8 APPENDIX

Algorithm 1: Top-*n* Ranked Annotation Placement Algorithm

Input: $a1$ = list of ranked annotations, n = annotations to place

Output: $a2$ = list of size n of placed annotations

1: set $a2$ = new list
2: copy $a1$ from 1 to n to $a2$
3: **for** $i = 1$ to n **do**
4:     set ann = retrieve annotation from $a2$ at position i
5:     **if** ann maps to a single x spot **then**
6:         set $x - spot$ = x
7:     **else**
8:         set $x - spot$ = the middle x position
9:     **end if**
10:    **if** ann maps to a timestep only **then**
11:        set $y - spot$ = halfway between top of temporal layout and window
12:    **else if** ann maps to a single y spot **then**
13:        set $y - spot$ = y
14:    **else**
15:        // find the most prominent position
16:        **if** ann maps to a set of lines **then**
17:            set $y - spot$ = the middle line's position at $x - spot$
18:        **else if** ann maps to one or more groups/layers **then**
19:            set $y - spot$ = the middle y position of the largest group/layer at $x - spot$
20:        **else if** ann maps to a combination of lines and groups **then**
21:            set $y - spot$ = the middle line's y-position at $x - spot$
22:        **end if**
23:    **end if**
24:    set ann's (x,y) = $(x - spot, y - spot)$
25: **end for**
26: **return** $a2$

Algorithm 2: Density-Based Annotation Placement Algorithm

Input: $a1$ = list of ranked annotations, w = annotation score threshold

Output: $a2$ = list of placed annotations

1: set $a2$ = new list
2: **for** $i = 1$ to $a1.size$ **do**
3:      set ann = retrieve annotation from $a1$ at position i
4:      **if** ann's score $< w$ **then**
5:         break
6:      **end if**
7:      set $spots$ = list of positions that ann can be placed at with lowest possible density field weight
8:      $(x - spot, y - spot)$ = the most prominent position in $spots$ for ann
9:      **if** ann's score $>$ the density field's score at $(x - spot, y - spot)$ **then**
10:        set ann's (x,y) = $(x - spot, y - spot)$
11:        add ann to $a2$
12:        update the density field with ann's score
13:      **end if**
14: **end for**
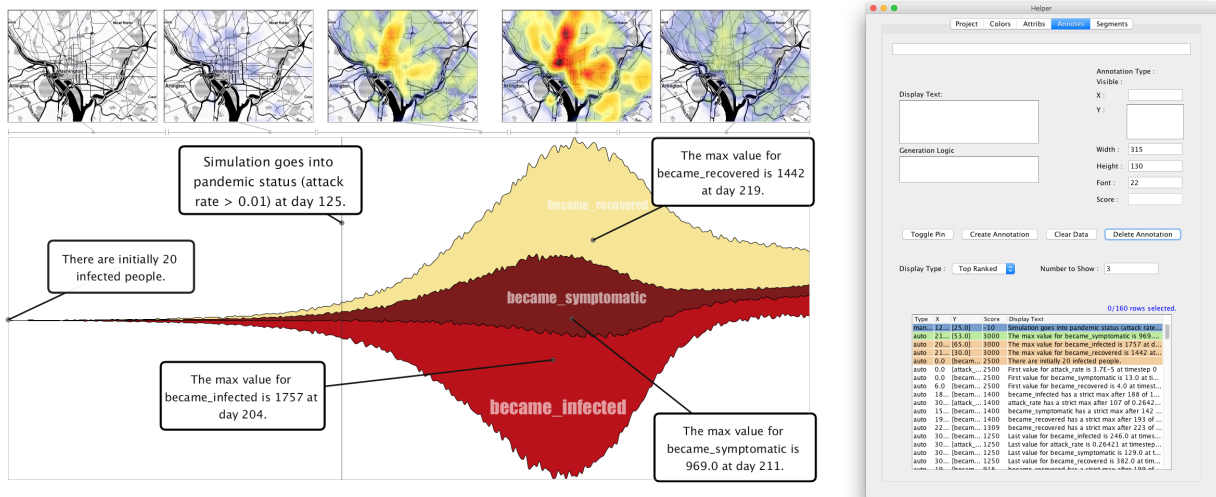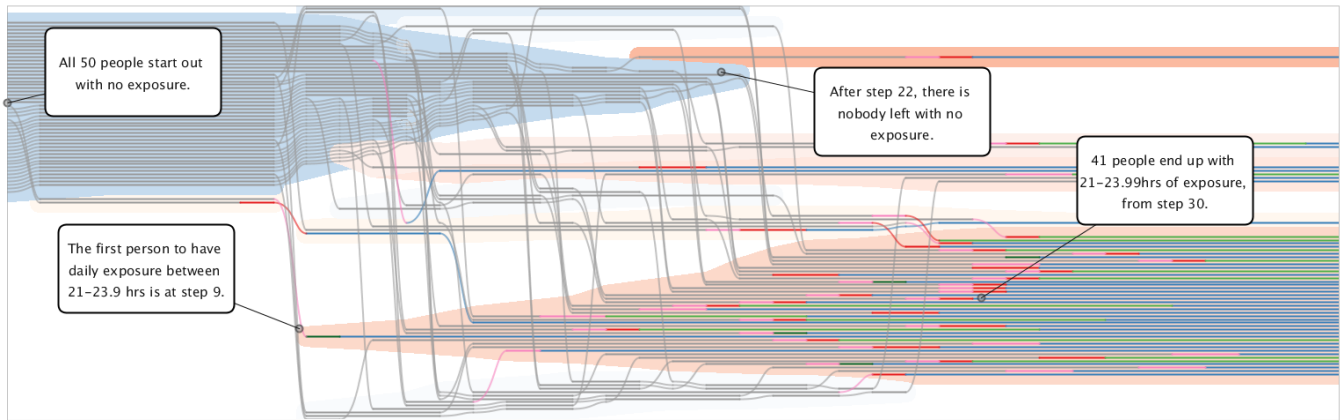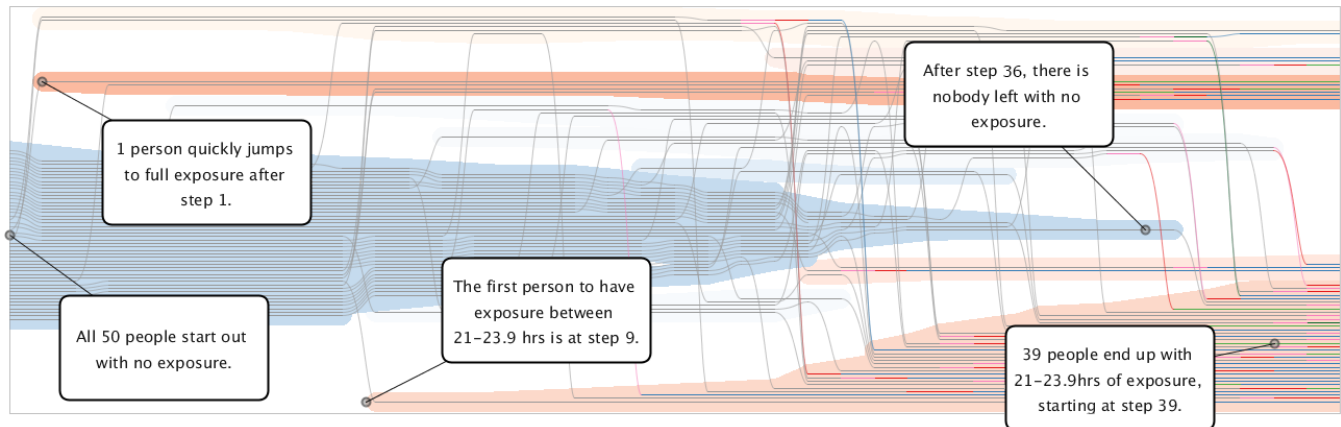15: **return** $a2$

Figure 11: This is a larger picture of the prototype TSI interface figure from the main paper, provided here to make it easier to see our details on the two views.

(a) Susceptibility parameter = 1.0.

(b) Susceptibility parameter = 0.5.

Figure 12: This is a larger picture from the main paper that compares two EpiSimS runs using annotated storylines (with data snapshots hidden). Each line represents one sampled person from the run. Line color denotes the person's current health status, which goes from gray (healthy) to red when they become infected. Storyline groups represent stages of daily exposure to infection, where blue is less (or none) exposure, and red is more (or complete) exposure. By varying a susceptibility parameter between the two runs, the created storylines show that people progress at different rates into the infected group stages. Because of the large number of lines and groups in this view, there are many visually salient features, which makes analysis more difficult. Annotations describing group-based POIs are used to explain how people generally go from low-exposure groups at the first day to high infection groups by the end of the simulation. When the susceptibility parameter is set to 1.0, this happens at a faster rate than when it is set to 0.5. Analysis at a person-based granularity is usually not done by the EpiSimS team due to the complexities of the data at this level, but using a TSI with annotations is one way to help this.
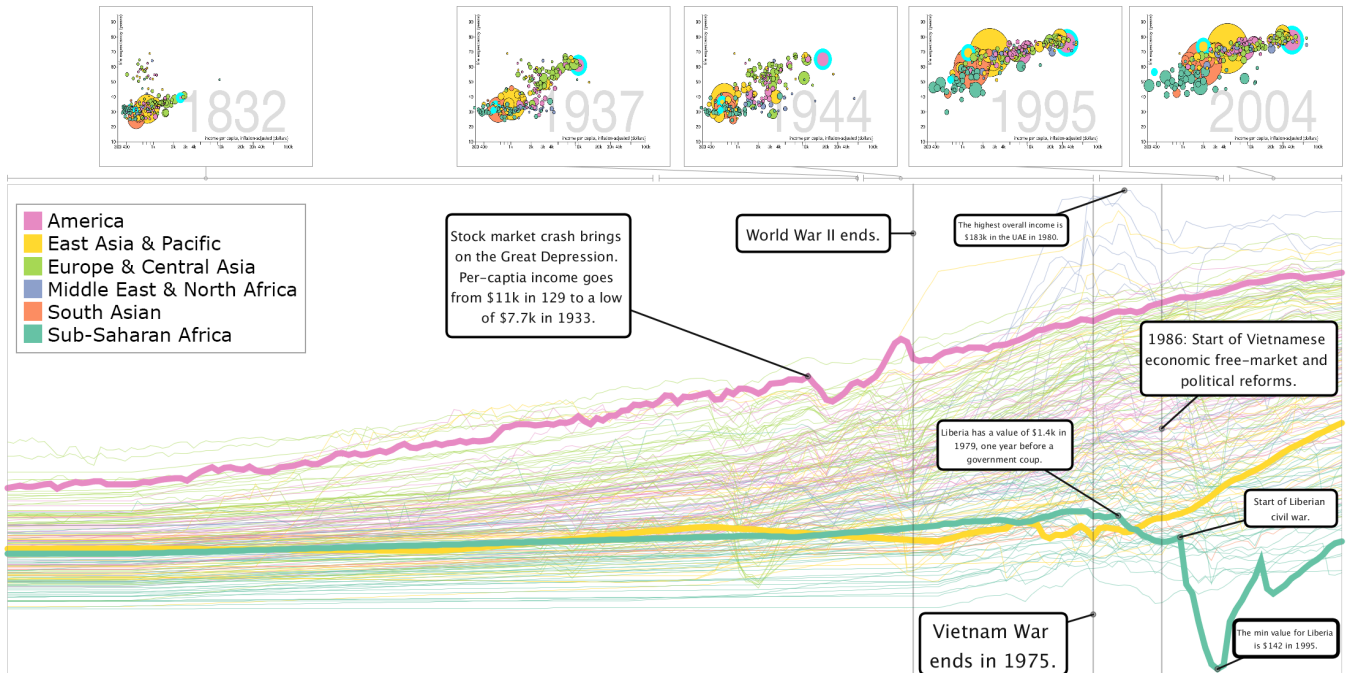
Figure 13: GapMinder's The Health and Wealth of Nations [5] was the subject of Hans Rosling's notable 2006 TED Talk that used animation to show the dynamic interplay of variables like GDP, population, and life expectancy. We use this data to expand one of the points from his talk: Vietnam's economic progress since the 1980s. The temporal layout shows income per capita from 1800-2014, with each line representing a country. The lines for three countries are highlighted (United States, Vietnam, Liberia). Data snapshots show GapMinder-like scatter plots where each country is a circle showing life expectancy (y-axis), income-per-capita (x-axis), and population (size). Countries in both components are colored by region. By highlighting the three countries in the temporal layout and appending annotations, we show that while Vietnam's economy has improved and become closer to the United States since the start of economic free-market reforms in 1986s, Liberia's has bottomed out due to instability and civil war.
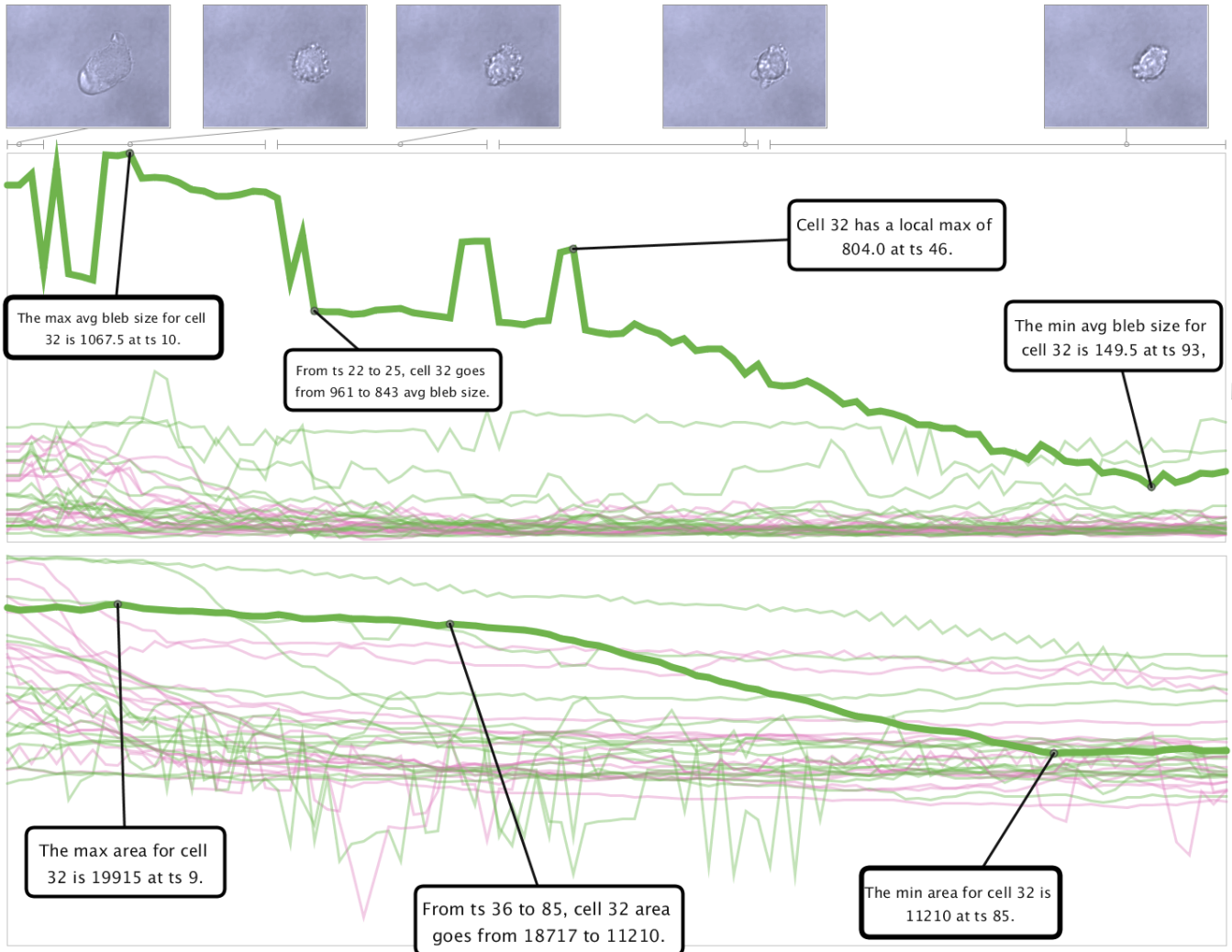
Figure 14: This TSI summarizes cell properties over time from a cellular behavior study [2]. Biomedical scientists conduct controlled experiments where they introduce stimuli and observe the resultant behavior in a collection of cells. Here, we map two extracted cell features using line charts: average bleb size (top) and area (bottom) over time. Each cell is a line; color (green or red) denotes the type of stimuli received. The data snapshots show video frames from the microscopy video for cell 32, who's line is highlighted and annotated in the charts. Annotations help clue the scientists to the selected cell's extrema points and behavior trends; it has an extremely high average bleb size and a relatively large overall area, though this latter property decreases over time.
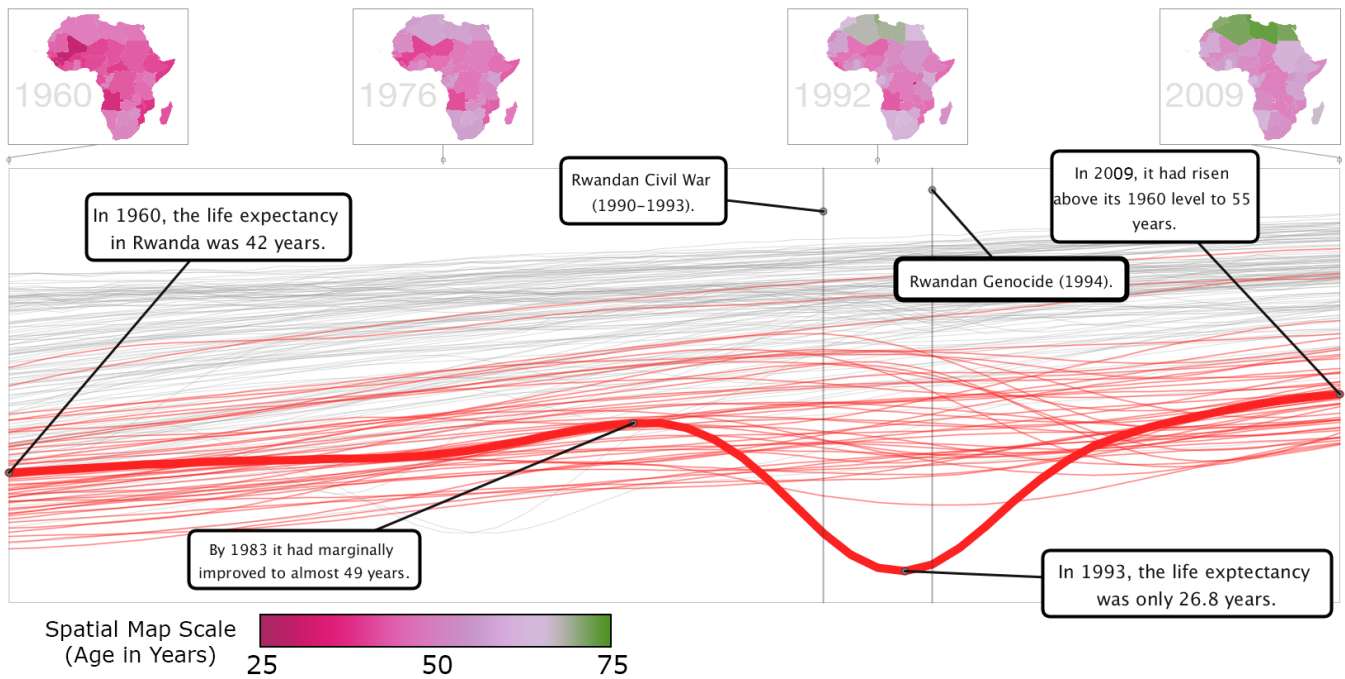
Figure 15: This TSI highlights life expectancy in Rwanda from 1960-2009. Every country in the world is shown in the line chart, though most are light gray lines. Sub-Sahara African countries are colored red, and Rwanda's line is emphasized via selection. Annotations are used to describe its extremas, and two additive annotations note relevant, significant events during this time. Data snapshots spatially show the life expectancy over all of Africa during selected years. Data from [4].
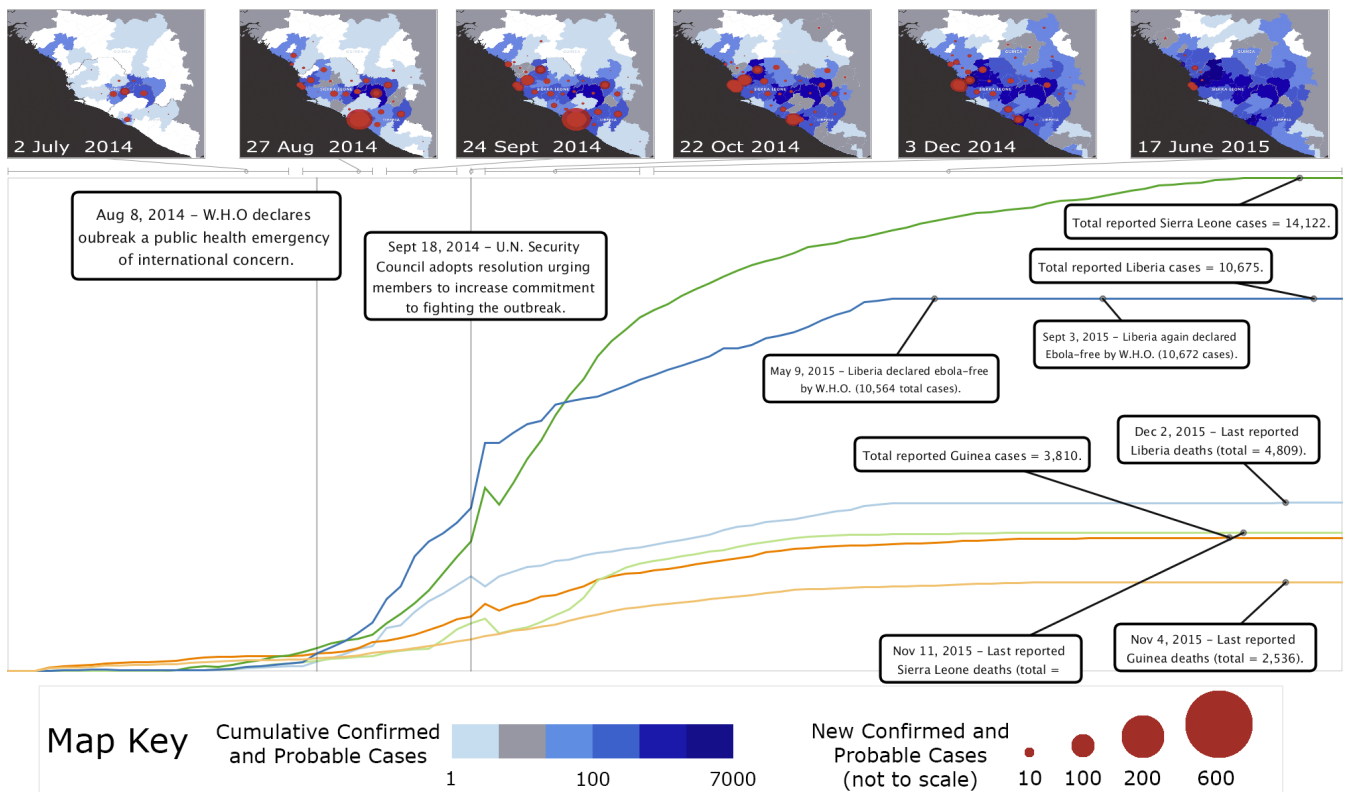
Figure 16: Mapping the West African Ebola epidemic that lasted from March 2014 to the end of 2015. Total suspected cases and deaths are shown for the three countries hardest hit by the virus: Sierra Leone, Liberia, and Guinea. Additive annotations note four events: two declarations by the World Health Organization (W.H.O) and United Nations Security Council, and two Liberia-specific annotations noting two instances when the W.H.O. officially declared Liberia Ebola-free (on May 9 and September 3, 2015). Additional annotations tell the total country-specific case amounts and when the last reported deaths happened. Data and map images retrieved from [3, 1].

REFERENCES

[1] 2014 ebola outbreak in west africa - reported cases graphs - CDC. `http://www.cdc.gov/vhf/ebola/outbreaks/2014-west-africa/`. Accessed March 03, 2016.

[2] Cell micrscopy study. Unpublished raw data.

[3] Who - ebola maps. `http://www.who.int/csr/disease/ebola/maps/en/`. Accessed March 22, 2016.

[4] World bank group. `http://www.worldbank.org/`. Accessed March 15, 2016.

[5] H. Rosling. Gapminder. *GapMinder Foundation http://www. gapminder. org*, page 91, 2009.