

Oregon's Population Forecast Methodology

Forecasts of Population by Age and Sex: 2010 to 2020

The state population projection by single year of age and sex uses the cohort-component method. In this method each birth cohort (the people born in a specified year) is projected forward (e.g., from age 15 in one year to age 16 a year later). Each component of population change – births, deaths, and migration – was projected from 2010 to 2020 based on recent fertility, mortality, and migration trends. Rates of fertility, mortality, and migration were developed based on historical trends and modified for the future based on national trends.

Projection of fertility rates were based on historical birth data obtained from the Oregon's Center for Health Statistics (OCHS). Projection of survival probability was developed based on historical data from OCHS and projection of life expectancy based on national trend. In-and-out migration by age and sex were derived from the 2000 census migration data file.

I. Methodology Overview

The cohort-component method is used to produce the state projections of population for July 1 of each projection years. This is the widely used forecasting method used by demographers. The July 1, 2000 population was used as a base to project the population in future years. Until the Census Bureau came up with adjusted July 1, 2000 population by age and sex based on the intercensal error correction, OEA developed its own population by age and sex based on the census count and intercensal estimate. The projections of total population for 2001 through 2009 were controlled to the annual estimates by Population Research Center, Portland State University. However, age-sex details produced by OEA do not match PSU's estimates.

Fertility rates, mortality rates (converted to survival rates to project population), and migration rates by age and sex were developed for 2000. For each age, the survival rate was applied to the population to obtain the population that would be one year older in the following year. The survived population and initial population were averaged to derive the population base to which rates of migration and childbearing were applied. Age-specific fertility rates were applied to women of childbearing age to derive projected births. Then the projected in-migration and out-migration rates by age and sex were applied to the population base to derive the migration volume which is controlled to fit Oregon's employment pattern. The migration rates are based on Census 2000 data on migration between 1995 and 2000.

II. Fertility and projection of births

Data on 2000 births by five year age groups of mother, obtained from OCHS, were used to derive age-specific fertility rates based on the July 1, 2000 population. Fertility rates were modified through the projection years based on historical and national trends. Special attention

was paid to the trend in total fertility rates (TFR), which are the sum of the age-specific fertility rates, because the TFR represents the implied completed fertility rate of women.

The total number of projected births was calculated as the product of the age-specific fertility rates and the female population of childbearing ages. The total number of resulting births through 2009 was controlled to the available data from the OCHS.

[Table ASFR]

III. Mortality and projection of deaths

Data on 1999, 2000, and 2001 deaths by age and sex were obtained from OCHS and used to calculate age-sex- specific death rates based on the estimated July 1, 2000 population. Due to the small number of deaths by single year of age and sex, three year average number of deaths centered on July 1, 2000 was used. Standard life tables for males and females were developed based on age/sex-specific deaths rates. The life tables were projected based on historical and national trends in life expectancies. From the life tables, survival rates were derived.

For each year in each age-sex group, the total of the starting population plus net migration multiplied by the projected survival rate was used to derive the projected population at the end of each year. The projected deaths were the difference between the survived population and the population at the beginning of each year. The projected deaths for years through 2008 were adjusted based on the data from OCHS.

[Table life table]

IV. Migration

Age/sex-specific in and out migration rates were developed based on the 2000 census. Oregon Employment Department's data on non-agricultural employment history and OEA's employment forecast were used to get a general trends and volume of future migration. In the census, each resident was asked about the residence five years ago. The 1995-2000 census migration characteristics were used to project the composition of migrants to derive total projected migration by age and sex.

[Table migration rate]

V. Final population projections

Since the projection of births, deaths, and migration were done separately, a final check is needed to make sure all the components of change add up to the age-sex detail.

VI. Future Population Projections

The inputs and assumptions are expected to change if state and national trend change. Based on the demand for race and Hispanic population forecast, future project will involve incorporating these elements. It will complicate the overall forecast process, however the demand is too great and the issue is too important to ignore.

Age-specific Fertility Rates and Total Fertility Rates

<u>Age</u>	<u>2000-2001</u>	<u>2001-2002</u>	<u>2002-2003</u>	<u>2003-2004</u>	<u>2004-2005</u>	<u>2005-2006</u>	<u>2006-2007</u>	<u>2007-2008</u>	<u>2008-2009</u>	<u>2009-2010</u>	<u>2010-2011</u>	<u>2011-2012</u>	<u>2012-2013</u>	<u>2013-2014</u>	<u>2014-2015</u>	<u>2015-2016</u>	<u>2016-2017</u>	<u>2017-2018</u>	<u>2018-2019</u>	<u>2019-2020</u>
15-19	0.0420	0.0390	0.0360	0.0341	0.0332	0.0339	0.0345	0.0340	0.0329	0.0330	0.0316	0.0317	0.0316	0.0315	0.0314	0.0316	0.0317	0.0318	0.0320	0.0321
20-24	0.1070	0.1037	0.1003	0.0976	0.0953	0.0961	0.0973	0.0957	0.0921	0.0926	0.0886	0.0888	0.0890	0.0889	0.0888	0.0890	0.0893	0.0895	0.0898	0.0900
25-29	0.1121	0.1117	0.1131	0.1126	0.1113	0.1135	0.1144	0.1122	0.1081	0.1084	0.1036	0.1037	0.1037	0.1034	0.1031	0.1033	0.1036	0.1039	0.1043	0.1046
30-34	0.0863	0.0863	0.0886	0.0901	0.0890	0.0912	0.0928	0.0902	0.0871	0.0874	0.0833	0.0835	0.0835	0.0832	0.0830	0.0832	0.0834	0.0835	0.0836	0.0837
35-39	0.0372	0.0382	0.0402	0.0420	0.0435	0.0446	0.0444	0.0435	0.0421	0.0422	0.0404	0.0405	0.0405	0.0403	0.0402	0.0403	0.0403	0.0404	0.0405	0.0406
40-44	0.0078	0.0080	0.0083	0.0088	0.0088	0.0090	0.0092	0.0089	0.0087	0.0087	0.0083	0.0083	0.0084	0.0084	0.0084	0.0084	0.0084	0.0085	0.0085	0.0085
TFR	1.9618	1.9348	1.9331	1.9262	1.9055	1.9414	1.9632	1.9227	1.8548	1.8617	1.7795	1.7824	1.7836	1.7789	1.7750	1.7793	1.7837	1.7884	1.7929	1.7973

Migration Rates

Based on historical data

<u>Age</u>	<u>In migrants</u>		<u>Out migrants</u>	
	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>
0	0.00801	0.00820	0.00704	0.00711
1	0.01683	0.01644	0.01139	0.01098
2	0.02217	0.02162	0.01503	0.01457
3	0.02732	0.02759	0.01834	0.01834
4	0.03019	0.03135	0.02040	0.02097
5	0.03705	0.03682	0.02537	0.02488
6	0.03625	0.03641	0.02450	0.02437
7	0.03459	0.03516	0.02323	0.02349
8	0.03270	0.03348	0.02202	0.02232
9	0.03046	0.03133	0.02108	0.02136
10	0.02876	0.02963	0.02055	0.02078
11	0.02729	0.02808	0.02016	0.02047
12	0.02683	0.02748	0.02004	0.02046
13	0.02620	0.02700	0.01965	0.02035
14	0.02613	0.02707	0.01919	0.02017
15	0.02328	0.02994	0.01677	0.02210
16	0.02474	0.03140	0.01746	0.02315
17	0.02701	0.03395	0.02014	0.02675
18	0.03084	0.03990	0.02474	0.03304
19	0.03960	0.04176	0.03376	0.03572
20	0.04524	0.04594	0.03916	0.03942
21	0.04918	0.04996	0.04270	0.04255
22	0.05280	0.05273	0.04421	0.04312
23	0.05674	0.05671	0.04315	0.04288
24	0.05819	0.05842	0.04215	0.04210
25	0.05808	0.05780	0.04192	0.04135
26	0.05827	0.05817	0.04034	0.04050
27	0.05677	0.05726	0.03899	0.03957
28	0.05450	0.05536	0.03757	0.03819
29	0.05187	0.05264	0.03643	0.03613
30	0.04950	0.05013	0.03487	0.03399
31	0.04760	0.04767	0.03307	0.03175
32	0.04559	0.04607	0.03089	0.03006
33	0.04293	0.04384	0.02901	0.02851
34	0.04002	0.04059	0.02791	0.02710
35	0.03706	0.03718	0.02675	0.02581
36	0.03370	0.03603	0.02444	0.02540
37	0.03235	0.03469	0.02278	0.02411
38	0.03148	0.03384	0.02159	0.02281
39	0.03020	0.03241	0.02097	0.02212
40	0.02887	0.03086	0.02048	0.02135
41	0.02739	0.02914	0.01970	0.02057
42	0.02594	0.02794	0.01876	0.01971
43	0.02452	0.02659	0.01805	0.01895
44	0.02421	0.02397	0.01840	0.01736
45	0.02307	0.02269	0.01763	0.01662
46	0.02165	0.02221	0.01651	0.01642
47	0.02114	0.02166	0.01605	0.01623
48	0.02081	0.02155	0.01592	0.01615
49	0.02054	0.02141	0.01578	0.01597
50	0.02011	0.02091	0.01560	0.01547
51	0.01934	0.01988	0.01524	0.01483
52	0.01882	0.01905	0.01487	0.01421
53	0.01859	0.01891	0.01418	0.01379
54	0.01854	0.01973	0.01326	0.01385
55	0.01821	0.02070	0.01218	0.01420
56	0.01777	0.02124	0.01131	0.01464
57	0.01684	0.02214	0.01040	0.01544
58	0.01692	0.02204	0.01031	0.01529
59	0.01762	0.02202	0.01052	0.01459
60	0.01805	0.02250	0.01053	0.01443
61	0.01889	0.02226	0.01088	0.01410
62	0.01841	0.02331	0.01031	0.01486
63	0.01847	0.02300	0.01036	0.01470
64	0.01810	0.02277	0.01057	0.01484
65	0.01814	0.02248	0.01107	0.01482
66	0.01896	0.02105	0.01177	0.01381
67	0.01886	0.02053	0.01147	0.01292
68	0.01811	0.01924	0.01122	0.01246
69	0.01719	0.01792	0.01119	0.01232
70	0.01600	0.01643	0.01086	0.01238
71	0.01521	0.01573	0.01015	0.01198
72	0.01424	0.01484	0.00946	0.01155
73	0.01346	0.01445	0.00937	0.01133
74	0.01269	0.01369	0.00941	0.01097
75	0.01249	0.01338	0.00944	0.01047
76	0.01222	0.01309	0.00907	0.00985
77	0.01271	0.01319	0.00915	0.01005
78	0.01335	0.01327	0.00927	0.01056
79	0.01416	0.01330	0.00962	0.01127
80	0.01401	0.01330	0.00932	0.01119
81	0.01402	0.01327	0.00933	0.01097
82	0.01428	0.01331	0.00908	0.01034
83	0.01444	0.01379	0.00926	0.01014
84	0.01558	0.01429	0.00886	0.00981
85	0.01603	0.01443	0.00876	0.00979