protection standard	1985	FAA	140,000
Underground construction standards	1989	OSHA	140,000
Auto fuel system integrity	1975	NHTSA	710,000
Trihalomethane in drinking water	1979	EPA	850,000
Aircraft seat cushion flammability	1984	FAA	850,000
Alcohol and drug controls	1985	FRA	850,000
Aircraft floor emergency lighting	1984	FAA	990,000
Concrete and masonry construction	1988	OSHA	990,000
Passive restraints for trucks and buses	1989	NHTSA	1,100,000
Children's sleepwear flammability ban	1973	CPSC	1,400,000
Auto side impact standards	1990	NHTSA	1,400,000
Metal mine electrical equipment standards	1970	MSHA	2,400,000
Trenching and evacuation standards	1989	OSHA	2,600,000
Hazard communication standard	1983	OSHA	2,700,000
Trucks, buses and MPV side-impact	1989	NHTSA	3,700,000
Grain dust explosion prevention	1987	OSHA	4,700,000
Rear lap/shoulder belts for autos	1989	NHTSA	5,400,000
Standards for radionuclides in uranium mines	1984	EPA	5,800,000
Ethylene dibromide in drinking water	1991	EPA	9,700,000
Asbestos occupational exposure limit	1972	OSHA	14,000,000
Benzene occupational exposure limit	1987	OSHA	15,000,000
Electrical equipment in coal mines	1970	MSHA	15,800,000
Arsenic emission standards for glass plants	1986	EPA	22,900,000
Cover/move uranium mill tailings	1983	EPA	76,100,000
Acrylonitrate occupational exposure limit	1978	OSHA	87,000,000
Coke ovens occupational exposure limit	1976	OSHA	107,400,000
Arsenic occupational exposure limit	1978	OSHA	180,800,000
Asbestos ban	1989	EPA	187,200,000
1,2-Dechloropropane in drinking water	1991	EPA	1,103,900,000
Hazardous waste land disposal ban	1988	EPA	7,084,000,000
Municipal solid waste landfills	1988	EPA	32,300,000,000
Formaldehyde occupational exposure limit	1987	OSHA	145,723,000,000
Atrazine/alachlor in drinking water	1991	EPA	155,640,000,000
Hazardous waste listing for wood-preserving chemicals	1990	EPA	9,635,870,000,000

Source: Adapted by Mark Stewart from W. Kip Viscusi, 'The Value of Life in Legal Contexts: Survey and Critique', *American Law and Economics Review* 2, no. 1 (2000): 195–222.

6000 to 7000 per year.[4] A defender of the expenditure on terrorism might argue that the number is that low primarily because of the counterterrorism efforts. Others might be more sceptical.

Acceptable risk

Another way to approach the issue is to compare the annual fatality rates caused by terrorism with those caused by other hazards. Table 2 provides relevant information. It leads to a consideration of the central analytic issue of acceptable risk. Is the likelihood of being killed

Table 2. Comparison of annual fatality risks

Hazard	Territory	Period	Total fatalities for the period	Annual fatality risk
World War II	Worldwide	1939–45	61,000,000	1 in 221
Cancers	US	2009	560,000	1 in 540
War (civilians)	Iraq	2003–08	113,616	1 in 1150
All accidents	US	2007	119,000	1 in 2500
Traffic accidents	US	2008	37,261	1 in 8200
Traffic accidents	Canada	2008	2431	1 in 13,500
Traffic accidents	Australia	2008	1466	1 in 15,000
Homicide	US	2006	14,180	1 in 22,000
Traffic accidents	UK	2008	2538	1 in 23,000
Terrorism	**Northern Ireland**	**1970–2012**	**1758**	**1 in 49,000**
Industrial accidents	US	2007	5657	1 in 53,000
Homicide	Canada	2008	611	1 in 55,000
Intifada	**Israel**	**2000–06**	**553**	**1 in 72,000**
Homicide	UK	2008	887	1 in 67,000
Homicide	Australia	2008	290	1 in 76,000
Terrorism	**US**	**2001**	**2982**	**1 in 101,000**
Natural disasters	US	1999–2008	6294	1 in 480,000
Drowning in bathtub	US	2003	320	1 in 950,000
Terrorism	**UK**	**1970–2012**	**2196**	**1 in 1,200,000**
Home appliances	US	yearly average	200	1 in 1,500,000
Deer accidents	US	2006	150	1 in 2,000,000
Commercial aviation	US	yearly average	130	1 in 2,300,000
Terrorism	**US**	**1970–2012**	**3309**	**1 in 4,000,000**
Terrorism	**Canada**	**1970–2012**	**336**	**1 in 4,300,000**
Terrorism	**UK**	**1970–2012**	**434**	**1 in 5,900,000**
Peanut allergies	US	yearly average	50–100	1 in 6,000,000
Lightning	US	1999–2008	424	1 in 7,000,000
Terrorism	**Australia incl. Bali**	**1970–2012**	**117**	**1 in 8,000,000**
Transnational terrorism	**World outside war zones**	**1975–2003**	**13,971**	**1 in 12,500,000**

Source: Terrorism fatalities sourced from the Global Terrorism Database developed by the US National Consortium for the Study of Terrorism and Responses to Terrorism (START). It contains country-by-country information for more than 80,000 terrorist incidents that have taken place throughout the world between 1970 and 2012. See http://www.start.umd.edu/gtd/.

by the hazard unacceptably high, or is it low enough to be acceptable? That is, just how safe is safe enough?

We often say that there is nothing more important than the value of human life. Yet, obviously, we don't really believe this. For example, Americans are clearly willing to sacrifice tens of thousands of lives per year to have the car, even though it is quite possible to move people without killing them: passengers killed on railways in a year can often be numbered on the fingers of one hand. Many other social policies involve the same sort of consideration. To take an extreme example, every year a few thousand people in the US die in falls from buildings that are more than one storey high. Those lives could be saved by closing off all buildings at the ground floor. To reject such a policy is to say tall buildings are worth that cost in lives. As a society, then, we regularly and inescapably adopt policies in which human lives are part of the price.

A review of 132 US federal government regulatory decisions associated with public exposure to environmental carcinogens found that regulatory action never occurred if the individual annual fatality risk was lower than 1 in 700,000.[5] Established regulatory practices in several developed countries are similar. In general risks are deemed unacceptable if the annual fatality risk is higher than 1 in 10,000 or perhaps higher than 1 in 100,000. They are deemed acceptable if the annual fatality risk is lower than 1 in 700,000 or perhaps one in a million or one in two million. Between these two regions is an area that might be considered tolerable risk.

These considerations, substantially accepted for years, even decades, by public regulatory agencies after extensive evaluation and considerable debate and public discussion, are designed to provide a viable, if somewhat rough, guideline for public policy. Clearly hazards that fall in the unacceptable range (traffic accidents, for example) should generally command the most attention and the most resources. Those in the tolerable range may also be worthy of consideration, though obviously the urgency is less, and only relatively inexpensive measures to further reduce the risk should be pursued. Those hazards in the acceptable range (drowning in bathtubs, for example) would generally be deemed of little or even negligible concern – they are risks we can live with – and further precautions would scarcely be worth pursuing unless they are quite remarkably inexpensive.

Overall, then, it is clear that governments have been able to set out, and agree upon, risk acceptance criteria for use in decision-making for a wide variety of hazards, including ones that are highly controversial and emotive, such as pollution, nuclear and chemical power plant accidents, and public exposure to nuclear radiation and environmental carcinogens.

As can be seen in Table 2, almost all annual terrorism fatality risks are lower than one in a million — for the USA, UK, Canada and Australia they are less than one in four million per year. Therefore they generally lie within the range deemed by regulators internationally to be safe or acceptable and do not require further regulation.[6] Applying conventional standards, then, terrorism currently presents a threat to human life in the Western world that is, in general, acceptable, and efforts, particularly expensive ones, to further reduce its likelihood or consequences are scarcely justified.

It is possible that any relaxation in security measures will increase the terrorism hazard risk. However, for the terrorism risk to border on becoming unacceptable by established risk conventions – that is, to reach an annual fatality rate of 1 in 100,000 – the number of fatalities from all forms of terrorism in the US and Canada would have to increase 40-fold, in Britain (excluding Northern Ireland) more than 55-fold and in Australia more than 80-fold.

We have been using historical data on terrorism here, and there is, of course, no guarantee that the frequencies of the past will necessarily persist into the future. However, there seems to be little evidence terrorists are becoming any more destructive, particularly in the West. In fact, if anything, there seems to be a diminishing, not expanding, level of terrorist activity and destruction, at least outside of war zones.[7] Those who wish to discount such arguments and projections need to demonstrate why they think terrorists will suddenly get their act together and inflict massively increased violence, visiting savage discontinuities on the historical data series.

Cost–benefit analysis

Cost–benefit analysis brings risks and costs together. A conventional approach to cost-effectiveness compares the costs of a security measure with its benefits, as tallied in lives saved and damage averted. The benefit of a security measure is a multiplicative composite of three considerations: the probability of a successful attack, absent the security measure,

the losses sustained in a successful attack, and the reduction in risk furnished by the security measure. In this way: benefit = (probability of a successful attack) × (losses sustained in the attack) × (reduction in risk).

The interaction of these variables can perhaps be seen in the following example. Suppose there is a dangerous curve on a road that results in an accident from time to time. To evaluate measures designed to deal with this problem, the analyst would need to estimate: (1) the probability of an accident each year under present conditions; (2) the consequences of the accident (death, injury, property damage); and (3) the degree to which a proposed safety measure lowers the probability of an accident (erecting warning signs) and/or the losses sustained in the accident (erecting a crash barrier). If the benefit of the risk-reduction measure – these three items multiplied together – outweighs its cost, the measure would be deemed to be cost-effective.

These considerations can be usefully finessed in a procedure known as 'break-even analysis'. In this, we seek to determine what the probability of an otherwise successful terrorist attack would have to be for a security measure to begin to justify its cost. Thus we set the cost of the measure equal to its benefit:

$$\text{cost} = (\text{probability of a successful attack}) \times (\text{losses sustained in the attack}) \times (\text{reduction in risk})$$

which becomes

$$(\text{probability of a successful attack}) = (\text{cost}) / [(\text{losses sustained in the attack}) \times (\text{reduction in risk})]$$

We have applied this approach to the overall increase in domestic homeland security spending in the US by the federal government (including for national intelligence) and by state and local governments. That is, we assume homeland security measures in place before the 9/11 attacks continue, and we evaluate the cost-effectiveness of the additional funds that have been allocated to homeland security. By 2009 this increase totalled some $75 billion per year. This is a very conservative measure of the degree to which homeland security expenditures have risen since 9/11, because it excludes such items as private sector expenditures, hidden and indirect costs of implementing security-related regulations and the costs of the terror-related (or terror-impelled) wars in Iraq and Afghanistan. To evaluate the reduction in risk provided by this array of security measures, we need to consider their effectiveness in deterring, disrupting or protecting against a terrorist attack.

In assessing risk reduction it is important, first, to assess the risk-reduction effectiveness of homeland security measures that were in place before 9/11. In addition, it should be kept in mind that the tragic events of 9/11 massively heightened the awareness of the public of the threat of terrorism, resulting in extra vigilance that has often led to the arrest of terrorists or the foiling of terrorist attempts at little or no cost to the government. In our analysis we assume that risk reduction caused by the security measures in place before 9/11 and by the extra vigilance of the public after that event together reduced risk by 50%. This is an exceedingly conservative estimate, because security measures that are at once effective and relatively inexpensive are generally the first to be implemented – for example, one erects warning signs on a potentially dangerous curve in the road before rebuilding the highway. Furthermore, most terrorists (or would-be terrorists) do not show much intelligence, cleverness, resourcefulness or initiative.[8] Therefore measures to deal with them are relatively inexpensive and are likely to be instituted first. Dealing with the smarter and more capable terrorists is more difficult and expensive, but these people represent, it certainly appears, a decided minority among terrorists.

For our analysis we assume that the increase in US expenditures on homeland security since 2001 have been dramatically effective, reducing the remaining risk by an additional 45%. Total risk reduction is generously assumed, then, to be 95%, with the pre-existing measures and the extra public vigilance responsible for 50% of the risk reduction and the enhanced expenditures responsible for the remaining 45%.

Putting this all together, we find that, in order for enhanced expenditures on homeland security to be deemed cost-effective under our approach – which substantially biases the consideration towards finding them effective – each year they would have to deter, disrupt or protect against 1667 otherwise successful attacks (e.g. something like the one attempted on Times Square in 2010[9]), which is more than four per day.[10]

There are extreme scenarios that can be taken to suggest that enhanced US security expenditures could be cost-effective, such as in the nightmare vision of a nuclear attack in a crowded city, as well as costly massive overreaction. However, for those who find such outcomes dangerously likely, the policy response would logically be to spend on reducing the risk of nuclear terrorism in the one case and to develop strictures to overreaction in the other. It would not be, for example, to spend tens of billions of dollars each year on protection measures.

Our findings dealing with the total enhanced homeland security expenditures should not be taken to suggest that *all* security measures necessarily fail to be cost-effective: there may be specific measures that are cost-effective. But each should be subjected to the kind of risk analysis we have applied to the overall increases in expenditure.

We have done so for several specific measures. It appears, for example, that the protection of a standard office-type building would be cost-effective only if the likelihood of a sizeable terrorist attack on the building is a thousand times greater than it is at present. Something similar holds for the protection of bridges. On the other hand, hardening cockpit doors on aircraft appears to be cost-effective. However, the provision for air marshals on the planes decidedly is not, and the cost-effectiveness of full-body scanners is questionable at best.[11] Overall, by far the most cost-effective counterterrorism measure is to refrain from overreacting.

Risk communication

Officials who seek to expend limited funds in a manner that best enhances public safety should be risk-neutral: insofar as this can be determined, they should deal with the objective likelihood the hazard will occur, and rely on that in their decision-making. Although we understand that people are often more risk-averse when considering issues like terrorism, we follow the US Office of Management and Budget requirement that governments expending tax money in a responsible manner need to be neutral when assessing risks, something that entails focusing primarily on mean estimates in risk and cost–benefit calculations, not primarily on worst-case or pessimistic ones.[12]

The willingness to accept risk, however, is influenced not only by its objective likelihood but by a variety of psychological, social, cultural and institutional processes that depend on such qualities as the uncontrollability of the risks; the dread (or fear) they inspire; their involuntary nature or catastrophic potential; whether they can be preventively controlled, are certain to be fatal, can easily be reduced, result in an inequitable distribution of risk, threaten future generations, or affect one personally; whether they are increasing or not observable, unknown to those exposed, new or unfamiliar, and unknown to science; and whether they have immediate effect or affect a large number of people.[13] It is important, then, for officials to communicate risk objectively. If they can convince their constituents

to adopt a risk-neutral perspective, they will be in a far better position to expend pubic funds in ways that most enhance public safety.

Because people are often more risk-acceptant or risk-averse than an objective analysis would dictate, politicians and bureaucrats face considerable political pressure over the terrorism issue. Their dilemma is nicely parsed by James Fallows. He points out that 'the political incentives here work only one way'. A politician who supports more extravagant counterterrorism measures 'can never be proven wrong' because an absence of attacks shows that the 'measures have "worked"', while a new attack shows that we 'must go farther still'. Conversely, a politician seeking to limit expenditure 'can never be proven "right"', while 'any future attack will always and forever be that politician's "fault"'.[14]

However, it is possible that politicians and bureaucrats are overly fearful about the political consequences. Indeed, sometimes leaders have been able to restrain their instinct to overreact, and this has often proved to be entirely acceptable politically. The US did not massively overreact to terrorist bombings against its soldiers and citizens in Lebanon in 1983 or over Lockerbie, Scotland, in 1988.[15] This is a particularly important issue because, as noted, it certainly appears that avoiding overreaction is by far the most cost-effective counterterrorism measure.

Moreover, although political pressures may force actions and expenditures that are unwise, they usually do not precisely dictate the level of expenditure. Thus, although there are recurrent public demands to 'do something' about terrorism, nothing in those demands specifically requires American officials to impose the removal of shoes in airport security lines, to require passports to enter Canada, to spread bollards like dandelions, or to make a huge number of buildings into forbidding fortresses. The UK, which faces an internal threat from terrorism that seems considerably greater than that for the US, appears nonetheless to spend proportionately much less than half as much on homeland security, and the same holds for Canada and Australia.[16] Yet politicians and bureaucrats there do not seem to suffer threats to their positions, or other political problems because of this relative restraint.

It is true that few voters spend a great amount of time following the ins and outs of policy issues and even fewer are certifiable policy wonks. But they *are* grown-ups, and it is just possible that they would respond reasonably to an adult conversation about terrorism.[17]

Responsible counterterrorism policy-making

In seeking to evaluate the effectiveness of the massive increases in homeland security expenditures since September 11, 2001, the common and urgent query has been 'are we safer?'. This, however, is the wrong question. Of course, we are 'safer' – the posting of a single security guard at one building's entrance enhances safety, however microscopically. The correct question is 'are the gains in security worth the funds expended?'. Or, as it was posed shortly after 9/11 by risk analyst Howard Kunreuther, 'How much should we be willing to pay for a small reduction in probabilities that are already extremely low?'.[18] Working to answer this absolutely central question involves dealing with considerations of cost per saved life and acceptable risk as fed into cost–benefit methodology.

As far as we can see, Department of Homeland Security (DHS) decision-makers do not follow robust risk assessment methodology. If they did, low cost solutions that are easily deployed and effective would be the first to be implemented, and we do not find this to be the standard. This observation is supported by a committee of the US National Academy of Sciences in a 2010 report. After spending the better part of two years

investigating the issue, the committee could not find 'any DHS risk analysis capabilities and methods' adequate for supporting the decisions made about spending on terrorism, and noted that 'little effective attention' was paid to 'fundamental' issues. With one exception, it was never shown 'any document' that could explain 'exactly how the risk analyses are conducted' and it looked over reports in which it was not clear 'what problem is being addressed'. This situation is particularly strange because, as the committee also notes, the risk models used in the department for *natural* hazards are 'near state of the art' and 'are based on extensive data, have been validated empirically, and appear well suited to near-term decision needs'.[19] Moreover, when it comes to terrorism, DHS appears to be exceptionally risk-averse: its decisions cannot be supported even with the most risk-averse utility functions possible, and its level of risk aversion is exhibited by few, if any, other government agencies, including the US Nuclear Regulatory Commission and the Environmental Protection Agency.[20]

For example, only once, as far as we can see, has DHS actually, if accidentally, engaged in a public assessment of acceptable risk. This involved the risk that body scanners that use X-ray technology will cause cancer. Asked about this, the DHS official in charge, John Pistole, essentially said that, although the cancer risk was not zero, it was acceptable. A set of studies, he pointed out, 'have all come back to say that the exposure is very, very minimal' and 'well, well within all the safety standards that have been set'.[21] Since the radiation exposure delivered to each passenger is known, one can calculate what the risk of getting cancer is for a single exposure using a standard approach that, though controversial, is officially accepted by nuclear regulators in the US and elsewhere. Based on a 2012 review of scanner safety, the fatal cancer risk per scan is about one in 60 million.[22] As it happens, the chance that an individual airline passenger will be killed by terrorists is much lower – one in 80 million.[23] Therefore, unless one believes that terrorists will in the near future become far more capable of downing airliners than they have been in the past, the risk of being killed by a terrorist in an airliner is already fully acceptable by the standards applied to the cancer risk from body scanners using X-ray technology. But no official, of course, has drawn that comparison.

Looking more broadly, any responsible analysis must also include a consideration of what else could have been done with the effort and money being expended on the policy proposed.[24] When we spend resources on regulations and procedures that save lives at a high cost, we forgo the opportunity to spend those same resources on measures that can save more lives at the same cost or even a lower one.[25] Homeland security expenditures invested in a wide range of more cost-effective risk reduction programmes like flood protection, vaccination and screening, vehicle and road safety, health care, and occupational health and safety would probably result in far more significant benefits to society. For example, diverting a few per cent of the nearly $10 billion per year spent on airline security could save many lives at a fraction of the cost if it were instead spent on seat belts for cars, bicycle helmets for children, tandem mass spectrometry screening programmes, front air bags, smoke alarms or tornado shelters.[26]

It may be useful in this light to put counterterrorism expenditures in the broadest comparative context. Björn Lomborg assembled a group of international experts to answer one question: 'if we had an extra $75 billion to put to good use, which problems would we solve first?'.[27] This sum is less than the amount the US spends on homeland security in a single year. More than 40 experts, tasked to do 'what is rational instead of what is fashionable', applied cost–benefit thinking to a wide range of issues. For many measures the benefit is ten times greater than the cost and, most importantly, the number of lives saved is spectacular. According to these analysts, an investment of merely $2 billion could save more

than 1.5 million lives: one million child deaths could be averted by expanded immunisation coverage, while community-based nutrition programmes could save another half a million. In assessing expenditures for dealing with transnational terrorism, by contrast, the experts found costs to be three to 25 times higher than any benefits.[28]

If diversions of funds would easily save many lives, a government obliged to allocate funds in a manner that best benefits society must explain why it is spending billions of dollars on security measures with very little proven benefit and why that policy is something other than a reckless waste of resources. This disregard of basic cost–benefit considerations not only wastes money but costs lives.

We recognise that risk and cost–benefit considerations should not be the sole criterion for public decision-making. Nonetheless, they provide important insights into how security measures may (or may not) perform, their effect on risk reduction and their cost-effectiveness. They can reveal wasteful expenditures and allow limited funds to be directed to where the most benefit can be attained. If risk and cost–benefit advice is to be ignored, the onus is on public officials to explain why this is so and to detail the trade-offs and cuts to other programmes that will inevitably ensue.

'Policy-making is a risky business', one group of analysts has acknowledged. But they continue, 'regardless of the varied desires and political pressures, we believe that it is the responsibility of analysts forcefully to advocate rational decision methods in public policy-making, especially for those with high risk'.[29] Or, as Paté-Cornell observes, if rational approaches to public policy-making are not utilised, politically driven processes 'may lead to raising unnecessary fears, wasting scarce resources, or ignoring important problems'.[30] Central in all this, as risk analyst David Banks has suggested, is 'the distinction between realistic reactions to plausible threats and hyperbolic overreaction to improbable contingencies'.[31]

To be irrational with your own money may be to be foolhardy, to give in to guilty pleasure, or to wallow in caprice. But to be irrational with other people's money, particularly where public safety is concerned, is to be irresponsible. In the end it becomes a dereliction of duty that cannot be justified by political pressure, bureaucratic constraints or emotional drives. Risk reduction measures that produce little or no net benefit to society or produce it at a very high cost cannot be justified on rational life-safety and economic grounds. They are not only irresponsible but, essentially, immoral.

Finally, even if officials cannot bring themselves to embrace appropriate methodology to determine the value of their spending on security measures, they still bear a fundamental responsibility to inform the public honestly and accurately of the risk that terrorism presents. Instead, the emphasis has been on exacerbating fears. Indeed, despite the importance to responsible policy of seeking to communicate risk, and despite the costs of irresponsible fear-mongering, just about the *only* official in the US who has ever openly put the threat presented by terrorism in some sort of context is New York's Mayor Michael Bloomberg, who in 2007 pointed out that people should 'get a life' and that they have a greater chance of being hit by lightning than of being struck by terrorism.[32] It might be noted that this unconventional outburst did not have negative consequences for him. Although he had some difficulties in his re-election two years later, his blunt, and essentially accurate, comments about terrorism were not the cause.

Notes

1. See, for example, ISO 31000–2009, *Risk Management: Principles and Guidelines* (Geneva, 2009); and Peter L. Bernstein, *Against the Gods: The Remarkable Story of Risk* (New York: John Wiley, 1996).

2. M. Elisabeth Paté-Cornell, 'Quantitative Safety Goals for Risk Management of Industrial Facilities', *Structural Safety* 13 (1994): 145.
3. Lisa A. Robinson et al., 'Valuing the Risk of Death from Terrorist Attacks', *Journal of Homeland Security and Emergency Management* 7, no. 1 (2010) . Characteristically court awards or compensation payouts are considerably lower. The average life insurance payout to 9/11 victims was $350,000, and workers' compensation was $400,000. Lloyd Dixon and Rachel K. Stern, *Compensation for Losses from the 9/11 Attacks* (Santa Monica, CA: RAND Institute for Civil Justice, 2004), 31, 17. Court awards may be higher than this, but not always. A study of aviation fatality payments found that the average compensation for cases that went to trial was roughly $1.2 million, with a maximum of $10 million in 2010 dollars; however, half of all payouts, including those settled before trials began, were less than $350,000. James S. Kakalik et al., *Costs and Compensation Paid in Aviation Accident Litigation* (Santa Monica, CA: RAND Institute for Civil Justice, 1988), x. Payments to the families of soldiers killed in the Iraq war total $500,000, up from $112,240 before that conflict. Joseph E. Stiglitz and Linda J. Bilmes, *The Three Trillion Dollar War: The True Cost of the Iraq Conflict* (New York: W.W. Norton, 2008), 17.
4. A useful comparison might be made with the Los Angeles Police Department, which operates with a yearly budget of $1.2 billion. Mayor Antonio R. Villaraigosa, *Budget for the Fiscal Year 2013–14* (City of Los Angeles, April 2013), 152. Considering only lives saved following the discussion above, that expenditure would be justified if the police every year saved some 170 lives when each saved life is valued at $7 million. At present there are some 300 homicides each year in the city and about the same number of deaths in car accidents. It is certainly plausible to suggest that both these numbers would be substantially higher without police efforts and accordingly that local taxpayers are getting pretty good value for their money. Moreover, the police provide a great many other services to the community for the same expenditure, from directing traffic to arresting burglars and shoplifters. Although efforts to police terrorism also provide such co-benefits, they are likely to be quite a bit lower than those provided by the Los Angeles police.
5. C. C. Travis et al., 'Cancer Risk Management: A Review of 132 Federal Regulatory Decisions', *Environmental Science and Technology* 21, no. 5 (1987): 415–20.
6. See also Kenneth T. Bogen and Edwin D. Jones, 'Risks of Mortality and Morbidity from Worldwide Terrorism: 1968–2004′, *Risk Analysis* 26, no. 1 (2006): 56; and Daniel Gardner, *The Science of Fear: Why We Fear the Things We Shouldn't—and Put Ourselves in Greater Danger* (New York: Dutton, 2008), 250–1.
7. See, for example, National Consortium for the Study of Terrorism and Responses to Terrorism, *Integrated United States Security Database (IUSSD): Data on the Terrorist Attacks in the United States Homeland, 1970 to 2011*, http://www.start.umd.edu/start/publications/START_IUSSDDataTerroristAttacksUS_1970-2011.pdf (accessed December 11, 2013).
8. Michael Kenney, '"Dumb" yet Deadly: Local Knowledge and Poor Tradecraft among Islamist Militants in Britain and Spain', *Studies in Conflict & Terrorism* 33, no. 10 (2010): 911; and John Mueller and Mark G. Stewart, 'The Terrorism Delusion: America's Overwrought Response to September 11', *International Security* 37, no. 1 (2012): 81. For a discussion of the real-world relevance of *Four Lions*, a fictional film about a bumbling band of would-be terrorists in Britain, see John Mueller, 'Introduction', *Terrorism Since 9/11: The American Cases*, ed. John Mueller (Columbus: Mershon Center, Ohio State University, 2013), 27–8, http://polisci.osu.edu/faculty/jmueller/since.html.
9. See *US v. Faisal Shahzad* (2010, USDC, SDNY), http://s3.amazonaws.com/nytdocs/docs/333/333.pdf.
10. For a fuller discussion and for the derivation of this number, see John Mueller and Mark G. Stewart, *Terror, Security, and Money: Balancing the Risks, Benefits, and Costs of Homeland Security* (New York: Oxford University Press, 2011), chap. 4.
11. Ibid., chaps. 6–7; Mark G. Stewart and John Mueller, 'Aviation Security, Risk Assessment, and Risk Aversion for Public Decisionmaking ', *Journal of Policy Analysis and Management* 32, no. 3 (2013): 615–633; and Mark G. Stewart and John Mueller, 'Terrorism Risks and Cost–Benefit Analysis of Aviation Security', *Risk Analysis* 33, no. 5 (2013): 893–908.
12. Office of Management and Budget, 'Guidelines and Discount Rates for Benefit–Cost Analysis of Federal Programs (Revised)', Circular No. A-94, Washington, DC, 1992.

13. Mark G. Stewart and Robert E. Melchers, *Probabilistic Risk Assessment of Engineering Systems* (London: Chapman & Hall, 1997), 208–216; Paul Slovic, Baruch Fischhoff, and Sarah Lichtenstein, 'Facts and Fears: Understanding Perceived Risk', in *Societal Risk Assessment: How Safe is Safe Enough?*, eds. Richard C. Schwing and Walter A. Albers (New York: Plenum, 1980), 181–216.
14. James Fallows, 'If the TSA were Running New York', theatlantic.com, May 2010.
15. On this issue, see Mueller and Stewart, *Terror, Security, and Money*, 179–82. One might also compare the reaction to 9/11 with that to the worst terrorist event in the developed world before then, the downing of an Air India airliner departing Canada in 1985, in which 329 people, 280 of them Canadian citizens, perished. Journalist Gwynne Dyer points out that, proportionate to population, the losses were almost exactly the same in the two cases. But, continues Dyer, 'here's what Canada didn't do: it didn't send troops into India to "stamp out the roots of the terrorism" and it didn't declare a "global war on terror." Partly because it lacked the resources for that sort of adventure, of course, but also because it would have been stupid.' Gwynne Dyer, 'The International Terrorist Conspiracy', 2 June 2006, http://gwynnedyer.com.
16. Mueller and Stewart, *Terror, Security, and Money*, 87–92.
17. For a discussion, see John Mueller, Mark G. Stewart, and Benjamin H. Friedman, 'Finally Talking Terror Sensibly', 24 May 2013, http://nationalinterest.org.
18. Howard Kunreuther, 'Risk Analysis and Risk Management in an Uncertain World', *Risk Analysis* 22, no. 4 (2002): 662–3. See also John Mueller, 'Some Reflections on What, if Anything, "Are We Safer?" might Mean', 11 September 2006, http:// cato-unbound. org.
19. National Research Council of the National Academies, *Review of the Department of Homeland Security's Approach to Risk Analysis* (Washington, DC: National Academies Press, 2010). An evaluation of a risk analysis tool developed for the DHS is similarly critical. The tool has 'thousands of input variables', many of which cannot be estimated with much precision, and it could generate results that are 'completely wrong'. Moreover, it takes so long to run that it was not possible 'to conduct even a superficial sensitivity analysis' of its 'many thousands of assumptions and parameter estimates'. In addition, it only deals with relative risk, not absolute risk (a key criticism as well in the 2010 National Research Council study), and its estimates of these 'are subject to strong, probably untenable, assumptions'. The tool is also insensitive to changes in the magnitude of risk and 'assumes no attack can be deterred'. Andrew R. Morral et al., *Modeling Terrorism Risk to the Air Transportation System* (Santa Monica, CA: RAND Corporation, 2012).
20. Mark G. Stewart, Bruce R. Ellingwood, and John Mueller, 'Homeland Security: A Case Study in Risk Aversion for Public Decision-Making', *International Journal of Risk Assessment and Management* 15, nos. 5– 6 (2011): 367–86; and Stewart and Mueller, 'Aviation Security'.
21. PBS NewsHour, 16 November 2010, http://www.pbs.org/newshour/bb/transportation/july-dec10/airsecurity_11-16.html.
22. Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR), *Health Effects of Security Scanners for Passenger Screening* (Brussels: European Commission, 26 April 2012). Passenger exposure to backscatter scanners is 0.4 mSv per scan. A 1 mSv dose, according to standard models, increases the risk of fatal cancers by 0.004%. The increase in fatal cancer risk per scan is thus $0.4 \times 0.001 \times 0.004\% =$ one in 60 million.
23. Three hundred and sixty-three airline passengers were killed by terrorists in the 14 years between 1999 and 2012. The total number of global airline passengers in same period was roughly 29 billion.
24. Bruce Schneier, *Beyond Fear: Thinking Sensibly about Security in an Uncertain World* (New York: Copernicus, 2003).
25. Tammy O. Tengs and John D. Graham, 'The Opportunity Costs of Haphazard Social Investments', in *Life-saving, Risks, Costs, and Lives Saved: Getting Better Results from Regulation*, ed. Robert William Hahn (Washington, DC: American Enterprise Institute, 1996), 167–82.
26. Mueller and Stewart, *Terror, Security, and Money*, 182–3.
27. Björn Lomborg, *Global Crises, Global Solutions* (Cambridge: Cambridge University Press, 2009), 1.
28. Todd Sandler, Daniel G. Arce, and Walter Enders, 'Transnational Terrorism', in Lomborg, *Global Crises*, 552. They place the value of life at $2 million in their calculations.
29. J. Brian Hardaker, Euan Fleming, and Gudbrand Lien, 'How should Governments make Risky Policy Decisions?', *Australian Journal of Public Administration* 68, no. 3 (2009): 256–71.

30. Elisabeth Paté-Cornell, 'Risk and Uncertainty Analysis in Government Safety Decisions', *Risk Analysis* 22, no. 3 (2002): 633–46.
31. David L. Banks, 'Statistics for Homeland Defense', *Chance* 15, no. 1 (2002): 10.
32. Sewell Chan, 'Buzz over Mayor's "Get a Life" Remark', nytimes.com, June 6, 2007. See also John Mueller, *Overblown* (New York: Free Press, 2006), 151–2.

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