Version 9.0.0 - Calibration/Validation

WFRC / MAG

Life Cycle

The Life Cycle model determines the how much of the TAZ population and households from the processed socioeconomic input file will be in one of three life cycle categories:

- Life Cycle 1 – households with no children and no seniors
- Life Cycle 2 – households with children and no seniors
- Life Cycle 3 – households with seniors (may have children)

The Life Cycle model does its calculations in three phases:

- Determine the TAZ population that is in three age groups
- Determine each age group population that is in the three life cycle categories
- Determine the number of households in each life cycle category

Population by Age Group

The Life Cycle model first estimates how much of the TAZ population falls into one of three Age Group categories:

- Age Group 1 – 0 to 17 years old
- Age Group 2 – 18 to 64 years old
- Age Group 3 – 65+ years old

The initial share of the TAZ population in each Age Group is determined by multiplying the TAZ household population by the TAZ-level Age Group percentages in the Lookup - BY-TAZAgePct - AllCo.csv file located in the 1_Inputs\0_GlobalData\1_HHDisag_AutoOwn directory. These initial TAZ-level Age Group percentages were calculated from 2020 Census block and 2020 ACS block group data summarized at the TAZ level.

The Census data was also summarized at the medium district level. If the Census TAZ data had fewer than 50 people, the percentages from medium districts were used. The medium district distribution of 2020 Census Age Group percentages for the Wasatch Front can be seen in the following Figure. The share of population in each of the Age Groups varies significantly by geography. Urban areas tend to have the highest share of population 18-64 years old and the fewest children and seniors. Suburban and rural areas tend to have the highest share of children.

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2020 Census % Population by Age Group by Medium District.

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The initial TAZ-based population by Age Group is then factored to reflect the year being modeled. This is done using the county population by Age Group forecasts found in ControlTotal_Age.csv located in 1_Inputs\2_SEData_ControlTotals directory. The Age Group county-level percentages are calculated from county-level population projections from the Kem C. Gardner Policy Institute (GPI), 2020-2060 State and County Total Population by Sex and Single-Year of Age. The GPI projections show a trend in all counties in the Wasatch Front model space toward a more senior population and fewer children. Adult population in the age range of 18-64 also saw a slight increase in population share.

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Figure 1: GPI County Population Projections by Age Group for Wasatch Front Counties.

The 2020 model base year population by county and Age Group was compared to the 2020 GPI county-level population by Age Group, shown in the following charts. The model's estimate of the population in each Age Group mirrors the GPI county-level projections.

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Figure 2: 2020 Model vs. 2020 GPI – % Population by Age Group and County.

Population by Life Cycle

The Life Cycle model uses parameters estimated from the 2012 Household Survey to convert population in Age Groups to population in a Life Cycle category. Unique parameters were estimated for each county and are found in Table 1.

Table 1: Percent of Age Group Population in Life Cycle 2 by County

County	0-17 Population Age Group (LC2 Fac 0-17)	18-64 Population Age Group (LC2 Fac 18-64)
Box Elder	0.993	0.664

County	0-17 Population Age Group (LC2 Fac 0-17)	18-64 Population Age Group (LC2 Fac 18-64)
Weber	0.982	0.606
Davis	0.974	0.711
Salt Lake	0.961	0.525
Utah	0.981	0.659

Only factors for Life Cycle 2 were estimated. Life Cycle 1 has no children leaving the 0-17 population to be divided between Life Cycles 2 and 3. Life Cycle 3 has no adults age 18-64 leaving the 18-64 population to be divided between Life Cycles 1 and 2. All of 65+ population lies completely within Life Cycle 3. Table 2 contains the equations used to calculate Life Cycle population.

Table 2: Equations to Calculate Age Group Population in Each Life Cycle Category

Age Group	Life Cycle 1	Life Cycle 2	Life Cycle 3
0-17	0	LC2 Fac 0-17	1 – (LC2 Fac 0-17)
18-64	1 – (LC2 Fac 18-64)	LC2 Fac 18-64	0
65+	0	0	1

Almost all of the child-aged population is contained within Life Cycle 2, ranging between 96.1% in Salt Lake County and 99.3% in Box Elder County. The remaining child population is in Life Cycle 3. The majority of the adult-not-a-senior population is contained in Life Cycle category 2, ranging between 52.5% in Salt Lake County and 71.1% in Davis County, with the remainder falling into Life Cycle 1.

The shares of the modeled 2019 base year population by Life Cycle were compared to the 2012 Household Survey at the county level. The model's estimate of population by Life Cycle category seemed reasonable at this level of geography with all modeled comparison points falling within 4% of the observed data.

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Figure 3: 2019 Model vs. 2012 Household Survey – % Population by Life Cycle and County.

Households by Life Cycle

The Life Cycle model calculates households by Life Cycle using the average household size for each Life Cycle category. Unique average household sizes were estimated for each county and Life Cycle from the 2012 Household Survey.

Table 3: Average Household Size by Life Cycle and County

County	Household Size for Life Cycle 1	Household Size for Life Cycle 2	Household Size for Life Cycle 3
Box Elder	1.86	4.21	2.41
Weber	1.88	4.53	1.81
Davis	2.14	4.68	2.33
Salt Lake	1.86	4.44	1.81
Utah	2.11	4.75	2.21

The TAZ-level population by Life Cycle category are divided by the average household size factors to generate an estimate of the share of TAZ-level households in each Life Cycle category. The share of households in each Life Cycle category is then multiplied by the total households in the TAZ to get the adjusted number of households per Life Cycle category.

A final check is made to avoid unrealistic household sizes for zones with smaller populations. The number of households for a given Life Cycle category are capped at the minimum and maximum household sizes found in Table 4.

Table 4: Allowed Minimum and Maximum Average Household Size by Life Cycle

Life Cycle Category	Minimum Household Size	Maximum Household Size
1	1	4
2	2	8
3	1	4

The shares of the modeled 2019 base year households by Life Cycle were compared to the 2012 Household Survey at the county level. The model's estimate of households by Life Cycle category seemed reasonable at this level of geography with all modeled comparison points falling within 1,5% of the observed data.

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Figure 4: 2019 Model vs. 2012 Household Survey – % Households by Life Cycle and County