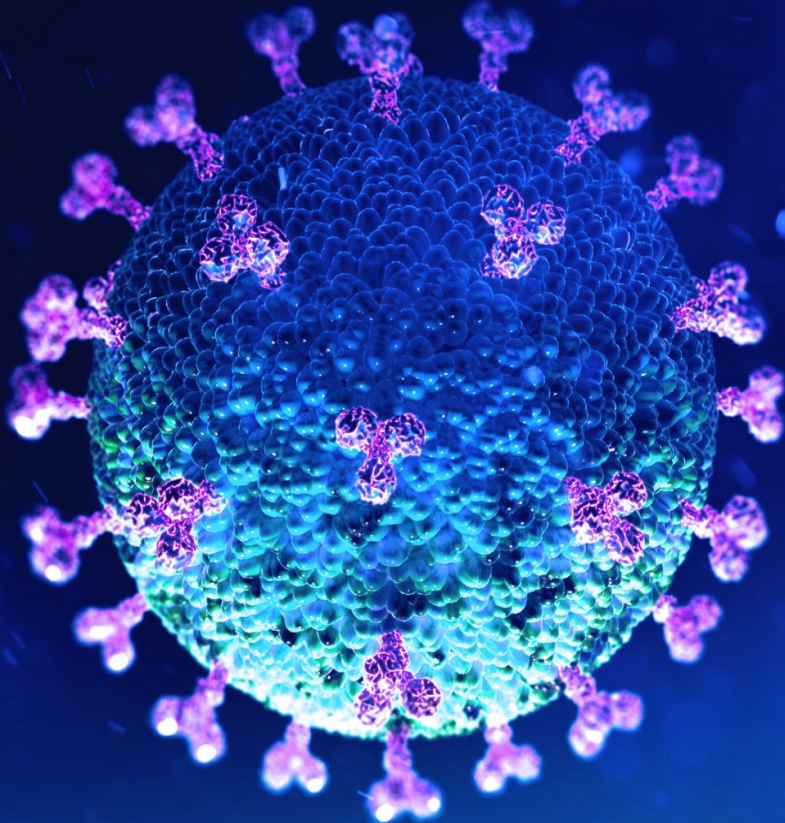




# Managing COVID-19 High-Risk Population Clusters

Targeted action can reduce strain on local hospital systems



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Retsef Levi

J. Spencer Standish (1945) Professor of  
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Massachusetts Institute of Technology

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# High Risk Population Clusters

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High risk patients: Over 65 OR younger individuals with comorbidities (e.g., obesity, diabetes, high blood pressure)

Today's webinar introduces two Risk Analytics Tools and suggested recommendations regarding high-risk population clusters (locations with high density of high-risk patients):

- Senior Living Facilities (e.g., retirement homes, assisted living, nursing homes and long-term care facilities)
- Micro-geographies (counties & ZIP codes) with high-risk population clusters

Why?

- Lessons from Italy and Spain, as well as Seattle, suggest that senior living facilities (e.g., nursing homes) and regions with dense clusters of older (over 65) and vulnerable population are major sources of risk for uncontrolled bursts of fatalities and patients who need critical care that can overwhelm our hospital systems

# Concentrated Risk in Senior Living Facilities

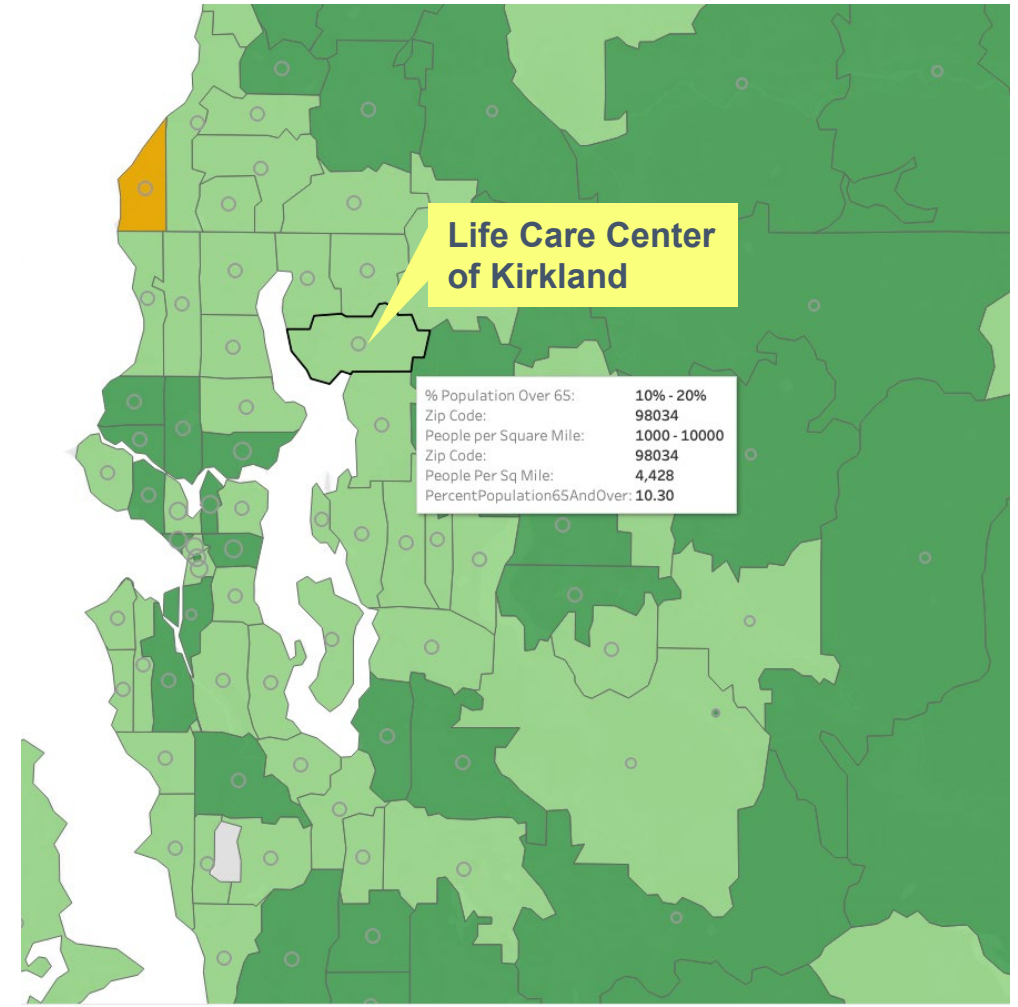
# Lessons from the Seattle Outbreak

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## One 120 bed nursing home in Seattle, WA

Over a two-week period from first confirmed COVID-19 case:

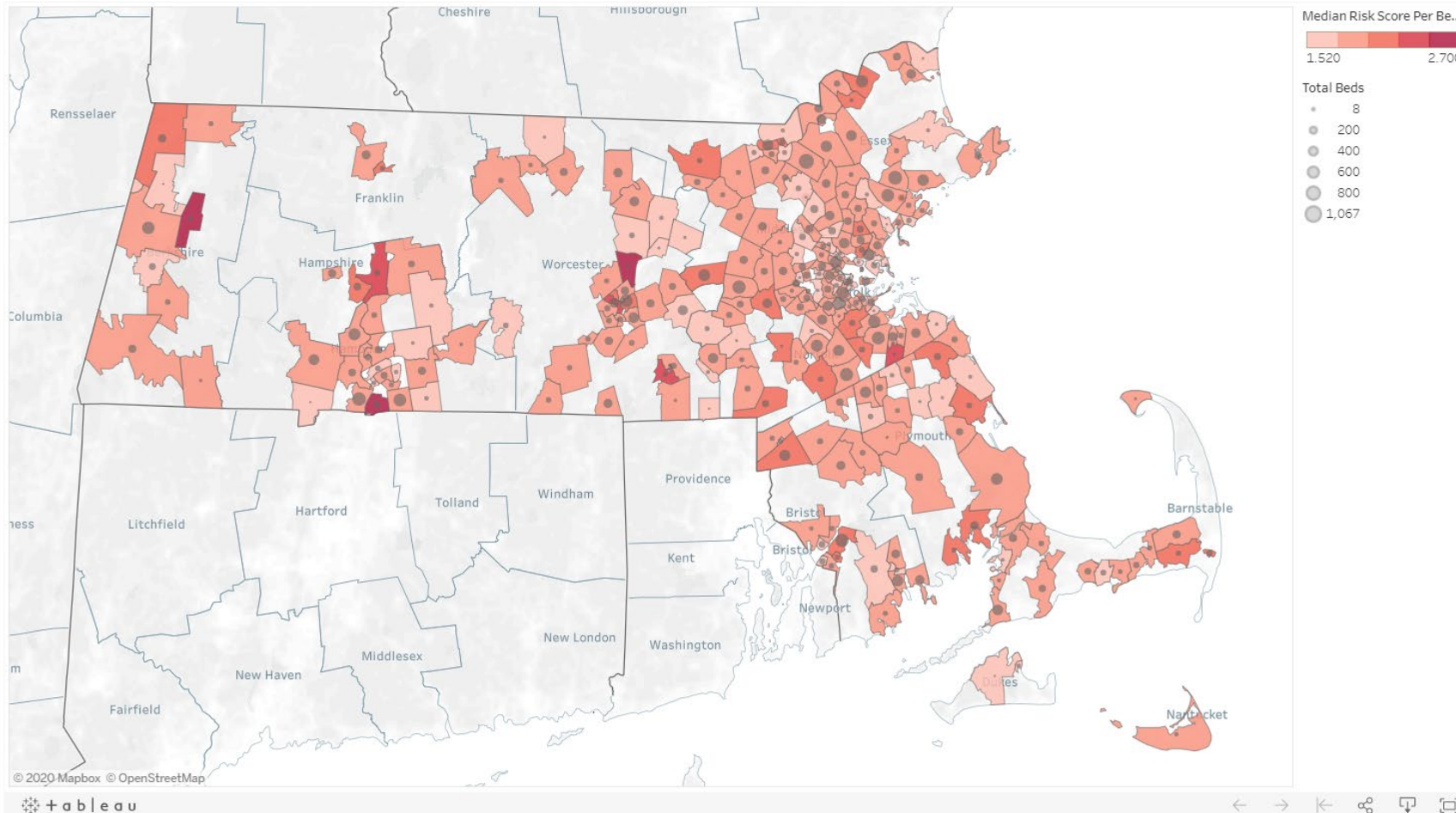
- About 75-80% of the 108 residents were infected
- More than a third of the 180 employees tested positive
- 30+ residents hospitalized
- 35 deaths tied to the facility



# Identifying High-Risk Facilities in MA

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National Map of High-Risk Facilities (including number of beds & risk scores)



## Methodology

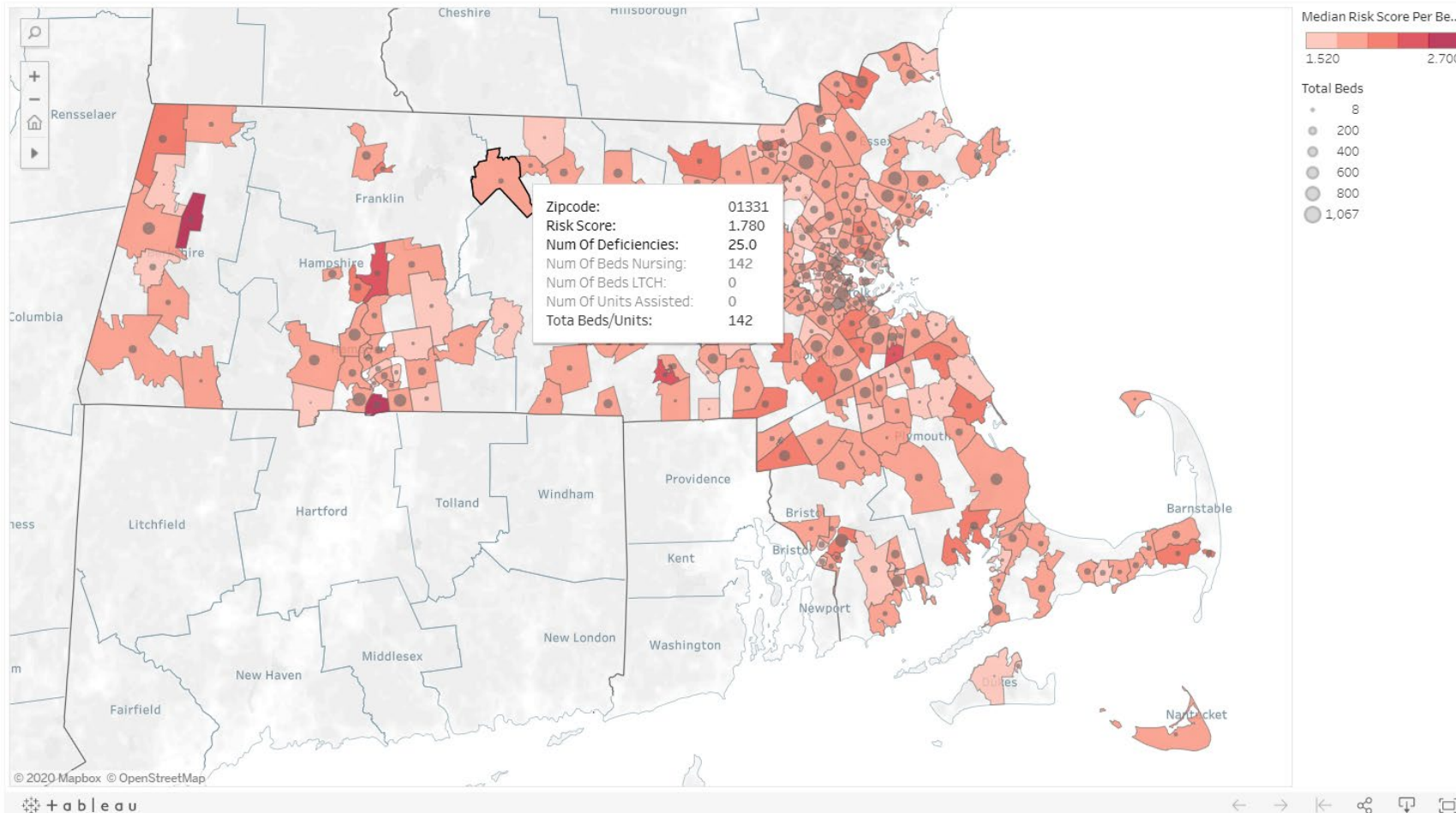
- Mapped all high-risk facilities in each state across the US
- Analyzed at zip code level the number of beds (size of circles) per type (nursing homes, assisted living & long-term care facility)
- Developed risk score (color) based on the safety record of the nursing homes



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# Current CDC Guidance as of 3/18/20

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Nursing homes and other long-term care facilities can take steps to assess and improve their preparedness for responding to coronavirus disease 2019 (COVID-19). This checklist should be used as one tool to develop a comprehensive COVID-19 response plan, including plans for:

- Rapid identification and management of ill residents
- Considerations for visitors and consultant staff
- Supplies and resources
- Sick leave policies and other occupational health considerations
- Education and training
- Surge capacity for staffing, equipment and supplies, and postmortem care

The checklist identifies key areas that long-term care facilities should consider in their COVID-19 planning. Long-term care facilities can use this tool to self-assess the strengths and weaknesses of current preparedness efforts. This checklist does not describe mandatory requirements or standards; rather, it highlights important areas to review to prepare for the possibility of residents with COVID-19.

[https://www.cdc.gov/coronavirus/2019-ncov/downloads/novel-coronavirus-2019-Nursing-Homes-Preparedness-Checklist\\_3\\_13.pdf](https://www.cdc.gov/coronavirus/2019-ncov/downloads/novel-coronavirus-2019-Nursing-Homes-Preparedness-Checklist_3_13.pdf)



# Major Unmitigated Risks Remain

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- **Suggestions and guidelines** are **not sufficient** without support  
(1-3M annual infection control violations because of limited resources)
- Employees and healthcare workers are not regularly tested or screened
- Healthcare workers often work across multiple facilities and increasing risk of multiple site outbreak
- Vendors and suppliers often move in and out of facilities without testing or screening
- Expected shortage of personal protection equipment (PPE) in a few weeks



# Suggested State Level Recommendations

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- State-wide mandated “**Shelter in Place**” for all senior living facilities to ensure no site exposure to anyone with unconfirmed or positive COVID-19 status
- Allocate resources to aggressively test & screen all residents, employees and vendors that enter the facility including those asymptomatic
- Create appropriate **state support system** of infection control & clinical expertise via telehealth services (experts that will provide support, training and enforcement)
- Ensure critical supply of medicines and PPE

# Micro-geographies with High-Risk Population Clusters

# Lessons from the Lombardy Region in Italy

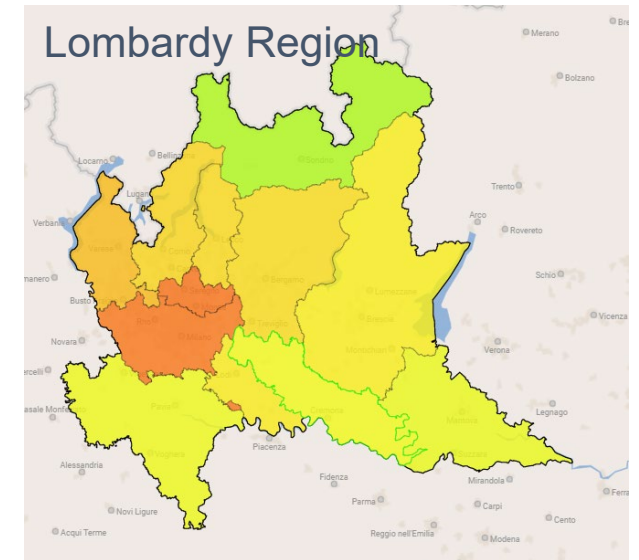
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**Most of the cases requiring hospitalization and fatalities occur in high-risk population clusters**

Town	% > 75	% > 65	% > 55
San Fiorano	12.42	25.17	39.55
Bertonico	16.42	29.92	42.69
Terranova dei Passerini	11.62	21.27	33.11
Castiglione di Adda	14.93	26.15	40.95
Castapusterlengo	14.26	25.67	38.49
Castelgenrundo	12.48	24.02	36.91
Condogno	15.84	27.56	40.13
Somaglia	11.75	22.04	34.28
Famio	10.70	19.74	28.20
Maleo	17.71	29.30	44.21
Bergamo	16.32	29.11	41.55
Treviso	17.27	20.68	43.34
Coderigo	11.44	20.68	34.84
Vo Eugune	16.15	28.50	44.34
Province Average	14.36	25.70	39.00



**Over 600 deaths in a city of 120K people**



# Lessons from the Lombardy Region in Italy

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Strict social distancing and testing proved to be effective in stopping disease spread in Condogno and Vo

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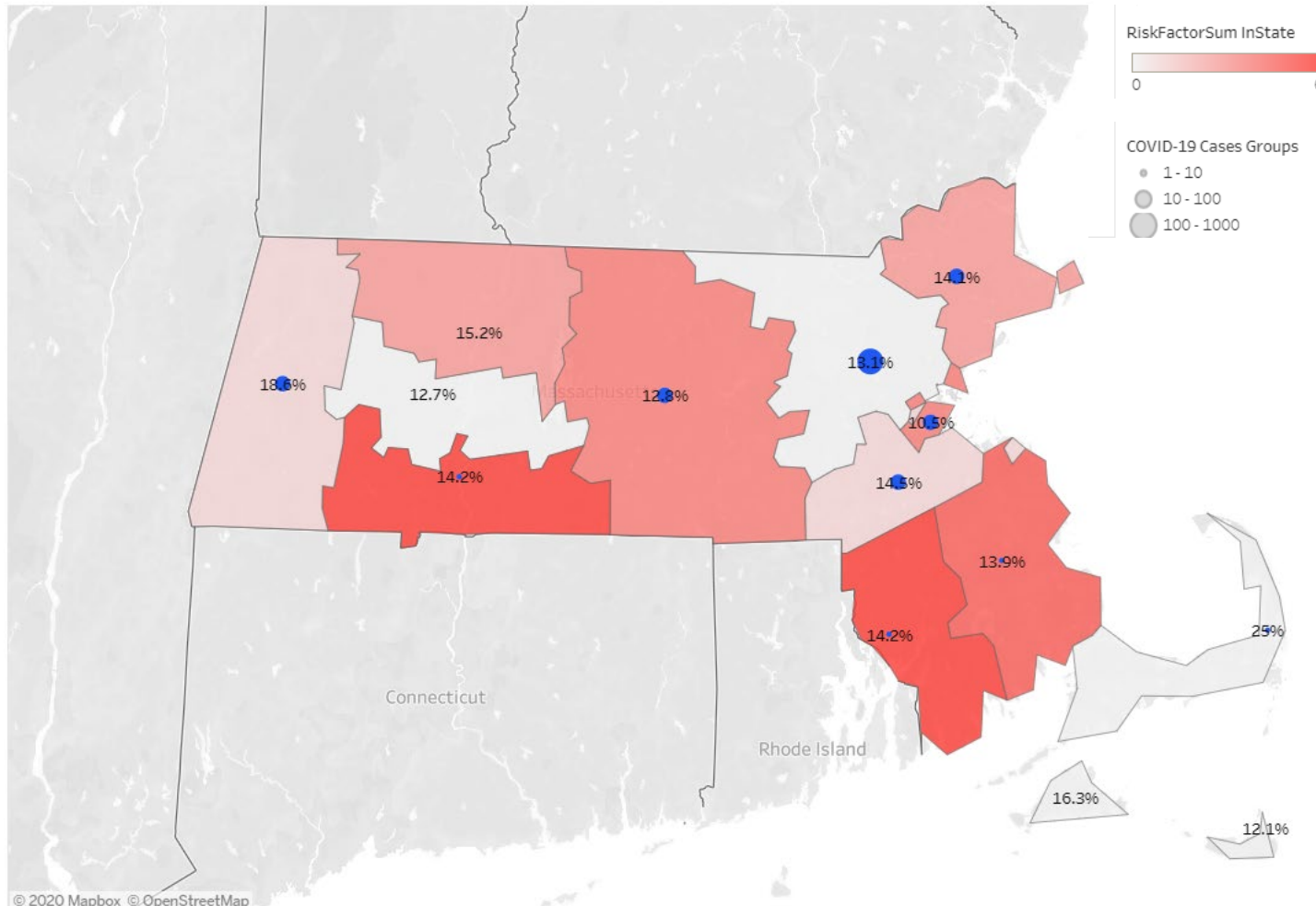
## Conclusions

- Micro-geography demographics can create potential high-risk clusters even with small population size
- This can lead to a rapid burst of hospital admissions and fatalities imposing significant strain on local hospital capacity
- HOWEVER; targeted aggressive social distancing and testing in these areas can significantly mitigate infection spread

# Identifying High-Risk Counties in MA

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COVID-19 Relative Risk Factors Comparison per State



## Methodology

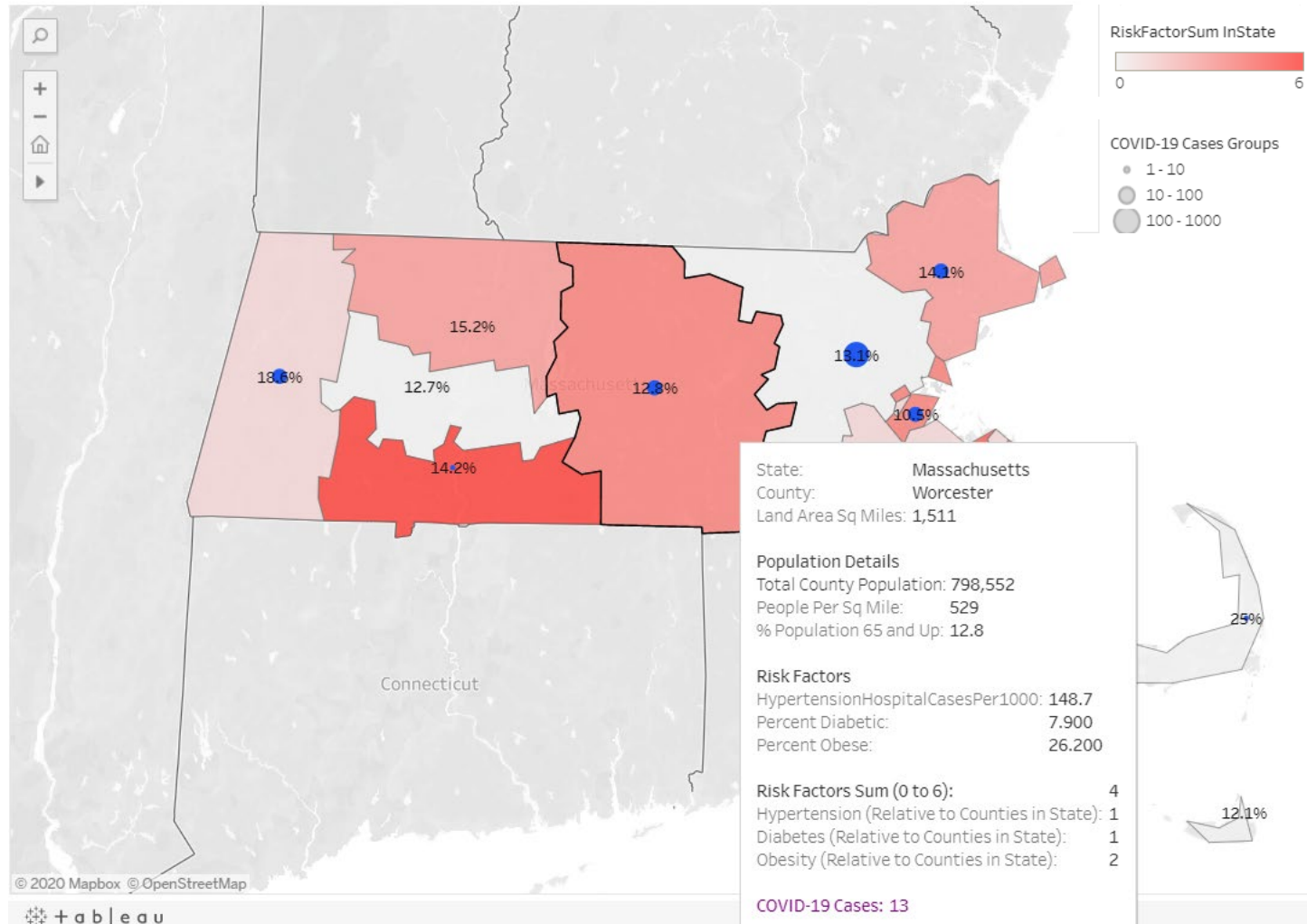
- Each county in the US is scored based on four metrics including % 65+, incidence of diabetes, hypertension and obesity
- % of Over 65 is marked in black number
- The color represents comorbidity risk – 2 for state top quartile, 1 for second top quartile, then sum
- Blue circles are updated based on number of currently identified COVID cases



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COVID-19 Relative Risk Factors Comparison per State



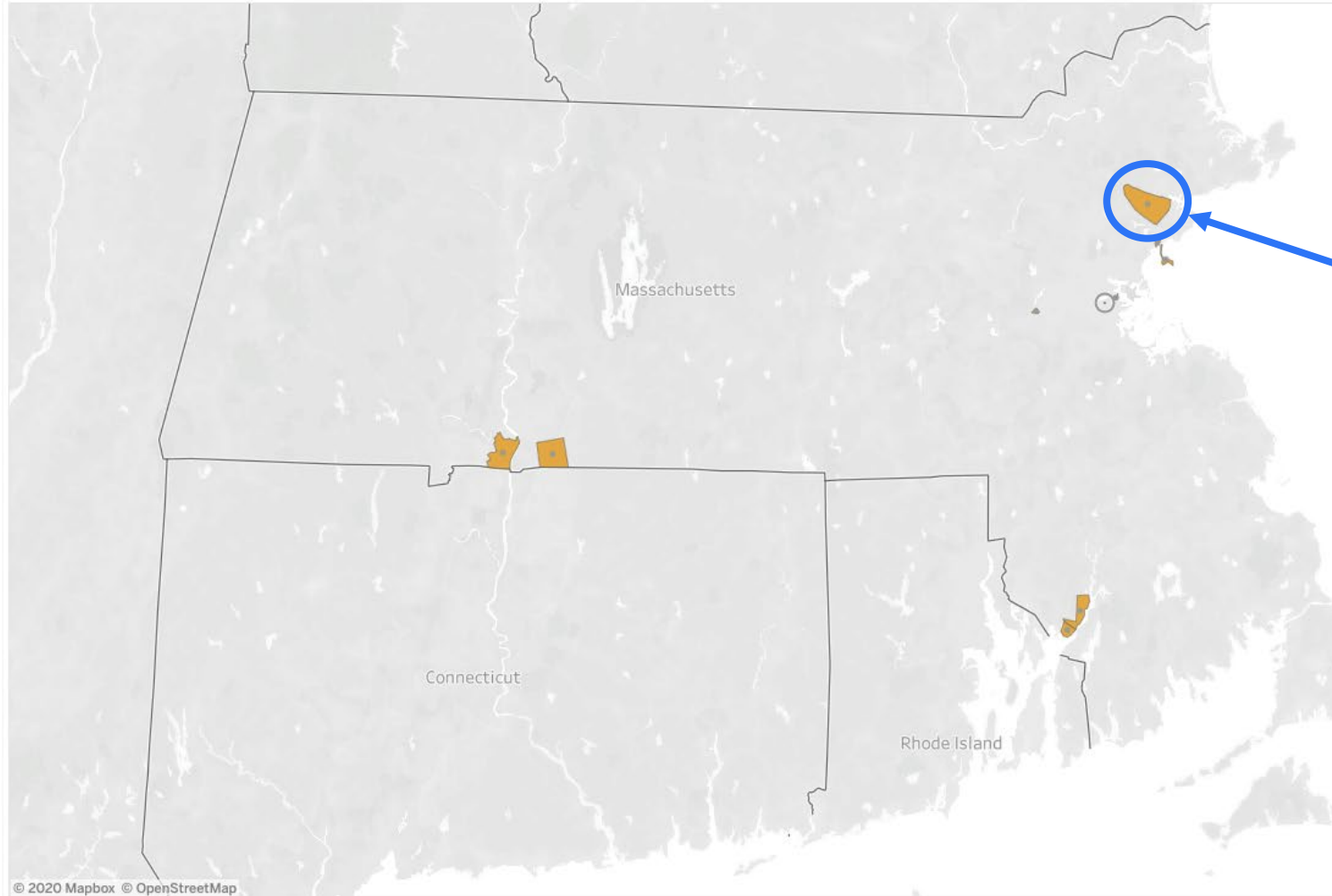
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# Lombardy-like Zip Codes in MA

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ZipCode Density & High Concentration of Elderly



**Essex County, MA (= Lombardy area in Italy)**

14 Cases (3/18/20)

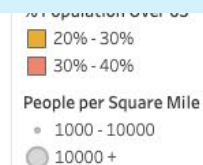
Let's take a close look at zip code 01960 with a population of 51K...

**Assume:**

10% infection rate → 5K COVID-19+ cases

20% over 65 → 1K over 65 COVID-19+ cases

20-30% Hospitalized → 200-300 cases





# Implications for Micro-Geographies with High-Risk Population Clusters

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Dynamic of outbreak is greatly affected by micro-geography risk factors:

- Outbreak spreading within high risk dense clusters could rapidly create a burst of fatalities and critically ill patients that could compromise local hospital systems
- Testing should be prioritized to aggressively test including those that are asymptomatic within high risk dense clusters and be informed by known identified cases clusters
- Social distancing enforcement should be aggressively applied to high risk clusters
- Together with capacity information it can be used to identify supply-demand mismatches and inform mitigation plans (capacity surge overflow and newly build capacity)