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# Epidemiology of enforcing travel restrictions in US peninsular regions during the COVID-19 pandemic

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# EPIDEMIOLOGY OF ENFORCING TRAVEL RESTRICTIONS IN US PENINSULAR REGIONS DURING THE COVID-19 PANDEMIC

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**Background** | Social distancing has changed lives. From the beginning of the COVID-19 pandemic in December 2019, governments across the globe have declared states of emergency and implemented isolation mandates to decrease transmission of the virus and hospital burden due to infection. Although limited by public opinion and transportation of resources, mandatory quarantines remain an effective way to dampen the spread of communicable disease.

Recently, an evaluation of the impacts of public health interventions in Wuhan, China, the origin of COVID-19, demonstrated that public health measures including travel restrictions, quarantining symptomatic patients, social distancing, and improved medical supplies coincided with significant decreases in caseload.[1] As COVID-19 case data in the Unites States continues to emerge, the effects of public health strategies need to be evaluated.

Public health interventions to quench the spread of COVID-19 varied greatly between US states. State travel restrictions differed dramatically. While some states implemented check points between borders, no state limited travel altogether.

Two peninsular regions, Barnstable County, Massachusetts, which includes Cape Cod, and Monroe County, Florida, which includes the Florida Keys, provide a natural experiment to evaluate the effectiveness of travel restrictions. The two counties are both adjacent to large metropolitan areas: Barnstable County is 53 miles from Boston, Mass. and Monroe is 51 miles from Miami, Fla. Furthermore, both metropolitan areas suffered from a high disease burden.

Because peninsular or island regions have limited ground access, it is more feasible to limit human movement, compared to a large metropolitan area with numerous entrances and exits. Travel restrictions were implemented in Monroe County, Fla but not in Barnstable County, Mass. To evaluate the effectiveness of enforced travel restrictions on COVID-19 case burden and deaths, epidemiologic data from Barnstable and Monroe County were examined.

**Methods** | *Covid-19 case burden.* Public access data on COVID-19 infections was retrospectively analyzed. Massachusetts Department of Health COVID-19 data was examined for daily incidence and death counts in Barnstable County. Florida Department of Health COVID-19 data was examined by county for daily incidence. For Florida cases, case count was recorded using the "EventDate" variable (date of symptom onset), and the date of death was reported using the "ChartDate" variable (date case was reported). Case rate was determined by the number of infections divided by US Census population estimates per 100,000 population. Descriptive statistics for Barnstable and Monroe County populations were obtained from US Census 2019 population estimates.[2]

*Travel restrictions*. Information on implemented travel restrictions was obtained from the Barnstable County Department of Health and Environment and

from the Monroe County Emergency Management websites.

**Results** | *Covid-19 case burden.* As of May 25, 2020, Barnstable County, MA had 1,277 reported cases of COVID-19 and 110 related deaths (Figure 1). Barnstable County had a case rate of 600 infections per 100,000 population. For the same period, Monroe County, FL had 107 cases and four deaths (Figure 2). Monroe County had a case rate of 144 infections per 100,00 population.

*Travel restrictions.* In Florida, the Monroe County Emergency Manager established a travel ban to the Florida Keys on March 20, 2020.[3] Check points at the bridge to the Florida Keys were implemented on March 27, 2020, prohibiting entry to anyone who could not demonstrate residency, ownership, or employment.[4] Phase 1 of Florida re-opening, the "Safe, Smart, Step-by-Step Plan for Recovery" was implemented May 4, 2020; travel restrictions within the Florida Keys were lifted but travel to the Florida Keys remains restricted at time of this report.[5]

While local citizen organizations pushed for the closure of bridges to Cape Cod in Barnstable County, no transportation-limiting quarantine measures were put into effect.[6] Individuals were asked to voluntarily quarantine for 14 days upon arrival and bring all necessary supplies for that time period.[6]

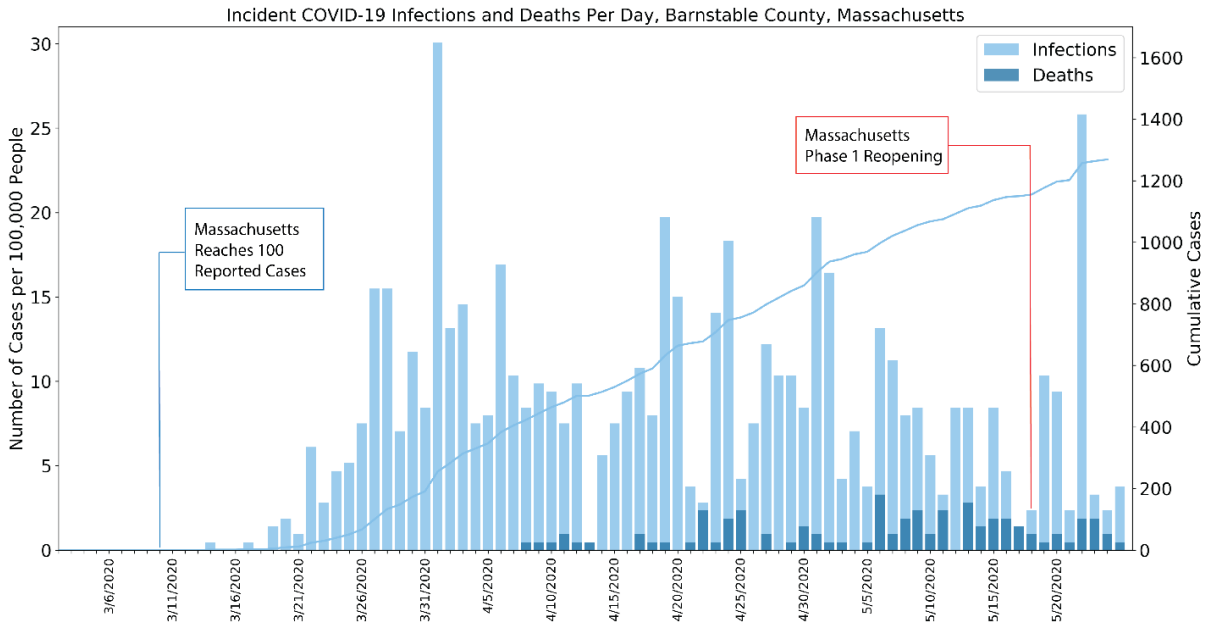


***Figure 1.*** *Reported COVID-19 infections in Barnstable County, Mass. and associated public health interventions. Bars indicate new infections and deaths per 100,000 people per day and utilizes the scale bar on the left. The line indicates the cumulative number of reported cases on each date and utilizes the scale bar on the right. Key dates indicated: Blue, Massachusetts reached 100 cases on March 12, 2020; Red, Phase 1 of Massachusetts re-opening plan began on May 18, 2020.*

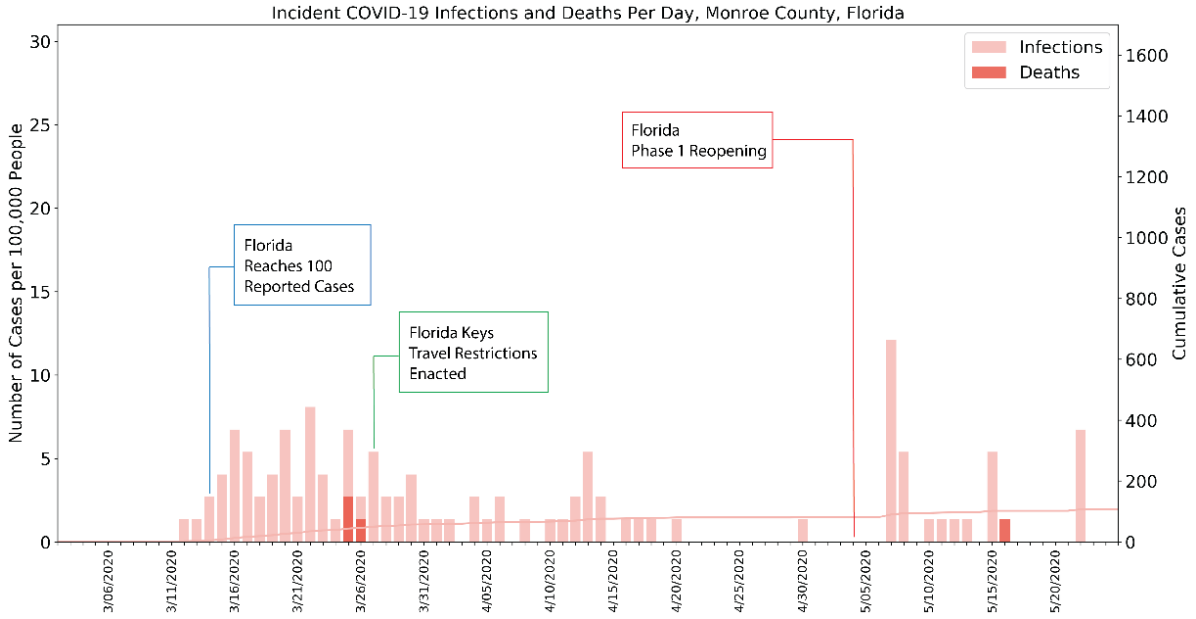


***Figure 2.*** *Reported COVID-19 infections in Monroe County, Fla and associated public health interventions. Bars indicate new infections and deaths per 100,000 people per day and utilizes the scale bar on the left. The line indicates the cumulative number of reported cases on each date and utilizes the scale bar on the right. Key dates indicated: Blue, Florida reached 100 cases on March 15, 2020; Green, Florida Keys travel restriction enacted on March 27, 2020; Red, Phase 1 of Florida re-opening plan began on May 4, 2020.*

**Discussion |** With a population 2.8 times larger than Monroe County, Fla., Barnstable County, Mass. had COVID-19 per capita rates of infection over four times higher than Monroe County. Public health interventions which aim to minimize the spread of a pandemic to regions with fewer health resources must be evaluated for their effectiveness. Physically isolated communities on peninsulas present an opportunity to examine the effects of enforced travel restrictions and quarantines on the spread of communicable disease. Although no policy statement for why travel restrictions were not in place in Barnstable but were for Monroe, we suspect the differences in policy stem from the feasibility of implementation and existing infrastructure.

The Florida Keys experience hurricanes and evacuations regularly, with 13 mandatory evacuations in the past 20 years.[7] Two roads, US 1 and Card Sound Road, control access to the Florida Keys by car. Residents know their evacuation zones and have existing documentation that facilitates forced movement of the Keys population, or the lack thereof. Cape Cod, on the other hand, has not seen a mandatory evacuation since 1991.[8] While a travel ban has been disruptive to the Keys economy, heavily reliant on tourism, the normalization of emergency measures likely lowered barriers to the implementation of travel restrictions. In Cape Cod, such restrictions may have been seen as a much more extreme measure due to the infrequency of severe natural disasters.

In Barnstable County, two bridges control access to Cape Cod, Bourne Bridge and Sagamore Bridge. In the beginning of the pandemic, Barnstable COVID-19 cases were not at elevated as those in nearby Massachusetts counties, likely limiting the perceived need for restricted access. Additionally, the perceived risk of population influx following COVID-19's pandemic designation (March 11, 2020) may have been different in the two locations. In Monroe County, this timing corresponded with the beginning of Spring Break tourist season and implementing a peninsular lockdown may have seemed more critical.[9] However, in Barnstable County, March and April are typically low tourism months and the risk of peninsular traffic may have seemed lower as a result.[10]

*Limitations*. The limitations of this study are based on the quality of the existing data. Existing data was not broken down by zip code in Massachusetts, limiting exact comparison of vulnerable peninsular regions. Additionally, specifications on where the death took place versus where the case originated is not available.

Finally, though the closest metropolitan area to Cape Cod is Boston, Mass., we cannot neglect the importance of cases introduced from other nearby high population and high COVID-19 caseload areas such as New York City and New Jersey. In contrast, Monroe Country, Fla. has no other major metropolitan neighbors besides Miami, Fla. This may affect the ability to directly compare these two peninsular counties, though any significant impact of traffic from these more distant metropolitan areas would ultimately strongly support the need to enforce travel restrictions at the state and county level as part of pandemic plans.

**Public Health Implications |** Public health relies on prevention. We demonstrate the effectiveness of travel restrictions for non-residents to peninsular areas when existing infrastructure exists to insulate a given population. Thus, in development of future emergency plans, public health officials should consider physical travel barriers in pandemic plans.

Both Barnstable and Monroe Counties are adjacent to large metropolitan areas, Boston and Miami, respectively, that have experienced similar incidences of COVID-19. Enforced travel restrictions into the Florida Keys helped lower cases of COVID-19. Ethical questions remain on the extent to which intrastate and interstate barriers to travel should be implemented and enforced. Nonetheless, we demonstrate the dramatic reduction in spread of COVID-19 when access to peninsular regions is minimized.

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