
Good Afternoon

Plagues, Pestilences Poxes and Pandemics

PLAGUES, PESTILENCES POXES AND PANDEMICS

OLLI at University of Illinois

2020 Fall Semester

SESSION 8

THE FUTURE AND COMING PLAGUES

October 20, 2020

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PURPOSE AND PLAN OF THIS PROGRAM (RECAP)

Provide a peripatetic, panoramic perusal of the particulars of the past, present and potential plagues, pestilences, poxes and pandemics that produce pervasive panic and persistently put peoples' permanence on this planet at prolonged peril, plus presenting possible positive principles of prevention.

Ramírez 2020

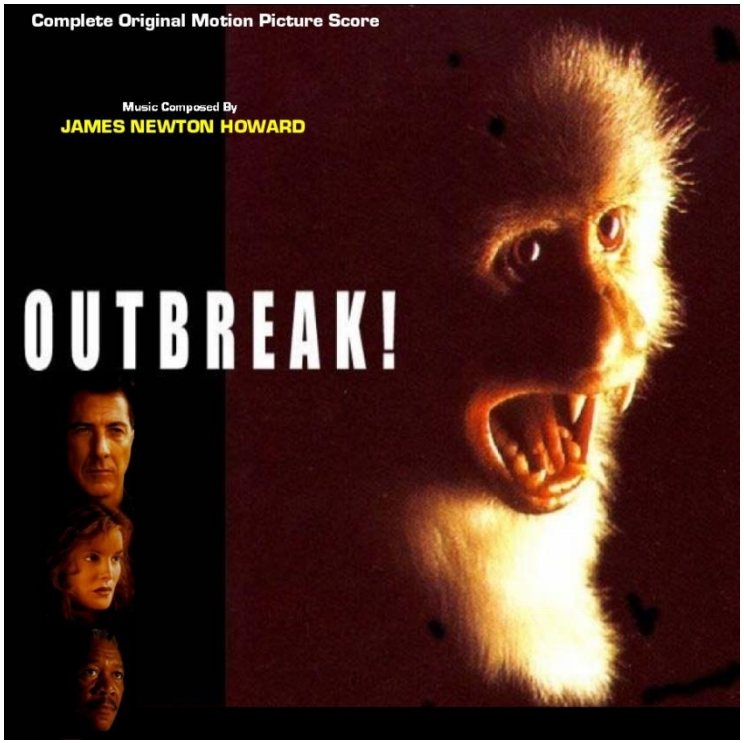
DISEASE ATTACKS IN MOVIES

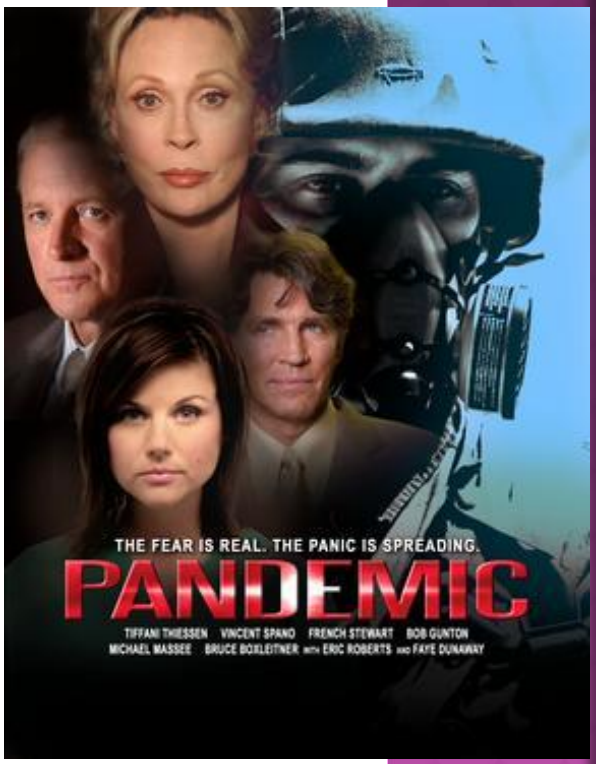

ON MARCH 11, 2008 THE GOVERNMENT SEALED OFF
AN APARTMENT COMPLEX IN LOS ANGELES.
THE RESIDENTS WERE NEVER SEEN AGAIN.
NO DETAILS.
NO WITNESSES.
NO EVIDENCE.
UNTIL NOW.
QUARANTINE


EPIDEMIC
IT'S COMING
...AND IT'S
DEADLY!
BIOHAZARD

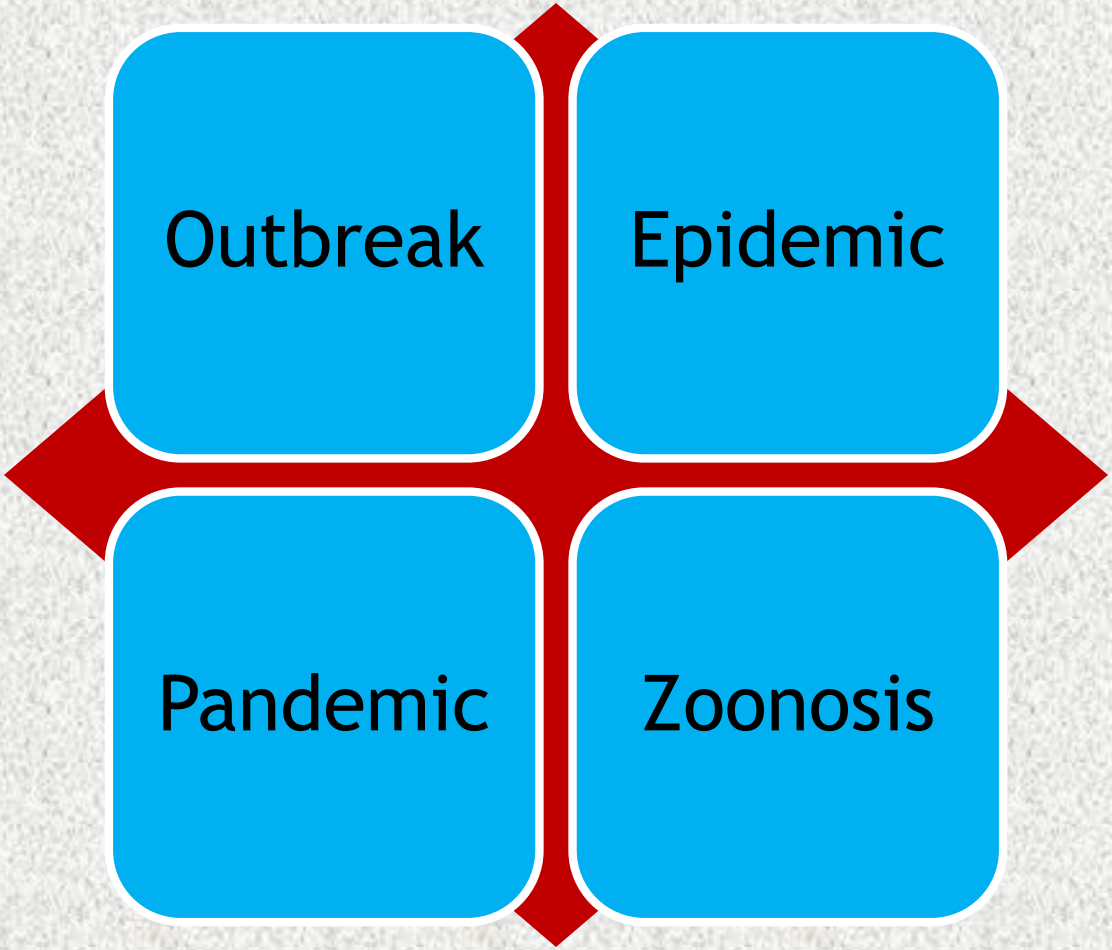

MARION COTILLARD
MATT DAMON
LAURENCE FISHBURNE
JUDE LAW
GWYNETH PALTROW
KATE WINSLET
NOTHING SPREADS LIKE FEAR
CONTAGION


ATTACK OF THE CURSED SYPHILIS
IT'S LURKING IN THE DEPTHS. WATCH OUT!
Starring
SYPHILIS · YOU · AND YOU · AND MAYBE YOU TOO
www.actoruels.org/syphilis
act


Complete Original Motion Picture Score
Music Composed By
JAMES NEWTON HOWARD
OUTBREAK!


THE FEAR IS REAL. THE PANIC IS SPREADING.
PANDEMIC
TIFFANI THIESSEN
VINCENT SPANO
FRENCH STEWART
BOB GUNTON
MICHAEL MASSEE
BRUCE BOXLEITNER
ERIC ROBERTS
FAYE DUNAWAY

DEFINITIONS
(REMINDER)



OUTBREAK

- Sudden increase in occurrences of a disease in a particular time and place.
- Small, localized group or an entire country or continent.
- Four linked cases of a *rare* infectious disease may be considered an outbreak.

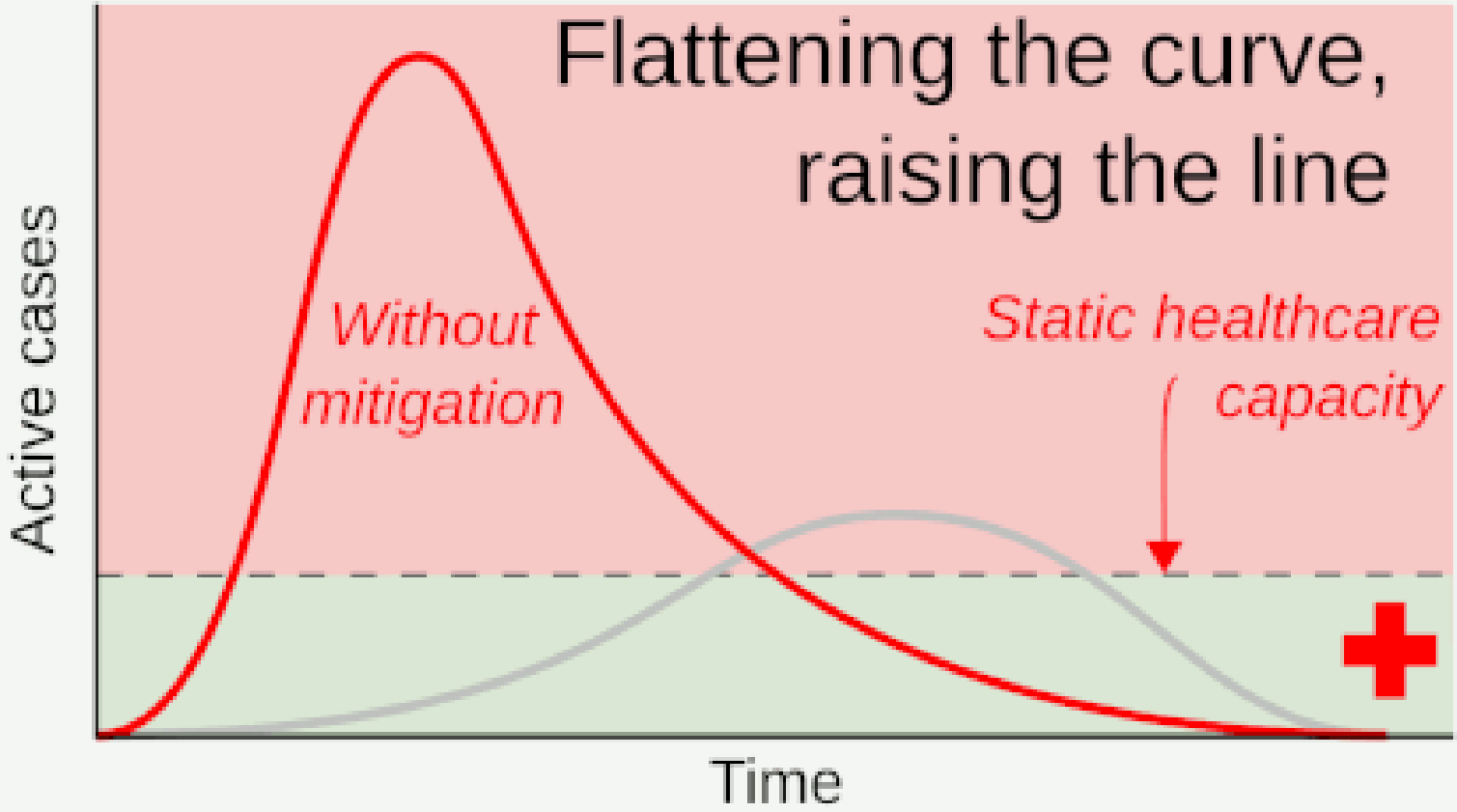
EPIDEMIC

- *Sudden* and *rapid* spread of disease to a large number of people in a population within a short period of time.
- Used for infectious diseases, and for diseases with an environmental origin.
- Erroneously used for smoking, vaping, opioids.

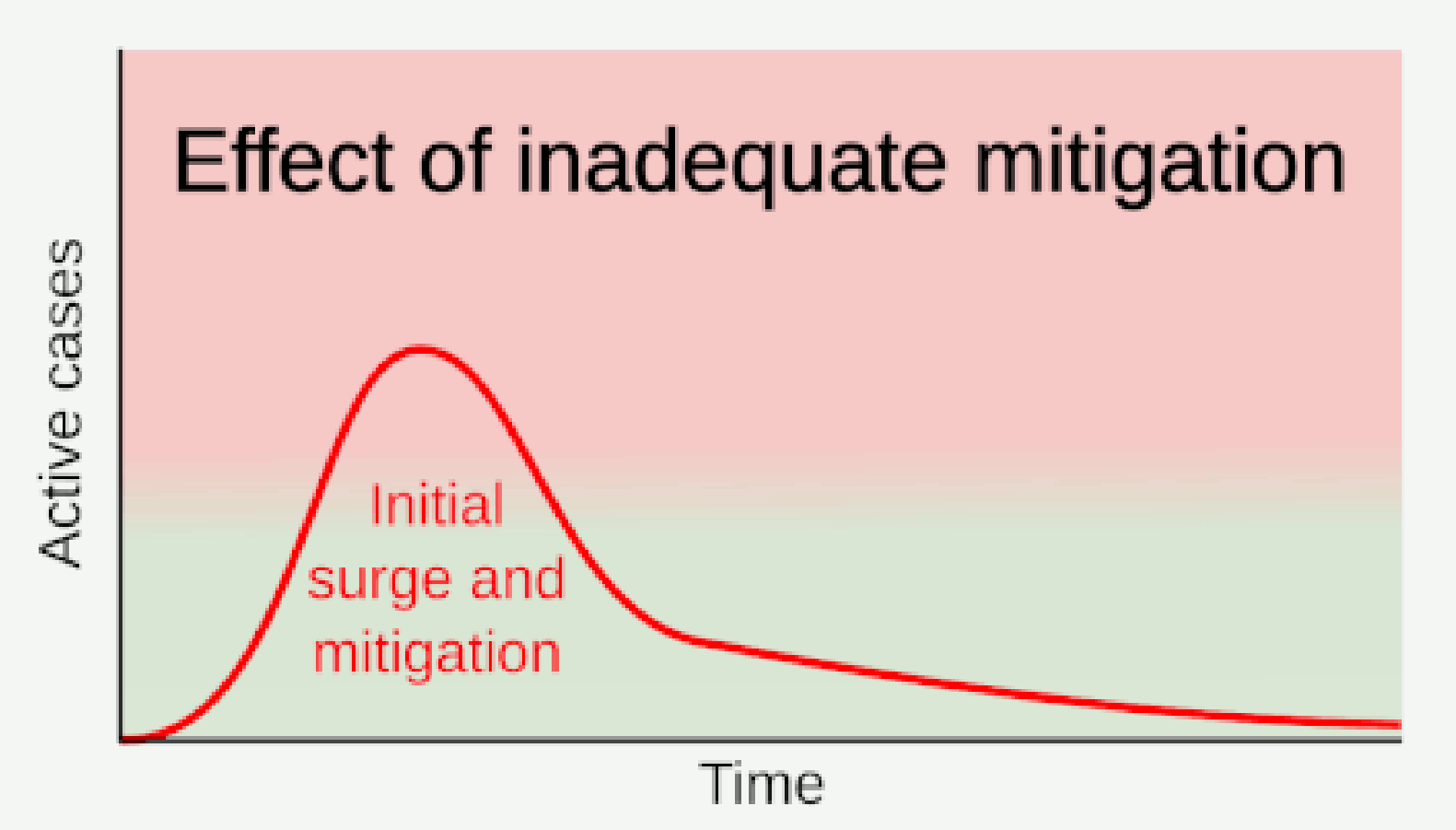
PANDEMIC

- An epidemic that crosses international boundaries, usually affecting people on a worldwide scale.
- Near-global disease outbreaks when multiple countries across the world are infected.
- Term refers to **extent** of illness not **speed** of spread.

FLATTENING THE CURVE



INADEQUATE MITIGATION



ZOONOSIS (1)
(PLURAL ZOONOSES)

- Infectious disease by an agent (virus, bacteria, prion or parasite) that has *jumped* from animal to human.
- First infected human transmits the infectious agent to at least one other human, who then infects others.
- Of 1,415 human pathogens, **61%** are zoonotic.

ZOONOSIS (2)

- Diseases that routinely involve animal to human transmission, such as rabies, are considered *direct zoonosis*.

- In *direct zoonosis* the disease is transmitted from animals to humans through media such as air (influenza) or through bites and saliva (rabies).

ZOONOSIS (3)

- In *indirect zoonosis* transmission occurs via an intermediate species (vector), which carries the disease pathogen without getting sick.

- When humans infect animals, it is called reverse zoonosis, zooanthroponosis, or antrhoponosis

CORONA VIRUSES

SARS (1)

- Severe acute respiratory syndrome (SARS) is a zoonotic origin virus called SARS-CoV or SARS-CoV-1.
- Caused the 2002–2004 SARS outbreak.
- In 2017, Chinese traced the virus through Asian palm civets to cave-dwelling horseshoe bats in Yunnan.
- At end of the epidemic in June 2003, the incidence was 8,422 cases with a case fatality rate (CFR) of 11%.

SARS (2)

- SARS originated in ecologically unprecedented conglomeration of wild animals.
- Bats live in caves, palm civets in trees, neither would normally contact humans.
- The civets were very sensitive to bat virus.
- Virus amplified its numbers, increased replication, increased chances to mutate and evolve.

SARS (3)

- In wet markets vendors display and sell live animals captured in the wild to consumers who slaughter and consume them at home
- A virus which lived in horseshoe bats spread into raccoon dogs, ferret badgers, snakes, palm civets.
- As it spread it mutated.
- In November 2003, a mutant formed started infecting people.

SARS (4)

- The virus disrupted cell immune response in lungs and produced pneumonia, edema and deprived body of oxygen.
- >8,000 sick, 774 died over next 6 months.
- Disappeared soon. ***Killed people too quickly to spread any farther.***
- No cases of SARS-CoV-1 reported since 2004.

OTHER CORONAS

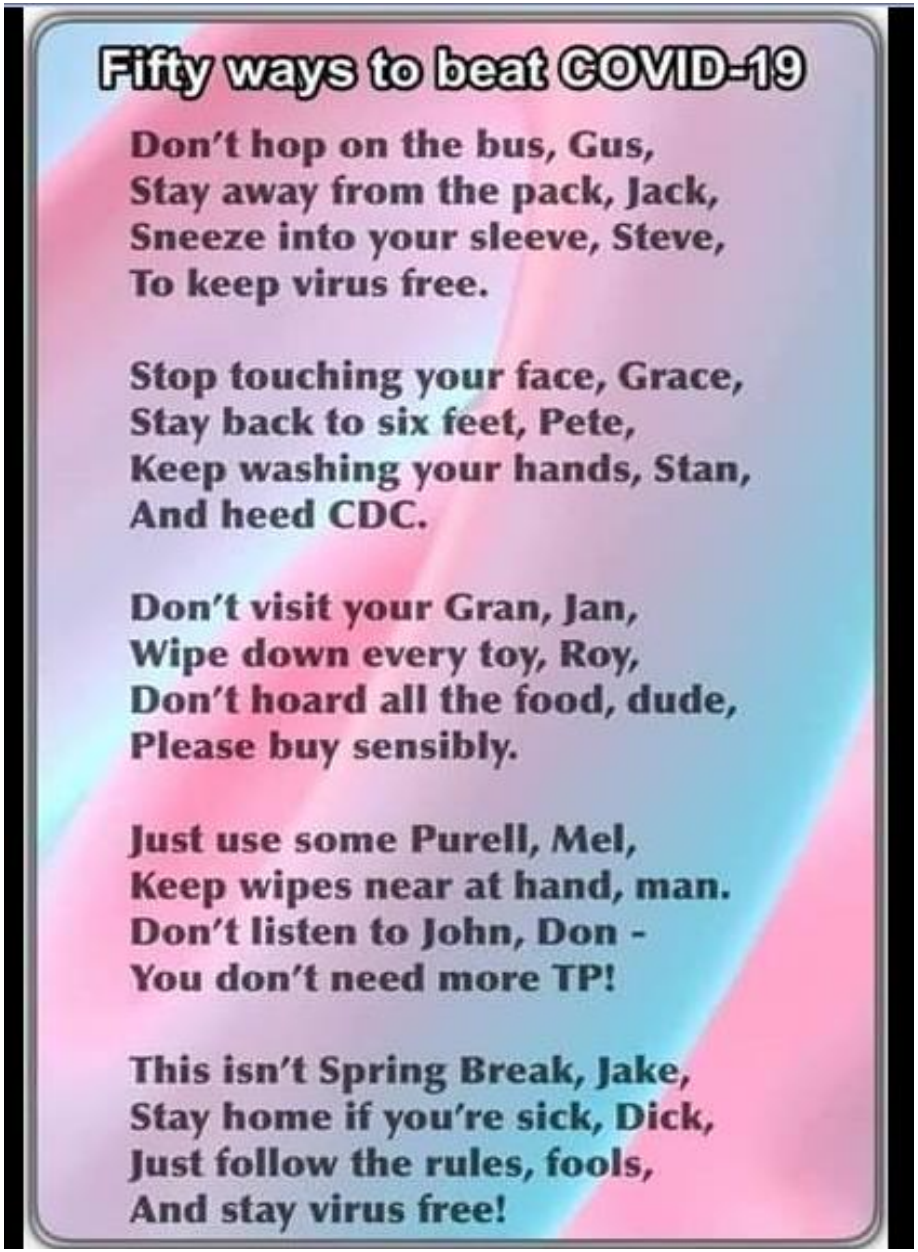
MERS CoV

- Middle East Respiratory Syndrome virus.
- MERS-CoV Virus from camels to humans (how?)
- WHO advises:
  - Avoiding contact with camels.
  - Eating only fully cooked camel meat.
  - Drinking only pasteurized camel milk.
  - Avoid drinking camel urine.

CoVID-19

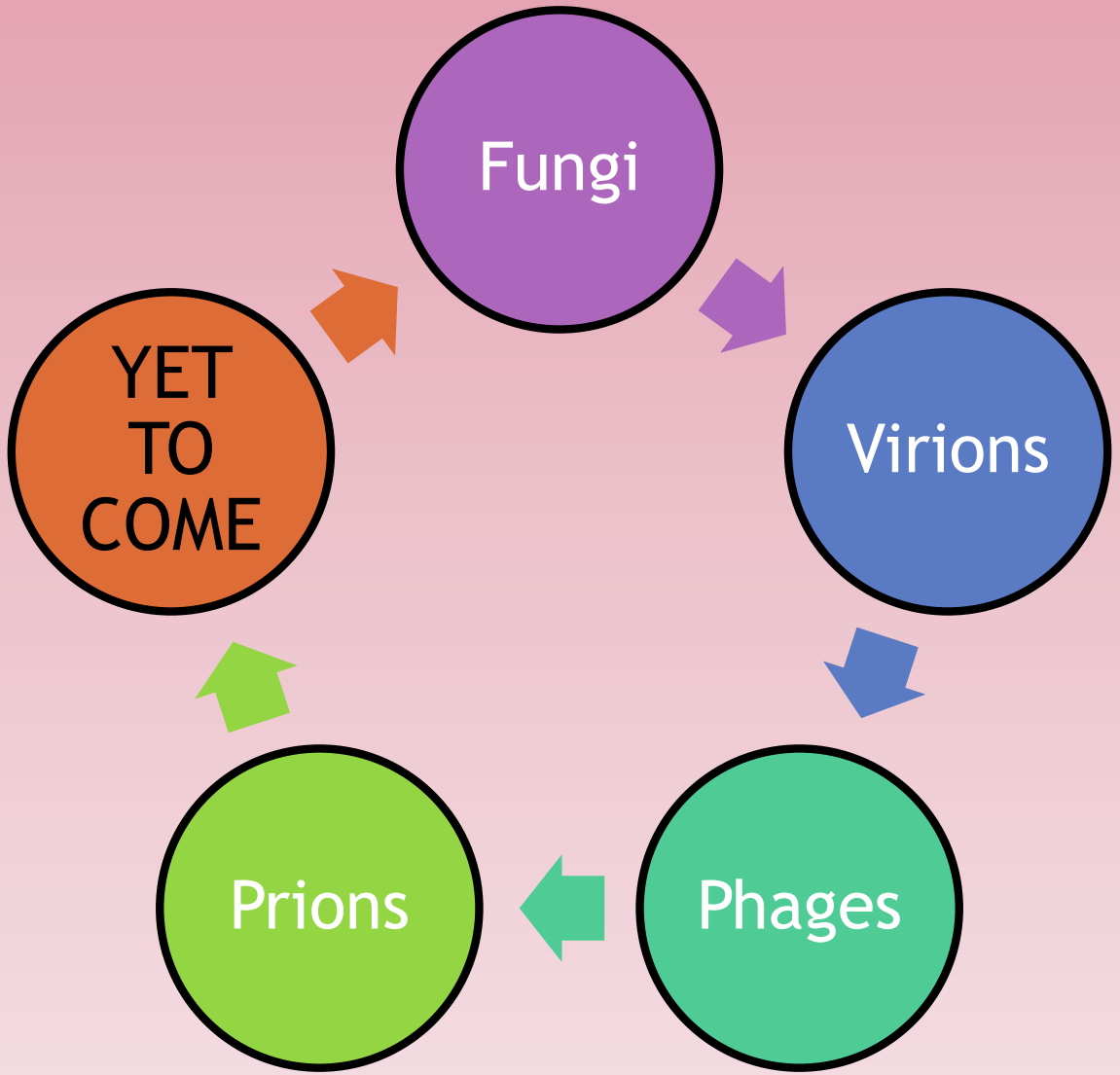
- Estimates of the number of people infected by one person with COVID-19, the R_0, have varied.
- The WHO's initial estimates of R_0 were 1.4–2.5 (average 1.95).
- In early April 2020 estimate of the median R_0 was 5.7.
- Basic R_0 without control measures can be as high as 8.9.[41]

To the tune of “50 Ways to Leave Your Lover” by Paul Simon.



QUESTIONS?

OTHER INFECTIOUS AGENTS



VIRIONS

VIRION (2)

- A complete, entire virus particle that has an RNA or DNA core with an external protein shell (capsid).
- The core confers infectivity and the capsid provides specificity to the virion.
- Extracelullar manifestation of the virus which is intracellular and is actively infecting.
- It is not dormant, it is more a ready, potentially infectious, cocked and loaded particle.

VIRIONS

- *Virion*: Single viral particle that is released from an infected cell and is capable of infecting other cells of the same type.
- It is a complete virus that does not have to be inside the cell to be infective.
- Not to be confused with:
  - *Viroid*: RNA w/o capsid, infects only plants.
  - *Virusoid*: Requires "helper" virus to replicate.

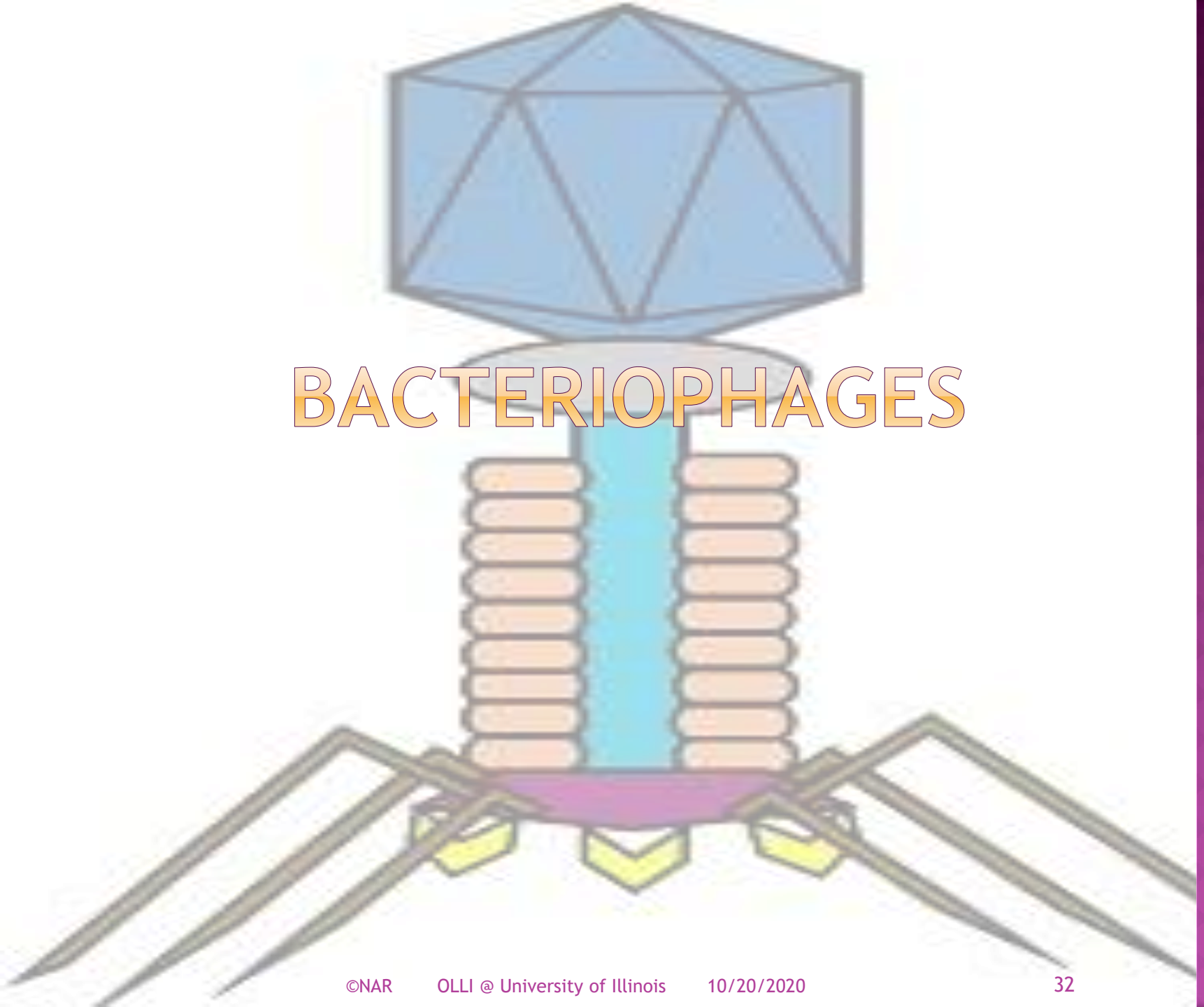
CORNY OLD JOKE

Question: Why do elephants have fleas?

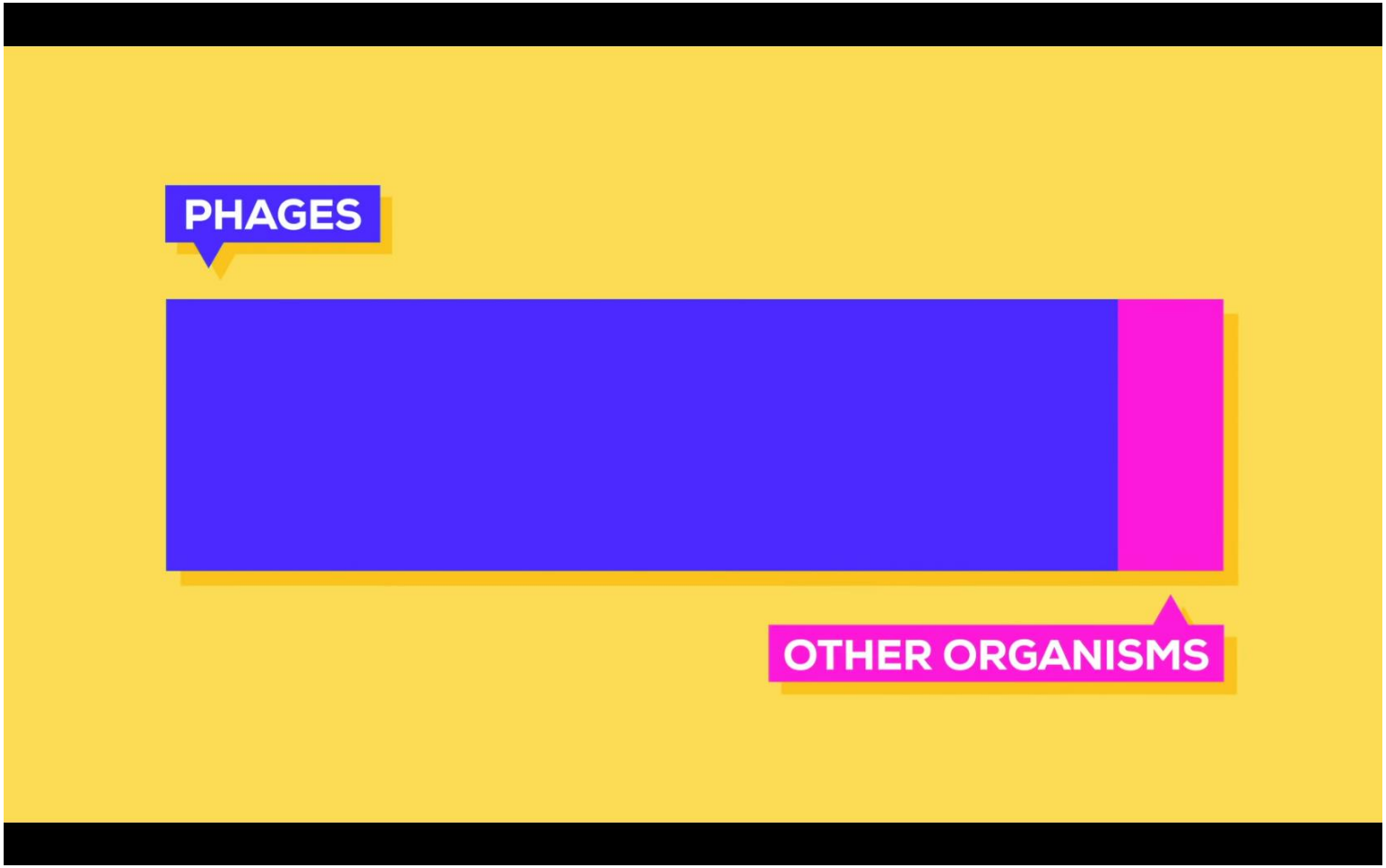
Answer: Because fleas can't have elephants!

Question: Why do bacteria have viruses?
Answer: Because viruses can't have bacteria!

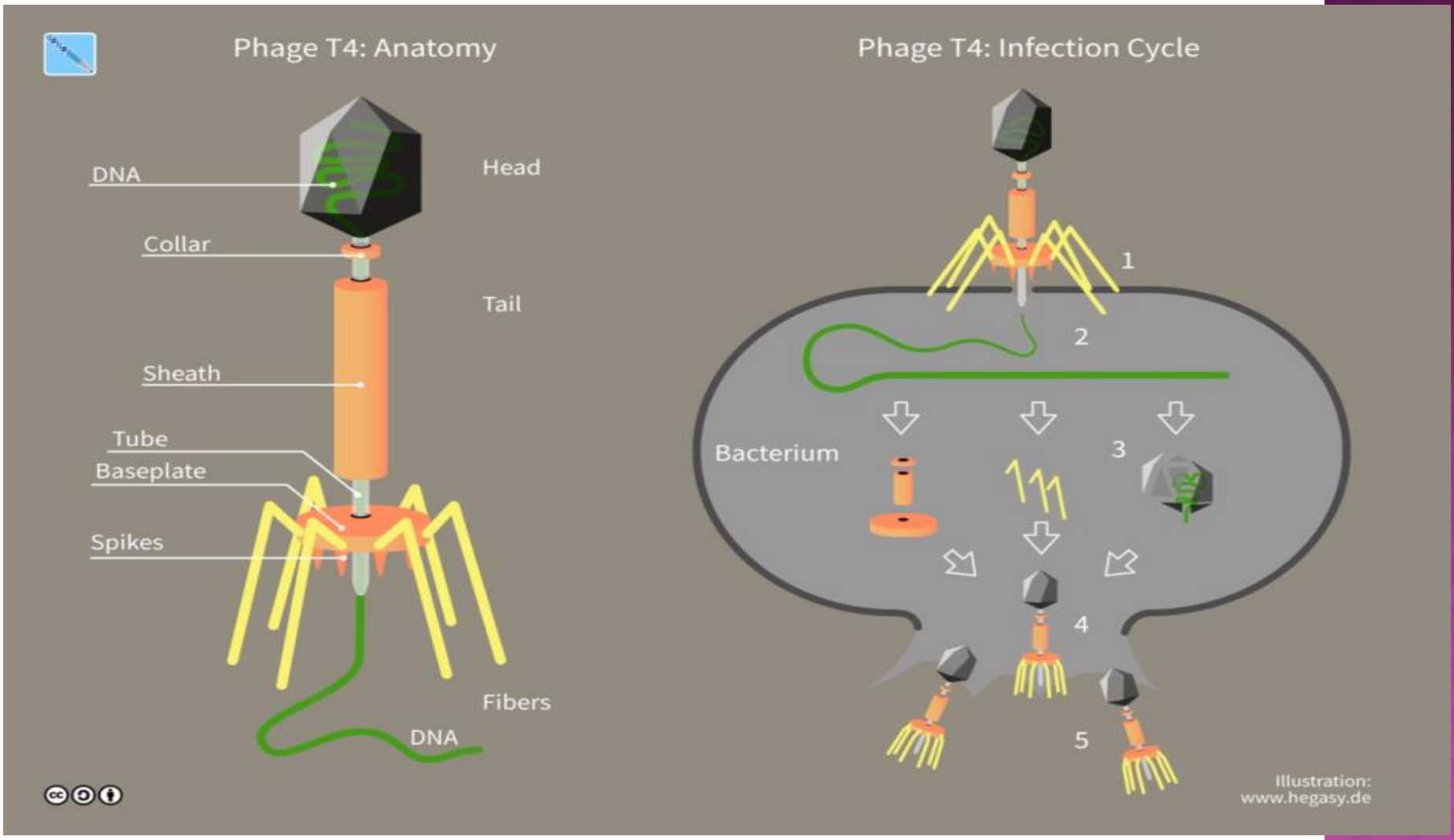
BACTERIOPHAGES



PHAGES AND ALL OTHER ORGANISMS



HOW PHAGES WORK



BACTERIOPHAGES

Phages, are a form of viruses that attach to bacteriae and inject a viral genome into the cell.

The viral genome replaces the bacterial genome, and this stops the bacterial infection.

More specific than antibiotics and are harmless to the host organism and the gut microbiota, reducing the chances of opportunistic infections.

A phage will kill a bacterium only if it matches the specific strain, so phage mixtures ("cocktails") are often used to improve the chances of success.

Samples from recovering patients may contain appropriate phages that can be grown to cure other patients infected with the same strain.

IF IT'S SO GOOD, THEN…

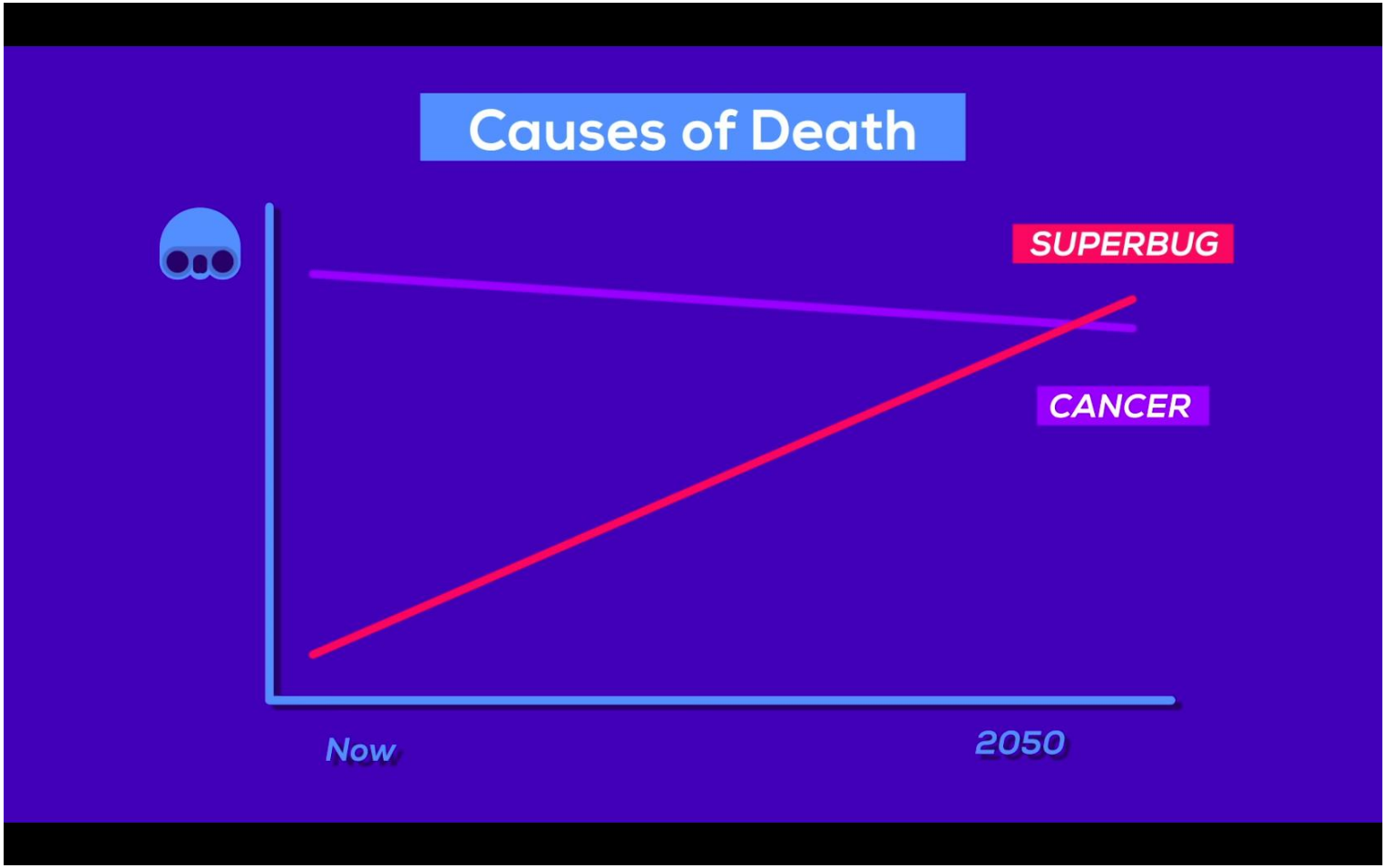
For many years it has been known that there are specific bacteriophages for *M. tuberculosis* but not for *C. difficile*.

Phage therapy in humans has not been approved in most Western countries.

The negative public perception of viruses may play a role in the reluctance to embrace phage therapy.

Washington and Oregon law allows naturopathic physicians to use any therapy that is legal any place in the world on an experimental basis.

In Texas, phages are considered natural substances and can be used in addition to (but not as a replacement for) traditional therapy.


Causes of Death
SUPERBUG
CANCER
Now
2050

PRIONS

PRIONS (1)

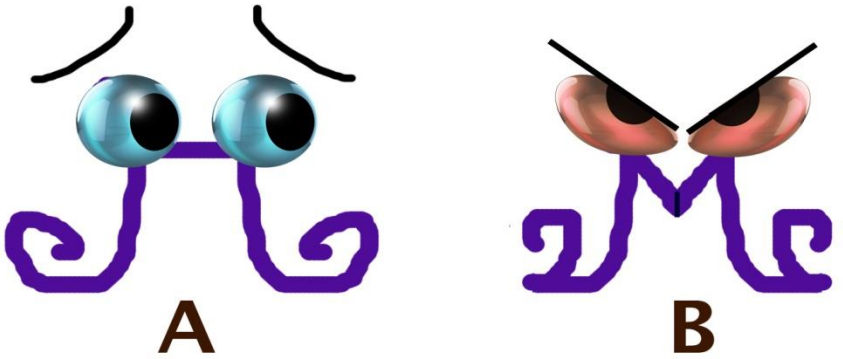
PRIONS (2)

- *Prion:* union of **pr**otein and **i**nfecti**on.**
- Described as a “proteinaceous infectious particle”, without genetic material.
- Has the ability to self-propagate and transmit its misfolded shape conformation to normal proteins of its same variety.

PRIONS (3)

- It is not known what causes a normal protein to misfold.

- The abnormal 3-D structure confers infectious properties, collapsing nearby protein molecules into the same shape.



PRIONS (4)

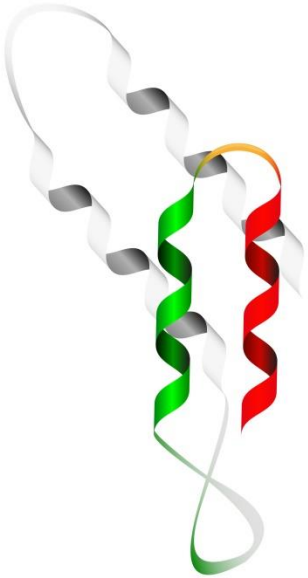
- All known infectious agents such as viruses, bacteria, fungi and parasites contain nucleic acids (DNA, RNA or both), prions are just a misfolded protein.

- Cause transmissible spongiform encephalopathies (TSEs):
  - Scrapie in sheep.
  - Chronic wasting disease (CWD) in deer.
  - Bovine spongiform encephalopathy (BSE) in cattle (mad cow disease).
  - Creutzfeldt–Jakob disease (CJD) in humans.

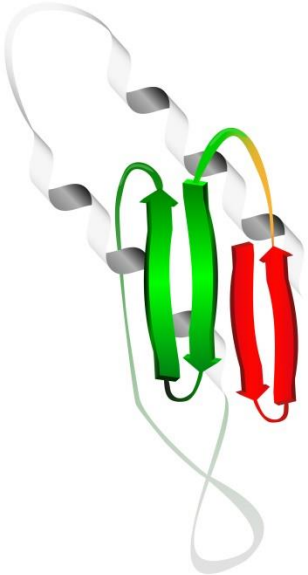
- All known prion diseases in mammals affect the structure of the brain, all are progressive, have no known effective treatment and are **always** fatal.

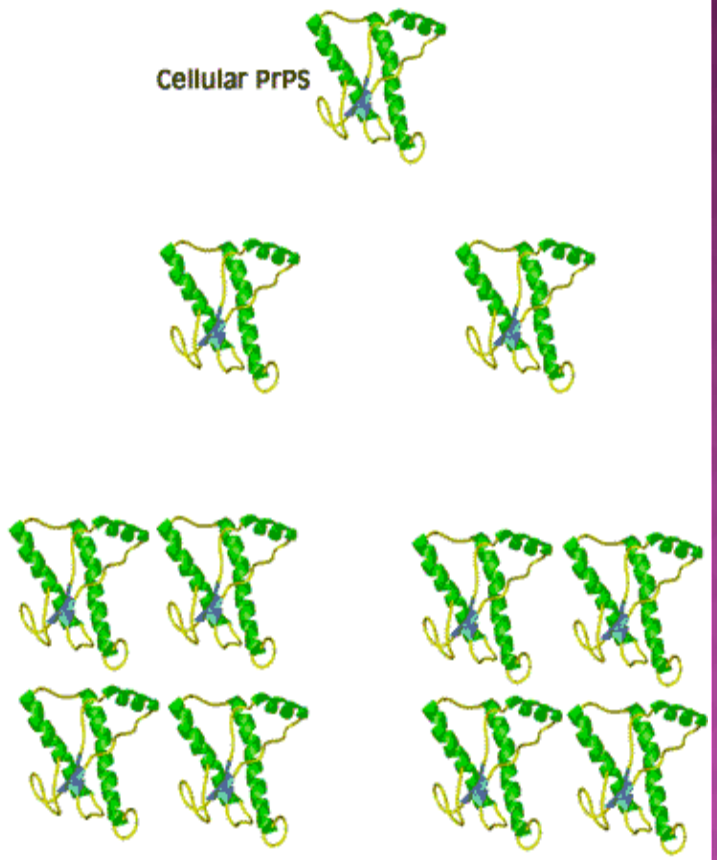
PRIONS (5)

PrP^{C}
is a normal protein

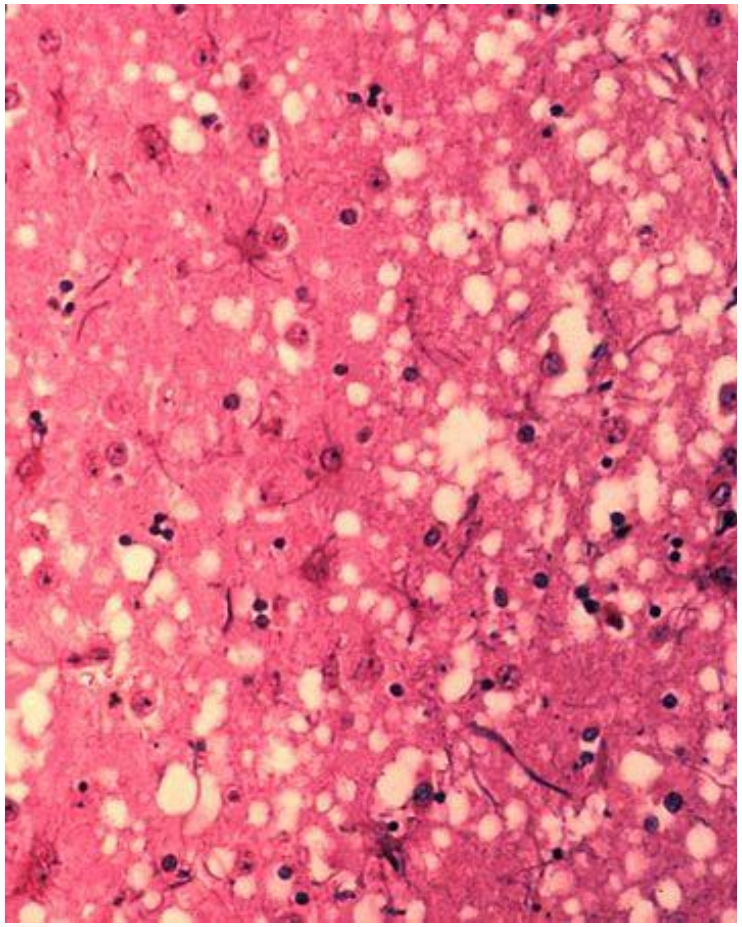


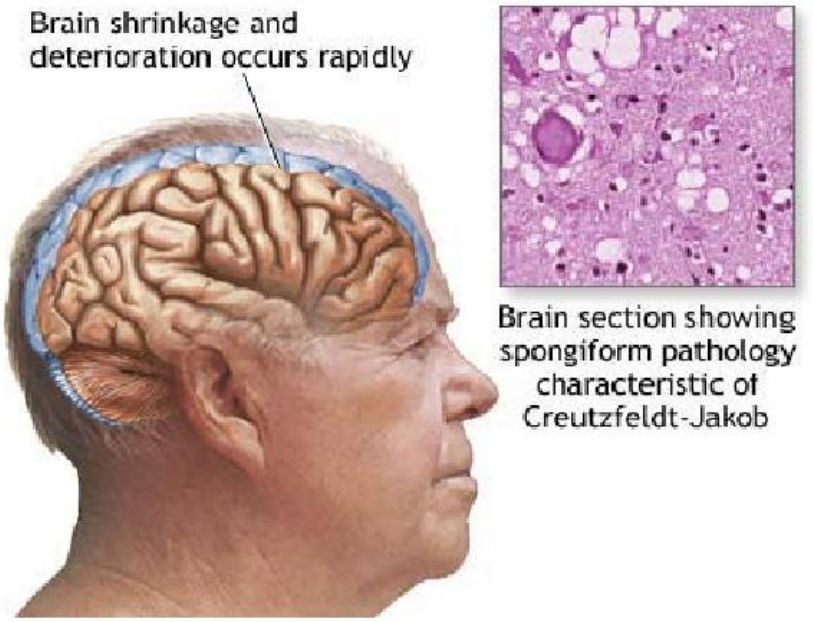
PrP^{Sc}
the disease-causing form of the prion protein





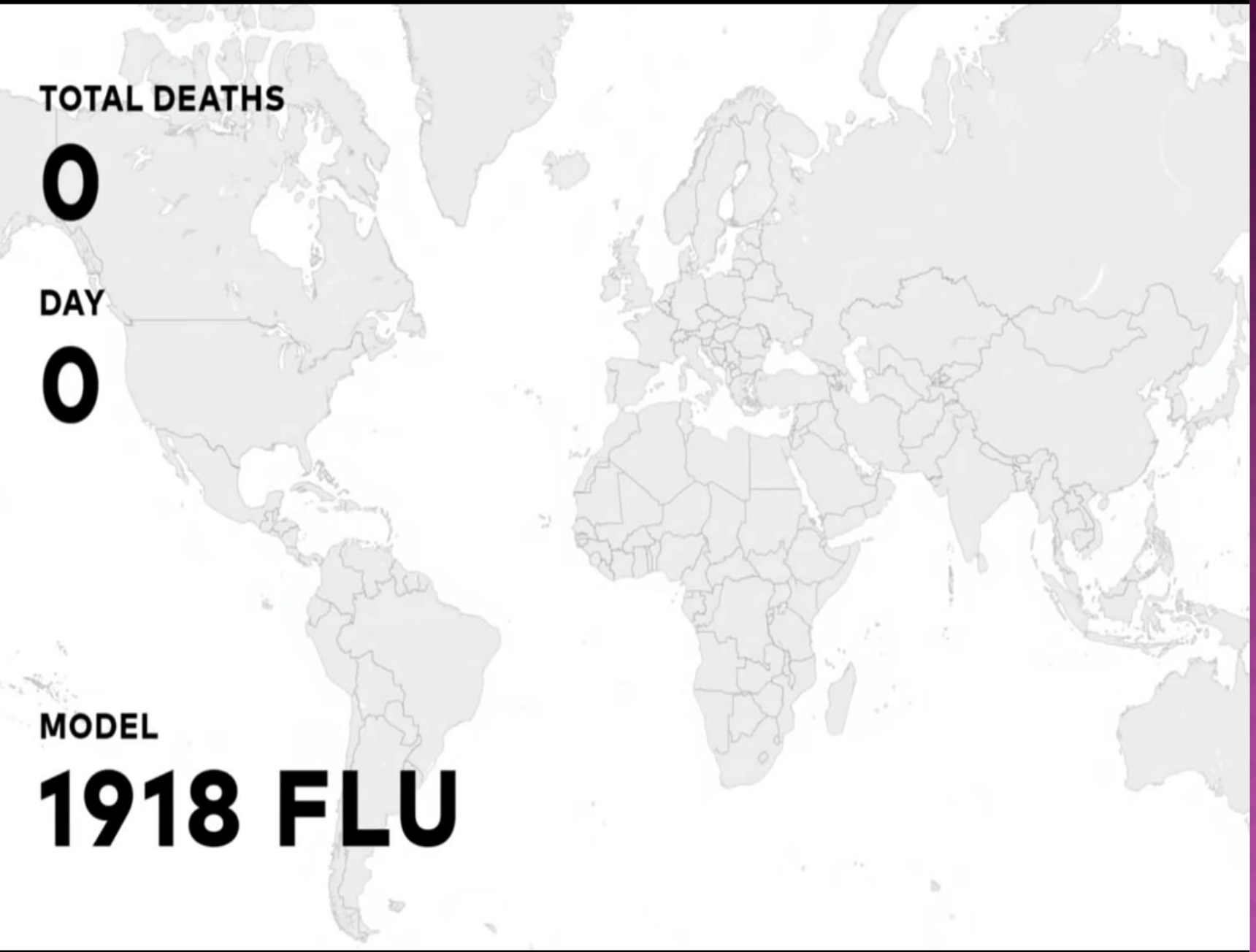
SPONGIFORM BRAIN

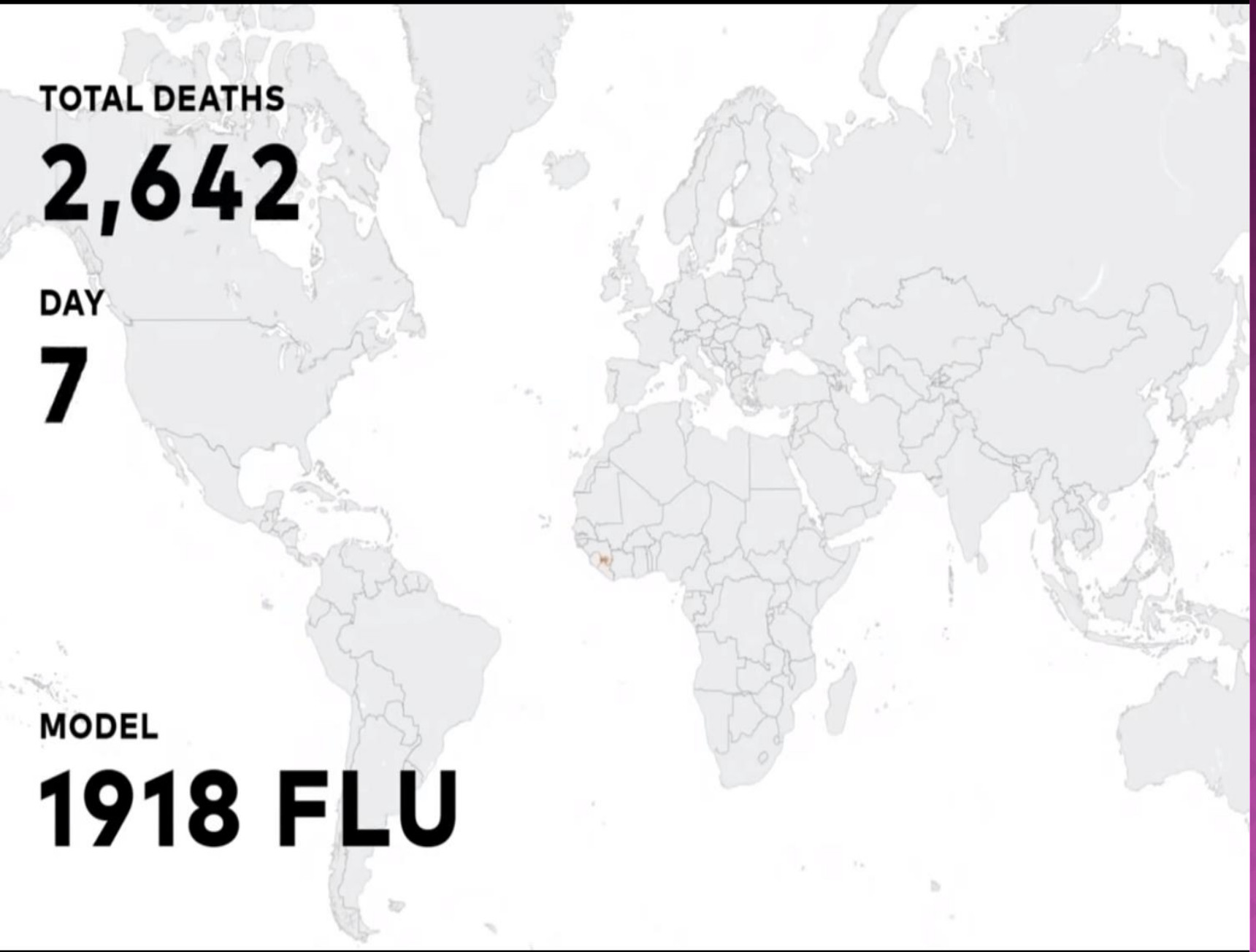


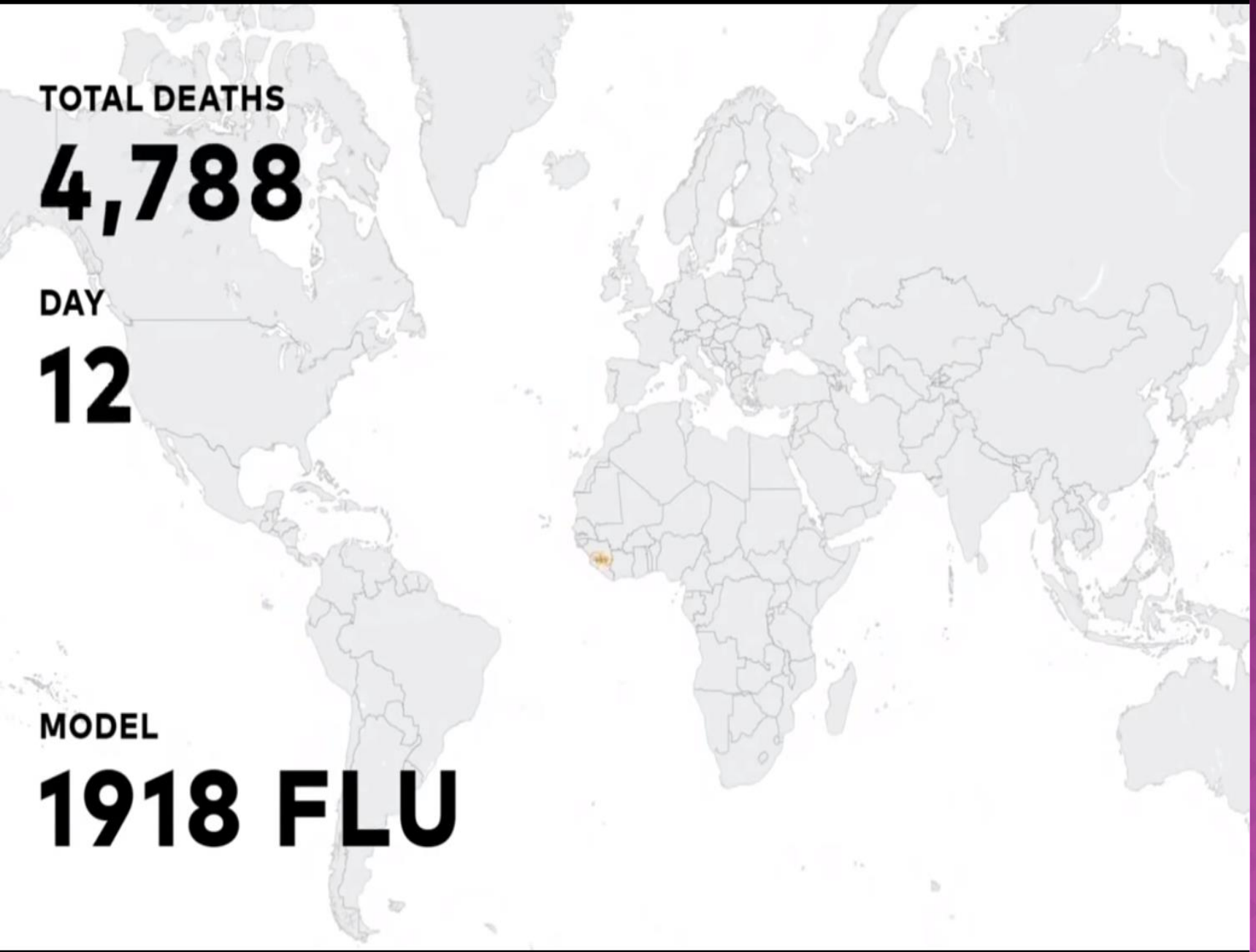


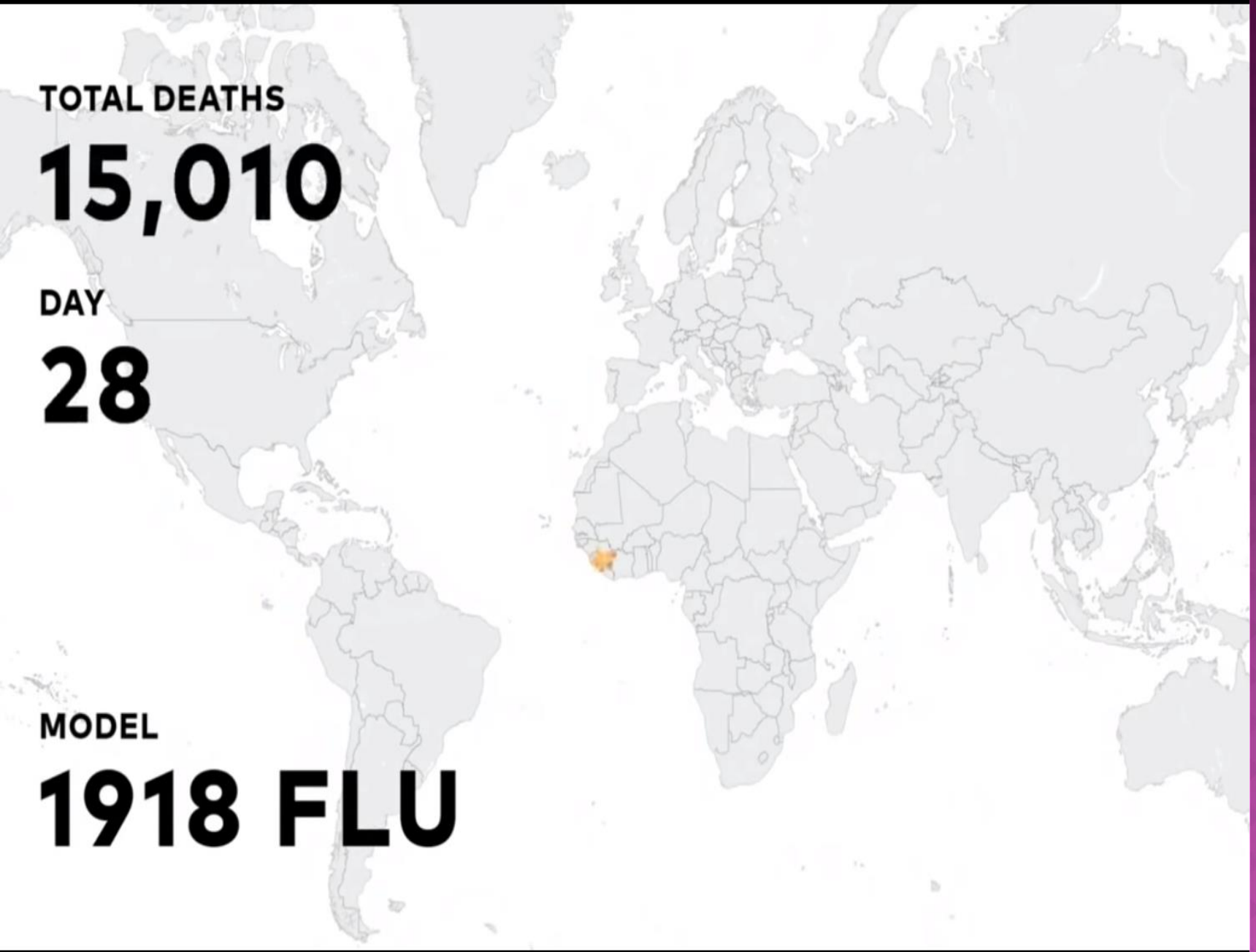
THEORETICAL SPREAD

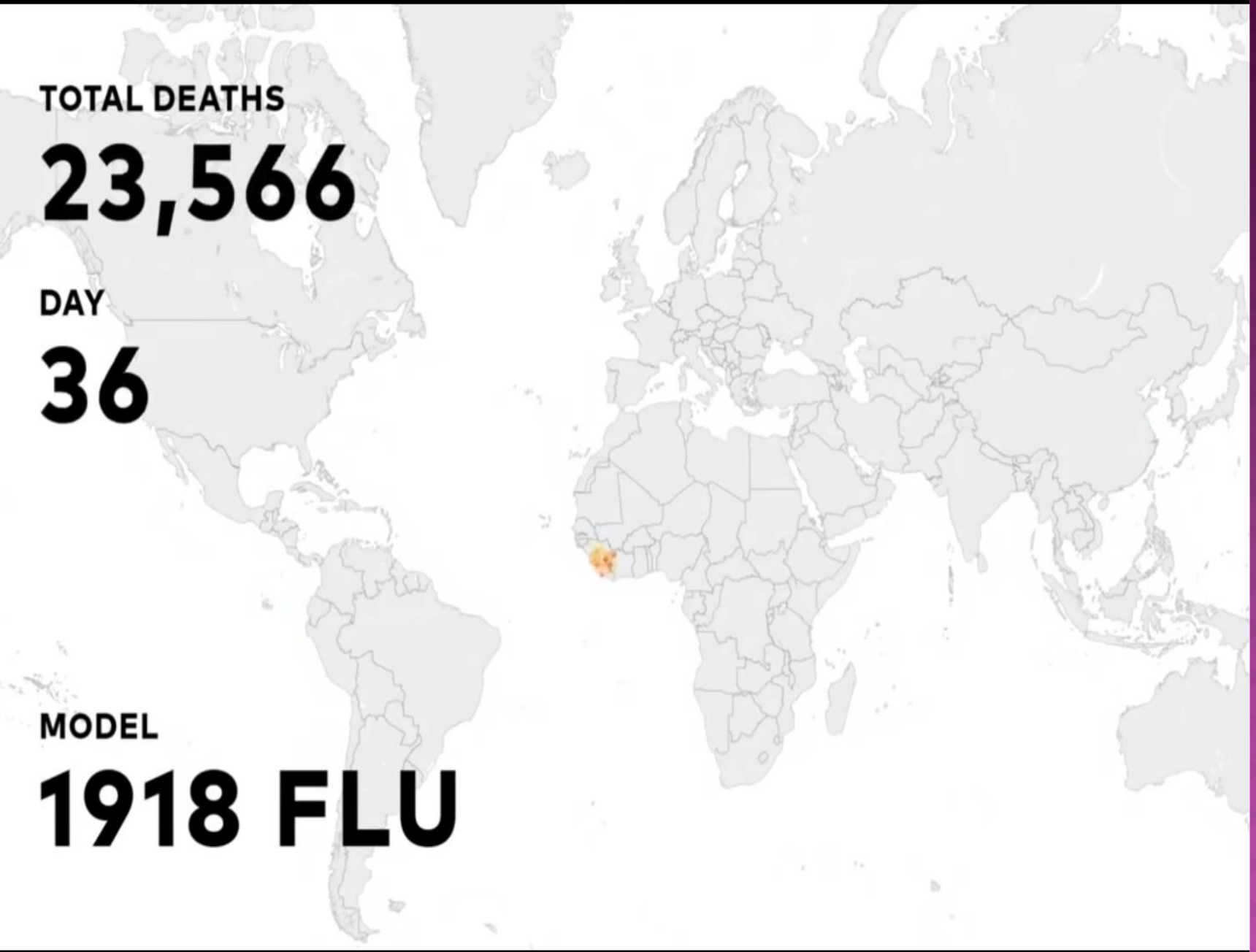
Respiratory Virus
Model: 1918 Flu Pandemic

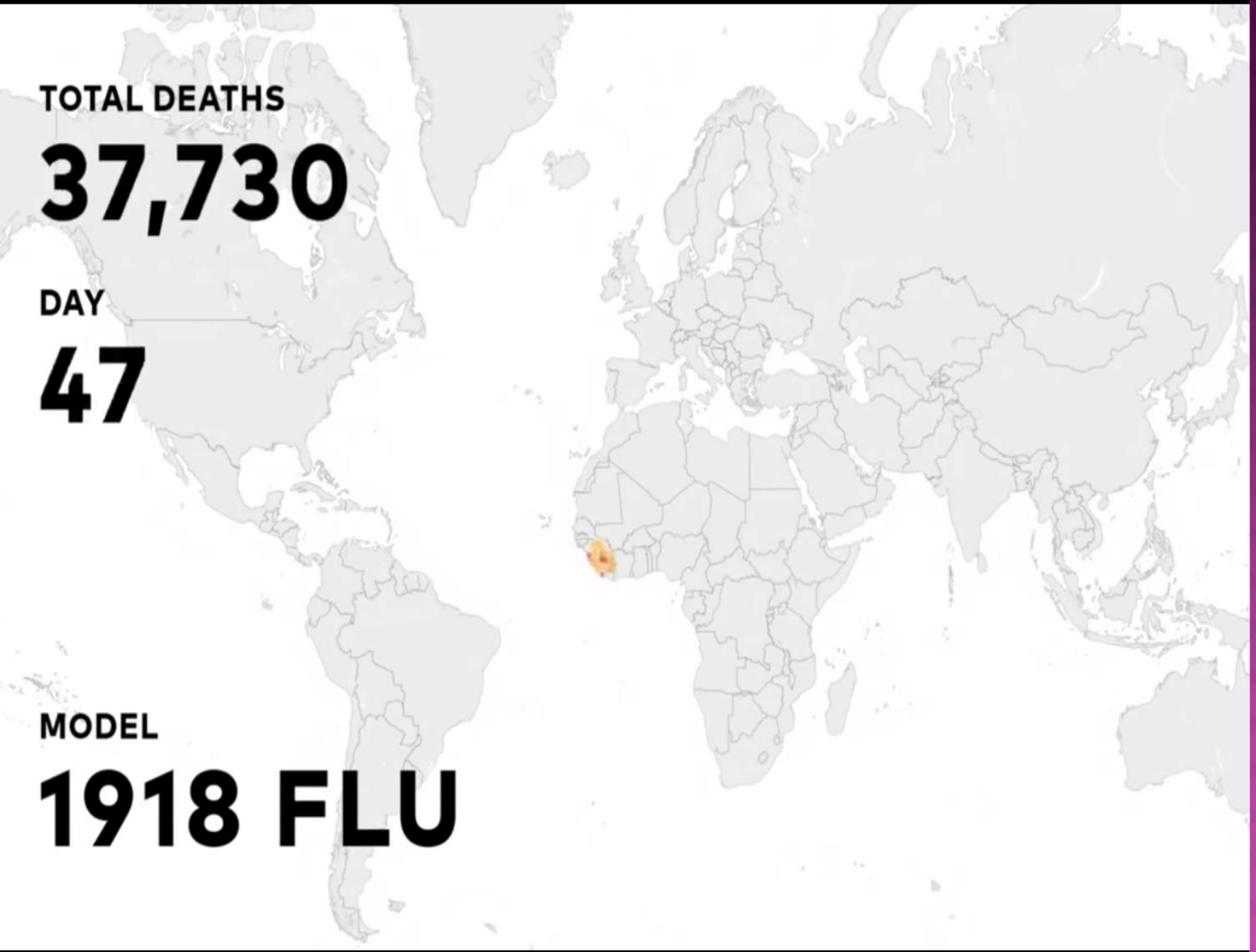

TOTAL DEATHS
0
DAY
0
MODEL
1918 FLU

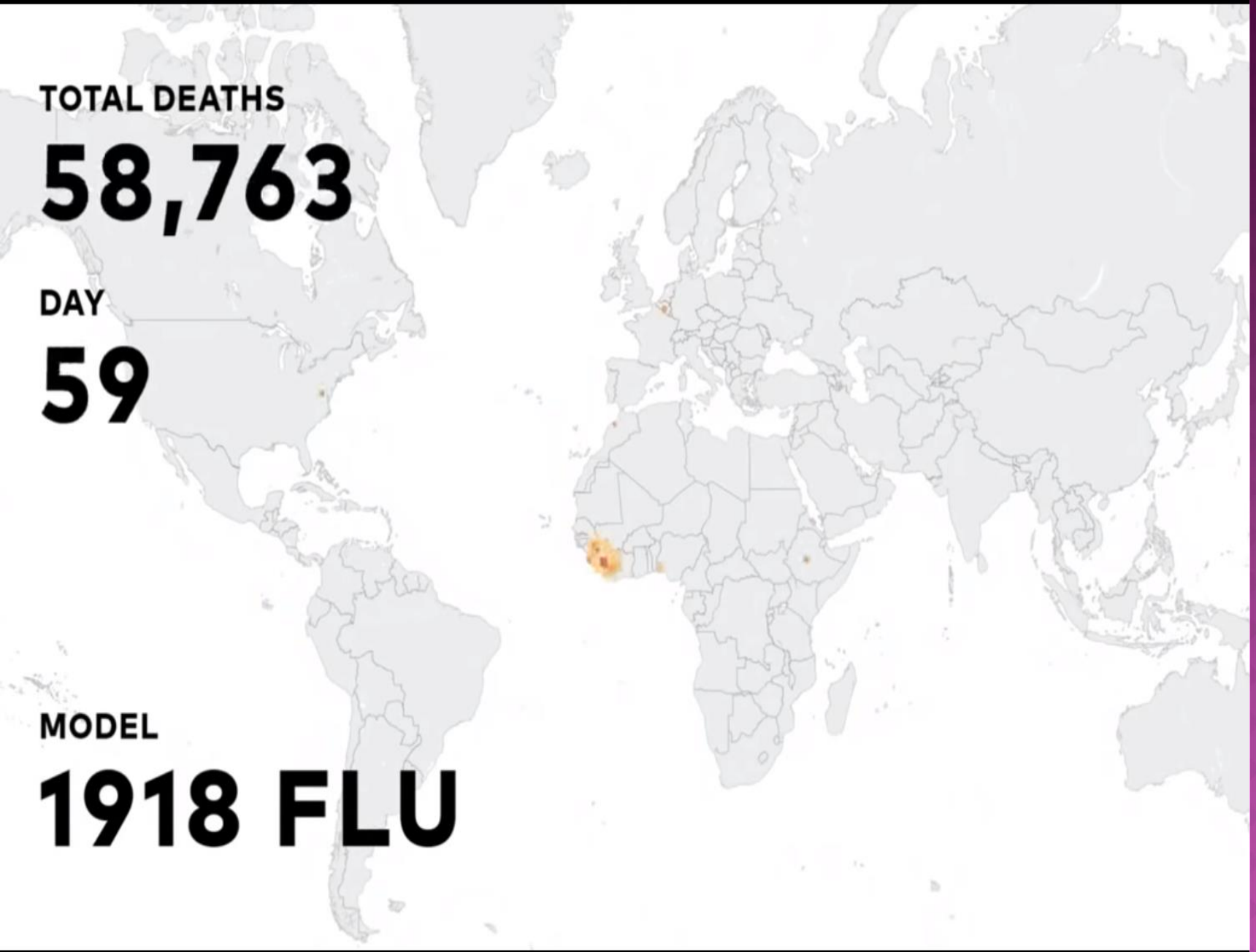

TOTAL DEATHS
2,642
DAY
7
MODEL
1918 FLU

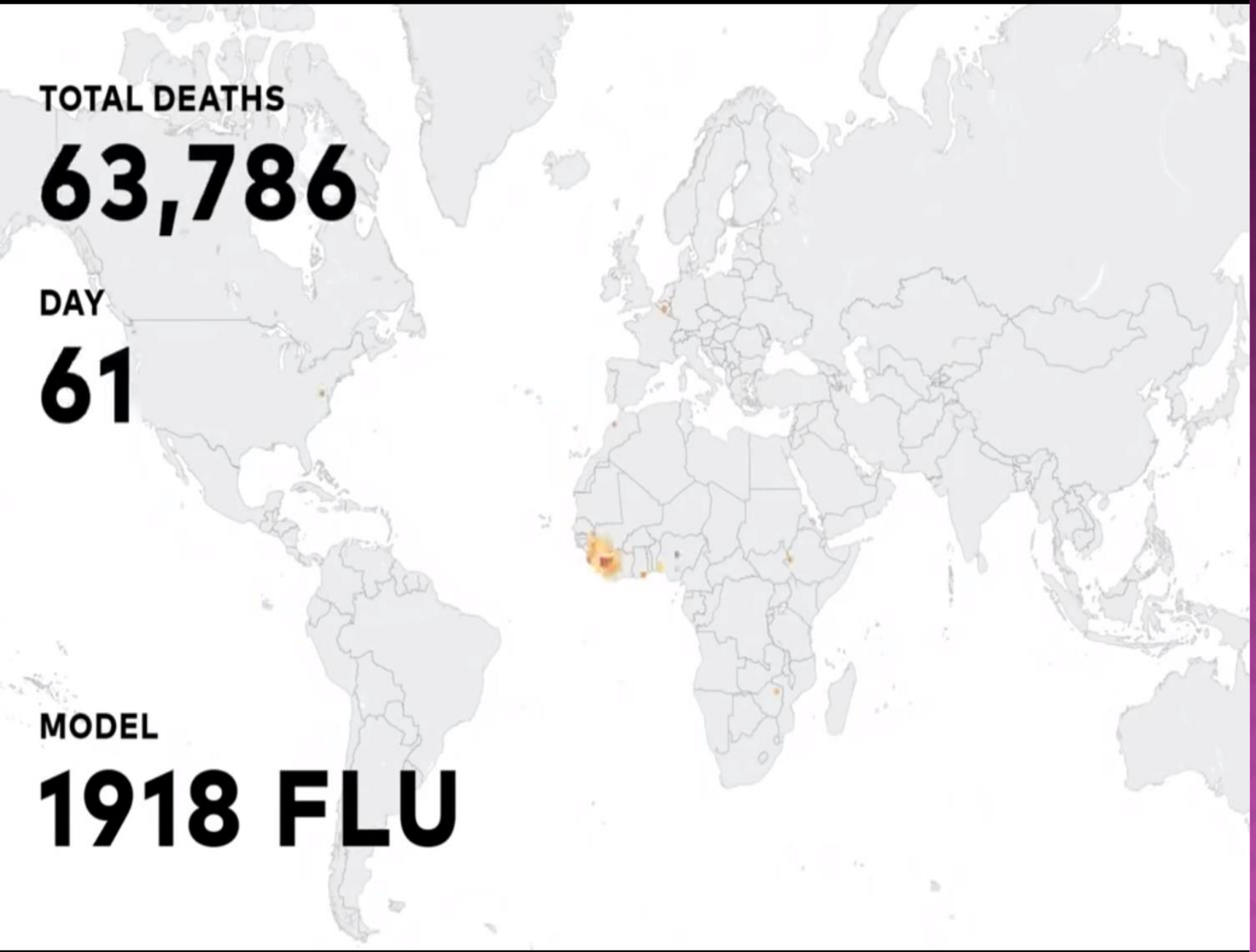

TOTAL DEATHS
4,788
DAY
12
MODEL
1918 FLU

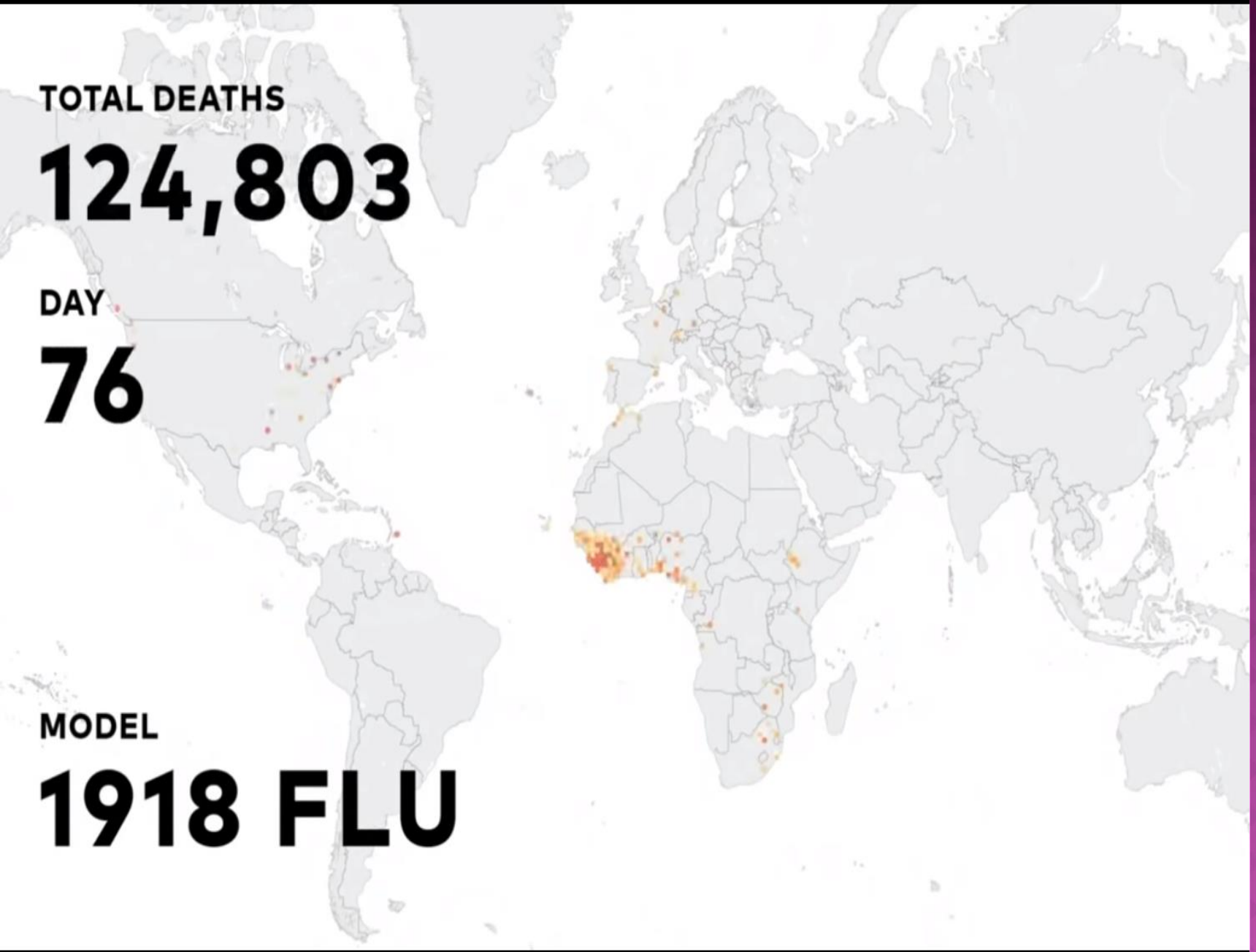

TOTAL DEATHS
15,010
DAY
28
MODEL
1918 FLU

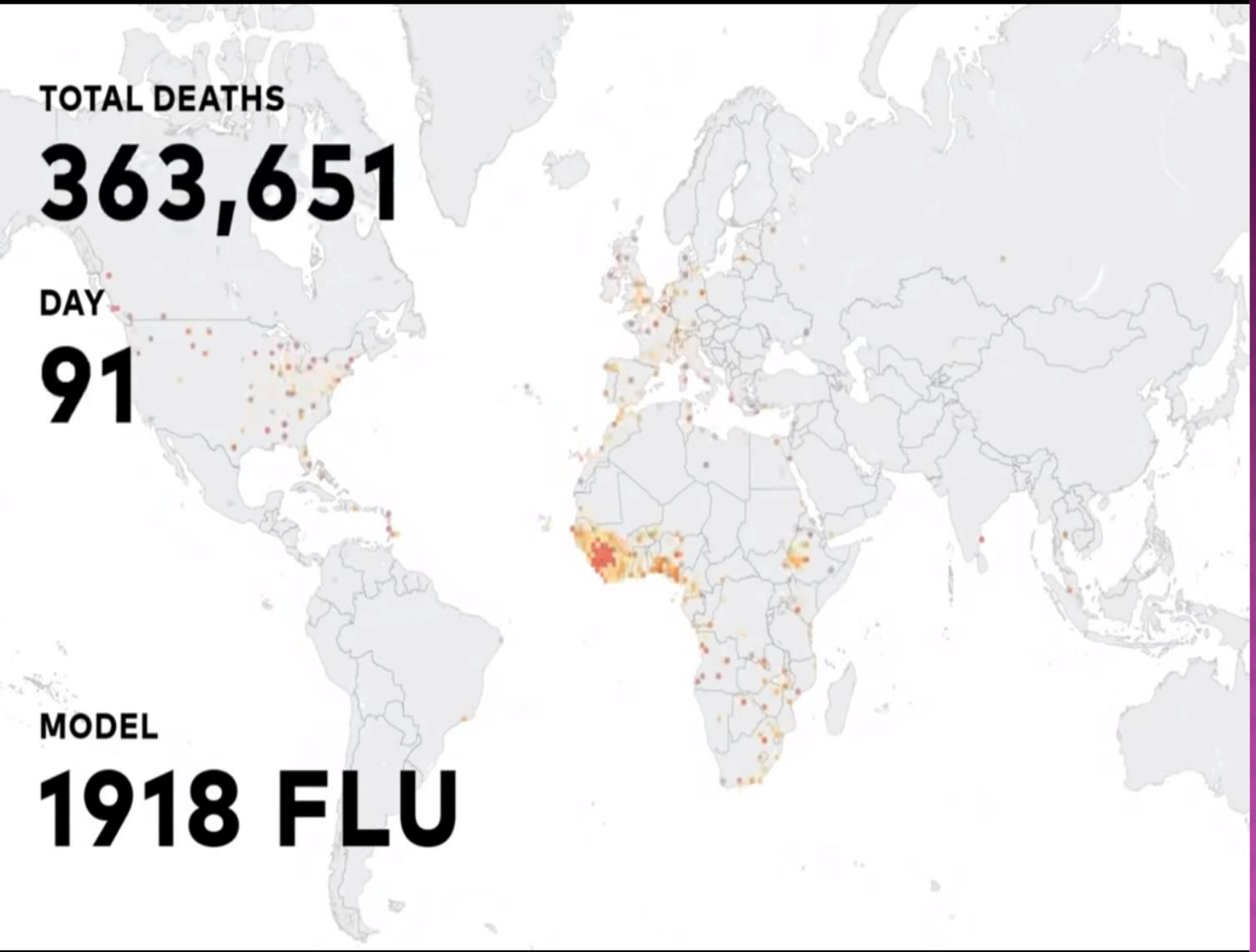

TOTAL DEATHS
23,566
DAY
36
MODEL
1918 FLU

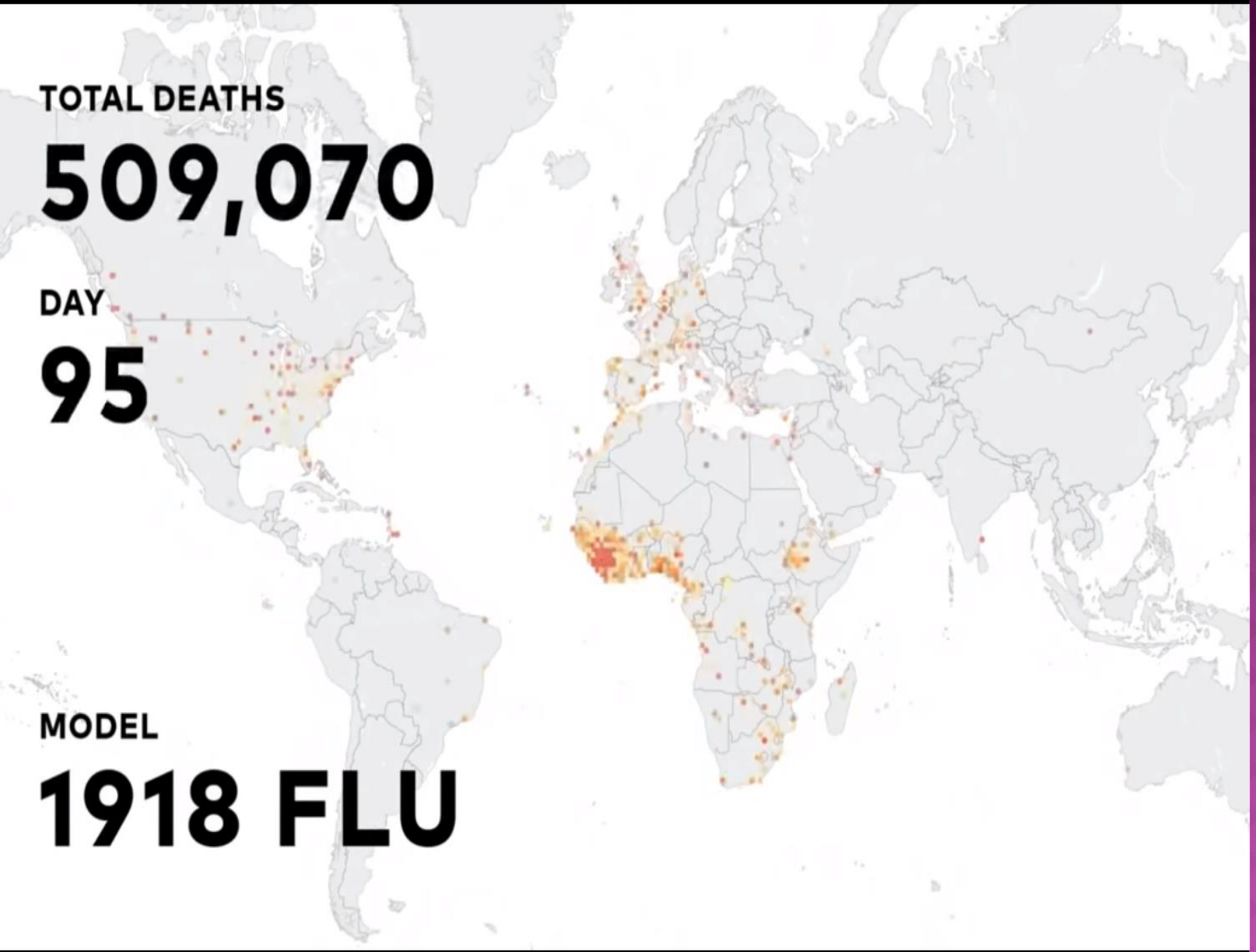

TOTAL DEATHS
37,730
DAY
47
MODEL
1918 FLU

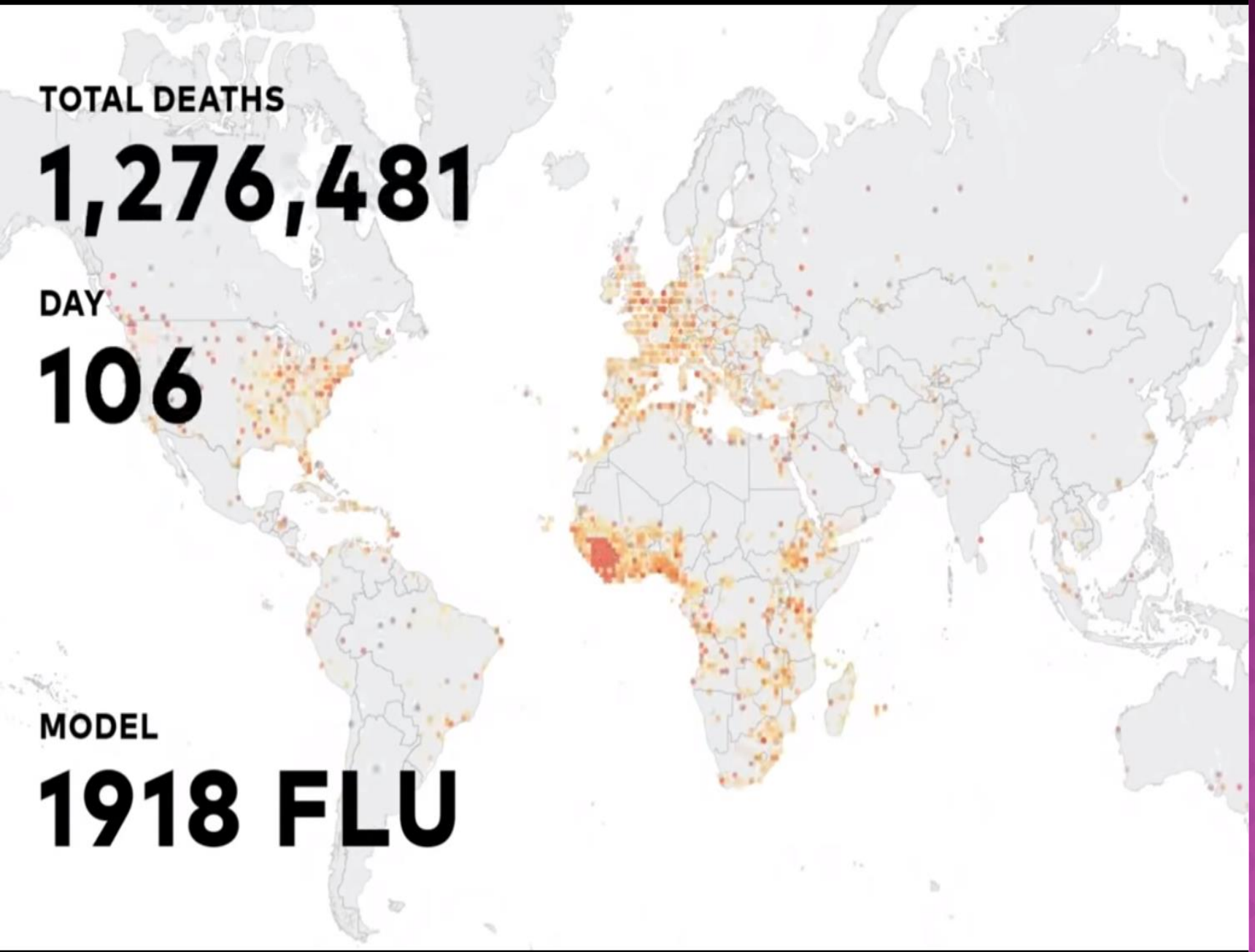

TOTAL DEATHS
58,763
DAY
59
MODEL
1918 FLU

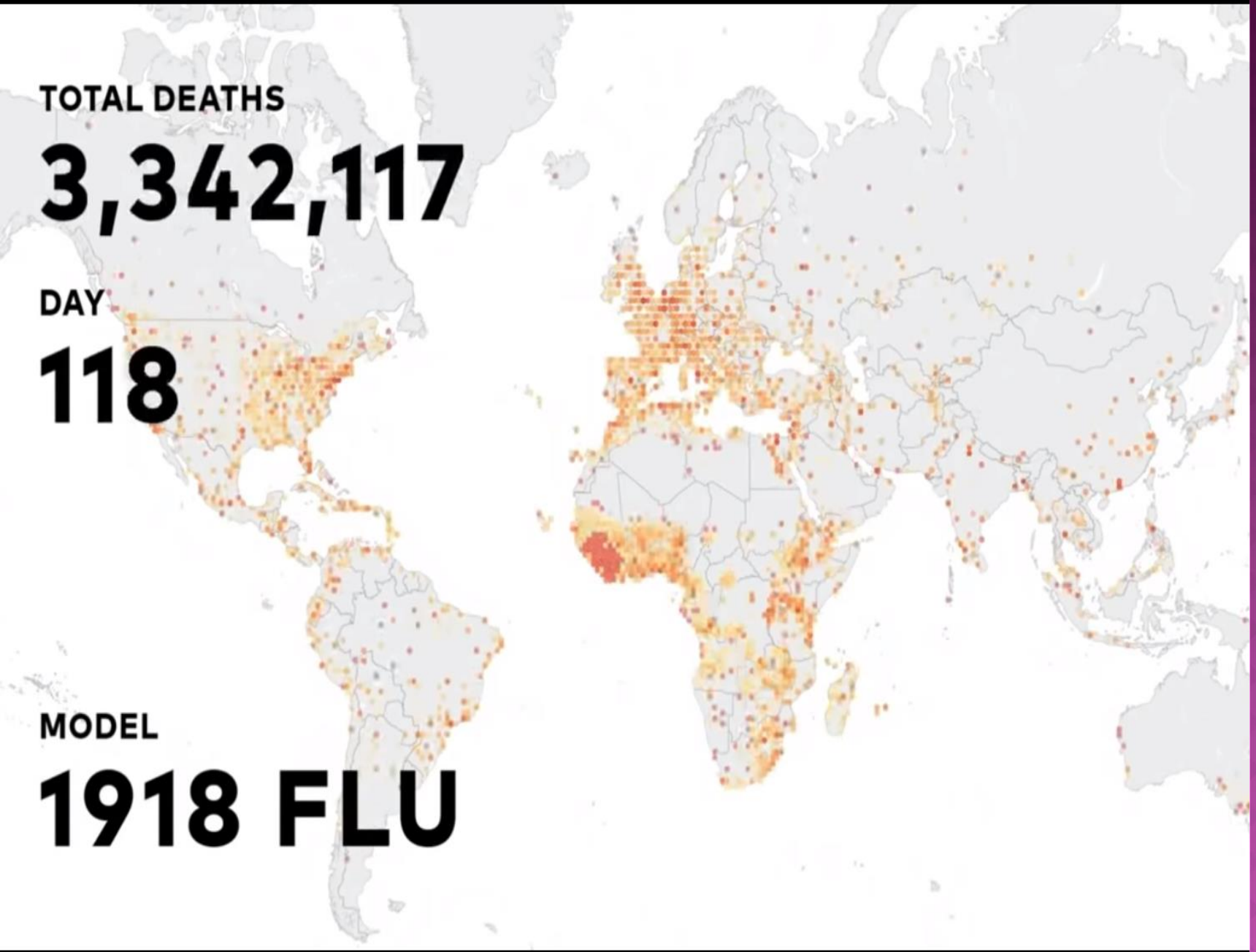

TOTAL DEATHS
63,786
DAY
61
MODEL
1918 FLU

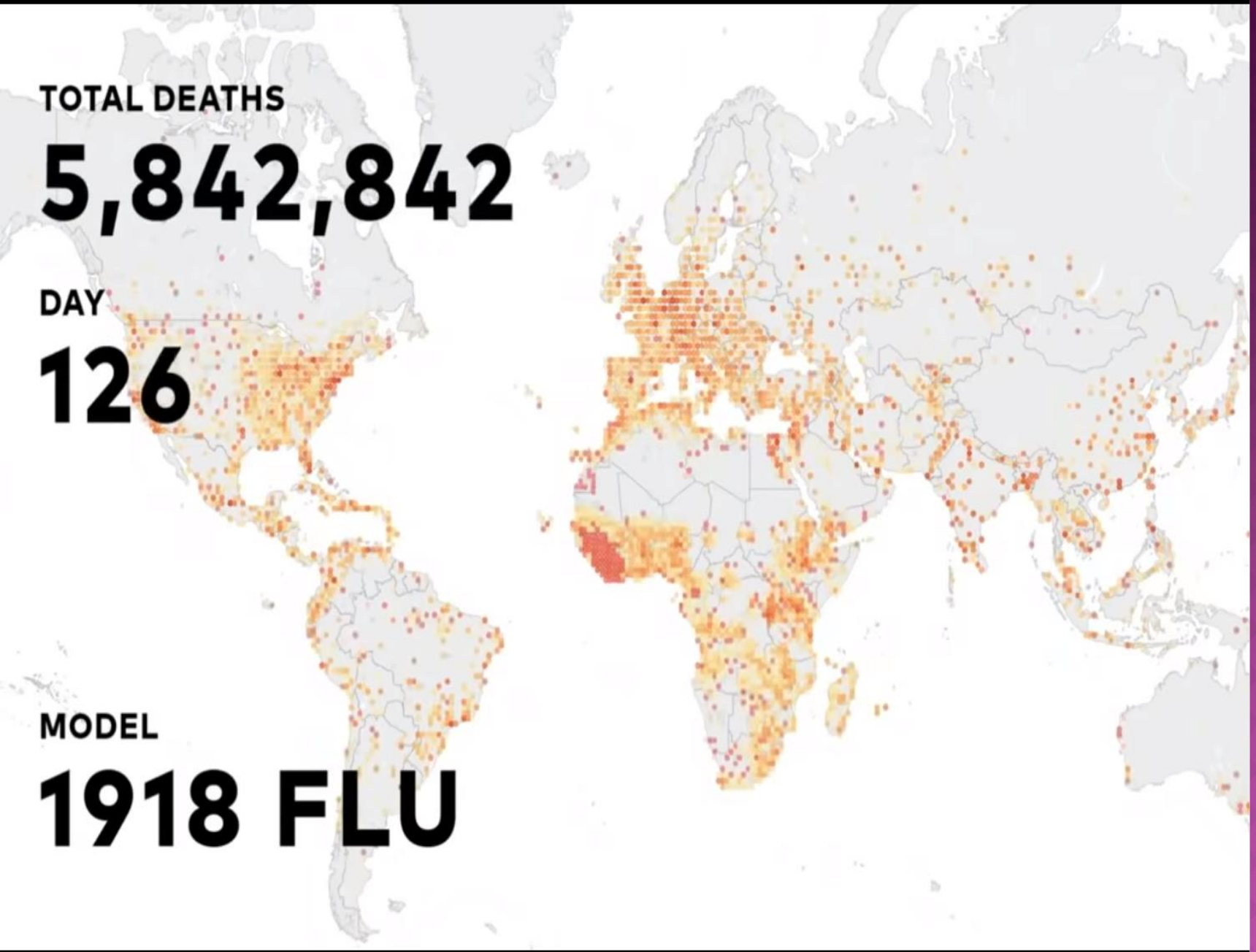

TOTAL DEATHS
124,803
DAY
76
MODEL
1918 FLU

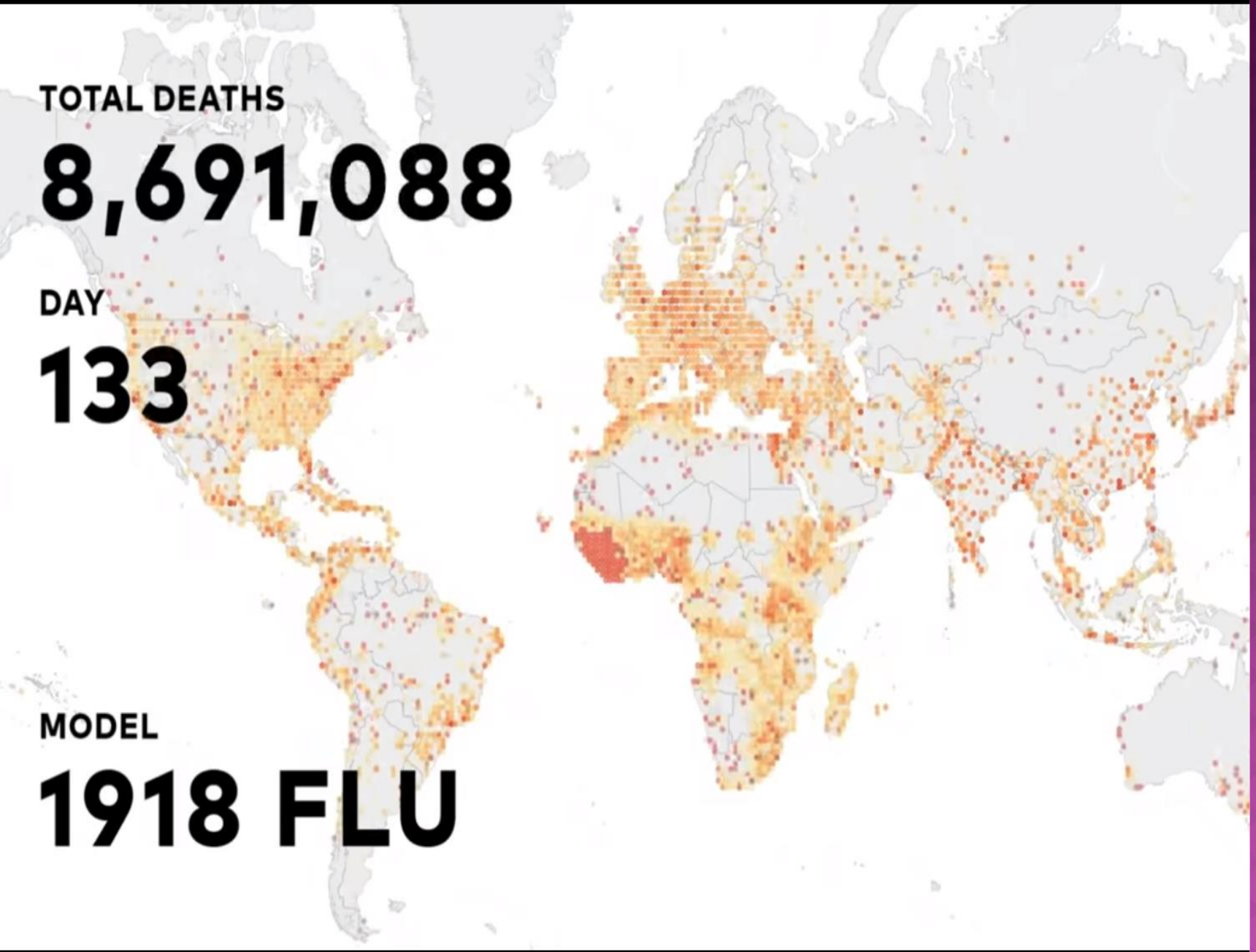

TOTAL DEATHS
363,651
DAY
91
MODEL
1918 FLU

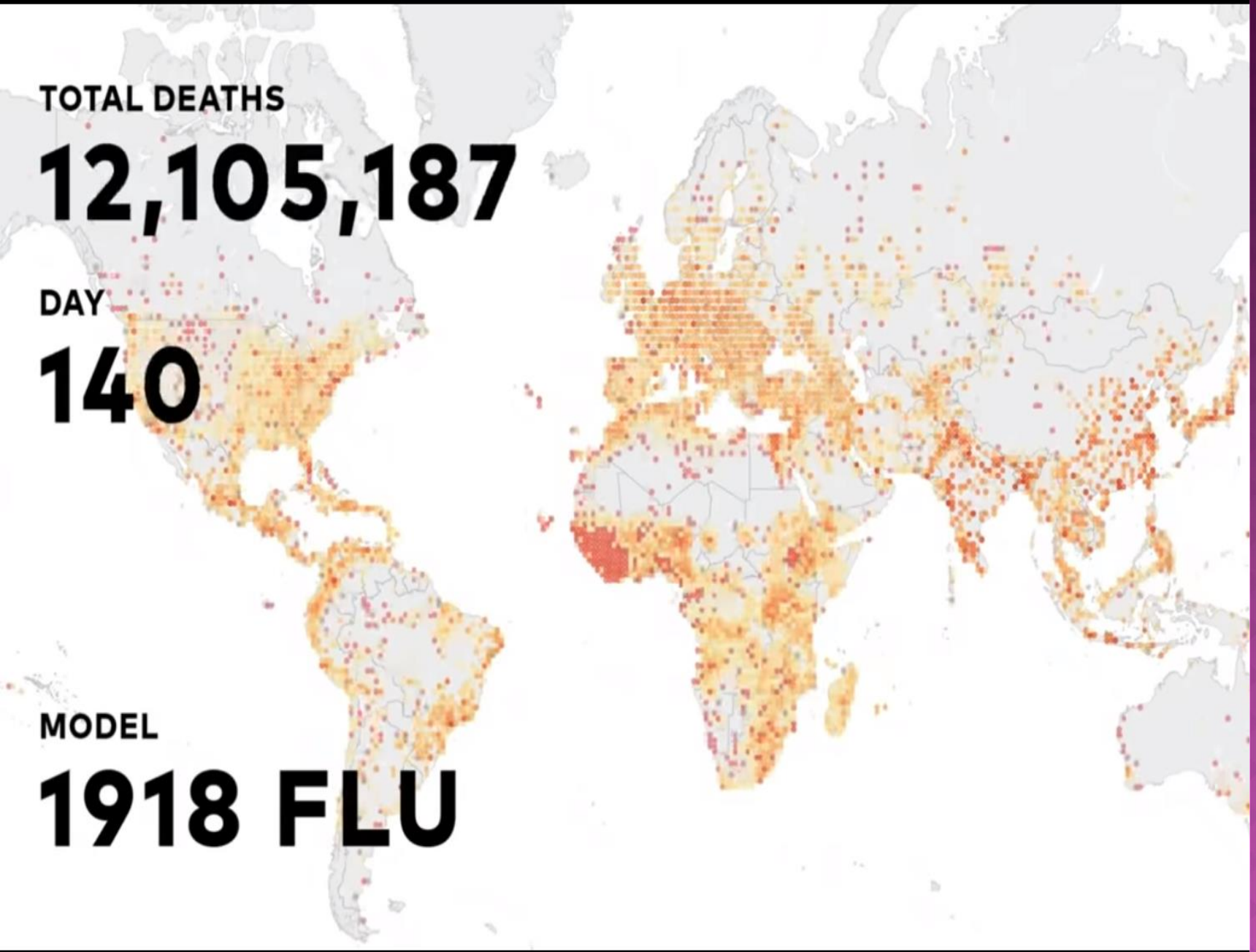

TOTAL DEATHS
509,070
DAY
95
MODEL
1918 FLU

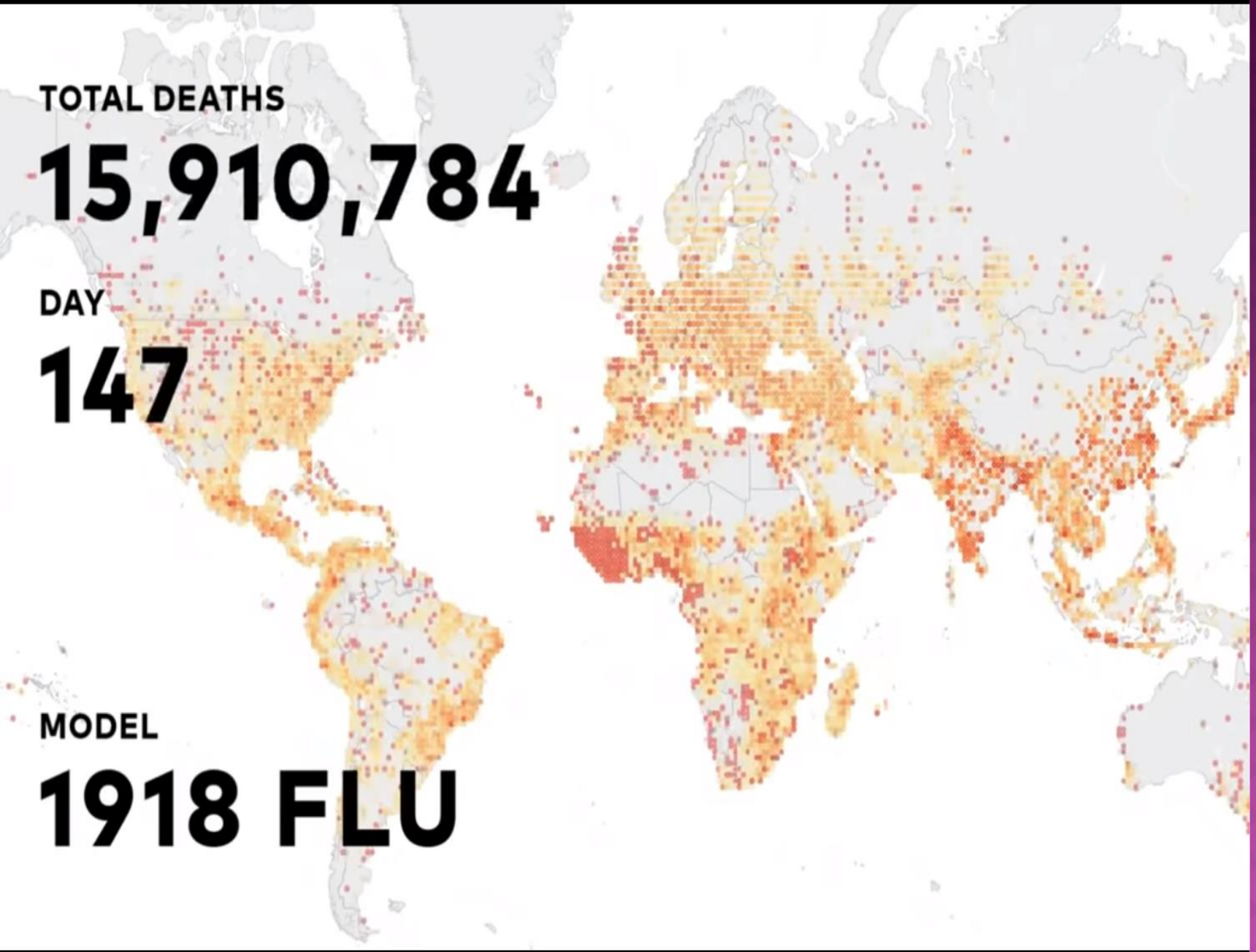

TOTAL DEATHS
1,276,481
DAY
106
MODEL
1918 FLU

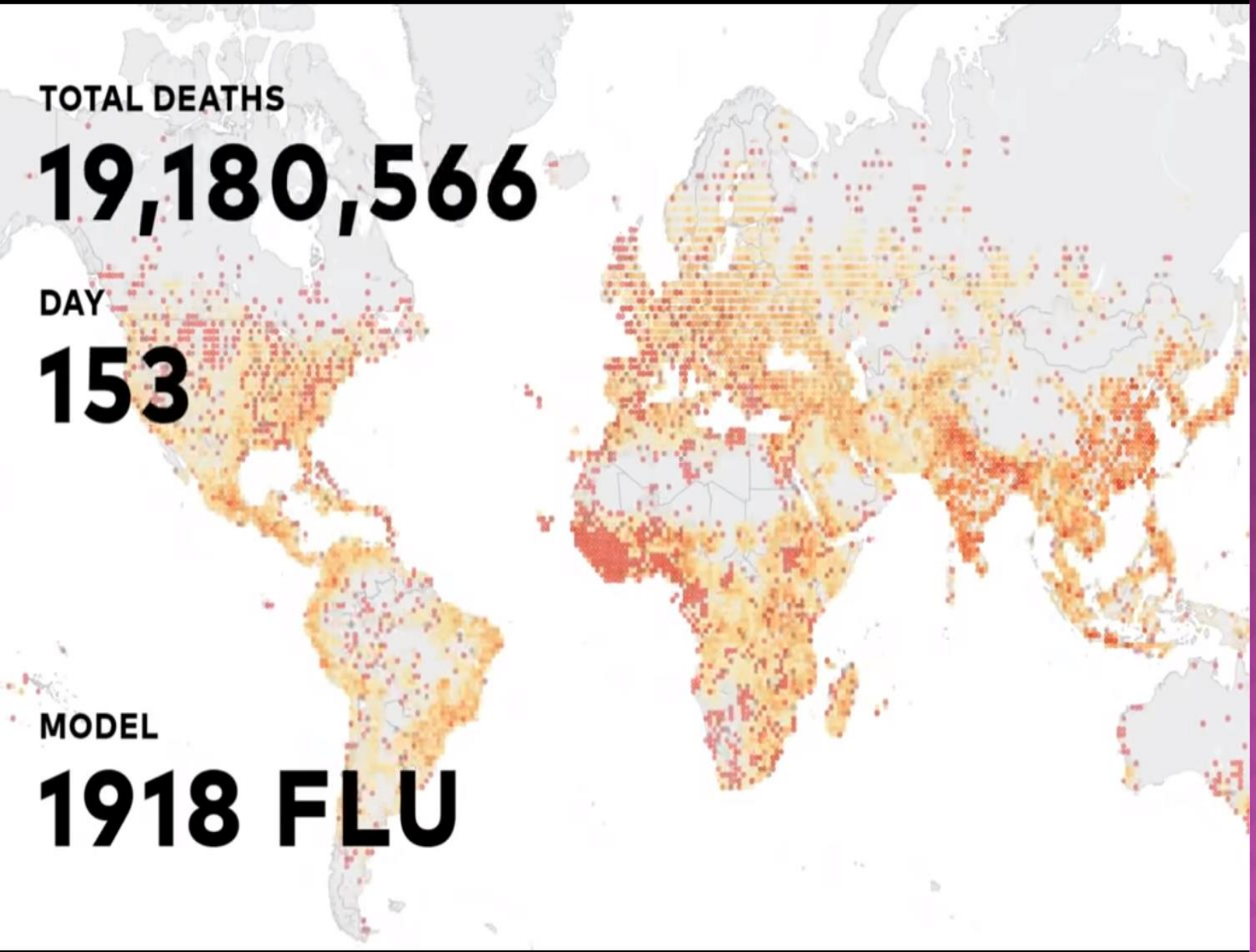

TOTAL DEATHS
3,342,117
DAY
118
MODEL
1918 FLU

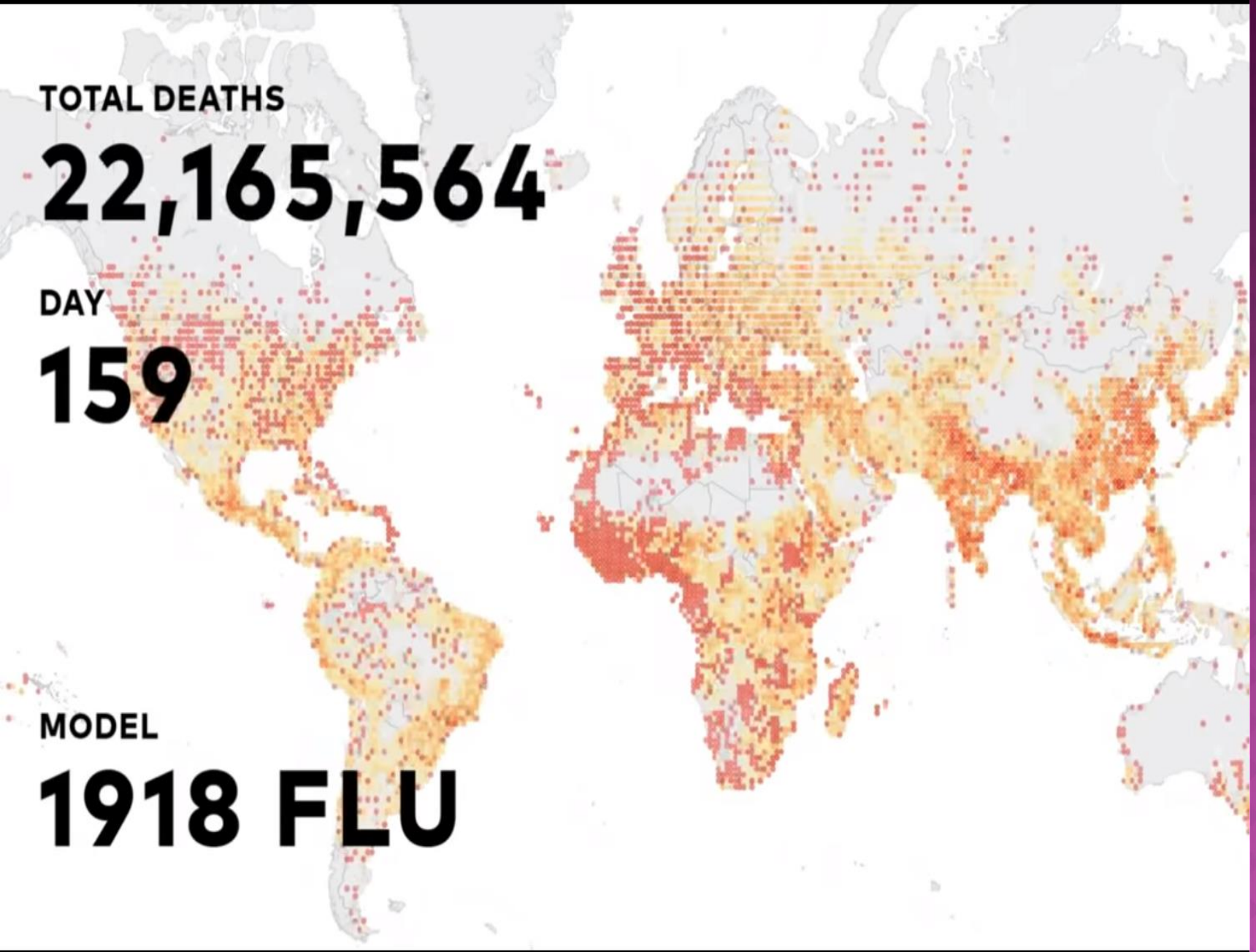

TOTAL DEATHS
5,842,842
DAY
126
MODEL
1918 FLU

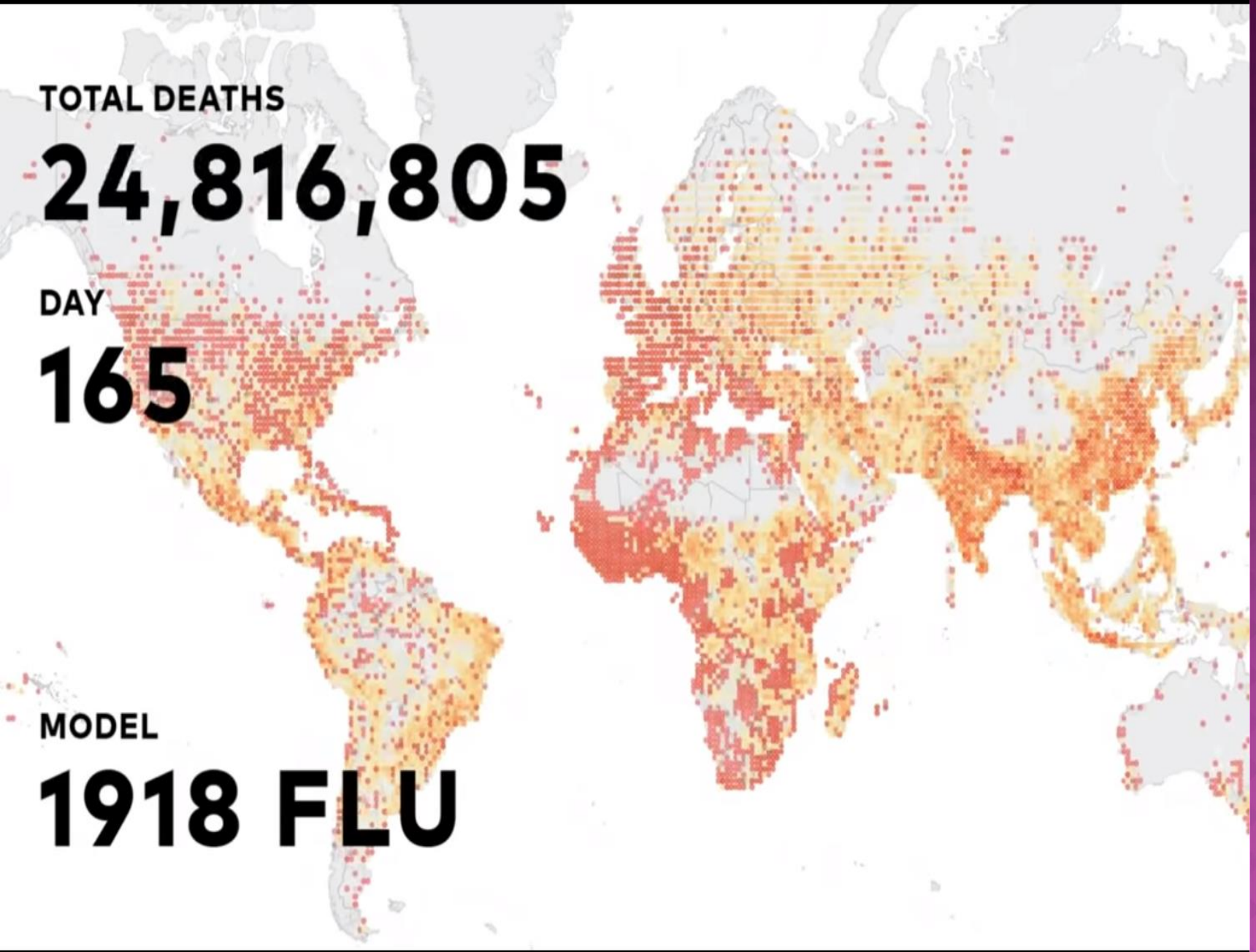

TOTAL DEATHS
8,691,088
DAY
133
MODEL
1918 FLU

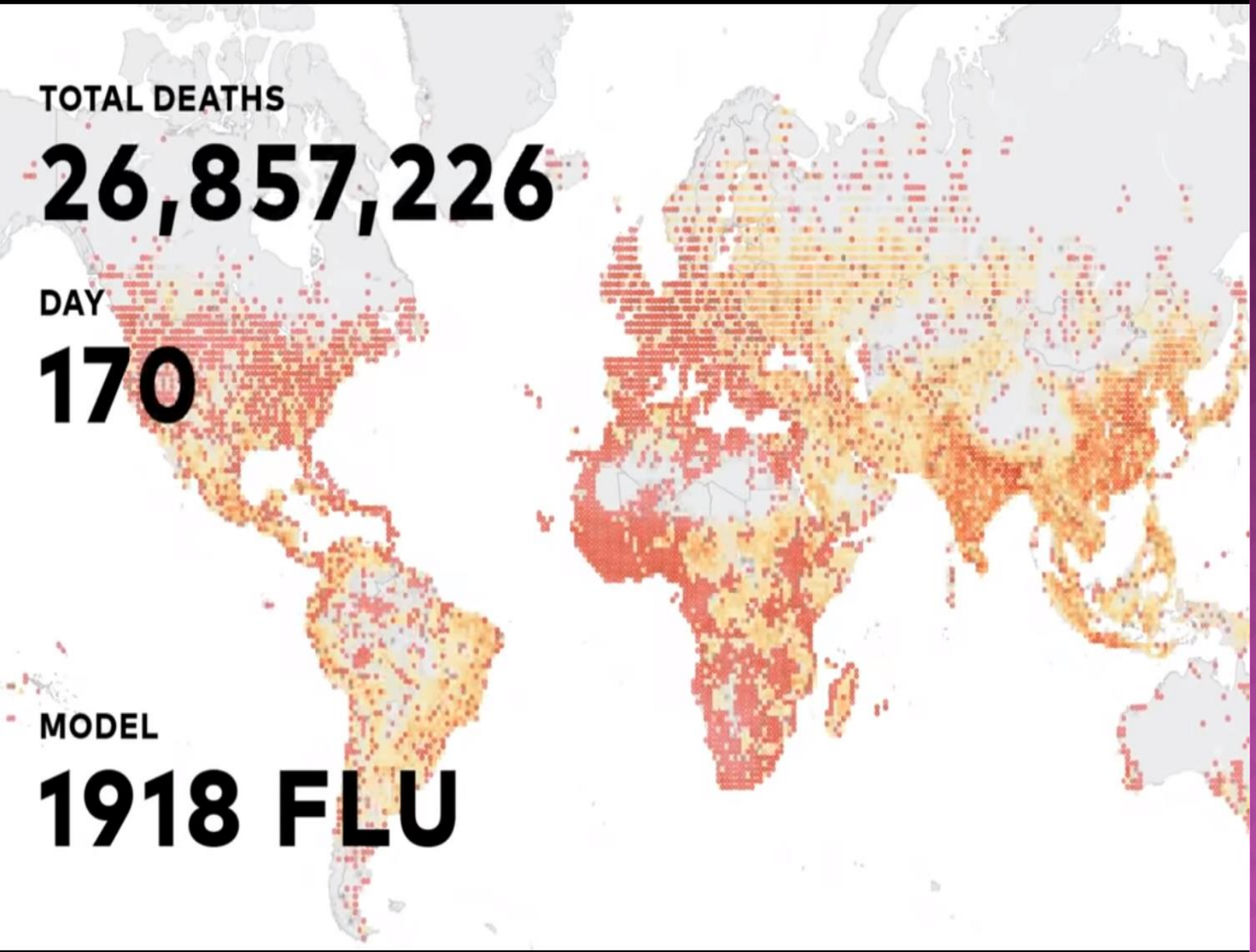

TOTAL DEATHS
12,105,187
DAY
140
MODEL
1918 FLU

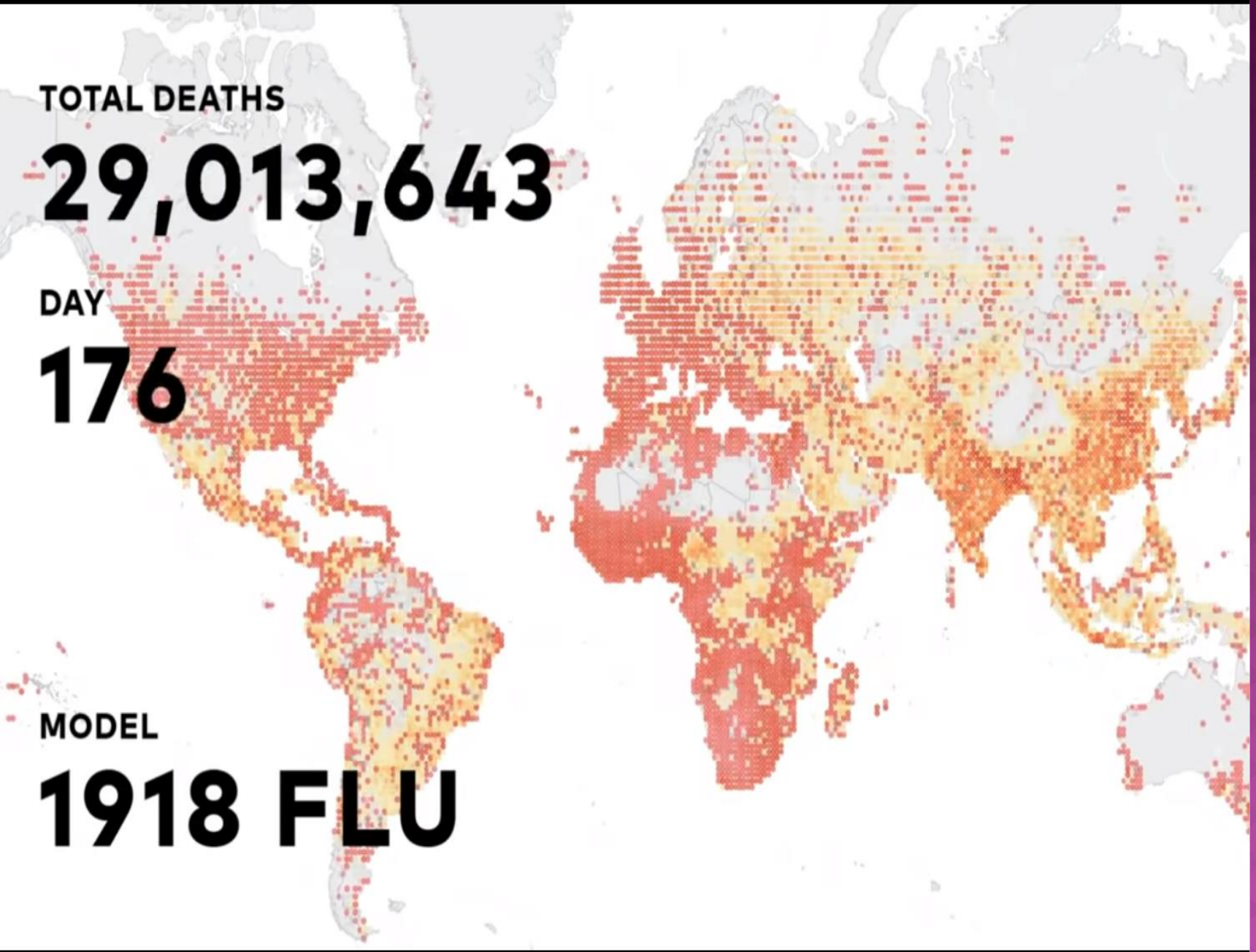

TOTAL DEATHS
15,910,784
DAY
147
MODEL
1918 FLU

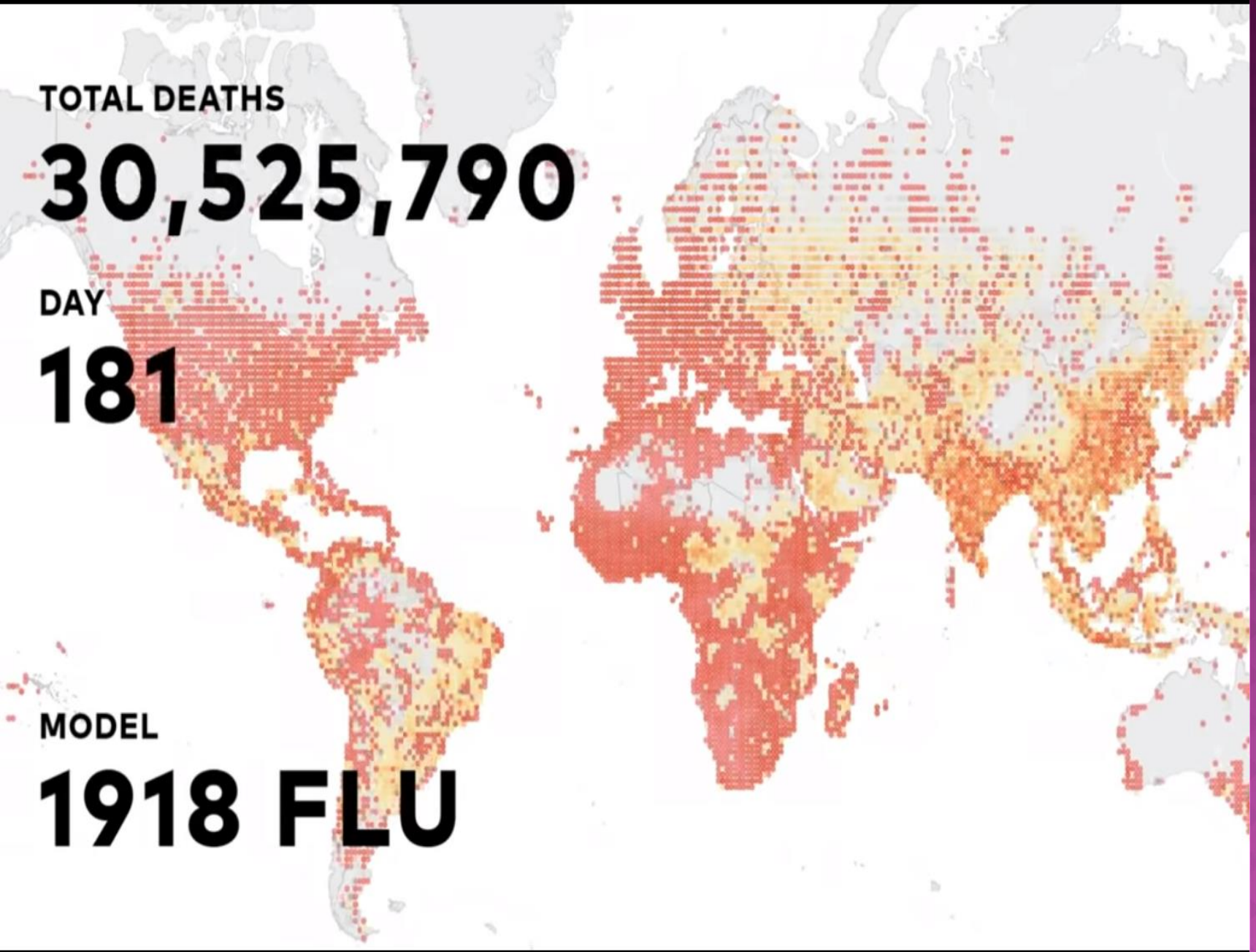

TOTAL DEATHS
19,180,566
DAY
153
MODEL
1918 FLU

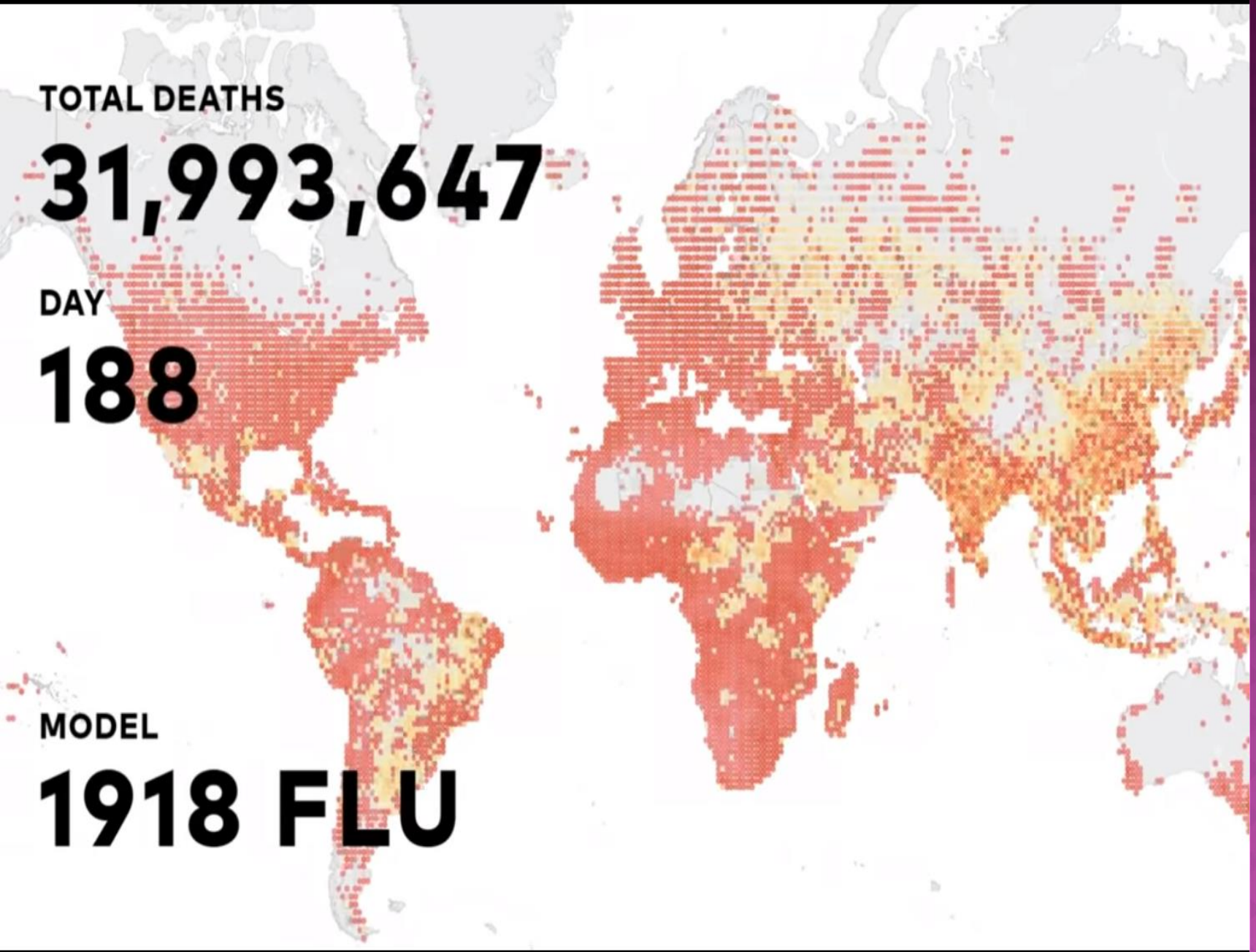

TOTAL DEATHS
22,165,564
DAY
159
MODEL
1918 FLU

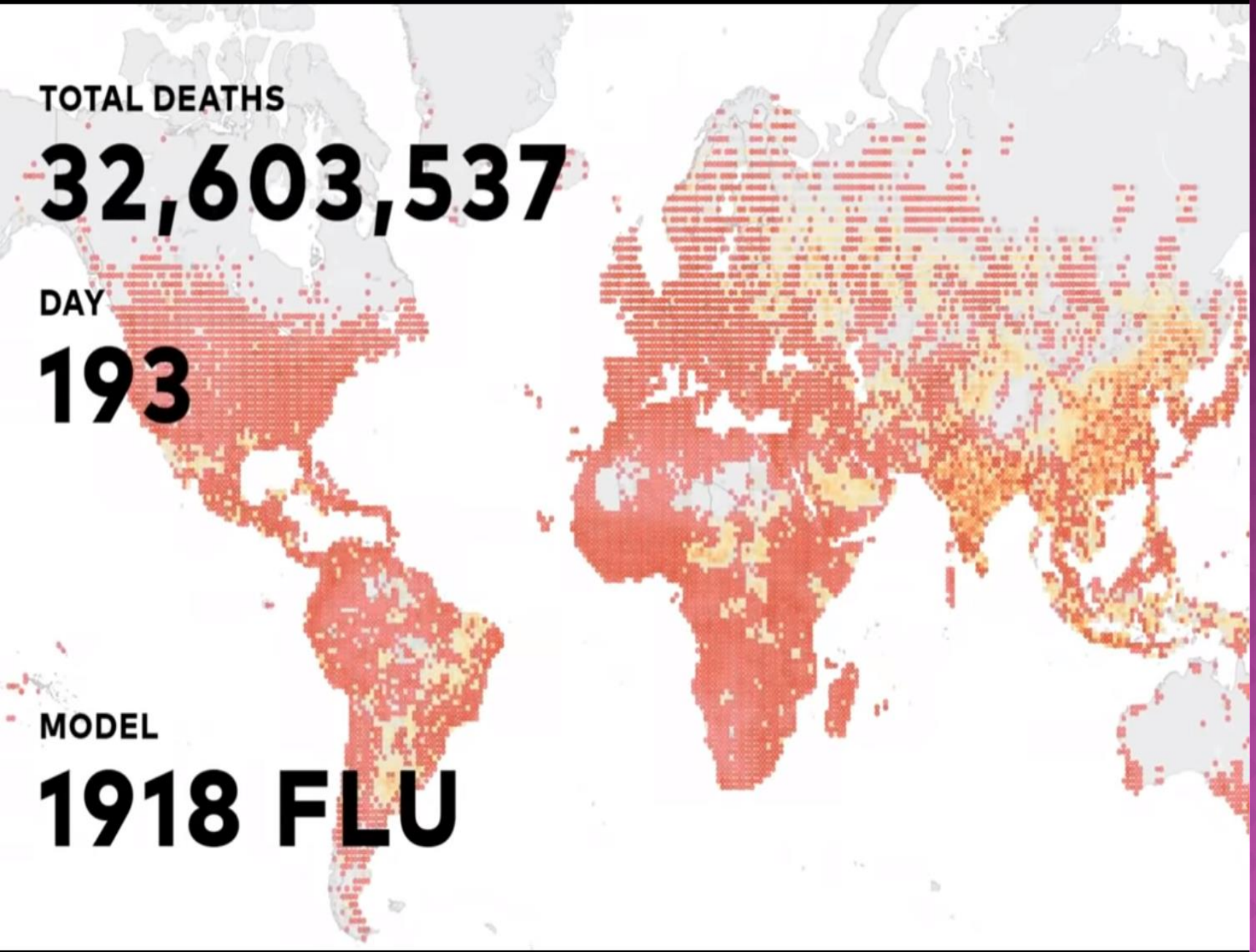

TOTAL DEATHS
24,816,805
DAY
165
MODEL
1918 FLU

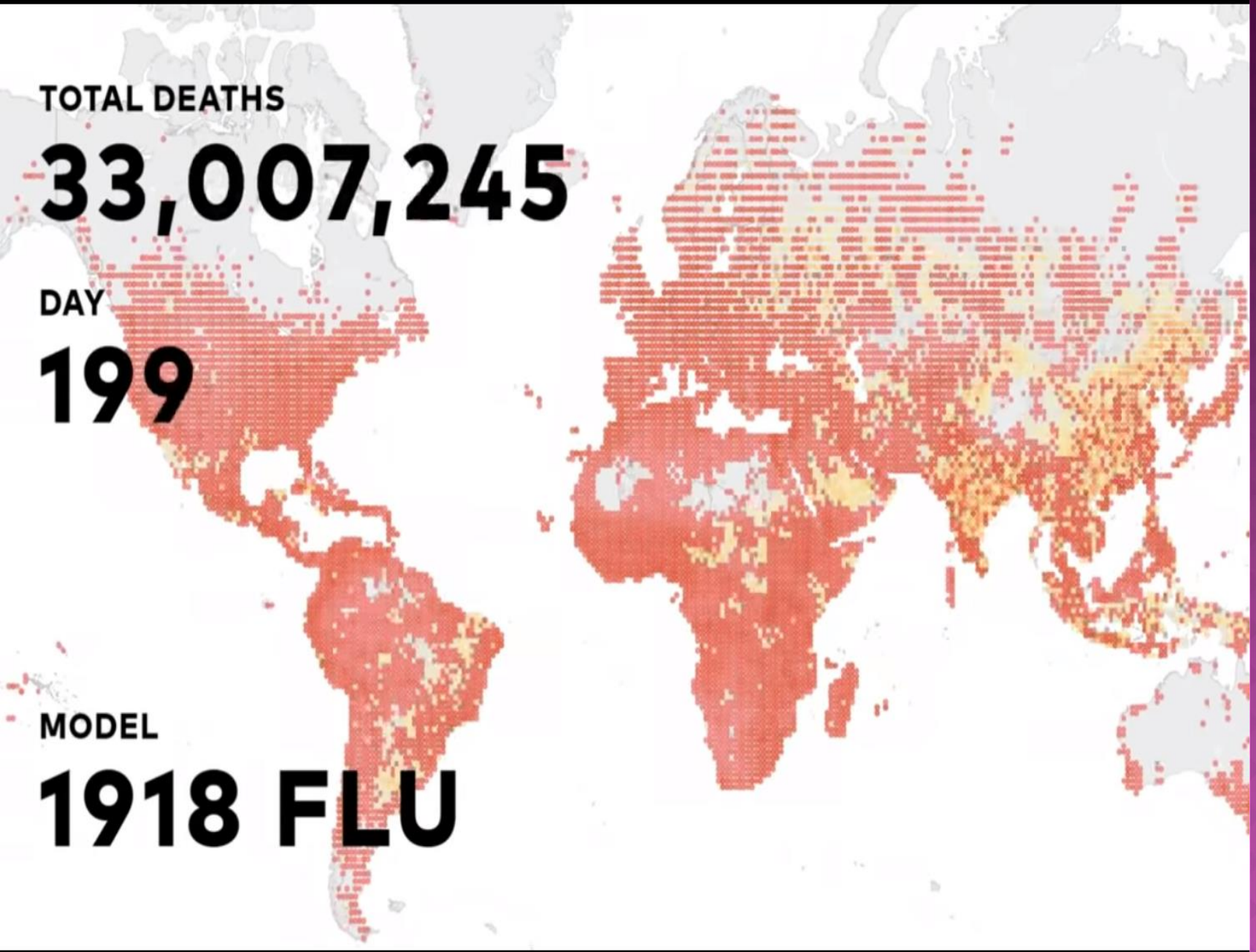

TOTAL DEATHS
26,857,226
DAY
170
MODEL
1918 FLU

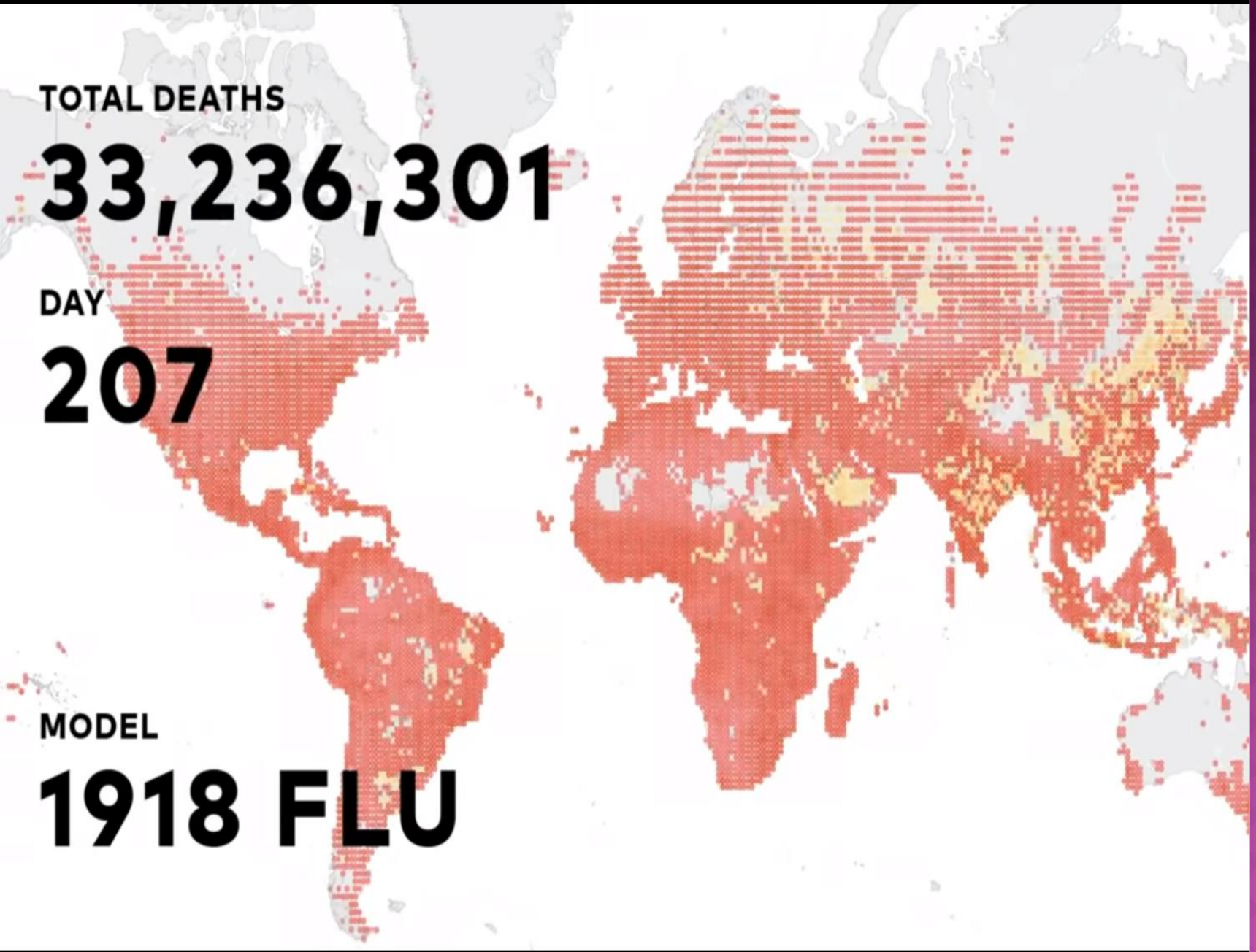

TOTAL DEATHS
29,013,643
DAY
176
MODEL
1918 FLU

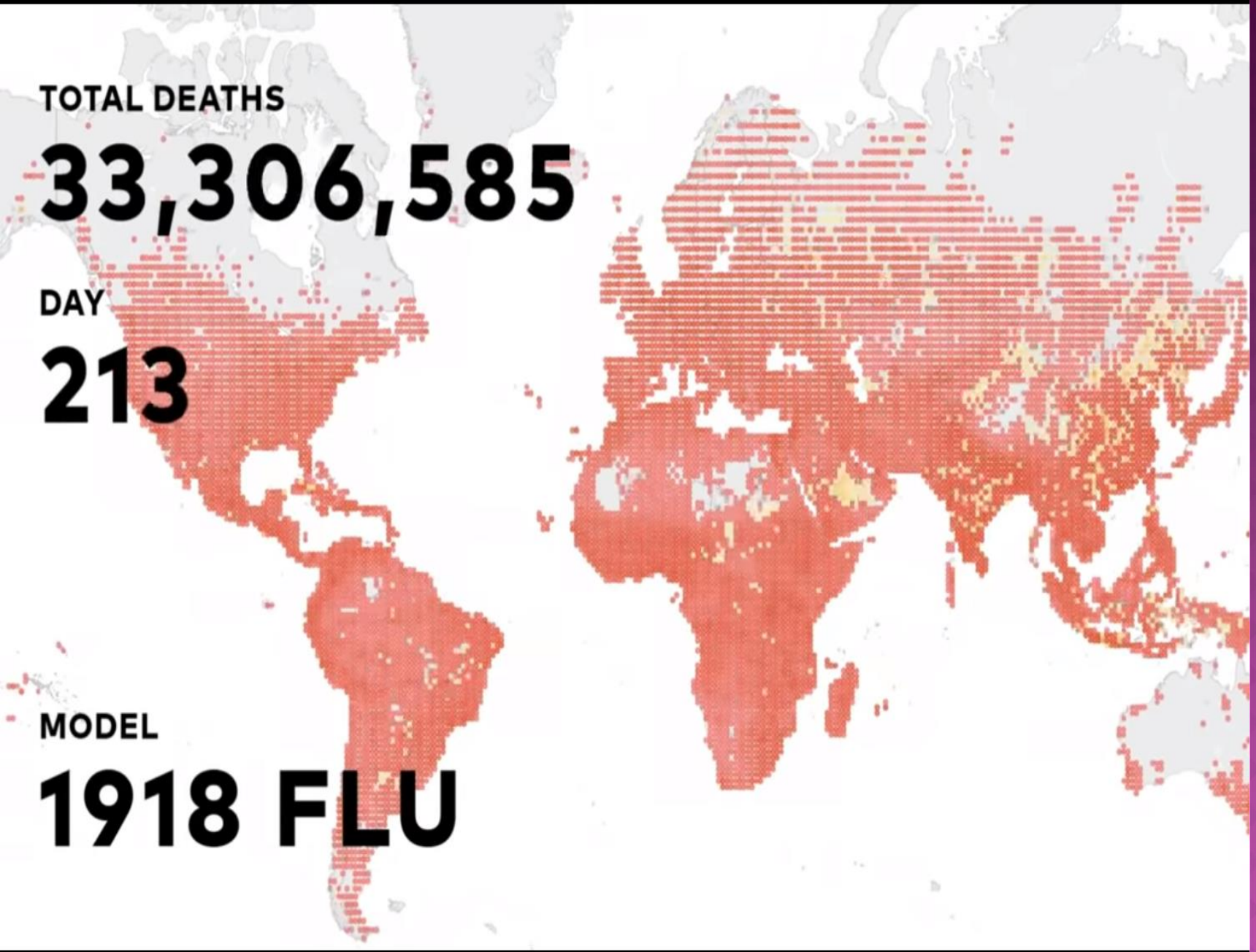

TOTAL DEATHS
30,525,790
DAY
181
MODEL
1918 FLU

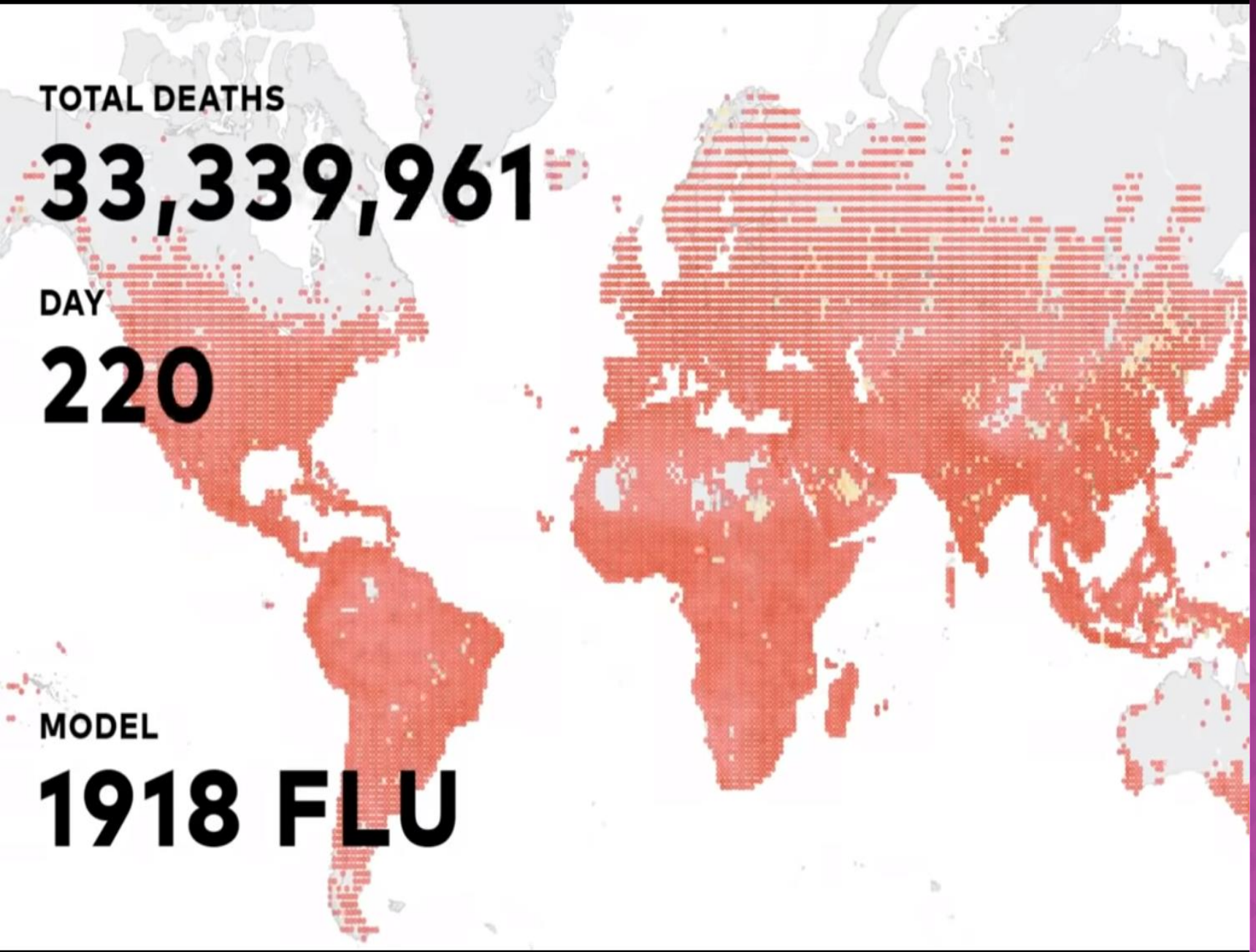

TOTAL DEATHS
31,993,647
DAY
188
MODEL
1918 FLU

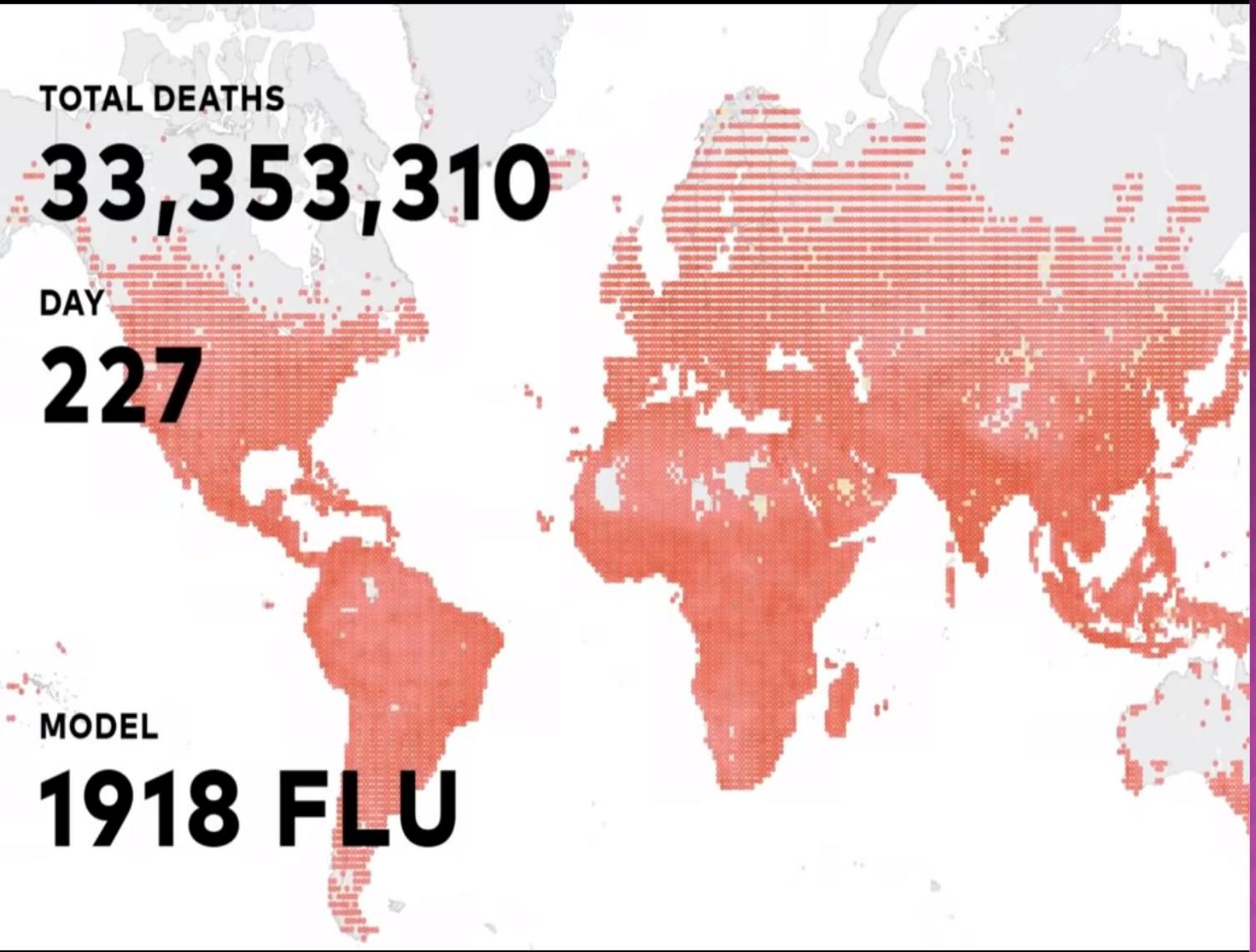

TOTAL DEATHS
32,603,537
DAY
193
MODEL
1918 FLU

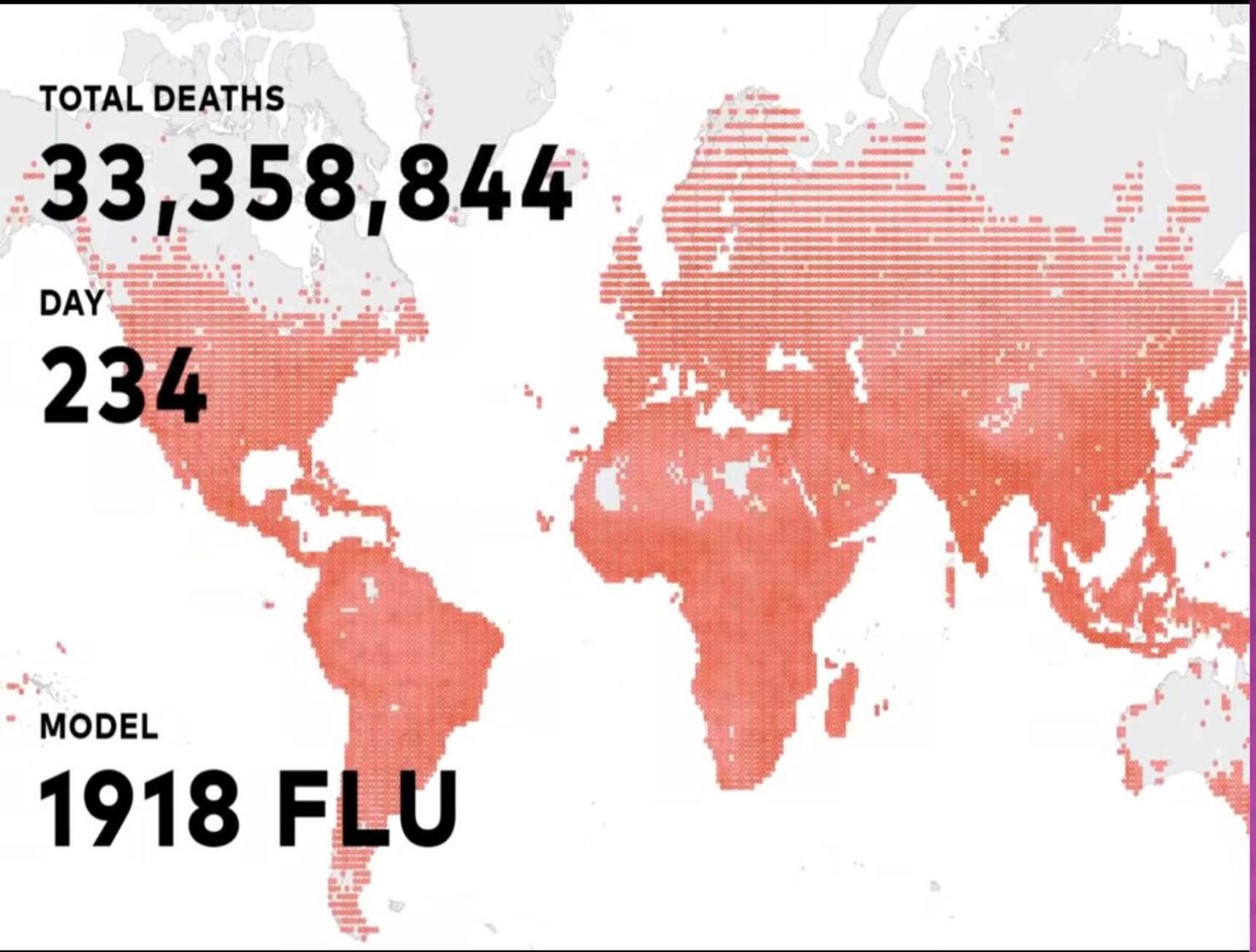

TOTAL DEATHS
33,007,245
DAY
199
MODEL
1918 FLU

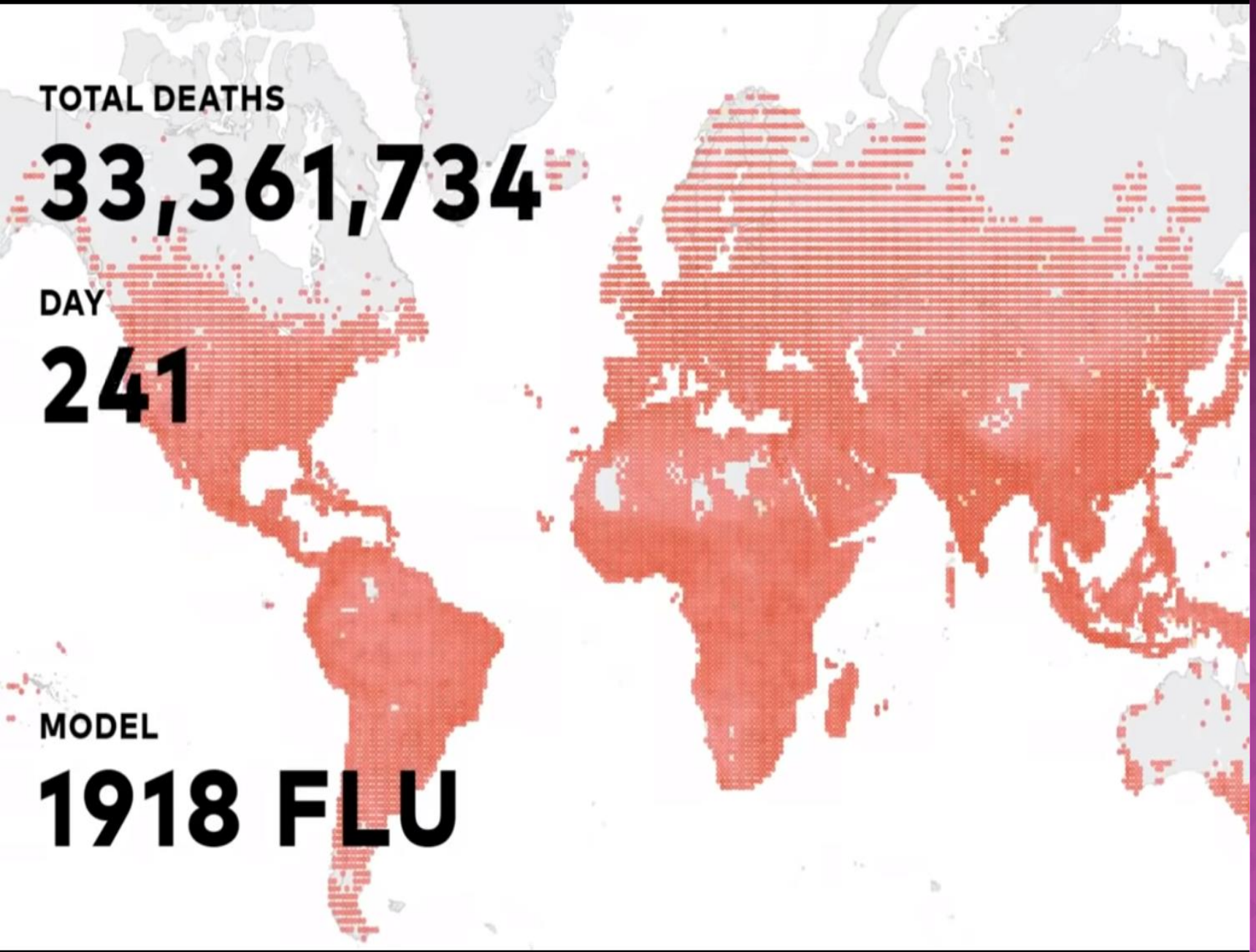

TOTAL DEATHS
33,236,301
DAY
207
MODEL
1918 FLU

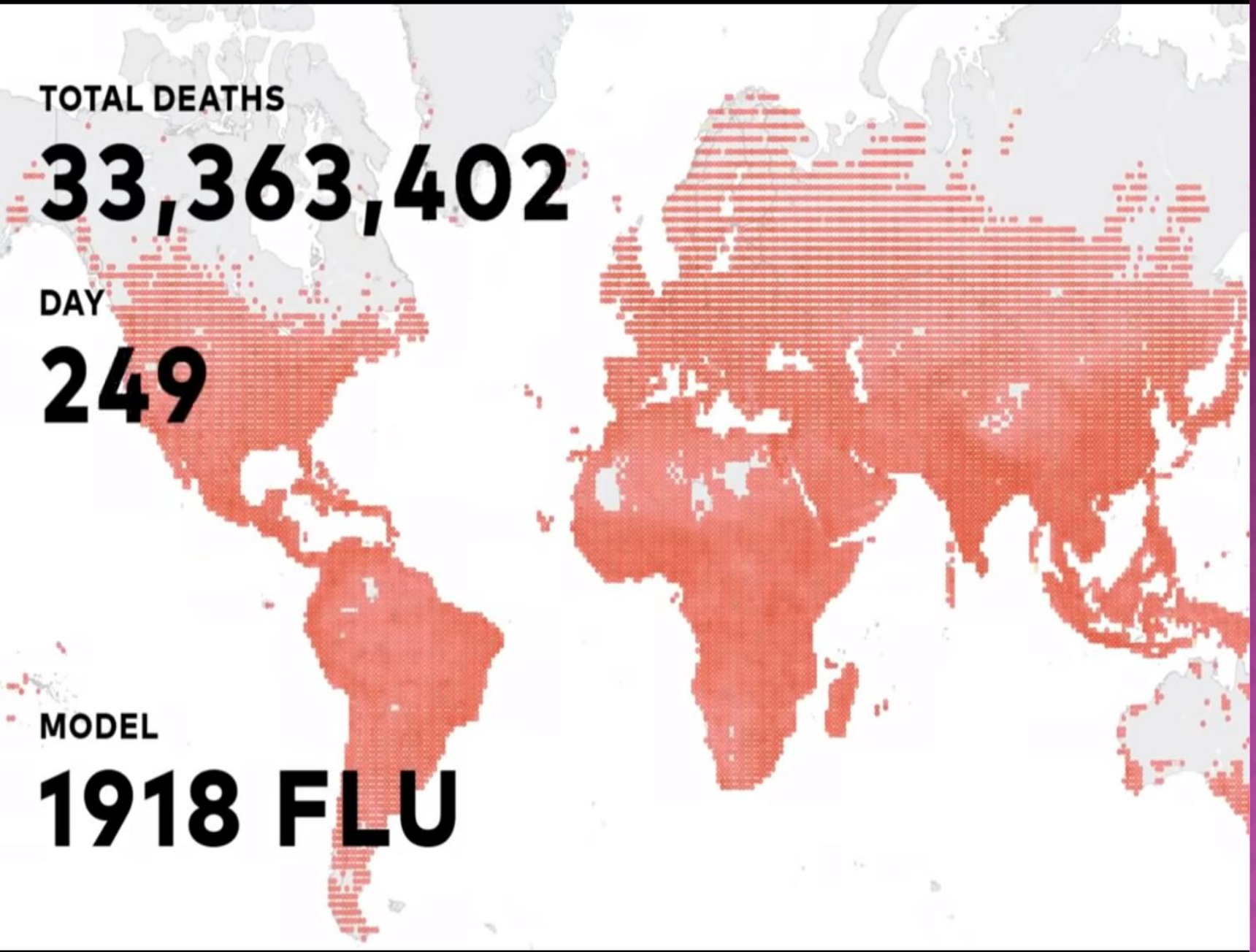

TOTAL DEATHS
33,306,585
DAY
213
MODEL
1918 FLU

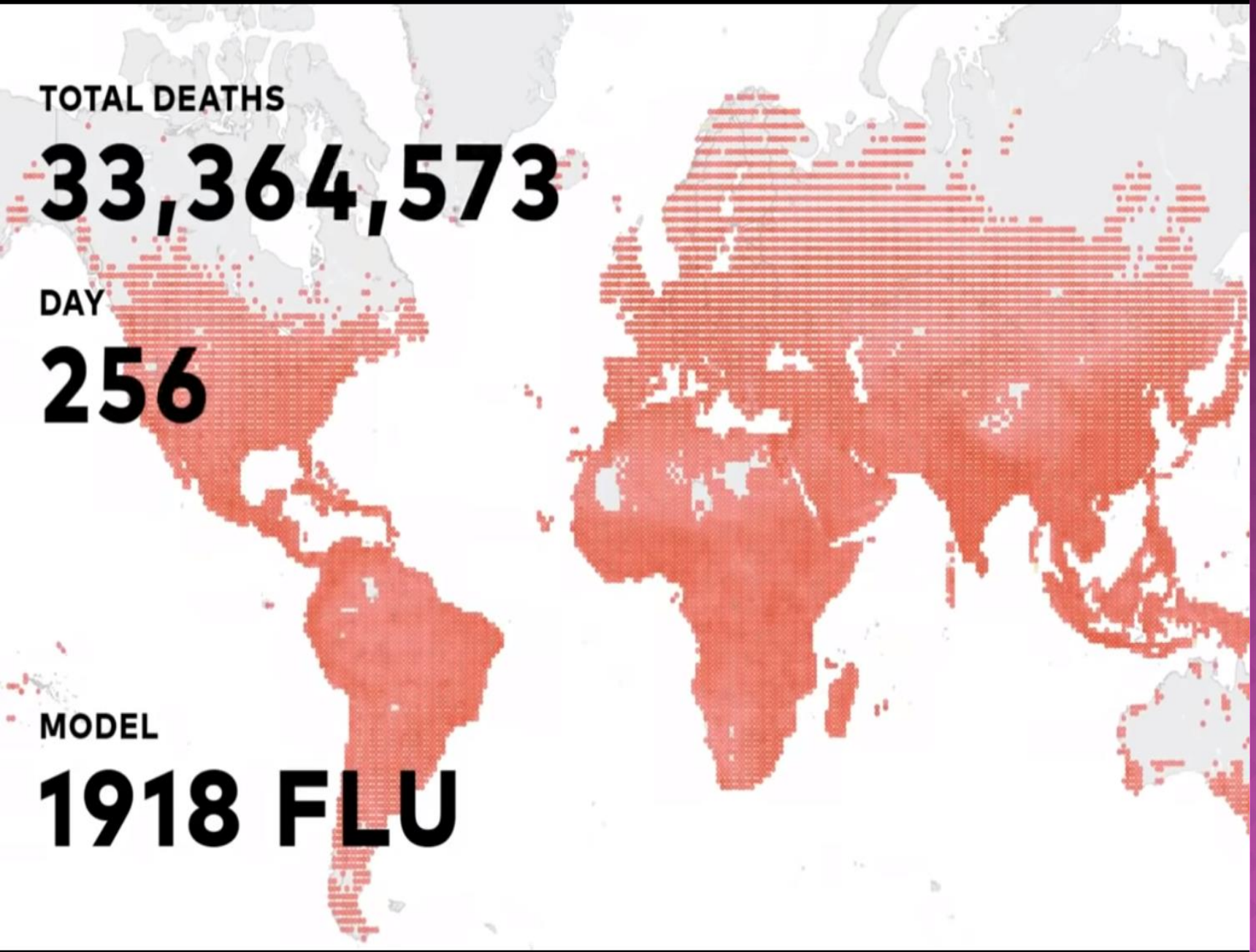

TOTAL DEATHS
33,339,961
DAY
220
MODEL
1918 FLU

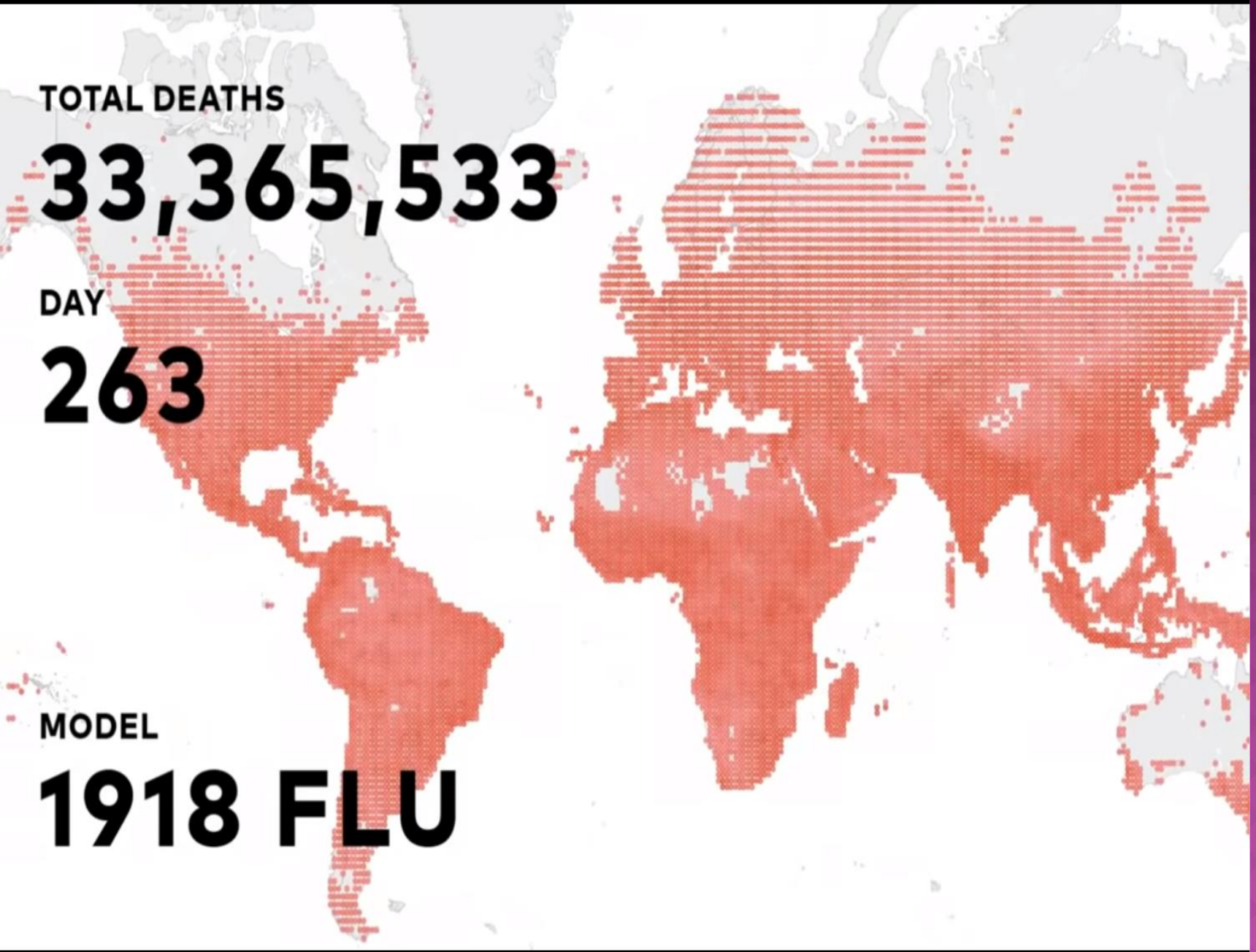

TOTAL DEATHS
33,353,310
DAY
227
MODEL
1918 FLU

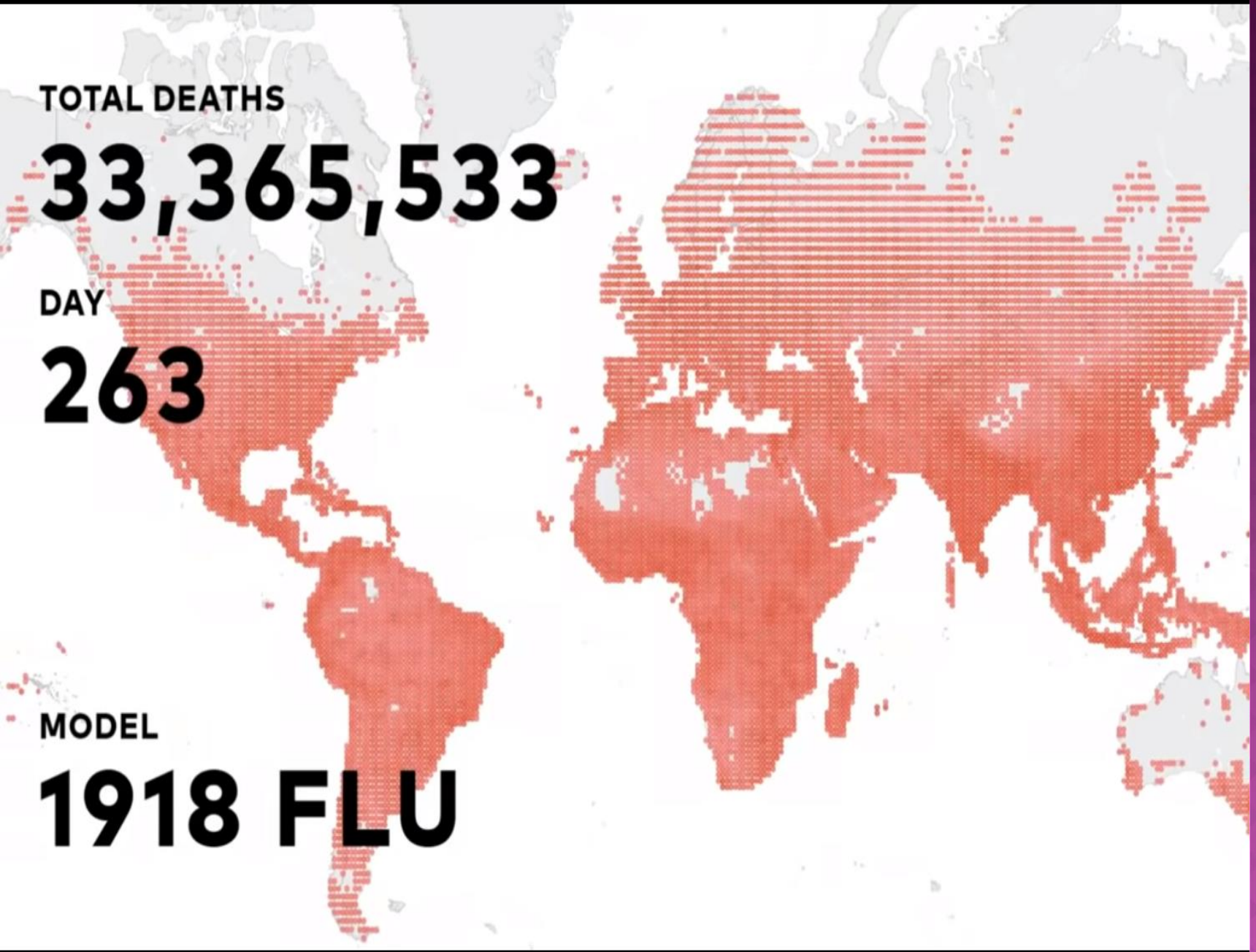

TOTAL DEATHS
33,358,844
DAY
234
MODEL
1918 FLU


TOTAL DEATHS
33,361,734
DAY
241
MODEL
1918 FLU


TOTAL DEATHS
33,363,402
DAY
249
MODEL
1918 FLU

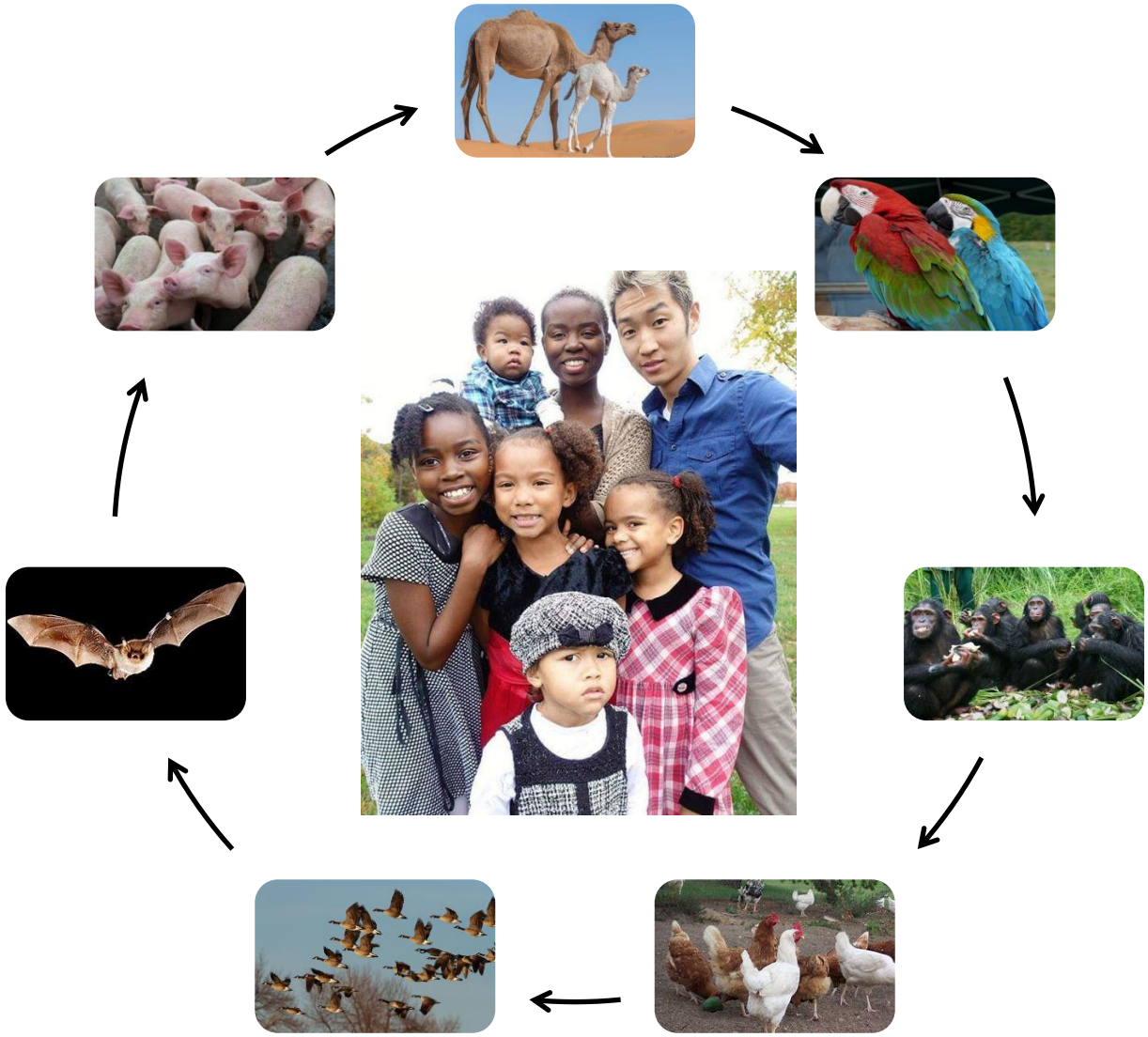

TOTAL DEATHS
33,364,573
DAY
256
MODEL
1918 FLU


TOTAL DEATHS
33,365,533
DAY
263
MODEL
1918 FLU


TOTAL DEATHS
33,365,533
DAY
263
MODEL
1918 FLU

ZOONOTIC SPILLOVERS

ZOONOSES AROUND US



SPILLOVER (1)

Most new human pathogens originate in the bodies of other animals.

>60% of new pathogens come from animals around us, 70% from wild animals.

142 viruses are known to have spilled over into people.

Host species are mostly domesticated species and wildlife that have adapted to the way we've changed their landscape.

SPILLOVER (2)

- Viruses jump species when there is close contact between an infected animal and a **susceptible** person.
- Animals share viruses by contact with feces, urine or blood, or respiratory droplets.
- Domesticated animals, like livestock, have been the largest source of virus spillover.
- This is due to their large numbers and our frequent close interaction with them.

SPILLOVER (3)

- Wild animals that have adapted to environments where humans dominate are another significant source of spillovers.
- Human encroachments on wildlife habitats increase opportunities and risks for animal-human interactions and spillover.
- Exploitation of wildlife like hunting and the wildlife trade have also led to transmission of zoonotic viruses.

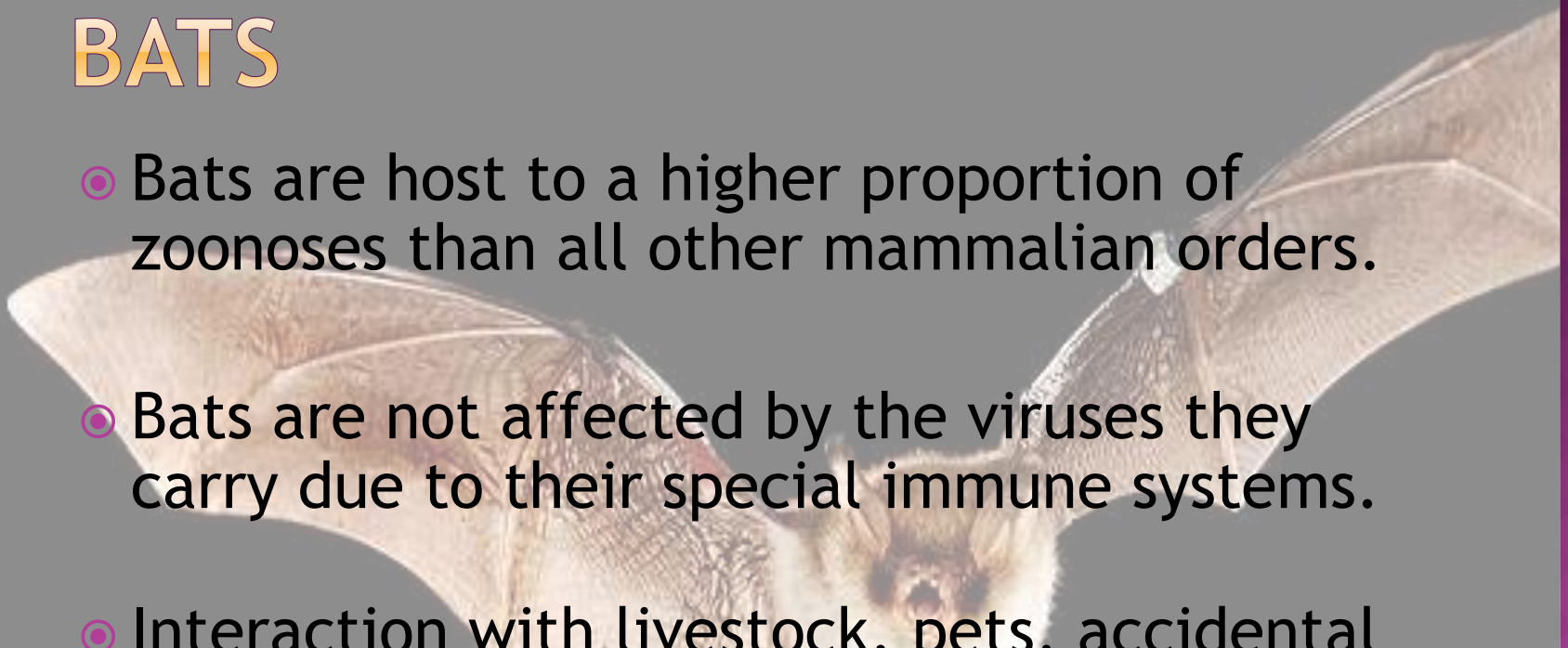
SPILLOVER (4)

- Humans have drastically changed the planet and nearly a third of all vertebrate species are threatened or endangered.
- Live wild animals sold in markets where animals and people mix in high density and close contact, present the perfect opportunity for host jumping.
- Most of these diverse and different species would have normally never come together in the natural world."
- Wildlife also shift their distributions to accommodate human activities that modify their natural landscape.

SPILLOVER (5)

- Wildlife markets are a petri dish for the next pandemic.
- The wildlife trade can be deadly for the wild animals involved and for people throughout the world.
- >200 organizations from across the world sent a letter to WHO urging them to endorse a permanent ban on the wildlife trade, including for food, medicine, fur, pets and other reasons.
- Governments must also help the traders involved to find new livelihoods as quickly as possible.

BATS



- Bats are host to a higher proportion of zoonoses than all other mammalian orders.
- Bats are not affected by the viruses they carry due to their special immune systems.
- Interaction with livestock, pets, accidental encounters, and scavenging bat carcasses, increase risk of transmission.
- The novel coronavirus comes from a group of viruses that originate or spread in bats.

SOME SPILLOVERS

- SARS from **bats** to pangolins (?) to civets.
- MERS from **bats** to camels.
- CoVID-19 from **bats** to pigs.
- EBOLA from **bats** to monkeys to deer.
- NIPAH virus from **bats**, pigs and fruit.
- HENDRA virus from **bats** to horses to humans.
- MARBURG virus from bats to monkeys.
- HIV from chimpanzees

Example of Spillover

PSITTACOSIS

PSITTACOSIS (PARROT FEVER) (1)

- Also known as ornithosis.
- Zoonosis caused by *Chlamydia psittaci*.
- Bacterium from infected parrots, macaws, cockatiels, and from pigeons, sparrows, ducks, hens, gulls and many other species of birds.
- The incidence of infection in canaries and finches is believed to be lower than in psittacine birds.

PSITTACOSIS (PARROT FEVER) (2)

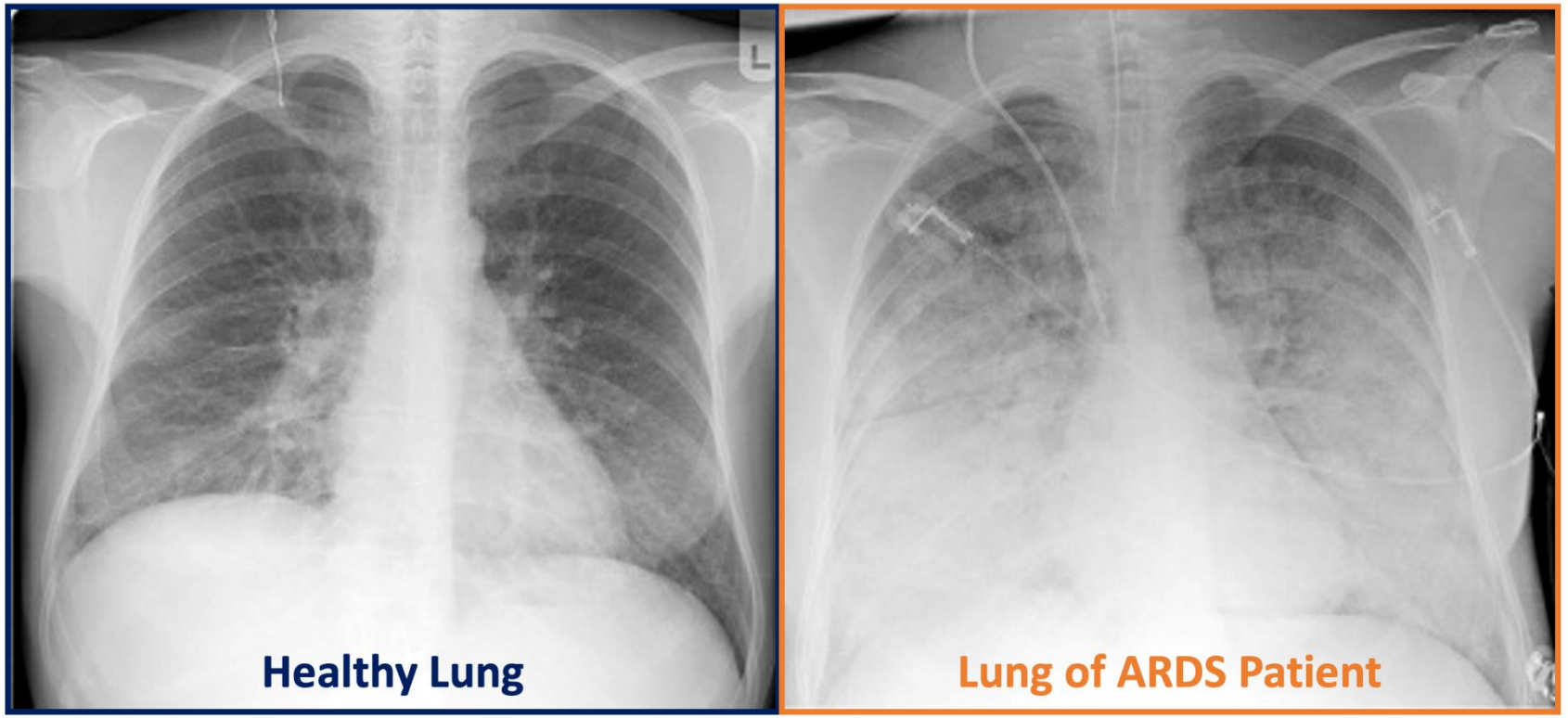
- Incubation period of 5-19 days in humans.
- Symptoms range from asymptomatic to systemic illness with severe pneumonia.
- In the 1st week, symptoms mimic typhoid fever:
  - Prostrating high fevers.
  - Joint pains.
  - Diarrhea.
  - Conjunctivitis.
  - Nose bleeds.
  - Low white blood cell count.
  - Rose spots (Horder's spots).
  - Spleen enlargement (end of the 1st week).

PSITTACOSIS (PARROT FEVER) (3)

- Severe respiratory infection associated with splenomegaly and/or epistaxis.
- Severe headache and nuchal rigidity that suggest meningitis are not unusual.
- In severe cases, towards the end of the 1st week, stupor or coma can result.
- 2nd week is more like acute pneumococcal pneumonia with continuous high fevers, headaches, cough, and dyspnea.

PNEUMONIA WITH WHITE-OUT

X-rays show patchy infiltrates and diffuse whiteout of lung fields.



PSITTACOSIS (PARROT FEVER) (4)

- *Chlamydia psittaci* bacterium can be transmitted by:
  - Mouth-to-beak contact.
  - Airborne inhalation of feather dust.
  - Inhalation of dried feces.
  - Contact with respiratory secretions of infected birds.
  - Person-to-person transmission is rare.

- Human mortality is less than 1%.

PSITTACOSIS (PARROT FEVER) (5)

- *Chlamydia psittaci* infection is called avian chlamydiosis, first reported in Europe in 1879.
- Infected birds shed the bacteria in feces and nasal discharges, which can remain infectious for several months.
- *C. psittaci* infections can be mild, severe, acute, or chronic with intermittent shedding.
- Signs in birds include inflamed eyes, difficulty breathing, watery droppings, and green urines.

PSITTACOSIS (PARROT FEVER) (4)

- Outbreak in the US in 1929-1930, largest up to then: 5,000 birds, 169 humans 33 dead.
- Led to the establishment of the National Institutes of Health.
- From 2002 through 2009, 66 human cases of psittacosis were reported to the CDC.
- Most resulted from exposure to infected pet birds, usually cockatiels, parakeets, and macaws.

PSITTACOSIS (PARROT FEVER) (6)

- Bird owners, veterinarians, pet shop employees, zookeepers are at risk of infection.
- Some outbreaks of psittacosis in poultry-processing plants have been reported.
- Birds are highly mobile vectors for chlamydial infection because they feed on the detritus of infected animals of all sorts.

EBOLA

- Around 2006 a bat virus started spilling over into humans.
- Ebola hemorrhagic fever can kill 90%.
- The 10th outbreak that began in 2018 was declared over in 2020 after infecting 3,470 people, killing 2,287 (a 65% fatality rate).
- The 2014 West African outbreak, led to more than 28,000 cases and 11,000 deaths.

EBOLA OUTBREAK 2014

EBOLA OUTBREAK 2014

EBOLA OUTBREAK 2014

EBOLA OUTBREAK 2014

EBOLA OUTBREAK 2014

EBOLA OUTBREAK 2014


EBOLA IS REAL
A B.C Avoid body contact
N.H.S No Hand shake
STAY SAFE
LAMPTEY
Other Speakers
BISHOP ABU KOROMA, BISHOP J. ARCHIBALD
APOSTLE MOSES KAY AND

EBOLA Graves (SIERRA LEONE 2014)

NIPAH VIRUS

NIPAH VIRUS (1)

- Drinking raw palm sap (palm toddy) contaminated by bat urine.
- Eating fruits partially consumed by bats.
- Using water from wells infected by bats.
- 5-14 days incubation.
- Encephalitis and death in **50-75%.**

NIPAH VIRUS (2)

NIPAH VIRUS (3)

NIPAH VIRUS (4)

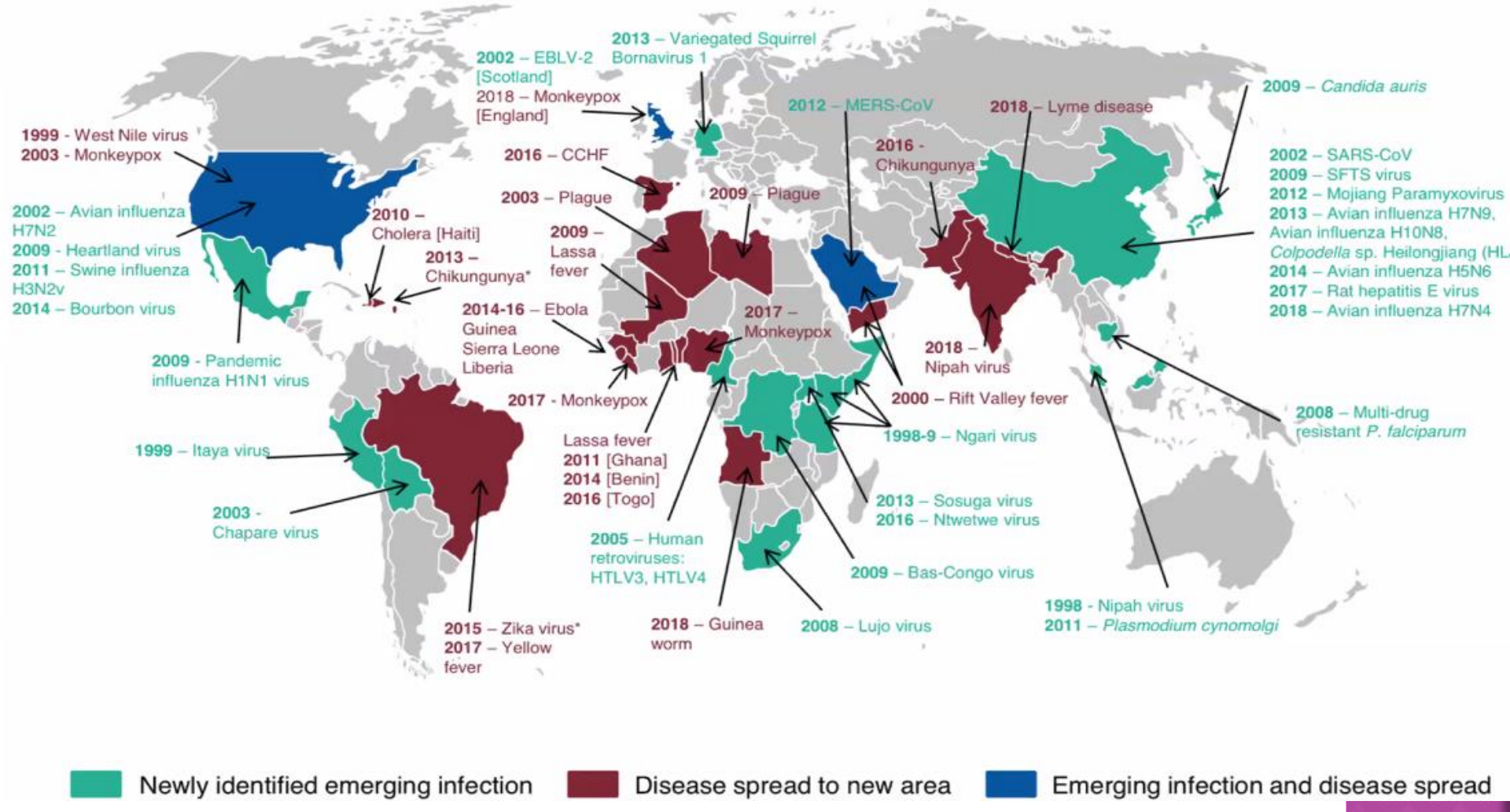
NIPAH VIRUS (5)

NIPAH VIRUS (6)

WHEN PEOPLE DRINK THE SAP
THEY MAY CATCH NIPAH
AND DIE.

NEW-NEW AND OLD-NEW INFECTIONS

Global map of significant and new emerging infections in humans: spread to new areas since 1998



WHAT DO WE DO NOW? (1)

- If we don't value the ecological, social, immunological and behavioral factors that control the emergence and spread of novel pathogens, our knowledge will be incomplete.

- The latest data on spillovers could help authorities prepare for pandemics and prevent outbreaks of disease.

- We should shift our thinking from pandemic response to pandemic prevention

WHAT DO WE DO NOW? (2)

- We must get rid of the medical, social and financial hubris that currently dominates science, economics and politics.

- We are ALL potential victims, we still have a lot to learn, a lot more to do, and need to create much more fairness towards everyone.

- The social determinants of health must be taken into consideration as inherent and inseparable from all levels of planning.

Social Determinants of Health

Economic Stability	Healthcare	Neighborhood & Environment	Education	Social & Community Context
Economic Harmony	Availability	Housing	Literacy	Community Resources
Concentrated Poverty	Accessibility	Parks & Playgrounds	Funding	Recreation & Leisure Activities
Job Training & Availability	Affordability	Ambulatory Ability and Ease	Elementary Education	Transportation Options/Costs
Availability of Food	Health Literacy	Segregation, Discrimination	Higher Education	Incarceration
Safe Housing	Insurance	Social Norms and Support	Libraries	Safety
Poverty Stresses	Provider Adequacy	Worksites	Technology	Trash, Toxins, Hazards

Ramírez 2019

WHAT DO WE DO NOW? (3)

- Even the experts now recognize the limits of their prognostication.
- Repeatedly we give microbes a helping hand:
  - We assist them in occupying new ecological niches.
  - We empower them to spread to new places.
  - We facilitate their infecting in new ways.
- Global interconnectivity, travel and commerce make it easy for viruses and their vectors to reach anywhere in the globe within 72 hours.
- Misuse of our miracle drugs has caused emergence of multi-drug resistance illnesses (PHAGES?).

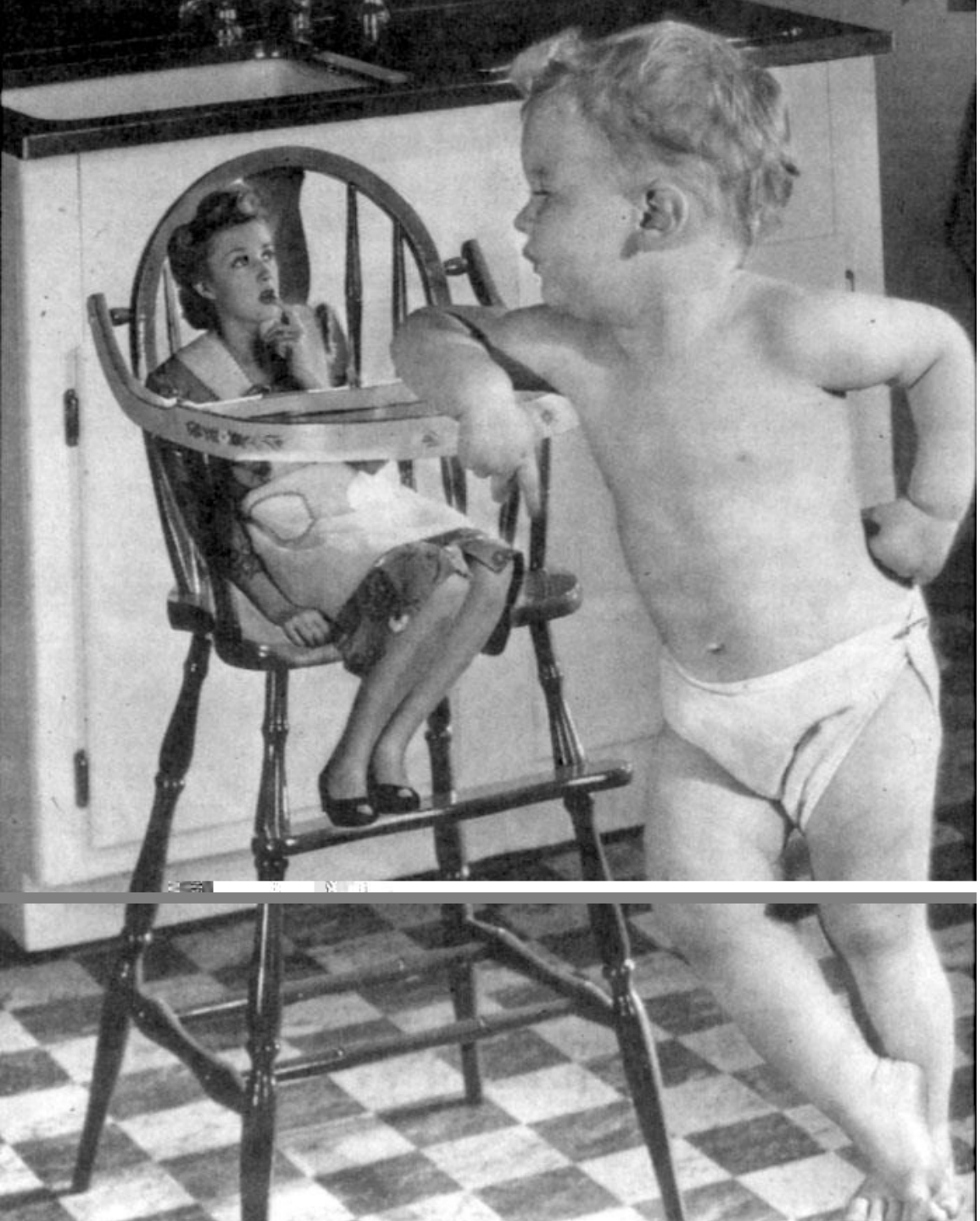
WHAT DO WE DO NOW? (4)

As we know, there are known knowns; there are things we know we know.

We also know there are known unknowns; that is to say we know there are some things we do not know.

But there are also unknown unknowns—the ones we don't know we don't know.

And if one looks throughout the history of our country and other free countries, it is the latter category that tend to be the difficult ones. (Donald Rumsfeld 2002)



Babies Rule!!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MY GRATITUDE

- Thank you for your participation in this ZOOM webinar. I appreciate your support and cooperation.
- I hope that that I have been able to give you interesting information and motivated you to do extra research on the topics.
- One of our members, Barbara Meyer has done just that, and she has sent me some very interesting bits of information about malaria.
- One of them is a US Army brochure on malaria illustrated by Dr. Seuss! Thank you, Barbara.

THANK YOU. ‘BYE