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Analysis of Equity Impacts of Cancellation of MBTA Late-Night Service

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Analysis of Equity Impacts of Cancellation of MBTA Late-Night Service

Summary

An analysis of the population affected by cancellation of the Massachusetts Bay Transportation Authority's (MBTA) Late-Night Service using the most recent American Community Survey (ACS) data and higher resolution Census geography shows that a disparate burden has been imposed on racial minorities, and also a disproportionate burden on low income populations.

MBTA's service equity analysis used an inappropriate methodology to estimate the populations with access to its late-night service and system-wide transit services. Federal Transit Administration (FTA) Circular 4702.1B Title VI Requirements and Guidelines for Federal Transit Administration Recipients, Chapter IV-14 (e) "Data Analysis" specifies that "the smallest geographic area that reasonably has access to the bus or rail stop or station" should be used to estimate transit ridership, such as Census Blocks or Block groups. Contrary to this guidance, the MBTA assumed that entire municipalities reached by MBTA transit lines constitute the service area or population with access to transit services. MBTA's methodology is unjustifiably coarse and inconsistent with best practices and mainstream transit research and understanding about transit access. More importantly, MBTA's methodology results in imprecise estimations of the affected populations and masks inequities resulting from service changes.

Background

Beginning in late March 2014, the MBTA implemented a program of extended weekend late-night hours on the rapid transit system (i.e. the T) and on 15 heavily used bus routes. This late-night service continued without changes until June 2015. In December 2015, the MBTA board directed the MBTA staff to discontinue all late-night service. Because the late night service program extended for more than 12 months, the FTA considered it a "permanent service," and its discontinuation constituted a major service change. Under US Department of Transportation regulations pertaining to Title VI of the Civil Rights Act of 1964, the MBTA was required to conduct a service equity analysis to evaluate, prior to implementation of any major service change, whether the major service change would have a discriminatory impact based on race, color, or national origin and whether low-income populations would bear a disproportionate burden or whether non-low-income populations would receive disproportionate benefits because of the changes.¹ The MBTA had not conducted the required service equity analysis prior to implementation of this program change, and was subsequently directed to do so after the fact by the FTA.²

In its service equity analysis, released in March 2016, the MBTA used two methods of analysis to assess whether discontinuation of late night service resulted in a disparate burden on minorities or a disproportionate burden

¹ Central Transportation Planning Staff (CTPS). Technical Memorandum. Service Equity Analysis of the Proposed Discontinuation of MBTA Late-Night Service. March 15, 2016. Accessible at [http://www.mbta.com/uploadedfiles/About the T/Board Meetings/Late-NightServiceDiscontinuanceSEAtoBoard31616.pdf](http://www.mbta.com/uploadedfiles/About%20the%20T/Board%20Meetings/Late-NightServiceDiscontinuanceSEAtoBoard31616.pdf)

² Dungca, N. T forced to consider late-night service alternatives. *Boston Globe*. March 16, 2016. Accessible at <https://www.bostonglobe.com/metro/2016/03/16/mbta-forced-consider-late-night-service-alternatives/GlYrZePa9EavC5QqbSYihM/story.html> ; Lawyers' Committee for Civil Rights and Economic Justice. Letter to Massachusetts Bay Transportation Authority. Re: Public Comment Re: Late Night Service Cancellation. March 30, 2016. Accessible at <http://lawyerscom.org/wp-content/uploads/2016/03/Lawyers-Committee-Letter-re-MBTA-Late-Night-Cancellation.pdf> .

on low-income populations.³ In the first method, the MBTA used rider survey data from a 2008-2009 Systemwide Rider Survey in combination with data from a March 2015 survey of late-night service passengers to estimate the comparison populations using weighted percentages. This first approach showed that discontinuation of late-night bus service imposed a disproportionate burden on low-income riders but not on minority riders. The analysis also found that discontinuation of late-night rapid transit service imposed a disparate burden on minority riders and a disproportionate burden on low-income riders. Thus, in three of out of four cases, there was a disparate or disproportionate burden imposed on the riders of concern.

The second method used to assess disparate or disproportionate burden relied on a population approach, using Census data at the scale of municipalities (i.e. cities and towns). In this Census-based approach, the MBTA assumed that the entire populations of the 175 municipalities through which any MBTA services run constitute the population with access to its services. It then compared the percentage of minority and low-income populations of this “MBTA systemwide” service area to the percentages of minority and low-income populations in the municipalities through which the late-night service operated. The result of this secondary, municipal-scale analysis was that there was no disparate burden on minorities and no disproportionate burden on the low-income population. Thus, it appeared that the results of two different forms of equity analysis were in conflict or even contradictory.

MBTA’s Census-based approach at the municipal scale was inappropriate. Federal Transit Administration (FTA) Circular 4702.1B Title VI Requirements and Guidelines for Federal Transit Administration Recipients, Chapter IV-14 (e) “Data Analysis” specifies that “the smallest geographic area that reasonably has access to the bus or rail stop or station” should be used to estimate transit ridership, such as Census Blocks or Block groups.⁴ Indeed, the scale of analysis has a significant impact on the results obtained. The analysis presented here follows FTA Title VI guidelines using Census data at the appropriate geographic scale and shows that disparate and disproportionate burdens are indeed evident in both a rider-survey analysis and population-based analysis.

Analysis

In order to analyze the impact of cancellation of the MBTA’s late-night service, we identified the population with access to MBTA’s system-wide bus, rapid transit, and commuter rail service and compared that population to the population with access to the late-night bus and rapid transit service. A resident is considered to have access if he is within one-quarter mile of an MBTA bus stop, one-half mile of a rapid transit (i.e. subway or light rail) station, and up to three miles of a commuter rail station. This geographic definition of access is consistent with FTA Circular 4702.1B Title VI Requirements and Guidelines for Federal Transit Administration Recipients, Chapter IV-14, as well as decades of research on transit behavior, and the judgment of most planners and transit researchers.⁵

³ Central Transportation Planning Staff (CTPS). Technical Memorandum. Service Equity Analysis of the Proposed Discontinuation of MBTA Late-Night Service. March 15, 2016.

⁴ Accessible at <https://www.transit.dot.gov/regulations-and-guidance/fta-circulars/title-vi-requirements-and-guidelines-federal-transit>

⁵ Ayvalik, C.K. and Khisty, C.J., 2002. Heuristic analysis of impacts of commuter rail station consolidation on pedestrian access. *Transportation Research Record*, 1793, 47–54; Beimborn, E.A., Greenwald, M.J., and Jin, X., 2003. Accessibility, connectivity, and captivity: impacts on transit choice. *Transportation Research Record*, 1835, 1–9; Biba, S. 2010. A new method for determining the population with walking access to transit. *International Journal of Geographical Information Science*. 24(3), 347-364; Burkhardt, J.E., 2003. Critical measures of transit service quality in the eyes of older travelers. *Transportation Research Record*, 1835, 84–92; Dill, J., 2003. Transit use and proximity to rail: results from large employment sites in the San Francisco, California, bay area. *Transportation Research Record*, 1835, 19–24; Evans, J.E., Perincherry, V., and Douglas, G.B.I., 1997. Transit friendliness factor: approach to quantifying transit access environment in a transportation

In order to determine the demographic characteristics of residents with access to these MBTA transit services, we used the U.S. Census Bureau's 2010-2014 American Community Survey 5-Year Estimates (ACS) at the Block Group level.⁶ ACS data is the most recent Census data available, and the Block Group is the smallest geographic unit of analysis at which the necessary demographic data is made available.

Using a Geographic Information System (GIS), one-quarter mile buffers were constructed around all MBTA bus stops, one-half mile around rapid transit stations, and three miles around commuter rail stations.⁷ The populations of Census Block Groups that intersected these buffers were considered to have access to bus, rapid transit, and commuter rail services (see map).

Using this buffer-intersect method, the minority population percentage with access to all MBTA bus stops, rapid transit stops, and commuter rail stations (i.e. MBTA systemwide access) was calculated and compared to the minority population percentage with access to late-night MBTA bus stops and rapid transit stations (i.e. T stops).⁸ In addition to the systemwide comparison, the minority population percentage with access to just MBTA bus stops and rapid transit stations was compared to the minority population percentage with access to late-night MBTA bus stops and rapid transit stations. Tables 1 and 2 show the results of this analysis. Using MBTA Title VI criterion, cancellation of the late-night service imposes a disparate burden on racial minorities.

The low income population percentage with systemwide MBTA access, as well as access to just bus and rapid transit stops, was similarly calculated and compared to the low income population percentage with access to late-night MBTA bus stops and rapid transit stations.⁹ Tables 3 and 4 show the results of this analysis. Using MBTA Title VI criterion, cancellation of the late-night bus service imposes a disproportionate burden on low income groups, although it does not do so with respect to rapid transit.

planning model. *Transportation Research Record*, 1604, 32–39; Hsiao, S., et al., 1997. Use of geographic information system for analysis of transit pedestrian access. *Transportation Research Record*, 1604, 50–59; Loutzenheiser, D.R., 1997. Pedestrian access to transit: model of walk trips and their design and urban form determinants around bar area rapid transit stations. *Transportation Research Record*, 1604, 40–49; O'Neill, W.A., Ramsey, R.D., and Chou, J., 1992. Analysis of transit service areas using geographic information systems. *Transportation Research Record*, 1364, 131–138; O'Sullivan, S. and Morrall, J., 1996. Walking distances to and from light-rail transit stations. *Transportation Research Record*, 1538, 19–26; Phillips, C.G. and Edwards, H.R., 2002. Socioeconomic, community-based approach for developing integrated mass transit systems application to city of Baltimore, Maryland. *Transportation Research Record*, 1797, 71–79; Zhao, F., et al., 2003. Forecasting transit walk accessibility – regression model alternative to buffer method. *Transportation Research Record*, 1835, 34–41.

⁶ Block groups are statistical divisions of census tracts and generally contain between 600 and 3,000 people. See U.S. Census, Geography, Reference, Geography Atlas – Block Groups.

<http://www.census.gov/geo/reference/webatlas/blockgroups.html>

⁷ GIS files for MBTA stops and routes on bus, rapid transit, and commuter rail were obtained from MassGIS. Accessible at <http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/layerlist.html>

⁸ Minority population was defined as the population of each Census Block Group that are Hispanic or non-White using 2014 ACS 5-year estimates Table B03002: Hispanic or Latino Origin by Race. This calculation of minority is consistent with FTA Title VI guidelines.

⁹ MBTA Title VI program defines a low-income rider as one whose household income is less than 60 percent of the median household income of the MBTA service area. The median of median household incomes of Block Groups within the MBTA Service Area for 2010 - 2014 was \$73,337. Under the MBTA Title VI program, low income riders are defined as those whose household income is less than 60% of that level, or \$44,002.20. Low income ridership was estimated using a count of households by Block Group with incomes at or below that income threshold. Median household income of Block Groups was obtained from 2014 ACS 5-year estimates Table B19013: Median Household Income in the Past 12 Months. Counts of households falling within specific income categories were obtained from ACS 2014 5-year estimates Table B19001: Household Income in the Past 12 Months.

MBTA Late-Night Service Area

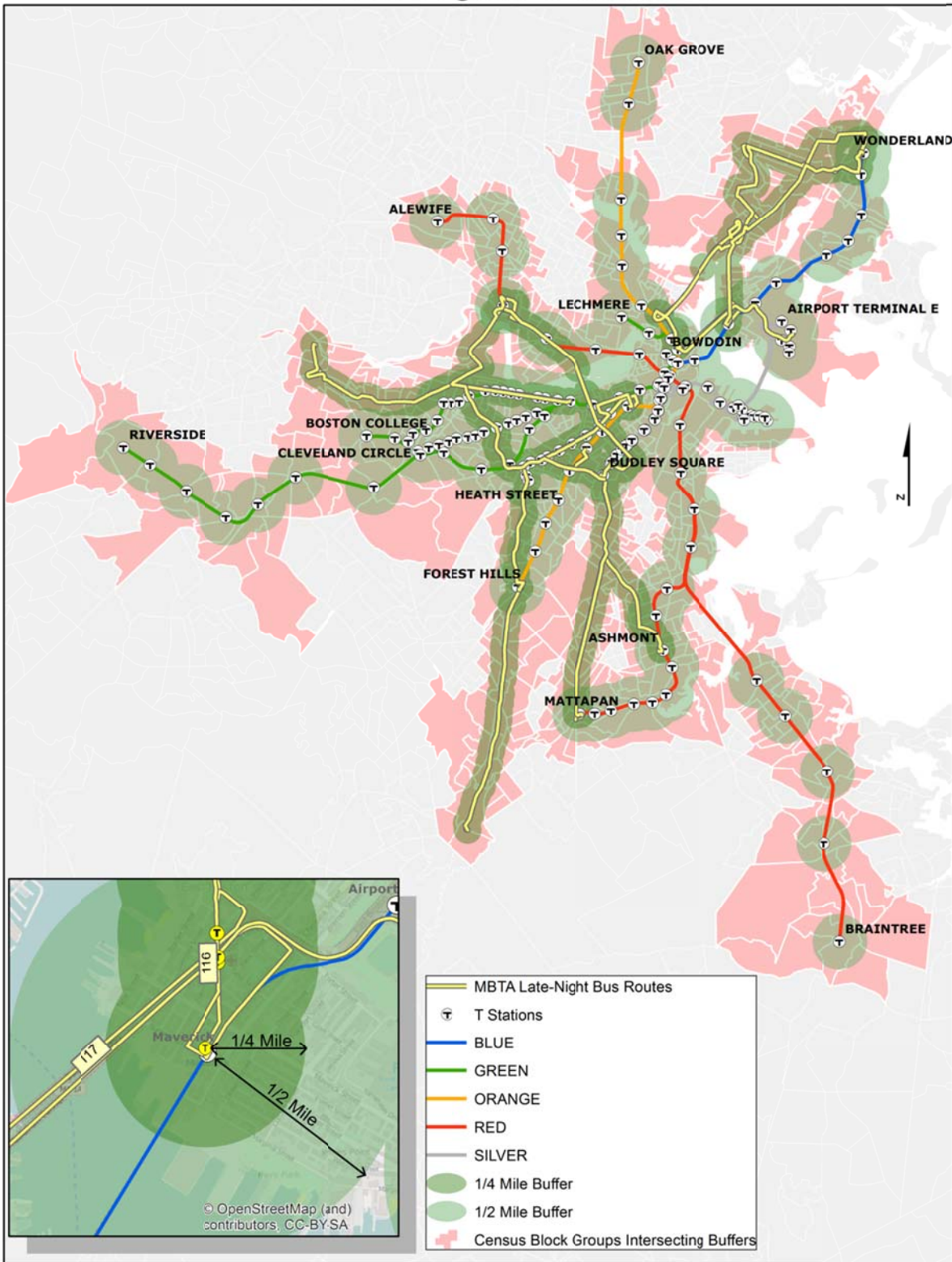


Table 1. Assessment of Disparate Burdens on Minority Population Due to Discontinuance of Late-Night Bus Service Using ACS 2014-2010 Block Group Data

Metric	Value
Population in MBTA Service Area	4,311,930
Population within 1/4 mile of all MBTA Bus Stops	2,233,310
Minority population in MBTA Service Area	1,281,726
Minority population within 1/4 mile of all MBTA Bus Stops	802,666
Minority population percentage in MBTA Service Area	30%
Minority population percentage within 1/4 mile of all MBTA Bus Stops	36%
Population within 1/4 mile of late-night MBTA Bus Stops	554,408
Minority population within 1/4 mile of late-night MBTA Bus Stops	297,015
Minority population percentage within 1/4 mile of late-night MBTA Bus Stops	54%
Ratio of late-night bus to all MBTA bus minority population	1.49
Ratio of late-night bus to systemwide minority population	1.80
Disparate burden threshold	>1.20
Result of disparate burden analysis	DISPARATE BURDEN

Table 2. Assessment of Disparate Burdens on Minority Population Due to Discontinuance of Late-Night Bus and Rapid Transit Services Using ACS 2014-2010 Block Group Data

Metric	Value
Population in MBTA Service Area	4,311,930
Population within 1/4 mile of all MBTA Bus and 1/2 mile of all T Stops	2,243,861
Minority population in MBTA Service Area	1,281,726
Minority population within 1/4 mile of all MBTA Bus and 1/2 mile of all T Stops	805,264
Minority population percentage in MBTA Service Area	30%
Minority population percentage within 1/4 mile of all MBTA Bus and 1/2 mile of all T Stops	36%
Population within 1/4 mile of late-night MBTA Bus and 1/2 mile of T Stops	1,003,519
Minority population within 1/4 mile of late-night MBTA Bus and 1/2 mile of T Stops	478,284
Minority population percentage within 1/4 mile of late-night MBTA Bus and 1/2 mile of T Stops	48%
Ratio of late-night to all MBTA bus and T minority population	1.33
Ratio of late-night to systemwide minority population	1.60
Disparate burden threshold	>1.20
Result of disparate burden analysis	DISPARATE BURDEN

Table 3. Assessment of Disproportionate Burdens on Low Income Population Due to Discontinuance of Late-Night Bus Service Using ACS 2014-2010 Block Group Data

Metric	Value
Households within MBTA Service Area	1,634,528
Households within 1/4 mile of all MBTA Bus Stops	867,072
Low income households in MBTA Service Area	548,446
Low income households within 1/4 mile of all MBTA Bus Stops	307,807
Low income household percentage in MBTA Service Area	34%
Low income household percentage within 1/4 mile of all MBTA Bus Stops	35%
Households within 1/4 mile of late-night MBTA Bus Stops	210,308
Low income households within 1/4 mile of late-night MBTA Bus Stops	90,512
Low income household percentage within 1/4 mile of late-night MBTA Bus Stops	43%
Ratio of late-night bus to all MBTA bus low income households	1.23
Ratio of late-night bus to systemwide low income households	1.28
Disproportionate threshold	>1.20
Result of disproportionate burden analysis	DISPROPORTIONATE BURDEN

Table 4. Assessment of Disproportionate Burdens on Low Income Population Due to Discontinuance of Late-Night Bus and Rapid Transit Services Using ACS 2014-2010 Block Group Data

Metric	Value
Households within MBTA Service Area	1,634,528
Households within 1/4 mile of all MBTA Bus and 1/2 mile of T Stops	879,199
Low income households in MBTA Service Area	548,446
Low income households within 1/4 mile of all MBTA Bus and 1/2 mile of T Stops	308,533
Low income household percentage in MBTA Service Area	34%
Low income household percentage within 1/4 mile of all MBTA Bus and 1/2 mile of T Stops	35%
Households within 1/4 mile of late-night MBTA Bus and 1/2 mile of T Stops	393,848
Low income households within 1/4 mile of late-night MBTA Bus and 1/2 mile of T Stops	156,048
Low income household percentage within 1/4 mile of late-night MBTA Bus and 1/2 mile of T Stops	40%
Ratio of late-night to all MBTA bus and T low income households	1.13
Ratio of late-night to systemwide low income households	1.18
Disproportionate burden threshold	>1.20
Result of disproportionate burden analysis	NO DISPROPORTIONATE BURDEN

Conclusion

In order to properly estimate the population affected by changes in transit services, it is necessary to identify populations with realistic access to these services; those populations within approximately one-quarter mile of bus stops, one-half mile of rapid transit stations, and three miles of commuter rail stations. When those

populations are identified, analysis shows that cancellation of MBTA's late-night bus and rapid transit services imposes disparate and disproportionate burdens on racial minorities and low income populations in at least three out of four cases. These findings hold true whether late night access populations are compared with systemwide MBTA populations (as MBTA did in its analysis) or just those populations with access to bus and rapid transit stops. It is worth noting that the assessment of disproportionate burden on low-income populations with respect to late-night bus and rapid transit access (Table 4) falls just short of the disproportionate burden threshold by only 0.02 or 2 percent. The fact that MBTA's rider survey analysis found there to be a disproportionate burden on low-income riders with respect to late-night rapid transit access suggests that the difference found here is likely insignificant, such that a disproportionate burden is more likely than not. Nevertheless, the results of this population analysis are more consistent with the analyses using rider survey data. It is clear that cancellation of MBTA's late-night service has imposed disparate and disproportionate burdens on minority and low income populations.

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