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Dying to die.

New micro and macro evidence that suicide terrorists are suicidal

Simon Varaine

Univ. Grenoble Alpes, Sciences Po Grenoble, PACTE, Grenoble 38000, France

+33 6 07 90 02 23

simon.varaine@sciencespo-grenoble.fr

Abstract

The self-sacrifice of suicide terrorists is subject to sophisticated models of altruistic sacrifice. Yet, a simpler account is that it reflects common suicidal tendencies. This paper offers new micro and macro evidence supportive of this hypothesis. At the micro level, the paper compares a sample of suicide and non-suicide terrorists in the United States from 1948 to 2017. Results indicate that suicide terrorists are more likely to display various established suicidal risk factors including history of child abuse, absent parent/s and relationship troubles. Results from Bayesian Model Averaging indicate that suicide risk factors outperform other individual factors (e.g. ideology, lone-actor terrorism) in explaining suicide terrorism. At the macro level, the paper takes advantage of the cross-national variations in suicidal tendencies to explain the incidence of suicide and non-suicide terrorist attacks worldwide from 1991 to 2014. Results reveal that countries with higher share of deaths from suicide display higher incidences of suicide attacks but similar incidences of non-suicide attacks. However, other contextual factors such as the share of Muslims also predict the incidence of suicide terrorism. The decision of some terrorists to sacrifice their life may well have been subject to over-theorization.

Key-words: suicide terrorism, suicidal tendencies, terrorism, altruism, self-sacrifice

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“The most dangerous creation of any society is the man who has nothing to lose.”

James Baldwin

1. Introduction

Suicide terrorists are individuals who purposely sacrifice their life in perpetrating violence for political aims (Pape, 2006; Atran, 2003). The personal decision of suicide terrorists to commit self-sacrifice seems challenging for standard theories of human behavior. From a rational perspective, suicide terrorists deliberately act against their interest in self-preservation. From an evolutionary perspective, suicide terrorists avoid any future opportunity for personal reproduction on the behalf of non-kin relatives, which seems hardly compatible with natural selection.

The foremost motivational explanation considers that suicide terrorism is an extreme form of altruistic devotion to the group (Atran, 2016; Swann et al., 2012; Whitehouse, 2018; Ginges et al., 2009; Whitehouse et al., 2017; Pape, 2006). Extreme altruism would have evolved through a multilevel selection process, allowing groups with altruistic individuals to survive and other to disappear (Whitehouse, 2018; Whitehouse et al., 2017; Atran, 2016). Yet, this hypothesis encompasses problems in evolutionary theory. Multilevel selection only occurs under specific conditions and should be considered the exception (Maynard Smith, 1976). Simulation studies do find that multilevel selection may foster altruistic devotion to the group in specific conditions (Choi & Bowles, 2007; Whitehouse et al., 2017), but they rest on the assumption that altruistic individuals have a non-null probability to survive and transmit their genes. In sum, multilevel selection may explain why individuals *risk* their lives for the group; there is however a qualitative step in explaining why individuals knowingly *sacrifice* their life for the group.

A simpler explanation is that suicide terrorism is not altruistic but rather reflects individual suicidal tendencies (Merari et al., 2009; Lankford, 2013b,a). Common suicidal behavior is less challenging for both rational and evolutionary perspectives. Individuals who have a low expected utility over their lifetime may rationally commit suicide (Hamermesh & Soss, 1974). From an evolutionary perspective, suicide may be explained by kin selection: individuals who have low prospect of reproduction and consider themselves to be a burden for kin relatives may engage in self-destruction (Brown et al., 2009). Thus, a possibility is that suicide terrorists engage in violence for the same reasons than non-suicide terrorists, but that

the specific decision to commit suicide or non-suicide missions reflects individual differences in suicidal tendencies.

The present paper offers a new test of the hypothesis that suicide terrorists are suicidal. The theoretical focus of the paper is on the perpetrator's intrinsic motivation, rather than the organization's strategic choice. A large literature focuses on the incentives for terrorist organizations to use suicide terrorism. In particular, research demonstrates that resorting to suicide terrorism is highly relevant for attacking accessible but hardened targets, which makes it an especially effective strategy in the case of foreign occupation (Pape, 2006; Collard-Wexler et al., 2014; Choi & Piazza, 2017). In this paper, I remain agnostic on the strategic choice behind the use of suicide terrorism by the organization - or even by the perpetrator planning the attack in the case of lone terrorism (see Capellan, 2015). Whatever the strategic choice behind a given attack, there must be a perpetrator willing to end their life in the attack, and the perpetrator may only be willing to do so for altruistic or suicidal motives. This does not mean that strategic considerations are not important in the explanation of suicide terrorism. For an attack to happen, it is not sufficient that individuals are willing to die, there must be strategic incentives to carry out suicide attacks for a cause. But, conversely, strategic incentives are insufficient to produce suicide terrorism: terrorist groups cannot launch suicide attacks if no one is willing to carry them out.

The present paper is the first to test the suicidal hypothesis by relying on both micro-level and macro-level data. The paper first compares a range of suicide risk factors among suicide terrorists compared non-suicide terrorists based on a sample of domestic terrorists in the United States from 1948 to 2017. Results reveal that suicide terrorists are significantly different from non-suicide terrorists with regard to suicide risk factors, while they display no observable differences on other factors. While all existing evidence about the suicidal hypothesis is currently based on micro-level data, the paper then offer a novel test of the hypothesis at the macro-level. The paper analyses the relationship at the macro-level between cross-national variations in suicide tendencies and suicide terrorist attacks worldwide from 1991 to 2016. Results show that the number of suicide terrorist attacks in a country is positively related with the national suicide rate, while the number of non-suicide terrorist attacks is not. Together, these findings offer new evidence supporting the hypothesis that suicidal tendencies play a role in suicidal terrorism.

The following section of the paper details existing evidence on the suicidality of suicide terrorists. Section 3 offers an overview of the empirical strategy of the paper. Section 4 is devoted to the individual level analysis and section 5 to the cross-country analysis. The last

section discusses the findings in relationship to studies on suicide terrorism and extreme altruism, and offers some policy implications.

2. Existing Studies on Suicidal Terrorism and Suicidal Tendencies

Despite passionate debates on whether suicide terrorists are suicidal (see Lankford, 2013a,b; Atran, 2014; Sela & Shackelford, 2014; McCauley, 2014), evidence insofar remains scarce. Assessing suicidal tendencies of suicide terrorists is methodologically challenging. Researchers can hardly apply clinical evaluations of candidates for suicide terrorism. One notable exception is Merari et al. (2009) who conducted psychological tests on fifteen Palestinian prisoners who attempted to commit a suicide attack, in comparison to prisoners who committed other types of attacks or organized suicide attacks. Their diagnoses indicate that perpetrators of suicide attacks displayed higher avoidant-dependent personality disorders, depressive symptoms and suicidal tendencies. However, it is impossible to disentangle whether the suicidal tendencies of the subjects preceded or followed the attack. Suicidal tendencies could reflect the hard conditions of incarceration and the psychological cost of the failure to achieve the attack (Brym & Araj, 2012b).

In response to Merari et al. (2009), Brym & Araj (2012a) conducted interviews with family members of forty Palestinians who committed suicide attacks. Their findings differ from those of Merari et al. (2009). In the year before the attacks, three-quarter of individuals did not show signs of depression or personal crisis according to their relatives. Nonetheless, interviews with family members encompass reliability issues, since they may be unaware of the psychological state and prone to picture their relatives in a more or less favorable light depending on their approval of suicide terrorism (see Merari, 2010, 83-102). For instance, Speckhard & Ahkmedova (2006) drew opposite conclusion based on interviews of close relatives of 34 Chechen suicide bombers. In their case, the interviews indicate that all individuals experienced the death or beating of close parents or friends prior to their involvement, which resulted in symptoms of post-traumatic stress in all cases, social alienation and isolation in nearly all cases and depression in around 60% of cases.

Another line of research relies on biographical data derived from public sources to assess the prevalence of established suicide risk factors among suicide terrorists. Using this approach, Lankford (2013b) found clues of suicide risk factors in nearly 130 suicide terrorists around the world: including, depressive disorders, post-traumatic stress disorder or other associated mental disorders, the death of a spouse or loved one, or negative catalyst events. In

another study focusing on the United States from 1990 to 2010, Lankford (2013a) compared the characteristics of suicide terrorists and rampage, workplace and school shooters, generally associated with mental disorders. Lankford (2013a) found high level of similarities between groups in terms of social and personal issues preceding the attack. However, as these studies are based on the researchers' evaluation of social and mental problems faced by the terrorists based on fragmentary data, one cannot exclude coding biases (Atran, 2014). Besides, they lack a control group of non-suicide terrorist, which would be necessary to gauge the specificity of suicide terrorists compared to non-suicide terrorists. It is possible that risk factors commonly associated to suicidal tendencies play a more general role in radicalization processes leading both to suicide and non-suicide terrorism.

To my knowledge, only one study addressed these issues. Freilich et al. (2019) compared a sample of 56 suicide terrorists to 391 non-suicide terrorists based on a collective open-source database of perpetrators of terrorist attacks in the United States. They measured suicidal tendencies based on evidence that terrorists had been diagnosed mentally ill or had previously attempted suicide. Albeit a higher proportion of suicide terrorists entered this category, the difference was not significant. Freilich et al. (2019) also found that suicide terrorists were significantly more likely to have a known history of alcohol/drug abuse, a secondary proxy of suicidal risk factors. In sum, their results indicated limited support for the suicidality hypothesis.

3. Overview of the Empirical Strategy

The present paper aims to offer a new test of the suicidal hypothesis based on micro- and macro-level evidence. At the micro-level, the paper relies on a new reliable open-source database on domestic terrorists who radicalized in the United States from 1948 to 2017. The PIRUS database is complementary with the data analyzed by Freilich et al. (2019). Firstly, the time span of the present data is larger than Freilich et al. (2019). Secondly, the PIRUS database focuses on individuals who radicalized in the United States, but who may have committed ideologically motivated crime elsewhere¹. Finally, the PIRUS database includes a larger set of

¹ In contrast, Freilich et al. (2019) focused on individuals who perpetrated ideologically motivated crimes in the United States, even if they radicalized elsewhere - such as in the case of the 9/11 attacks. Since these individuals were non-US citizens, one can wonder whether the probability of clinical diagnoses for mental illness and the availability of information on previous suicidal attempts was comparable to the rest of the sample. In such cases, absence of evidence may not be evidence of absence. On this regard, Lankford (2018) re-examined evidence of mental illness among the hijackers of the 9/11 attacks. For most (13) cases, existing biographical evidence was too scarce to allow any psychological assessment. In the other cases, Lankford (2018) found evidence of mental health problems that may relate to suicidal tendencies.

biographical information on perpetrators which allows new insights about suicide risk factors. I measured the prevalence of a range of established suicide risk factors in a sample of narrowly defined suicide terrorists ($N = 20$) compared to non-suicide terrorists ($N = 1,214$), controlling for differences in available information. I also assessed whether similar results were found in a sample of near-suicide terrorists, i.e. individuals who presumably expected to be killed in perpetrating violence ($N = 26$).

Then, the paper offers a first attempt to generalize the results at the macro-level by taking advantage of the cross-national variation in suicidal tendencies. Epidemiological evidence reveals high differences in suicidal behaviors across national contexts (Naghavi, 2019). In the 1990-2016 period, the share of deaths from suicide was more than ten times higher in countries with the highest suicide rates compared to countries with the lowest suicide rates (Naghavi, 2019). If the self-sacrifice of suicide terrorists reflects suicidal tendencies, countries with high prevalence of suicidal tendencies should have more candidates for suicide terrorism but no more candidates for non-suicide terrorism. Hence, the incidence of suicide terrorist attacks should increase with the prevalence of suicidal tendencies in a country, while this should not be the case for non-suicide attacks. The paper tests this hypothesis based on a cross-national analysis of suicide and non-suicide terrorist attacks in 137 countries from 1991 to 2014.

4. Individual Level Evidence: Suicide Risk Factors and Suicide Terrorism in the United States (1968-2017)

4.1. Methods

Data. I relied on the Profiles of Individual Radicalization in the United States (PIRUS) database, developed by the University of Maryland (National Consortium for the Study of Terrorism and Responses to Terrorism [START], 2018). The data is based on public sources and gathers a representative sample of more than 2,100 profiles of radical activists in the United States from 1948 to 2017. To be included, individuals must have perpetrated ideologically motivated illegal acts or have been known members of organizations designated as terrorists and / or whose leader has committed ideologically motivated violence. Besides, individuals must have been radicalized in the United States. The PIRUS database results from a collective coding effort and tests on double-coded samples of the database indicated that the data respects common standards of inter-coder reliability (LaFree et al., 2018).

Suicide versus non-suicide terrorists. I first excluded individuals who did not actively participate in a plot involving violence. In the remaining sample of terrorists ($N = 1,241$), I identified suicide terrorists, narrowly defined as individuals who committed suicide in perpetrating violence. The PIRUS database does not directly identify suicide terrorists. To do so, I first selected individuals that were currently dead due to suicide ($N = 35$). I then conducted research for each case based on public sources to specifically identify suicide terrorists. Among, the 35 suicide cases, I identified 20 cases as suicide terrorists. This includes 5 suicide bombers, 2 plane hijackers, and 13 individuals who committed suicide while or directly after perpetrating firearm violence. Among the remaining 15 cases, 9 committed suicide long ago after perpetrating violence, whom I included in the non-suicide terrorist category². I was not able to find information on the six remaining cases and excluded them from the analyses³. As a result, I obtained a group of suicide terrorists ($N = 20$, 1.6% of the sample), which can be compared to non-suicide terrorists ($N = 1,214$).

Suicide risk factors. I screened variables related to personal characteristics of terrorists in the PIRUS database to identify all variables that may capture established suicide risk factors based on scientific research on suicidality.

Child abuse. Meta-analytic evidence demonstrates that individuals that were abused as child are at significantly higher risk of suicide attempt: three times more likely in case of sexual abuse and two and a half more likely in case of physical or emotional abuse (Angelakis et al., 2019; Dube et al., 2001; Bruffaerts et al., 2010). I relied on the following question: “Is there evidence that the individual was abused - either verbally or physically - as a child? If there is no information, assume 0 for No”. I generated a binary variable coded 0 = no evidence of abuse (1,184 cases; 96% of valid cases), 1 = evidence of abuse (50 cases; 4% of valid cases).

History of mental illness. There is a strong correlation between mental disorders and suicidal behaviors (Nock et al., 2008; Cavanagh et al., 2003), albeit the intensity of the relationship depends on the kind of mental disorders. Unfortunately, the PIRUS database does not include information on specific mental disorders. I assessed the experience of any mental disorder based on the following question: “Is there evidence presented in the sources that the individual had a history of mental illness? If there is no information, assume 0 for No”. I

² The inclusion of these cases in the suicide terrorist category does not alter the conclusions. Results can be sent by the author upon request.

³ The inclusion of these cases in the suicide or in the non-suicide terrorist category does not alter the conclusions. Results can be sent by the author upon request.

generated a binary variable coded 0 = no evidence of mental illness (1,051 cases; 85% of valid cases), 1 = evidence of mental illness - either according to public/popular speculation or professionally diagnosed (183 cases; 15% of valid cases).

Relationship troubles. Social isolation - either living alone or loneliness feelings - is related to suicidal behaviors (Calati et al., 2019). I relied on the following question: “Did subject typically have difficulty finding or maintaining romantic relationships?”. I generated a binary variable coded missing for cases in which the response was unknown (833 cases), 0 = no troubles (290 cases; 72% of valid cases), 1 = troubles (111 cases; 28% of valid cases).

Absent parent/s. Household dysfunction during childhood, including parents’ separation, has been shown to increase the risk of attempted suicide in later life (Dube et al., 2001). Notably, parent loss, either due to death, divorce or other causes, is related to subsequent suicidal behaviors (Bruffaerts et al., 2010). I relied on the following question: “Are/were there any parents absent (separated, divorced, killed, suicide, or dead of natural causes?) during the individual’s childhood?”. I generated a binary variable coded missing for cases in which the response was unknown (901 cases), 0 = no parenthood absence (220 cases; 66% of valid cases), 1 = parenthood absence - either father, mother or both (113 cases; 34% of valid cases).

History of alcohol/drug abuse. Substance abuse is a common correlate of suicidal behaviors (Adams & Overholser, 1992). I relied on the following question: “Is there evidence presented in the sources that the individual had a history of alcohol or drug abuse? If there is no information, assume 0 for No”. I generated a binary variable coded 0 = no evidence of alcohol/drug abuse (1,071 cases; 87% of valid cases), 1 = evidence of alcohol/drug abuse (163 cases; 13% of valid cases).

Trauma. There is evidence that the personal experience of some traumatic events - such as sexual and interpersonal violence - increases suicide ideations and, in some cases, suicide attempts (Stein et al., 2010). I relied on the following question: “Prior to radicalization, was subject ever exposed to any traumatic event in which he witnessed an event or events that involve actual or threatened death or serious injury, or a threat to the physical integrity of others, where his response involved intense fear, helplessness, or horror?”. I generated a binary variable coded missing for cases in which the response was unknown (908 cases), 0 = no trauma (206 cases; 63% of valid cases), 1 = trauma (120 cases; 37% of valid cases).

Other individual factors. I tested the effect of a range of characteristics usually included in analyses of profiles of terrorists (Freilich et al., 2019; LaFree et al., 2018): gender, immigrant background, military experience, previous criminal activity, education level and

social stratum (see the detailed coding of socio-demographic variables in the online appendix). I also tested the effect of variables that are specifically susceptible to affect suicidal terrorism according to the literature.

Ideology. Some studies suggested that Islamist ideologies specifically provide beliefs that help reducing the cost of killing and dying in suicide missions (Perry & Hasisi, 2015; Moghadam, 2009). I measured the terrorist's ideology based on a categorical variable coded 0 = far-left (120 cases; 11% of valid cases), 1 = far-right (557 cases; 53% of valid cases), 2 = Islamist (369 cases; 35% of valid cases), and missing otherwise.

Lone. Evidence indicates that lone terrorists have a distinct psychological profile than terrorists affiliated to a group (Gruenewald et al., 2013). Lone terrorists generally display higher prevalence of mental disorders than affiliated terrorists (Corner & Gill, 2015). Lone terrorists are also more likely to be socially isolated than affiliated terrorists (Gruenewald et al., 2013; Capellan, 2015). Besides, previous evidence indicated that lone terrorists are more likely to engage in suicide missions than affiliated terrorists (Gruenewald et al., 2013; Freilich et al., 2019). Hence, it is possible that the suicide risk factors under study related to lone terrorism rather than suicide terrorism. I relied on the following question: “Was the individual in a group?”. I generated a binary variable coded 0 = affiliated terrorist - either member of an above-ground political movement or activist group, an informal group of fellow extremists or a formal extremist organization or an extremist movement (932 cases; 76% of valid cases), 1 = lone actor (302 cases; 24% of valid cases).

Empirical strategy. I conducted statistical analyses in three ascendent steps, due to the small size of the sample of suicide terrorists. I firstly focused on bivariate analyses. Second, I computed multivariate logistic regression analyses to test the effect of each significant suicide risk factor, controlling for the other factors that were significant in bivariate analyses. Third, I relied on Bayesian Model Averaging in order to compare the explanatory power of suicide risk factors to other factors⁴. This method measures the posterior probability for each given regression model (including a given set of independent variables) to be plausible based on the Bayesian information criterion (BIC), in order to account for uncertainty in model specification (Raftery, 1995). This allows to estimate parameters for each independent variable taking into account model uncertainty. The posterior inclusion probability, i.e. the “model-averaged probability of including a certain predictor in the model, given the observations”, is a good

⁴ Analyses were performed using the *BMA* package in R, built upon Raftery's (1995) algorithm.

indicator of the relevance of a given predictor in comparison to others across all possible models (Hinne et al., 2020: 201).

A common limitation of data based on public sources is that the available information varies across cases. The lack of information results in missing values for most variables under study. I excluded observations with missing values by listwise deletion in the bivariate and the first multivariate analyses. This decision is conservative: this eliminates potential biases due to unequal information at the cost of reducing the sample. For other variables - namely child abuse, history of mental illness and history of alcohol/drug abuse - the dataset codes the absence of information in the same category than the absence of trouble. This does not allow distinguishing true zeros (e.g. no child abuse) from false zeros (e.g. no evidence of child abuse but actual child abuse), which may result in bias in the analyses⁵. To mitigate such bias, I tested for the difference in information between suicide and non-suicide terrorists. I computed for each individual the sum of the number of non-missing values for all variables in the database. By dividing this value by the number of variables, I obtained the share of valid values, which is a fair measure of the level of available information about each individual in the database. The mean share of valid values was 0.65 in the database (*s. d.* = 0.16), meaning that on average an individual had 35% of missing values in variables of the PIRUS database.

The handling of missing values becomes more problematic when performing Bayesian Model Averaging and the sensitivity analyses, since such methods include all variables simultaneously. Listwise deletion would result in removing 95% of observations of the analysis because only 5% of individuals in the PIRUS have complete data for all the independent variables under study. For that reason, I relied on a different method to handle missing values, namely regression-based multiple imputation (Rubin, 2004). Such method has already been used by studies using multivariate analyses on the PIRUS dataset (e.g. Jasko et al., 2017, Lafree et al., 2020, Jasko and Lafree, 2020). This method generates multiple datasets in which missing values are replaced with values imputed based on multiple regression models including the other variables as predictors – in order to maximize the information in the dataset to impute the missing values. The different values created for missing values in each dataset reflects the degree of uncertainty in the true value. I created 5 datasets with imputed values using this

⁵ For instance, it is possible that suicide terrorists received more media attention than non-suicide terrorists (see Jetter, 2019), resulting in more available information about them and hence a higher probability that a history of child abuse would be detected among suicide terrorists.

method⁶. I performed Bayesian Model Averaging for each dataset and then pooled and averaged the results.

4.2. Results

Main results. Table 1 presents the distribution of variables across non-suicide and suicide terrorists. Fisher's exact tests revealed that, over the six suicide factors, four are significantly related to suicide terrorism at the 5% threshold. The prevalence of child abuse among suicide terrorist is 20% (4/20), compared to 4% (46/1,214) among non-suicide terrorists ($p = .007$). 35% (7/20) of suicide terrorists have a history of mental illness, compared to 14% (176/1,214) of non-suicide terrorists ($p = .020$). The prevalence of relationship troubles among suicide terrorist is 67% (8/12), compared to 26% (103/389) among non-suicide terrorists ($p = .005$). Finally, 67% (8/12) of suicide terrorists had absent parent/s, compared to 33% (105/321) of non-suicide terrorists ($p = .025$).

[Insert Table 1 around here]

Bivariate tests revealed no significant association between other factors and suicide terrorism. None of the sociodemographic and personal characteristics are significantly different among suicide and non-suicide terrorists. The proportion of individuals who engaged in suicide terrorism does not differ by ideology, $\chi^2_{2,N=1,046} = 3.13, p = .209$. The proportion of lone actors is not significantly higher among suicide terrorists, with a share of 40% (8/20), compared to 24% (294/1,214) among non-suicide terrorists ($p = .117$). Except suicide risk factors, the only factor that is significantly associated with suicide terrorism is the share of valid values. There is a significant higher share of valid values in the PIRUS database for suicide terrorists ($M = 74, s.d. = 20$) compared to non-suicide terrorists ($M = 64, s.d. = 15$), $t(1232) = 2.64, p = .008$.

[Insert Table 2 around here]

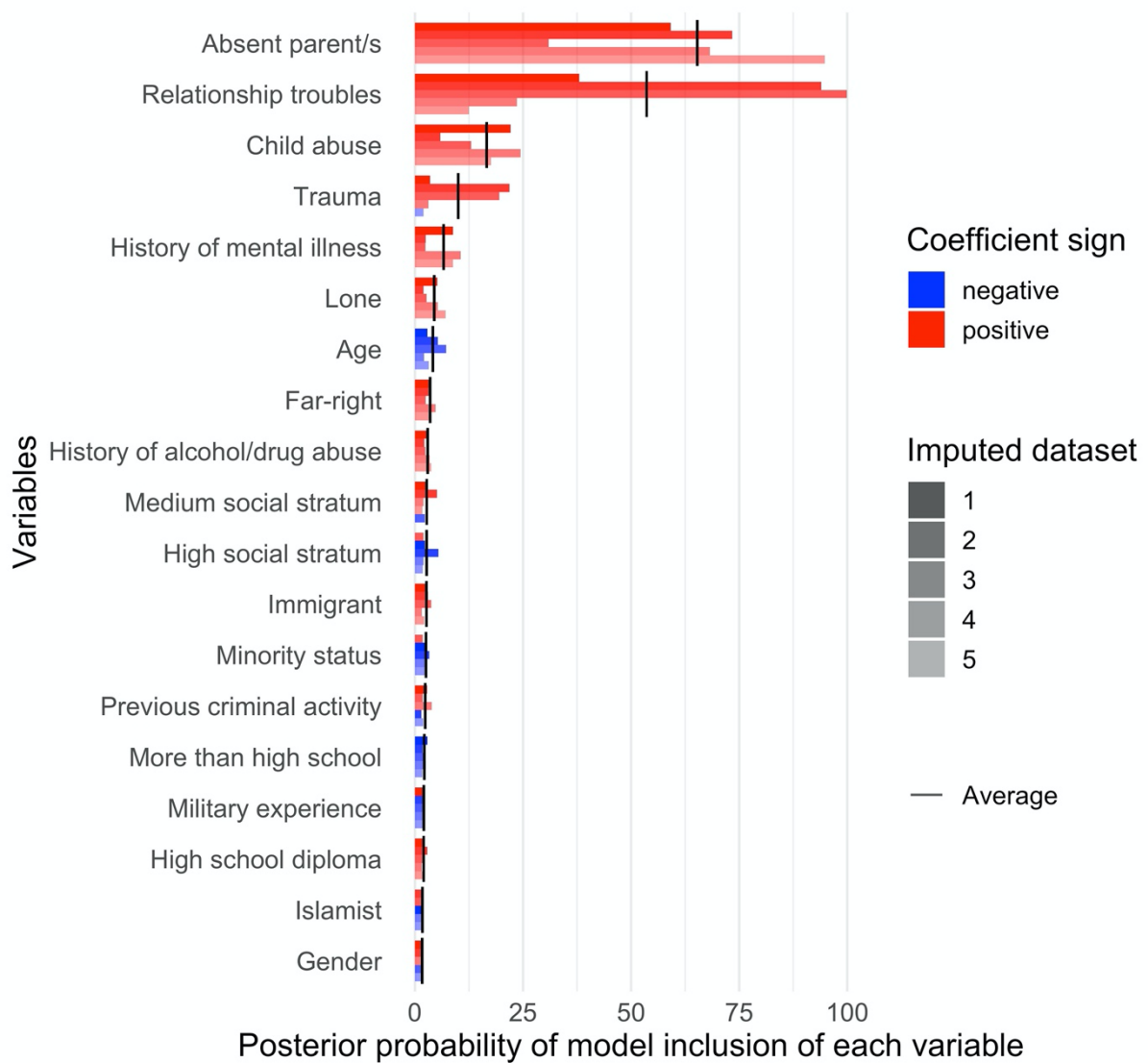
⁶ Analyses were performed using the MICE package in R. I computed the multiple imputation using all variables described in the methods section - including suicide risk factors, other individual factors as well as the output variable (suicide terrorism). Indeed, previous studies advise to use the outcome in the imputation of predictors rather than excluding it (Moons et al., 2006).

I computed logistic regressions of suicide terrorism to test the effect of the four suicide risk factors that were significant in bivariate analyses, controlling for the share of valid values. The estimates are presented in Table 2. Results confirmed that child abuse is significantly related to suicide terrorism. In contrast, history of mental illness is no longer significantly related to suicide terrorism at the 5% threshold when controlling for the share of valid values. This suggests that the higher prevalence of mental illness among suicide terrorists partly reflects the greater available information about them. Finally, results confirmed that suicide terrorists are significantly more likely to have had relationship troubles and experienced absent parenthood.

Figure 1 presents the results from Bayesian Model Averaging based on the multiple imputed datasets. For each independent variable (on the vertical axis), it presents the posterior probability of model inclusion on the horizontal axis (going from 0 to 100%) of the variable in each of the five imputed datasets. The color of the bar represents the sign of the posterior mean of each coefficient (positive sign in red and negative sign in blue). The dark vertical lines represent the posterior probability of model inclusion of each independent variable averaged across the five imputed datasets. The detailed results are provided in the online appendix⁷. Among all the independent variables included, those with the highest posterior probability of model inclusion are suicide risk factors: in descending order, absent parent/s (65.3%), relationship troubles (53.6%), child abuse (16.6%), trauma (10.0%) and history of mental illness (6.6%). Besides, these variables display a positive coefficient (except for trauma in one imputed dataset), in line with the expectations. In contrast, all other variables have a posterior probability of model inclusion inferior to 5.0% - including the other individual factors, and one suicide risk factor, namely history of alcohol/drug abuse. This clearly indicates that on average suicide risk factors outperform the other factors in explaining that for an individual to engage in suicide terrorism. Suicide risk factors (especially absent parent/s and relationship troubles) seem to be the most plausible explanations of suicide terrorism in the data.

Figure 1: Posterior probability of model inclusion of each independent variable from Bayesian Model Averaging, for each imputed dataset, based on logistic regression models predicting suicide terrorism (versus non-suicide terrorism)

⁷ See “Results from Bayesian Model Averaging regarding suicide terrorists”.



Additional analyses. A secondary question is whether suicidal tendency explain not only why individuals directly commit suicide but also why individuals take extreme risks with their life in perpetrating violence. To explore this possibility, I conducted similar analyses on a secondary sample of *near-suicide* terrorists, i.e. individuals who presumably expected to be killed in perpetrating violence. The selection of the near-suicide terrorists' sample is detailed in the online appendix. Fisher's exact tests revealed that, over the six suicide factors, only one is significantly related to near-suicide terrorism (see the detailed bivariate results in the online appendix). The prevalence of child abuse among near-suicide terrorist is 23% (6/26), compared to 3% (40/1,150) among non-suicide terrorists ($p = .000$). Bivariate tests revealed that none of the other factors are significantly related to near-suicide terrorism, except the share of valid values. There is a significant higher share of valid values in the PIRUS database for near-suicide terrorists ($M = 80, s.d. = 12$) compared to non near-suicide terrorists ($M = 64, s.d. = 15$), $t(1174) = 5.27, p = .000$. I computed a logistic regression model to test the

effect of child abuse, controlling for the share of valid values. Results confirmed that child abuse is significantly related to near-suicide terrorism. See the detailed regression results regarding near-suicide terrorism in the online appendix. As for suicide terrorism, I also computed Bayesian Model Averaging based on logistic regression models predicting near-suicide terrorism. The results are detailed in the online appendix⁸. Overall, the variables that have the highest posterior probability of model inclusion are, in descending order: child abuse (94.6%), lone (28.7%), relationship troubles (27.0%), trauma (12.9%) and having completed more than high school - as compared to less than high school (10.79%). Thus, suicide risk factors (especially child abuse) are among the most plausible explanations of near-suicide terrorism, but in contrast to results relative to suicide terrorism, other non-suicide factors are also likely to play a role (such as being a lone actor).

4.3. Discussion

I analyzed whether suicide terrorists are more likely to exhibit established suicidal risk factors than non-suicide terrorists based on a representative sample of domestic terrorists from the United States between 1948 and 2017. Overall, results are consistent with the hypothesis that suicide terrorism is related to common suicidal tendencies. Over the six suicide risk factors under study, three are significantly related with suicide terrorism in a simple model controlling for the difference in available information across cases. Namely, I found that suicide terrorists were more likely to have been abused as children, to have had a history of relationship troubles and to have experienced absent parenthood. In contrast, no significant difference was found on sociodemographic characteristics, previous involvement in violence and crime, ideology and group membership. This indicates that differences in suicide risk factors were not a mere artifact due to confounding factors or samples heterogeneity. Besides, this supports the view that suicide terrorists follow similar patterns of radicalization to non-suicide terrorists, and that the specific decision to commit suicide or non-suicide missions reflects individual differences in suicidal tendencies. Furthermore, results from Bayesian Model Averaging confirm that suicide risk factors outperform other individual factors in explaining suicide terrorism.

The present results must be interpreted in light of the small size of the sample of suicide terrorists. Some differences between suicide terrorists and non-suicide terrorists may have not been detected due to lack of statistical power. This may be true for sociodemographic and personal factors. In this regards, Sabri & Schulze (2020) recently compared the

⁸ See “Results from Bayesian Model Averaging regarding near-suicide terrorists”

sociodemographic profiles of suicide and non-suicide terrorists of the Hamas and Palestinian Islamic Jihad based on a large sample gathering more than 200 suicide terrorists. Their results revealed differences between groups in age, education and familial status.

This consideration may also be true for suicide risk factors. One cannot exclude that non-significant suicide risk factors in the present analysis actually play a role in suicide terrorism. It is worth noticing that even when non-significant, all the suicide risk factors under study were generally related with suicide terrorism in the expected direction. The possibility that suicidal tendencies were undetected in some cases is even more likely as regards to the fact that established suicide risk factors generally have a limited predictive power and that half of suicides occur among people who would be viewed as low risk (Franklin et al., 2017; Large et al., 2017). Symmetrically, the fact that three suicide risk factors were found significant despite low statistical power suggests that suicidal tendencies play a crucial role in suicide terrorism.

A secondary finding was that, over the six suicide risk factors under study, only one - child abuse - was robustly higher among near-suicide terrorists (i.e. who presumably expected to be killed in perpetrating violence). Besides, results from Bayesian Model Averaging show that other individual factors are likely to explain near-suicide terrorism, along with child abuse. On the one hand, this may be interpreted as a confirmation, from a second sample, that suicidal tendencies play a role in suicide terrorism, broadly defined as “the readiness to die in the process of committing a terrorist act” (Freilich et al., 2019). Indeed, among the suicide risk factors under study, child abuse may be considered as one of the most predictive (Franklin et al., 2017; Angelakis et al., 2019). On the other hand, this suggests that suicidal tendencies play a lesser role in the decision to engage in action with readiness of being killed, compared to the decision to directly commit suicide in action. This indicates that there is a difference between knowingly sacrificing one's life and taking risks with one's life - even with a low probability to survive. This may partly explain why Freilich et al. (2019) found limited support for the suicidal hypothesis when analyzing suicide terrorism based on a broad definition.

In addition to the limitations due to low sample size, the empirical analysis does not allow to exclude potential omitted variable bias and is hardly generalizable outside the US case. In particular, one may wonder whether the results are also valid in countries in which suicide terrorism receive a higher support from "constituent" communities (Ginges et al., 2009) and is used by well-implanted terrorist groups (Pape, 2006). To generalize the findings, I analyze in the following section the relationship between cross-national variation in suicide tendencies and variations in suicide and non-suicide terrorist attacks.

5. Cross-Country Evidence: Suicide Rate and Suicide Terrorist Attacks Worldwide (1991-2014)

5.1. Methods

Suicide and non-suicide attacks. I relied on the Global Terrorism Database (GTD) collected by the University of Maryland (National Consortium for the Study of Terrorism and Responses to Terrorism (START), 2017). It is currently the most comprehensive open-source database on all terrorist attacks worldwide since 1970. The GTD includes all violent incidents intentionally perpetrated by sub-national actors to attain a political aim, outside the context of legitimate warfare categories, with the intention to influence a broader audience. Among these terrorist attacks, the GTD identifies suicide attacks as cases in which there is “evidence that the perpetrator did not intend to escape from the attack alive”. I constructed two dependent variables, respectively the number of suicide attacks and the number of non-suicide attacks by country and year according to the GTD.

Suicidal tendencies. I measured the prevalence of suicidal tendencies by country and year by the share of deaths from suicide from the Global Burden of Disease Study (GBD) covering 195 countries from 1990 to 2016 (Global Burden of Disease Collaborative Network, 2018). The GBD is currently the most accurate source for cross-national estimates on deaths from suicide (Naghavi, 2019).

Control variables. I controlled for a range of confounding factors that may affect both the number of suicide and non-suicide attacks, according to research on the cross-national causes of terrorism: the population size, share of discriminated population, level of democracy, regime durability, occurrence of civil war and Gross Domestic Product (GDP). See the online appendix for detailed rationale, sources and descriptive statistics regarding these control variables.

Besides, evidence suggests that Muslim majority countries experience a higher number of suicide terrorist attacks (e.g. Choi & Piazza, 2017). I controlled for the share of Muslim population based on quadrennial estimates from the World Religion Dataset (Maoz & Henderson, 2013). Besides, it has been argued that suicide terrorism is especially used as an asymmetric warfare strategy against foreign military occupation (Pape, 2006), even though evidence on this matter is disputed (Choi & Piazza, 2017; Moghadam, 2006). I generated a

binary variable capturing instances of foreign occupation based on the list of foreign military occupations assembled for the 1950-2013 period by Vishwasrao (2019).

Empirical strategy. The analyzed sample includes 137 countries over the 1991-2014 period⁹. I analyzed the number of suicide and non-suicide attacks by country and year based on negative binomial regression models, the standard method in studies analyzing counts of terrorist attacks, characterized by overdispersion. To compare the effects of the independent variables on the number of suicide attacks and the number of non-suicide attacks, I computed the same models on both dependent variables. I tested a main model including all independent variables, and a second model including country and year fixed effects to control for potential unmeasured national and historical factors. To infer causality, the independent variables were one-year lagged. Finally, as in the individual-level analysis, I performed Bayesian Model Averaging in order to compare the explanatory power of suicide rate in contrast to the other independent variables. I relied on logistical regressions for this method¹⁰: the dependent variables being binary – a positive value indicating the occurrence of one or multiple suicide (or non-suicide) attack(s) in a country during a given year, and a null value indicating the absence of such attack(s).

5.2. Results

General comments. The GTD recorded a total of 1,634 suicide attacks (2,5% of all attacks) and 63,200 non-suicide attacks in the sample¹¹. Both suicide and non-suicide attacks were concentrated in specific countries. Iraq experienced in 2014 both the higher number of suicide attacks (236) and non-suicide attacks (3,133). In contrast, 93% of countries did not experienced any suicide attacks during a given year (44% for non-suicide attacks). A Spearman correlation indicated that the number of suicide and non-suicide attacks were significantly related, $\rho = 0.31, p = .000$.

⁹ The lower limit of the study period is due on the lack of data on the share of deaths from suicide before 1990.

¹⁰ The primary reason is that, to my knowledge, there is currently no package allowing to perform Bayesian Model Averaging on negative binomial regressions in R or Stata. This also provides a robustness check since the use of logistic regressions to analyze the occurrence of terrorist attack(s) is not uncommon in the literature (e.g. Kurrild-Klitgaard et al., 2006; Choi and Piazza, 2016).

¹¹ The sample excluded Afghanistan due to lack of data about the level of democracy. Afghanistan experienced a high number of suicide attacks (731) and non-suicide attacks (5,786) in the study period. The inclusion of Afghanistan raised the total number of suicide attacks to 2,365. I computed the analyses including Afghanistan in the sample - excluding the democracy variable. The results were unchanged. Results can be sent by the author upon request.

Main results. Table 3 presents results from regression models. The dependent variable is the number of suicide attacks in models (1) and (2). Results from model (1) indicate that the share of deaths from suicide is positively and significantly related to the number of suicide attacks. The effect of the share of deaths from suicide is still significant in model (2) including country and year fixed effects. Models (3) and (4) are the same than models (1) and (2) except that the dependent variable is the number of non-suicide attacks. Results from model (3) indicate that the share of deaths from suicide is not significantly related to the number of non-suicide terrorist attacks. The coefficient is still insignificant in model (4) including country and year fixed effects¹².

[Insert Table 3 around here]

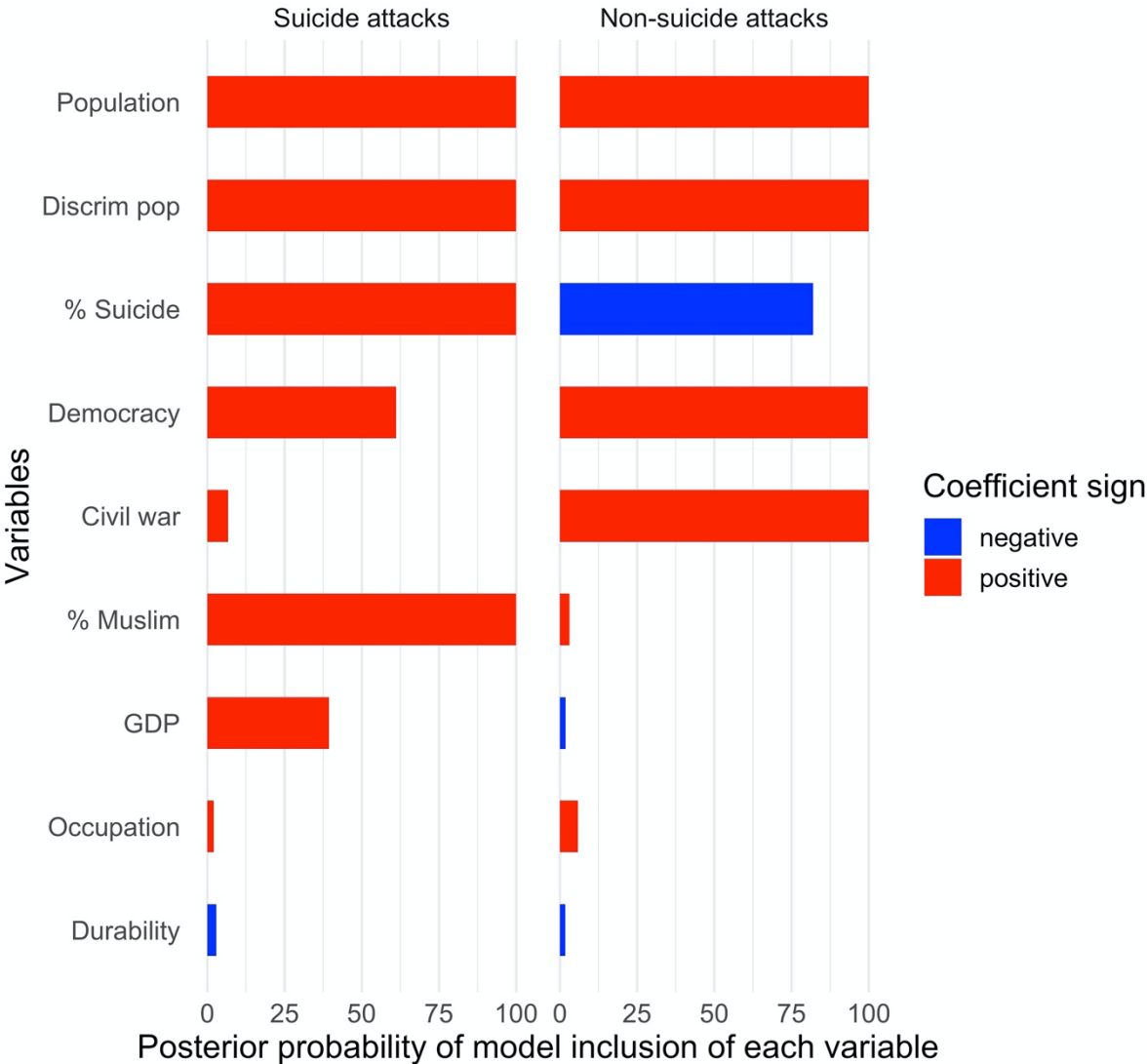
Control variables. Although statistical significance is not achieved in all models, coefficients of the control variables are in the expected direction when significant. Overall, results suggest that the incidences of suicide and non-suicide attacks are higher in populated, rich, democratic countries with young institutions, high level of discrimination and which experience a civil war. Besides, the share of Muslim population is positively related to both the number of suicide and non-suicide attacks. Finally, in contradiction with the view that suicide attacks are specifically used against foreign occupation (Pape, 2006), results indicate that occupied countries experience significantly more non-suicide attacks but do not experience more suicide attacks.

Bayesian Model Averaging. Figure 2 presents the results from Bayesian Model Averaging of logistic regressions predicting the occurrence of suicide attack(s) (on the left) and non-suicide attack(s) (on the right). As in the individual level analysis, Figure 2 presents the posterior probability of model inclusion of each independent variable, and the color of the bar represents the sign of the posterior mean of each coefficient. The detailed results are provided in the online appendix. Results show that the population size and the share of discriminated population have a maximal probability (100%) of model inclusion for predicting both suicide and non-suicide terrorism. Both the suicide rate and the share of Muslim population have a

¹² The number of observations is lower in models (2) and (4) because they exclude countries which experienced no suicide attacks in the study period. Indeed, these cases were perfectly predicted by the country fixed effects in model (2). To ensure sample comparability between model (2) and (4), These cases were also excluded from the sample analyzed in model (4). The conclusions were unchanged when including these countries in model (4). Results can be sent by the author upon request.

maximal posterior probability of model inclusion to explain suicide terrorism, but not non-suicide terrorism. The suicide rate has a high posterior probability (82.0%) of model inclusion to predict non-suicide terrorism, but the posterior mean coefficient has a negative sign. This indicates that the suicide rate is consistently and positively associated with the occurrence of suicide attack(s), but is somehow negatively related to the occurrence of non-suicide attack(s). The GDP also has a higher posterior probability of model inclusion to explain suicide attack(s) than non-suicide attack(s). On the other hand, the level of democracy and the occurrence of a civil have a maximal posterior probability of model inclusion regarding the explanation of non-suicide attack(s) but not of suicide attack(s).

Figure 2: Posterior probability of model inclusion of each independent variable from Bayesian Model Averaging, for each imputed dataset, based on logistic regression models predicting the occurrence of terrorist attack(s)



Robustness checks. I tested the same regression models than those presented in Table 3 with the share of depression as an alternative measure of suicidal tendencies. I used estimates of the age-standardized prevalence of depressive disorders (Global Burden of Disease Collaborative Network, 2018). The share of depression only imperfectly correlate with the share of deaths from suicide in the sample, $r(2971) = 0.10, p = .000$. Hence the share of depression is not redundant with the share of deaths from suicide. Estimates from negative binomial regression analyses including the share of depression instead of the share of deaths from suicide converge with previous results (see the detailed regression results in the online appendix). The share of depression is positively and significantly related to the number of suicide attacks. In contrast, the share of depression is not significantly related to the number of non-suicide attacks.

I tested whether the effect of the share of deaths from suicide is found before and after 2001 (see the detailed regression results in the online appendix). Results confirmed that the share of deaths from suicide is significantly related to the number of suicide attacks both before and after 2001. In contrast, the share of deaths from suicide is not significantly related to the number of non-suicide attacks both before and after 2001. Finally, I tested linear regression models on the number of (suicide and non-suicide) terrorist attacks per capita – an alternative measure of terrorist activity that captures people’s actual probability to face terrorism (Jetter & Stadelmann, 2019). I tested models with similar specification than those presented in Table 3. The detailed results are presented in the online appendix. The suicide rate has no significant effect on the number of suicide attacks per capita in the first model but has a significant positive effect in the full model including country and year fixed effects. As expected, the suicide rate has no significant effect on the number of non-suicide attacks per capita, in both models with and without country and year fixed effects. In sum, the results are moderately robust.

5.3.Discussion

I analyzed the cross-national associations between the share of deaths from suicide and the number of suicide and non-suicide terrorist attacks. I found that countries with higher share of deaths from suicide experience significantly more suicide terrorist attacks but a similar number of non-suicide attacks. These results support the hypothesis that suicidal tendencies play a role in suicide terrorism.

However, results of the cross-country analysis are less clearcut than the individual level analysis when it comes to comparing the suicide rate with other factors in explaining the number of suicide versus non-suicide terrorist attacks using Bayesian Model Averaging. On the one hand, as expected, the suicide rate displays the most contrasted effect: it is consistently positively associated with suicide attacks, while it is not associated or even negatively related to non-suicide terrorism. This may suggest that the number of non-suicide terrorist attacks is lower in countries with high suicidal tendencies because potential terrorists perpetrate suicide rather than non-suicide missions. On the other hand, Bayesian Model Averaging shows that some factors other than the suicide rate differentially explain suicide and non-suicide terrorism. In particular, countries with a large proportion of Muslim and rich countries seem to be associated with a higher probability of experiencing suicide attack(s), while countries that endure a civil war and democratic countries seem to be associated with a higher probability of experiencing non-suicide attack(s). These results indicate that factors other than suicidal tendencies also enter the explanation of suicide terrorism. This do necessarily contradict the suicidal hypothesis, as these factors may play a role at the organizational or societal levels, while suicidal tendencies may be a key factor at the individual level. For instance, it is possible that religious discourses offering a justification for martyrdom make suicidal individuals more likely to be involved in suicide terrorism, while suicidal individuals would rather resort to “normal” suicide in countries in which such discourses are not widespread. Besides, one may think that relatively poor countries and countries facing civil wars are more prone to produce non-suicide as compared to suicide attacks because they are more affected by “greedy” forms of political violence in which insurgents are primarily motivated by material gains rather than grievances (Collier & Hoeffler, 2004). Suicidal tendencies are likely to play a lesser role in such conflicts because suicidal individuals should be not interested in sacrificing for material gains, while they may be interested in advancing their political cause. Yet, one cannot exclude from the cross-country analysis alone that such factors play a role through affecting the perpetrators’ intrinsic motivations.

The cross-country analysis has several limitations. Firstly, although the analysis includes controls from the literature on cross-national determinants on terrorism, omitted-variable bias cannot be excluded. Besides, the number of terrorist attacks in a country is not a direct measure of the number of terrorists from this country. Unfortunately, there is no systematic data on the number of terrorists worldwide. It is yet reasonable to assume that the number of terrorist attacks depends on the number of terrorists, and previous studies usually

relied on the number of attacks to test hypotheses about terrorist mobilization (e.g. Krueger, 2017).

Another concern is that estimates of the share of deaths from suicide could be unequally reliable across countries. Even though the GBD addressed cross-national variation in data quality through a range of correction (see Naghavi, 2019), one cannot exclude that suicide reporting practices differ across countries in correlation with reporting biases in the counting of terrorist attacks. However, this should not significantly alter the present conclusions. Firstly, I see no reason why suicide attacks in particular, but not non-suicide attacks, would be more systematically reported in countries that more systematically report deaths from suicide. Besides, results revealed that the effect of the share of deaths from suicide is still significant when including country fixed effects. This indicates that, putting aside the mean variations between countries, the share of deaths from suicide predicts longitudinal variations across countries in the number of suicide attacks. Finally, the share of depression offered an alternative measure of suicidal tendencies.

Overall, one cannot conclude from the cross-country analysis alone that suicide terrorists are suicidal. Such macro associations may always reflect some ecological fallacy. But given existing micro evidence presented in the individual level analysis and existing evidence from different geographical locations (Merari et al., 2009; Speckhard & Ahkmedova, 2006; Lankford, 2013b), it is likely that this macro association reflects the fact that suicide terrorists are suicidal.

6. General Discussion

The hypothesis that suicide terrorists are suicidal has stimulated passionate opposition (Sela & Shackelford, 2014; Atran, 2014; McCauley, 2014). Among its detractors, Atran (2014) argued that the suicidal hypothesis is a symptom of fundamental attribution error, i.e. the common human tendency to attribute others' behavior to psychological causes and to attribute one's behavior to external causes. Scholars who disregard the suicidal hypothesis may be subject to non-less common human tendency: base rate fallacy, i.e. focusing on specific cases and ignoring base rates (Kahneman & Tversky, 1972). Around 1.6% of the US population dies from suicide (Naghavi, 2019). Among US domestic terrorists, the exact same proportion committed suicide in perpetrating violence. Hence, suicide terrorism may be no more than the statistical conjunction of suicide and terrorism.

Detractors of the suicidal hypothesis overlook the base rate of suicides. In doing so, they exclude that suicidal individuals may fight for a political cause. In fact, most individuals who will eventually commit suicide display normal social and clinical characteristics (Large et al., 2017). Suicidal individuals, as all humans, may have altruistic motives and believe in a political cause. Then, is there a more meaningful way to commit suicide than through advancing one's political cause? Since 1993, around 200 Palestinians died in perpetrating suicide bombings to fight Israeli occupation (Sabri & Schulze, 2020; Johnston, 2018). Over the same period, it can be estimated that 4,000 Palestinians died from common suicides¹³. Thus, if 5% of Palestinians who were to commit suicide anyway did it through suicide bombings against Israeli occupation, this would account for Palestinians suicide bombings over this period. Is this proportion unrealistic, given that a majority of the Palestinian population supports the use of suicide attacks (Kohut & Bell, 2013)?

This paper offers new micro and macro evidence supportive of the hypothesis that suicide terrorists are suicidal (Lankford, 2013a,b; Merari et al., 2009). These results are in contradiction with the foremost explanation of suicide terrorism as driven by altruistic devotion to the group (Atran, 2016; Pape, 2006; Swann et al., 2012; Whitehouse, 2018; Ginges et al., 2009). The present results do not indicate that suicide terrorists are *not* altruistic *at all*. Suicide terrorists are not suicidal individuals who randomly perpetrate violence. A simple look at the geographical and historical concentration of suicide attacks shows that suicidal tendencies do not randomly translate into suicide terrorism. Results from the cross-country analysis confirm that suicide attacks are related to a range of contextual causes other than the suicide rate. Hence, the present results do not contradict the view that altruism, as well as other factors, play a role in suicide terrorism. However, the results suggest that the difference between suicide and non-suicide terrorists regarding the perpetrator's intrinsic motivation may be simply explained by variations in suicidal tendencies.

The suicidal hypothesis has a main analytical advantage as compared to the altruistic hypothesis: it explains why suicide terrorism is an extremely rare phenomenon. As state by Victoroff: "approximately 0.00024% of Saudis were documented to have become suicide bombers in Iraq. Any theory of suicide terrorism must account for this observation" (2009, 397). The altruistic hypothesis states that sacrificial tendencies for the group are a human

¹³ This estimation is based on applying the GBD estimated yearly suicide rate of West Bank and Gaza to its population since 1993 to 2019 - with simple application of the 2016 suicide rate for the 2017-2019 period. With a mean estimated suicide rate of 4.5 per 100,000 inhabitants, West Bank and Gaza range among countries with the lowest suicide rates in the world.

universal, i.e. a potential residing among all humans (Whitehouse, 2018; Whitehouse et al., 2017; Atran, 2016). The invocation of a universal does a poor job in explaining why the behavior under study is extremely rare. In contrast, the suicidal hypothesis explains the extreme rarity of suicide terrorism as the simple statistical conjunction of two relatively rare phenomena: suicide and terrorism.

Besides being empirically and analytically grounded, the suicidal hypothesis is parsimonious. Put simply, suicide terrorism is the conjunction of suicide and terrorism. Both phenomena are well documented and relatively under control for standard theories of human behavior. In contrast, the altruistic hypothesis encompasses a deep reconsideration of existing conceptions of humans, as basically interested in their preservation and not willing to sacrifice for non-kin relatives. It is not to say that existing conceptions should never be reconsidered. But such reconsideration should only be made in case of well-documented contradictory evidence. Evidence about suicide terrorism seems neither well-documented nor contradictory enough to justify such reconsideration. In sum, suicide terrorism may well be a case of over-theorization based on fragmentary data.

Future research avenues and policy implications

One remaining question concerns the process by which suicidal individuals eventually engage in suicide terrorism. There are several options: i) suicidal individuals are more likely to self-select into terrorist groups, ii) terrorist groups screen potential candidates and are more likely to select individuals with suicidal tendencies, iii) there is no difference in the selection of terrorists according to suicidal tendencies, but once they have joined terrorist groups, suicidal individuals are more likely to engage in suicide attacks, while others engage in other activities (non-suicide attacks, logistics, communication, etc.). The present research does not directly allow to disentangle these different mechanisms. At a first look, the last option seems more likely as there does not seem to be a strong over-representation of suicidal individuals among terrorists. As already mentioned, the proportion of American domestic terrorists who committed suicide in mission is the same as the share of deaths from suicides among American citizens. Worldwide, the proportion of suicide missions over all terrorist attacks (around 2.5%) is a bit higher than the average proportion of deaths from suicide (around 1.5% according to Naghavi, 2019), which may indicate some selection effect. Regarding the second option in particular, various studies highlight that terrorist groups engage in screening of potential recruits. They suggest that organizations are mostly looking for educated and skilled recruits (De Mesquita, 2005, Benmelech et al., 2012). Yet, there may be cases in which suicidal tendencies may even be indirectly screened among candidates. Al-Qaeda seems to have been, at least at its

beginnings, a highly selective terrorist organization. According to Sageman (2011: 166), only 10 to 30% of those trained in the organization's camps were eventually invited to join the jihad. The Al-Qaeda training manual, found by the Manchester Metropolitan Police in 2000, offers insight on the qualities screened among new recruits. In the document, one of the first qualifications for members – following “Islam”, “Commitment” and “Maturity” – is “Sacrifice”: the member “has to be willing to do the work and undergo martyrdom for the purpose of achieving the goal and establishing the religion of majestic Allah on earth” (Al-Qaeda, 2000). This suggests that willingness to commit self-sacrifice was expressly looked after by the organization when recruiting individuals, which may indirectly select individuals with suicidal tendencies. However, more research would be needed to assess the relative importance of such a selection mechanism across terrorist groups.

How can the results inform counter-terrorist policies? Firstly, the present study suggests that efforts to fight against group-level indoctrination and individual receptivity to terrorist propaganda may be of little use to tackle the specific issue of suicide terrorism. In Western countries, following the recent waves of terrorist attacks, large resources have been dedicated to prevention programs based on literacy and critical thinking to counter violent radicalization (Lombardi et al., 2014, Radicalization Awareness Network, 2019). The results of the present study do not allow to gauge the efficiency of such policies to fight terrorism in general, but they suggest that these initiatives are unlikely to affect the individual decision to commit suicide missions, since this decision seems to be related to individual dispositions to suicidality rather than ideological commitment. The present study suggests that policies should tackle, on the one hand, common causes of terrorism – such as group-based discriminations –, and on the other hand, common causes of suicides, rather than fighting extreme indoctrination. Secondly, the public debate would probably benefit from a demystification of “martyrdom” (see Lankford, 2013b). Currently, suicide attacks draw significantly more media attention than non-suicide attacks (Jetter, 2019). Indeed, suicide attacks convey a strong signal of irrationality and extreme devotion to the cause, which result in a “threat that, to most observers, appears to be impossible to deter or defend against” (Hoffman & McCormick, 2004: 250). Such newsworthiness is precisely what terrorists look for. There is evidence that the larger the media attention devoted to a terrorist attack, the higher the likelihood of future attacks (Jetter, 2017). Conveying the information that suicide terrorism is related to common suicidal tendencies rather than to extreme devotion to a group may help reducing the psychological impact of suicide terrorist attacks among targeted populations as well as the prestige associated with it among followers, and eventually reduce the incentive for organizations to resort to such tactics.

Data availability statement

The data that support the findings are available from the University of Maryland. Restrictions apply to the republication of these data, which were used under license for this study. Data are available at <https://www.start.umd.edu/data-tools/profiles-individual-radicalization-united-states-pirus> for the individual-level study and <https://www.start.umd.edu/gtd/contact/download> for the cross-country study with the permission of the University of Maryland.

References

- Adams, D. M., & Overholser, J. C. (1992). Suicidal behavior and history of substance abuse. *The American journal of drug and alcohol abuse*, 18, 343–354.
- Al-Qaeda (2000). *Training Manual*. Translation by the United States Department of Justice. Available at: https://irp.fas.org/world/para/manualpart1_1.pdf
- Angelakis, I., Gillespie, E. L., & Panagioti, M. (2019). Childhood maltreatment and adult suicidality: A comprehensive systematic review with meta-analysis. *Psychological medicine*, 49, 1057–1078.
- Atran, S. (2003). Genesis of suicide terrorism. *Science*, 299, 1534–1539.
- Atran, S. (2014). Martyrdom's would-be myth buster. *Behavioral and Brain Sciences*, 37, 362–363.
- Atran, S. (2016). The Devoted Actor: Unconditional Commitment and Intractable Conflict across Cultures. *Current Anthropology*, 57, S192–S203.
- Benmelech, E., Berrebi, C., & Klor, E. F. (2012). Economic conditions and the quality of suicide terrorism. *The Journal of Politics*, 74(1), 113–128.
- Brown, R. M., Brown, S. L., Johnson, A., Olsen, B., Melder, K., & Sullivan, M. (2009). Empirical support for an evolutionary model of self-destructive motivation. *Suicide and Life-Threatening Behavior*, 39, 1–12.
- Bruffaerts, R., Demyttenaere, K., Borges, G., Haro, J. M., Chiu, W. T., Hwang, I., Karam, E. G., Kessler, R. C., Sampson, N., & Alonso, J. (2010). Childhood adversities as risk factors for onset and persistence of suicidal behaviour. *The British journal of psychiatry*, 197, 20–27.
- Brym, R. J., & Araj, B. (2012a). Are suicide bombers suicidal? *Studies in Conflict & Terrorism*, 35, 432–443.
- Brym, R. J., & Araj, B. (2012b). Suicidality and suicide bombing revisited: A rejoinder to Merari. *Studies in Conflict & Terrorism*, 35, 733–739.
- Calati, R., Ferrari, C., Brittner, M., Oasi, O., Olfe, E., Carvalho, A. F., & Courtet, P. (2019). Suicidal thoughts and behaviors and social isolation: A narrative review of the literature. *Journal of affective disorders*, 245, 653–667.

- Capellan, J. A. (2015). Lone wolf terrorist or deranged shooter? A study of ideological active shooter events in the United States, 1970–2014. *Studies in Conflict & Terrorism*, 38, 395–413.
- Cavanagh, J. T., Carson, A. J., Sharpe, M., & Lawrie, S. M. (2003). Psychological autopsy studies of suicide: A systematic review. *Psychological medicine*, 33, 395–405.
- Choi, J.-K., & Bowles, S. (2007). The coevolution of parochial altruism and war. *Science*, 318, 636–640.
- Choi, S. W., & Piazza, J. A. (2016). Ethnic groups, political exclusion and domestic terrorism. *Defence and Peace Economics*, 27(1), 37-63.
- Choi, S.-W., & Piazza, J. A. (2017). Foreign military interventions and suicide attacks. *Journal of Conflict Resolution*, 61, 271–297.
- Collard-Wexler, S., Pischedda, C., & Smith, M. G. (2014). Do foreign occupations cause suicide attacks? *Journal of Conflict Resolution*, 58, 625–657.
- Collier, P., & Hoeffler, A. (2004). Greed and grievance in civil war. *Oxford economic papers*, 56(4), 563-595.
- Corner, E., & Gill, P. (2015). A false dichotomy? Mental illness and lone-actor terrorism. *Law and Human Behavior*, 39, 23.
- De Mesquita, E. B. (2005). The quality of terror. *American journal of political science*, 49(3), 515-530.
- Dube, S. R., Anda, R. F., Felitti, V. J., Chapman, D. P., Williamson, D. F., & Giles, W. H. (2001). Childhood abuse, household dysfunction, and the risk of attempted suicide throughout the life span: Findings from the Adverse Childhood Experiences Study. *Jama*, 286, 3089–3096.
- Franklin, J. C., Ribeiro, J. D., Fox, K. R., Bentley, K. H., Kleiman, E. M., Huang, X., Musacchio, K. M., Jaroszewski, A. C., Chang, B. P., & Nock, M. K. (2017). Risk factors for suicidal thoughts and behaviors: A meta-analysis of 50 years of research. *Psychological bulletin*, 143, 187.
- Freilich, J. D., Parkin, W. S., Gruenewald, J., & Chermak, S. M. (2019). Comparing extremist perpetrators of suicide and non-suicide attacks in the United States. *Terrorism and political violence*, 31, 943–965.
- Ginges, J., Hansen, I., & Norenzayan, A. (2009). Religion and Support for Suicide Attacks. *Psychological Science*, 20, 224–230.

- Global Burden of Disease Collaborative Network (2018). *Global Burden of Disease Study 2017 (GBD 2017) Results*. <http://ghdx.healthdata.org/gbd-results-tool>.
- Gruenewald, J., Chermak, S., & Freilich, J. D. (2013). Distinguishing “loner” attacks from other domestic extremist violence: A comparison of far-right homicide incident and offender characteristics. *Criminology & Public Policy*, 12, 65–91.
- Hamermesh, D. S., & Soss, N. M. (1974). An Economic Theory of Suicide. *Journal of Political Economy*, 82, 83–98.
- Hinne, M., Gronau, Q. F., van den Bergh, D., & Wagenmakers, E. J. (2020). A conceptual introduction to Bayesian model averaging. *Advances in Methods and Practices in Psychological Science*, 3(2), 200-215.
- Hoffman, B., & McCormick, G. H. (2004). Terrorism, signaling, and suicide attack. *Studies in Conflict & Terrorism*, 27(4), 243-281.
- Jasko, K., LaFree, G., & Kruglanski, A. (2017). Quest for significance and violent extremism: The case of domestic radicalization. *Political Psychology*, 38(5), 815-831.
- Jasko, K., & LaFree, G. (2020). Who is more violent in extremist groups? A comparison of leaders and followers. *Aggressive behavior*, 46(2), 141-150.
- Jetter, M. (2017). The effect of media attention on terrorism. *Journal of Public Economics*, 153, 32-48.
- Jetter, M. (2019). More bang for the buck: Media coverage of suicide attacks. *Terrorism and political violence*, 31(4), 779-799.
- Jetter, M., & Stadelmann, D. (2019). Terror per capita. *Southern Economic Journal*, 86(1), 286-304.
- Johnston, W. R. (2018). *Chronology of Terrorist Attacks in Israel*. <http://www.johnstonsarchive.net/terrorism/terrIsrael.html>.
- Kahneman, D., & Tversky, A. (1972). Subjective probability: A judgment of representativeness. *Cognitive Psychology*, 3, 430–454.
- Kohut, A., & Bell, J. (2013). *Muslim Publics Share Concerns about Extremist Groups*. Technical Report Pew Research Center.
- Krueger, A. B. (2017). *What Makes a Terrorist*. Princeton and Oxford: Princeton University Press.

- Kurrild-Klitgaard, P., Justesen, M. K., & Klemmensen, R. (2006). The political economy of freedom, democracy and transnational terrorism. *Public Choice*, 128(1), 289-315.
- LaFree, G., Jensen, M. A., James, P. A., & Safer-Lichtenstein, A. (2018). Correlates of violent political extremism in the United States. *Criminology*, 56, 233–268.
- Lankford, A. (2013a). A comparative analysis of suicide terrorists and rampage, workplace, and school shooters in the United States from 1990 to 2010. *Homicide studies*, 17, 255–274.
- Lankford, A. (2013b). *The Myth of Martyrdom: What Really Drives Suicide Bombers, Rampage Shooters, and Other Self-Destructive Killers*. New York: St. Martin's Press.
- Lankford, A. (2018). A psychological re-examination of mental health problems among the 9/11 terrorists. *Studies in Conflict & Terrorism*, 41, 875–898.
- Large, M. M., Ryan, C. J., Carter, G., & Kapur, N. (2017). Can we usefully stratify patients according to suicide risk? *BMJ*, 359, j4627.
- Lombardi, M., Ragab, E., & Chin, V. (Eds.). (2014). *Countering radicalisation and violent extremism among youth to prevent terrorism* (Vol. 118). IOS Press.
- Maoz, Z., & Henderson, E. A. (2013). The world religion dataset, 1945–2010: Logic, estimates, and trends. *International Interactions*, 39, 265–291.
- Maynard Smith, J. (1976). Group selection. *The Quarterly Review of Biology*, 51, 277–283.
- McCauley, C. (2014). How many suicide terrorists are suicidal? *Behavioral and brain sciences*, 37, 373–374.
- Merari, A. (2010). *Driven to Death: Psychological and Social Aspects of Suicide Terrorism*. Oxford: Oxford University Press.
- Merari, A., Diamant, I., Bibi, A., Broshi, Y., & Zakin, G. (2009). Personality characteristics of “self martyrs”/“suicide bombers” and organizers of suicide attacks. *Terrorism and Political Violence*, 22, 87–101.
- Moghadam, A. (2006). Suicide terrorism, occupation, and the globalization of martyrdom: A critique of Dying to Win. *Studies in Conflict & Terrorism*, 29, 707–729.
- Moghadam, A. (2009). Motives for Martyrdom: Al-Qaida, Salafi Jihad, and the Spread of Suicide Attacks. *International Security*, 33, 46–78.

- Moons, K. G., Donders, R. A., Stijnen, T., & Harrell Jr, F. E. (2006). Using the outcome for imputation of missing predictor values was preferred. *Journal of clinical epidemiology*, 59(10), 1092-1101.
- Naghavi, M. (2019). Global, regional, and national burden of suicide mortality 1990 to 2016: Systematic analysis for the Global Burden of Disease Study 2016. *BMJ*, 364.
- National Consortium for the Study of Terrorism and Responses to Terrorism (START) (2017). *Global Terrorism Database*. <http://www.start.umd.edu/gtd/>.
- National Consortium for the Study of Terrorism and Responses to Terrorism (START) (2018). *Profiles of Individual Radicalization in the United States (PIRUS)*. <http://www.start.umd.edu/data-tools/profiles-individual-radicalization-united-states-pirus>.
- Nock, M. K., Borges, G., Bromet, E. J., Alonso, J., Angermeyer, M., Beautrais, A., Bruffaerts, R., Chiu, W. T., De Girolamo, G., & Gluzman, S. (2008). Cross-national prevalence and risk factors for suicidal ideation, plans and attempts. *The British Journal of Psychiatry*, 192, 98–105.
- Pape, R. A. (2006). *Dying to Win: The Strategic Logic of Suicide Terrorism*. New York: Random House.
- Perry, S., & Hasisi, B. (2015). Rational Choice Rewards and the Jihadist Suicide Bomber. *Terrorism and Political Violence*, 27, 53–80.
- Radicalization Awareness Network (2019). *Education and radicalisation prevention: Different ways governments can support schools and teachers in preventing/countering violent extremism*. Ex post paper, 6.
- Raftery, A. E. (1995). Bayesian model selection in social research. *Sociological methodology*, 111-163.
- Rubin, D. B. (2004). *Multiple imputation for nonresponse in surveys* (Vol. 81). John Wiley & Sons.
- Sageman, M. (2011). *Leaderless jihad: Terror networks in the twenty-first century*. University of Pennsylvania Press.
- Sabri, A., & Schulze, G. G. (2020). Are suicide terrorists different from ‘regular militants’? *Public Choice*.

- Sela, Y., & Shackelford, T. K. (2014). The myth of the myth of martyrdom. *Behavioral and Brain Sciences*, 37, 376–377.
- Speckhard, A., & Ahkmedova, K. (2006). The Making of a Martyr: Chechen Suicide Terrorism. *Studies in Conflict & Terrorism*, 29, 429–492.
- Stein, D. J., Chiu, W. T., Hwang, I., Kessler, R. C., Sampson, N., Alonso, J., Borges, G., Bromet, E., Bruffaerts, R., & De Girolamo, G. (2010). Cross-national analysis of the associations between traumatic events and suicidal behavior: Findings from the WHO World Mental Health Surveys. *PloS one*, 5.
- Swann, W. B., Jetten, J., Gómez, A., Whitehouse, H., & Bastian, B. (2012). When group membership gets personal: A theory of identity fusion. *Psychological review*, 119, 441.
- Victoroff, J. (2009). Suicide terrorism and the biology of significance. *Political Psychology*, 30, 397–400.
- Vishwasrao, S., Schneider, M., & Chiang, E. P. (2019). The Effects of Military Occupation on Growth. *Kyklos*, 72, 183–207.
- Whitehouse, H. (2018). Dying for the group: Towards a general theory of extreme self-sacrifice. *Behavioral and Brain Sciences*, 41.
- Whitehouse, H., Jong, J., Buhrmester, M. D., Gómez, A., Bastian, B., Kavanagh, C. M., Newson, M., Matthews, M., Lanman, J. A., & McKay, R. (2017). The evolution of extreme cooperation via shared dysphoric experiences. *Scientific Reports*, 7, 44292.

Tables

Table 1: Distribution of variables across non-suicide and suicide terrorists and bivariate statistical tests

	Non-suicide (N=1,214)	Suicide (N=20)	p-value
Suicide risk factors			
Child abuse	4%	20%	.007
History of mental illness	14%	35%	.020
Relationship troubles	26%	67%	.005
Absent parent/s	33%	67%	.025
History of alcohol/drug abuse	13%	25%	.170
Trauma	36%	50%	.472
Other factors			
Mean age (s.d.)	33 (13)	30 (12)	.461
Gender	93%	95%	1.000
Minority status	40%	28%	.344
Immigrant	13%	17%	.721
Military experience	16%	19%	.730
Previous criminal activity	46%	56%	.453
Education			.532
Less than high school	16%	22%	
High school diploma	26%	33%	
More than high school	58%	44%	
Social stratum			.907
Low	8%	7%	
Medium	62%	57%	
High	30%	36%	
Ideology			.209
Far-left	12%	0%	
Far-right	53%	68%	
Islamist	35%	32%	
Lone	24%	40%	.117
Mean share of valid values (s.d.)	64 (15)	74 (20)	.008

Notes. Sample size varies across variables. P-values < .05 in bold. P-values are based on Fisher's exact test (two-tailed) for binary variables, chi2 test for education, social stratum and ideology, and t-test (two-tailed) for age and share of valid values.

Table 2: Odds ratios from logistic regression analyses of suicide terrorism (versus non-suicide terrorism)

	(1)	(2)	(3)	(4)
Child abuse	4.143* (2.525)			
History of mental illness		2.390+ (1.172)		
Relationship troubles			5.425** (3.403)	
Absent parent/s				4.037* (2.548)
Share of valid values	1.032* (0.0162)	1.034* (0.0162)	1.055* (0.0288)	1.087* (0.0383)
Observations	1234	1234	401	333
Pseudo R-squared	0.0553	0.0481	0.117	0.125

Standard errors in parentheses
+ p<0.10,* p<0.05,** p<0.01,*** p<0.001
Sample size varies across models due to listwise deletion

Table 3: Unstandardized coefficients from negative binomial analyses of the number of terrorist attacks

Dependent variable	(1)	(2)	(3)	(4)
	Suicide attacks		Non-suicide attacks	
Share of deaths from suicide (t-1)	1.149*** (0.105)	0.993** (0.380)	0.0204 (0.0401)	-0.343 (0.180)
Share of Muslim (t-1)	5.715*** (0.404)	-14.51 (10.30)	0.559*** (0.138)	-4.241 (3.039)
Log GDP per capita (t-1)	0.468*** (0.102)	1.742*** (0.425)	0.0293 (0.0369)	0.179 (0.139)
Log Population (t-1)	1.145*** (0.0931)	7.712*** (2.227)	0.985*** (0.0359)	3.204*** (0.592)
Discriminated population (t-1)	9.117*** (0.977)	7.479* (2.923)	1.828*** (0.405)	-1.549 (0.875)
Democracy (t-1)	0.129*** (0.0280)	0.0343 (0.0391)	0.0799*** (0.00995)	0.0293 (0.0163)
Regime durability (t-1)	-0.0106** (0.00377)	-0.0323* (0.0140)	-0.0110*** (0.00156)	-0.0146** (0.00527)
Civil war (t-1)	0.437*** (0.128)	0.336* (0.153)	0.388*** (0.0548)	0.313*** (0.0599)
Foreign military occupation (t-1)	0.391	0.186	0.496*	1.091*

	(0.608)	(1.022)	(0.234)	(0.491)
Constant	-29.63***	-135.3***	-14.68***	-46.97***
	(1.951)	(39.23)	(0.632)	(10.39)
lnalpha	2.460***	0.516***	1.486***	-0.117*
	(0.0951)	(0.140)	(0.0303)	(0.0560)
Country fixed effects	No	Yes	No	Yes
Year fixed effects	No	Yes	No	Yes
Observations	2971	1094	2971	1094
Pseudo R-squared	0.185	0.290	0.0616	0.194

Standard errors in parentheses

* p<0.05,** p<0.01,*** p<0.001

Models (2) and (4) exclude countries with no records of suicide attacks in the study period

Dying to die.

New micro and macro evidence that suicide terrorists are suicidal

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Individual Level Evidence: Suicide Risk Factors and Suicide Terrorism in the United States (1968-2017)

Detailed coding of socio-demographic individual factors

In study 1, I tested the effect of a range of individual characteristics usually included in analyses of profiles of terrorists (Freilich et al., 2019; LaFree et al., 2018). Four variables captured demographic characteristics. I used a continuous variable measuring the age of the perpetrator at the time of the plot ($M = 33$, $s. d. = 13$), with 28 missing cases. For *gender*, I used a binary variable coded 0 = female (84 cases; 7% of valid cases), 1 = male (1,150 cases; 93% of valid cases). I measured minority status, based on the ethnicity of the individual, by a binary variable coded missing for cases in which the ethnicity was unknown (89 cases), 0 = white (694 cases; 61% of valid cases), 1 = other (451 cases; 39% of valid cases). I identified immigrant individuals with a binary variable coded missing for cases in which the residency status was unknown (62 cases), 0 = born citizen (1,018 cases; 87% of valid cases), 1 = naturalized citizen or resident (154 cases; 13% of valid cases).

Two variables captured previous involvement in violence and crime. I generated a binary variable to assess military experience coded missing for cases in which there was no information about military experience (382 cases), 0 = never in the US or a foreign military (716 cases; 84% of valid cases), 1 = ever was in the US or a foreign military (136 cases; 16% of valid cases). I identified individuals with previous criminal activity with a binary variable coded missing for cases in which there was no information (483 cases), 0 = no history of criminal activity prior to radicalization (407 cases; 54% of valid cases), 1 = history of criminal activity prior to radicalization (344 cases; 46% of valid cases).

Two variables captured the social background of individuals. I measured the education level by a categorical variable coded missing for cases in which there was no information (712 cases), 0 = Less than high school (87 cases; 17% of valid cases), 1 = high school diploma (136 cases; 26% of valid cases), 2 = more than high school (299 cases; 57% of valid cases). I measured the individuals' social stratum as adulthood by a categorical variable coded missing for cases in which there was no information (635 cases), 0 = Low¹ (49 cases; 8% of valid cases), 1 = Middle² (368 cases; 61% of valid cases), 2 = High³ (182 cases; 30% of valid cases).

¹ E.g. receives welfare, lives close to the poverty line, regularly unemployed or at best works a blue collar job, lives in subsidized housing.

² E.g. does not receive welfare, lives in lower-middle or middle class neighborhood, has steady professional employment, owns or holds a mortgage on a house, has college degree.

³ E.g. works a high-income, white-collar job, lives and owns a house in a middle or upper class neighborhood, can afford luxury items, has college degree or is self-employed as a successful entrepreneur.

Results from Bayesian Model Averaging regarding suicide terrorists

Table A2: Posterior probability of model inclusion of each independent variable from Bayesian Model Averaging, for each imputed dataset, based on logistic regression models predicting suicide terrorism (versus non-suicide terrorism)

Variables	Dataset 1	Dataset 2	Dataset 3	Dataset 4	Dataset 5	Average
Intercept	100	100	100	100	100	100
Gender	1.8	1.5	1.7	1.6	1.7	1.66
Age	2.9	5.3	7.2	2.1	3.2	4.14
Education: High school diploma	2	2.9	1.8	1.6	1.8	2.02
Education: More than high school	2.9	1.8	1.9	2.5	1.7	2.16
Medium social stratum	2.5	5.1	2.3	2	1.7	2.72
High social stratum	2.3	5.4	2	2	1.8	2.7
Minority status	2.5	3.3	1.8	2.8	2.3	2.54
Immigrant	2.7	3	3.8	1.6	2.2	2.66
Military experience	1.9	2.3	2	1.9	2.1	2.04
Previous criminal activity	2.8	1.5	1.8	3.9	1.9	2.38
Ideology: Far-right	3.4	3.5	2.5	4.8	3.4	3.52
Ideology: Islamist	1.7	1.5	1.9	1.7	1.8	1.72
Lone	5.2	2	2.7	5.3	7.1	4.46
Child abuse	22.1	5.9	13	24.4	17.6	16.6
Trauma	3.5	21.9	19.5	3.1	2	10
History of alcohol/drug abuse	2.9	2.2	2.4	3.4	3.8	2.94
History of mental illness	8.8	2.5	2.4	10.6	8.8	6.62
Absent parent/s	59.2	73.4	30.9	68.2	94.8	65.3
Relationship troubles	38	94	99.9	23.6	12.5	53.6

Table A3: Posterior mean coefficient of each independent variable from Bayesian Model Averaging, for each imputed dataset, based on logistic regression models predicting suicide terrorism (versus non-suicide terrorism)

Variables	Dataset 1	Dataset 2	Dataset 3	Dataset 4	Dataset 5	Average
Intercept	-4.7124503	-5.252297	-5.394966	-4.7642884	-5.0965093	-5.0441022
Gender	0.0057691	0.001228	-0.0007261	0.0029396	-0.0016516	0.0015118
Age	-0.0005775	-0.001464	-0.0022168	-0.0002657	-0.0006766	-0.00104012
Education: High school diploma	0.0050588	0.012713	0.0012122	0.0005898	0.0015601	0.00422678
Education: More than high school	-0.0130913	-0.00226	-0.003946	-0.0103975	-0.0009058	-0.00612012
Medium social stratum	0.0090501	0.032714	-0.0080995	0.005417	0.0008472	0.00798576
High social stratum	-0.0070045	-0.037213	0.0039502	-0.0054314	-0.0014273	-0.0094252
Minority status	-0.0105941	-0.016899	0.0010134	-0.013149	-0.0082651	-0.00957876
Immigrant	0.0148448	0.019137	0.0279117	0.0008862	0.0091183	0.0143796
Military experience	0.0046047	-0.010507	-0.0057281	-0.0059771	-0.0081108	-0.00514366
Previous criminal activity	0.0127118	-0.002007	0.0001731	0.0216917	-0.0041236	0.0056892
Ideology: Far-right	0.0178651	0.017705	0.0087406	0.0305721	0.0171775	0.01841206
Ideology: Islamist	-0.000393	0.001108	0.0031881	-0.0024146	-0.0013503	0.00002764

Lone	0.0348449	0.006238	0.0109474	0.0358951	0.0524785	0.02808078
Child abuse	0.3472758	0.059282	0.1683705	0.3955867	0.2495964	0.24402228
Trauma	0.0199209	0.248521	0.2097161	0.0150917	-0.0014882	0.0983523
History of alcohol/drug abuse	0.0165968	0.008156	0.010611	0.0214102	0.0260271	0.01656022
History of mental illness	0.0825943	0.011029	0.0088797	0.1023393	0.0766327	0.056295
Absent parent/s	0.7840623	1.035276	0.3500228	0.9595382	1.6166969	0.94911924
Relationship troubles	0.4486098	1.562013	2.0866104	0.2649031	0.1097711	0.89438148

Selection of near-suicide terrorists

I selected in the sample of non-suicide terrorists all individuals that had been killed, either by authorities or rival groups ($N = 81$). I conducted research based on public sources to identify all cases in which individuals presumably expected to be killed in perpetrating violence. I identified 26 cases as near-suicide terrorists. In all cases, individuals were killed as a result of their violent action by violently resisting arrest. Among the remaining cases, I included 17 cases in the non near-suicide category because evidence did not indicate that the perpetrators expected to be killed⁴. I excluded the remaining 38 cases because evidence did not allow to assess whether the individual expected to be killed in perpetrating violence⁵. As a result, I obtained a group of near-suicide terrorists ($N = 26$), which can be compared to non near-suicide terrorists ($N = 1,150$).

⁴ This included 7 individuals killed afterward by capital punishment, 3 shot by authorities without having opposed resistance, 3 killed by military strikes, 2 killed in shootouts while escaping after a robbery and 2 assassinations.

⁵ This included cases for whom I did not find information and cases for whom information did not allow to evaluate whether the individual expected to be killed in action - such as cases of foreign fighters who died in fights with rival groups in unknown circumstances.

Bivariate results regarding near-suicide terrorists

Table A4: Distribution of variables across non-suicide and suicide terrorists and bivariate statistical tests

	Non near- suicide (N=1,150)	Near- suicide (N=26)	p-value
Suicide risk factors			
Child abuse	3%	23%	.000
History of mental illness	14%	19%	.570
Relationship troubles	25%	40%	.232
Absent parent/s	34%	25%	.592
History of alcohol/drug abuse	13%	15%	.767
Trauma	36%	40%	.787
Other factors			
Mean age (s.d.)	33 (13)	33 (12)	.973
Gender	93%	96%	1.000
Minority status	38%	54%	.152
Immigrant	13%	15%	.764
Military experience	16%	12%	.784
Previous criminal activity	45%	56%	.313
Education			.355
Less than high school	17%	11%	
High school diploma	26%	16%	
More than high school	57%	74%	
Social stratum			.907
Low	8%	0%	
Medium	63%	55%	
High	29%	45%	
Ideology			.096
Far-left	12%	21%	
Far-right	55%	33%	
Islamist	34%	46%	
Lone	24%	38%	.109
Mean share of valid values (s.d.)	64 (15)	80 (12)	.000

Notes. Sample size varies across variables. P-values < .05 in bold. P-values are based on Fisher's exact test (two-tailed) for binary variables, chi2 test for education, social stratum and ideology, and t-test (two-tailed) for age and share of valid values.

Regression results regarding near-suicide terrorists

Table A5: Odds ratios from logistic regression analyses of near-suicide terrorism (versus non near-suicide terrorism)

	(1)
Child abuse	3.942** (2.042)
Share of valid values	1.069*** (0.0170)
Observations	1176
Pseudo R-squared	0.136

Standard errors in parentheses
 + p<0.10,* p<0.05,** p<0.01,***
 p<0.001

Results from Bayesian Model Averaging regarding near-suicide terrorists

Figure A1: Posterior probability of model inclusion of each independent variable from Bayesian Model Averaging, for each imputed dataset, based on logistic regression models predicting near-suicide terrorism (versus non near-suicide terrorism)

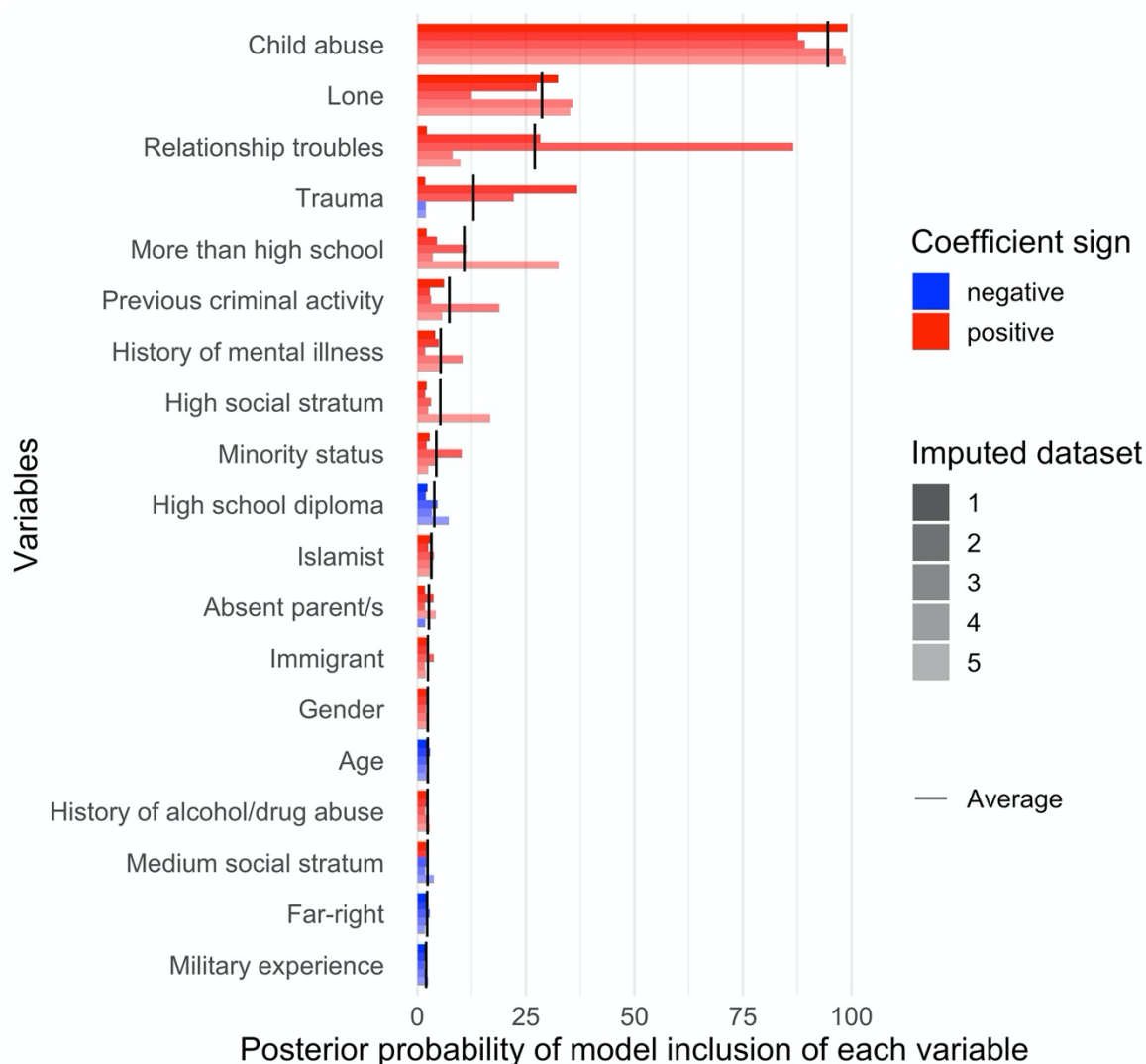


Table A6: Posterior probability of model inclusion of each independent variable from Bayesian Model Averaging, for each imputed dataset, based on logistic regression models predicting near-suicide terrorism (versus non near-suicide terrorism)

Variables	Dataset 1	Dataset 2	Dataset 3	Dataset 4	Dataset 5	Average
Intercept	100	100	100	100	100	100
Gender	2.4	2.5	2	2.3	2.6	2.36
Age	2.1	2.9	2.2	2	2.6	2.36
Education: High school diploma	2.3	1.9	4.6	3.3	7.2	3.86
Education: More than high school	2.1	4.5	11.2	3.5	32.5	10.76
Medium social stratum	2	2	2	1.8	3.8	2.32
High social stratum	2.1	1.8	3.1	2.5	16.8	5.26
Minority status	2.8	2.1	10.2	4	2.5	4.32
Immigrant	2.5	2.1	3.8	1.7	1.9	2.4
Military experience	1.7	2	1.6	2.1	2.5	1.98
Previous criminal activity	6.1	2.9	3.1	18.9	5.7	7.34
Ideology: Far-right	2.2	2	2.8	2.4	1.7	2.22
Ideology: Islamist	3.2	2.5	3.8	3.4	3	3.18
Lone	32.4	27.5	12.5	35.8	35.2	28.68
Child abuse	99.1	87.7	89.3	98.1	98.7	94.58
Trauma	1.8	36.8	22.2	1.9	1.9	12.92
History of alcohol/drug abuse	2.1	2.1	1.8	2.7	2.9	2.32
History of mental illness	4.1	4.9	1.8	10.4	5.5	5.34
Absent parent/s	1.7	3.7	1.7	1.8	4.2	2.62
Relationship troubles	2.2	28.3	86.6	8.1	9.9	27.02

Table A7: Posterior mean coefficient of each independent variable from Bayesian Model Averaging, for each imputed dataset, based on logistic regression models predicting near-suicide terrorism (versus non near-suicide terrorism)

Variables	Dataset 1	Dataset 2	Dataset 3	Dataset 4	Dataset 5	Average
Intercept	-3.5558927	-3.6583009	-3.9015605	-3.5812942	-3.716502	-3.68271006
Gender	0.0127983	0.0134882	0.0090261	0.012601	0.0154713	0.01267698
Age	-0.0001445	-0.0003498	-0.0002171	-0.0001304	-0.0002853	-0.00022542
Education: High school diploma	-0.0056948	-0.0027402	-0.0225237	-0.0129666	-0.0447337	-0.0177318
Education: More than high school	0.0040519	0.0183537	0.0658705	0.0128764	0.2542217	0.07107484
Medium social stratum	0.0035054	0.0034422	-0.0040919	-0.0016273	-0.0030221	-0.00035874
High social stratum	0.0055692	0.002143	0.010364	0.006575	0.1162689	0.02818402
Minority status	0.0076882	0.0041038	0.0577102	0.0152656	0.0064486	0.01824328
Immigrant	0.0078631	0.0050619	0.0191573	0.0015938	0.0043566	0.00760654
Military experience	-0.0010707	-0.0037778	-0.0022704	-0.0051999	-0.0084201	-0.00414778
Previous criminal activity	0.0269504	0.0081569	0.0106399	0.1208096	0.026028	0.03851696
Ideology: Far-right	-0.0043426	-0.0031111	-0.0087761	-0.0064051	-0.002164	-0.00495978
Ideology: Islamist	0.0108266	0.0062682	0.0149806	0.0118682	0.0091883	0.01062638
Lone	0.249672	0.2070637	0.0799821	0.2810221	0.2753353	0.21861504

Child abuse	1.8550293	1.4644674	1.4504901	1.7753588	1.7941381	1.66789674
Trauma	0.0025111	0.3149033	0.1662675	-0.0030956	-0.0035792	0.09540142
History of alcohol/drug abuse	0.0053497	0.0050085	0.0037244	0.0093321	0.0112775	0.00693844
History of mental illness	0.0187215	0.0251432	0.0032629	0.0717503	0.0301808	0.02981174
Absent parent/s	0.0001868	0.0142444	0.0013702	-0.0019883	0.0170072	0.00616406
Relationship troubles	0.0045519	0.2141491	0.9146818	0.0443132	0.057959	0.247131

Cross-Country Evidence: Suicide Rate and Suicide Terrorist Attacks Worldwide (1991-2014)

Rationale and sources of control variables

I controlled for a range of confounding factors that may affect both the number of suicide and non-suicide attacks, according to research on the cross-national causes of terrorism. The log population size was expected to increase the number of terrorist attacks (Kis-Katos et al., 2011; Freytag et al., 2011; Choi & Piazza, 2016; Piazza, 2017; Ghatak et al., 2019). The share of discriminated population, derived from the Ethnic Power Relations database (Vogt et al., 2015), was expected to increase the number of terrorist attacks (Choi & Piazza, 2016; Piazza, 2017; Ghatak et al., 2019). Various studies indicate that democratic regimes experience more terrorist attacks (Kis-Katos et al., 2011; Freytag et al., 2011; Piazza, 2017). Following these studies, the level of democracy was captured through a composite Polity scale from -10 (autocracy) to 10 (democracy) (Center for Systemic Peace, 2018b). The regime durability in years (Center for Systemic Peace, 2018b) has been found to decrease terrorist attacks (Freytag et al., 2011; Piazza, 2017; Ghatak et al., 2019). Civil war, measured in magnitude from 0 to 5 (Center for Systemic Peace, 2018a), was expected to increase the number of terrorist attacks (Kis-Katos et al., 2011; Freytag et al., 2011; Piazza, 2017; Ghatak et al., 2019). The log of the Gross Domestic Product (GDP) per capita was expected to increase the number of terrorist attacks (Kis-Katos et al., 2011; Freytag et al., 2011; Ghatak et al., 2019).

Variables description

Table A8: Description of Study variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Number of suicide attacks	2971	.55	6.88	0	236
Number of non-suicide attacks	2971	21.3	112	0	3133
Share of deaths from suicide (t-1)	2971	1.31	.863	.109	6.61
Share of Muslim (t-1)	2971	.256	.359	0	1
Log GDP per capita (t-1)	2971	7.75	1.66	4.17	11.5
Log Population (t-1)	2971	16.4	1.37	13.3	21
Discriminated population (t-1)	2971	.0374	.104	0	.84
Democracy (t-1)	2971	3.44	6.35	-10	10
Regime durability (t-1)	2971	25	32.1	0	204
Civil war (t-1)	2971	.161	.793	0	6
Foreign military occupation (t-1)	2971	.0313	.174	0	1

Results from Bayesian Model Averaging

Table A9: Posterior probability of model inclusion and mean coefficient of each independent variable from Bayesian Model Averaging, based on negative binomial regression models predicting the number of terrorist attacks

Variables	Suicide attacks		Non-suicide attacks	
	Posterior probability of model inclusion	Posterior mean coefficient	Posterior probability of model inclusion	Posterior mean coefficient
Intercept	100	-1.946e+01	100	-1.065e+01
Share of deaths from suicide (t-1)	100.0	6.501e-01	82.0	-1.321e-01
Share of Muslim (t-1)	100.0	2.709e+00	3.1	5.157e-03
Log GDP per capita (t-1)	39.4	6.692e-02	1.8	-1.386e-04
Log Population (t-1)	100.0	8.199e-01	100.0	6.597e-01
Discriminated population (t-1)	100.0	3.720e+00	100.0	2.604e+00
Democracy (t-1)	61.1	2.776e-02	99.7	3.105e-02
Regime durability (t-1)	2.9	-8.073e-05	1.7	-8.437e-06
Civil war (t-1)	6.7	1.070e-02	100.0	6.818e-01
Foreign military occupation (t-1)	2.1	9.545e-03	5.8	2.137e-02

Regression results: tests with the alternative measure of suicidal tendencies

Table A10: Unstandardized coefficients from negative binomial analyses of the number of terrorist attacks

Dependent variable	(1)	(2)	(3)	(4)
	Suicide attacks		Non-suicide attacks	
Share of depression (t-1)	0.547* (0.240)	4.237** (1.415)	-0.0646 (0.0640)	-0.235 (0.497)
Share of Muslim (t-1)	4.168*** (0.421)	-14.82 (10.11)	0.558*** (0.137)	-4.657 (3.039)
Log GDP per capita (t-1)	-0.0262 (0.105)	1.564*** (0.427)	0.0358 (0.0371)	0.200 (0.139)
Log Population (t-1)	1.037*** (0.106)	8.663*** (2.046)	0.984*** (0.0360)	2.820*** (0.559)
Discriminated population (t-1)	6.937*** (1.150)	6.945* (2.923)	1.883*** (0.410)	-1.522 (0.878)
Democracy (t-1)	0.166*** (0.0334)	0.0549 (0.0412)	0.0783*** (0.0102)	0.0299 (0.0164)
Regime durability (t-1)	0.00497 (0.00513)	-0.0279 (0.0145)	-0.0106*** (0.00157)	-0.0150** (0.00529)
Civil war (t-1)	-0.0172 (0.140)	0.274 (0.152)	0.388*** (0.0548)	0.327*** (0.0602)
Foreign military occupation (t-1)	0.274 (0.603)	0.271 (0.999)	0.491* (0.234)	1.148* (0.491)
Constant	-23.33*** (1.913)	-164.2*** (35.86)	-14.46*** (0.668)	-39.70*** (9.673)
Inalpha	2.924*** (0.0959)	0.508*** (0.139)	1.486*** (0.0303)	-0.112* (0.0559)
Country fixed effects	No	Yes	No	Yes
Year fixed effects	No	Yes	No	Yes
Observations	2971	1094	2971	1094
Pseudo R-squared	0.120	0.291	0.0616	0.194

Standard errors in parentheses

* p<0.05,** p<0.01,*** p<0.001

Models (2) and (4) exclude countries with no records of suicide attacks in the study period

Regression results: tests with split samples

Evidence indicates that 9/11 was a turning point in historical trends of terrorism (Smith & Zeigler, 2017; Atran, 2006). I tested whether the effect of the share of deaths from suicide was found before and after 2001.

Table A11: Unstandardized coefficients from negative binomial regression analyses of the number of terrorist attacks

Dependent variable	(1)	(2)	(3)	(4)
	Suicide attacks		Non-suicide attacks	
Share of deaths from suicide (t-1)	1.291*** (0.179)	1.075*** (0.138)	-0.0399 (0.0477)	0.114 (0.0653)
Share of Muslim (t-1)	1.937** (0.663)	5.885*** (0.473)	-0.348 (0.179)	1.211*** (0.210)
Log GDP per capita (t-1)	0.207 (0.194)	0.334** (0.119)	-0.0923 (0.0490)	0.166** (0.0555)
Log Population (t-1)	0.804*** (0.181)	1.178*** (0.110)	0.852*** (0.0502)	1.134*** (0.0511)
Discriminated population (t-1)	8.703*** (1.536)	10.000*** (1.256)	1.679*** (0.463)	2.519*** (0.760)
Democracy (t-1)	0.107* (0.0485)	0.133*** (0.0331)	0.0770*** (0.0119)	0.0809*** (0.0160)
Regime durability (t-1)	-0.0179 (0.0114)	-0.00828 (0.00466)	-0.00469* (0.00215)	-0.0131*** (0.00250)
Civil war (t-1)	0.419* (0.212)	0.483** (0.169)	0.391*** (0.0561)	0.460*** (0.119)
Foreign military occupation (t-1)	-18.97 (26608.5)	0.464 (0.676)	-0.108 (0.350)	0.746* (0.337)
Constant	-22.07*** (4.216)	-28.88*** (2.209)	-11.18*** (0.861)	-18.84*** (0.922)
Inalpha	2.025*** (0.331)	2.257*** (0.106)	1.025*** (0.0462)	1.703*** (0.0431)
Period	<i>Before</i> <i>2001</i>	<i>After</i> <i>2001</i>	<i>Before</i> <i>2001</i>	<i>After</i> <i>2001</i>
Observations	1105	1733	1105	1733
Pseudo R-squared	0.224	0.189	0.0601	0.0733

Standard errors in parentheses
* p<0.05,** p<0.01,*** p<0.001

Regression results: tests with terrorist attacks per capita

An alternative way of measuring terrorist activity is to use the number of terrorist attacks per capita, which reflects the actual probability for an inhabitant in a given country to face terrorism (Jetter and Stadelmann, 2019). I tested the regression models by using the number of suicide attacks and non-suicide attacks per capita.

Table A12: Unstandardized coefficients from linear regression analyses of the number of terrorist attacks per capita

Dependent variable	(1)	(2)	(3)	(4)
	Suicide attacks per capita		Non-suicide attacks per capita	
Suicide rate (t-1)	6.91e-09 (6.07e-09)	1.06e-07* (4.94e-08)	-1.46e-08 (7.59e-08)	-3.71e-07 (4.16e-07)
Share of Muslim (t-1)	6.14e-08*** (1.52e-08)	-2.44e-06** (7.44e-07)	7.29e-07*** (1.90e-07)	6.62e-07 (6.27e-06)
log GDP per capita (t-1)	1.30e-08** (4.08e-09)	2.23e-08 (3.86e-08)	1.36e-07** (5.10e-08)	-1.45e-06*** (3.25e-07)
log Population (t-1)	2.28e-09 (3.37e-09)	2.62e-07 (1.47e-07)	1.49e-08 (4.21e-08)	3.91e-06** (1.24e-06)
Share of discriminated population (t-1)	1.94e-07*** (4.47e-08)	2.09e-07 (2.65e-07)	5.92e-07 (5.59e-07)	-2.41e-06 (2.23e-06)
Democracy score (t-1)	1.27e-09 (9.24e-10)	-4.37e-09 (4.40e-09)	3.77e-08** (1.16e-08)	2.37e-08 (3.71e-08)
Regime durability (t-1)	-4.87e-10** (1.79e-10)	-4.06e-09** (1.31e-09)	-8.24e-09*** (2.24e-09)	-4.28e-08*** (1.10e-08)
Civil war (t-1)	3.30e-09 (5.86e-09)	6.58e-09 (1.63e-08)	5.10e-07*** (7.33e-08)	4.29e-07** (1.37e-07)
Foreign military occupation (t-1)	3.09e-08 (2.66e-08)	-7.24e-07*** (1.41e-07)	4.09e-07 (3.32e-07)	-4.78e-06*** (1.19e-06)
Constant	-35.50*** (2.406)	-17.12*** (0.640)	-124.7*** (28.11)	-43.41*** (8.569)
Country fixed effects	No	Yes	No	Yes
Year fixed effects	No	Yes	No	Yes
Observations	2,969	1,093	2,969	1,093
Pseudo R-squared	0.020	0.464	0.030	0.678

Standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05

Models (2) and (4) exclude countries with no records of suicide attacks in the study period

References

- Atran, S. (2006). The moral logic and growth of suicide terrorism. *Washington Quarterly*, 29, 127–147.
- Center for Systemic Peace (2018a). *Major Episodes of Political Violence (MEPV) and Conflict Regions, 1946-2016*. <http://www.systemicpeace.org/inscrdata.html>.
- Center for Systemic Regime Peace (2018b). *Polity IV Project - Political Characteristics and Transitions, 1800-2016*. <http://www.systemicpeace.org/inscrdata.html>.
- Choi, S.-W., & Piazza, J. A. (2016). Ethnic groups, political exclusion and domestic terrorism. *Defence and Peace Economics*, 27, 37–63.
- Choi, S.-W., & Piazza, J. A. (2017). Foreign military interventions and suicide attacks. *Journal of Conflict Resolution*, 61, 271–297.
- Freytag, A., Krüger, J. J., Meierrieks, D., & Schneider, F. (2011). The origins of terrorism: Cross-country estimates of socio-economic determinants of terrorism. *European Journal of Political Economy*, 27, S5–S16.
- Ghatak, S., Gold, A., & Prins, B. C. (2019). Domestic terrorism in democratic states: Understanding and addressing minority grievances. *Journal of conflict resolution*, 63, 439–467.
- Jetter, M., & Stadelmann, D. (2019). Terror per capita. *Southern Economic Journal*, 86(1), 286-304.
- Kis-Katos, K., Liebert, H., & Schulze, G. G. (2011). On the origin of domestic and international terrorism. *European Journal of Political Economy*, 27, S17–S36.
- Krueger, A. B. (2017). *What Makes a Terrorist*. Princeton and Oxford: Princeton University Press.
- LaFree, G., Jensen, M. A., James, P. A., & Safer-Lichtenstein, A. (2018). Correlates of violent political extremism in the United States. *Criminology*, 56, 233–268.
- Piazza, J. A. (2017). Repression and terrorism: A cross-national empirical analysis of types of repression and domestic terrorism. *Terrorism and Political Violence*, 29, 102–118.
- Smith, M., & Zeigler, S. M. (2017). Terrorism before and after 9/11 – a more dangerous world? *Research & Politics*, 4.
- Vogt, M., Bormann, N.-C., Rügger, S., Cederman, L.-E., Hunziker, P., & Girardin, L. (2015). Integrating Data on Ethnicity, Geography, and Conflict: The Ethnic Power Relations Data Set Family. *Journal of Conflict Resolution*, 59, 1327–1342.