Parking counts – Understanding demand in cities

July 12, 2017

Chris McCahill
State Smart Transportation Initiative

Kasia Hart
Metropolitan Area Planning Council
A network of reform-oriented state DOTs, founded in 2010 and housed at the University of Wisconsin.

- Executive-level Community of Practice
- Technical assistance
- Resource for the transportation community
Metro Boston Perfect Fit Parking Initiative

PHASE 1: NEW METRICS AND MODELS FOR PARKING SUPPLY & DEMAND

Kasia Hart, Transportation Policy Associate

MAPC
METROPOLITAN AREA PLANNING COUNCIL
About MAPC

• Regional Planning Agency (RPA) for 101 cities and towns in Greater Boston

• Promote smart growth and regional collaboration
Why Parking?

• Parking: link between transportation and land use planning

• Oftentimes, parking requirements are based on outdated information, and not reflective of actual demand for parking

• Parking is expensive to construct, and when overbuilt, can increase housing construction costs, hinder development, and limit use of alternative modes of transportation
The present values below represent regional average values (from field work) for building and parking specifications. These represent the default values for which all parking use ratios are estimated. See below the legend for guidance on unbundled and affordable housing options.

<table>
<thead>
<tr>
<th></th>
<th>Number of Units</th>
<th>Average Rent ($)</th>
<th>Average Area (sq ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studios</td>
<td>20</td>
<td>$975</td>
<td>550</td>
</tr>
<tr>
<td>1 Bedroom</td>
<td>60</td>
<td>$1,150</td>
<td>750</td>
</tr>
<tr>
<td>2 Bedroom</td>
<td>60</td>
<td>$1,450</td>
<td>950</td>
</tr>
<tr>
<td>3+ Bedroom</td>
<td>10</td>
<td>$1,575</td>
<td>1200</td>
</tr>
<tr>
<td>Total</td>
<td>150</td>
<td>$1,275</td>
<td>125,000</td>
</tr>
</tbody>
</table>

Number of Affordable Units: 20
Monthly Price per Stall: $50

rightsizedparking.org
Perfect Fit Parking: Aligning Parking Supply and Demand

- Goal: collect data to gain insight into the existing relationship between parking supply and demand at multifamily developments
Perfect Fit Parking: Research Question(s)

1. What is the current demand for residential off-street parking at multifamily developments in Metro Boston?

2. What factors influence variation in demand?

3. How can parking requirements and policies take this variation into consideration so as to limit the amount of excess parking that is constructed?
Phase 1

ARLINGTON, CHELSEA, EVERETT, MALDEN, & MELROSE
Data Collection

Surveyed 126 multifamily properties

Conducted overnight parking counts at 80 multifamily properties
Property Manager Surveys

- Contacted property managers via email, phone, and snail mail

- Questions fall in two categories:
  - **Parking**: how many and what kind of spaces, parking available for other users, do residents pay for parking, etc.
  - **Housing**: number of units, rental cost/purchase price, rental or condo building

- Received 126 responses
Overnight Counts

- Visited each of the 126 properties overnight on a weeknight during presumed peak occupancy
- Counted number of spaces provided and number of spaces occupied
- Noted whether any spaces are reserved for particular users and general parking lot conditions (striping, numbering, etc.)
- Obtained adequate data from 80 properties
4,511 Parking Spaces Counted

Serving 3,913 housing units

1,187 unused parking spaces

356,100 sq ft of empty space
How full were the parking lots?

Average: 74%
How full were the parking lots?

Parking Utilization Rate by Surveyed Property (N=80)
How full were the parking lots?

Parking Utilization Rate by Surveyed Property (N=80)
0.2 to 2.2 parking spaces supplied per unit

Parking Supply per Unit by Surveyed Property (N=80)

Average: 1.15
On average, parking lots were **74%** full.
# Phase 1 Model

## Building Characteristics
- Parking supply per unit
- % of affordable units
- Tenure
- Average number of bedrooms/unit
- Average Rent
- Parking cost included
- Building square footage
- Floor Area Ratio
- % building coverage of lot
- Year of construction

## Neighborhood Characteristics
- Number of jobs accessible by transit within 30 minutes
- WalkScore
- Block size
- Median rent
- InfoUSA
- AllTransit score
- Transit Connectivity Index
- Transit as percentage of income
Location matters...

- Jobs Accessible by Transit within 30 minutes
...but supply may drive demand

- Parking supply
Parking Supply Reduction Strategies

• Zoning Changes
  ◦ Reduce or eliminate parking minimums
  ◦ Implement parking maximums
  ◦ Modify parking requirements based on use and/or access to transit

• Change incentives
  ◦ Unbundle price of parking
  ◦ Allow developers to pay a fee-in-lieu of parking
  ◦ Carsharing credits
Don’t let past thinking dictate future planning

- Collect Data
- Engage Stakeholders
- Context-Specific!
Phase 2

WHAT’S AHEAD: METRO BOSTON
Phase 2

• Have begun work in 5 communities in the Inner Core subregion, including Boston, Brookline, Cambridge, Medford, and Watertown

• Engaging with developers and property management companies directly

• Eventually-online tool for easily accessible comparable data
Recommendations

- Get in touch with property managers/developers directly to complete survey
- Partner with municipal staff
- Recruit local assistance
- Clearly convey purpose and benefits of project
Thank you!

Kasia Hart, MAPC
khart@mapc.org | 617-933-0745

Please visit our project website at: perfectfitparking.mapc.org

Supported by the Barr Foundation and the Boston Region Metropolitan Planning Organization’s Unified Planning Work Program
Residential Parking Use in Madison, Wisc.
Lessons for Simpler Studies

Chris McCahill | July 12, 2017
Study overview

- Multi-family apartments
- 80 sites
- Mid-2015 to mid-2016
Building characteristics (80 sites)

- Number of units in building(s): 3 to 404 (65 avg.)
- Avg. number of bedrooms: 1 to 3.4 (1.5 avg.)
- Avg. unit size: 230 to 1,310 sq. ft. (700 avg.)
- Avg. rent: $200 to $2,500 ($1,000 avg.)
- Affordable housing: At least 10 sites (incomplete data)
- Building age:
Parking characteristics (80 sites)

• Priced parking (34 sites): $10 to $185 ($102 avg.)
• 27 sites have garages
• Of those, garages account of 81% of spaces
• Parking supply: 0 to 2.3 per unit (1.1 avg.)
• Parking demand: 0 to 1.4 per unit (0.7 avg.)
• Avg. parking occupancy: 67%
General findings

• No patterned difference between lots and garages

• Building age has small effect
  • Newer buildings = higher parking use
  • Due to larger units and higher rents

• Building characteristics explain about 50% of variation
  • Unit size, rent, parking price, etc.

• Neighborhood characteristics explain about 40%
  • Population density, distance to transit, Walk Score, etc.

• Many variables are related
Variable effects

Left graph: Average unit size (sq. ft.) vs. Vehicles per unit.
Right graph: Walking accessibility vs. Vehicles per unit.
Final model (standardized coefficients)

Parking demand =

+ 0.47 avg. unit size*
- 0.29 walk access*
- 0.22 pop. density*
- 0.21 parking price*
- 0.09 street parking

* 95% confidence

There may be reasons to include “no effect”
Final model

Off-Street Residential Parking Use: Madison, WI
Beta version (Last updated August 2016)

- Population density (per sq. mi.)*
  - 100: 4,000
  - 200: 8,000
  - 300: 12,000
  - 400: 16,000
  - 500: 20,000

- Walking accessibility (0 to 100)*
  - 0

- Average unit size (sq. ft.)*
  - 200: 700
  - 300: 1,600

- Parking price per month*
  - 0

- On-street parking
  - Yes

- Expected parking occupancy: 0.83 vehicles per unit

Accessibility Map
Click on the map for neighborhood characteristics.

This tool is under development and should not be used to guide decision-making. Estimates are based on observed parking occupancy at 80 multifamily residential sites throughout the city of Madison. For more information, contact the developers at ssti.us.

* Indicates significant variable
Accessibility measures

• Transportation + land use
  • E.g., jobs or non-work destinations

• Better predictor than other neighborhood measures

• Useful in other planning applications

• Specific data/analysis needs
  • **Data:** HERE, InfoUSA, OpenStreetMap, GTFS, etc.
  • **Software:** Sugar Access, Network Analyst, OpenTripPlanner, etc.

• More information at *ssti.us*
### Lessons learned: Data needs

#### Building features

<table>
<thead>
<tr>
<th>Vars. in model</th>
<th>Variable added</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>unitSize</td>
<td>0.25</td>
</tr>
<tr>
<td>2</td>
<td>parkPrice</td>
<td>0.52</td>
</tr>
<tr>
<td>3</td>
<td>parkStreet</td>
<td>0.56</td>
</tr>
<tr>
<td>4</td>
<td>roomOccRate</td>
<td>0.56</td>
</tr>
<tr>
<td>All building features</td>
<td></td>
<td>0.56</td>
</tr>
</tbody>
</table>

#### Neighborhood measures

<table>
<thead>
<tr>
<th>Vars. in model</th>
<th>Variable added</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>log(transitGrav)</td>
<td>0.32</td>
</tr>
<tr>
<td>2</td>
<td>popDens</td>
<td>0.42</td>
</tr>
<tr>
<td>3</td>
<td>log(actGrav)</td>
<td>0.43</td>
</tr>
<tr>
<td>4</td>
<td>log(jobsGrav)</td>
<td>0.43</td>
</tr>
<tr>
<td>All neighborhood measures</td>
<td></td>
<td>0.43</td>
</tr>
</tbody>
</table>

#### Accessibility measures

<table>
<thead>
<tr>
<th>Vars. in model</th>
<th>Variable added</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>accessWalk*</td>
<td>0.40</td>
</tr>
<tr>
<td>2</td>
<td>jobsTransit</td>
<td>0.41</td>
</tr>
<tr>
<td>3</td>
<td>accessTransit</td>
<td>0.41</td>
</tr>
<tr>
<td>4</td>
<td>jobsWalk</td>
<td>0.41</td>
</tr>
<tr>
<td>All accessibility measures</td>
<td></td>
<td>0.41</td>
</tr>
</tbody>
</table>

* Walk Score™ = 0.35

### Three final options (five variables each):

- **accessWalk** + popDens + unitSize + parkPrice + parkStreet ($R^2 = 0.65$)
- **walkScore** + popDens + unitSize + parkPrice + parkStreet ($R^2 = 0.63$)
- **log(transitGrav)** + popDens + unitSize + parkPrice + parkStreet ($R^2 = 0.63$)
Lessons learned: Data collection

• Site selection
  • ~50 sites + 8 for each variable
  • Full representation of important variables

• Surveys
  • Costly and may get low response rate
  • Start with available data (websites, municipal records, etc.)
  • Contact owners to fill gaps (parking price, vacancies, etc.)

• Field counts
  • Enclosed parking is biggest challenge
  • ITE Parking Generation: 12am-4am
  • ULI Shared Parking: 7pm-12am (visitors) – largest of two counts

• Long-term: Require reporting under TDM program
Should **supply** be included?

- Strong relationship is important to consider
  - E.g., demand management
- Maybe less useful in estimating demand
  1. Doesn’t answer: “How much should be provided?”
  2. The only physical constraint
     - Helps explain high $R^2$
  3. External factors probably affect supply and demand

![Graph showing the relationship between parking demand and supply](image)
Additional resources

• McCahill, C. “Factors Affecting Parking Occupancy in Madison, Wisconsin,” *Transportation Research Record* 2651 (in press).

• Past studies
  • Right Size Parking (King County, Washington)
  • Park Right DC (Washington, DC)
  • Stalled Out (Chicago)
  • Perfect Fit Parking (Boston)

• *Parking Reform Made Easy* (R. Willson, 2013)
  • Tips on estimating parking demand from combination of Census data, ITE guide, aerial photos, and field data
  • Guidance on setting parking standards
Thank you!
A recording of this webinar will be on the SSTI website tomorrow.

mccahill@ssti.us
www.ssti.us
@SmartTransp

khart@mapc.org
www.mapc.org
@MAPCMetroBoston