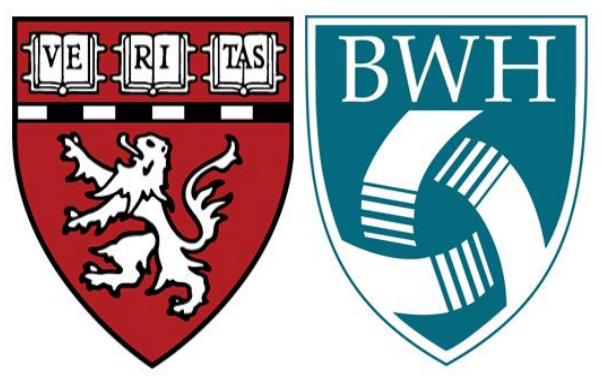


AREA-LEVEL SOCIOECONOMIC STATUS INDICATORS FOR OBSERVATIONAL STUDIES OF MEDICATION USE: A COMPARISON OF ZIP CODE AND CENSUS-BLOCK GROUP BASED AGGREGATION

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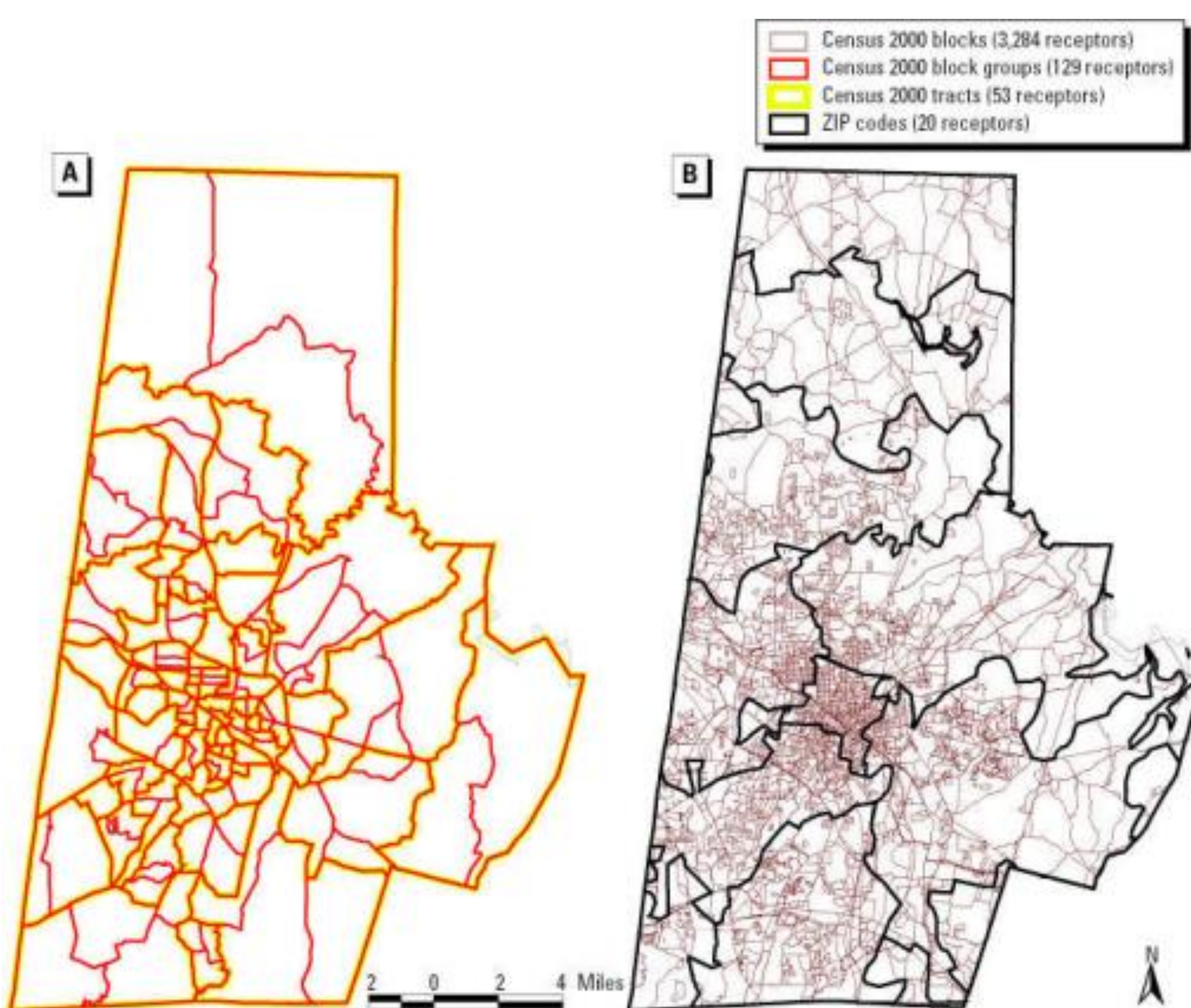
Background

- Electronic healthcare data are critical for evaluating medication outcomes in routine care.
- However, they typically do not record information on socioeconomic status (SES), which may be an important confounder in observational studies.
- Therefore, we merged area-level SES data from the US Census Bureau with patient-level electronic healthcare data and compared broader-level ZIP code-based aggregation with more granular census-block group-based aggregation in an illustrative cohort of generic versus brand-name atorvastatin initiators

Methods

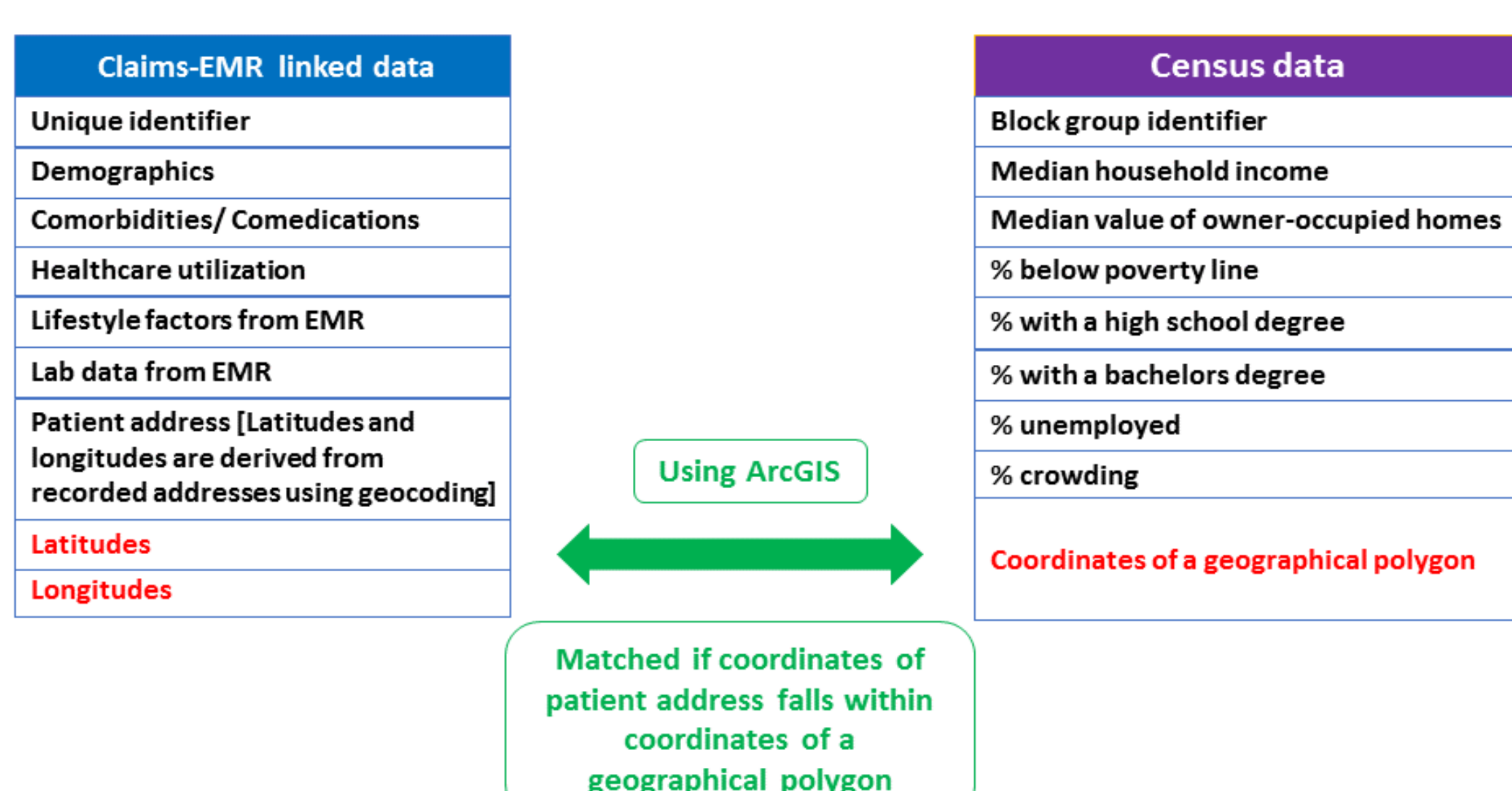
- We identified a cohort of generic or brand-name atorvastatin initiators between November 30, 2011 and December 31, 2013 from Medicare claims linked to electronic medical records (EMR) from the Partners healthcare system in Boston.
- Using geocoding, patient addresses were spatially linked to data from the American Community Survey to assign area-level SES variables to each patient based on the census block group and the ZIP code of his/her address.
- Census block group is the most granular level of geography at which aggregate statistics are available and is illustrated in Figure -1 in comparison to ZIP code
- These variables were used to compute a validated deprivation measure, the RTI SES index, which incorporates measures of unemployment, education, poverty, and housing in a single measure (range 0-100).
- Correlation between block group-based SES index (SES_{BG}) and ZIP code-based SES index (SES_{ZC}) was reported. Differences in the SES index between generic and brand-name atorvastatin initiators were evaluated using t-tests

Figure 1 – Illustration of zip code and census block groups



Source: Dolinoy DC, Miranda ML. GIS modeling of air toxics releases from TRI-reporting and non-TRI-reporting facilities: impacts for environmental justice. Environ Health Perspect. 2004;112(17):1717-1724

Figure 2 – Linkage of statin cohort to census data



Disclosures:

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Methods

Figure 3 – Computation of SES index

$$\text{SES Index Score} = 50 + (-0.07 * \text{crowded}) + (0.08 * \text{prop100}) + (-0.10 * \text{pct_poverty}) + (0.11 * \text{hhinc100}) + (0.10 * \text{high_educ}) + (-0.11 * \text{low_educ}) + (-0.08 * \text{pct_unemp})$$

Abbreviations:

- crowded = Percentage of households containing one or more person per room
- prop100 = Median value of owner-occupied values, standardized to range from 0-100
- pct_poverty = Percentage of persons below the federally defined poverty line
- hhinc100 = Median household income, standardized to range from 0-100
- high_educ = Percentage of persons aged ≥ 25 years with at least 4 years of college
- low_educ = Percentage of persons aged ≥ 25 years with less than a 12th-grade education
- pct_unemp = Percentage of persons aged 16 years or older in the labor force who are unemployed (and actively seeking work)

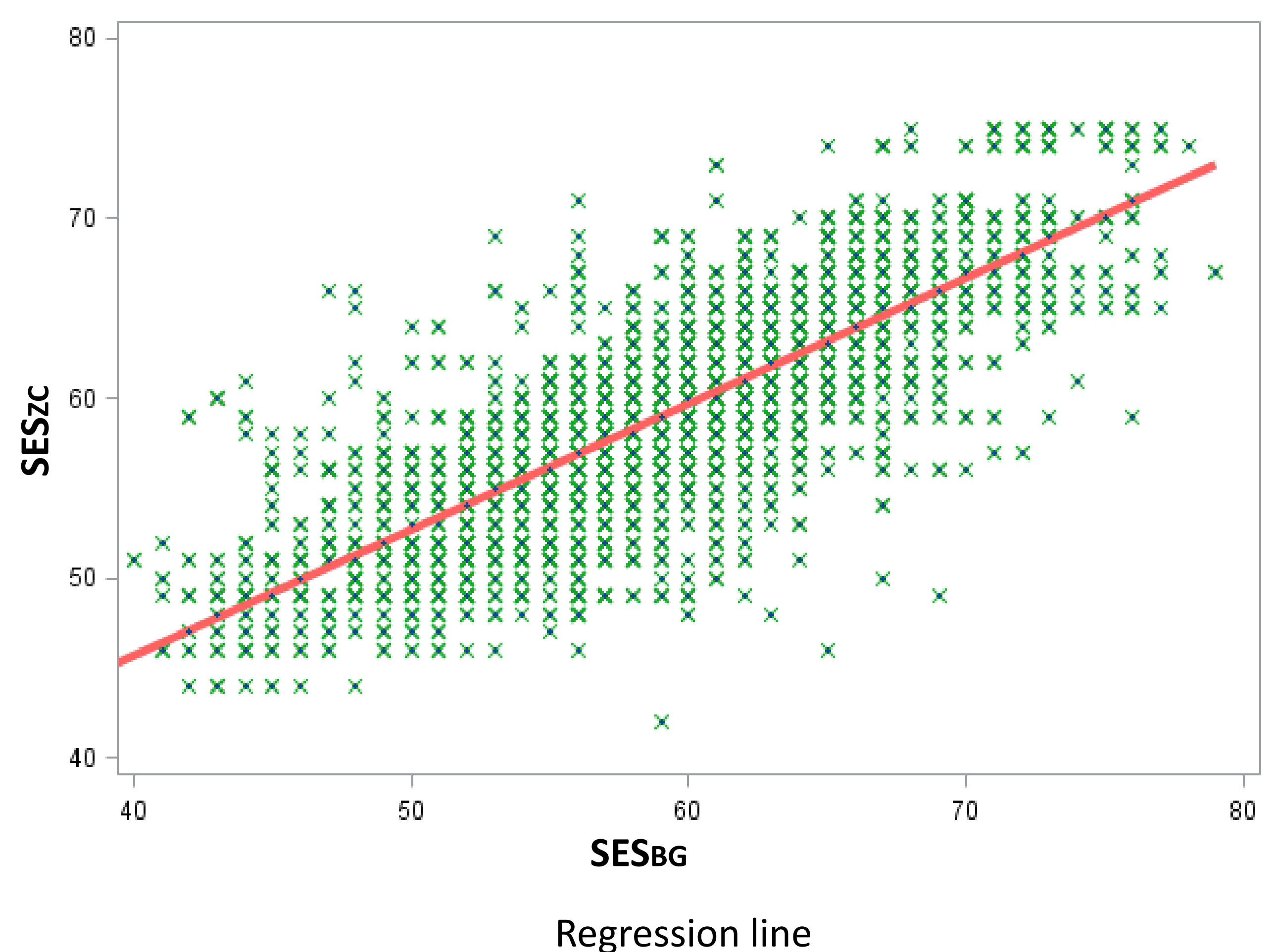
Source: Chapter 3: Creation of New Race, Ethnicity Codes and SES Indicators for Medicare Beneficiaries Chapter 3. January 2008. Agency for Healthcare Research and Quality, Rockville, MD. <http://archive.ahrq.gov/research/findings/finalreports/medicareindicators/medicareindicators3.html>

Results

Table 1 - Block group vs. Zip code SES comparison of statin initiators in New England after introduction of generic Atorvastatin

	Block group SES variables	Zip code SES variables
N	7109	7109
Median household income (Mean, SD)	83,558.2 (39,297.6)	87,537.5 (40,522.6)
% Poverty (Mean, SD)	9.6(10.3)	8.6 (9.1)
% Unemployed (Mean, SD)	7.4(5.8)	7.5(3.3)
Median value of home (Mean, SD)	415,790.8(197,813.6)	405,616.3(173,338.0)
% crowding (Mean, SD)	1.3 (2.9)	1.5 (1.7)
% with less than high school (Mean, SD)	7.8 (8.5)	8.3 (6.8)
% with a bachelors degree (Mean, SD)	45.8 (22.2)	45.4 (19.3)
SES index (Mean, SD)	59.1 (6.3)	59.0 (5.5)

Figure 4 - Scatterplot of the block group-based SES index (SES_{BG}) and ZIP code-based SES index (SES_{ZC}) with a fitted regression line



- Among 7,109 eligible patients, the mean (\pm standard deviation) SES_{ZC} (59.0 ± 5.5) was similar to the mean SES_{BG} (59.1 ± 6.3), with a **Pearson correlation coefficient of 0.81**.

- When the SES index between generic atorvastatin initiators was compared to brand-name atorvastatin initiators, both SES_{ZC} (58.9 ± 5.5 vs. 59.8 ± 5.7) and SES_{BG} (59.0 ± 6.4 vs. 59.9 ± 6.3) suggested that brand-name initiators had higher SES than generic initiators ($p < 0.001$ for both).

Conclusion

- Aggregated SES data based on ZIP codes, which are easily accessible in most data sources, reasonably approximate SES data based on census block groups, which require availability of street-level addresses.