

Understanding the Implication of Some Counter-Terrorism (CT) Measures: A Mathematical Perspective

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Abstract

Terrorist propaganda, like contagious diseases are produced and spread by few disgruntled members of the society who misconstrued and distort governments socio-economic ideologies, opinions and policies; with the sole aim of winning political goals through violence. Fear and intimidation, the common strategies of both terrorist and security agencies often influenced the decisions of the whole population. Most government's measures to prevent the spread of terrorist propaganda involve aggressive military crackdown on suspected propagators. This paper presents a dynamic model of "how the policy of preventing the spread of terrorist propagandas may impact on the ideological evolution of the population and as well as the propensity to advance the spreading of the propaganda". The construct is a simple differential equation model of the propagandist evolutionary dynamics; whose variables are parameters of six sub-populations. Analytical techniques used to study the solution paths of the model yielded three equilibrium points and their respective local stability criteria are discussed. The result shows that government's sensitization campaigns, arrest, imprisonment and rehabilitation measures may help to depopulate the fanatics and strengthen the conscious and repented populations. However, this may accelerate the fanatic's persuasion of the virgin population to follow their cause. Also the subsequent future decline in the size of the repented population insinuates that ideal intervention measures must incorporate efforts to identifying and solving the root causes of terrorism. Otherwise, with high rate of illiteracy, poverty, increase stigmatization and rejection of the repented population by their host communities may eventually ensnare them to becoming a cheap target for terrorist recruitment opportunity. High worsening effect of arrest and detention, even though may depopulate the semi-fanatical and the fanatical populations at the long run, will initially rise to a critical level before reaching zero. This has the implication of not only advancing their persuasion of the virgin population to support terrorist cause but could also provoke "blowback" actions in the susceptible population. Even among the unarrested members, this could increase their sympathy for their colleagues, and hence the temerity to be more active in spreading their propaganda. Hence, government must tread with caution, while preventing the propagation of terrorist ideologies.

Keywords: Propaganda; Sensitization campaign; Arrest; Imprisonment; Rehabilitation; Stigmatization; Rejection

Introduction

Insecurity and terrorism in particular, has over the recent decades became a torn on the flesh of most democratic nations, especially, in the aftermath of the bombing of the world trade center in USA in September 11, 2001 by the Al-Qaida terrorist group [1]. These and other socio-political decadents has been a major driver of the unprecedented explosion of institutions of organized crimes such as kidnapping for ransoms, hostage-taking, human trafficking, cattle rustling, oil bunkering, militancy, political assassinations, and armed robbery, the world over and in Nigeria in particular [2].

In many countries of the world, claiming ignorance of the danger of terrorist propaganda has become a serious social problem which sometimes endangers both the established socio-economic and political fabric of the countries themselves [3]. For this reason, various extreme efforts to control the propagation of terrorism ideologies are already being made in those countries. Most democratic government measures toward curtailing the propagation of the ideologies of this hydra-headed vices and emerging anti-social trend-terrorism, include persuasive efforts through comprehensive dialog to discourage propagators, routine sensitization campaigns about the danger of terrorist propagandas in electronic media, and even the use of military-offensive against the suspected propagators [4].

In what appears to be a stroke of irony, perhaps, most democratic government in the world have promulgation of draconian legislations, resolve to launching a harsh crackdown on free-speech and other civil

liberties that allegedly supports or glorify terrorism [5-10], less than a decade after the bombing of the World Trade Centre in September 11th 2001 by the Al-Qaida terrorist group. There is no doubt therefore that these Counter-Terrorism (CT) measures is aimed at criminalizing terrorist propaganda and other forms of support thereby raising the costs of being associated with a terrorist group for individuals who would otherwise willingly provide various kinds of support, like dissemination of propaganda, raise funds, recruit operatives, procure supplies, facilitate travel, and provide safe houses etc. Since support and logistical networks are essential requirements for terrorists to succeed, liberty-reducing measures were intended to make it difficult for terrorist groups to operate, by increasing the costs of terrorism [11-14]. Terrorism scholars have argued that such anti-terrorism laws which have resulted in harsh crackdown on free-speech and other civil liberties of citizens alleged to support or glorify terrorism engendered "collective punishment approach" and the use of "indiscriminate violence" against the civilian population by the security agencies.

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For example, in its effort to counter terrorism activities and as well as the propagation of its ideologies, the Nigerian government arose from its aftermath of high profile cases of vandalism and terrorist attacks on its oil installations [15-20], oil bunkering and kidnapping for ransom in the South-South region by the Niger Delta militant groups; frequent holocaust of attack on public offices, worship centres, educational institutions, etc., in the North East region by Boko Haram terrorist groups; and widespread incident of armed robbery, kidnapping, political assassination and other forms of organized crimes between 2009 & 2015, to promulgate stringent legislations tagged "Terrorism Prevention Act (TPA) 2011" and "Terrorism Prevention (Amendment) Act (TPAA) 2013. Currently, a harsh crackdown on hate speech and other related campaigns of calumny capable of inciting ethnic or religious crises has been one of President Muhammadu Buhari's government key anti-terrorism and anti-crises slogans on print and electronic media.

As observed by Amnesty International and other Human Right Organizations, some of the provisions of these legislations embodies several anti-human right protection clauses and falls short of the requirements of fundamental human rights protection. And even their implementations, most often, grossly violate the fundamental right and liberties of the citizenry. These legislations which covers several sections, has a far reaching provisions ranging from definition and prescription of crimes of terrorism, to intelligence gathering, prevention of propagation of terrorism ideologies, investigation and prosecution of terrorist suspects and other related offence. Immediately after the enactment of these Acts, young men and women that were suspected of aiding the propagation of terrorist propagandas or rendered one form of support or having joined Boko Haram terrorist group were picked up from their houses and on the streets and taken to military detentions and prisons. Many others were maimed or outrightly killed during open military assault on suspected terrorist communities. Dozens of fanatical religious leaders and worship centres and as well as some socio-cultural organizations suspected to spreading or aiding the propagation of terrorist ideologies were immediately place on strict surveillance list [21-25].

According to Amnesty International and Human Rights Watch, in the first six months of the year 2013 alone, 950 men were unlawfully detained by the Nigerian government [26-29]. If and when, these men make it out of detentions or prisons alive (many die of disease, starvation or torture); their animosity against the government usually increased and they became easy targets for Boko Haram's recruitment efforts. Most scholars observed that the key provisions of Nigerian Terrorism Prevention Acts are incompatible with Nigerians Human Rights obligations [30-41]. They goes further to observe that the provisions of the Acts used terms that are overbroad in scope; violate the "legality" requirement for criminal offences; and or unlawfully restricting a range of rights. Such breaches of rights and civil liberty include freedom of thought, conscience and religion; freedom of opinion and expression; freedom of association, freedom of the media, and freedom of assembly. Thus, failing to adhere to demonstrable proportionality; same provisions relating to investigation and detention is not consistent with various provision of human right laws. Some administrative provisions lack any provisions for meaningful access to effective legal remedies and procedural safeguards; and consequently infringing on the right of due process in fair hearing.

It is worth noted that other democratic nations are not exempted from these gross violation and abuse of fundamental human right and civil liberty of the citizenry, in the guise of preventing terrorism and

the spread of propagandas. For examples, the French government also launched a harsh crackdown on speeches that allegedly supports or glorifies terrorism; less than a week after the massive public rallies in defense of freedom of expression in the aftermath of the Charlie Hebdo terrorist attack [42]. In a circular published on 12th, January 2015, the French Minister of Justice-Christiane Taubira instructed prosecutors to take tough action against those who purposely defend or glorify terrorism or spread terrorist propaganda. Restrictions have expanded from existing prohibitions on incitement to much broader and less defined areas such as the "glorification" of and "apology" for terrorism. Thus, within three weeks, 150 prosecutions were launched resulting in dozens of verdicts, including 18 prison sentences imposed largely for the crime of "apologie du terrorisme (apology of terrorism)". In a similar effort to suppress terror speech, the President Francois Hollande signed on 9th, February 2015 a decree allowing the French government to ban without a court order websites suspected of advocating terrorism. The French authorities have used these new powers to block five websites, which they claimed condone terrorism [43,44].

The 2004 Madrid train bombings and the 2005 London terrorist attacks also added urgency to the issue of devising preventive security policies in an era of rising extremist violence and suicide terrorism. Consequently, governments of United States and other liberal democracies also adopted various liberty reducing measures intended to make it difficult for terrorist groups to grow and operate inside liberal societies. For instance, on 26th, October 2001, the United States president George Bush signed into law the "Patriot Act", which made it a criminal offense to provide support to groups designated as terrorist organizations; provisions that indirectly limit speech and other activities that might be intended or unintended to facilitate terrorist activities. In 2002, Denmark enacted a CT law to criminalize instigation of acts of terrorism. In 2005, Australia included various forms of seditious into its CT laws and gave public officials the power to ban groups perceived to advocate terrorism. In 2006, United Kingdom passed the "Terrorist Act" that made it illegal to glorify terrorism and encourage the commission and preparation of terrorist activities.

However, these reactions of the Nigerian government, her French counterpart and other democratic nations to roll back protections on free-speech and other fundamental right and liberty of its citizen in a guise to countering terrorism by preventing the spread of its ideologies are representative of how democratic governments have responded to the threat of terrorism since September 11th, 2001 World Trade Centre terrorist attack; event which underscored the vulnerability of liberal societies to cataclysmic acts and revealed the potentially awful psychological, social and economic costs of failing to prevent acts of terrorism.

These examples are symbolic of a larger effort of liberal societies to regulate incitement to terrorism and as well as the propagation of its ideologies. The rationale for prohibiting terrorist advocacy and other forms of support is the worry that terrorists can exploit the civil liberties and individual freedoms on which liberal societies are built to further their violent ends. Under the shield of free-speech protections, for example, terrorist groups can spread their ideologies, recruit operatives, and raise funds, and so on. The advocacy of terrorism, if left unchecked can then effectively augment the capacity of terrorist groups to undermine the security of liberal societies. Thus, criminalizing terrorist ideologies and other forms of supports, raises the costs of being associated with a terrorist group for individuals who would otherwise be willing to provide various kinds of supports such as spreading of their ideologies, raising funds, recruit operatives, procure

supplies, facilitate travel, provide safe houses, etc. Since support and logistical networks are essential for terrorists to succeed, liberty-reducing measures are intended to make it difficult for terrorist groups to operate by increase the costs of terrorism as well as spreading their propagandas.

That democratic government curtails or suppresses free-speech protections and other fundamental rights and liberties of the citizenry in the aftermath of terrorist attacks has a well-documented empirical pattern. The decrease in privacy and the concomitant increase in security agency's surveillance powers are other important CT policies adopted by various liberal societies. Regardless of the security justification for such CT measures, the political incentives that drive these policy interventions are well understood: (i) The legislators need to alleviate public fears and respond to citizens' demands to do something about terrorism, especially in the wake of major terrorist attacks and (ii) Perhaps, and most importantly, public officials need to insure themselves against the political and electoral costs that would be borne when another terrorist attack takes place, should they oppose draconic CT measures in times of crisis.

Notwithstanding the political motive behind any liberty-reducing CT measures, the empirical pattern of curtailing or suppressing free-speech protections and other rights of the citizenry raises a critical fundamental security question: ***how does the policy of restraining the spread of terrorist propagandas impact on the ideological evolution of the population and as well as the propensity to advance the spreading of the propagandas?*** In all the researches over the past decades; to find a lasting solution to this hydra-headed problem of mankind (terrorism), scholars and policymakers have unavoidably neglected this important question, probably, because terrorist attacks are not natural disasters. And also terrorists do not wear identifying military uniforms, confined to designated geographical hubs (e.g. barracks) nor do they obey the conventional military warfare rules.

Terrorist propaganda, like contagious diseases or infections are usually produce and spread through a few disgruntled members of the society who misconstrued and distort government's philosophy, ideology, opinions and policies with the sole aim of wining political goals through violence without a commensurable effort by government to identify and classify the cause and nature of the propaganda, and as well as remedying them. Government's measures toward curtailing the spread of such propaganda often revolve around rapid military-offensive against suspected propagators and the widely criticized policies of restricting the freedom of expression and other fundamental rights and liberties of the citizenry; a measure which always result in intimidation, indiscriminate arrest and detention of suspected offender. These measures which often create disaffection, rancor, acrimony, coercion, tension and fear, help to fueled and heighten animosity throughout the civilian population towards the government as well as fanning the ember of enmity between the governed and the government. Often time, such atmosphere would incite "Herostratos" syndrome within the susceptible population and a blowback effect which increase support and funding for the radical terrorist group and as well as enhancing the spread of terrorist propaganda and recruitment; a condition that is at variant with the policy justification of government CT measures.

Terrorism mostly an ideologically (ethno-religious or political) driven crime and ideal CT measure mostly constrained by the heterogeneous terrain [45] and asymmetric nature of the battle field; insufficient, and unreliable data/information and as well as limited human resources, requires collaborative team work and a compendium

of ideologically driven methods/strategies from both inter/intra ideological collaborators to reverse the trends. Such collaboration are only visible in an atmosphere that is devoid of rancor, acrimony, coercion, tension, intimidation and fear but congenial to expression of both self and nationalist opinions. An atmosphere that engender trust and confidence building between the governed and the government and also stimulate a healthy civil-military relationship; such is synonymous to a society that guaranteed freedom of expression and respect for fundamental human right and liberty of its citizens.

Philosophically, terrorist propagandas or ideology—one of the key drivers of terrorist recruitment and activities as observed earlier, mostly are distortions and misconstruction of government's philosophies, opinions, policies and programs by a small group of disgruntled members of the society; to garner unwarranted moral supports for anti-government agenda. The distortion during the process of spreading the propaganda and the mechanism of spreading the propaganda thus produced are vital aspect in the transmission of terrorist ideology. Therefore, terrorist propaganda when viewed under the mirror of an ideal communication feedback concept reveals two major important information: (i) The poorly communicated, or truncated or distorted or misconstrued political ideologies, or philosophies or policies or programs of government, and (ii) How the governed (society) perceived or understood and hence identify with the political ideologies, or philosophies or policies or programs of government.

Most often, accurate knowledge of what is happening, why it happens and what will happen in advance in the society is obviously part of the solution. Therefore, improper identification and classification of the nature and causes of terrorism, and as well as its propaganda; is one of the major drivers of most government counter-productive CT measures. While, alienation or divorcement of citizen from governance, due to unpopular government policies, unclear and improper orientation of the citizen on government's socio-economic policies, philosophy, ideologies and programs; gross ignorance and high rate of illiteracy; and as well as other socio-economic vices such as high rate of youth unemployment and high poverty index are major drivers of terrorism and its ideologies.

Finally, the concept of de-legitimization of terrorism and its propaganda among the local population (i.e. taking the local populations' support away from the terrorist's organization) seems to either lack merit or not properly understood and acceptable among democratic governments and CT policymakers. Delegitimization of terrorism among the local population connote taking the war of terror to the door step of the local population by psychologically divorcing the local populations trust, confidence and moral supports from the terrorist and their propaganda. Thereby, paving way for the initiation of an all-inclusive "in policing" mechanism necessary to facilitate and encourage effective and efficient intelligence gatherings—a panacea to ideal CT measure. Terrorism scholars are of the consensus that an all-inclusive "in group" policing and cooperation with the local population will yield much more result than government crackdowns on citizen's civil-right and liberty, as well as the collective punishment and indiscriminate violence approaches of military force, since the locals have much better intelligence as to who are and where the terrorists are located in their community.

Secondly, taking the local populations' support away from the terrorist's organization would create serious havoc for the terrorists and their cause receives less attention and therefore becomes delegitimized. These efforts are not only the necessary and sufficient conditions but imperative because every ethno-ideologically driven terrorism are

derivatives of a specific part of the population and are perceived to fight for the cause and rights of their group, hence they oftentimes find great support within their home population and their cause is oftentimes seen as a legitimate one by the home population. Moreover, ethno-ideologically driven terrorism has common underlying issues that cause the violence to escalate and because ethno-ideological groups are oftentimes closely intermingled and connected to the population they represent, "they seek and promote this identity through terrorist activities, which have a two-fold effect. First, terrorism creates communal bonds that result from the retaliation of the government or rival communities. Secondly, the inevitable persecution that follows draws attention to their cause among the larger population, increasing their numbers and financial support.

However, since one of the primary security justification for government's liberty-reducing CT measures is to preventing the spread of terrorism propaganda, thereby reducing the number of susceptible population who would have otherwise be persuaded to joining, or sympathized with or support the organization, it is important to investigate how the measure of preventing the propagation of terrorist propaganda affects the motivations of terrorist groups to plot and carryout further attack as well carryout recruitment. Therefore, this study employs a mathematical dynamic model approach to investigate "how the policy of restraining the spread of terrorist propagandas impact on the ideological evolution of the population and as well as the propensity to advance the spreading of the propagandas".

This study enjoy a major significance of uncovering the novelty results regarding the dynamic consequences of preventing the propagation of terrorist ideology through government's campaign about the danger of terrorist propaganda, arrest and imprisonment of the fanatical population as a CT measure not only inimical to the fundamental rights and liberties of the citizenry but also at variant with the policy justification of government. A result that is missing from contemporary scholarly and policy debates about terrorism prevention. Paying close attention to the way "an organization" operates can reveal how it will evolve, too. Therefore, a realistic model for the spread of terrorist propaganda have major theoretical and practical significance, for example, in minimizing damages caused by propaganda, regulating the spread of misinformation during a time of terrorist attacks, and disseminating relevant news and information to counter the propaganda.

The dynamic analysis underscores the importance of assessing such strategy of terrorism prevention in light of government's ignorance or nonchalance attitude toward proper identification and classification of the nature and causes of terrorism, proper management of information, and as well as the inducement of security agencies responsible for terrorism prevention. It suggests that in a society where government respond to major terrorist attacks by restraining the spread of terrorist propagandas, security agencies try less efficient because the pain of the attack is ameliorated somewhat by the future gains from having a better CT environment; a finding that has several important institutional and policy implications. The dynamic analysis can also help understanding the effectiveness of preventive measures in situations in which governments engage in preemptive actions to foil various social harms, and, as such it contributes to a small but growing political economy of prevention.

Mathematical Model of the Spread of Terrorist Ideology

The spread of terrorist propaganda unlike the spread of false-rumour or extreme ideology which have elicited a number of

mathematical models to study the dynamics of human behavior in response to their spread have escaped the attention of scholars and policymakers. Most significantly, the vulnerability effects of government intense sensitization campaign about the danger of terrorist propaganda and as well as the worsen effect of indiscriminate arrest and detention of suspected propagators of terrorist propagandas has hardly been studied. However, scholars like, Cheng et al. [16] have modeled the suppressing of false rumor by the use of the truth; Ana in his PhD dissertation also attempted modeling with uncertainty the ideological evolution of a society with extreme groups, while Aldila et al. [2] had modeled human behavior involve in the spread of extreme ideology in a close society. Characterizing his human population into five sub-populations, (i.e. general, semi-fanatical, fanatical, aware and repented populations), Aldila et al. studied the effect of government interventions on the ideological evolution of the population involve in spreading extreme ideology. In his concluded the authors, observed that "the more fanatical people are arrested, the better the control of the spread of extreme ideology" [2].

Unfortunately, in many circumstances the worsening effects of indiscriminate arrest and detention of suspected propagators of terrorist propaganda can be counter-productive to the anticipated government policy justification. The passion of members of the fanatical population who have not been arrested yet in spreading their propaganda more intensively is one example in which this model attempt to address. In this article, we develop a dynamic model based on the work of Aldila et al. [2] to investigate how the policy of restraining the spread of terrorism propaganda in the aftermath of terrorist attacks affects the ideological evolution of the population and as well as their propensity to advance the spread of terrorism propaganda under worsen effect of government intervention measures.

As observed earlier terrorism mostly an ideologically (ethno-religious or political) driven crime and ideal CT measure mostly constrained by the heterogeneous terrain [46] and asymmetric nature of the battle field [47] insufficient, and unreliable data/information and as well as limited human resources, requires collaborative team work and a compendium of ideologically driven methods/strategies from both inter/intra ideological collaborators to reverse the trends. Such collaboration are only visible in an atmosphere that is devoid of rancor, acrimony, coercion, tension, intimidation and fear but congenial to expression of both self and nationalist opinions [48-50]. An atmosphere that engender trust and confidence building between the governed and the government and also stimulate a healthy civil-military relationship; a society that engenders and guarantees not only free flow of information, protect freedom of expression but educate and respect its citizens' fundamental human right and liberty.

The Dynamic Model

The basic law of terrorist propaganda as a form of erroneous or extremist theory states that the propagandas' strength is directly proportional to the significance of the subject towards the individual concerned and to the uncertainty of the evidence at hand. To develop our model, we characterized our potential human population $N(t)$ in a close society at any time (t) into six separate subpopulations, namely [51-53].

- (i) The virgin population $G(t)$, denotes population of individuals who have no knowledge of terrorist propagandas, and neither are willing to spread it;
- (ii) The cognizance population $C(t)$ denotes population of

individuals who have knowledge of terrorist's propaganda but are not courageous enough to spread it;

- (iii) The semi-fanatical population $S(t)$ denotes populations of individuals who have the knowledge of terrorist propagandas and sympathetically spreading it;
- (iv) The fanatical population $F(t)$ denotes population of individuals who have full knowledge of terrorist propaganda and are passionately spreading it;
- (v) The imprisoned population $P(t)$ denote population of individuals who have arrested and imprisoned for spreading terrorist propaganda, and
- (vi) The repented population $R(t)$ denotes population of imprisoned individuals who have been rehabilitated, counseled and released from prison for spreading terrorist propaganda.

Similar to Aldila et al. [2] model, let government's intervention measures to control the spread of terrorist propaganda include mass sensitization campaign about the dangers of terrorist ideology, and as well as arrest and detention and subsequent rehabilitation of suspected propagators be denoted by the variables (δ_1) and (δ_2) . The presence of the fanatical population $F(t)$ will transform the virgin population $G(t)$ to cognizance $C(t)$ at the rate (β_1) , and cognizance $C(t)$ to semi-fanatic $S(t)$ at the rate (β_2) . The presence of parameter (β_1) denote the rate of awareness of $G(t)$ to learn to become $C(t)$, while the presence of parameter (β_2) relates to how fast the $C(t)$ learn to become $S(t)$. Finally, $S(t)$ will transform themselves to $F(t)$ at the rate of (γ) . This parameter also represent the rate of awareness of $S(t)$ to contribute in spreading terrorist ideology. In general, we assumed that $(\gamma, \beta_1, \beta_2 > 0)$.

Let (δ_1) denote the rate at which $G(t)$, and $C(t)$ are converted through government's sensitization campaign about the danger of terrorist propaganda, and (δ_2) denote the rate at which some fanatical people $F(t)$ are arrested. We assume that a larger (δ_2) will also increase the rate of persuasion intensity for the unarrested fanatical population,

and modeled this as $\beta_1(1 + w\delta_2)$, with (w) denoting the worsening effect parameter of the arrest of some fanatical population $F(t)$. If $(\delta_2 = 0)$ then, persuasion intensity is reduced to (β_1) . When $F(t)$ are arrested and converted to $P(t)$, they will be rehabilitated and counseled by the government about the misdirection of their ideology at a rate (η) before release. With this reformation process, some $P(t)$ will separate into $R(t)$ population which can persuade $G(t)$ to be aware of the danger of terrorist ideologies at a rate $q\eta P(t)$ while some $P(t)$ might come back to $F(t)$ at a rate $(1-q)\eta P(t)$. In a real life situation, this intervention is dependence on how intensely the government provides education and orientation to $G(t)$ and $S(t)$ populations to make them aware of the danger of terrorism ideologies. With this intervention, some of $G(t)$ and $S(t)$ population will be transformed to $C(t)$ population. Illustrated below in (Figure 1), is a detail transition diagram of the flow between the various populations.

With the above assumptions and transition diagram, the mathematical model to illustrate the spread of terrorist propaganda with worsening effect of government's intervention is given by the system of six linear ODEs (1) with all parameter descriptions and their range of values given in Table 1 below.

$$\left. \begin{aligned} \frac{dG}{dt} &= \alpha - N^{-1} [G(t) [\beta_1(1 + w\delta_2)F(t) + \beta_2 R(t)]] - (\delta_1 + \mu)G(t) \\ \frac{dC}{dt} &= \delta_1(G(t) + S(t)) - \mu C(t) \\ \frac{dS}{dt} &= N^{-1} [\beta_1(1 + w\delta_2)G(t)F(t)] - (\delta_1 + \mu + \gamma)S(t) \\ \frac{dF}{dt} &= \gamma S(t) + (1-q)\eta P(t) - (\delta_2 + \mu)F(t) \\ \frac{dP}{dt} &= \delta_2 F(t) - q\eta P(t) - (1-q)\eta P(t) - \mu P(t) \\ \frac{dR}{dt} &= N^{-1} \beta_2 G(t) R(t) + q\eta P(t) - \mu R(t) \end{aligned} \right\} \quad (1)$$

Suppose the total human population is constant, then from the

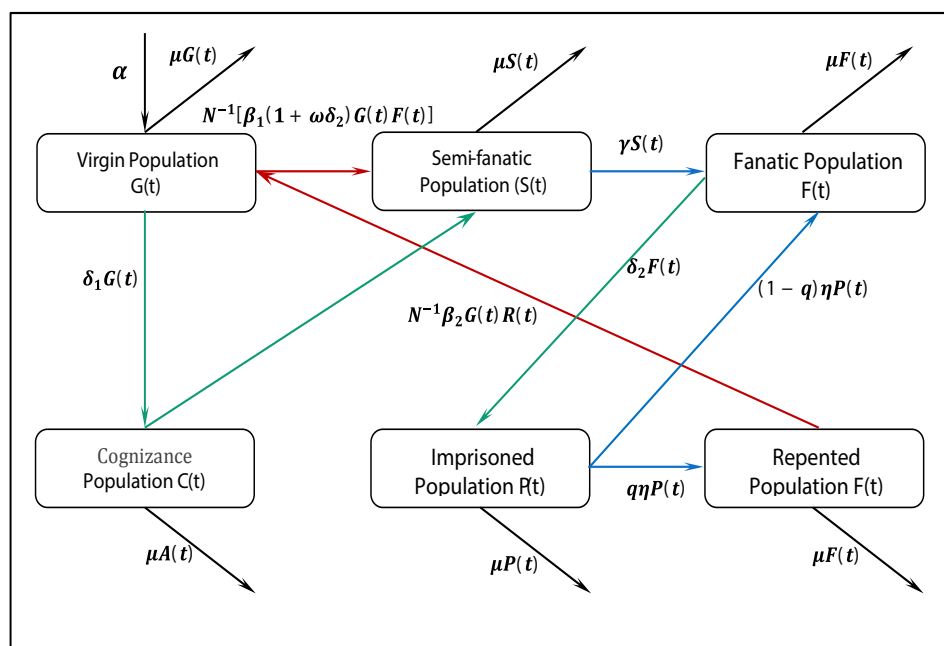


Figure 1: Terrorist propaganda transmission model.

Variable Parameter	Description	Value
N	Total population	1000
G(t)	Virgin population (40% of N)	400
C(t)	Conscious population (30% of N)	300
S(t)	Semi-fanatical population (20% of N)	200
F(t)	Fanatical population (10% of N)	100
P(t)	Imprisoned population (40% of F(t))	40
R(t)	Repented population (60% of P(t))	24
α	New birth recruitment rate	0.04
β_1	Persuasiveness rate for F(t)	0.6
β_2	Persuasiveness rate for R(t)	0.01
δ_1	Campaign intervention rate	(0,1)
δ_2	Imprisonment intervention rate	10%
ω	Worsening effect of δ_2	1.0
μ	Natural death rate	0.00004
Γ	Transition rate from S(t) to F(t)	0.033
η	Duration of imprisonment	0.00018
q	Repentant rate of P(t)	0.5

Table 1: Model Variables, Parameters and their Description.

system of ODEs (1) the growth rate of the population at any time (t) can be given by

$$\frac{dN}{dt} = \alpha - \mu N(t), \text{ and } N(t) = \alpha \mu^{-1} \quad (2)$$

On its human resource point of view, research findings indicates that the popularity Z(t) (fanatical population) of a given terrorist organization varies directly with its numbers of potential ideology propagators. Thus

$$Z(t) = \alpha N(t) = \alpha^2 \mu^{-1} \quad (3)$$

Analysis of the model

In this section, we first performed the mathematical analysis of the equation (1) to find the equilibrium points and their local stability. To determine the equilibrium points, let the dynamic of each population in equation (1) equals zero:

$$\left. \begin{aligned} 0 &= \alpha - N^{-1}[G(t)[\beta_1(1 + \omega\delta_2)F(t) + \beta_2 R(t)] - (\delta_1 + \mu)G(t)] \\ 0 &= \delta_1(G(t) + S(t)) - \mu C(t) \\ 0 &= N^{-1}[\beta_1(1 + \omega\delta_2)G(t)F(t)] - (\delta_1 + \mu + \gamma)S(t) \\ 0 &= \gamma S(t) + (1 - q)\eta P(t) - (\delta_2 + \mu)F(t) \\ 0 &= \delta_2 F(t) - q\eta P(t) - (1 - q)\eta P(t) - \mu P(t) \\ 0 &= N^{-1}\beta_2 G(t)R(t) + q\eta P(t) - \mu R(t) \end{aligned} \right\} \quad (4)$$

Here we find three different equilibrium points: the first equilibrium point represents when only the virgin population G(t) and cognizance population C(t) are established in the system, while other populations are zero. This equilibrium point is given by

$$\varphi_1 = \left(G_1(t), C_1(t), S_1(t), F_1(t), P_1(t), R_1(t) \right) = \left(\frac{\alpha}{\delta_1 + \mu}, \frac{\alpha\delta_1}{\mu(\delta_1 + \mu)}, 0, 0, 0, 0 \right) \quad (5)$$

This equilibrium point (5) will always be non-negative and always exist. The second equilibrium point represents when only the virgin population G(t), the cognizance population C(t) and the repented population R(t) are established in the system, while the rest of the subpopulations are zero. This second equilibrium is given by:

$$\varphi_2 = \left(G_2(t), S_2(t), F_2(t), C_2(t), P_2(t), R_2(t) \right) = \left(\frac{\alpha}{\beta_2}, 0, 0, \frac{\alpha\delta_1}{\mu\beta_2}, 0, \frac{\alpha(\beta_2 - \delta_1 - \mu)}{\mu\beta_2} \right) \quad (6)$$

As can be seen above, equilibrium point (6) is non-negative provided,

$$L_1 = \frac{\beta_2}{\delta_1 + \mu} > 1 \quad (7)$$

The last equilibrium point represents when all subpopulations are positive. This third equilibrium point (let call it ϕ_3) which depend on the values of F(t) and R(t), unfortunately is not simple to be shown in explicit form. But for numerical purposes, the existence of the equilibrium point ϕ_3 can be given by

$$\left. \begin{aligned} G(t) &= \frac{\alpha K}{\mu\beta_2(\mu + \eta)R(t)}; \\ S(t) &= \frac{k\beta_1(\omega\delta_2 + 1)F(t)}{\mu\beta_2(\mu + \eta)(\delta_1 + \gamma + \mu)}; \\ C(t) &= \frac{K\delta_1(\beta_1\omega\mu\delta_2 F(t) + \mu\beta_1 F(t) + \gamma\alpha + \mu\alpha + \alpha\delta_1)}{\mu^2\beta_2(\mu + \eta)R(t)(\delta_1 + \gamma + \mu)}; \\ P(t) &= \frac{\delta_2 F(t)}{(\mu + \mu)} \end{aligned} \right\} \quad (8)$$

With $K = (-\eta q\delta_2 F(t) + \eta\mu R(t) + \mu^2 R(t))$ while F(t) and R(t) are obtained from the solution of a coupled quadratic polynomial, given by

$$\left. \begin{aligned} H_1(F(t), R(t)) &= -F(t)[\eta q\gamma\beta_2\delta_2(\omega\delta_2 + 1)F(t) - \gamma\mu\beta_1(\omega\delta_2 + 1)R(t)] \\ &\quad (\eta + \mu) + \beta_2(\eta q\delta_2 + \mu\eta + \mu^2 + \mu\delta_2)(\delta_1 + \gamma + \mu) \\ H_2(F(t), R(t)) &= \mu R(t)(\eta + \mu) + (\beta_2\mu R(t) - \alpha\beta_2 + \alpha\mu + \alpha\delta_1) + \\ &\quad \mu F(t)R(t)(\mu\beta_1(\omega\delta_2 + 1)(\eta + \mu) - \eta q\beta_2\delta_2) - \\ &\quad F^2(t)\eta\mu q\beta_1\delta_2(\omega\delta_2 + 1) - \eta q\alpha\delta_2(\delta_1 + \mu)F(t) \end{aligned} \right\} \quad (9)$$

By substituting the parameter values, the existence of endemic equilibrium for F(t) and R(t) can be shown numerically in Figure 2. If there is intersection between H_1 and H_2 in the first quadrant, we can say that a third equilibrium point ϕ_3 exists.

To investigate the local stability of equilibrium points mentioned above, first we find the Jacobian matrix (J) of the system of ODE (1) which is given in the form of:

$$\begin{bmatrix} \frac{\beta_1(\omega\delta_2 + 1)\mu F(t)}{\alpha} - \frac{\mu\beta_2 R(t)}{\alpha} - (\delta_1 + \mu) & 0 & 0 & -\frac{\beta_1(\omega\delta_2 + 1)\mu G(t)}{\alpha} & 0 & 0 & -\frac{\mu\beta_2 G(t)}{\alpha} \\ \frac{\beta_1(\omega\delta_2 + 1)\mu F(t)}{\alpha} & -(\delta_1 + \mu + \gamma) & \frac{\beta_1(\omega\delta_2 + 1)\mu G(t)}{\alpha} & 0 & 0 & 0 & 0 \\ 0 & \gamma & -(\delta_2 + \mu) & 0 & (1 - q)\eta & 0 & 0 \\ \delta_1 & \delta_1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \delta_2 & 0 & -\eta q - (1 - q)\eta - \mu & 0 & 0 \\ \frac{\mu\beta_2 R(t)}{\alpha} & 0 & 0 & 0 & \eta q & \frac{\mu\beta_2 G(t)}{\alpha} - \mu \end{bmatrix}$$

Evaluate equilibrium point ϕ_1 in Jacobian matrix (J) give us

$$J_1 = \begin{bmatrix} -(\delta_1 + \mu) & 0 & -\frac{\beta_1(\omega\delta_2 + 1)\mu}{\delta_1 + \mu} & 0 & -\frac{\mu\beta_2}{\delta_1 + \mu} \\ 0 & -(\delta_1 + \mu + \gamma) & \frac{\beta_1(\omega\delta_2 + 1)\mu}{\delta_1 + \mu} & 0 & 0 \\ 0 & \gamma & -\delta_2 - \mu & (1 - q)\eta & 0 \\ \delta_1 & \delta_1 & 0 & 0 & 0 \\ 0 & 0 & \delta_2 & -\eta q - (1 - q)\eta - \mu & 0 \\ 0 & 0 & 0 & \mu q & \frac{\mu\beta_2}{\delta_1 + \mu} - \mu \end{bmatrix}$$

Equilibrium point ϕ_1 is locally asymptotically stable if all eigenvalues of are negative. Here we have three explicit eigenvalues, i.e.

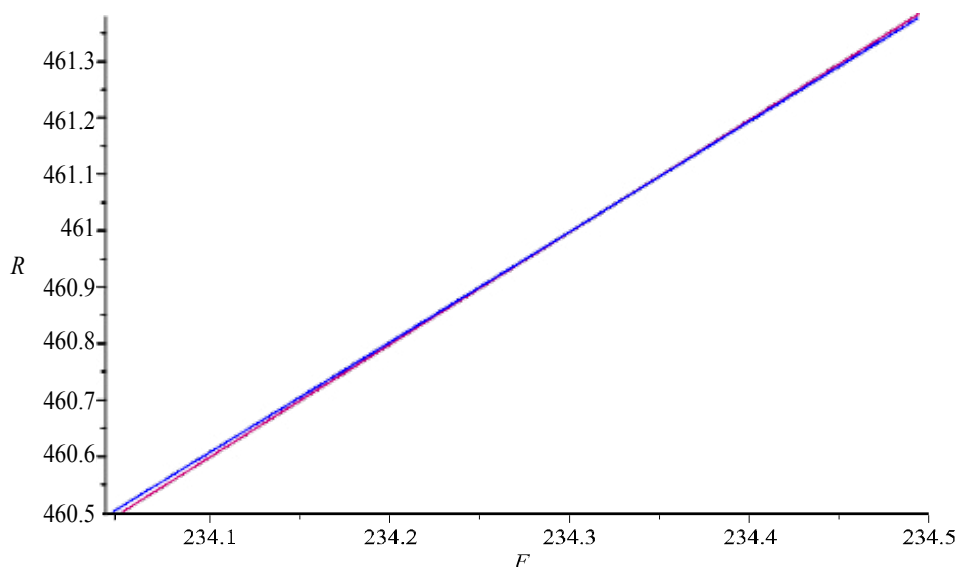


Figure 2: Existence of endemic equilibrium for F(t) and R(t).

$$\lambda_1 = -\mu, \lambda_2 = -(\delta_1 + \mu) \text{ and } \lambda_3 = -\frac{\mu(1-L_1)}{\delta_1 + \mu}$$

The other eigenvalues is taken from roots of $D_3\lambda^3 + D_2\lambda^2 + D_1\lambda + D_0$ where

$$\left. \begin{aligned} D_3 &= \delta_1 + \mu \\ D_2 &= (\delta_1 + \mu)(\delta_1 + \delta_2 + \eta + 3\mu + \gamma) \\ D_1 &= (2\mu\delta_1 + 2\delta_2 + 2\gamma\mu + 3\mu^2 + \delta_1\delta_2 + \eta\delta_1 + \gamma\delta_2 + \delta_2q\eta + \eta\gamma + 2\eta\mu) \\ &\quad (\delta_1 + \mu) - \gamma\beta_1\mu(1 + \omega\delta_2) \\ D_0 &= (\mu\eta + \mu^2 + \mu\delta_2 + \delta_2q\eta)(\delta_1 + \gamma + \mu) - \gamma\beta_1\mu(\mu + \eta)(1 + \omega\delta_2) \end{aligned} \right\} \quad (10)$$

According to the Routh-Hurwitz stability criteria, all roots of equation (10) are negative, if

$$\left. \begin{aligned} K_0 &= \frac{\gamma\beta_1\mu(\mu + \eta)(1 + \omega\delta_2)}{(\mu\eta + \mu^2 + \mu\delta_2q\eta)(\delta_1 + \mu)(\delta_1 + \gamma + \mu)} < 1; \\ K_1 &= \frac{\gamma\beta_1\mu(1 + \omega\delta_2)}{(2\mu\delta_1 + 2\mu\delta_2 + 2\gamma\mu + 3\mu^2 + \delta_1\delta_2 + \eta\delta_1 + \gamma\delta_2 + \eta\gamma + 2\eta\mu)} < 1; \\ K_2 &= \frac{D_3D_0}{D_2D_1} < 1 \end{aligned} \right\} \quad (11)$$

Using the same approach as with the first equilibrium, we evaluate the local stability criteria of ϕ_2 with the following Jacobian matrix

$$J_2 = \begin{bmatrix} \beta_2 & 0 & -\frac{\beta_1(\omega\delta_2 + 1)\mu}{\delta_1 + \mu} & 0 & 0 & -\mu \\ 0 & -(\delta_1 + \mu + \gamma) & \frac{\beta_1(\omega\delta_2 + 1)\mu}{\delta_1 + \mu} & 0 & 0 & 0 \\ 0 & \gamma & -\delta_2 - \mu & 0 & (1-q)\eta & 0 \\ \delta_1 & \delta_1 & 0 & -\mu & 0 & 0 \\ 0 & 0 & \delta_2 & 0 & -\eta q - (1-q)\eta - \mu & 0 \\ \beta_2 - \delta_1 - \mu & 0 & 0 & 0 & \eta q & 0 \end{bmatrix}$$

Again with the Routh-Hurwitz criteria, we can try to find the local stability criteria of ϕ_2 . From the characteristic polynomial of J_2 , we find one explicit eigenvalue $(\lambda_2), (\lambda_3)$, and two other eigenvalues will be negative if and only if $(L_2 > 1)$. The other eigenvalues are taken from the characteristic polynomial of $(G_3\lambda^3 + G_2\lambda^2 + G_1\lambda + G_0 = 0)$ where

$$\left. \begin{aligned} G_3 &= \beta_1 \\ G_2 &= \beta_2(3\mu + \gamma + \mu + \delta_1 + \delta_2) \\ G_1 &= 3\beta_2\mu^2 + 2\beta_2\mu(\gamma + \eta + \delta_1 + \delta_2) - \gamma\beta_1\mu(1 + \omega\delta_2) \\ &\quad + \beta_2(\gamma\eta + \delta_1\eta + \delta_1 + q\eta\delta_2 + \delta_2\gamma) \\ G_0 &= \beta_2(\mu^2 + q\eta\delta_2 + \mu\delta_2 + \mu\eta)(\mu + \delta_1 + \gamma) \\ &\quad - \gamma\beta_1\mu(1 + \omega\delta_2)(\mu + \mu) \end{aligned} \right\} \quad (12)$$

According to the Routh-Hurwitz stability criteria, all roots of equation (12) will be negative if and only if

$$\left. \begin{aligned} M_0 &= \frac{\gamma\beta_1\mu(1 + \omega\delta_2)}{3\beta_2\mu^2 + 2\beta_2\mu(\gamma + \eta + \delta_1 + \delta_2) + \beta_2(\gamma\eta + \delta_1\eta + \delta_1 + q\eta\delta_2 + \delta_2\gamma)} < 1, \\ M_1 &= \frac{\gamma\beta_1\mu(1 + \omega\delta_2)(\mu + \eta)}{\beta_2(\mu^2 + q\eta\delta_2 + \mu\delta_2 + \mu\eta)(\mu + \delta_1 + \gamma)} < 1 \\ M_2 &= \frac{G_0G_2}{G_1G_2} < 1 \end{aligned} \right\} \quad (13)$$

The existence of equilibrium point and their respective stability criteria for the model are represented on Table 2, below:

Numerical simulation and result

In this section, we show the dynamics of each sub-population (Figure 3), and their implication on the dynamics of propagation of terrorist ideology. The parameter values for this simulation are taken from Table 1, above. For the numerical simulation, a closed population of $N=1000$ people is assumed. This population consists of 40% Virgin population, 30% Conscious population, 20% semi-fanatical population and 10% fanatical population.

The Dynamics of the population at varying intervention measures: The first condition represented by the red curve denotes when there is no intervention from the government. It means there is no campaign about the dangers of terrorist ideology ($\delta_1=0$), and hence no arrest and imprisonment of fanatical people ($\delta_2=0$). The Figure 3(a) below shows that, with or without government intervention measures,

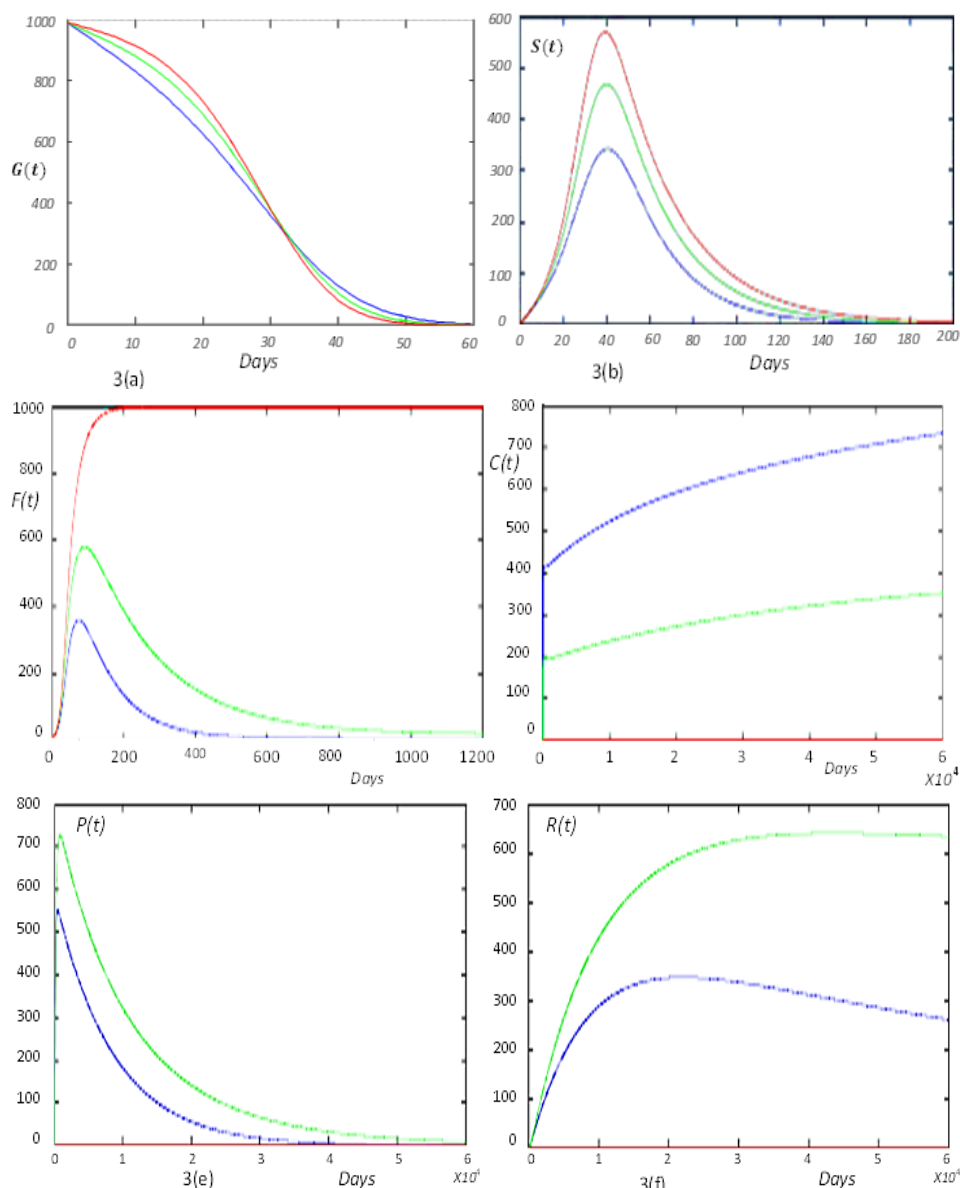


Figure 3: Dynamics of sampled population at government intervention measures.

Stability Point	Parameters		Stability Criteria ϕ_1			Stability Criteria ϕ_2		
	δ_1	δ_2	K_0	K_1	K_2	M_0	M_1	M_2
ϕ_1	0.01	0.01	0.33	0.19	0.002	0.19	0.32	0.002
ϕ_2	0.004	0.005	1.86	1.06	0.04	0.42	0.75	0.001
ϕ_3	0.0	0.0	14217	2242	0.006	9.45	59.9	0.06

Table 2: Existence and Stability Criteria for Equilibrium points.

the virgin population $G(t)$ will decline gradually, as shown by the red curve ($\delta_1=0, \delta_2=0$); green curve ($\delta_1=0.004, \delta_2=0.005$) and the blue curve ($\delta_1=\delta_2=0.01$), respectively.

From Figure 3(b) above; with no government intervention measure, the semi-fanatic population $F(t)$ rises to its peak initially in the first 40 day but gradually declined with consistency in government intervention measures, as shown by the red curve ($\delta_1=0, \delta_2=0$); green curve ($\delta_1=0.004, \delta_2=0.005$) and the blue curve ($\delta_1=\delta_2=0.01$), respectively. Similarly, Figure 3(c) below shows that with no intervention the whole

population became filled with fanatical people. In contrast, when there is intervention from the government which is shown by the green curve ($\delta_1=0.004, \delta_2=0.005$) and the blue curve ($\delta_1=\delta_2=0.01$), the fanatic population rises to its peak initially in the first 100 days but gradually declined with consistency in the intervention measures.

From Figure 3(d) above; the conscious population $C(t)$ experiences a drastic decline with no government intervention measures, but with more awareness created by government intervention measures, the population became filled with terrorist ideologies conscious people, as

shown by the red curve ($\delta_1=0, \delta_2=0$); green curve ($\delta_1=0.004, \delta_2=0.005$) and the blue curve ($\delta_1=\delta_2=0.01$), respectively. For the dynamics of the imprisoned population $P(t)$, Figure 3(e) below shows that, with no government intervention measures, there is no prisoner since nobody was arrested. $P(t)$ only increase rapidly immediately government intervention measure commence, but gradually decline with consistency in the intervention measures, as shown by the red curve ($\delta_1=0, \delta_2=0$); green curve ($\delta_1=0.004, \delta_2=0.005$) and the blue curve ($\delta_1=\delta_2=0.01$), respectively.

Very significant and perhaps, worrisome is the dynamics of the repented population $R(t)$. Figure 3(f) above indicates that with appropriate government rehabilitation and reformation program for the imprisoned population, the number of repented population will increase drastically, as shown by green curve ($\delta_1=0.004, \delta_2=0.005$) and the blue curve ($\delta_1=\delta_2=0.01$). However, the sensitivity analysis of the blue curve ($\delta_1=\delta_2=0.01$) reveals that as government increases its intensity of intervention measures, without a commensurable effort to identifying and solving the problems that causes terrorism, the repented population would eventually decline in future. Some repented persons will become converted to the conscious population $C(t)$ and some to the semi-fanatical $S(t)$ population and some finally back to fanatical population $F(t)$ where the cycle of spread of terrorist propaganda and activities resume.

Therefore, it can be seen that the impact of the government campaign and imprisonment will decrease the size of the fanatical

population $F(t)$, while on the other hand increasing the size of the Conscious $C(t)$ and repented $R(t)$ population.

Effect of Arrest/imprisonment on the dynamics of terrorism ideology: A simulation of how the variation in arrest of the fanatical population ($1 \leq \omega \leq 15$) will affect the spread of terrorism ideology is shown in Figure 4. Here, we assume that 40% of fanatical populations are imprisoned. From Figure 4(a), imprisonment could increase sympathy among fellow fanatics; hence the population that has not been caught will be more active in spreading their ideology. Worsening parameter (ω) will affect the dynamics of the fanatical population in the short run. Even though in the end the fanatical population will disappear, a large value of (ω) will incite a large number of fanatical people to occur faster and will increase the size of the fanatical population more compared with a small value of (ω) Figure 4(b), also demonstrate the same effect of increase ω on dynamics of the semi-fanatical population.

Effect of awareness campaign on the dynamics of terrorism ideology: The next simulation is performed to show the sensitivity of the effect of government campaign about the dangers of terrorism ideology (δ_1). In this case, we assume that there are only a few fanatical people who can be arrested and imprisoned ($\delta_1=0.0001$). From Figure 5, we can see that a larger value of δ_1 will increase the size of the conscious population $C(t)$, (Figure 5 (a)) and decrease the size of the fanatical population $F(t)$, (Figure 5 (b)). This means the government must campaign more intensely so that more people will be aware that the ideology is dangerous and they will stay away from the fanatical population.

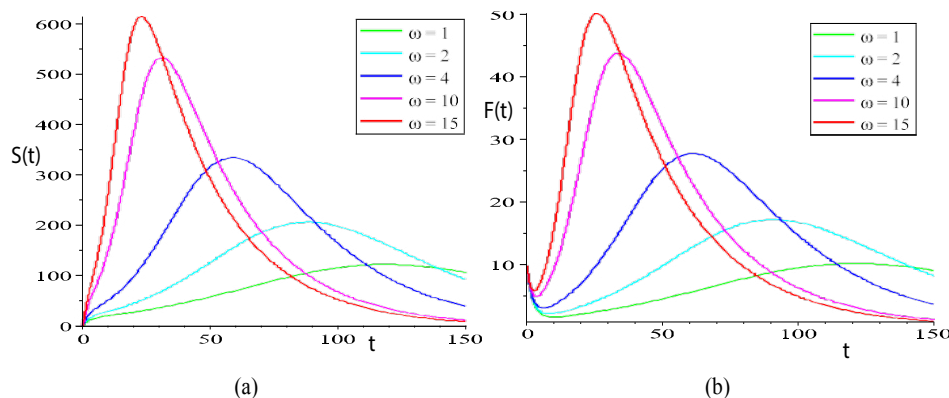


Figure 4: Sensitivity of with respect to number of (a) semi-fanatic population (b) fanatic population.

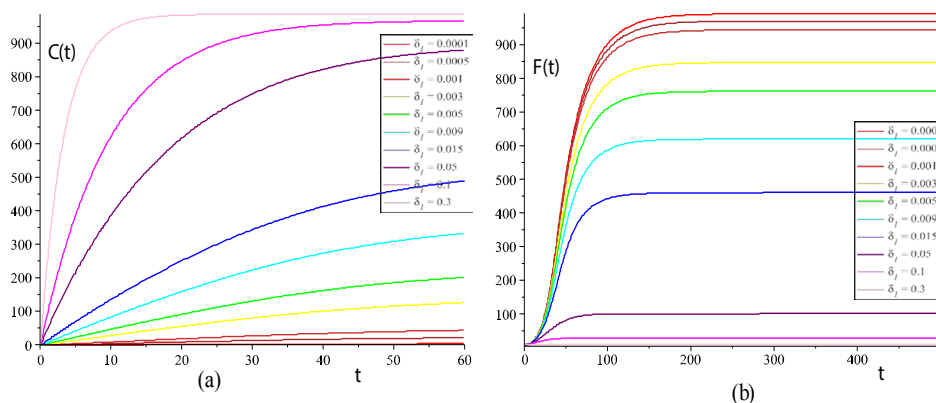


Figure 5: Sensitivity of (δ_1) with respect to number of (a) Conscious population, (b) Fanatic.

Results of the Analysis

The study shows that in a world in which democratic governments respond to major security threat such as terrorism with restrictions on freedom of expression and other fundamental rights and liberties of its citizens in the guise of preventing the spread of terrorist propagandas, such policies seems to have serious moral vulnerability and a boomerang effect of endangering government effort at preventing terrorism and may engender more support for the terrorist. For instance the result of analysis shows that intense government sensitization campaigns about the danger of terrorist propaganda, and as well as arrest, imprisonment and rehabilitation of suspects, even though would depopulate the fanatical population and strengthen the conscious and the repented populations has the propensity of accelerating the fanatic's persuasion of the virgin population to follow their cause.

Furthermore, the subsequent future decline in the size of the repented population also insinuates that ideal government intervention measures must include a conscious effort and commitment to fully integrate and retain the repented population among the society. Else, with high rate of unemployment, illiteracy and poverty, and increase stigmatization and rejection of the ex-convicts (repented population) by their host communities, the repented population would eventually decline in future. Some repented persons will become converted to the conscious population and some to the semi-fanatical population and some finally back to fanatical, where the cycle of spreading terrorist propaganda and activities heighten. Thus, some repented people becoming a cheap target for terrorist propaganda and recruitment opportunity; condition which is at variant with the policy justification of government CT measures. Collaborating this fact, terrorism research findings over the last decades confirm that more than 60% of terrorist commanders, weapon managers and experts are ex-prisoners who have been theoretically reformed and rehabilitated but cannot find succor from government, nor enabling environment to fully integrate into their communities [12,15].

As seen in Figure 4, worsen effect of indiscriminate arrest and imprisonment measures could increase sympathy among fellow unapprehended fanatical and the semi-fanatical members. Hence the population that has not been caught will be more active in spreading their propaganda. High intensity of indiscriminate arrest-as evidence in most security crackdown on suspected terrorist communities, will populate both the fanatical and semi-fanatical population to a critical level with a short period, even though at the end these populations will disappear. This sharp increase in their population will incite a large number of fanatical and semi-fanatical people to occur faster and will increase the size of their population more compared to a low intensity of arrest and imprisonment. This will hitherto, not only advance their persuasion of the virgin population but could also provoke "Herostratos" syndrome in the conscious population [10,21,24]. Hence some conscious population will be converted to the fanatical population.

On the other hand, from the perspective of high intensity of government's sensitization campaign about the danger of terrorist ideology, Figure 5, shows that such effort will increase the size of the conscious population (Figure 5 (a)) and decrease the size of the fanatical population (Figure 5 (b)). The security implication of this measure is that; government must sustain its high intensity of sensitization campaign so that the virgin population will be aware of the danger of terrorist ideology and will both stay away from the fanatical population and refuse to be persuaded to supporting their cause.

Addressing the security implications

The study recommends that in a society in which democratic governments respond to major security threat such as terrorism with restrictions on freedom of expression and other fundamental rights and liberties of its citizens in the guise to prevent the spread of terrorist propagandas, such policies could engendered "collective punishment approach" and the use of "indiscriminate violence" against the civilian population by the security agencies. This could have serious moral vulnerability and a boomerang effect of garnering undue sympathy, motivation and support for the terrorist, and thus, inciting "Herostratos syndrome" in the susceptible population, thereby jeopardizing government's effort at preventing terrorism. Therefore to address such anti-security implications, ideal anti-terrorism measure should include a commitment: (i) To properly identify and classify the nature and causes of terrorism, and as well as proactive measures to ameliorating the causes-such as high rate of illiteracy, poverty, youth unemployment, alienation of the masses from government's policies and programs, (ii) To psychologically delegitimize terrorism and its propaganda among the local population (i.e. taking the local populations' support away from the terrorist's organization); (iii) To routinely sensitize, oriented and educate the masses of government's policies and programs and as well as the danger of terrorist ideology; and (iv) To remain faithful to its fundamental social values by "respecting the fundamental human rights and liberties" of the citizen and cooperate with the local population in times of duress. These measures have the capacity of creating not only the needed awareness and correcting some of the misgivings/erroneous ideologies of the terrorist among the local population; engender trust and confidence building between the governed and the government; stimulate healthy civil-military relationship; delegitimized terrorism and its propaganda among local population but also boost efficient and reliable intelligence gathering for proper identification and smart-targeting of terrorists and causes of terrorism.

De-legitimization of terrorism and its propaganda: Since terrorists do not wear identifying military uniforms, are not confine to designated geographical hubs (e.g. barracks) nor do they obey the conventional military warfare rules and regulation; therefore ideal CT measures must include a commitment to psychologically de-legitimize terrorism and its propaganda among local population. For effective and efficient de-legitimization process, government must give the local population more legitimacy and concession in order to gain their cooperation and supports. The security agencies must promote, encourage and protect the privacy of local population who can serve as necessary informants. They must cooperate and work together with the moderate local population, motivate and respect their fundamental human right and liberty as these will engender trust and confidence building between the governed and the government; garner the necessary moral supports for the initiation of an all-inclusive, proactive and efficient "in group policing" mechanism between the security agencies and the local population; and facilitate and encourage efficient intelligence gathering [31,40,41]. "In group policing" and cooperation with the local population will yield much more result than government crackdowns on citizen's civil-right and liberty; and the collective punishment approach and as well as the indiscriminate violence strategies of military force since the locals have much better intelligence as to who are, and where the terrorists are located in their community.

Moreover, taking the local populations support away from the terrorist's organization will creates serious havoc for the terrorists and its cause receives less attention and therefore becomes delegitimized.

These efforts are not only the necessary and sufficient conditions but imperative because every ethno-ideological driven terrorism are derivatives of a specific part of the population and are perceived to fight for the cause and rights of their group. Hence they oftentimes find great support within their home population and their cause is oftentimes seen as a legitimate one by the home population. Moreover, ethno-ideologically driven terrorism has common underlying issues that cause the violence to escalate and because ethno-ideological groups are oftentimes closely intermingled and connected to the population they represent, they seek and promote this identity through terrorist activities, which (i) Creates communal bonds that result from the retaliation of the government or rival communities, and (ii) The inevitable persecution that follows, draws attention to their cause among the larger population, thus increasing their numbers and financial support.

Proper identification and classification of the nature and causes of terrorism: Democratic government must painstakingly encourage measures that properly identify and classify the nature and prime causes of terrorism and as well as its propaganda with the aim to judiciously tackling them; while remaining faithful to its fundamental social values even in the time of duress. Governments' socioeconomic and political reforms and development objectives should include a proactive and mandatory masses oriented policy implementation plan to solving both the causes of terrorism and as well as the problems caused by terrorism. Prominent among these are high rate of illiteracy, high poverty and youth unemployment indices. Such strategy has the propensity of decreasing the probability of further terrorist attacks, reduce the spread of terrorist propagandas and hence boost government's CT measures.

Routine sensitization, enlightenment and education of the masses of government's policies and programs: Cheng et al. [16] while proposing "an effective rumor-containing strategy" in the mist of limited rumor-containing budget, emphasized the efficacy of suppressing false-rumor by the use of the truth as a panacea to curtailing its propagation. Therefore, a proactive actions plan to suppress the spread of terrorist propagandas by implementing an effective and efficient counter-information system to clarify the uncertainties or doubts and correct the erroneous or misconstrued information-content of terrorist propaganda, is a panacea to reducing the probability of the susceptible population being persuaded to support or join the organization and spread their propagandas. An all-inclusive system of governance that emphasize proper sensitization, enlightenment and education of the citizens about government's socioeconomic and political philosophy, ideologies, policies and programs, will help to create the needed awareness, educate and prepare the masses psychologically to resist terrorist propagandas and as well as attracting the citizens' overwhelming support and defense of government policies and programs. These would save much of the resources hitherto spent on indiscriminate apprehension, arrest, imprisonment and rehabilitation of suspected terrorists and propagators of terrorist ideologies.

Provision of the basic amenities, service and infrastructures: Major index of terrorism prevention is education. As much as education is the key to any nation's socio-economic development, it is also the key to ethno-ideological crimes like terrorism. According to UNICEF, Amnesty International and Human Right Watch, illiteracy is a major driving force behind most ethno-ideologically driven terrorism, especially in Africa; as illiterate youths below the age of 18 form about 45% of the entire population of most terrorist organization such Boko Haram, ISIS, AQIM, AlQaeda, Al-Shabab, etc. [3,4,31]. This underlying issue has advanced the establishment of most

Islamic schools with Islamic fundamentalist curricula in their related countries. This provide only but obsolete learning environment than the state funded modern schools. These schools are main recruitment opportunity for ethno-ideological driven terrorist organizations [3,50]. Therefore government socio-economic reforms and development plan that incorporate mandatory mass literacy and compulsory qualitative education of the susceptible youth population is one of the panaceas to effective terrorism prevention.

Good governance and collaborative effort: Finally, the general weakness of most central governments and high levels of corruption in the society make it easier for terrorism to thrive in Africa than in countries with effective security, intelligence and military capacities as well as efficient educational system [17]. Further complicating the strategic CT situation in Africa are the vast cultural and ethnic differences across geographical boundaries; thus making the gathering and interpretation of intelligence information difficult [4,17]. Hence the fight against terrorism is not a job which can be undertaken by one single Nation's security agency, but requires collaborative team work and input from a wide range of national and international organizations including law enforcement agencies, the military, the intelligence services, the financial sector, the diplomatic service and health organizations. The key to success is organization, cooperation and coordination, while a prerequisite for success is good governance. This is central to the effective administration of a state's resources, the rule of law, and the development of a strong civil society. Only if such a structure is in place can the war against terror, which is fuelled by dissatisfaction and ignorance, be won.

Discussion

A deterministic mathematical model to demonstrate the spread of terrorism propaganda is constructed in this study. Government's interventions measures to curtail the spread of terrorist are considered in two ways: (i) Through a sensitization campaign about the dangers of terrorist ideology, and (ii) By restraining the semi-fanatical and fanatical population through arrest and imprisonment. Unfortunately, restraint strategies through arrest and imprisonment of these populations have been shown to aggravate the effect by increasing the size of both populations to advance their persuasion on the virgin population.

Mathematical analysis to find all possible equilibrium points and local stability has reveals three equilibrium points: (i) When only the virgin and the conscious populations exist; (ii) When only the virgin, the conscious and the repented populations exist; and (iii) The coexistence of the fanatic and the repented populations. From the numerical simulation, it is shown that government's intervention measures through mass sensitization campaign about the danger of terrorism ideology should be consider cautiously since it has the propensity to accelerate the fanatical population's persuasion of the virgin population to follow their cause. As consideration of the high worsening effect of arrest and imprisonment of suspects, even though the size of the semi-fanatical and the fanatical populations may continue to decline toward zero, these populations will reach a critical level before reaching zero, and this may have a counter-productive effect on government justification for adopting the measures.

The analysis has implications for contemporary debates regarding how to balance anti-terrorism protections with individual freedoms. It shows that even if the restrictions on freedom of expression and other liberty-reducing policies are effective at reducing the spread of terrorism ideology; such measures may not necessarily have the intended security benefit. At the least, the analysis suggests that

“the burden of empirical proof should be on the proponents of liberty-reducing CT measures who must show that such policies are effective in preventing terrorist attacks”. The result that the efficacy of free-speech restrictions is questionable on efficiency grounds is especially important since laws restricting free-speech might pose fundamental challenges to the institutional and social fabric of liberal-societies beyond their questionable effect on security. The language of anti-incitement statutes synonymous with such policies invariably contains indeterminate terms such as “incitement”, “glorification” and “encouragement of terrorism”, an ambiguity that gives government officials the ability to purge political viewpoints or to sanction speech that has little chance of inciting violence, should they intend to do so.

Concerned about such proliferation of anti-terrorism laws, three international rapporteurs on freedom of expression (the UN Special Rapporteur on Freedom of Opinion and Expression, the OSCE Representative on Freedom of the Media, and the Special Rapporteur on Freedom of Expression of the Organization of American States, OAS) adopted in December 2005 a Joint Declaration, which states that: “While it may be legitimate to ban incitement to terrorism or acts of terrorism, States should not employ vague terms such as glorifying” or promoting terrorism when restricting expression. Incitement should be understood as a direct call to engage in terrorism with the intention that this should promote terrorism, and in a context in which the call is directly causally responsible for increasing the actual likelihood of a terrorist act occurring” [34]. Most fundamentally, efforts to target speech that may lead to incitement place at risk values that citizens in liberal-societies deem essential, such as freedom of speech, freedom to dissent, right to privacy and family life, freedom of expression etc., especially when anti-terrorism incitement provisions do not require a direct link between speech and incitement or intentions to induce violence.

Furthermore, the study suggests that the effectiveness of liberty-reducing CT measures should be considered in the light of the incentives of bureaucratic agencies responsible for terrorism prevention instead of the susceptibility of the local population. In this context, scholars and governmental reports have documented various security agency complicities in terrorism and other organized crimes. Taking the Nigerian environment for example, the Daily Post of August 29, 2017 stated that a fully kitted military officer was among 30 kidnappers, armed robbery suspects arrest in Kogi state Nigeria; “Two Policemen, Naval Officer were Paraded For Armed Robbery, Kidnap” in Kogi state Nigeria - live Channels TV broadcast, 10th October 2017; “Police Arrest Two Ex-Military Officers for Alleged Robbery” in Katsina state Nigeria-Live Channel TV broadcast, 5th January 2018, to mention just a few. Other complicities are bureaucratic culture of rewarding quantity over quality; a focus on short-term at the expense of long-term strategic analysis; inability to connect the dots, among other problems [29]. Scholars have also pointed out numerous bureaucratic inefficiencies in collecting, analyzing, and sharing intelligence [9].

Scholars have widely documented that preventive policies that reduce citizen’s rights and liberties to presumably making it difficult for terrorist groups to operate inside liberal societies might instead make terrorist activity more difficult to detect, which can aggravate the bureaucratic inefficiencies. In general, our analysis suggests that security agencies would prefer to magnify the threat of terrorism (use propaganda) so as to justify and augment their CT powers. This finding, for example, is consistent with empirical observations regarding the use of informants and agents provocateurs to instigate terrorist acts; a tactic that has been documented, at least, since the nineteenth century struggle against anarchist terror [13].

Very significant also, the notion that policing terror sometimes turnout to encouraging it is not a thing of the past. The FBI, of course, has a long history of infiltrating dissident organizations and in many instances acting as agents’ provocateurs to instigate violence. In the context of the US fight against AlQaeda terrorism, the security agencies has routinely used paid informants not to capture existing terrorists, but often to cultivate them by offering ideas and incentives that encourage individuals to engage in terrorist activity [1]. This fact was collaborated by Human Rights Watch [31] and the press reports have documented that FBI-involved agents orchestrated several well-known terror plots of the last decade, including the Miami Seven; the Washington DC Metro bombing plot; the New York City subway plot; and the attempt to blow up Chicago’s Sears Tower, among others [28]. Other evidences include the “Illusion of Justice; Human Rights Abuses in US Terrorism Prosecutions” [31]; “Government agents, directly involved in most high-profile US terror plots” [49]; “Deploying Informants, the FBI Stings Muslims” [42]. In the case of the “Newburgh Four”, for example, who were accused of planning to blow up synagogues and attack a US Military base, a US District Judge said, “I believe beyond a shadow of a doubt that there would have been no crime here except the government instigated it, planned it and brought it to fruition”, “Documents provide rare insight into FBI’s terrorism stings” [43].

Conclusion

Since restricting the rights and liberties of citizen has been a typical response of democratic governments to major terrorist attacks, we need to understand the security consequences of such CT measures which, although might increase the cost of terrorism, cannot completely suppress terrorist activity and propagandas. This study provides a necessary first step analysis of the boomerang effect of such policies. It suggests that in a society in which democratic governments respond to major terrorist attacks with restrictions on rights and liberties of its citizenry, such policy interventions have a moral vulnerability and boomerang effect which can engender terrorist activities and as well as the spread of its propaganda. The analysis underscores the fact that a commitment to respect the fundamental rights and liberties of the citizenry and cooperate with the moderate local population in times of duress can be of much security advantage than otherwise.

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