

STATISTICAL ISSUES IN COUNTER-TERRORISM

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The statistical community is eager to help the U.S. government respond to the recent terrorist attacks. In some situations, it is possible that our expertise can play a valuable support role for developing counter-terrorist measures.

This report lists promising initiatives described to me by many statisticians scattered around the country. Doubtless, it represents only a small portion of the thinking that statisticians have begun to do. From the discussions I have had, I am certain that any credible research program in this area would quickly accumulate the people and resources needed to achieve success.

Initiative 1: Karen Kafadar (U. of Colorado-Denver) and Cliff Spiegelman (Texas A&M) independently suggested that statisticians become involved in developing and testing the screening or profiling criteria used for baggage and passenger search. This proposal was strongly seconded by Max Morris (Iowa State).

Comment: The FAA and other government agencies have developed screening criteria for air travelers, baggage checks, international arrivals, security clearance, and probably many other applications. I have been involved with baggage check criteria, and at least in that case am sure that the criteria that are currently in use have not been statistically tested or optimized. One barrier to improvement is that, for obvious reasons, the criteria must be secret. Another barrier is that the criteria must withstand legal scrutiny that ensures non-discrimination.

Initiative 2: Bernie Harris (U. of Wisconsin-Madison) is organizing a workshop to explore whether statistical risk analysis can contribute to counter-terrorism. The Army Research Office and the Bureau of Transportation Statistics are funding the workshop. Key participants include Lee Abramson (Nuclear Regulatory Commission), Roger Cooke (University of Delft), Torborn Thedeen (Director, Center for Safety Analyses in Stockholm), and Art Fries (Institute for Defense Analyses). The workshop will take place in early December.

Comment: Classical risk analysis may not be the most useful perspective here, but it is worth exploring. A non-classical aspect of this application relates to game theory, since hardening one target may simply encourage terrorists to redirect their efforts, and thus the risk analysis must examine a portfolio of investment in protection. The Bureau of Transportation Statistics hopes the workshop will take a broad view of the problem.

Initiative 3: Alan Karr (National Institute of Statistical Sciences) points out that heightened security checks will likely raise problems of

- record linkage (which is especially difficult when foreign names and addresses are transliterated non-uniquely);
- data quality (false matches are expensive and can create liability, whereas missed matches can be fatal);
- confidentiality (the federal government is closely restricted on how information can be shared, and the duty to protect citizen privacy is unchanged).

There is a significant body of statistical research in all three of these areas that could be drawn upon for designing information systems that address terrorist threats.

Comment: NISS has substantial expertise in these areas, and their collaborative relationships with federal agencies make them a natural leader on such projects. It is possible that the scope will need to be broadened to include similar issues that arise in biometric identification technologies.

Initiative 4: Many people have long been involved in applying statistical methods to network intrusion detection. I have worked with Roy Maxion (Computer Science at Carnegie Mellon), and other active statisticians include Martin Theus, Matthias Schonlau, Bill DuMouchel (all at AT&T) and Yehuda Vardi (Rutgers). The urgency of these efforts can only increase in the coming months.

Comment: DARPA has led the way in funding and directing much of this research, but their approach has not been specifically statistical. And despite the excellent theoretical contributions of many statisticians, I do not believe that any detection system yet conceived has either an adequate accuracy rate or sufficient speed to respond to realistic threats. NIST has done some work on integrating a generic detection package with an automated threat-response protocol (the NAÏVE system), and that seems an essential part of any practical solution.

Besides these relatively mature initiatives, there are other areas in which statisticians may be able to contribute. For example, I was asked by the Bureau of Alcohol, Tobacco, and Firearms to provide help in reviewing discriminant analysis methods to identify chemical taggants in fertilizer used for explosives. Also, biostatistical work in detecting disease clusters and streamlining the approval and production of vaccines is clearly crucial in responding to bioterrorism. And many federal agencies are currently working to develop threat-and-response scenarios---this entails listing many possible event factors (such as attack type, target, international response, public response) and then gaming out the consequences for each combination of factor levels. Since there are many factors, each with many levels, then the search space is large; perhaps statistical ideas such as Latin hypercube sampling would expedite the process.