Service Equity Analysis
Ridership vs. Population Data

Rev. 11/07/12
Overview

• Describe FTA’s role in reviewing the methodology
• Data used and why
• Step-by-step illustrations on a service equity analysis
• Examples are for ILLUSTRATIVE PURPOSES ONLY
• Examples will use population data or ridership data
Analysis Submission & Assistance

- Service Equity analyses are part of your Title VI program if you are a transit provider with 50 or more fixed route vehicles in peak service located in a UZA of 200,000 + pop.
- FTA regions can provide technical assistance on the methodology prior to Board Action.
- After Board Approval, FTA will not provide technical assistance.
- FTA can provide technical assistance on the methodology to examine whether the analysis is properly documented.
What Should be Included in Service Equity Analysis

Requirements and Guidelines
Chapter IV Requirements for Fixed Route Providers

• “Major Service Change” policy defined
• Describe how the proposed service change meets your definition of a major service change as defined in your Title VI Program.
• Analysis Framework:
  – Data Set(s) Described
  – Comparison analysis
    • Comparison of impacts using population data around impacted routes to population of service area; or
    • Comparison of impacts using ridership data of impacted routes to ridership of service area
Chapter IV Requirements for Fixed Route Providers Cont.

• Analysis should include:
  – Step-by-step analytical methodology
  – Overlay Maps if using population data
  – Accompanied by the tables describing impacts
  – Narrative of method of analysis
  – Applies “adverse effects” definition consistently
Chapter IV Requirements for Fixed Route Providers Cont.

• Analysis should include:
  – Applies “disparate impact/disproportionate burden policy” consistently
  – Provides a conclusion (e.g., whether there is disparate impact or not)
  – If there is a disparate impact, the legal test must be properly documented
  – If there is a disproportionate burden, take steps to avoid, minimize or mitigate impacts where practicable
Data

Requirements and Guidelines
Pre-Analysis Considerations

• What datasets will you use?
  • Population or
  • Ridership

• **Population** compares the population in Census blocks or block groups served by the affected route(s) with the population of the service area

• **Ridership** compares the ridership of the affected route(s) with the ridership of the system
Clear Analytical Approach

- Dataset(s) in the analysis must be clear *(using either population or ridership data)*, and include reasons for the dataset(s) chosen, and techniques for collecting the data.

- If agency uses population data, it must describe the geographic level used to measure minority and low-income concentrations (Census tract, block, or TAZ to compare with population of service area).

- If agency uses ridership data, it must describe the routes impacted and the minority and low-income concentrations (to compare to system-wide ridership).

A Traffic Analysis Zone (TAZ) is a special area delineated by state and/or local officials for tabulating traffic-related data.
Pre-Analysis Considerations (Cont.)

• If using population data, at which geographic level will you measure minority and low-income concentrations?
  – Census block
  – Census block group or tract
  – Traffic analysis zone

• Describe techniques/technologies to collect data
Determining Data for GIS Analysis

- Obtain Block, Census tract, or Traffic Analysis Zone-level Household data
  - Race and ethnicity
  - Income
  - National origin
Assemble Information Needed for Analysis

• Demographic Data
  – U.S. Census
  – Local Data
• GIS Layers
  – Census Block
  – Census Tract
  – Traffic Analysis Zone (TAZ)
  – Route maps
• Ridership Data
  – Transit Rider Origin and Destination Surveys

A TAZ is a special area delineated by state and/or local officials for tabulating traffic-related data
Ridership Data for Rider Analysis

• Identify transit riders using affected routes
  – Route change
  – Headway change
  – Span of service change
  – Route elimination

• Identify minority and low-income riders
Illustrative Purposes ONLY

Examples are to assist you in understanding the concepts
Assessing Service with Population Data

Scenario A
Major Service Change Policy

• Our Sample Major Service Change definition:
  
  • The establishment of new bus or rail routes
  • A reduction of service on a given route of more than 20% of its route miles on any bus or rail route
  • The elimination of any bus or rail service
  • A major modification that results in a 25% or greater reduction in the number of daily service hours provided
Adverse Effects: Impacts in relation to “Major Service Change”

- Consider the degree of adverse effects/impacts, and analyze those impacts when planning changes.
- Analysis between existing and proposed service changes:
  - Service changes that reduce service (eliminate route, removing trips on a route, changing span of service)
  - Service changes that change the frequency of service (headway changes)
  - Disparate impact analysis should consider the degree of adverse affects
If there is a potential disparate impact

If a disparate impact is found, the transit provider may implement the service change only if:

“the recipient (1) has a substantial legitimate justification for the proposed service change; **and** (2) the transit provider can show that there are no alternatives that would have a less disparate impact on minority riders but would still accomplish the transit provider’s legitimate program goals.”
Disparate Impact
Definition and Disparate Impact Policy

Requirements and Guidelines
Disparate Impact Definition

• Facially neutral policy or practice that disproportionately affects members of a protected class identified by race, color, or national origin;
• The Recipient’s policy or practice lacks a substantial legitimate justification; and
• where there exists one or more alternatives that would serve the same legitimate objectives, but with less disproportionate effect on the basis of race, color, or national origin
Consistent Disparate Impact Policy

• Policy is clearly stated
• Consistent with the policy in your approved Title VI program
• Application is mathematically consistent throughout the analysis
• **Disparate impact policy defines a material difference**
  – May be presented as a statistical percentage of impacts borne by minority populations
  – Has to pass the “so what” test
Disparate Impact Policy

• Disparate Impact Policy is a policy where the change is deemed materially different:

  – Our Sample agency has defined its disparate impact policy to be +/-2% statistical difference between the effects on minorities compared to the impacts borne by non-minority passengers:

    • Material differences like this must be applied to system-wide demographics to a) individual routes and b) routes cumulatively
Disproportionate Burden Policy

• Disproportionate Burden Policy is a policy where the change is deemed materially different on low-income populations

Our Sample agency has defined its disproportionate burden policy as +/-2% statistical difference between the effects on low-income populations compared to the impacts borne by non-low-income passengers:

• Material difference will apply system-wide demographics to a) individual routes and b) routes cumulatively
Assessing Impacts

• Assess impacts on minority and low-income populations at GIS level:
  – MAPS of proposed changes and demographic data will assist in this analysis

• Tables showing impacts of each type of route or service change (routing frequency, span of service, addition or elimination of routes).
Example 1: GIS Analysis
MWRTA, MA – Area Map

Metro West Regional Transit Authority (MWRTA) Data

- Total Pop = 242,916
- Total HH = 97,524
- Minority Pop = 50,829
- Percent minority = 21%
- Median HH Income = $93,000
- 60% of median HH Income = $57,000
- Percent Low-Income Pop = 18%
GIS Analysis – Map Existing Transit Routes on TAZ Layer
GIS Analysis – Map of Low-Income Areas

Low-income threshold is 18% of regional population
GIS Analysis – Transit Routes on Low-Income Areas
GIS Analysis – Map of Minority Areas

Minority threshold of 21% determined by total service area population
GIS Analysis – Transit Routes on Minority Areas
Sample A: Service Change

Analysis must identify impacts of service change to:

1. Low-income and minority populations
2. Population around Impacted transit routes as compared to population of service area
GIS Analysis – Overlay Affected Routes to Identify Low-Income TAZs

¼ mile buffer is used to identify the affected population
GIS Analysis - Eliminated Routes on Minority TAZs
GIS Analysis – Overlay Affected Route to Determine Minority TAZs

¼ mile buffer is used to identify the affected population
Calculate Effects of Service Change Using Population

**MWRTA - Regional Population & Household Data**

<table>
<thead>
<tr>
<th>Total Population</th>
<th>Minority Population</th>
<th>Percent Minority</th>
<th>Low-income Population</th>
<th>Percent Low-income</th>
</tr>
</thead>
<tbody>
<tr>
<td>242,916</td>
<td>50,829</td>
<td>21%</td>
<td>43,000</td>
<td>18%</td>
</tr>
</tbody>
</table>

**MWRTA - Affected TAZ Area Population Data**

<table>
<thead>
<tr>
<th>Route #</th>
<th>Change type</th>
<th>Total Population in the</th>
<th>Minority Population</th>
<th>Percent Minority</th>
<th>Low-income Population</th>
<th>Percent Low-income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Route 6</td>
<td>Discontinued</td>
<td>5,870</td>
<td>800</td>
<td>14%</td>
<td>250</td>
<td>4%</td>
</tr>
<tr>
<td>Route 7</td>
<td>Discontinued</td>
<td>9,500</td>
<td>2,500</td>
<td>26%</td>
<td>2,100</td>
<td>22%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>15,370</td>
<td>3,300</td>
<td>21%</td>
<td>2,350</td>
<td>15%</td>
</tr>
</tbody>
</table>

Disparate Impact Policy +/-2%.
Regional Population DATA of 21% compared to 21% of total routes adversely effected; compare the 21% to Route 7 which is 26%

Set threshold with demographic data
Analysis with demographic data
Calculate Effects of Service Change

Statistical Significance

<table>
<thead>
<tr>
<th>Geographic Area</th>
<th>Affected TAZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>60%</td>
<td>50%</td>
</tr>
<tr>
<td>50%</td>
<td>40%</td>
</tr>
<tr>
<td>40%</td>
<td>30%</td>
</tr>
<tr>
<td>30%</td>
<td>20%</td>
</tr>
<tr>
<td>20%</td>
<td>10%</td>
</tr>
<tr>
<td>10%</td>
<td>0%</td>
</tr>
</tbody>
</table>

5% DELTA
What Does This Mean?

– Grantee needs to conclude disparate impact or not based on their own analysis.
– The narrative, along with the tables should be able to draw a conclusion.
– Again, grantees can carry out actions that may result in disparate impact as long as they have properly documented that they have met the legal test.
Example 2: GIS Analysis – Map Existing Transit Routes
GIS Analysis – Map Predominantly Minority Areas

Minority threshold of 37% determined by total service area population
GIS Analysis – Map Predominantly Low-Income Areas

For this analysis, low-income means a person whose household income is at or below the U.S. Department of Health and Human Services poverty guidelines.

Low-income threshold of 35% determined by total regional population.
Example 2: Service Change

Analysis must identify impacts of service change to:

1. Low-income and minority populations
2. Population of Impacted transit routes as compared to population of service area
GIS Analysis – Overlay Affected Route to Determine Minority TAZs

¼ mile buffer is used to identify the affected population
Calculate Effects of Service Change Using Population

### Regional Population Data

<table>
<thead>
<tr>
<th>Total Population</th>
<th>Minority Population</th>
<th>Percent Minority</th>
<th>Low-Income Population</th>
<th>Percent Low-Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,081,726</td>
<td>403,736</td>
<td>37%</td>
<td>378,604</td>
<td>35%</td>
</tr>
</tbody>
</table>

Set threshold with demographic data

### Affected TAZ area Population Data

<table>
<thead>
<tr>
<th>Route #</th>
<th>Change type</th>
<th>Day</th>
<th>Population in the Corridor</th>
<th>Minority Population</th>
<th>Percent Minority</th>
<th>Minority Threshold</th>
<th>Low-income Population</th>
<th>Percent Low-Income</th>
<th>Low-Income Threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>Segments discontinued</td>
<td>Weekday</td>
<td>5,250</td>
<td>2,783</td>
<td>53%</td>
<td>37%</td>
<td>714</td>
<td>14%</td>
<td>35%</td>
</tr>
<tr>
<td>22</td>
<td>Segments discontinued</td>
<td>Saturday</td>
<td>5,250</td>
<td>2,783</td>
<td>53%</td>
<td>37%</td>
<td>714</td>
<td>14%</td>
<td>35%</td>
</tr>
<tr>
<td>22</td>
<td>Segments discontinued</td>
<td>Sunday</td>
<td>5,250</td>
<td>2,783</td>
<td>53%</td>
<td>37%</td>
<td>714</td>
<td>14%</td>
<td>35%</td>
</tr>
</tbody>
</table>

Analysis with demographic data/GIS
Assessing Service Impacts Using Ridership Data

Scenario A
Ridership

• GIS maps can be helpful but are not required
• Ridership data must be by route in order to compare the minority and low-income populations riding the impacted routes with the minority and low-income populations of the system
• Document surveys taken, sample sizes, etc. to show adequate ridership data for the service equity analysis
Calculate Effects of Service Change Using Ridership

Table 3 - MWRTA - Regional Ridership Data

<table>
<thead>
<tr>
<th>Total Systemwide Riders</th>
<th>Minority Riders</th>
<th>Percent Minority</th>
<th>Low-Income Riders</th>
<th>Percent Low-Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td>2,542</td>
<td>1,057</td>
<td>42%</td>
<td>950</td>
</tr>
</tbody>
</table>

Table 4 - MWRTA - Affected Route Ridership Data

<table>
<thead>
<tr>
<th>Route No &amp; Day</th>
<th>Discontinued Segment - Ridership</th>
<th>Minority Riders</th>
<th>% Minority Riders</th>
<th>Low-Income Riders</th>
<th>% Low-Income Riders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Route 6</td>
<td>Weekday</td>
<td>184</td>
<td>55</td>
<td>30%</td>
<td>37</td>
</tr>
<tr>
<td>Route 7</td>
<td>Weekday</td>
<td>672</td>
<td>380</td>
<td>57%</td>
<td>400</td>
</tr>
<tr>
<td>Total</td>
<td>Weekday</td>
<td>856</td>
<td>435</td>
<td>51%</td>
<td>437</td>
</tr>
</tbody>
</table>

Disparate Impact Policy +/-2%:
Regional Ridership of 42% compared to 51% of total adverse affected

Set threshold with ridership data

Analysis with ridership data
Calculate Effects of Service Change

Statistical Significance

- Systemwide Riders
- Affected Riders

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Systemwide Riders</th>
<th>Affected Riders</th>
</tr>
</thead>
<tbody>
<tr>
<td>60%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

15% Delta
## Impact of Potential Service Adjustments on Minority and Low Income Passengers

### Weekly Numbers

<table>
<thead>
<tr>
<th>Bus Lines</th>
<th>Wkly Ons</th>
<th>Under20k</th>
<th>Minority</th>
<th>%&lt;20k</th>
<th>% Min</th>
<th>Impacted</th>
<th>Under20k</th>
<th>Minority</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>50,340</td>
<td>25,081</td>
<td>21,602</td>
<td>50%</td>
<td>43%</td>
<td>1,453</td>
<td>724</td>
<td>624</td>
</tr>
<tr>
<td>14</td>
<td>56,929</td>
<td>20,727</td>
<td>10,639</td>
<td>36%</td>
<td>19%</td>
<td>4,623</td>
<td>1,683</td>
<td>864</td>
</tr>
<tr>
<td>15</td>
<td>39,479</td>
<td>15,902</td>
<td>7,414</td>
<td>40%</td>
<td>19%</td>
<td>2,396</td>
<td>965</td>
<td>450</td>
</tr>
<tr>
<td>19</td>
<td>18,396</td>
<td>7,309</td>
<td>4,509</td>
<td>40%</td>
<td>25%</td>
<td>688</td>
<td>273</td>
<td>169</td>
</tr>
<tr>
<td>20</td>
<td>52,845</td>
<td>21,450</td>
<td>13,172</td>
<td>41%</td>
<td>25%</td>
<td>1,572</td>
<td>638</td>
<td>392</td>
</tr>
<tr>
<td>23</td>
<td>952</td>
<td>446</td>
<td>248</td>
<td>47%</td>
<td>26%</td>
<td>237</td>
<td>111</td>
<td>62</td>
</tr>
<tr>
<td>47</td>
<td>4,562</td>
<td>679</td>
<td>2,012</td>
<td>15%</td>
<td>44%</td>
<td>659</td>
<td>98</td>
<td>291</td>
</tr>
<tr>
<td>59</td>
<td>1,781</td>
<td>455</td>
<td>414</td>
<td>26%</td>
<td>23%</td>
<td>280</td>
<td>71</td>
<td>65</td>
</tr>
<tr>
<td>62</td>
<td>13,596</td>
<td>4,177</td>
<td>4,093</td>
<td>31%</td>
<td>30%</td>
<td>1,161</td>
<td>357</td>
<td>349</td>
</tr>
<tr>
<td>67</td>
<td>6,294</td>
<td>3,264</td>
<td>3,079</td>
<td>52%</td>
<td>49%</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>70</td>
<td>19,346</td>
<td>7,186</td>
<td>4,965</td>
<td>37%</td>
<td>26%</td>
<td>1,014</td>
<td>377</td>
<td>260</td>
</tr>
<tr>
<td>75</td>
<td>65,337</td>
<td>33,005</td>
<td>22,653</td>
<td>51%</td>
<td>35%</td>
<td>998</td>
<td>402</td>
<td>187</td>
</tr>
<tr>
<td>115</td>
<td>19,406</td>
<td>7,565</td>
<td>3,864</td>
<td>39%</td>
<td>20%</td>
<td>378</td>
<td>150</td>
<td>93</td>
</tr>
<tr>
<td>119</td>
<td>21,728</td>
<td>7,379</td>
<td>4,359</td>
<td>34%</td>
<td>20%</td>
<td>931</td>
<td>378</td>
<td>232</td>
</tr>
</tbody>
</table>

### Ridership Adjusted Lines

<table>
<thead>
<tr>
<th>Lines</th>
<th>Wkly Ons</th>
<th>Under20k</th>
<th>Minority</th>
<th>%&lt;20k</th>
<th>% Min</th>
<th>Impacted</th>
<th>Under20k</th>
<th>Minority</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>370,990</td>
<td>154,623</td>
<td>103,022</td>
<td>42%</td>
<td>28%</td>
<td>16,390</td>
<td>6,228</td>
<td>4,037</td>
</tr>
</tbody>
</table>

### Total Percent Impacted

<table>
<thead>
<tr>
<th>Ridership All Bus Lines</th>
<th>1,266,568</th>
<th>527,728</th>
<th>381,169</th>
<th>42%</th>
<th>30%</th>
</tr>
</thead>
</table>

“**Impacted Ons**” calculated by taking the number of trips eliminated in a given hour times the number of passengers per trip during that hour and adding up the number of passengers impacted in a week. **Disparate Impact Policy +/-5%**
If There is a Potential Disparate Impact

If a disparate impact is found, the transit provider may implement the service change only if:

“the recipient (1) has a substantial legitimate justification for the proposed service change; and (2) the transit provider can show that there are no alternatives that would have a less disparate impact on minority riders but would still accomplish the transit provider’s legitimate program goals.”
Steps Taken if *Disparate Impact* Found

- **Disparate Impact?**
  - Yes
  - No

  **Analysis Complete**

  **Take Actions to Avoid, Minimize, Mitigate (Revise Changes)**

  **Reanalyze Changes for Disparate Impact**

  **Legal Test Met**
  - Yes
  - No

  **Analysis Complete**

  **Possible Title VI Violation**
Alternative Services Available

• What alternative services are available for people impacted by the service change?
• How would the use of alternatives affect riders’ travel times and costs?
  – Example: Other lines or services, potentially involving transfers and/or other modes, that connect affected riders with destinations they typically access
  – Can test alternatives using a trip planner
Determine Mitigation

**Avoid**
- The service change that results in WORST IMPACTS
- Revise service change, requiring reanalysis

**Minimize**
- Alignment changes located to nearby lines with same origin and trip destinations
- Cost containment strategies to limit impacts to riders.
- Market mitigation strategies that may help offset impacts

**Mitigate**
- Expand demand-response service in impact area
- Guaranteed ride home program
Recap

• Major Service Change defined
• Describe how the service change exceeded major service change

✓ Analysis Framework Clearly Described
  – Data Set(s) Described
  – Comparison analysis
    • Comparison of impacts using population data to population of service area; or
    • Comparison of impacts using ridership data to ridership of service area
Recap

• Analysis should include
  – Step-by-step analytical methodology
  – Overlay Maps
  – Accompanied by the tables describing impacts
  – Narrative of method of analysis
  – “Adverse effects” definition applied consistently
  – “Disparate impact policy” applied consistently
  – Provide a conclusion (whether there is a disparate impact or not)
  – Determine whether there is a disproportionate burden or not
  – Legal test properly documented
  – Explore avoidance, minimizing impacts, mitigation
Questions?

Contact(s): FTAtitleVItraining@dot.gov