1. Board Of Health Packet

   Documents:

   BOHMIN20200820.PDF
   PPT COVID REPORT 9.14.PDF
   COVID REPORT.PDF
   COVID SEPT. SURGE REPORT.PDF

BOARD OF HEALTH
Meeting

Town of Nantucket
3 East Chestnut Street
Nantucket, Massachusetts 02554
www.nantucket-ma.gov

Commissioners: Stephen Visco (chair), Malcolm MacNab, MD, PHD (Vice chair), James Cooper, Meredith Lepore, Melissa Murphy
Staff: Roberto Santamaria, Artell Crowley, Kathy LaFavre, John Hedden, Anne Barrett, Hank Ross

~~ MINUTES ~~
Thursday, August 20, 2020

This meeting was held via remote participation using ZOOM and YouTube,
Pursuant to Governor Baker's March 12, 2020 Order Regarding Open Meeting Law

Called to order at 3:00 p.m. by Mr. Visco

Staff in attendance: R. Santamaria, Health Director; A. Crowley
Attending Members: Stephen Visco; Malcolm MacNab, MD, PHD; James Cooper; Meredith Lepore; Melissa Murphy, Select Board

I. ANNOUNCEMENTS

II. PUBLIC COMMENTS – ANY MEMBER OF THE PUBLIC MAY ADDRESS COMMISSIONERS AT THIS TIME

1. None

III. DIRECTOR'S REPORT

1. One thing going well is we've been able to keep the number of cases low. One more case today brings us to 50. This latest case was caught locally, so we will be focusing on contact tracing.
2. Staff has been keeping up with food inspections. Madison Humphry will be our seasonal night inspector for the rest of the season.
3. Murphy – Asked if Mr. Santamaria has heard any feedback regarding earlier restaurant closings from the community or businesses.
   Santamaria - We have heard good things as well as some backlash. On NPR today, they talked about how bars in other states are starting to deal with COVID. We are just ahead of the curve.

IV. APPROVAL OF MINUTES

1. July 16, 2020
2. July 30, 2020
3. August 7, 2020

Action **Motion to Approve.** (made by: Cooper) (seconded)
Roll-call vote Carried unanimously//Murphy, MacNab, Cooper, Lepore, and Visco-aye

V. BOH APPLICATIONS REVIEW

1. Increase loan: Brannigan, 5 Fishers Landing, (38-151) increase by $7,000 for replacement of tank

Sitting Visco, MacNab, Cooper, Lepore, Murphy
Documentation Supporting documents and plans, staff recommendations.
Discussion **Santamaria** – The original estimate omitted the replacement tank.
Action **Motion to Approve the extra funding.** (made by: MacNab) (seconded)
Roll-call vote Carried unanimously//Murphy, Cooper, Lepore, MacNab, and Visco-aye

2. Variance: 3 Gladlands (80-234), local bylaw Section 62.03(C) well protection zone

Sitting Visco, MacNab, Cooper, Lepore, Murphy
Documentation Supporting documents and plans, staff recommendations.
Discussion **Marianne Hanley**, Gullicksen, Hanley, & Gifford LLP – To create a covenant lot, they need to install a separate septic and well.

PROPOSED

Crowley – Reviewed Local Regulation 62 regarding protection of wells. If a lot was created before 1995, it meets maximum feasible compliance; any lot created after must comply. 2017 BOH approved local Regulation 78 which mandates testing of drinking wells. In general, private wells are fairly shallow; our sandy soil conditions allow quick travel of contaminants. There should be a high standard to be granting this variance, i.e. the lot would be unusable. He sees no compelling reason to allow this. There are also a lot of concerns how this Board would deny variances in the future. This does not comply and should be denied.

Cooper – Asked if the lot could be reconfigured to make everything work.

Lepore – Confirmed they are planning to put in a second well for the new lot.

Santamaria – For the lot to be viable, it must have an independent water source.

Hanley – Because of the shape of the lot, this was the only way to fit in the required septic and well.

Visco – The only to get it to comply is to ask neighbors to move their septics; they have the room. Right now, this doesn't comply; it creates a lot detrimental to the environment.

Murphy – It's hard to understand how 3 feet is that critically important; 3 feet seems negligible.

Crowley – The regulations set a standard; once you waive out, the requests start to increase.

MacNab – We've had similar requests before, sometimes only inches; it starts getting slippery. This board has been strict about the regulations.

Cooper – He doesn't support this request.

Hanley – Asked for a continuance to the next meeting for the applicant to do further research.

Action **Motion to Continue to the next regularly scheduled meeting, September 17th.** (made by: MacNab) (seconded)

Roll-call vote Carried unanimously//Lepore, Murphy, Cooper, MacNab, and Visco-aye

3. Variance: 14 North Cambridge Street (59.4-101) Local regulation, 52.02(A) and 51.00 setbacks

Sitting Visco, MacNab, Cooper, Lepore, Murphy

Documentation Supporting documents and plans, staff recommendations.

Discussion **Crowley** – This is a failed septic; the only issue is the wetlands coastal dunes and salt marsh. This would meet maximum feasible compliance. It is an I/A system. Recommend approval.

Action **Motion to Grant the variance as requested.** (made by: Cooper) (seconded)

Roll-call vote Carried //Cooper, Murphy, MacNab, Lepore, and Visco-aye

4. Variance: 9 Beach Street (73.1.3-24), local regulation 52.02(A) setbacks

Sitting Visco, MacNab, Cooper, Lepore, Murphy

Documentation Supporting documents and plans, staff recommendations.

Discussion **Paul Santos**, Nantucket Surveyors – This is to relocate the septic on the lot. We're still within 100 feet of the coastal resource and need relief for that. This has been submitted to the ConCom for similar relief.

Action **Motion to Grant the variance as requested.** (made by: Cooper) (seconded)

Roll-call vote Carried unanimously//MacNab, Cooper, Murphy, Lepore, and Visco-aye

5. Variance: 4 Seven Mile Lane (72-33), local regulation 64.04.B.1 wellhead and nitrogen loading

Sitting Visco, MacNab, Cooper, Lepore, Murphy

Documentation Supporting documents and plans, staff recommendations.

Discussion **Steven Cohen**, Cohen & Cohen Law P.C. – Within a recharge zone for an I/A system for a bedroom credit.

Crowley – The credit would be against Town property. This is a net benefit to the environment. We are in favor of this.

Action **Motion to Grant the variance as requested.** (made by: Lepore) (seconded)

Roll-call vote Carried unanimously//Cooper, MacNab, Murphy, Lepore, and Visco-aye

PROPOSED

VI. BOH QUESTIONS AND CONCERNS

1. **Cooper** – We said we were having wells checked every two years; asked if we are on board to do that.
   Santamaria – COVID kind of messed that up causing us to fall behind. We will reach out to all property owners and caretaker groups. The outreach plan got derailed, pushing it back to this fall and winter. We will miss one year of data.
   Cooper – Suggested having the wells checked with property transfers.
   Santamaria – A lot of property transfers already do that though we can alter the regulations to require it. He will contact Town Counsel about that.
   Visco – Asked if there has been an increase in testing.
   Santamaria – Yes. Barnstable County has been supplying us with water bottles and sample kits. This test is a simple drinking water test; PFAS tests are farmed out.
2. **MacNab** – Asked if we are going to discuss Regulation 51, forgiveness of 10 years or more. We owe it to Madaket Residents to address that.
   Bill Grieder, Madaket Conservation Association Chair – This dovetails with two policies on previous applications. Since BOH has improved and tightened regulations, we've pushed that out on our newsletter. One issue is updated information available to the public; currently the posted Regulations 51,52, & 62 don't have the latest BOH regulations updates. Asked if there is a way the BOH can request additional help or time to assist staff in getting these updated and out to the public.
   Visco – He hears Mr. Grieder's concerns. Asked about updating the website.
   Santamaria – He will make updating the website a priority.
   Visco – We need to put Regulation 51 on the agenda to increase the sewer-connection variance. Asked for it to be on the next agenda.
3. **Murphy** – Asked for an update on the COVID reopening plans and wonders if we need a meeting in 2 weeks to assess how we stand before schools open. It feels like there will be a lot of life before our next scheduled meeting.
   Santamaria – With the reopening plans, he's going back and forth with the Superintendent of Schools on a reopening protocol for the schools; he's been providing technical information for those protocols. The public need to understand no plan is going to meet everyone's needs; there will be compromises that might upset some people. COVID is so new and so destructive, and so disruptive that if it feels like we are making up as we go, that's because we are.
   Murphy – She'd rather have a meeting on the schedule and cancel it than try to do it the other way around. We also need to be aware of how to handle the situation if one child shows up at school with COVID.
   Lepore – If there is an outbreak in the community, she saw something about the State making mobile units available. Also, all school children are now required to be vaccinated; asked how the Health Department might ensure that happens.
   Santamaria – We don't have a Public Health nurse on staff; if we did, the Health Department have its own vaccine supplies. He's working with Gary Shaw to get as much vaccine to the Island as possible.
   Lepore – Perhaps the Town needs to think about getting a Public Health nurse; our population is at the point to support that.
   MacNab – He supports scheduling another meeting.
   Asked if there is a way to hire a part-time nurse or borrow one until a Public Health nurse is hired.
   Santamaria – He will talk to Director of Finance Brian Turbitt to see if there is money available. He works closely with Elizabeth Harris at the hospital; she handles a lot of that for us and the Town pays a significant portion of her salary.
   Murphy – Suggested September 3rd at 3 p.m. for a placeholder meeting.
4. **Cooper** – Asked for an update on the PFAS testing of wells on the other side of the runway.
   Santamaria – As far as he knows, houses were tested; some houses on the east side came back above threshold and some below the threshold.
   Lepore – One house on the west side tested positive.

PROPOSED

VII. ADDITIONAL DOCUMENTS USED

1. Draft BOH Minutes as listed
2. Local Regulations 51, 52, & 62

VIII. ADJOURN

Action	**Motion to Adjourn at 3:59 p.m.** (made by: Lepore) (seconded)
Roll-call vote	Carried unanimously//Murphy, Lepore, Cooper, MacNab, Visco-aye

Submitted by:
Terry L. Norton

PROPOSED

COVID-19 Report to Board of Health & Selectboard

9/14/2020

Testing

of Total PCR tests to date (9/13 AM) = 7,829 (including OIH & Sherburne)

PCR tests using Self-pay/Work-pay option (CastNet) = 2,793

Regularly testing 50-100 per day (on average)

Recent surge has increased that number temporarily

Overview

- We know now that large crowds over Labor Day weekend were spreader events
- We had 26 cases in 5 days
- Contact tracing is in progress

Metrics

Indicator	Measure	Status
1	COVID-19 positive test rate	🟡
2	Number of individuals who died from COVID-19	🟢
3	Number of patients with COVID-19 in hospitals	🟢
4	Healthcare system readiness	🟢
5	Testing capacity	🟢
6	Contact tracing capabilities	🟡

Legend

🟢 Positive trend

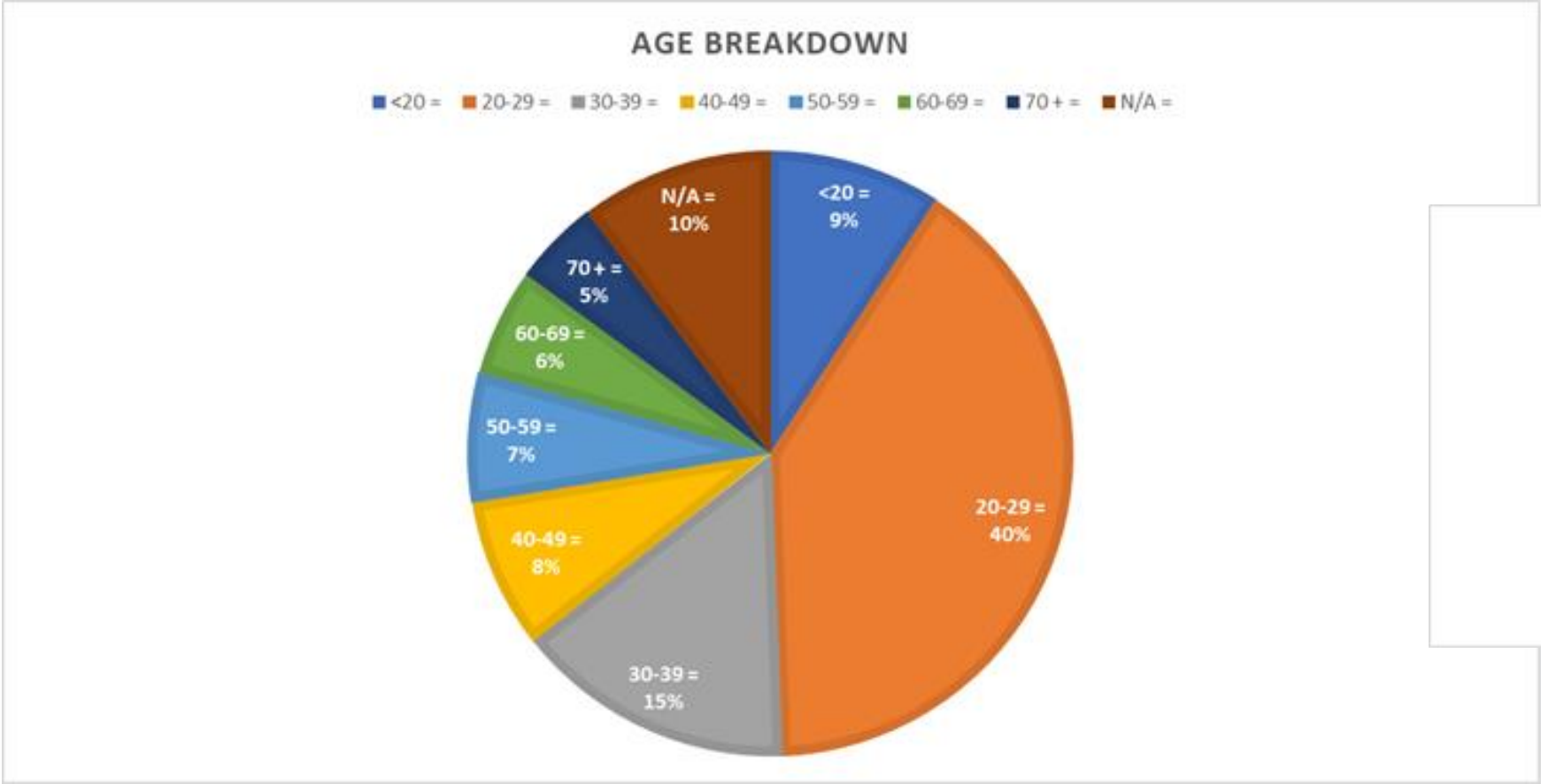
🟡 In progress

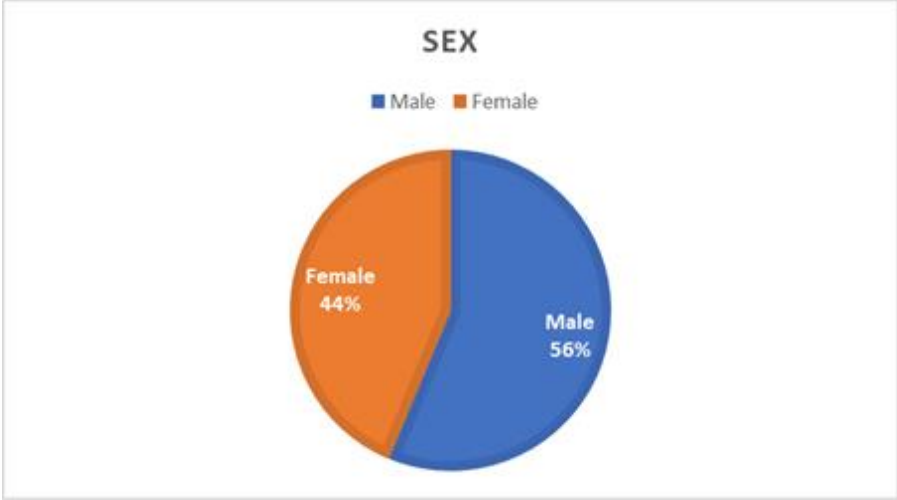
🔴 Negative trend

Metrics (continued)

- **COVID-19 positive test rate** – Want to keep this number below 10%. Currently at 1.14% of total (89 out of 7,829). And 1.85% of 9/12 testing (1/54). 4.22% of 7 day average (29 out of 687 tests)
- **Number of individuals who died from COVID-19** – Keep below 5% of cases. Currently 1.12% (1 out of 89) of cases but 0.013% of those tested
- **Number of patients with COVID-19 in hospitals** – Keep below 10. Currently 0
- **Healthcare system readiness** – Qualitative response. Currently "Yes"
- **Testing capacity** – Qualitative. Ability to keep up with demand. Currently, "yes"
- **Contact tracing capabilities** – Qualitative. Ability to keep up with demand. Currently "Yes" but there is difficulty
- **Sewer Predictive Incidence** – Keep below 5%. Monitor for spikes. Currently 0% in Sconset & 2% in Surfside (9/8 sample)

Metrics (continued)





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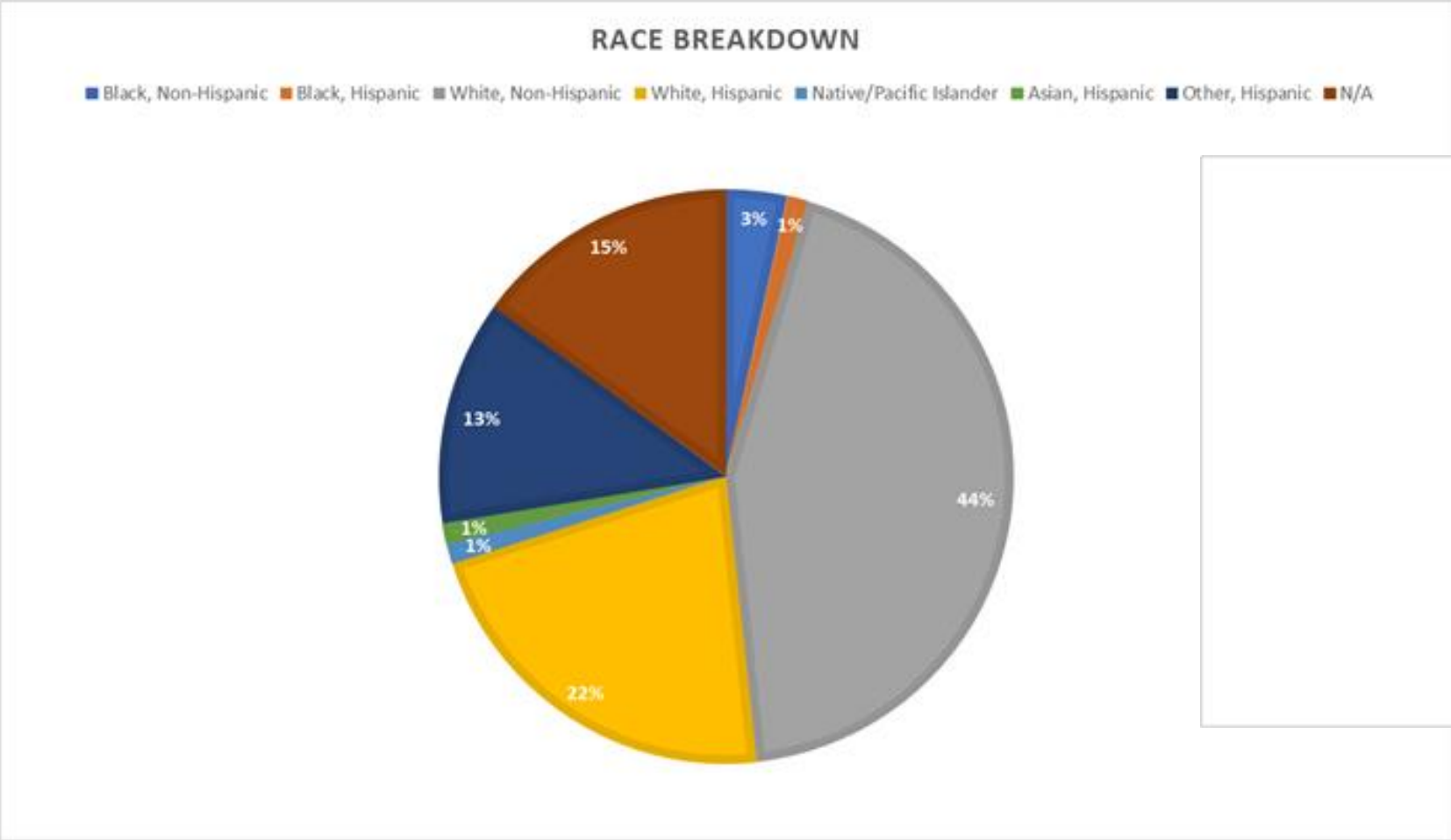

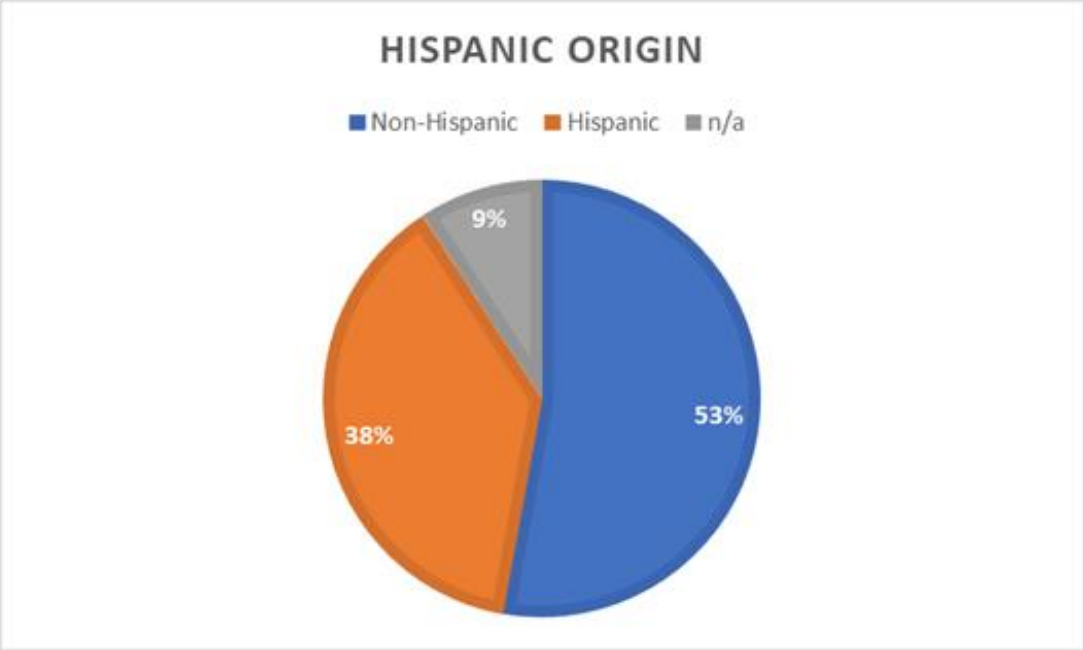

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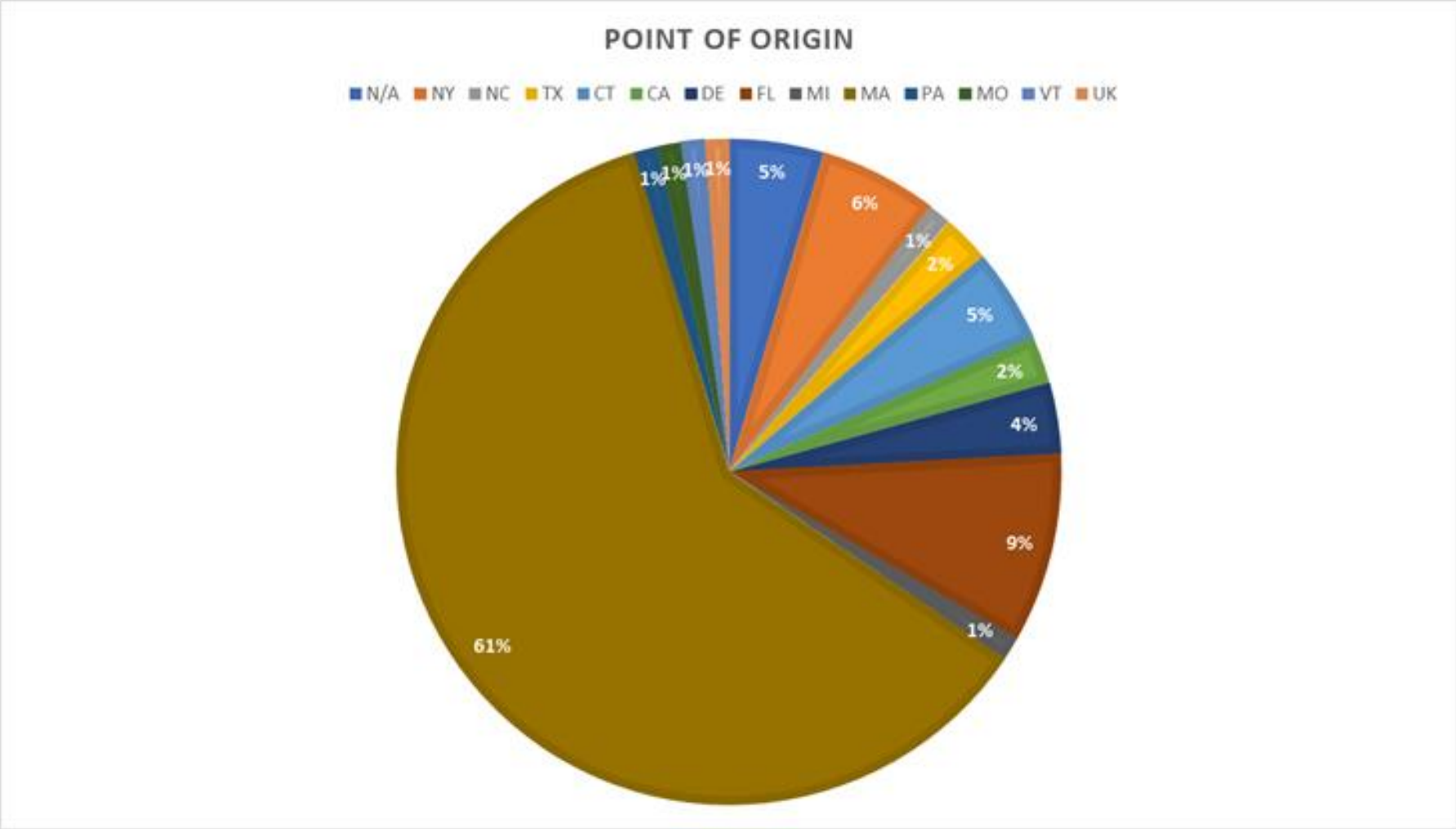

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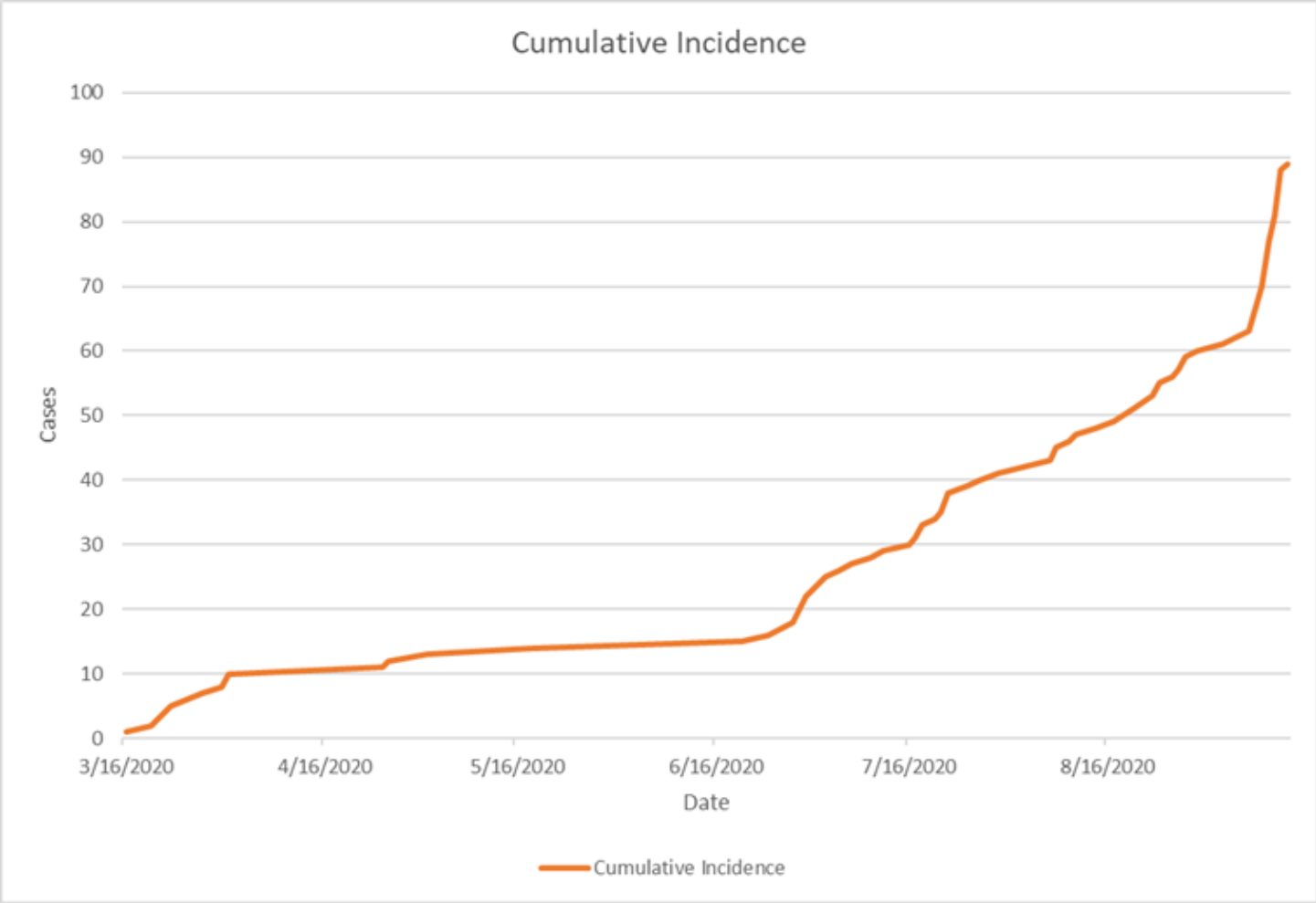

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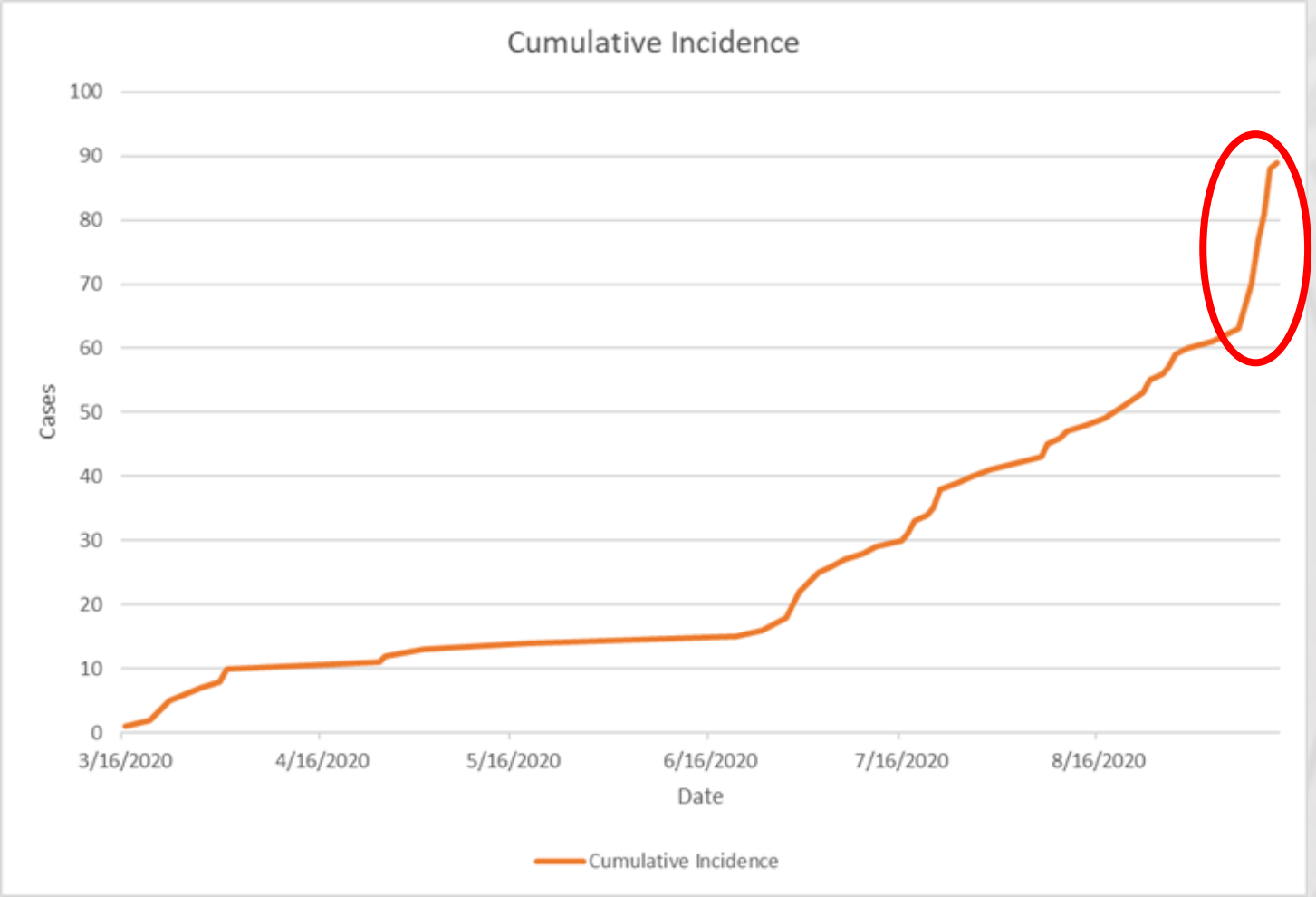
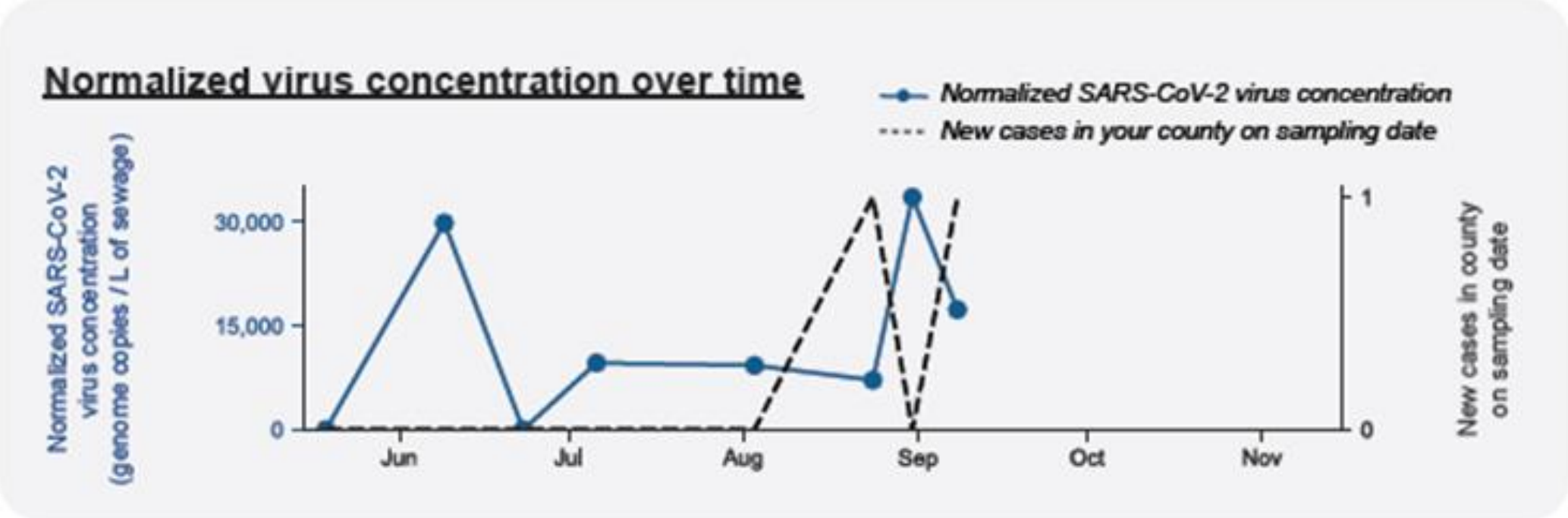
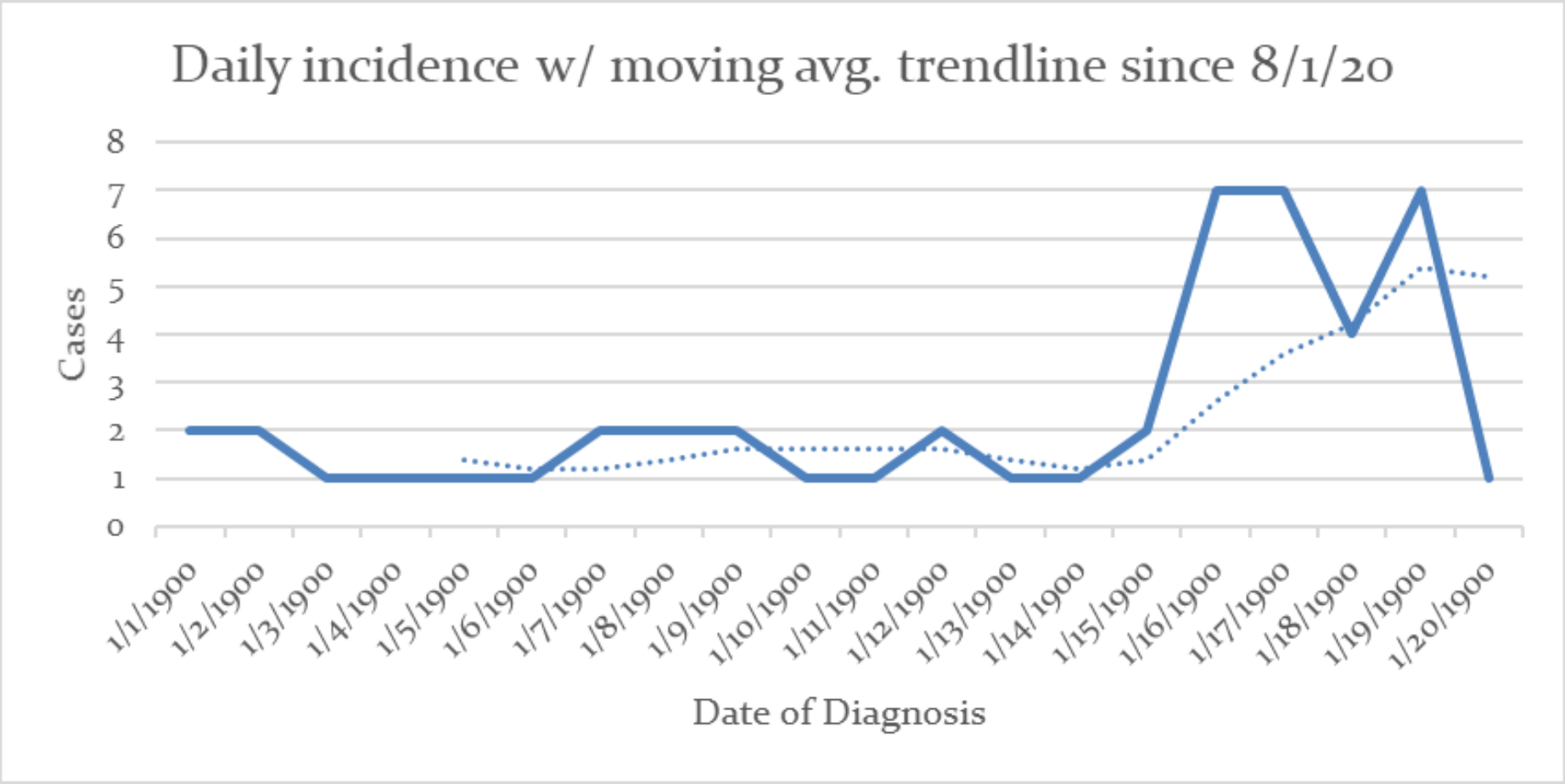


Metrics (Sewage)



Flatten The Curve



Next Steps: "Trades" enforcement and outreach campaign

- Step 1: Outreach & Education (1-2 weeks)
- Step 2: Enforcement (1-2 weeks, if daily incidence continues to increase)
- Step 3: Moratorium (indefinitely, until incidence decreases)

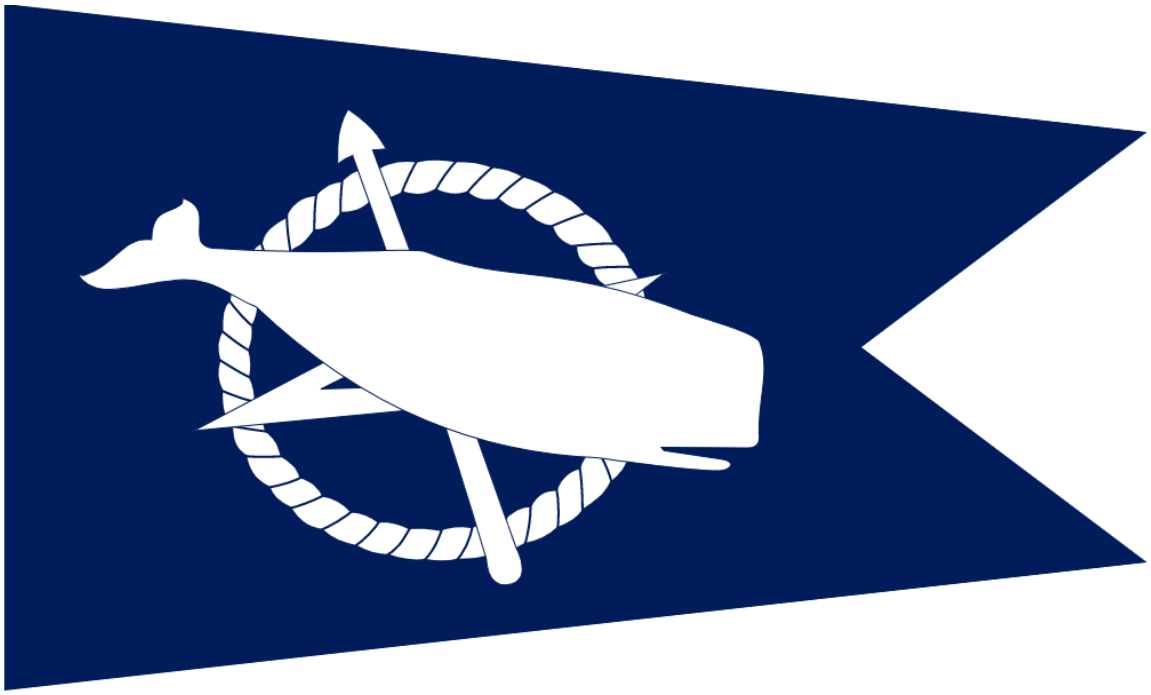
TOWN OF NANTUCKET, MASS

INCORPORATED 1671

Nantucket

COVID-19 Response

May 20, 2020 | Version 1.0



Acknowledgments

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Public Health
Prevent. Promote. Protect.

Introduction

Coronavirus Disease 2019 (COVID-19) is a respiratory infectious disease that is caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). First identified in Wuhan, China in 2019, this illness has wreaked havoc on the population and the economy of the world. As of May 16, 2020, there have been more than 4.6 million cases worldwide and more than 310,000 deaths globally. Furthermore, there is no evidence of long-term immunity to the virus without a vaccine, and herd immunity will not be reached in the immediate future.

This report is intended to inform the decisions of the Board of Health and the Select Board as they navigate the intricacies of the COVID-19 (SARS CoV2) outbreak in the USA & Massachusetts. Nantucket is in a unique position in that it is an island separate from the mainland of Massachusetts and has successfully prevented any significant spread of COVID-19 on the island. However, due to the island's seasonal nature as a summer colony, Nantucket faces a series of decisions that will affect the health of the population and the economic future.

What is Epidemiology?

Six months ago, not many people knew how to spell epidemiology, let alone what it meant. The fourth edition of "A Dictionary of Epidemiology" defines epidemiology as:

"The study of the distribution and determinants of health-related states or events in specified populations, and the application of this study to the control of health problems."

In lay terms, epidemiology is the study of illnesses and how they spread in populations. On Nantucket, this specifically addresses the year-round residential population and includes the seasonal population. Epidemiology is used to guide decision making in medicine, pharmaceuticals, and government policy.

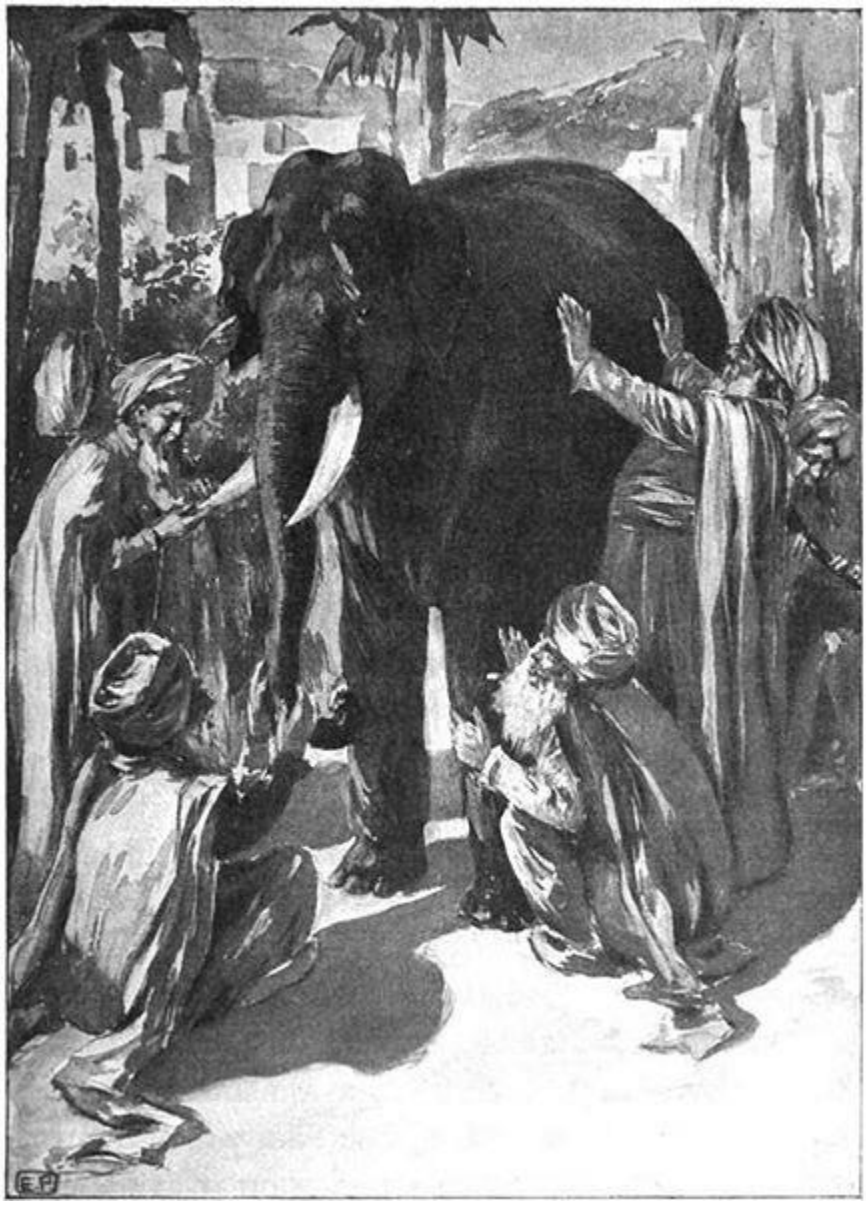
There is a common misconception that epidemiologic models forecast a decision to be made. With proper analysis and interpretation, epidemiology can be used as a tool by stakeholders to inform decisions within a broader scope. As to say, epidemiology is part of a much larger picture. It is important to note that epidemiology is not the application of statistics to introduce bias in decision making. An epidemiologic model is an interpretation of empirical evidence (data) to explain, define, or predict a disease's behavior within a given population.

What are Epidemiology Models?

An epidemic model is a mathematical model that seeks to visualize the relationship between all variables within a system and population of study. These models are often visualized as graphs or charts but can be shown in many different iterations. Models are tremendous in their ability to simplify the observations in the world to answer specific questions. However, models must properly integrate evidence and science to avoid misuse for nefarious or political purposes. It is imperative that the model fits the question being asked. Models are custom made to answer specific questions, and to apply a generic model to answer a specific question is erroneous and can lead to disastrous decisions.

Types of Models

There are many different types of models that can be used for various reasons. For example, a researcher may use Survival Analysis to follow and measure patient lifespan from the date they were placed on a ventilator (intervention) to recovery, death, or loss to follow-up (censored). Different models display separate facets of the same, yet much bigger, picture. The aforementioned example, when studied in specific settings, will only answer questions regarding the risk of death relative to time once a person is put on a ventilator after hospitalization. Such a model cannot be extrapolated to all risks of death for all COVID patients in any hospital across the world.



Not much different than the blind men and the elephant.

Image Source: "The Heath readers by grades", D.C. Heath and Company (Boston), 1907, US public domain

When modeling infectious diseases, like COVID-19, one must ponder the question carefully (*What exactly am I trying to learn?*) Furthermore, one must also consider the audience, as the interpretation of epidemic models is complex and may lead to confusion, distrust, or misinterpretation. All models have limitations, the main point is to choose a model that best fits the needs of the hypothesis. In an overall population, infectious disease models typically fall under the following three categories:

1. **Models that attempt to simplify interrelated or complex systems, such as disease transmission**. Often, these models use categories or "compartments" that relate to how a disease spreads in a population. The challenge with these models is they often oversimplify disease transmission due to few data inputs. Thus, these models do not account for dynamic populations (such as on Nantucket), or ongoing system and behavior changes. One such model is the S.E.I.R. (Susceptible, Exposed, Infected and Resistant) model developed by Kermack & McKendrick in 1927. This model puts a population in one of four categories and models an epidemic through a static population.

   Recently, the Nantucket Board of Health and Select Board was offered an analysis based on this model using the "epidemic calculator" developed by Gabriel Goh. A screenshot (Figure 1) of this calculator can be seen below, modeling an outbreak of SARS-CoV2 in a static population of 28,854 (approximate summer Nantucket population). The primary issue with this calculator is that it does not take into consideration competing risks such as, age, comorbidities, and changes in the population.

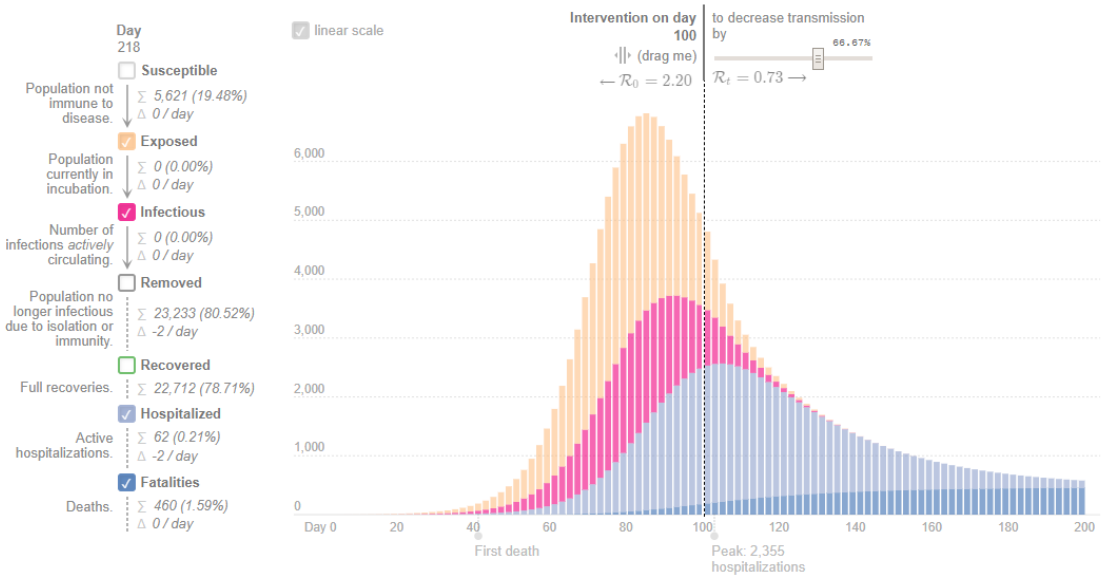


Figure 1. Screenshot of S.E.I.R. visualization in a population of ~29,000 with no dynamic changes, and no behavioral interventions until day 100 (marked by dotted black line).

2. **Models that try to forecast the future**. These models use existing data to project the illness in a short timeframe. Data such as mobility, healthcare capacity, and susceptibility can all be used to predict the movement of the disease. However, due to the dynamic nature of behavior and population, forecasts are only good for a short period of time as data fluctuations occur. An example of data forecasting is the set of hurricane spaghetti models seen to predict the path of a hurricane. As the data changes, the predicted path changes. There are more than 14 predictive models that the Centers for Disease Control and Prevention (CDC) is using to predict the spread of COVID-19 in the United States. The CDC predictive model for the Commonwealth of Massachusetts' cumulative reported deaths is below (Figure 2).

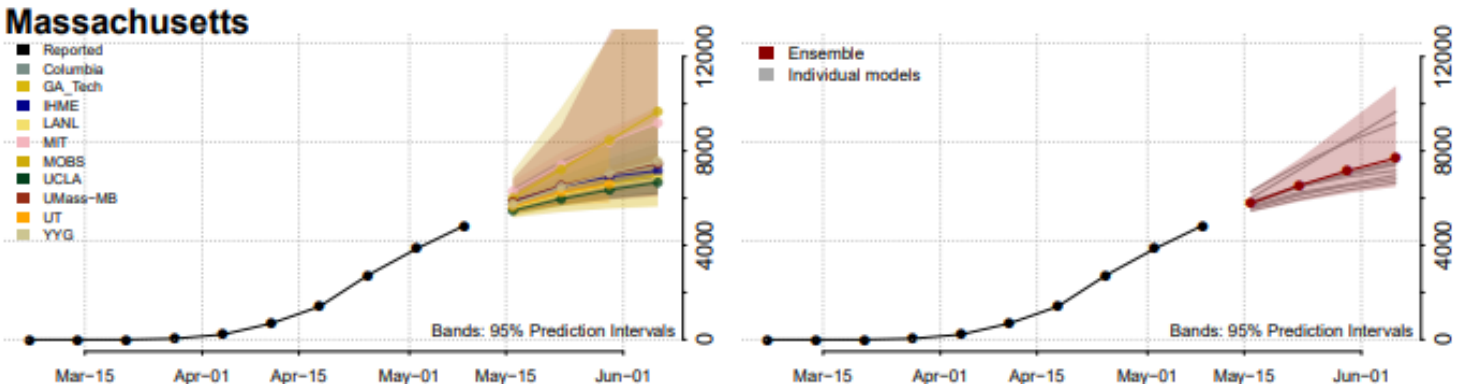


Figure 2: CDC predictive model for Cumulative deaths in Massachusetts. These predictive models forecast two weeks into the future.

3. **Models that strategically show multiple outcomes and scenarios**. These strategic models attempt to visualize potential implications of different interventions in different contexts. These models are perhaps the most useful to decision-makers and stakeholders when considering intervention strategies. With multiple predictions and models at hand, a decision-maker can pick the best course of action that meshes with all other variables that affect the population they are responsible for. Figure 3 (below) shows two different scenarios in Italy for the COVID-19 epidemic. The top two graphs show what the epidemic curves would be if mitigation measures were relaxed, and the bottom two show what the epidemic curves would be with strict mitigation in place.

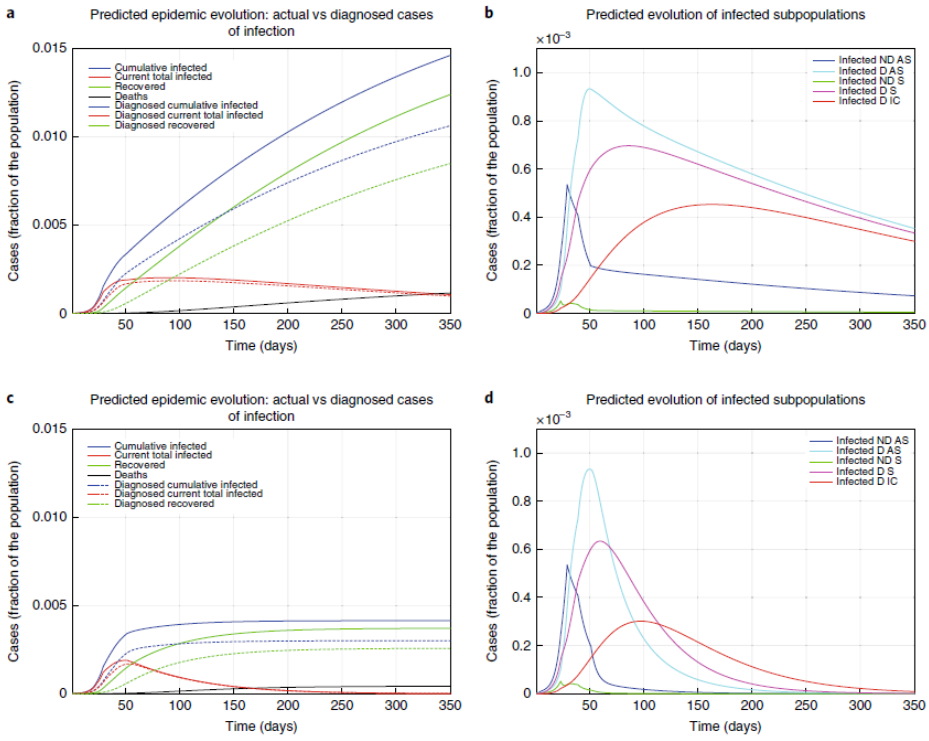


Fig. 3 | The effect of lockdown. a–d, Epidemic evolution predicted by the model for the COVID-19 outbreak in Italy when, after day 50, the social distancing countermeasures are weakened, leading to a larger $R_0 = 0.98$ (**a**,**b**), or strengthened, leading to a smaller $R_0 = 0.50$ (**c**,**d**). **a**,**c**, The difference between the actual (real cases) and perceived (diagnosed cases) evolution of the epidemics. The plots in **b** and **d** distinguish between the different categories of infected patients: non-diagnosed asymptomatic (ND AS), diagnosed asymptomatic (D AS), non-diagnosed symptomatic (ND S), diagnosed symptomatic (D S) and diagnosed with life-threatening symptoms (D IC). Note that **a**,**c** and **b**,**d** have different scales.

Figure 3 Source: Giordano, G., Blanchini, F., Bruno, R. et al. Modelling the COVID-19 epidemic and implementation of population-wide interventions in Italy. Nat Med (2020).

What does this mean to me?

By using good data and information, the Select Board and the Board of Health can choose the most appropriate course of action for the island. The models and information contained herein should be used to make the best decisions possible for the island but cannot be the sole reasoning for decision-making. Use this information in conjunction with the reports given from the commonwealth, the information from the Nantucket Economic Impact Workgroup, and from the EBP report issued the week of May 15.

COVID-19 Background

China/Worldwide (Source: WHO COVID-19 Situation Reports)

On December 31, 2019, the World Health Organization (WHO) was informed of cases of pneumonia caused by an unknown factor (unknown etiology) in Wuhan City, Hubei province of China. By January 4, 2020, 44 cases of the same pneumonia were reported to WHO. These cases were associated with a single seafood market in Wuhan City. On January 7, 2020, the Chinese authorities isolated and identified a new type of coronavirus, and its genetic code was sequenced by January 12, 2020. By January 20, 2020, imported cases were reported in Japan, Thailand, and the Republic of Korea, with China reporting 278 cases.

By February 1, 2020, nearly 12,000 cases were confirmed worldwide, spread across 23 different countries (including USA). Person-to-person transmission of the virus was confirmed on or around January 22, and by February 1, asymptomatic spread was confirmed and 98.9%. Of all cases, were localized in China (11,953 globally). On March 1, China accounted for 91.8% of cases globally (87,137).

On April 1, China accounted for only 10% of global cases. Italy accounted for 12.8% and USA accounted for 19.8%. Total global cases on April 1 were 823,626.

By May 1, there were 3,175,207 cases worldwide, spread over 188 countries and territories. The United States had 1,035,353 confirmed cases on May 1 (32.6% globally) as opposed to China, which only had 84,385 (2.7% globally). It is important to note that a significant portion of cases remain unreported due to lack of testing and reporting in many countries across the world, including within the USA.

USA (Source: CDC Coronavirus Disease 2019, Cases, Data, & Surveillance Dashboard)

The first case reported in the USA occurred January 24, 2020. Through approximately February 26, all cases were localized in individual pockets, usually located in nursing or long-term care facilities. By March 1st, the USA was seeing 6 new cases per day. That number jumped to over 200 per day by March 9. From March 1 through April 6, the USA was in an exponential growth phase of transmission/diagnosis. Since then, the USA has entered a "plateau" stage, consistently diagnosing approximately 23,000 cases per day. The following figure show the national breakdown as of May 14, 2020.

New Cases by Day

The following chart shows the number of new cases of COVID-19 reported by day in the U.S. since the beginning of the outbreak.

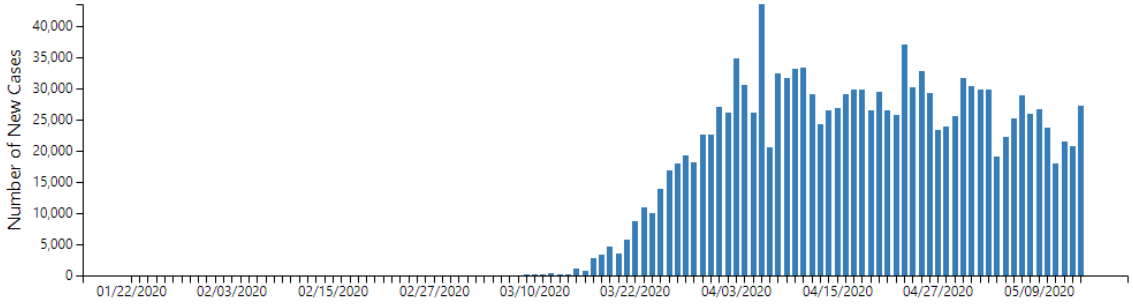


Figure 4: Source CDC COVID-19 Surveillance Dashboard

Cases by Age

The following chart shows the age of people with COVID-19. Data were collected from 1,112,531 people, and age was available for 1,109,884 (99.8 %) people.

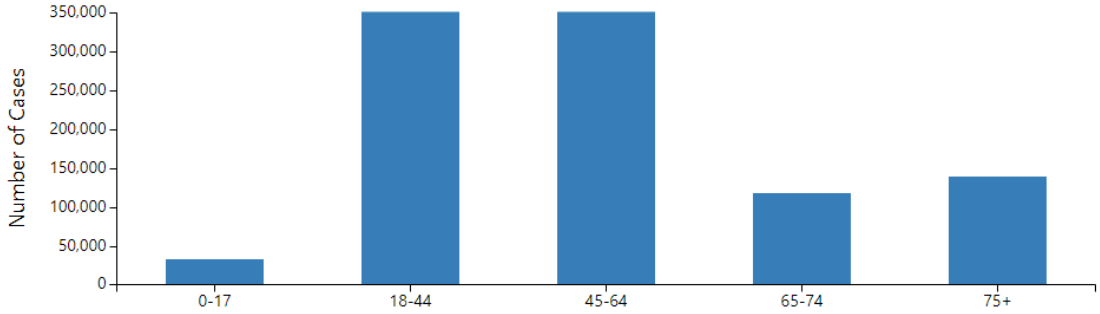
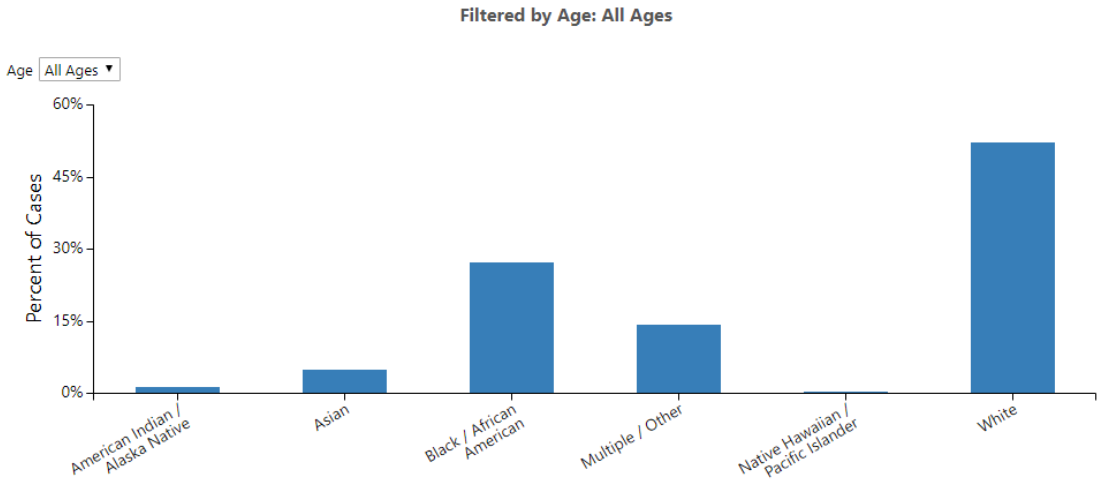


Figure 5: Source CDC COVID-19 Surveillance Dashboard

Cases by Race & Age

The following chart shows the race of people with COVID-19. Data were collected from 1,097,519 people, but race was only available for 520,745 (47.4%) people.



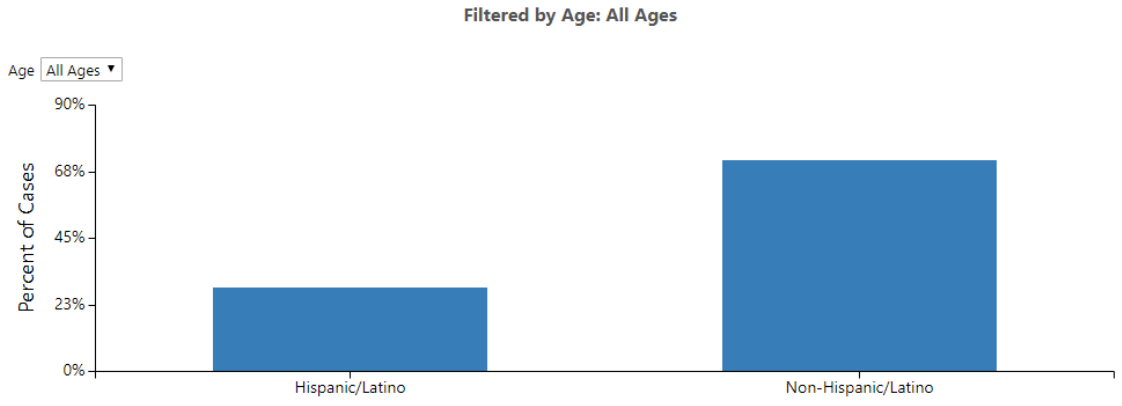
Percent of Cases

	American Indian / Alaska Native	Asian	Black / African American	Multiple / Other	Native Hawaiian / Pacific Islander	White
s	1.2%	4.8%	27.2%	14.2%	0.3%	52.3%

Figure 6: Source CDC COVID-19 Surveillance Dashboard

Cases by Ethnicity & Age

The following chart shows the ethnicity of people with COVID-19. Data were collected from 1,112,531 people, but ethnicity was only available for 490,649 (44.1%) people.



Percent of Cases

	Hispanic/Latino	Non-Hispanic/Latino
Percent of Cases	28.4%	71.6%

Figure 7: Source CDC COVID-19 Surveillance Dashboard

As of late April, pneumonia is now the leading cause of death in the USA.

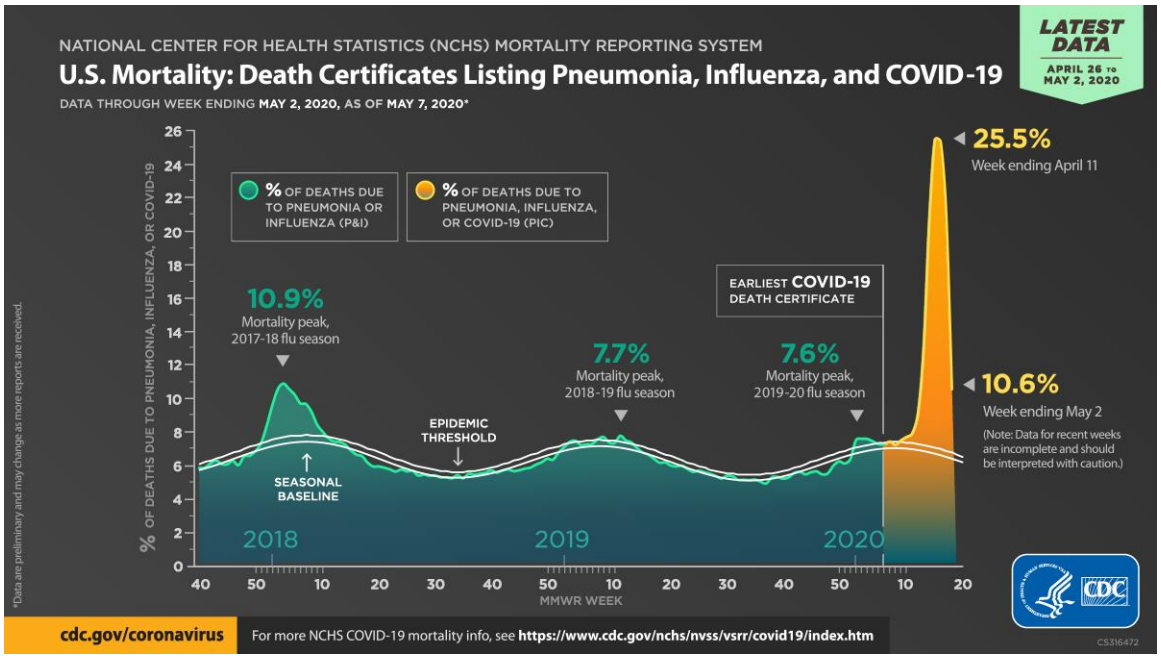


Figure 8: Source CDC COVID-19 Surveillance Dashboard

Massachusetts (Source: MA COVID-19 Dashboard)

Following the initial cases in the USA, Massachusetts started tracking COVID-19 data on March 9. At that point, MA had 41 confirmed cases. By March 31 Massachusetts had 6,620 cases throughout all its counties, and 89 deaths (1.34%) were attributed to COVID-19. By April 30, Massachusetts reported 62,205 cases and 3,562 (5.7%) deaths. On May 16th, Massachusetts reported 84,933 cases and 5,705 (6.7%) deaths. The mortality of 6.7% is alarming, but when stratified into age groups, the rate changes significantly (Figure 11).

Due to alarming COVID-19 infection trends in the USA, Massachusetts Governor Charlie Baker declared a state of emergency on March 10. On March 23, Gov. Baker issued an emergency order to close all non-essential businesses. This order has since been extended through May 18, at which point an extended phased reopening plan was released.

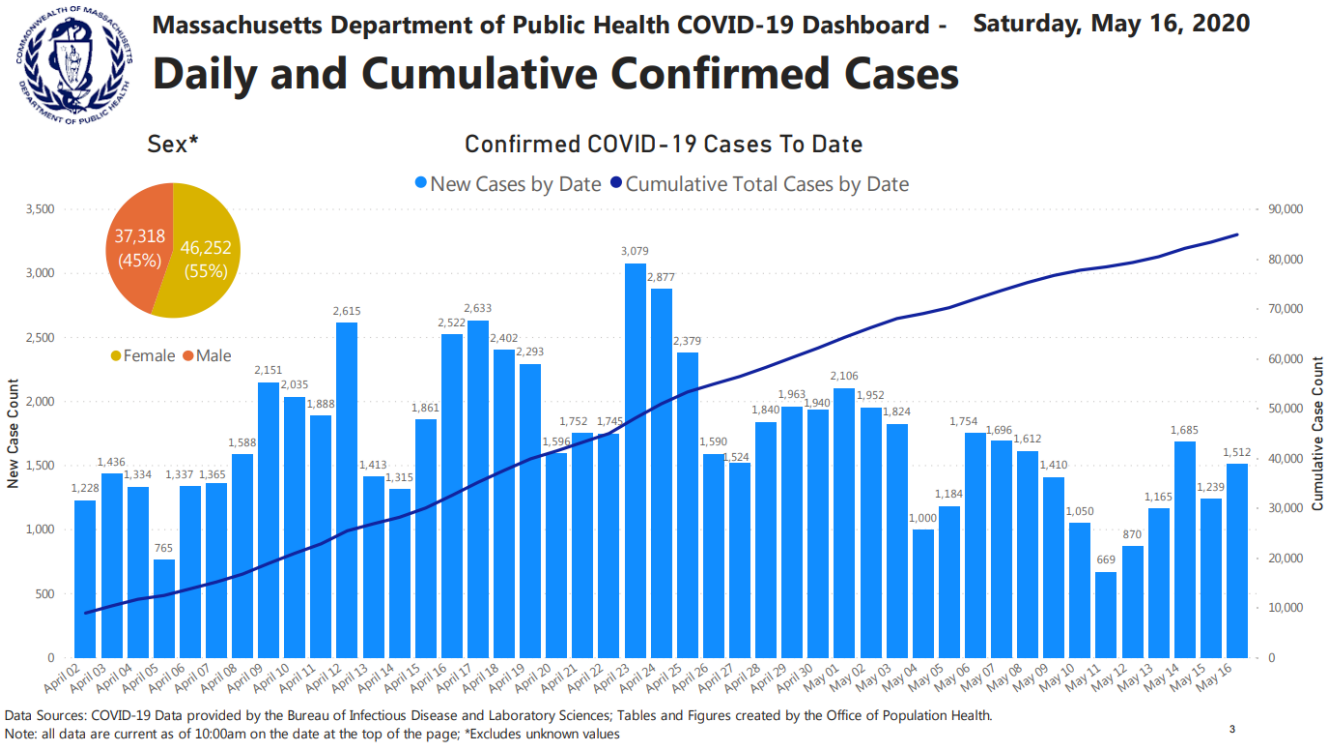


Figure 9: Source Massachusetts COVID-19 Surveillance Dashboard

It is important to note that though the cumulative cases within the Commonwealth continue to rise, the number of new cases per day has dropped significantly from 3,079 at its peak on April 23 to 1,512 as of March 16. This trend is positive for the Commonwealth and points toward safe opening of the state shelter in place orders.

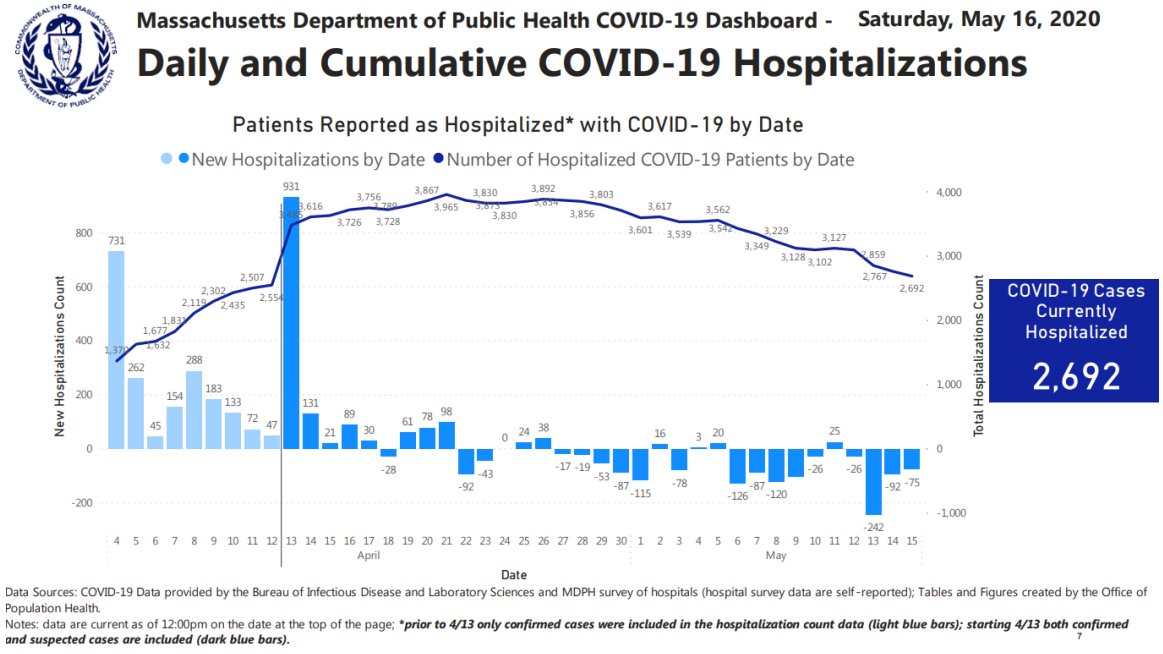


Figure 10: Source Massachusetts COVID-19 Surveillance Dashboard

Both the Commonwealth's and Nantucket's emergency orders were issued in the anticipation that a surge of cases, as seen in New York City, can quickly overwhelm the hospital system. Figure 10 shows that the hospitalization of COVID patients is trending downward.

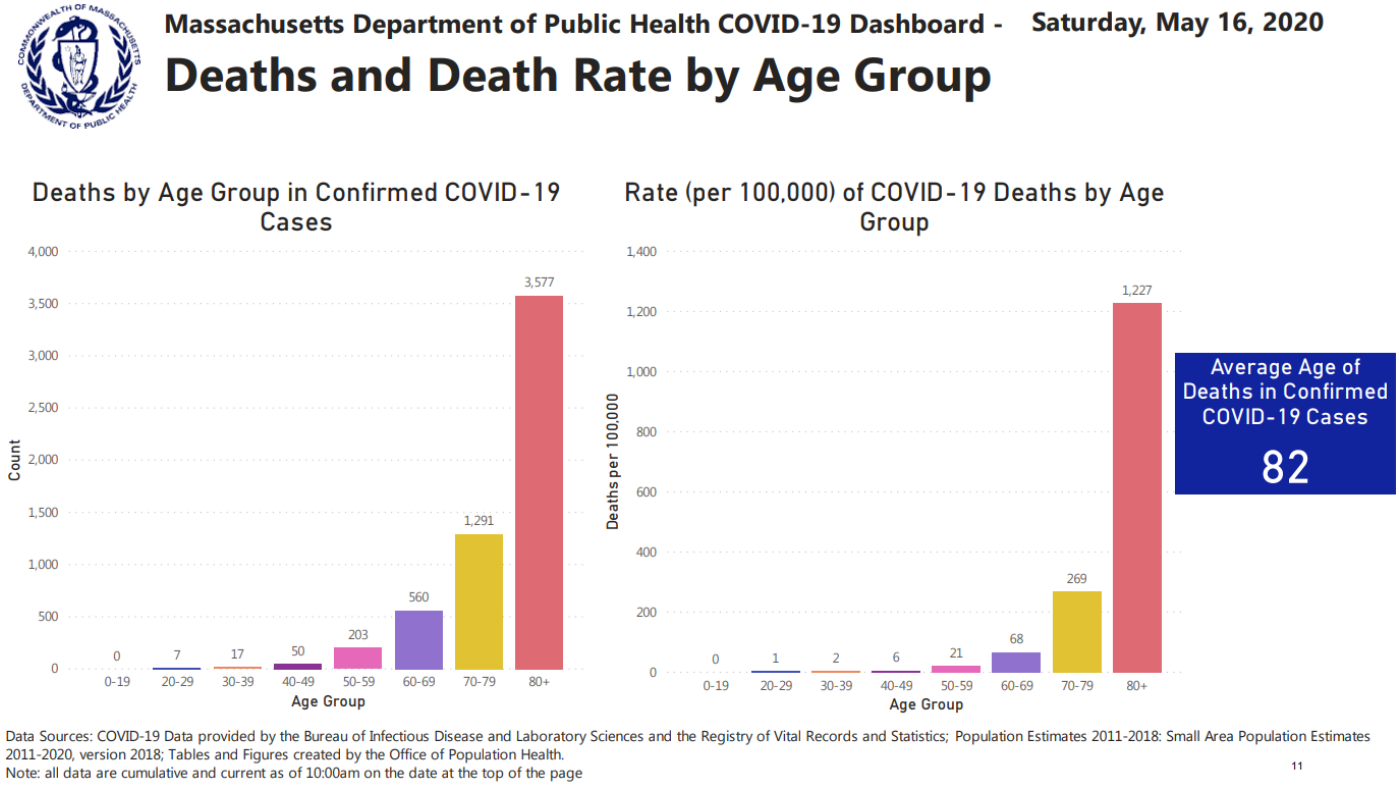


Figure 11: Source Massachusetts COVID-19 Surveillance Dashboard

Age stratification is important to understand the Case Fatality Rate (CFR) of 6.7%. Deaths from COVID-19 cluster among patients aged 80 and above. Of the 5,705 deaths, 3,577 (62.7%) are patients aged 80 and older, 1,291 (22.6%) are people aged 70-79, and 560 (9.8%) are people aged 60-69. This age group (60+) makes up 37.7% of all cases across the commonwealth, but accounts for more than 95% of all deaths in the Commonwealth.

By focusing interventions and outreach to this population, policymakers like the Board of Health and the Select Board can significantly reduce the burden of disease among this population.

Nantucket (Source: MA COVID-19 Dashboard & NCH Update Page)

On March 22, Nantucket had its first case of COVID-19. This case was imported by an off-island resident that was diagnosed at Nantucket Cottage Hospital (NCH). Subsequently, NCH set up a drive through testing area for Nantucket residents and visitors experiencing symptoms. The hospital and clinics were closed to visitors, and only patients needing essential care are allowed. Since then, there has been only a total of 14 cases. The hospital has tested a total of 453 residents and visitors, as of May 19. When removing the 13 pending tests (May 18), the island's total positive test rate is 3.09%, which is much lower than the Commonwealth's (8%). Unfortunately, Nantucket has already experienced one death from local COVID patients, though various seasonal residents who live off-island have also perished of COVID related complications.

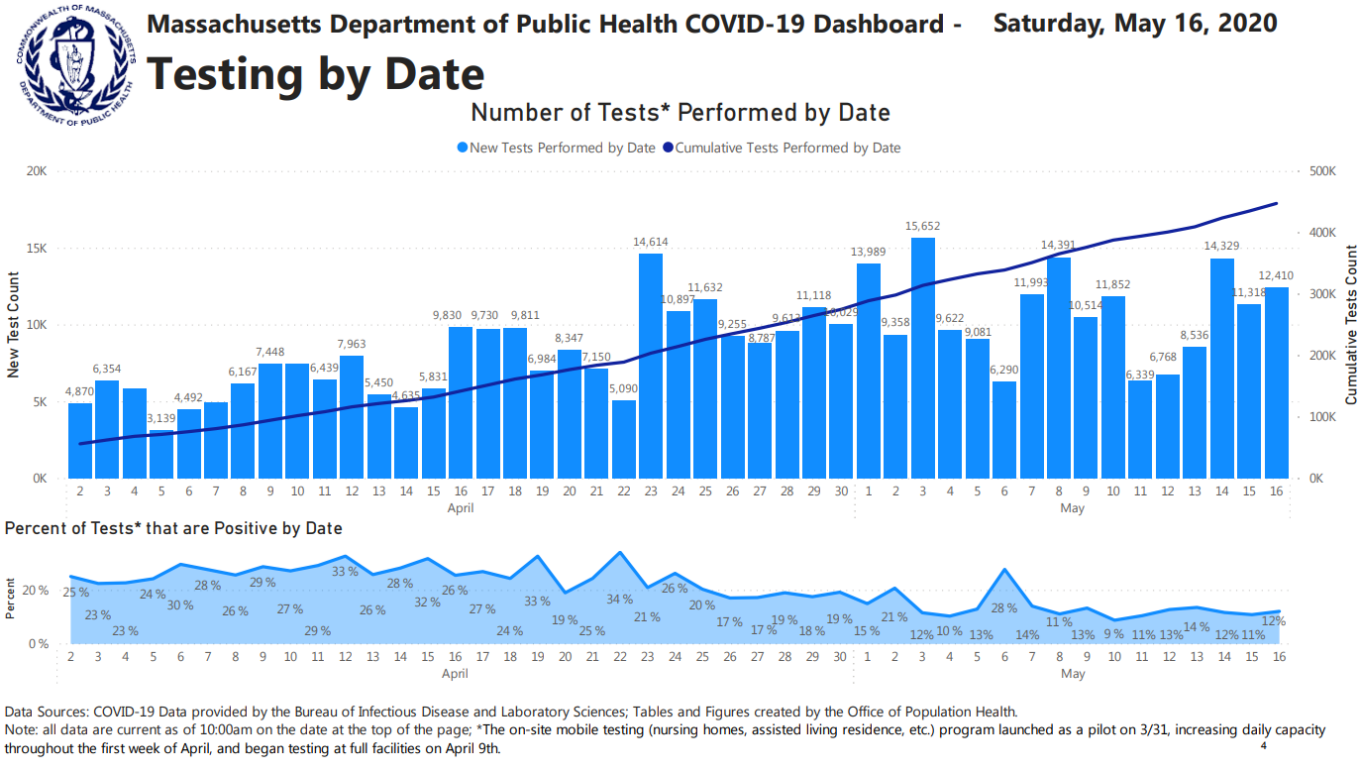


Figure 12: Commonwealth testing data by date with cumulative trend line

Next Steps/Analysis

Governor's Phased Orders

On May 18, Governor Baker released the Commonwealth's plan to slowly reopen the economic via a four-phase reopening plan. The administration is using a data-based approach to reopen the economy while also considering the actions of neighboring states. In the plan, Baker spreads opening of individual industries weekly, within each phase. The basic overview of the phases can be seen below (Figure 13 & 14).

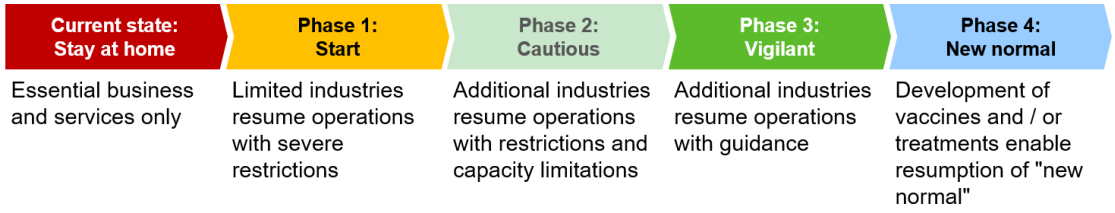


Figure 13: Basic review of each phase in reopening

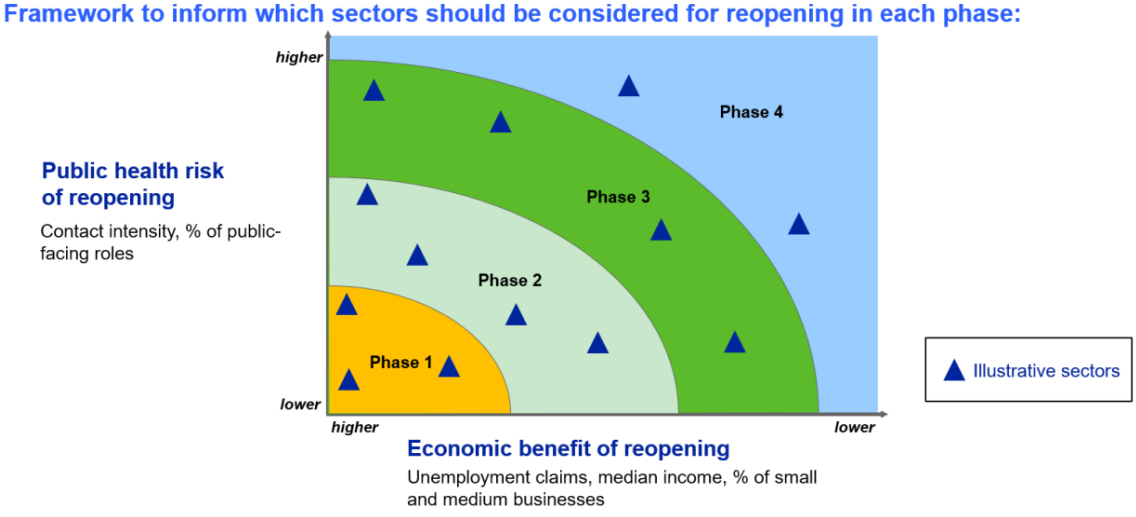
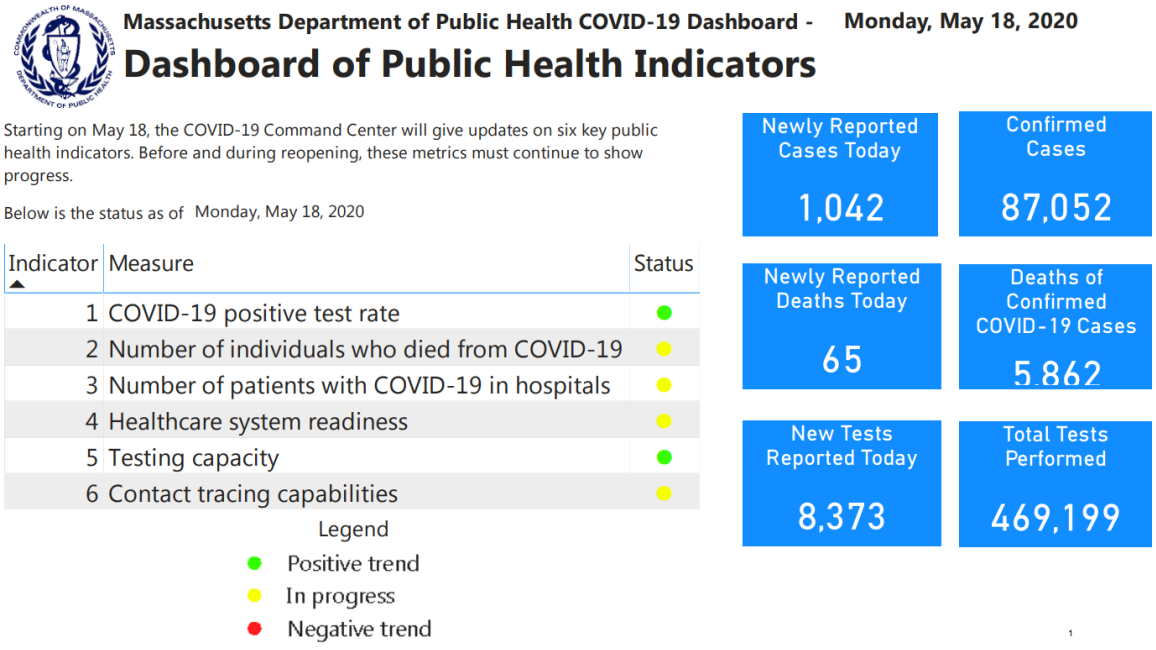


Figure 14: Economic reasoning behind each phase of reopening

Testing/Surveillance on Nantucket

On Nantucket island, it is imperative to implement a level of active surveillance. There have been various proposals for surveillance programs across many sectors of the island community. Currently, the Nantucket Cottage Hospital is working on a plan to assess seroprevalence of antibodies on the island to gauge baseline viral burden on the island. The BioBot study of the Nantucket Surfside Wastewater Treatment Facility (SWTF), found a prevalence of COVID on the island to be only 11 cases.

Nantucket must maintain green or yellow status on the six viral indicators to avoid a slide back into a stricter mitigation level. The indicators are detailed on the state COVID dashboard (Figure 15).



Massachusetts Department of Public Health COVID-19 Dashboard - Monday, May 18, 2020

Dashboard of Public Health Indicators

Starting on May 18, the COVID-19 Command Center will give updates on six key public health indicators. Before and during reopening, these metrics must continue to show progress.

Below is the status as of Monday, May 18, 2020

Indicator	Measure	Status
1	COVID-19 positive test rate	●
2	Number of individuals who died from COVID-19	●
3	Number of patients with COVID-19 in hospitals	●
4	Healthcare system readiness	●
5	Testing capacity	●
6	Contact tracing capabilities	●

Legend
- Positive trend
- In progress
- Negative trend

Newly Reported Cases Today: 1,042	Confirmed Cases: 87,052
Newly Reported Deaths Today: 65	Deaths of Confirmed COVID-19 Cases: 5,862
New Tests Reported Today: 8,373	Total Tests Performed: 469,199

Figure 15: Community Health Status Indicators

“Join in our success” outreach campaign

An outreach campaign to inform the public regarding the governor’s orders must be rolled out as soon as possible to maintain a low incidence and prevalence rate on the island. It is imperative that the public maintain strict adherence to social distancing rules and other viral spread mitigation standards. The “Join our Success” campaign invites visitors and seasonal residents to help maintain the low level of incidence by *joining in our success* of flattening the curve. Therefore, maintaining a flattened curve for the foreseeable future. This campaign should include but must not be limited to the following:

- Social media outreach by the town, local business and trade associations
- PSA’s and informative videos that can air on local television and radio
- Signs and advertisements at local ports of entry
- Advertising on Steamship Authority, Hyline, and airport websites and ticketing centers
- COVID educators and island ambassadors to help inform the public at the landfill and downtown areas
- Handouts, fliers, and other educational material that can be distributed in restaurants and retail centers
- And any other recommendations by Economic Recovery Taskforce

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Appendix A

Roberto J. Santamaría, MPH, MBA, REHS/RS Curriculum Vitae

EDUCATION

Johns Hopkins Bloomberg School of Public Health (Baltimore, Maryland) Expected May 2022
Doctor of Public Health (Dr.PH)
Concentration: Health Policy & Management Health Equity & Social Justice

Salve Regina University (Newport, Rhode Island) December 2013
Master of Business Administration (MBA)

Boston University School of Public Health (Boston, Massachusetts) May 2011
Master of Public Health (MPH)
Concentration: Epidemiology & Biostatistics

University of Central Florida (Orlando, Florida) May 2009
Bachelor of Science Degree (BS)
Major: Molecular Biology & Microbiology

RELEVANT EXPERIENCE

Town of Nantucket, Director of Health & Human Services	8/2015 - Present
Town of Framingham, Deputy Director of Public Health/Interim Director	11/2013 – 5/2015
City of Everett, Director of Public Health	5/2011 – 11/2013
City of Everett, Public Health Emergency Preparedness Coordinator	5/2010 – 5/2011
University of Central Florida Dept. of Chemistry	11/2005 – 5/2009

LANGUAGES

Native Proficiency in English & Spanish

AFFILIATIONS & CERTIFICATIONS

- Executive Board Member - Massachusetts Environmental Health Association
- Member - National Environmental Health Association
- Member – Housing Nantucket Board of Directors
- Registered Environmental Health Specialist / Registered Sanitarian
- Six Sigma Green Belt

Appendix B

Definitions

Case Fatality Rate: The proportion of cases of a specified condition which are fatal within a specified time.

$$\text{CFR (expressed as a percentage)} = \frac{\text{\# of Deaths from a disease}}{\text{\# of diagnosed cases of that disease}} \text{ X } 100$$

Censoring: Loss of subjects from a follow-up study; the occurrence of the event of interest among such subjects is uncertain after a specified time when it was known that the event of interest had not occurred; it is not known, however, if or when the event of interest occurred subsequently. Such subjects are described as censored.

Epidemiology: "The study of the distribution and determinants of health-related states or events in specified populations, and the application of this study to the control of health problems."

Incidence: The number of instances of illness commencing, or of persons falling ill, during a given period in a specified population. More generally, the number of new events, e.g., new cases of a disease in a defined population, within a specified period of time.

Mathematical Model: A representation of a system, process, or relationship in mathematical form in which equations are used to simulate the behavior of the system or process under study. A mathematical model is deterministic if the dependent variables involved take on values not allowing for any play of chance. A model is said to be stochastic, or random, if random variation is allowed to enter the picture

Prevalence: The number of events, e.g., instances of a given disease or other condition, in a given population at a designated time; sometimes used to mean Prevalence Rate. When used without qualification, the term usually refers to the situation at a specified point in time (point prevalence). Note that this is a number, not a rate.

Stratification: The process of or result of separating a sample into several subsamples according to specified criteria, such as age groups, socioeconomic status, etc. The effect of confounding variables may be controlled by stratifying the analysis of results.

Survival Analysis: A class of statistical procedures for estimating the Survival Function and for making inferences about the effects on it of treatments, prognostic factors, exposures, and other covariates.

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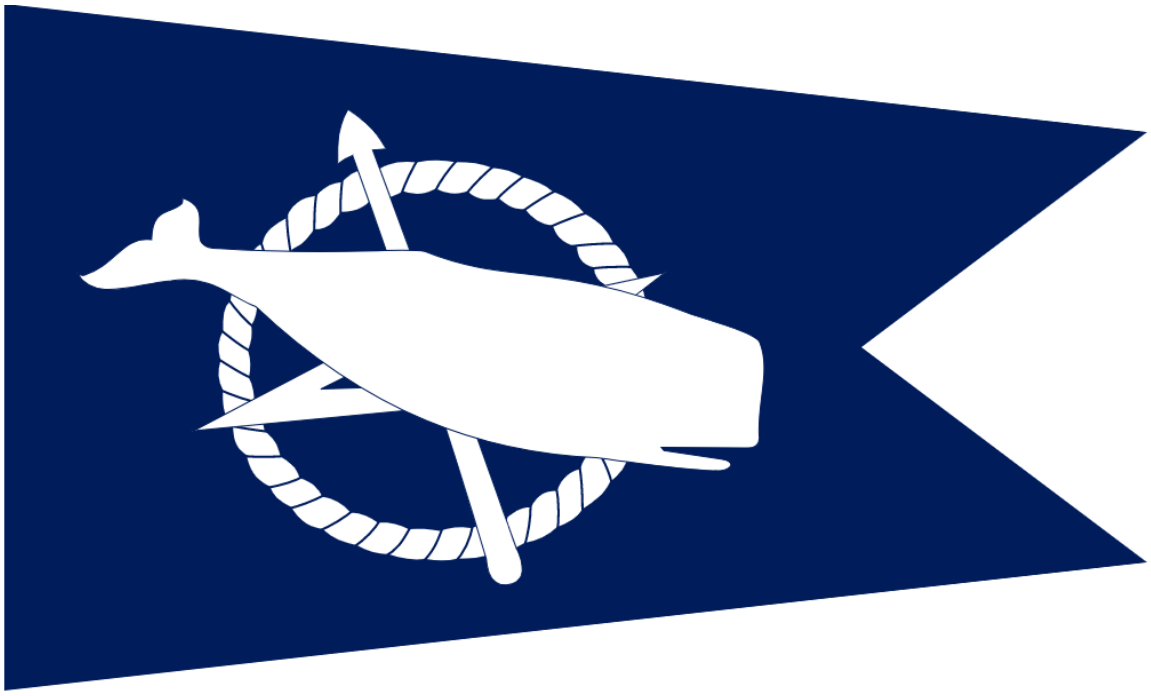
Nantucket COVID-19 Response

Version 2.0: "September Surge"

September 14, 2020



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Reviewer: Teresa E. Schrader, MPH, M.Div, R.N. BSN

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Public Health
Prevent. Promote. Protect.

Introduction

Coronavirus Disease 2019 (COVID-19) is a respiratory infectious disease that is caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). First identified in Wuhan, China in 2019, this illness has wreaked havoc on the population and the economy of the world. As of September 13, 2020, there have been more than 28.7 million cases worldwide and more than 920,000 deaths globally. In the USA, the cases count exceeds 6.4 million with a cumulative death count of over 193,000. Furthermore, there is no evidence of long-term immunity to the virus without a vaccine, and herd immunity will not be reached in the immediate future.

Recent research has shown that reinfection of a previously recovered patient is possible (Bentivegna, 2020). This has long-term implications on government response and treatment techniques. Quarantine and isolation measures will be in place for longer periods of time, along with enhanced mitigation measures in place for the foreseeable future. The progress on a possible vaccine is ongoing but slow. The USA will be enforcing enhanced mitigation efforts and dealing will seasonal resurgences of COVID-19 until at least the end of 2021, pending pharmaceutical intervention.

This report is intended to inform the decisions of the Board of Health and the Select Board as they navigate the intricacies of the COVID-19 (SARS CoV2) outbreak in the USA & Massachusetts. Nantucket is in a unique position in that it is an island separate from the mainland of Massachusetts and had successfully prevented any significant spread of COVID-19 on the island until the end of August 2020. However, in early September (9/1 – 9/13), a significant increase in cases presented in the working population of the island and resulted in a 41.9% (26) increase in cumulative incidence for the island since tracking began in March of 2020. The Nantucket Health & Human Services Department and the Nantucket Cottage Hospital report cases in an online portal at (NantucketHospital.org) and counts all positive RT-PCR reports regardless of the patients' address. Therefore, the local count (89 as of 9/13) is higher than the state reported data (62 as of 9/12).

What is Epidemiology?

The fourth edition of "A Dictionary of Epidemiology" defines epidemiology as:

"The study of the distribution and determinants of health-related states or events in specified populations, and the application of this study to the control of health problems."

In lay terms, epidemiology is the study of illnesses and how they spread in populations. On Nantucket, this specifically addresses the year-round residential population and includes the seasonal population. Epidemiology is used to guide decision making in medicine, pharmaceuticals, and government policy.

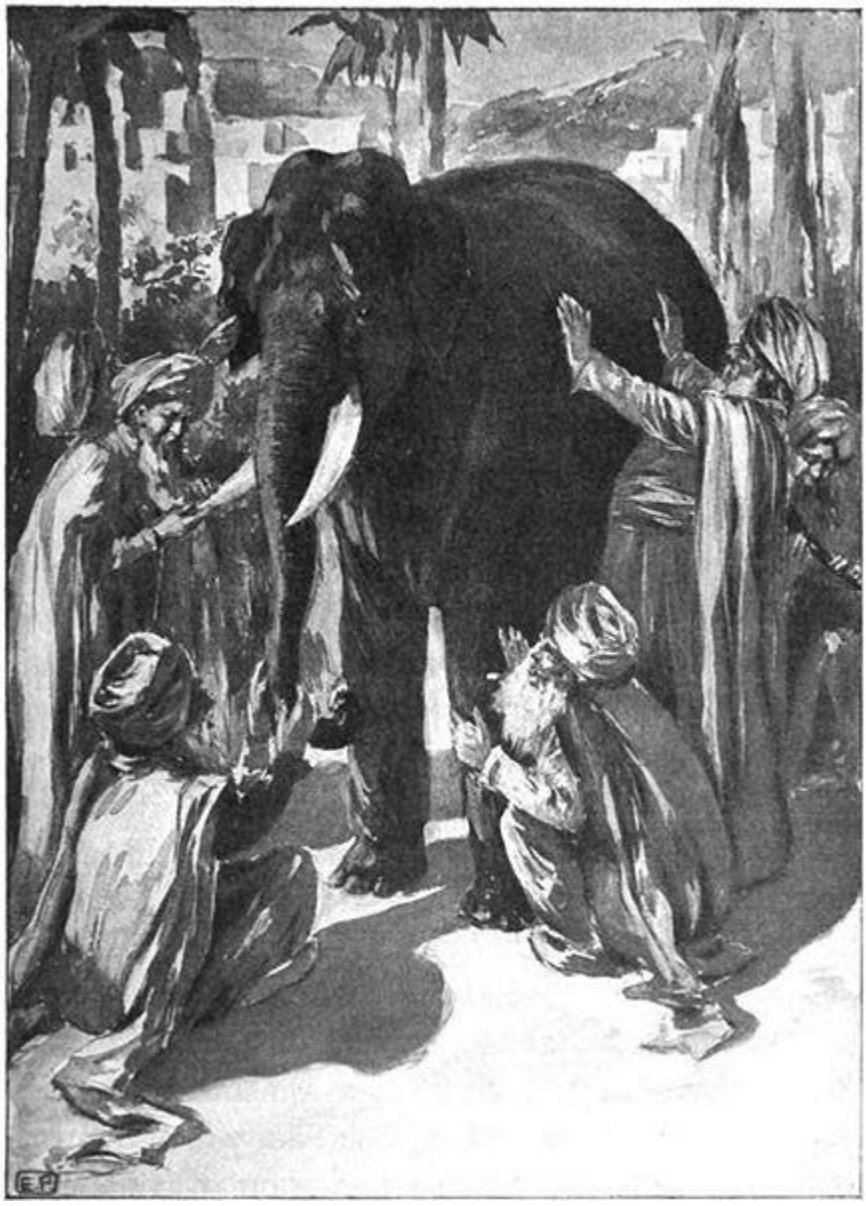
There is a common misconception that epidemiologic models forecast a decision to be made. With proper analysis and interpretation, epidemiology can be used as a tool by stakeholders to inform decisions within a broader scope. As to say, epidemiology is part of a much larger picture. It is important to note that epidemiology is not the application of statistics to introduce bias in decision making. An epidemiologic model is an interpretation of empirical evidence (data) to explain, define, or predict a disease's behavior within a given population.

What are Epidemiology Models?

An epidemic model is a mathematical model that seeks to visualize the relationship between all variables within a system and population of study. These models are often visualized as graphs or charts but can be shown in many different iterations. Models are tremendous in their ability to simplify the observations in the world to answer specific questions. However, models must properly integrate evidence and science to avoid misuse for nefarious or political purposes. It is imperative that the model fits the question being asked. Models are custom made to answer specific questions, and to apply a generic model to answer a specific question is erroneous and can lead to disastrous decisions.

Types of Models

There are many different types of models that can be used for various reasons. For example, a researcher may use Survival Analysis to follow and measure patient lifespan from the date they were placed on a ventilator (intervention) to recovery, death, or loss to follow-up (censored). Different models display separate facets of the same, yet much bigger, picture. The aforementioned example, when studied in specific settings, will only answer questions regarding the risk of death relative to time once a person is put on a ventilator after hospitalization. Such a model cannot be extrapolated to all risks of death for all COVID-19 patients in any hospital across the world.



Not much different than the blind men and the elephant.

Image Source: "The Heath readers by grades", D.C. Heath and Company (Boston), 1907, US public domain

When modeling infectious diseases, like COVID-19, one must ponder the question carefully (*What exactly am I trying to learn?*) Furthermore, one must also consider the audience, as the interpretation of epidemic models is complex and may lead to confusion, distrust, or misinterpretation. All models have limitations, the main point is to choose a model that best fits the needs of the hypothesis. In an overall population, infectious disease models typically fall under the following three categories:

1. **Models that attempt to simplify interrelated or complex systems, such as disease transmission**. Often, these models use categories or "compartments" that relate to how a disease spreads in a population. The challenge with these models is they often oversimplify disease transmission due to few data inputs. Thus, these models do not account for dynamic populations (such as on Nantucket), or ongoing system and behavior changes. One such model is the S.E.I.R. (Susceptible, Exposed, Infected and Resistant) model developed by Kermack & McKendrick in 1927. This model puts a population in one of four categories and models an epidemic through a static population.

   Recently, the Nantucket Board of Health and Select Board was offered an analysis based on this model using the "epidemic calculator" developed by Gabriel Goh. A screenshot (Figure 1) of this calculator can be seen below, modeling an outbreak of SARS-CoV2 in a static population of 28,854 (approximate summer Nantucket population). The primary issue with this calculator is that it does not take into consideration competing risks such as, age, comorbidities, and changes in the population.

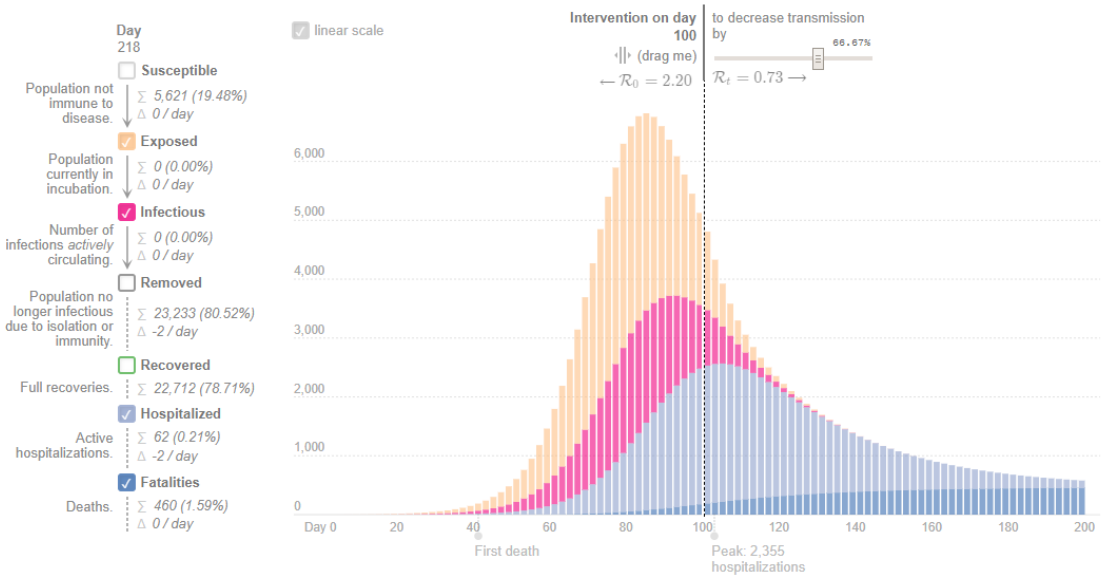


Figure 1. Screenshot of S.E.I.R. visualization in a population of ~29,000 with no dynamic changes, and no behavioral interventions until day 100 (marked by dotted black line).

2. **Models that try to forecast the future**. These models use existing data to project the illness in a short timeframe. Data such as mobility, healthcare capacity, and susceptibility can all be used to predict the movement of the disease. However, due to the dynamic nature of behavior and population, forecasts are only good for a short period of time as data fluctuations occur. An example of data forecasting is the set of hurricane "spaghetti models" seen to predict the path of a hurricane. As the data changes, the predicted path changes. There are more than 14 predictive models that the Centers for Disease Control and Prevention (CDC) is using to predict the spread of COVID-19 in the United States. The CDC predictive model for the Commonwealth of Massachusetts' cumulative reported deaths is below (Figure 2).

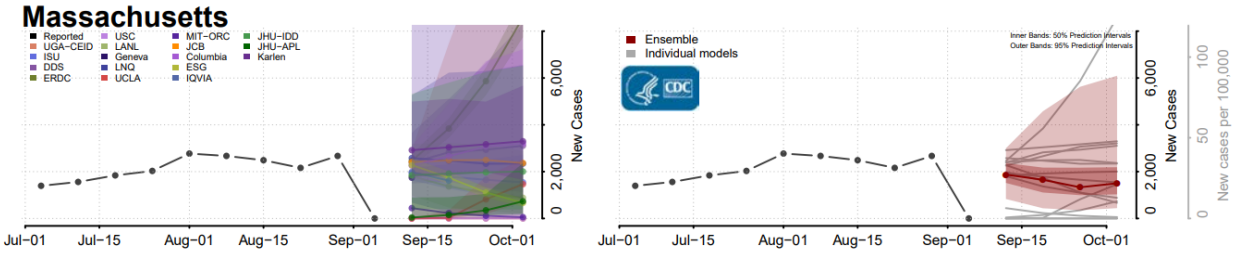


Figure 2: CDC predictive model for Cumulative deaths in Massachusetts. These predictive models forecast two weeks into the future.

3. **Models that strategically show multiple outcomes and scenarios**. These strategic models attempt to visualize potential implications of different interventions in different contexts. These models are perhaps the most useful to decision-makers and stakeholders when considering intervention strategies. With multiple predictions and models at hand, a decision-maker can pick the best course of action that meshes with all other variables that affect the population they are responsible for. Figure 3 (below) shows two different scenarios in Italy for the COVID-19 epidemic. The top two graphs show what the epidemic curves would be if mitigation measures were relaxed, and the bottom two show what the epidemic curves would be with strict mitigation in place.

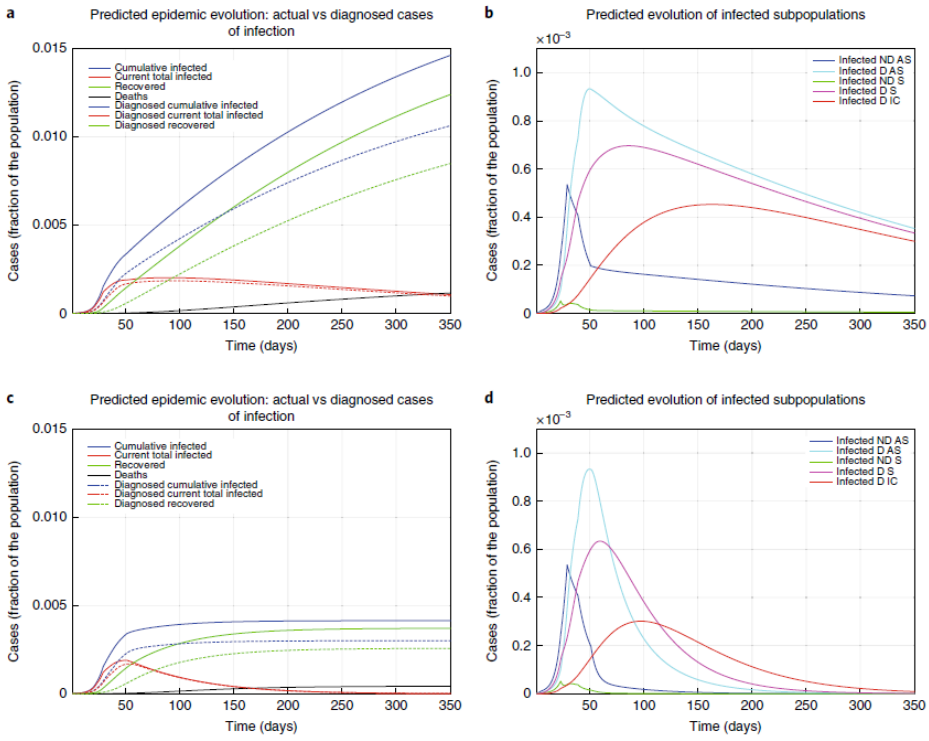


Fig. 3 | The effect of lockdown. a–d, Epidemic evolution predicted by the model for the COVID-19 outbreak in Italy when, after day 50, the social distancing countermeasures are weakened, leading to a larger $R_0 = 0.98$ (**a**,**b**), or strengthened, leading to a smaller $R_0 = 0.50$ (**c**,**d**). **a**,**c**, The difference between the actual (real cases) and perceived (diagnosed cases) evolution of the epidemics. The plots in **b** and **d** distinguish between the different categories of infected patients: non-diagnosed asymptomatic (ND AS), diagnosed asymptomatic (D AS), non-diagnosed symptomatic (ND S), diagnosed symptomatic (D S) and diagnosed with life-threatening symptoms (D IC). Note that **a**,**c** and **b**,**d** have different scales.

Figure 3 Source: Giordano, G., Blanchini, F., Bruno, R. et al. Modelling the COVID-19 epidemic and implementation of population-wide interventions in Italy. Nat Med (2020).

What does this mean to me?

By using good data and information, the Select Board and the Board of Health can choose the most appropriate course of action for the island. The models and information contained herein should be used to make the best decisions possible for the island but cannot be the sole reasoning for decision-making. Use the information contained herein to make the best decisions for the island during the September Surge.

COVID-19 Background

China/Worldwide (Source: WHO COVID-19 Situation Reports)

On December 31, 2019, the World Health Organization (WHO) was informed of cases of pneumonia caused by an unknown factor (unknown etiology) in Wuhan City, Hubei province of China. By January 4, 2020, 44 cases of the same pneumonia were reported to WHO. These cases were associated with a single seafood market in Wuhan City. On January 7, 2020, the Chinese authorities isolated and identified a new type of coronavirus, and its genetic code was sequenced by January 12, 2020. By January 20, 2020, imported cases were reported in Japan, Thailand, and the Republic of Korea, with China reporting 278 cases.

By February 1, 2020, nearly 12,000 cases were confirmed worldwide, spread across 23 different countries (including USA). Person-to-person transmission of the virus was confirmed on or around January 22, and by February 1, asymptomatic spread was confirmed and 98.9%. Of all cases, were localized in China (11,953 globally). On March 1, China accounted for 91.8% of cases globally (87,137).

On April 1, China accounted for only 10% of global cases. Italy accounted for 12.8% and USA accounted for 19.8%. Total global cases on April 1 were 823,626.

By May 1, there were 3,175,207 cases worldwide, spread over 188 countries and territories. The United States had 1,035,353 confirmed cases on May 1 (32.6% globally) as opposed to China, which only had 84,385 (2.7% globally). On September 13, there were 28,830,715 cases worldwide with China accounting for only 90,187 (0.31% globally).

It is important to note that a significant portion of cases remain unreported due to lack of testing and reporting in many countries across the world, including within the USA.

USA (Source: CDC Coronavirus Disease 2019, Cases, Data, & Surveillance Dashboard)

The first case reported in the USA occurred January 24, 2020. Through approximately February 26, all cases were localized in individual pockets, usually located in nursing or long-term care facilities. By March 1st, the USA was seeing 6 new cases per day. That number jumped to over 200 per day by March 9. From March 1 through April 6, the USA was in an exponential growth phase of transmission/diagnosis. The USA has entered a "plateau" stage, consistently diagnosing approximately 23,000 cases per day in early April and continued through May. However, in June, a significant spike occurred, peaking on July 16, with a steady decline following through August. Unfortunately, following Labor Day weekend and the beginning of the school year, the USA once again finds itself in a sharp increase of daily diagnoses. The following figure show the national breakdown as of September 13, 2020.

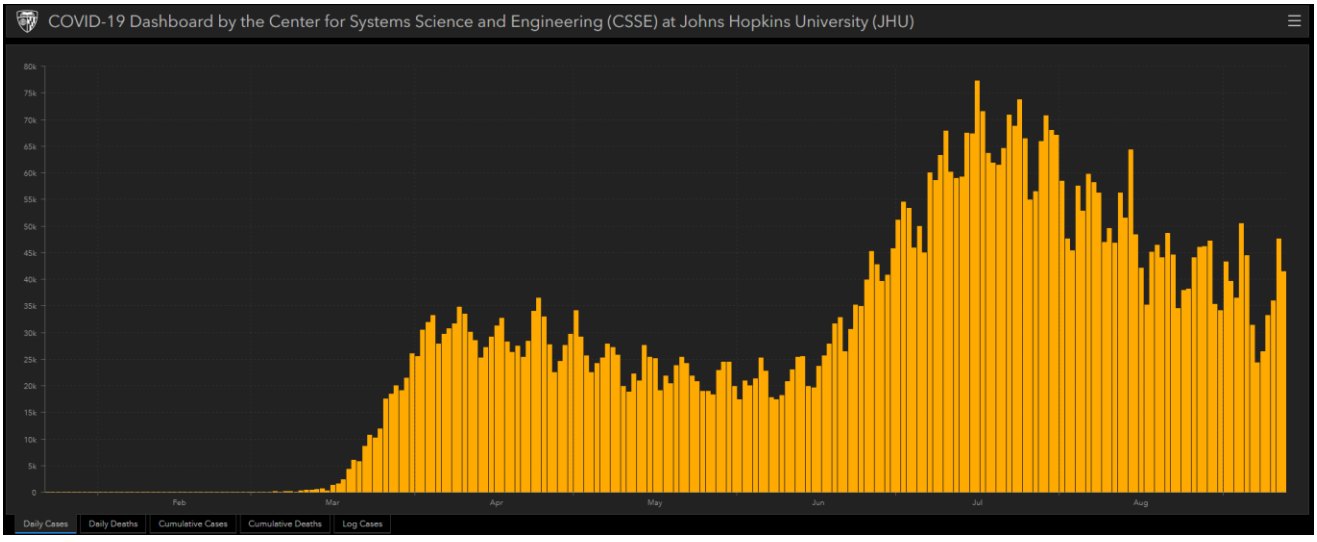


Figure 4: Source Johns Hopkins University COVID-19 Surveillance Dashboard

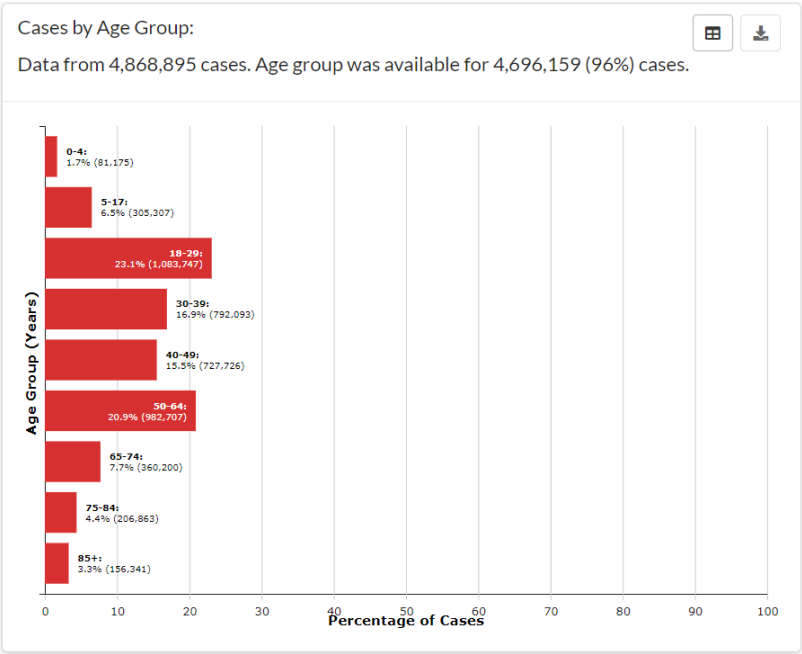


Figure 5: Source CDC COVID-19 Surveillance Dashboard

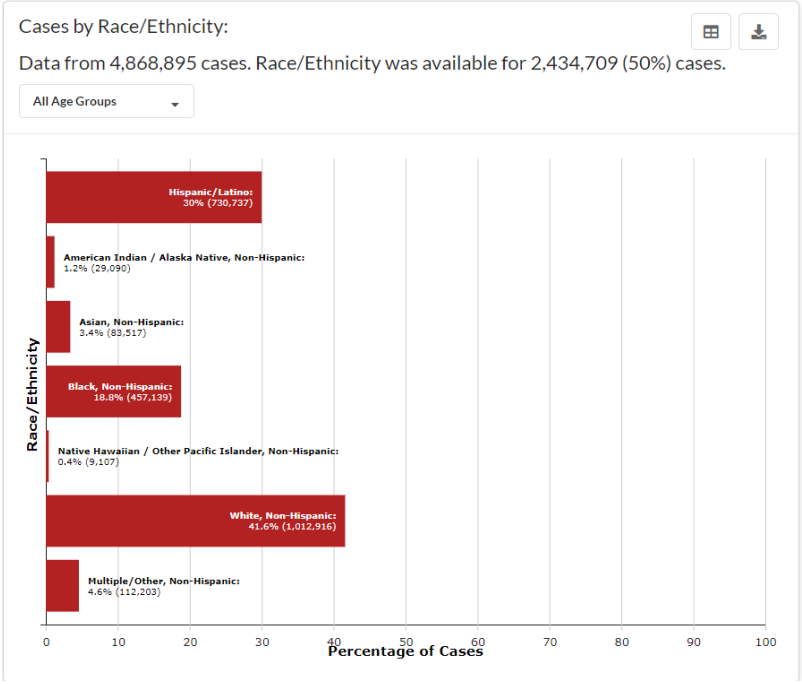


Figure 6: Source CDC COVID-19 Surveillance Dashboard

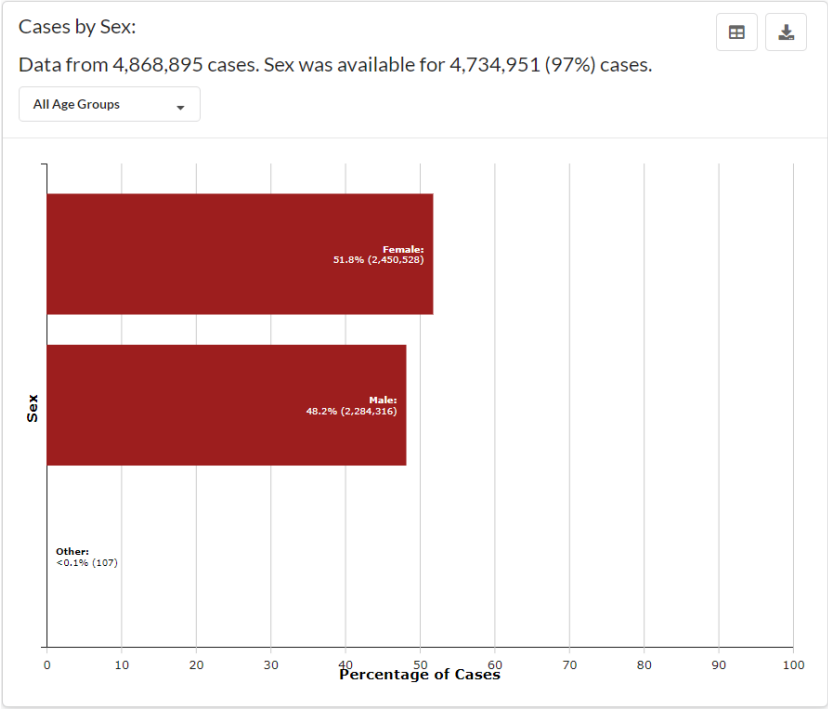


Figure 7: Source CDC COVID-19 Surveillance Dashboard

Massachusetts (Source: MA COVID-19 Dashboard)

Following the initial cases in the USA, Massachusetts started tracking COVID-19 data on March 9. At that point, MA had 41 confirmed cases. By March 31, Massachusetts had 6,620 cases throughout all its counties, and 89 deaths (1.34%) were attributed to COVID-19. By April 30, Massachusetts reported 62,205 cases and 3,562 (5.7%) deaths. On September 12th, Massachusetts reported 122,637 cases and 8,987 (7.3%) deaths. The mortality of 7.3% is alarming, but when stratified into age groups, the rate changes significantly (Figure 9). Due to alarming COVID-19 infection trends in the USA, Massachusetts Governor Charlie Baker declared a state of emergency on March 10. The state of emergency continues as of September 13, 2020.

Since Version 1 of this report (May 20, 2020), Governor Baker has rolled out widespread molecular testing (RT-PCR). To date, 2,968,723 molecular tests have been administered. Furthermore, the Baker administration issued a Travel Order on August 11, that requires quarantines and travel registration for individuals travelling to and from high-risk states.

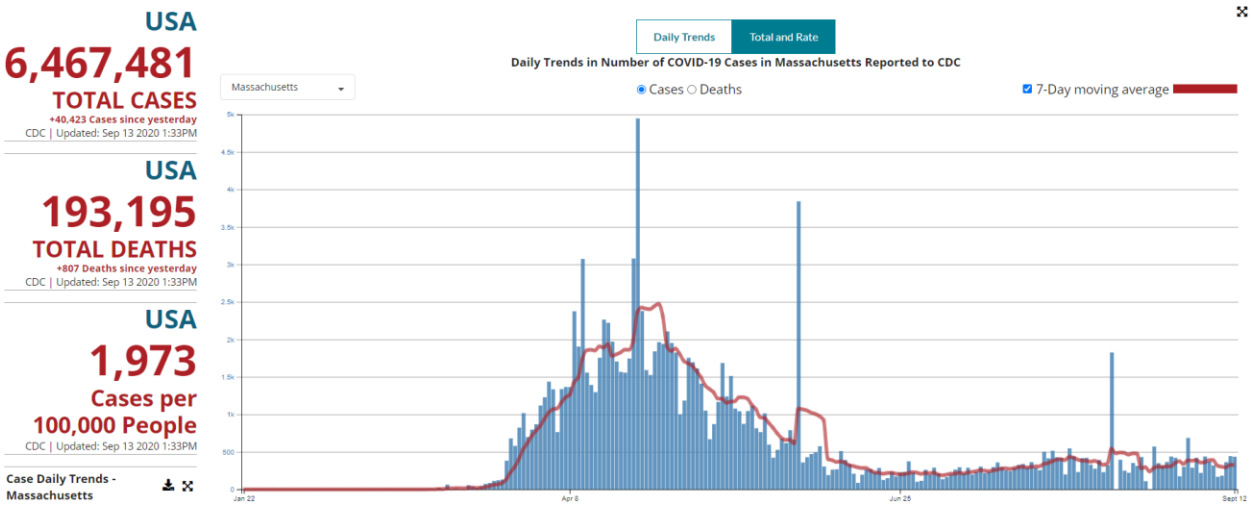


Figure 8: Source CDC COVID-19 Surveillance Dashboard

It is important to note that though the cumulative cases within the Commonwealth continue to rise, the number of new cases per day has dropped significantly from 3,079 at its peak on April 23 to 435 as of September 12. This trend is positive for the Commonwealth.

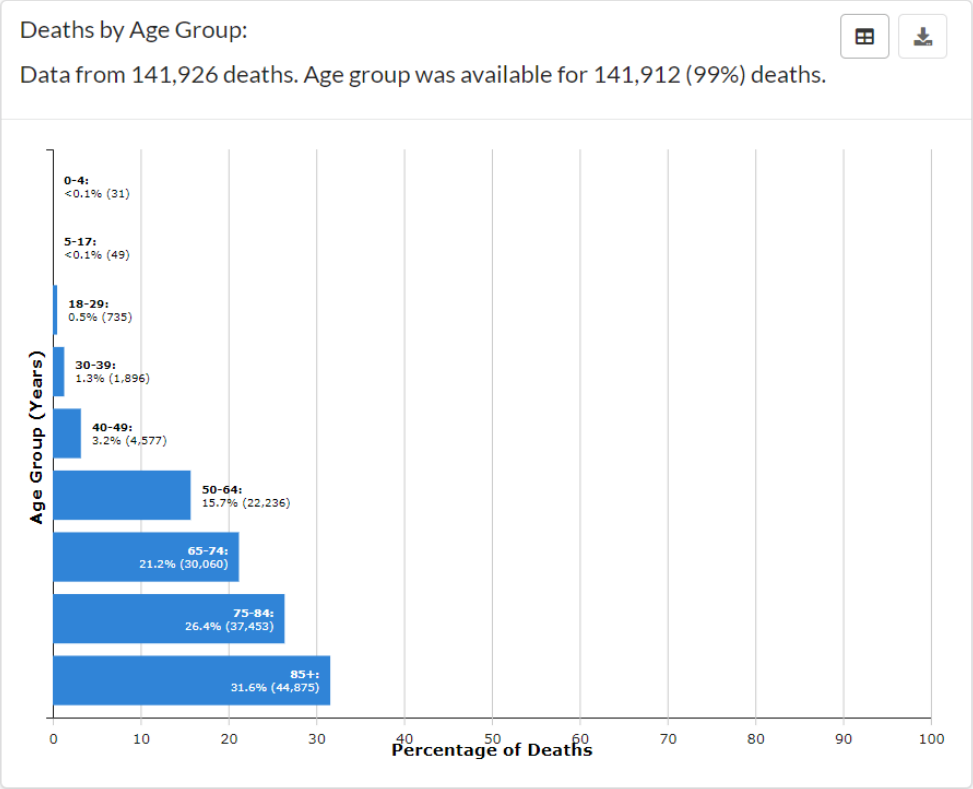


Figure 9: Source Massachusetts COVID-19 Surveillance Dashboard

Age stratification is important to understand the Case Fatality Rate (CFR) of 7.3%. Deaths from COVID-19 cluster among patients aged 80 and above. Of the 141,926 deaths nationally, 44,875 (31.6%) are patients aged 85 and older, 37,453 (26.4%) are people aged 75-84, and 30,060 (21.2%) are people aged 65-74. This age group (65+) makes up 37.7% of all cases across the commonwealth (May 2020 data), but accounts for more than 79.2% of all deaths.

By focusing interventions and outreach to this population, the Board of Health and the Select Board working together with community stakeholder significantly reduce the burden of disease among this population on Nantucket.

Nantucket (Source: MA COVID-19 Dashboard & NCH Update Page)

On March 22, Nantucket had its first case of COVID-19. This case was imported by an off-island resident that was diagnosed at Nantucket Cottage Hospital (NCH). Subsequently, NCH set up a drive through testing area for Nantucket residents and visitors experiencing symptoms. The hospital and clinics were closed to visitors, and only patients needing essential care are allowed. Since then, the hospital has tested a total of 7,829 residents and visitors, as of September 12. Unfortunately, Nantucket experienced one death from local COVID patients, though various seasonal residents who live off-island have also perished of COVID related complications.

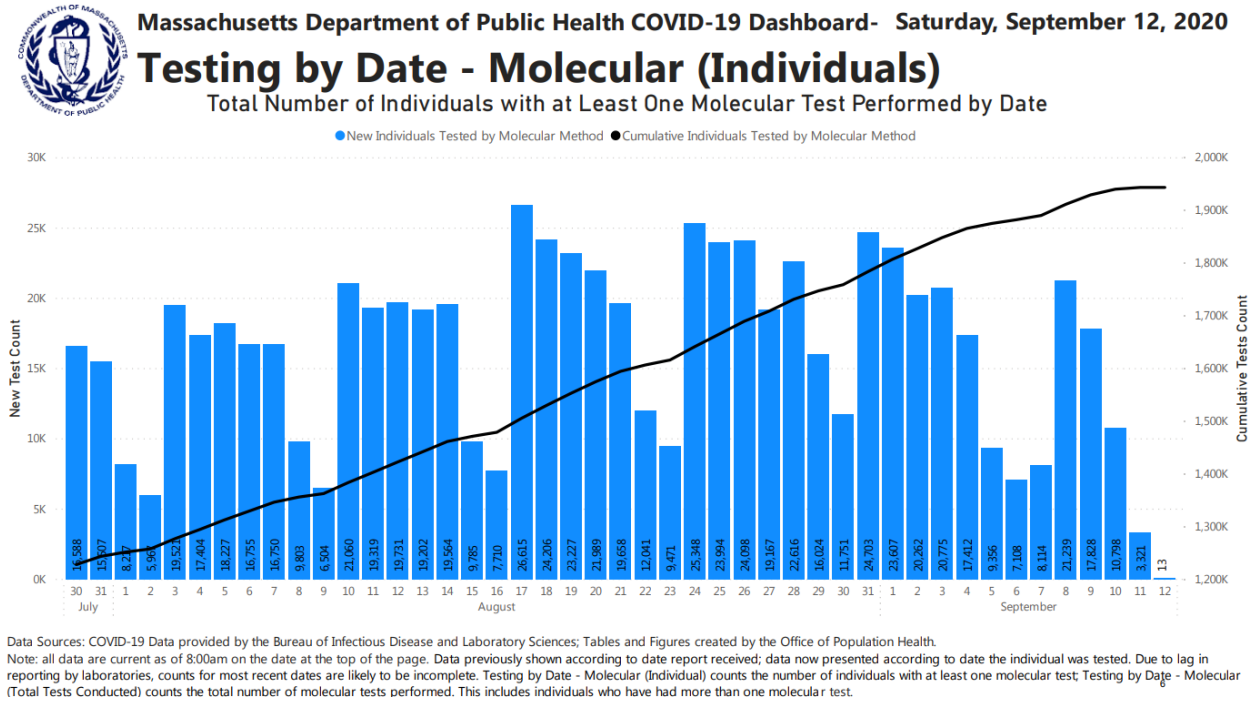


Figure 10: Commonwealth testing data by date with cumulative trend line

Nantucket: September Surge (Source: MA COVID-19 Dashboard & NCH Update Page)

On Wednesday, September 9, Nantucket had its highest single day incidence of 7 new cases. This was followed by 7 more cases 9/10, 4 on 9/11, 7 on 9/12, and 1 on 9/13. This represents a 42% increase in cumulative incidence over the course of 4 days. If there continues to be a rise in cases, strict mitigation measures will need to be reimplemented.

Initially, these 26 cases did not seem to have much in common. Contact tracing immediately revealed that at least 15 patients work in the Landscaping, Construction, Cleaning, and other House Services trades. Most patients are either asymptomatic or mildly symptomatic. Nearly all 26 cases speak English as a second language or do not speak English at all. No cases are hospitalized, as of September 13. The following data visualizations breakdown the information as we know it.

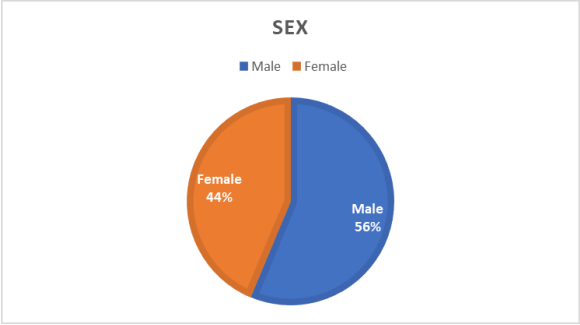


Figure 11: Sex Breakdown of Nantucket Cases

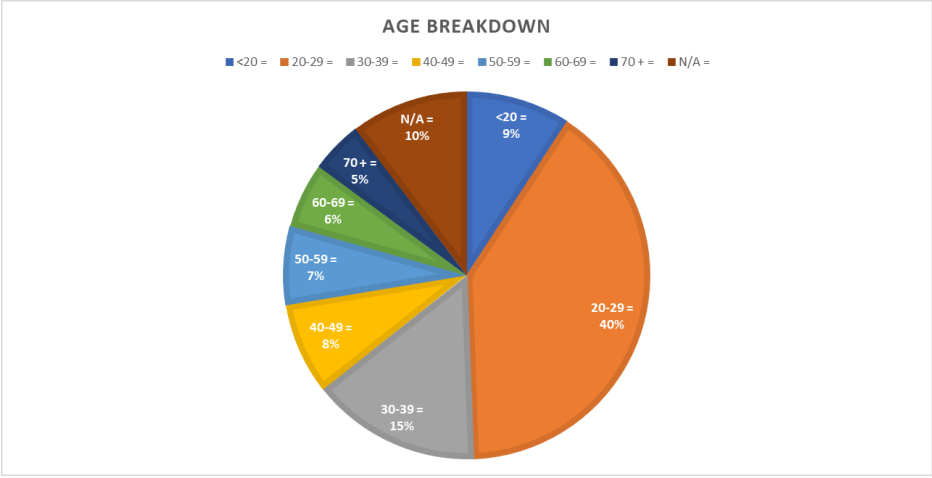


Figure 12: Age Breakdown of Nantucket Cases

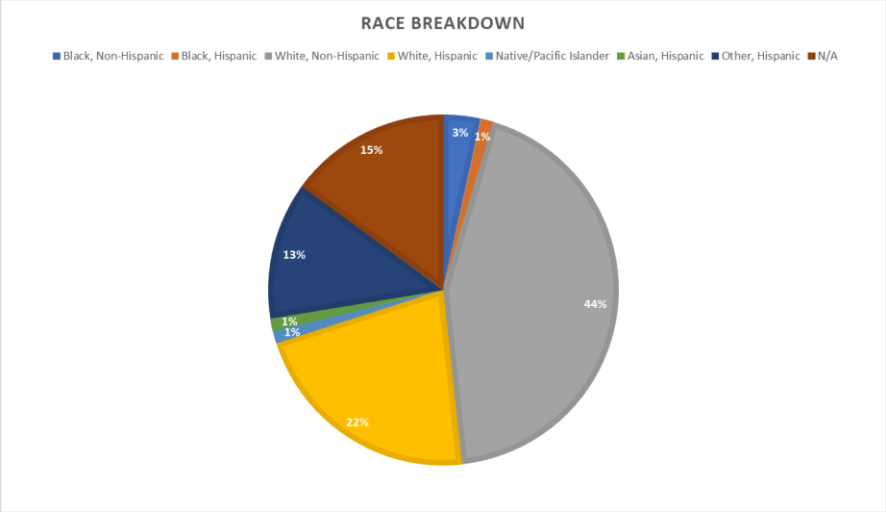


Figure 13: Full Racial Breakdown of Nantucket Cases

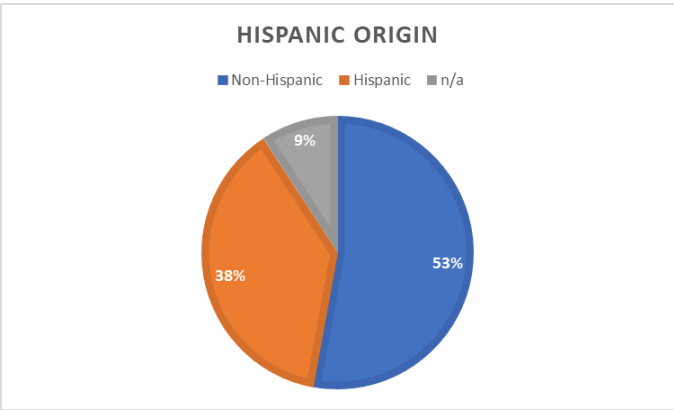


Figure 14: Hispanic Origin Breakdown of Nantucket Cases

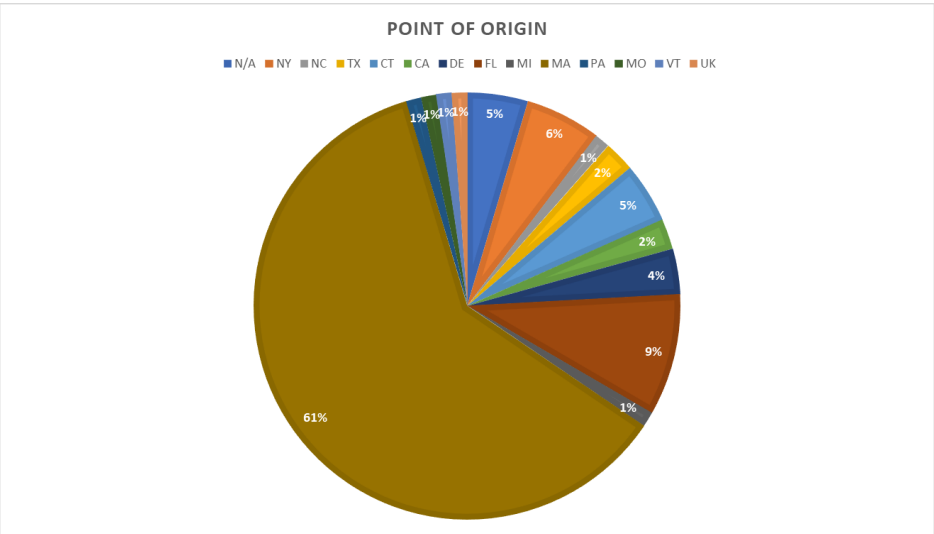


Figure 15: Points of Origin for Nantucket Cases

Next Steps/Analysis

Case Testing/Surveillance on Nantucket

Nantucket Cottage Hospital continues to provide its CastNet asymptomatic surveillance program. Furthermore, contacts of cases are coming in to get tested in large quantities. As more positive test results emerge the cumulative incidence increases (Figure 16). However, this is expected. There will be more cases as time moves forward. Cumulative incidence is not the best information to forecast disease spread, as the trend is always upward. It is easy to use cumulative growth to scare and intimidate a lay-person. Therefore, it is not recommended as a valid metric for use in decision making.

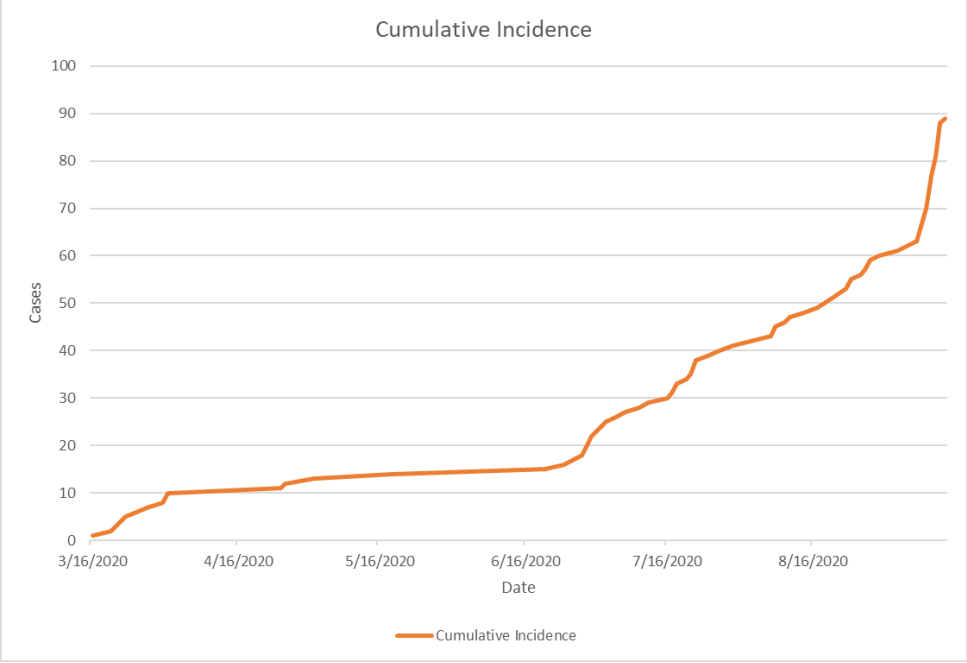


Figure 16: Cumulative Incidence of cases on Nantucket

The best indicator/metric for success is the daily incidence (Figure 17). Keeping this number as close to 0 as possible allows primary care providers and hospital personnel to handle the incoming cases that are symptomatic and require care. Keeping this number down was the primary goal sought after in the early days of the pandemic. Commonly referred to as a "Flattening of the curve" this is the process of preventing geometric growth by implementing interventions to interrupt the chain of transmission. Logistically, a flattened curve spreads out the total burden of cases over time and allows for hospital personnel to intervene in more severe cases with greater ease. Thus, resulting in a lesser loss of life.

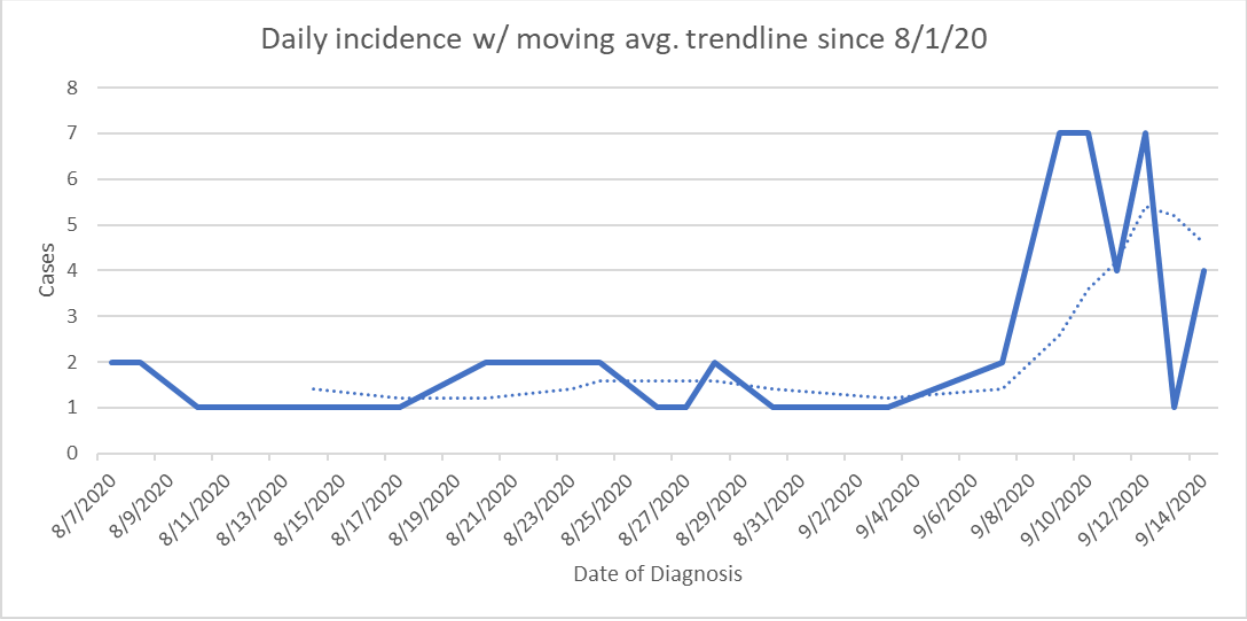


Figure 17: Daily incidence with a 5-period moving average trend line.

Sewage Testing and Forecasting

The BioBot study of the Nantucket Surfside Wastewater Treatment Facility (SWTF), has been taking continuous samples at the surfside treatment plant since June. Siasconset sewage samples have been taking place since late July. The samples from the Siasconset Sewage Treatment plant have come back negative on every test. However, the Surfside Wastewater Treatment Facility (WWTF) has consistently reported COVID viral load in the sewage. However, the viral load seems to be on a downward trend (Figure 18). Sewage testing provides an early indicator to further viral spread (Medema, 2020). As an early indicator, we must use this tool to maintain vigilance on the possible spread of the virus on Nantucket.

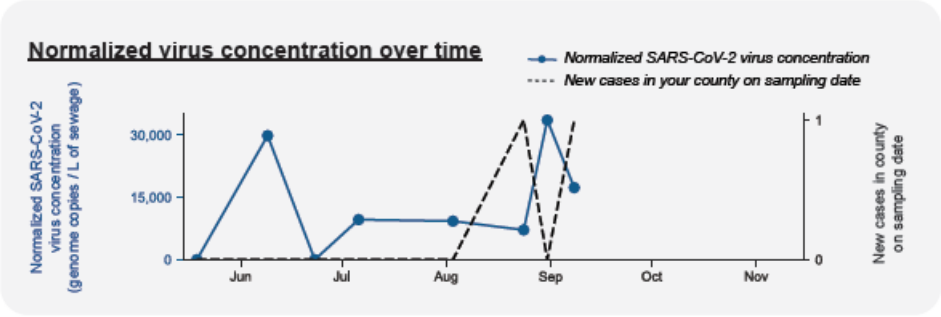


Figure 18: BioBot sewage testing at WWTF (Sampled September 8)

"Trades" enforcement and outreach campaign

As we move forward and identified community spread with a connection to job sites and recreation, it is imperative that the Town move forward with a staged intervention plan that targets the most at-risk population within the September Surge. This population includes, but is not limited to, Spanish-speaking landscapers, cleaners, painters, carpenters, and other tradespeople who live in communal and/or shared housing.

Step 1: Outreach & Education (1-2 weeks)

- Provide informational media (PSA, fliers in different languages, etc.) to crew foremen, business owners and retailers that serve the at-risk communities
- Enhance community-wide support systems to ensure that those isolating, and quarantining do not suffer financially or from food insecurity (Food-Pantry, Rental assistance, etc.)
- PPE care packages will be distributed at frequented locations
- Communicate with business owners the importance of social distancing, contact tracing logs, masks, and other mitigation measures at jobsites
- Inspectors will visit jobsites and explain the importance of mitigation measures and provide masks to those who need it

Step 2: Enforcement (1-2 weeks, if daily incidence continues to increase)

- Fines of up to $300 per violation on a jobsite (Governor's order #31) will be issued to the business owner that is not maintaining COVID mitigation standards
- If 3 or more violations by the same business owner is witnessed, in any given 3-day period, by delegated staff, the business owner's permit to operate may be suspended
- Limitation of personnel on any jobsite

Step 3: Moratorium (indefinitely, until incidence decreases)

- Cessation of operations for specific businesses to decrease transmission potential

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Appendix A

Roberto J. Santamaría, MPH, MBA, REHS/RS Curriculum Vitae

EDUCATION

Johns Hopkins Bloomberg School of Public Health (Baltimore, Maryland) Expected May 2022
Doctor of Public Health (Dr.PH)
Concentration: Health Policy & Management Health Equity & Social Justice

Salve Regina University (Newport, Rhode Island) December 2013
Master of Business Administration (MBA)

Boston University School of Public Health (Boston, Massachusetts) May 2011
Master of Public Health (MPH)
Concentration: Epidemiology & Biostatistics

University of Central Florida (Orlando, Florida) May 2009
Bachelor of Science Degree (BS)
Major: Molecular Biology & Microbiology

RELEVANT EXPERIENCE

Town of Nantucket, Director of Health & Human Services	8/2015 - Present
Town of Framingham, Deputy Director of Public Health/Interim Director	11/2013 – 5/2015
City of Everett, Director of Public Health	5/2011 – 11/2013
City of Everett, Public Health Emergency Preparedness Coordinator	5/2010 – 5/2011
University of Central Florida Dept. of Chemistry	11/2005 – 5/2009

LANGUAGES

Native Proficiency in English & Spanish

AFFILIATIONS & CERTIFICATIONS

- Executive Board Member - Massachusetts Environmental Health Association
- Member - National Environmental Health Association
- Member – Housing Nantucket Board of Directors
- Registered Environmental Health Specialist / Registered Sanitarian
- Six Sigma Green Belt

Appendix B

Definitions

Case Fatality Rate: The proportion of cases of a specified condition which are fatal within a specified time.

$$\text{CFR (expressed as a percentage)} = \frac{\text{\# of Deaths from a disease}}{\text{\# of diagnosed cases of that disease}} \text{ X } 100$$

Censoring: Loss of subjects from a follow-up study; the occurrence of the event of interest among such subjects is uncertain after a specified time when it was known that the event of interest had not occurred; it is not known, however, if or when the event of interest occurred subsequently. Such subjects are described as censored.

Cumulative Incidence, Cumulative Incidence Rate: The number or proportion of a group of people who experience the onset of a health-related event during a specified time interval; this interval is generally the same for all members of the group, but, as in lifetime incidence, it may vary from person to person without reference to age.

Epidemiology: "The study of the distribution and determinants of health-related states or events in specified populations, and the application of this study to the control of health problems."

Incidence: The number of instances of illness commencing, or of persons falling ill, during a given period in a specified population. More generally, the number of new events, e.g., new cases of a disease in a defined population, within a specified period of time.

Mathematical Model: A representation of a system, process, or relationship in mathematical form in which equations are used to simulate the behavior of the system or process under study. A mathematical model is deterministic if the dependent variables involved take on values not allowing for any play of chance. A model is said to be stochastic, or random, if random variation is allowed to enter the picture

Prevalence: The number of events, e.g., instances of a given disease or other condition, in a given population at a designated time; sometimes used to mean Prevalence Rate. When used without qualification, the term usually refers to the situation at a specified point in time (point prevalence). Note that this is a number, not a rate.

Stratification: The process of or result of separating a sample into several subsamples according to specified criteria, such as age groups, socioeconomic status, etc. The effect of confounding variables may be controlled by stratifying the analysis of results.

Survival Analysis: A class of statistical procedures for estimating the Survival Function and for making inferences about the effects on it of treatments, prognostic factors, exposures, and other covariates.

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