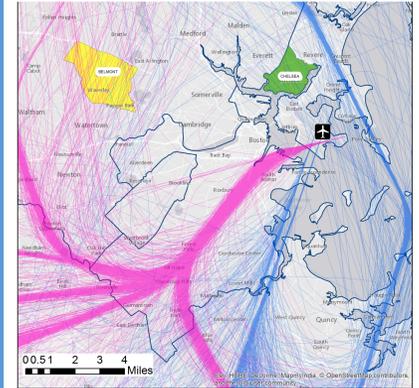


Can't hear yourself think!

Tracking change over time in ground-level aircraft noise in Belmont and Chelsea, Massachusetts

BACKGROUND

The noise generated by aircrafts is not only a source of annoyance but also a predictor of several health and economic problems, including sleep deprivation, cardiovascular diseases and property depreciation^{1,2}. There is spatial variation in the impact of noise in different areas along aircraft routes; some communities are more severely impacted than others.



Chelsea and Belmont are two sample cities that have seen a rise in complaints related to aircraft noise due to the new runway 33 Left. The Boston International Logan Airport has implemented the use of RNAV navigation technique that allows aircrafts to fly over a narrow path instead of the earlier fanned out path without any complications. However, this leads to intense noise being concentrated over some communities. The airport noise monitoring experts use Day Night Level as a noise metric. According to this metric, the noise exposure over Chelsea and Belmont is not significant enough to introduce a flight route change. However, the complaints by residents in these towns paint a different picture. Experts in the field suggest the use of a different metric like Level Weighted Population that takes into consideration the population highly annoyed by the noise exposure.

METHODOLOGY

→ Data Sources

Aircraft noise data was procured from Boston Logan Airport Noise Study and demographic data from US Census 2010 and 2014 American Community Survey data.

→ Demographic maps

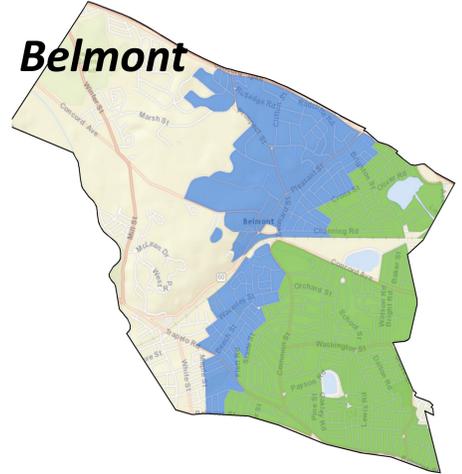
Race and ethnicity were used as the measure of demographic diversity in Chelsea and Belmont. Dot density technique was used to portray number of individuals from different races and choropleth map generated to show Hispanic origin.

→ Noise exposure maps

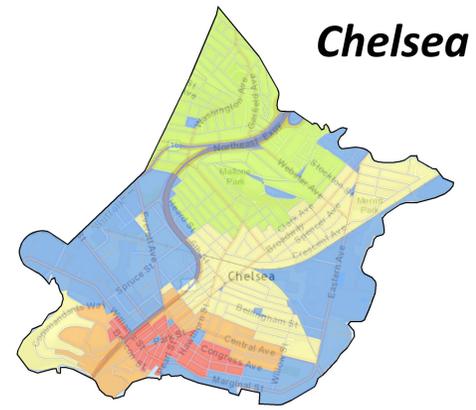
Choropleth maps were generated to visualize DNL noise exposure in 2010, 2012 and 2014 in Chelsea and Belmont.

→ Flight routes maps

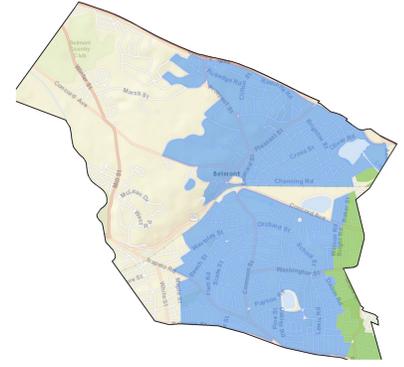
Flight routes from ESRI were joined to Census Block level data.



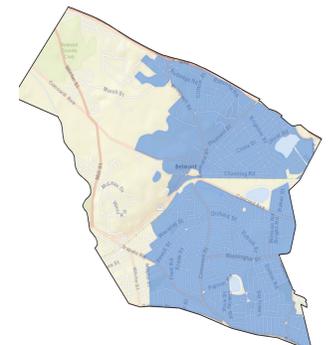
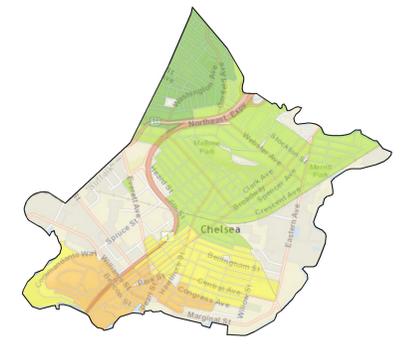
2014



Chelsea



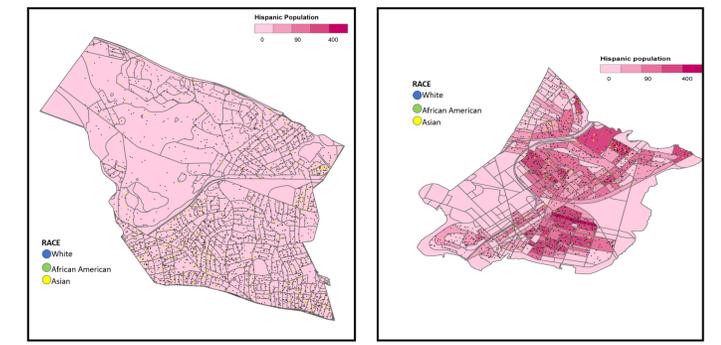
2012



2010



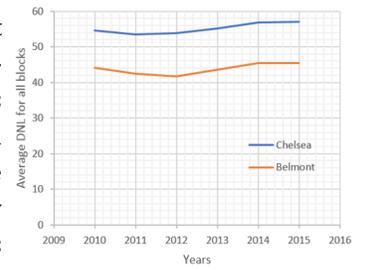
Over the years, the choice of flight routes due to the new RNAV technology has impacted Chelsea and Belmont differently.



Comparing the race and ethnicity of the residents of Chelsea and Belmont is interesting. Chelsea that has mostly foreign-born communities is the second-most densely populated city in Massachusetts whereas Belmont has majorly US born residents and is not as densely populated.

RESULTS

With a median income of \$30161, Chelsea is poorer than Belmont, having a median income of \$95377. The area in Chelsea with high density of Hispanic population intersects with the area recorded to have >65 DNL of noise in 2014. Although both towns have seen an increase in their average DNL over the years, the juxtaposition of soci-



DISCUSSIONS

As the airport continues to push the RNAV technology forward the effects of the narrow flight routes on communities remains to be taken into consideration. While Belmont faces lower levels of noise exposure from aircrafts than Chelsea, the residents of Belmont have voiced their concerns at these low DNLs of noise. Active representation in decision making bodies can be one reason for this. Using a fanned out pattern of flights can be a way of reducing intense noise faced by communities like Chelsea that are very close to the airport. Lack of use of contouring for DNL was a limitation of the analysis and should be considered in future analyses.

REFERENCES AND ACKNOWLEDGEMENTS

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 Data Sources: Boston Logan Airport Noise Study; US Census Bureau 2010; American Community Survey 2014; ESRI
 Special thanks to Prof. Thomas Stopka, Ms. Anna Kaplan and Mr. Wig Zamore

Projection: NAD 1983 State Plane Massachusetts Mainland FIPS 2001
 References:
 1. Fidell, S., Mestre, V., Schomer, P., Horonjeff, R., & Reid, T. (2014). A systematic rationale for defining the significance of aircraft noise impacts. *The Journal of the Acoustical Society of America*, 136(3), 1129-1138.
 2. Hansell, A. L., Blangiardo, M., Fortunato, L., Floud, S., de Hoogh, K., Fecht, D., ... & Beevers, S. (2013). Aircraft noise and cardiovascular disease near Heathrow airport in London: small area study. *Bmj*, 347, f5432.

