

Response to CDC Director Frieden's Opposition to a Travel Ban.

Yaneer Bar-Yam
New England Complex Systems Institute
October 13, 2014

A few days ago, CDC Director Tom Frieden, explained his opposition to the use of a travel ban to combat the spread of Ebola. Here I discuss the points made by Frieden and point out that many of them are not based upon scientific evidence. Most importantly, the travel ban he opposes is a "straw man" not reflecting reasonable strategies to prevent global spread of the disease nor the sophistication of carefully planned ones. The key to prevention is effective screening rather than absolute bans. The screening that is currently being done is insufficient. The issue is not that we need travel bans per se, but that we need sufficiently effective screenings, even ones that are onerous on travelers. Just as other healthcare interventions can be done poorly or well, concerns about how travel limits should be done can be addressed, and the use of travel limitations should not be rejected out of hand. Complex systems science has shown that cascading events occur in networked systems, and the use of boundaries is an important strategy for preventing catastrophic events.

A public debate about the use of travel bans for prevention of spreading of Ebola epidemic from West Africa has attracted much attention. Recent comments by CDC Director Tom Frieden have been in response to this public discussion. The comments by Frieden were published by FOX news as an Opinion on Oct. 9, 2014 [1]. I repeat these statements here and provide a direct point by point commentary.

Opinion: CDC Chief: Why I don't support a travel ban to combat Ebola outbreak

The first case of Ebola diagnosed in the United States has caused some to call on the United States to ban travel for anyone from the countries in West Africa facing the worst of the Ebola epidemic.

That response is understandable. It's only human to want to protect ourselves and our families. We want to defend ourselves, so isn't the fastest, easiest solution to put up a wall around the problem?

But, as has been said, for every complex problem, there's a solution that's quick, simple, and wrong.

This has indeed been said and it is surely true that proposed solutions that do not recognize indirect effects often fail. But understanding these indirect effects is the key to understanding the impact of policy decisions. One could just as directly argue that the existing policy is such a "quick, simple and wrong" failed solution. Thus, such a statement is not evidence. Whether a particular solution is wrong must be demonstrated and not just claimed.

A travel ban is not the right answer. It's simply not feasible to build a wall – virtual or real – around a community, city, or country. A travel ban would essentially quarantine the more than 22 million people that make up the combined populations of Liberia, Sierra Leone, and Guinea.

It appears that Frieden opposes the practicality of a completely impervious wall that does not allow travel to or from these countries. However, it is not necessary to limit travel to these countries to prevent an outbreak from spreading. Nor is it necessary for the wall to be completely impervious.

Travel limitations that consist of screening for fever are being done today. These screening activities limit the travel of people from the countries. The key to preventing spread of a disease is to have effective screening. Ebola is challenging for screening because of the long period in which a person can be infected and not manifest symptoms, up to 21 days. Screening for fever is not effective during this period, and even afterwards taking Advil or other fever suppressing medication makes it ineffective. Effective screening would require the possibility of keeping people under observation for up to 21 days. Shorter periods could be used if there is reliable information about potential exposure. Setting up such an observation system would be a major effort, but is not out of the question given the nature of the epidemic. While a waiting period might be considered a hardship for individuals, one should also recognize that the greatest risks are to the family, friends and business partners of those who travel from West Africa to other locations. In a recent report a message from a Liberian visitor to a U.S. resident friend was quoted “Why haven’t you visited me?” The friend’s response: “Hey, I love you, don’t get angry with me, you know? Give me the 21 days. You want me to live, you know?” [2]

As to the idea that a barrier has to be impervious, one might ask whether Frieden locks his door to his house when he is not there. By his logic he would not. Surely criminals can enter through a broken window. Sophisticated criminals can disable alarm systems. There is no security system that is perfect. Nevertheless, most people lock their doors and buy alarm systems because they reduce the probability of adverse events. Differences in probability are significant. Reducing the probability of an outbreak outside of West Africa can give time to gain control of the epidemic where it is, rather than combating it in many places.

When a wildfire breaks out we don't fence it off. We go in to extinguish it before one of the random sparks sets off another outbreak somewhere else.

This claim is not true [3,4]. There are two major ways that wildfires are fought. Direct methods that attack the fire itself, and indirect methods that create fire breaks away from the fire to prevent its spreading beyond a confined area. Both are used. Thus, “fence it off” is indeed an essential tool for firefighters. Both methods are used because each has its merits and limitations. They are not mutually exclusive, which seems to be an assumption of Frieden.

Frieden is, however, implying that an analogy with firefighting might be useful in considering how we fight epidemics. This means that our learning from firefighting should also include the possibility of using fire breaks in the context of epidemics, validating the suggestions by others in favor of travel restrictions. Many of the same considerations apply. By creating a barrier to spreading, one can limit the places that one has to fight the fire. A realistic perspective about what can be done enables success by focusing attention on what can be done. An unrealistic perspective about the ability to combat the fire everywhere makes things worse rather than better, leading to a larger area that is burned in a fire. Still, the analogy to fire fighting is not complete and we need to be careful about lessons it offers.

We don't want to isolate parts of the world, or people who aren't sick, because that's going to drive patients with Ebola underground, making it infinitely more difficult to address the outbreak.

Frieden does not support any of his claims with scientific references. In a recent twitter conversation, when Frieden (or others in his name using his Twitter account) made a similar claim [5], references were cited on his behalf [6].

The first such reference is to an article analyzing quarantines using a theoretical rational agent model exploring the possibility that people may strive to escape quarantine under some conditions [7]. This is not the same as saying that any quarantine is counterproductive. It implies that we need to design quarantines appropriately and this is explicitly stated in the paper. Indeed, another example of such behavioral issues cited in the article is that of people avoiding vaccinations [8], a problem in the US today, but not one which has motivated Frieden to advocate that childhood vaccination programs be cancelled. Another reference [9] points to the need for care in implementation of quarantines to cases for which it is applicable and recognizes that one of the key issues is that public health officials today do not have experience with their use. Neither article indicates that quarantines are inappropriate under all circumstances or should be dismissed out of hand as Frieden has done. We have done a more extensive literature review and did not find other articles that provide support for Frieden's position. The literature widely recognizes that quarantines require careful implementation and carry their own risks. Surely, there are reasons to be careful in how quarantines are implemented. This can be said of essentially all healthcare activities. That quarantines can be an important aspect of epidemic control is not counterindicated by the literature. Indeed, it is historically recognized as a key method of epidemic control.

It could even cause these countries to stop working with the international community as they refuse to report cases because they fear the consequences of a border closing.

Perhaps some consider an externally forcefully imposed quarantine on West African countries as an appropriate model. Frieden's remarks do not in principle indicate why this would be done. Nor do they show why they wouldn't be effective. Still, working in collaboration with those countries to create an appropriate exit screening strategy that

would prevent people from leaving with infections is very different from what Frieden is suggesting and then opposing, and can be both medically and politically acceptable.

Stopping planes from flying from West Africa would severely limit the ability of Americans to return to the United States or of people with dual citizenship to get home, wherever that may be.

Note that the statement “stopping planes” is a specific model of how travel limitations would be implemented. Effective screening is a different plan. Even stopping all travelers from leaving would be different from stopping planes. Surely, we can agree with Frieden’s statement in its literal form that stopping planes would severely limit people from returning to the US. Even a strategy of careful screening would do so. Still this may not be an unreasonable imposition on their travel given the epidemic risks. When travel is delayed or even cancelled by weather or volcanic ash people have to adjust and do so. Delaying travel by up to 21 days from West Africa is not as much of a problem as deaths of those who will be infected if they do travel without sufficient screening. Only if we ignore the future consequences of current actions would travel inconvenience trump the spread of a deadly disease.

In addition to not stopping the spread of Ebola, isolating countries will make it harder to respond to Ebola, creating an even greater humanitarian and health care emergency.

Setting up exit screening is not the same as stopping planes from flying. Indeed, by providing effective screening it is likely that airlines would be less reluctant to fly into the affected countries because they could be assured that they would not be carrying sick individuals back.

Importantly, isolating countries won’t keep Ebola contained and away from American shores. Paradoxically, it will increase the risk that Ebola will spread in those countries and to other countries, and that we will have more patients who develop Ebola in the U.S.

This statement has not been substantiated. Indeed, it is reasonable to suggest that by limiting the outbreaks to these countries the focus of limited resources can be made for the response there. It is important to note that the benefit of travel restrictions is not just for “American shores,” but also globally, including India, China and other countries in Europe, Africa and Asia. Limitations on travel can reduce the incidence of outbreaks both over the short and long term. Border closings were successfully used by Senegal. While the border security was not perfect, the one individual infected that illegally crossed from Guinea was rapidly isolated [10]. An approach that allowed for some, but limited travel, has been reported in the Sierra Leone district of Koinadugu, the last district that has not reported any Ebola cases [11].

People will move between countries, even when governments restrict travel and trade. And that kind of travel becomes almost impossible to track.

Security systems do not stop all criminals. Still, we use security systems because not everyone is a criminal. Not everyone has the means, ability or desire to circumvent the security. Reducing the probability of sick people traveling from West Africa can reduce the number of cases that arrive in the US, as well as elsewhere in the world. That this is a reasonable approach is already manifest in the use of fever screening. It is just not sufficient for Ebola, so effective screening requires that more be done.

Isolating communities also increases people's distrust of government, making them less likely to cooperate to help stop the spread of Ebola.

Isolation works both for communities with and without cases of Ebola. Isolating healthy communities from sick ones will make healthy communities more respectful of their governments. This is apparent in the responses in the U.S. to Frieden's statement. Even for communities with sick individuals, it is reasonable to expect that when a government responds successfully and there are a decreasing number of sick individuals, respect for the government will increase. The opposite can be expected if the number increases as is happening in West Africa.

Isolating communities and regions within countries will also backfire. Restricting travel or trade to and from a community makes the disease spread more rapidly in the isolated area, eventually putting the rest of the country at even greater risk.

Frieden gives no evidence to support the claim that isolating communities will backfire. He apparently considers only isolation of communities with sick individuals and not of communities of healthy individuals. An isolated healthy community maintains its health. Even an isolated sick community has the benefit of not having additional sick individuals reach it and the ability to focus on limiting the transmission within the community. More generally, how the disease spreads depends on what is done in the context of isolation. Isolation is only part of an overall policy for addressing the transmission.

It is important to note that having boundaries that separate infected and uninfected regions of a country is also extremely helpful to the process of international travel restrictions. Given areas that are disease free, it is possible to require that individuals who travel internationally are from those areas or have been in those areas for three weeks.

Note that travel restrictions for people who have been in contact with sick individuals is very much part of the standard protocol for Ebola containment and prevention of outbreaks both in West Africa and in the US. Such individuals are placed in isolation for the incubation period. The reason for this is apparent and the same reasons apply to communities as they do to individuals. When there is an extensive outbreak the process of contact tracing breaks down as it has in West Africa and community isolation and tracking is a way to address the disease spread at the community level.

It is widely accepted that any individual who has had contact with an Ebola patient has to be isolated for three weeks. A similar protocol can be applied to individuals who wish to move from an area in which there is likelihood of contact, to one where there is none.

To provide relief to West Africa, borders must remain open and commercial flights must continue.

Indeed there is no problem with borders being open and commercial flights continuing. What is a problem is for people to be able to leave those countries without sufficient screening, which may include a long individual quarantine period.

There is no more effective way to protect the United States against additional Ebola cases than to address this outbreak at the source in West Africa. That's what our international response—including the stepped-up measures the president announced last month—will do.

There is no doubt that a response in Africa that is effective will be helpful. However, we have not yet achieved such a level of response. Indeed, in hindsight, had we limited travel from the regions that were affected early in the epidemic, the disease would be restricted to those areas. This is a general property of cascades in complex systems, whether they are epidemics, fires, or other processes that involve transmission through networks of connectivity. Using barriers to transmission limits the extent of the transmission process. Similarly, if now we prevent travel from regions in which the disease is located, we will have less to address in the future.

What works most effectively for quelling disease outbreaks like Ebola is not quarantining huge populations.

This claim is unsupported.

What works is focusing on and isolating the sick and those in direct contact with them as they are at highest risk of infection. This strategy worked with SARS and it worked during the H1N1 flu pandemic. Casting too wide a net, such as invoking travel bans, would only provide an illusion of security and would lead to prejudice and stigma around those in West Africa.

This statement is puzzling. Neither SARS nor H1N1 were limited by contact tracing. SARS spread widely and was limited in its impact primarily by behavioral change (e.g. wearing of masks) **and travel restrictions**. H1N1 was never limited, it spread across the world and has become endemic to the global population. The mortality from that epidemic is estimated at 290,000, a mortality rate of 0.005% [12]. Comparing this with the mortality rate of Ebola if it becomes globally present is surprising to say the least. The best examples of contact tracing relevant to this discussion are those of previous Ebola outbreaks. These occurred in small villages where contacts can be much more easily limited and traced. Indeed, the arrival of Ebola to urban areas surely made this approach more difficult and it may be entirely ineffective once there are more than just a

few cases. This conclusion follows from the large number of contacts that are typically required to be traced for even a single individual. Isolating a large number of contacts in a city is tantamount to isolating a neighborhood. This is indeed what is being proposed as an effective approach to containing the disease [13].

Moreover, it is easy to show that the tracking and isolation of contacts is ineffective for many types of diseases and to claim it will be effective in this case is not supported by the evidence. As to the issue of stigma: Surely stigma will be present if people are not screened sufficiently and the public cannot know if they are contagious or not.

Americans can be reassured we are taking measures to protect citizens here.

When leaders realistically address the challenge citizens can be reassured. When they adopt policies that are manifestly ineffective they should not be [14].

Today, all outbound passengers from Guinea, Liberia, and Sierra Leone are screened for Ebola symptoms before they board an airplane.

As is clear from the medical understanding of the latent period, and as is clear from the experience, this screening is insufficient.

Staff from CDC and the Department of Homeland Security's Customs & Border Protection will begin new layers of entry screening, first at John F. Kennedy International Airport in New York this Saturday, and in the following week at four additional airports -- Dulles International Airport outside of Washington, D.C.; Newark Liberty International Airport; Chicago's O'Hare International Airport; and Hartsfield-Jackson Atlanta International Airport.

Similarly this screening is insufficient but it is a limited recognition that screening is indeed justified. The key is not to do screening as "security theater" but real screening that will be effective.

Combined, these U.S. airports receive almost 95 percent of the American-bound travelers from the Ebola-affected countries.

Travelers from those countries will be escorted to an area of the airport set aside for screening. There they will be observed for signs of illness, asked a series of health and exposure questions, and given information on Ebola and information on monitoring themselves for symptoms for 21 days. Their temperature will be checked, and if there's any concern about their health, they'll be referred to the local public health authority for further evaluation or monitoring.

Controlling Ebola at its source – in West Africa – is how we will win this battle. When countries are isolated, we cannot get medical supplies and personnel efficiently to where they're needed – making it impossible to fight the virus in West Africa.

As the WHO's Gregory Hartl said recently, "Travel restrictions don't stop a virus. If airlines stop flying to West Africa, we can't get the people that we need to combat this outbreak, and we can't get the food and the fuel and other supplies that people there need to survive."

As indicated above, we can effectively screen passengers leaving the affected countries without limiting travel to them.

We know how to stop Ebola: by isolating and treating patients, tracing and monitoring their contacts, and breaking the chains of transmission.

This is correct only when we have a few cases. Given the current outbreak in urban environments this statement is not supported by the evidence.

Until Ebola is controlled in West Africa, we cannot get the risk to zero here in the United States.

Agreed. However, we can reduce the risk dramatically by making appropriate changes to screening processes that reduce the travel of infected individuals. This is important not just to the United States but to the entire world.

[1] Opinion: CDC Chief: Why I don't support a travel ban to combat Ebola outbreak . Fpx News (Oct. 9, 2014) <http://www.foxnews.com/opinion/2014/10/09/cdc-chief-why-dont-support-travel-ban-to-combat-ebola-outbreak/>

[2] Ebola weighs on Rhode Island's Liberians, Boston Globe, (Oct. 8, 2014) <http://www.bostonglobe.com/metro/2014/10/07/liberians/Fi6p1vSgDXWrUXI3GX7DtO/story.html>

[3] Wildland Fire Suppression Tactics Reference Guide, Colorado Firecamp (1996) <http://www.coloradofirecamp.com/suppression-tactics/how-to-attack.html>

[4] Fire Management Strategies and Tactics, Idaho Firewise (2014) <http://www.idahofirewise.org/fighting-fires/fire-management-strategies-and-tactics/>

[5] Imposing quarantine on entire nations would backfire and fuel the #Ebola epidemic. #CDCchat, DrFriedenCDC, <https://twitter.com/DrFriedenCDC/status/517773918728626177>

[6] https://twitter.com/Black_Shoals/status/517777416509718528

[7] A. Mesnard, P. Seabright, Escaping epidemics through migration? Quarantine measures under asymmetric information about infection risk.. CEPR Discussion Papers, No. 6653 (2008).

[8] P. Geoffard, T. Philipson, Rational epidemics and their public control, International Economic Review, 37 (3), 603-624 (1996).

[9] J. Barbera, A. Macintyre, L. Gostin; et al., Large-Scale Quarantine Following Biological Terrorism in the United States: Scientific Examination, Logistic and Legal

Limits, and Possible Consequences JAMA. 2001;286(21):2711-2717 (doi:10.1001/jama.286.21.2711).

[10] The Ebola Miracle: How Senegal Has Dodged the Outbreak, International Business Times, (Sept 27, 2014) <http://www.ibtimes.com/ebola-miracle-how-senegal-has-dodged-outbreak-1695858>

[11] T. C. Frenkel, The fight to save the last Ebola-free district in Sierra Leone, Washington Post, (Oct. 10, 2014), <http://www.washingtonpost.com/news/storyline/wp/2014/10/10/the-fight-to-save-the-last-ebola-free-district-in-sierra-leone/>

[12] F. S. Daewood, et. al., Estimated global mortality associated with the first 12 months of 2009 pandemic influenza A H1N1 virus circulation: a modelling study, The Lancet Infectious Diseases, 12, 9, 687-695 (2012) doi:10.1016/S1473-3099(12)70121-4.

[13] Y. Bar-Yam, DRAFT New Ebola Response Strategy: Local Care Team Early Detection Response, NECSI (Oct. 12, 2014). <http://necsi.edu/research/management/health/ebolaresponse.html>

[14] 75% of Doctors Support Travel Ban from West Africa According to SERMO Poll, Yahoo News (Oct 13, 2014). <http://finance.yahoo.com/news/75-doctors-support-travel-ban-151500745.html>