Where do terrorists come from?
Deterrence-related insights from modeling the spread of fanatic behavior

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Abstract

The population dynamics underlying the diffusion of ideas and behaviors can be conceptualized similarly to those involved in the spread of infections. Here we use two simple models of epidemics to identify differences in how fanatic behavior leading to terrorism can be modeled and understood. We use a simple variant between the two models identifying different ways to think about state changes in the population and its effects. The use of models of epidemic contagion is not necessarily straight forward when thinking about the spread of ideas and behaviors.

Deterrence and terrorism

Researchers have studied the complex phenomenon of deterrence from many perspectives for decades without reaching consensus on many dimensions of the issue or on a conclusive definition for the term (see Wenger & Wilner, 2012). Deterrence research has been developed using game theory (Cadigan & Schmitt, 2010), decision theory, epidemiology (Castillo-Chavez & Song, 2010), and political science, among other theoretical approaches. According to the Merriam-Webster dictionary,[3] deterrence is "the act or process of deterring," "the inhibition of criminal behavior by fear, especially of punishment," "the maintenance of military power for the purpose of discouraging attacks (nuclear attacks)." One can say that deterrence is the act of making someone decide not to do something, or it is the act of preventing a particular act or behavior from happening. The idea that deterrence is related to action, or inaction, which makes someone decide not to do something seems central to the concept and useful both in theoretical and practical terms.

Terrorist Activity,[4] in this initial dynamic conceptualization, can be identified as an accumulation of *Terrorist Attacks* over time, and *Terrorist Attacks,* in turn, as a function of adversarial capacity[5] (e.g., the number of *Terrorists* available). As *Terrorist Attacks* increases, independently of the terrorists' target selection process (Martinez-Moyano et al., 2015), the amount of accumulated *Terrorist Activity* increases (see Figure 1), fueling the *Perceived Success of Terrorism* (as perceived by attackers). Such perceived success increases the *Mobilization Rate* of radicalized individuals joining the *Terrorist* ranks,

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[3] https://www.merriam-webster.com/, accessed March 7, 2024.
[4] Words in italics identify constructs (or variables) in the diagrams/models used throughout the document.
[5] For simplicity reasons, in this initial conceptualization, capacity is only captured via the number of individuals available (i.e., terrorists). In further elaboration, capacity will be expanded to include other important dimensions such as specialized knowledge, technology, access, and financial resources.

thereby increasing the capacity of *Terrorists* to conduct even more *Terrorist Attacks* (see Loops[6] R1—the success-creates-success loops—depicted in Figure 1). In this theory, the existence of *Terrorists* is a necessary, and sufficient, condition for the existence of *Terrorist Attacks* as two basic assumptions of this conceptualization are that (1) without *Terrorists*, no attacks occur, and (2) that the individuals in the *Terrorists* stock are motivated and able to perpetrate such attacks.

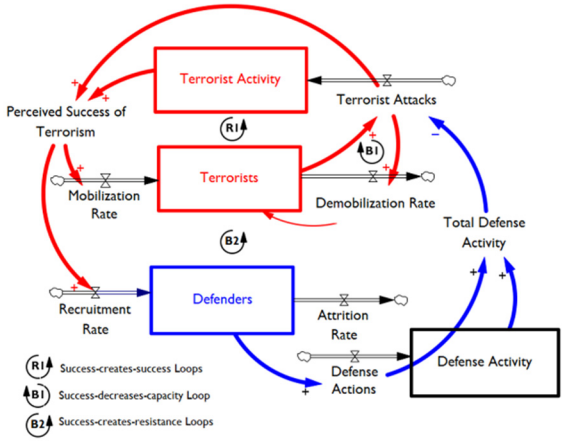

Figure 1. Terrorism-Defense Interactions[7]

In addition to directly contributing to the accumulation of *Terrorist Activity*, *Terrorist Attacks* influences the *Demobilization Rate* of terrorists[8] leading to a decrease in available *Terrorists*. As the *Demobilization Rate* increases with an increased number of *Terrorist Attacks*, the outflow from available *Terrorists* increases making the overall accumulation of *Terrorists* (adversarial capacity) decline. As a result of a lower number of available *Terrorists* (lower adversarial capacity), the number of *Terrorist Attacks* will consequently decline,[9] closing a balancing feedback mechanism (see Loop B1—the success-decreases-capacity loop) with the potential to depleting the accumulation of available *Terrorists*.

As *Terrorist Attacks* increase, assuming a non-zero success rate, the *Perceived Success of Terrorism* will increase and will lead to increases in the *Recruitment Rate* of defenders, making the number of available *Defenders* larger. Having more *Defenders* (a measure of defender capacity) translates into more *Defense Actions*, which adds to *Total Defense Activity*, leading to a decrease in the number of *Terrorist Attacks*, creating a balancing feedback process that counteracts attackers' activity (see B2—the success-creates-resistance loops).

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[6] The name is plural (loops) because two feedback loops are included: one that goes through the accumulation (*Terrorists*) and another that goes through the flow (*Terrorist Attacks*).

[7] Arrows indicate the direction of implied causality between factors. Signs ("+" and "–") indicate the polarity of the relationship. A "+" sign means that, all else equal, increases in the factor at the beginning of the arrow will result in increases in the factor at the end of the arrow. Similarly, a "–" sign means that, all else equal, increases in the factor at the beginning of the arrow will result in decreases in the factor at the end of the arrow.

[8] More adequately, *Terrorist Attacks*, which assumes that some attacks are suicidal, and, in others, the operatives are killed either by accident or by defense actions, leads to the death of terrorists. For simplicity, "Death Rates" flows and labels are not included in Figure 2, but they are considered in Figure 4 as part of the death rate.

[9] The exact form of this decline is not clear because it is a function of the marginal value of attackers as attackers reach zero. However, because as the number of attackers declines, each individual attacker becomes more valuable, the shape of the value function should have a maximum value of 1 and decrease from there to the total number of attackers available to the organization. The decline can be linear, nonlinear, or discontinuous (step function).

Terrorist Attacks, as described earlier, are not only a function of the total accumulated *Terrorists* available (terrorist capacity): they are also affected by the actions the defense takes at any point in time (*Defense Actions*) and by the accumulation of these actions over time (*Defense Activity*[10]). Both current and past actions conform *Total Defense Activity*, which thwarts attacks. Assuming a greater-than-zero success rate for defense action, as *Total Defense Activity* increases, the number of *Terrorist Attacks* decreases. Thus, in the presence of *Defenders* engaging in defense action, the existence of motivated *Terrorists* is a necessary, but not sufficient, condition for the existence of *Terrorist Attacks*.

The negative causal link between *Total Defense Activity* and *Terrorist Attacks* represents an operational component of deterrence ("the act of making someone decide not to do something," "the act of preventing a particular act or behavior from happening"). *Total Defense Activity*, in this aggregate representation, includes actions by different organizations on the "defense" side. Thus, when *Total Defense Activity* increases, ceteris paribus, the number of *Terrorist Attacks* decreases.

The existence of *Terrorist Attacks* is needed as a strong signal to sustain the effort related to *Defense Actions*. This linkage creates a counterintuitive balancing process in which success in defense activity (leading to a decreased number of *Terrorist Attacks*) leads to diminished incentives to maintain or increase defense capacity (Repenning & Sterman, 2001). An eroded defense capacity creates the right environment for future adversarial attacks and success.

Figure 2 presents a preliminary, high-level view of the general underlying accumulations (stocks) and flows relevant to the creation and maintenance of adversarial (terrorist) capacity (i.e., workforce). This initial conceptualization identifies the accumulations that are relevant to the formation of adversarial capacity and the flows that increase these accumulations over time. Four main accumulations of population are identified in this emerging theory of adversarial capacity: *Populace (P), At risk (A), Radicalized (R), and Terrorists (T).* The stock of *Terrorists* cannot be considered in isolation, separate from the population from which they are drawn. Terrorists come from the population at large ("*Populace*") and, after sufficient time, will return to that population, or they will die.

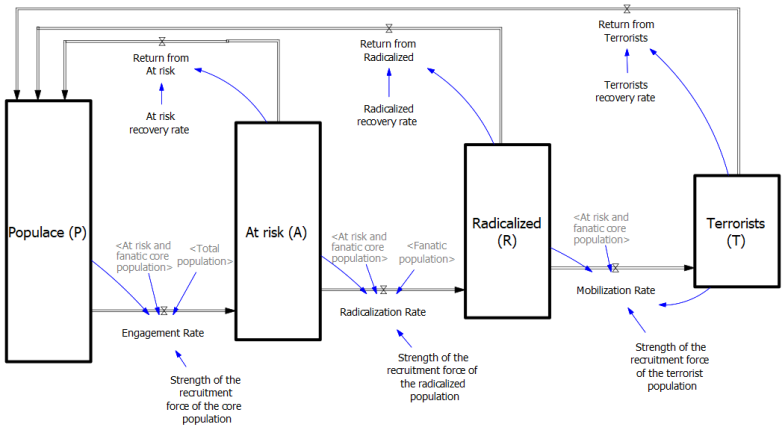

Figure 2. Progression to Terrorism and "direct return" conceptualization.

[10] This accumulation is akin to what Almog (2004) describes as "assets in a victory bank." (see, Almog, D. (2004). Cumulative Deterrence and the War on Terrorism. *The US Army War College Quarterly: Parameters*.).

In this conceptualization, the source of all terrorists is the populace (P). Individuals from the populace, through an engagement process, become members of the at-risk population (A). Engagement is accomplished by recruitment efforts of a fanatic core (FC) population. The population at risk, those radicalized, and those already convinced of the terrorism mission represent the fanatic core (FC) population that creates the possibility for the terrorism stock to grow over time (FC = A + R + T).

To conceptualize the outflows from the different stocks in this theory, we use two different approaches. The first approach (represented in Figure 2), using ideas from epidemiological modeling proposed by Castillo-Chavez and Song (2010), links the fanatic core stocks back to the susceptible stock directly assuming that the degree of fanatism in which the individuals are at any point in time can be reverted directly to its original state of susceptibility. The second approach uses a phased approach to state changes (see Figure 3). In this approach, individuals can only move one step at a time in the chain recognizing that behavior change takes place in increments that can be reverted under the correct circumstances. In this second conceptualization, terrorists that are convinced that it is a good idea to stop their membership in an adversarial organization (or in their individual pursuits) move back to the radicalized accumulation via the demobilization rate. Demobilizing individuals is a first step to decreasing terrorist capacity and activity because, although these individuals likely are still radicalized, they are no longer convinced of acting on their beliefs and participate in terrorist activities. These individuals, if convinced, can be mobilized again and actively participate in terrorism. In a way, these individuals are only one step away from terrorism once they demobilize. Radicalized individuals move to the at-risk population via the deradicalization rate, and at-risk individuals move back to the populace via the disengagement rate.

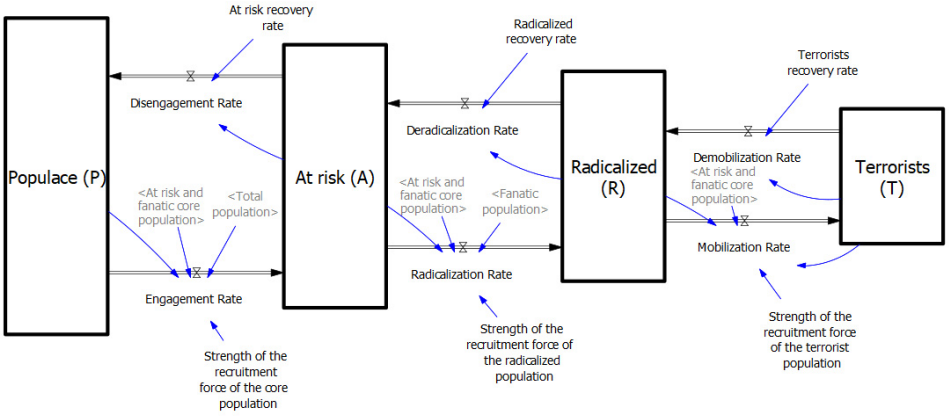

Figure 3. Progression to Terrorism and “phased return” conceptualization.

In these conceptualizations, direct and phased, individuals can move back and forth along the chain over time. These conceptualizations assume a constant number of people in the population as no one enters or leaves the chain over time. This is useful to generate insights into the levers available to the defense in achieving deterrence in the (relatively) short term. In the long term, new arrivals to the population (via births and immigration) and departures from it (via death or outmigration) should be considered and can have a significant impact on the dynamics. As explained before, particularly in terrorism, long time horizons are warranted as many of the reasons for becoming radicalized and many of the grievances of the population can have multigenerational effects.

Figure 4 shows the dynamic implications of changing the conceptualization of how returns happen in the real world, from direct to phased. By changing the conceptualization, the dynamics change in an important way in terms of the predictions that the model generates. Particularly, the population of terrorists after 60 simulated months, changes from ~50 people to about ~75 people (approximately 50% increase).

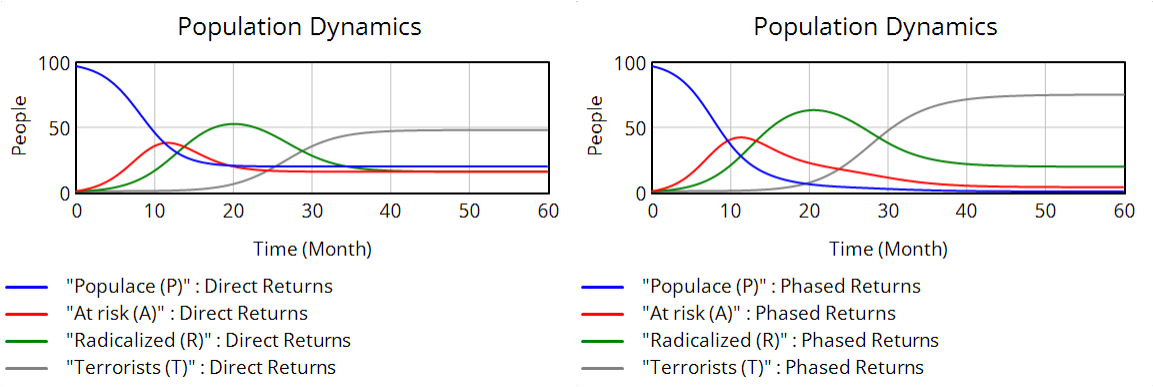

Figure 4. Terrorism Dynamics.

Although additional initial simulation experiments have been conducted (not shown here due to space limitations), further analysis is needed to clarify critical dimensions of deterrence (and associated metrics) and the dynamic processes that drive deterrence over time. Additional work is also needed to clarify how the processes that drive adversarial capacity and adversarial activity are connected both to deterrence and to the analogous concepts of defense capacity and defense activity (and deterrence of defense activity, as suggested by hiatuses in adversarial activity leading to decreased incentives in the development of defense capacity and, consequently, activity). In addition, the two conceptualizations captured in the figures presented here should be further developed in terms of detail and dynamic complexity (Senge, 1990).

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