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Demographic and Service Need Projections for the Aging Population: 2020-2030

A Projection Model for the Baby Boomers of San Mateo County

Extended Executive Summary

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BACKGROUND & DOCUMENT OVERVIEW

In August 2006, The Lewin Group and its partners were contracted by the San Mateo County (SMC) Health Department to develop a model that would project the socio-demographic characteristics, as well as the health, housing, and transportation service needs for its aging "baby boomer" population for the years 2020 and 2030. Baby boomers are individuals born between 1946 and 1964, and are considered the largest generational cohort in recent history. Over the following 13 months, the Lewin Group developed the model by working closely with the Health Department and its partners, which included the San Mateo County Department of Housing, the Commission on Aging, Health Plan of San Mateo, samTrans, and the San Mateo Medical Center. Leaders from these entities comprised the project Steering Committee.

This report focuses on the approach and methodology used to build the projection model. The estimates and projections generated from this model are expected to assist the County and community in making policy decisions regarding baby boomers' needs for a variety of services within the county. The Steering Committee, in consultation with community partners and other topic area experts, will lead a process to develop policy recommendations.

The range of projections of population characteristics and service needs, because of their distance in the future, required an interdisciplinary team. The research team included expertise from top researchers in the country, including Lisa Alecxih from The Lewin Group, who is nationally known for her expertise in aging and long term care issues, Dr. Stephen Golant from the University of Florida, who specializes in housing patterns and transportation behaviors of older persons, and John Pitkin, President of Analysis and Forecasting, Inc., a demographic research firm. The team systematically combined rigorous analysis of numerous data sources with local insights about trends and the forces shaping them.

The first part of the document provides a detailed description of the model structure, which is based on micro-simulation, meaning it uses the 2000 Census person level micro-data. Lewin analyzed this data and supplemented it with other local, statewide, and national research. Local primary data research included:

- A county-wide household survey of over 936 SMC residents, including oversamples of the Coastside communities, low-income residents, and the African-American, Asian and Latino populations. The survey instrument was also translated and fielded in Spanish.
- Focus groups with monolingual Cantonese and Mandarin older adults residing in San Mateo County.
- Key informant interviews with representatives from real estate and housing sectors.
- Key informant interviews with acute and long-term care providers.

Once all of the data sources were combined, they were built into an interactive, computer-based model, which provides demographic and service needs projection output reports. Some adjustable input variables enable the Health Department to both update the model with the most current information available and examine alternative potential trends by creating different projection scenarios. Input variables include factors that could change over time, such as net migration rates and changes in real income.

The next part of the document focuses on a brief introduction to the output reports. The six different output reports include the following categories: Socio-demographic, Housing, Mobility (transportation), Healthcare provider supply needed, Long term care supply needed, and Vulnerable populations (which layers income, race/ethnicity and disability status).

The final part of the document describes the protocol for accessing information from the model. For your reference, attached you will also find an appendix which discusses the underlying assumptions and probabilities associated with the model. It is hoped that the model will be instrumental in helping San Mateo County plan for future services by providing County-specific socio-demographic projections for the years 2020 and 2030. As the first model of its kind in the County, the projections and ability to understand the distribution of the older adult population by key factors, such as the level of frailty and income, will yield valuable insights for strategic planning, service delivery and policy decisions for the County and community groups.

MODEL STRUCTURE

What is Micro simulation?

The model developed by Lewin for SMC is a micro simulation model, that is, it uses the 2000 Census micro-data – individual records containing detailed information about individual residents in San Mateo County – as the basis of analysis. Using such detailed data serves two purposes: 1) it provides the most direct and accurate way to simulate the impact of policy or environmental changes on county residents and 2) it allows for the highest degree of output detail, enabling the tabulation of results by subgroups defined by socio economic characteristics, tenure status, disability levels, and other characteristics.

The Model simulates the socio-economic composition and utilization of housing, transportation, acute care and long term care services by baby boomers through 2030. The overall objective of the model is to simulate the effects of changes in various socio-economic characteristics on future need for different types of services for this specific generational cohort. It is important to note that the model was structured to follow the same generation (baby boomers: those born between 1946 and 1964 – age 41- 59 in 2005 -- and pre-boomers: those born between 1931 and 1945 – age 60-74 in 2005) from 2005 until 2020 and then to 2030. Although it gives very specific details about this population, it does not however, allow us to compare this generational cohort with other cohorts in the future (i.e. slightly younger generations).

The model begins with a representative sample of the adult population residing in San Mateo County from the 2000 Census with a record for each person's age, sex, income, and many other characteristics. The model then uses a Monte Carlo simulation [1] to impute information on disability, acute health care use, and other information not available in 2000 Census from other data sources. To understand how the model adjusts the 2000 Census data to trend it forward, it is important to understand that the Baby Boomer Services Needs Model is not a static model.

[1] The Monte Carlo simulation imputes values for different variables for each individual in 2000 Census sample by drawing a random number between zero and one and comparing it to the fixed probability of that event occurring for an individual with a given set of socio-demographic characteristics.

Although the estimates for each year are based on the same underlying set of person records, the model alters the person-level record either by changing the values of reported variables (e.g., increasing people's age, and allowing people to die through the years), or by changing the person-weight on the record to mirror the population size and composition of future years. Please see the appendix for more information on the data sources.

Variable Input Parameters

The model includes several key parameters that are likely to affect the demand for services in the future. These parameters allow the user to change the value of certain trends or probabilities. The flexible, parameter-driven nature of the model will enable the County to examine the impact of policy options that might influence the parameters.

Table 1 lists the ten model parameters that users can change the value of and create different scenarios (please see appendix for more details).

Table 1 Model Parameter Definition

Socio-Demographic Input Parameters	Explanation
Net Migration	Annual expected net migration based on an analysis of past patterns. Net migration gives the user the ability to use three projected migration patterns in San Mateo County: low, middle and high. Net migration is the difference between in migration and out migration from the County.
Change in annual real income	The use of real income removes the effect of differences in inflation[2] from year-to-year during the historical period. We applied the historical trend in real income from 2000 to 2005 to project future income because the trends appeared to be reasonable over the longer period.
Housing Input Parameters	**Explanation**
Tenure status follows current baby boomer behavior or follows pattern of current seniors (pre-boomers)	A major assumption for the housing need projections is the tenure status in each age cohort. The model allows the user to choose between two scenarios of projecting tenure status in 2020 and 2030: 1) the tenure status of baby boomer remains the same as in 2005; or 2) reflects the tenure status of current seniors based on socio-demographic status.

[2] Inflation rate during the period of 1999 to 2004 for San Francisco-Oakland-San Jose Area is 1.1152464. 2000 Census reflects income in 1999 and 2005 American Community Survey reflects income in 2004. Inflating rate for corresponding years were calculated by dividing 2004 consumer price index by 1999 consumer price index for all urban consumers of San Francisco-Oakland-San Jose area. (data source: http://data.bls.gov/cgi-bin/surveymost?cu)

Table 1 Model Parameter Definition (cont.)

Housing Input Parameters	Explanation
Rate of real increase in rental expenses	Annual real rate of increase in gross rents in San Mateo based on fair market rent for two bedroom in San Francisco Area 1994-1999.[3] The rate of real increase in rental expenses parameter allows the user to incorporate alternative rates of change in rental expenditures into the model and examine the impact on renters' housing cost burdens. The use of real rental expenses increase removes the effect of differences in inflation from year-to-year during the projection period and reflects 2005 dollars.
Rate of real increase in ownership expenses	The rate of real increase in ownership expenses parameter allows the user to examine the affordability of housing within the County. Ownership costs are the **sum of payments** for: mortgages; deeds of trust; contracts to purchase; debts on the property (including payments for the first and second mortgages, home equity loans, and other junior mortgages); real estate taxes; fire, hazard, and flood insurance on the property; utilities (electricity, gas, and water and sewer); fuels (oil, coal, wood, etc.); and where appropriate: monthly condominium or mobile home costs.
Acute Health Input Parameters	**Explanation**
Physician use rates for minorities different from white non-Hispanics	Patients from different ethnic groups have different physician preferences. With increasing diversity, San Mateo County may witness similar use patterns for one or another specialty physician across different ethnic groups. This model allows the user to maintain racial differences in physician demand between minorities and non-Hispanic White or to assume everyone has the same demand as non-Hispanic Whites of the same age/sex group.
Change in use of services in-county versus out-of-county	According to our analysis of the inpatient service use data from Office of Statewide Health Planning and Development (OSHPD) and interviews with health care providers within the County, about 15 percent of San Mateo County residents went out of the County for different types of health care services. This parameter allows the user to capture this trend and more accurately project physician demand within San Mateo County.
Change in physician use pattern	Shifts in the use of specialty physicians relative to primary care physicians will impact the estimates of demand for physicians. This parameter allows the user to vary use patterns in the model by increasing or decreasing use rates for primary care physicians relative to current use.
Change in average length of inpatient hospital stay	The shift in the locus of care from an inpatient institutional model to an outpatient community model has raised much attention to its impact on inpatient service demand. This parameter allows for altering the average length of stay, impacting number of beds and services needed.

[3] Since 2000 the fair market rent has declined in real terms and we did not think this was a reasonable long term assumption

Table 1 Model Parameter Definition (cont.)

Long Term Care Input Parameters	Explanation
Disability Rate	Disability is defined as requiring assistance with any Activities of Daily Living (ADLs) or Instrumental Activities of Daily Living (IADLs)[4]. In the last two decades, the use pattern of long term care services among the frail older adult has changed significantly partly due to the disability prevalence changes among the elderly population. Given the existence of different theories on disabilities, this parameter allows the user to change the rate of increase or decrease in age adjusted disability rates to examine the impact on demand for services.

OUTPUT REPORTS

The model output provides aggregate population projections for each type of service by demographic and economic status. The output tables include detailed information for the population aged 41-74 in 2005, and project for 2020 and 2030, by an individuals' age, sex, marital status, nativity, disability, tenure status and location of residence within the county crossed with income in the output.

- **Housing output** presents the population size with two different levels of housing cost burdens (30% and 50%) by socio-economic characteristics. It also provides detailed projection information for both renters and owners.
- **Mobility output** summarizes the estimated number of people who needs Redi-Wheel services at a point-in-time by age and county sub-region residence.
- **Healthcare output** provides the projected demand for **acute health care** which includes projected **need for hospital beds** and **demand for different types of physicians**. There is a sub-report that **estimates the of number of older adults in assisted living facilities**.
- The final part of the output tables focuses on **vulnerable populations** with different levels of disabilities by people's age, race, and income level.

[4] ADL limitations were defined as *requiring the help of another person to perform* the following activities: bathing, dressing, eating, transferring, using the toilet, and getting around inside the house. Similarly, IADL disabilities were defined as needing the help of another person with the following six activities: paying bills, taking medication, using the telephone, getting around outside the house, doing light housework, and preparing meals.

MODEL PROTOCOLS

The model will be housed in the San Mateo County Health Department. Annual updates of the input parameters will involve Steering Committee partners, such as the Department of Housing, SamTrans, and the San Mateo Medical Center. Updated projections will be released to different County Departments and will be available to the general public by contacting the Health Policy and Planning Division of the Health Department.

CONCLUSION

This model, its projections and our ability to understand the distribution of the older adult population by key factors, such as the level of frailty and income, will yield valuable insights for strategic planning, service delivery and policy decisions for the County and community groups.

APPENDIX

Data Sources and Key Assumptions

There were a number of data sources used to build the projection model. These included:

Input Data Set: 2000 Census Public Use Microdata Sample (PUMS) for San Mateo County

The 2000 Census Public Use Microdata Sample (PUMS) is data at the individual level and includes actual responses to the 2000 Census questionnaire for a 5 percent sample of the population, with a minimum threshold of 100,000 people. PUMS may not cross state boundaries and there is no territory that is not assigned to a PUMS. Large urban counties like San Mateo County are typically subdivided into multiple PUMS. San Mateo had six PUMS in the 2000 Census and a total of 36,233 individual records, 10,922 of which represent the cohorts of interest for this model. The model required us to project demand for services based on two or more demographic variables (e.g. by age and by income); therefore, it was important to use individual-level data rather than aggregated results (which typically condition only on a single variable, e.g. age or income).

Data extracted from the 2000 Census required a number of modifications in order to serve as the input data set to the model. These included:

- Adjusting the weight variable in 2000 Census to match the 2005, and project the 2020 and 2030 population composition based on individual's age, race, nativity, sex, and geography.
- Monte Carlo Simulation was used to project deaths in the future.
- Adjusting marital status for households in which one of the married couple become deceased through the years.
- Imputing values from 2007 Survey of San Mateo Residents Age 41-74 (discussed in detail below) to PUMS data set based on socio-demographic characteristics and PUMS location.
- Assigning values for functional limitations; we employed a non-parametric mapping technique that assigned each individual in our PUMS data set a set of probabilities of having different functional limitations, conditional on the individual's demographics and his or her answers to the 2000 PUMS disability questions. Our data source for functional limitations is the 1996 panel of the Survey of Income and Program Participation (SIPP) Wave 11[i] disability modules. SIPP is a nationally representative longitudinal survey of the community-dwelling population. The SIPP provides greater detail about disability by asking many more questions than the decennial census instrument. However, the SIPP data do not support state or county level analyses.
- Impute replacement rate of retirement income for people turning 65 at 2020 or 2030. The replacement rate expresses postretirement income as a share of pre-retirement income based on individual's age and household income.

2007 Survey of San Mateo Residents Age 41-74

A random digit dial survey supplemented by a convenience sample of in-person interviews with additional African Americans for a total of 936 completed interviews of San Mateo residents age 41-74. Questions focused on relevant topics not available from other data sources, such as the likelihood of the respondents remaining in the County or moving elsewhere, by the desired socio-demographic characteristics. The survey instrument was translated and fielded in Spanish. The survey also included oversamples of the Coastside residents, low-income households, and the Asian, Spanish and African-American population.

Monolingual Focus Groups of Older Adults Residing in San Mateo County

Research included two focus groups with monolingual Cantonese and Mandarin speaking residents of San Mateo County. Both groups were asked to discuss similar questions to those included in the survey instrument mentioned above. This was translated and transcribed.

Key Informant Interviews with Experts in Housing and Healthcare Providers

The Lewin Group conducted a series of key informant interviews to supplement existing quantitative data. The Steering Committee supplied the Lewin Group with names and contact information of experts in the housing development, acute health, and long-term care sectors. Interviews were conducted by phone, recorded, and transcribed.

2005 OSHPD Inpatient Hospital Discharge Data

Hospital inpatient day projections for inpatient care were calculated based on inpatient days, by age, gender and race from 2005 OSHPD data and the total 2005 population. The percentage of County residents going out of the County for hospital inpatient services was inferred from this data.

Health Resources and Services Administration Physician Supply and Demand Model

This model was developed by The Lewin Group and used to tabulate the ratio of number of physicians by specialty divided by total population characteristics, such as age, race and sex. National level data was used for this because of the lack of data at county level.[ii]

San Mateo County Transit District (SamTrans) Redi Wheel point-in-time number of users

Only those persons whose disabilities prevent them from using regular bus service, all of the time or some of the time, are eligible for the Redi Wheel service offered by samTrans.[iii] Probabilities were generated for San Mateo residents with any IADL or ADL, using Redi-Wheel utilization data, and projecting by age and sub-region of County.

Key Probabilities and Assumptions Used for Projections

Socio-Demographic Probabilities and Assumptions

Population Assumptions

Births: Births are projected based on the modeled population of women of child-bearing ages and by age, race, and nativity-specific fertility rates. These rates are calibrated to 2001-2002 vital statistics births, modeled populations of women, and then trended forward in proportion to age and race-specific fertility rate trends in the U.S. Bureau of the Census middle series projection of fertility (Hollman, Mulder, Kallen 2000).

Deaths: Deaths are projected from the modeled population of all ages and by age, sex, and race-specific mortality rates. These rates are calibrated to 2000-2004 vital statistics deaths, modeled populations and then trended forward in proportion to age, sex, and race-specific mortality rate trends in the U.S. Bureau of the Census middle series projection of mortality (Hollman, Mulder, Kallen 2000). An analysis of deaths through 2005 showed a growing decline of actual deaths below these trends especially in San Mateo County and the Bay Area. Reflecting this divergence as well as information provided by the San Mateo County Department of Health showing a similar trend as far back as 1990, death rates through 2015 are assumed to decline by 2.32% per year below the HMK (2000) projection in the County, by 2.12% per year in the remainder of the Bay Area, and 0.89% per year in the rest of the U.S. After 2015, death rates in all three regions are assumed to decline by a further 0.89% per year below the HMK (2000) projection.[iv]

Immigration: The model's assumption holds immigration to the U.S. constant at the average level estimated by the U.S. Census Bureau for 2000-2005 and San Mateo's share of U.S. immigration at the level observed in 2000-2005 (American Community Survey 2005). Past research has shown that California's share of total U.S. immigrants fell from a peak of 36% in the 1980s to 24% in the 1990s.[v] It is believed California's current share of U.S. immigrants of new immigrants will not return to pre-1990 levels and that current trends are likely to persist.

Emigration: Foreign-born emigration, is assumed to be constant at population-based rates by age, sex, country of origin, and years since immigration (arrival in the U.S.). This rate is derived from rates estimated at 1996-2004 rates, estimated from Current Population Survey panel data by Van Hook et. al. (2006).

Domestic Migration: Population-based gross rates of migration between San Mateo County and the rest of the U.S. and the reverse, by age, rage, and nativity, are calibrated to 1995-2000 rates, as estimated from the Census 2000 question on place of residence in 1995. The "estimation" period of 2000-2004 rates is scaled proportionally (in down / out up) so that the modeled population of San Mateo County equals the estimated total population on Jan. 1, 2005 (mean of Census Bureau and California DoF estimates). Thereafter, different population-specific gross migration rates are used to generate three projection scenarios in the model.

- *Medium (Base) series*. All in-migration rates to San Mateo County, for the different age-sex-race-nativity groups, are progressively increased (proportionally) by .2 % per year for 15 years and then held constant through 2030. Conversely, all out-migration rates from San Mateo County are progressively decreased by .2% per year for the first 15 years and thereafter held constant. The net result is an increase in total population at (approximately) the same rate per year on average as between 1980 and 2000, i.e. 5,600

per year between 2005 and 2030 slightly less than the 6,100 per year recorded between the censuses of 1980 and 2000. (The latter figure includes an improvement in census coverage between 1980 and 2000 and therefore slightly overstates the actual increase in population.)

- *Low series*. All in-migration rates to San Mateo County are progressively decreased (proportionally) by .6 % per year for 15 years and then held constant through 2030. Conversely, all out-migration rates from San Mateo County are progressively increased by .6% per year for the first 15 years and thereafter held constant. The net result is an increase in total population at (approximately) the same rate per year on average as between 1970 and 1980, i.e. 3,260 per year between 2005 and 2030 slightly more than the 3,100 per year recorded between the censuses of 1980 and 2000. This series incorporates a continuation of the long-term trend toward lower net elderly migration to San Mateo County.

- *High Series*. Age-specific adjustments are estimated for the 1995-2000 Census gross migration rates so that the population "projected" forward from the 2000 Census matches the size and age distribution of the county's 1/1/2005 population as estimated by the Census Bureau and DoF (mean of the two). After 2005, a weighted average of the 1995-2000 and 2000-2005 migration rates is used to reflect the migration experience of the entire decade. These weights count the latter period more heavily. As in the Medium (Base) Series, total population increases at (approximately) the same rate per year on average as between 1980 and 2000. However, *due to shifts in the age pattern of migration between the pre- and post-2000 periods, net migration rates for the Baby Boom cohorts are substantially higher in this series than in the Medium series.* The Dot-Com boom period, roughly corresponding to 1995-2000, was unusually unfavorable for migration of middle and retirement-age population to San Mateo County, and the High series reflects the more recent and higher rates in this part of the life course.

All the other demographic rates, immigration, emigration, mortality, and fertility, are the same in the three series. This approach is based on the observation that domestic migration has historically been the least stable and predictable component of growth in the elderly population.

Disability Status Assumptions

The estimates were derived by combining data from several sources because no single data source provides county level detail for impairments with ADLs. Before projecting the number of people with disabilities for 2020 and 2030, the number of people with disability in 2000 and 2005 had to be estimated. The input 2000 Census data contains responses for three broad questions about disability for all persons aged 15 and older. However, these types of limitations are not effective measures for assistance needs. More commonly used to define disability are the so-called functional limitations, usually defined as requiring the help of another person in order to perform any of a number of Activities of Daily Living (ADLs) or Instrumental Activities of Daily Living (IADLs). In order to generate estimates of the numbers of persons with functional limitations, we employed a non-parametric mapping technique that assigned each individual in our PUMS data set a set of probabilities of having different

functional limitations, conditional on the individual's age and his or her answers to three broad PUMS disability questions.

To estimate the total number of people with different disability levels, we aggregated the probabilities of having each of the disability class for all the individual records in the input data sets and applied population weights. To estimate number of people with disabilities for the years 2005, 2020, and 2030 we applied population weight variable for these year to input data set 2000 weights.

Income Assumptions

The model assumed the person level growth rate would mirror the underlying historical growth rate witnessed over last six years. To project person level income, we used 2000 Census and 2005 American Community Survey to examine the person level income trend of San Mateo County residents between 2000 and 2005 by each person's age, marital status and employment status. Due to small sample size limitations and internal validity concerns resulting from three dimensional combinations, we instead looked at the income change for San Francisco Bay Area counties residents and applied average real income change to San Mateo County residents.

Housing Probabilities and Assumptions

To understand the housing affordability the County will face in the future with changing underlying demographic composition and any new County or state policy initiatives, the model projects number of renters or owners who will contribute 30 percent or 50 percent of their household income on housing cost.

In 2020 and 2030, the measure for housing affordability for each household captures both the change in person level income within the same household and increase in housing cost overall. The extent of the change depends on the value the user sets for the parameters.

Rental Expense Assumptions

In 2005, renters age 41 years and above living in San Mateo County spent on average $1,266 on rent every month which was about 30 percent of the household income, this figure was used as a baseline.

Owner Expense Assumptions

In 2005, home owners with mortgage, age 41 years or older, and living in San Mateo County spent on average $2,736 on mortgages every month which is about 29 percent of the household income. This information was used as baseline for future projections.

Mortgage Status Assumptions

The current elderly population has significantly higher rates of home ownership without a mortgage compared to the baby boomers. The "Tenure Status Remain the Same as Current Seniors" parameter simulates tenure status among the Baby Boomers to be similar to the current elderly cohort in 2020 and 2030. The alternative scenario maintains the Baby Boomers 2005 tenure status for the future projections.

Health and Social Services Assumptions and Probabilities

Physician Use Assumptions
We used the physician use rate generated by Lewin Group Physician Demand and Supply Model based on people's age, sex and race.

Hospital Use Assumptions
The model applies the 2005 average length of stay in hospitals based on 2005 OSHPD data.

Alternative Residential Facilities Assumptions
The model applied national assisted living use rate by age groups to project number of potential assisted living residents (Table 2).

Table 2. Assisted living use rate by age

Age	Assisted living use rate
65-74	0.20%
75-84	1.17%
85+	3.93%

[i] Wave 11 of the 1996 SIPP Panel was used and it represents adult disability prevalence between December 1998 and March 1999, closely matching the 2000 Census timeframe. We explored using the most recent SIPP Panel, Wave 8 of 2001 Panel, collected from June 2003 to September 2003, but found that , with the exception of children with MR/DD which are excluded from this model's analysis, the disability prevalence rates of adults were very similar to the 1996 Panel data.

[ii] ftp://ftp.hrsa.gov/bhpr/workforce/PhysicianForecastingPaperfinal.pdf

[iii] SamTrans Paratransit Information Guide: http://www.samtrans.org/rwguide.html

[iv] The assumption that the differential decline in death rates in San Mateo County, and by extension the Bay Area, will be complete in about 2015 is based on a conversation with Dr. Scott Morrow, MD, MPH, MBA, San Mateo County Health Officer, 5/23/2007.

[v] The data are highlighted in Myers, Dowell, John Pitkin and Julie Park. 2004. "California's Immigrants Turn the Corner." Urban Initiative Policy Brief. Los Angeles, CA: University of Southern California.