

# Demographic Multipliers: Data Mining & Measuring Development Impacts

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**F**iscal impact analysis is an important tool for assessing how new development will impact municipal costs and revenues, helping leaders make better decisions for their communities. Thirty-eight years ago, Robert Burchell and David Listokin formalized a set of demographic multipliers critical to measuring development impacts, such as added populations added school students, and consequent costs necessary to support public services.

By 2006, Burchell and Listokin had released several demographic multipliers, mostly based on the census Public Use Microdata Sample (PUMS) records. With improved methodology, they narrowed geographic coverage from multi-state regions to the state level (and three regions within New Jersey). However, their most recent multipliers are based on records collected from the 1990's.

## Estimation Biases due to Demographic Changes Over Time

Between 2000 and 2010, the average household size remained constant or declined everywhere except in five states. Unfortunately, the 2006 multipliers have not been updated, disconnecting it from today's demographic realities and making it less relevant for sound planning.

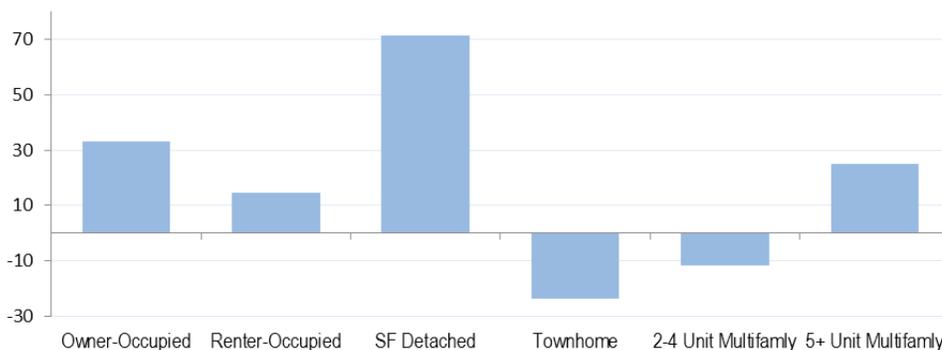


Figure 1: Using 2000 PUMS-based School-Age Children Ratio would Result Significant Estimation Biases: Percent Difference for Newly Built 2-Bedroom Units in New Jersey

Sources: 2000 PUMS-based SAC: *New Jersey Demographic Multipliers*, 2006; 2014 PUMS-based SAC: Community Data Analytics, 2016, analysis of 2010-2014 5-Year PUMS records.

**The implication is clear:** Using old multipliers overestimates development impacts on many occasions, a point repeatedly confirmed by our research findings at Community Data Analytics (cda-esi.com). For example, the 2000 PUMS-based School-Age Children (SAC) in New Jersey are generally higher than the current amount of SAC in 2014. Figure 1 demonstrates that the old multipliers overestimate SAC in single-family detached units by 70 percent, while underestimating one-quarter of the SAC for townhomes.

## Enormous Geographical Variations

Should we adhere to state-wide multipliers?

Only if demographic multipliers cannot be generated for areas smaller than a state.

Based on newly-built units as the sample, traditional multipliers are *highly sensitive to building activity*. During an economic (and development) downturn, statistically valid multipliers can be unavailable due to a lack of new units. Substituting this sample with a mover sample would extend multipliers to the smallest reporting unit, Public Use Microdata Area or PUMA, covering approximately 100,000 to 150,000 persons.

Figure 2 at right shows that the 2014 PUMA-level SAC by 2-bedroom multifamily units in the Washington DC region exhibit significant discrepancies of up to almost seven times.

## Mining the PUMS Records for the Best Demographic Multiplier

With advancements in data mining technology and statistical programming, demographic multipliers can be generated in days rather than years as was previously offered in the 2000's. The most significant development in data mining apart from developing multipliers at the PUMA level is that PUMS records are released annually.

Analysts who study development impact should always use the most current multipliers. Likewise, they should abandon state-wide multipliers and opt for PUMA-level multipliers. Failing to do so runs the risk of being negligent.

## Data-mining of the PUMS records and the Potential of Measuring Impact

### a. Analyzing PUMS Records

PUMS records provide data down to the level of each person within a household and the characteristics of its housing unit. This raw data provides the best free figures outside of an expensive survey or interview using a specifically designed questionnaire. Yet, even with interface services like IPUMS, analyzing PUMS records requires an in-depth understanding of PUMS file structure, variable definition, data codes, the use of weights and sophisticated programming skills. That is why impact analysts have relied on the multipliers generated by Burchell and Listokin

### b. Customized Samples to Test Impact Scenarios

Different samples can be drawn from PUMS records. Initially, we should use the mover sample to get locally-relevant multipliers. To explore the impact of a Transit Oriented Development, an analyst can cut a sub-sample of households living in multifamily units, and with conditions on commuting and vehicle accessibility. Similarly, to test maximum school impacts, one can draw a sub-sample of households with adults between the ages of 30 and 55.

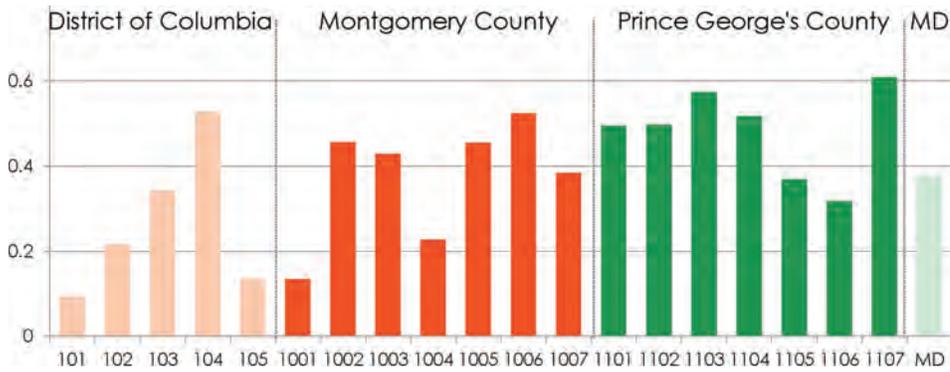


Figure 2: 2014 School-Age Children Ratios Vary Greatly within the Washington, DC Region: For Households Recently Moved into a 2-bedroom Multifamily Unit

Sources: Community Data Analytics, Econsult Solutions, Inc. based on 2010-2014 5-Year PUMS. The number in the horizontal axis is PUMA designation.

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### c. Extended Multipliers & Planning Ratios

Impact analysts can utilize the rich information of PUMS to generate additional multipliers such as public-school attendees, non-public school

students, number of workers, workers driving to work or using public transit, all may be differentiated by age cohort or grade group. Other planning ratios include the number of accessible vehicles and average household income by housing configuration.

### d. Choices of Housing Configurations

Housing configurations are constructed by several variables: number of bedrooms, structure type (single family, townhome and multifamily), tenure (rental or owned), and others like number of units in the structure, condominium, or home value. Appropriate multipliers can be generated

based on a variety of samples for an array of housing configurations.

*For discussion of the most updated multipliers, readers can check <http://www.econsultsolutions.com/a-new-technique-for-more-accurate-impact-assessment/>.*

*Please also consult PUMS technical documentation at <http://www.census.gov/programs-surveys/acs/technical-documentation/pums/documentation.html>.*

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