AJPP 2019 Estimation Details

Revised November, 2019

County-Level Estimation

The 2019 estimates are based on the synthesis of surveys conducted between 2012 and 2017.¹ Population totals are based on the <u>Census Bureau's Population Estimates Program (PEP)</u> most recent county population by age, sex, race and Hispanic origin.

We first examine the distribution of survey responses across counties in the US. We aim for a minimum of 1,000 observations per geographic area for reliable population estimation. Even across hundreds of independent samples and multiple years, many counties in the US are sampled too infrequently to be able to estimate the Jewish population reliably. When county-level sample sizes are too small to estimate reliably, counties are combined. Combinations are designed to align with UJA Federation areas, or as close an approximation to those areas as possible. Counties outside of these areas were grouped based on information about economic areas from the <u>Cluster Mapping</u> project.

We then estimate a logistic regression model that predicts the likelihood an adult identifies as Jewish when asked their religion. Factors involved in weighting across the sample of surveys are included in the model. These include geographic distribution (counties/county groups, state) and characteristics of the samples (sex, age, race/ethnicity, educational attainment). The model is fit using Bayesian Multilevel estimation with Poststratification (BMP). The basic model is displayed below, where the outcome variable, y_i , represents the Jewish identification of the respondent (yes/no), for i = 1, ..., total number of respondents.

$$\begin{split} \Pr(y_{i} = 1) &= logit^{-1}(\beta_{0} + \beta^{female}.female_{i} + \alpha_{j[i]}^{race-ethn} + \alpha_{k[i]}^{age} + \\ &\alpha_{l[i]}^{edu} + \alpha_{m[i]}^{age.edu} + \alpha_{n[i]}^{county} + \alpha_{o[i]}^{county.edu} + \alpha_{p[i]}^{state} + \alpha_{q[i]}^{survey} \\ &\alpha_{j}^{race-eth} \sim N(0, \sigma_{race-eth}^{2}) \text{ for } j = 1, 2, 3, 4 \text{ categories of } race - eth \\ &\alpha_{k}^{age} \sim N(0, \sigma_{age}^{2}) \text{ for } k = 1, \dots, 6 \text{ categories of } age \\ &\alpha_{l}^{edu} \sim N(0, \sigma_{edu}^{2}) \text{ for } l = 1, 2 \text{ categories of } educational \text{ attainment} \\ &\alpha_{k,l}^{age.edu} \sim N(0, \sigma_{age.edu}^{2}) \text{ for } k, l = 1, \dots 12 \text{ categories of } age.edu \\ &\alpha_{n}^{county} \sim N(0, \sigma_{county}^{2}) \text{ for } n = 1, \dots \# \text{ of } counties \\ &\alpha_{n,l}^{state} \sim N(0, \sigma_{state}^{2}) \text{ for } p = 1, \dots \# \text{ of } states \\ &\alpha_{q}^{survey} \sim N(0, \sigma_{stare}^{2}) \text{ for } q = 1, \dots \# \text{ of } surveys \end{split}$$

Counties were grouped into clusters based on census division, population density, and prior estimates of Jewish population incidence. A sample of 1,000 simulations post-convergence are saved from the final, fitted model, and used to develop population estimates – in conjunction with the

¹ The sample includes one survey conducted in 2018 in order to make use of the large sample size.

most recent census data on county distributions of age, race, sex, and education by county. State level estimates are derived from the sum of county group estimates within the state.

Metropolitan Area Estimation

For 2019 models, metropolitan areas were limited to 70 areas. This includes the top 40 metropolitan areas along with other major metropolitan areas. Previous metropolitan area models used Consolidated Statistical Based Area (CBSA) definitions of metropolitan areas for clustering of respondents within geographic areas. CBSAs are larger geographic areas than counties. For example, the New York metropolitan area as defined using CBSAs consists of 23 counties in New York, New Jersey, and Pennsylvania.

Revised estimates are derived directly from the county level model, aggregating over counties (or county groups) that are included in each metropolitan area. For county groups that are not wholly part of a metropolitan area, population estimates are distributed proportionally based on the total population distribution that is included in the CBSA definition of the metropolitan area.