World health Outbreaks (seen in data viz):

**Early year numbers are small**

**HIV:** increasing every year, but proportional to overall increase in network volume. 2007 dengue outbreak saw relative decrease in network volume for the first time, recovering for good in 2010. HIV sees extreme prevalence throughout the entirety of the dataset. It especially dominates the pub network.

**Ebolavirus:** 2014

**Dengue virus 2:** 2007-2011 LARGE outbreak.

**Dengue virus 1:** 2007-2011 LARGE outbreak.

**Dengue virus 3:** 2007-2011 LARGE outbreak.

**West Nile virus:** 2009-2011 LARGE outbreak.

**Hepacivirus C:** 1992-1996. 2000-2006 small growing increase.

**Hepatitis C:** 2006-2008 LARGE outbreak.

**Hepatits B:** middling but consistent prevalence

**Zika:** 2015-2017 LARGE outbreak.

**Hepatitis E:** 1992-93. 2000-2006 small growing increase.

**Focus areas:**

dengue outbreak 2007-2011

Hep C 2006-2008 outbreak

Zika outbreak

Increase/decrease in HIV network density in response to outbreaks

**Subfocuses (see if these line up consistently)**

Scholarly Communication Events (eg conferences)

Scientific Innovation Event

Public Awareness

Policy Events (funding, etc)

**Points:**

How does the network react when an outbreak occurs?

Does collaboration increase or decrease?

How reliable is network activity in reflecting outbreaks?

Why, when outbreaks occur, does research on certain major pervasive viruses (HIV) significantly decrease when other times it does not? (See Dengue)

**For Dr. Qin / Sarah:**

How does this relate to the overarching investigation goals of GenBank? I.e, if I were to write up a paper on the subject of scientific reactivity to public health events, what are some of the GenBank goals I should attempt to answer?

* Does funding decrease for some virus communities during some outbreaks vs others? Eg Dengue or Hep.C. Where does funding go, and what triggers funding changes?
* Equity in funding (ie does international attention and then funding only come when high profile / western countries begin to suffer?) WHO is doing research? Is it global? (Look at datasets, ask sarah!)
* Look into datasets of which countries are working on which viruses, and which countries those viruses are affecting during outbreaks
* WHY is there a massive jump in Hep. C research in 2006-2008, but no discernable outbreak? (It’s more like HIV than say, Zika.) Difference between long term and short term disease issues? Ie Zika was a short term problem, but Hep. C is long term, similar to HIV.
* Create report.

**Dengue Outbreak (primarily virus 2) 2007-2011**

<https://en.wikipedia.org/wiki/2005_dengue_outbreak_in_Singapore>

[https://en.wikipedia.org/wiki/2006\_de ngue\_outbreak\_in\_India](https://en.wikipedia.org/wiki/2006_de%20ngue_outbreak_in_India)

<https://en.wikipedia.org/wiki/2006_dengue_outbreak_in_Pakistan>

<https://en.wikipedia.org/wiki/2009_Bolivian_dengue_fever_epidemic>

While we see in the data, a very large increase in scientific activity under all 3 Dengue viruses between 2007-2011, this is traceable to a large worldwide Dengue outbreak in Singapore, India, Pakistan, and Bolivia. These outbreaks were significant – Bolivia requested foreign aid for “the worst outbreak in the country’s history.” At the time of the 2006 Pakistan outbreak, it was its worst on record. The 2005 outbreak in Singapore was its worst disease outbreak since SARS. These comprise the major Dengue fever outbreaks in the past 20 years. From the visualization, we see that scientific activity began (eg papers were finished, submitted, and published which is a reasonable timeline) about one year after these outbreaks began. **This suggests that a large portion of scientific virus research is reactive to public health outbreaks. As viruses can appear or surge at any given time with little predictability, this makes intuitive sense that the virus community jumps on outbreaks, as they pose the greatest imminent risk to the public AND they comprise the greatest scientific interest points.**

An important note is that HIV research, during this outbreak, decreased at an amount relative to the increase in the Dengue activity.

**Hep C 2006-2008 outbreak**

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5079374/>

<https://en.wikipedia.org/wiki/Hepatitis_C#Epidemiology>

<https://www.hhs.gov/hepatitis/learn-about-viral-hepatitis/data-and-trends/index.html>

https://www.cdc.gov/hepatitis/outbreaks/HCVOutbreaks-PWID.htm

We see a massive increase in scientific activity around Hepatitis C virus between 2006 and 2008, while there is little activity before this point. Hepatitis C is a massive global problem, where an estimated 143 million people suffer chronically. Upon investigation, we see a general and steady increase in Hep. C cases from 2006. This corresponds to the height and progression of the Opioid crisis in the United States (according to the CDC, the highest reported severe incidence of Hep. C in the US is among 20-29 year olds – those most likely to inject drugs, as Hepatitis is spread by bodily fluid / sex / other physical contact.)

HIV activity did not decrease, unlike during the Dengue outbreak. I believe this may be because Hep. C is so widespread, that like HIV, the importance of the research stays more constant than something like Zika. However, after this given period, Hep. C activity substantially decreases, so I’m unsure about this hypothesis. Perhaps there was a policy event (eg governmental funding, opioid addiction policy) that led to this spike?

**Zika outbreak 2015-2017**

As many people know, around the time of the 2016 FIFA World Cup, there was a Zika outbreak in more than 20 countries significant enough to create significant international travel concern, and for the WHO to declare Zika as a Public Health Emergency of International Concern. Before 2015, there were little to no papers on the Zika virus – its emergence was new in 2015**. This is another solid case of the scientific community reacting to the latest and newest public health outbreaks.** Activity ceases after 2017, in part because our data ends in 2018, but this corresponds to the end of local transmission of the virus in many of the affected countries

Additionally, HIV activity again decreases (although not by a very significant amount) during this outbreak.

**Ebola:**

**West Nile:**

**Takeaways / Further Investigation:**

Dengue outbreak led to a large decrease in HIV research, but Zika (largely) and Hep C did not. Why? Was the Dengue outbreak more severe? More scientifically interesting? Did governments react differently to this than Zika or Hep. C in terms of funding, etc? Was there greater international concern over Dengue fever than other health events?

**HIV study over the years**