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Methodology for State-Level Projections of Primary Care Physician Workforce
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Overview

Current health care utilization data were used to project state-level primary care physician workforce needs from 2015 to 2030. These projections took into account population growth, the aging of the population, and the rise in the number of insured that is attributable to the Affordable Care Act. Underlying these projections is the assumption of a constant state-level productivity rate of primary care delivery, as measured by the mean level of visits per primary care physician in 2010. These projections may over- or under-state future demand if utilization patterns are altered by unforseen factors such as improvement in public health, new technologies, or economic trends. Similarly, productivity rates may vary in response to the ongoing transformation of primary care.

Steps of Analysis

1) **Medical Expenditure Panel Survey (MEPS) Estimates of Primary Care Use:** We pooled data from the 2008-2010 MEPS to estimate current primary care use—measured by the mean number of visits to primary care physicians across age and sex groups as well as insurance status. Because of small sample sizes, estimates within states are not possible with MEPS data. We instead used age-sex primary care visit rates at the region level.
2) **Number of Primary Care Physicians across States:** We used data from the 2010 American Medical Association (AMA) Masterfile to calculate the number of primary care physicians currently available to meet observed use. Based on the MEPS figures obtained in Step 1, we then estimated the mean annual number of visits for each primary care physician within a state.
3) **Changes in Population Size and Age Distribution:** With 2015-2030 state-level population projections by age and sex, we projected increases in the number of primary care visits due to population growth and aging across states. State-level differences in insurance rate were used to weight visit rates. Where possible we use population projections based on 2010 Census data and estimated by individual states. Otherwise, we used Census Bureau projections based on 2000 Census data.
4) **Universal Coverage:** To examine the impact of the Affordable Care Act (ACA) on the volume of primary care visits, we begin by estimating the number of additional visits assuming universal coverage—where *all* of the uninsured both obtain insurance and use primary care at the same rate as the insured. Specifically, we repeat the calculations in step 3, but use the mean number of visits of the insured (rather than a weighted average of the insured and uninsured). Multiplying these visit rates with population projections for each age-sex group allowed us to calculate the additional number of visits that would occur assuming universal coverage.
5) **Partial Coverage Under the ACA:** Under the ACA not all of the uninsured will obtain insurance and the proportion that will obtain coverage varies substantially across states. We used state-level estimates of decreases in the number of uninsured--available from a Kaiser Family Foundation/Urban Institute report—to adjust downward the universal coverage estimates from Step 4. Moreover, because of the current uncertainty across states associated with the expansion of Medicaid to cover many of the uninsured, we provided two sets of estimates based on whether or not a state expands Medicaid.
6) **State-Level Projections of Needed Primary Care Physicians, 2010-2030:** Combining the results from steps (3) and (5), we then calculated overall estimates of the number of primary care physicians that would be necessary to meet future demand based on current visit rates by age, sex and region, as well as current productivity rates of primary care physicians across states. We can then specify which portion of the change is due to state-level change in population, aging and the ACA; we also adjusted our estimates to reflect the phasing in of the ACA.

We discuss each of these steps in greater detail below. The data elements used for the projections are listed in Figure 1.

Figure 1. Data Sources

Number of Primary Care Visits	
MEPS 2008-2010	Consolidated Files from 2008-2010 were used to obtain region, age, sex and insurance status at the individual-level; corresponding office-based medical event files were used to create counts of office-based visits to primary care physicians. Combining these two data sets, we estimated the mean number of visits across region, sex and age groups (Step 1 below).
Estimates of Number of Uninsured by Age and Sex	
ACS 2009-2011	Data from the American Community Survey (ACS) were used to obtain counts by state, sex and age groups of the number of insured and uninsured persons to obtain a weighted state-level count of primary care visits in Step 3.
Estimates of Practicing Primary Care Physicians	
AMA Masterfile 2010	For Step 2, we used the 2010 AMA Masterfile to identify physicians actively practicing in primary care. The analysis was restricted to physicians in direct patient care (020), and did not include residents (012) or those with an unspecified practice status (100). Primary care physician are identified as those with a primary specialty of general practice (GP), family physicians (FP/FM), internal medicine (IM) or geriatrician (IMG or FPG). Counts are adjusted for retirement and non-primary care activity (e.g. hospitalists or emergency medicine). Using physician practice addresses, we obtained state-level counts.
Population Projections by Age and Sex, 2010-2030	
US Census Bureau (based in Census 2000)	The latest state projections by age and sex available from the US Census Bureau were based on Census 2000 and were released in 2005. The Census Bureau has not created nor plans to create state-level estimates based on Census 2010.
Individual State Projection (based on Census 2010)	A number of states have produced their own population projections based on the 2010 Census- we used these individual state projections when they were available. The following states have created their own projections : Alabama, Alaska, Arizona, California, Delaware, Hawaii, Indiana, Kentucky, Maine, Maryland, Mississippi *, Montana, New Jersey, New York, North Carolina, Oregon, Pennsylvania, South Dakota, Tennessee, West Virginia, Wisconsin, Wyoming. Mississippi projections did not include 2030; to obtain 2030 counts, we extrapolated from 2010 to 2035 trends across age/sex groups. The source of these state projection are listed in each of the briefs. These population projections were used in Step 3 to estimate the volume of visits as population and age distribution changed across states.
State Level Estimates of the Reduction of Uninsured, With and Without Medicaid Expansion	
Kaiser Family Foundation/Urban Institute: State-by-State Implications of the ACA	In Step 5 of the analysis, we used state-level estimates of the effect of the ACA on changes in the number of uninsured available in a recent Kaiser Family Foundation/Urban Institute study (John Holahan, Matthew Buettgens, Caitlin Carroll and Stan Dorn, "The Cost and Coverage Implications of the ACA Medicaid Expansion: National and State-by-State Analysis, November 1, 2012). These estimates are based on the Urban Institute's Health Insurance Policy Simulation Model (HIPSM) and provide estimates that assume a State would opt to either expand or not expand Medicaid. This model provides state-by-state estimates of the impact of ACA on federal and state Medicaid costs, Medicaid enrollment, and the number of uninsured (See Table ES-3 of the KFF Report).
Phasing in of Affordable Care Act	
March 2012 CBO Coverage Estimates (Table 3)	We used March 2012 Congressional Budget Office projections of the national effect of the ACA on the number of uninsured to capture year-by-year, from 2012 to 2017, changes reflecting the different start dates of different elements of the law (Step 6).

Step 1. MEPS-based Estimates of Primary Care Use

The MEPS is administered by the Agency for Healthcare Research and Quality (AHRQ) and collects data from a nationally representative sample of individuals and families regarding health conditions, health status, use of medical services, insurance coverage, and access to care. Ideally rates specific to each state could have been calculated; however, small cell sizes (for age/sex/insurance combinations) would yield imprecise estimates for many states. Instead, we used estimates from each Census region (Northeast, Midwest, South and West)Medical Expenditure Panel Survey (MEPS) data from 2008-2010 is used to calculate the mean number of primary care visits across insurance status, region, age and sex groups. The data was pooled across three years to allow for adequate sample sizes within each of the 96 cells (2x4x6x2). While the annual consolidated MEPS files reports the number of *office-based visits* for each respondent, it does not contain a separate count of primary care visits. To obtain this count, we used the 2008-2010 office-based medical event file, which include physician speciality information, to obtain counts of visit to primary care physicians. Unfortunately, the medical event file does not include specialty information about non-physicians providing care. In 2010, approximately 6.4% of all office-based visits were to a nurse/ nurse practitioner or to a physician assistant, but an indeterminate number of these visits were for primary care. Moreover, the amount of care delivered by nurse/nurse practitioners and physician assistants is underreported because visits that involved care from both a physician and some other type of provider is categorized as a physician visit.[1] We restrict our counts of visits to primary care physicians: general practitioners/family physicians, pediatricians, or general internists (geriatricians are not identified).

Calculation of Mean Number of Primary Care Visits by Age and Sex Groups (Step 1), Alaska

		MEPS PC Visits (West Region)			
Sex	Age	Insured	Uninsured	% Uninsured	Mean PC Visits
M	0-4	2.49	1.65	12.9%	2.38
F	0-4	2.23	1.61	11.1%	2.16
M	5-19	0.90	0.27	12.9%	0.82
F	5-19	0.98	0.31	13.9%	0.89
M	20-24	0.58	0.15	40.3%	0.41
F	20-24	0.92	0.48	31.9%	0.78
M	25-44	0.86	0.27	32.0%	0.67
F	25-44	1.27	0.69	22.4%	1.14
M	55-64	1.68	0.88	19.6%	1.52
F	55-64	1.97	1.23	16.8%	1.85
M	65+	2.82	0.17	1.5%	2.78
F	65+	2.82	0.49	1.3%	2.79

EXAMPLE OF CALCULATIONS: Mean primary care visits for the West were obtained using MEPS and the percentage uninsured is from the ACS. For each group, the mean number of PC visits for each age-sex group is the weighted average of the visit means for the insured and uninsured used in Step 3. For example, for 0-4 year old boys, the predicted mean number of PC visits is equal to 2.38 [=((2.49)*(100%-12.9%)) + ((1.65)*(12.9%))] .

[1] According to the 2010 data description (http://meps.ahrq.gov/data_stats/download_data/pufs/h135g/ h135gdoc.pdf, retrieved 9/7/2013): "The questionnaire also establishes whether the person saw or spoke to a medical doctor (SEEDOC). If during the medical visit the patient did not see a specialty doctor (DRSPLTY), or, if the person did not see a physician (i.e., a medical doctor), the respondent was asked to identify the type of medical person seen (MEDPTYPE)."

This information from the office-based events file was combined with the main consolidated file. For respondents without an office-based visit, the count of primary care visits equals zero. As noted above, we then use these data to calculate mean number of visits across region, insurance status, sex and age groups (0-4, 5-19, 20-24, 25-44, 45-64, 65+). The way age groups are defined reflects the need to match the data with population projections available from states, which are often based on 5-year intervals. Sample weights were used to obtain all estimates.

Finally, to calculate state-specific mean number of primary care visits across each age-sex groups, we created a weighted average of the means for insured and uninsured persons using American Community Survey (ACS) data on insurance coverage from the three-year rollup data for 2009-2011. The state of Alaska is used to illustrate these calculations (Table 1).

Step 2. Estimates of the Number of Primary Care Physicians across States

We identified primary care physicians in the 2010 American Medical Association (AMA) Masterfile by selecting physicians in direct patient care with a primary specialty of family medicine, general practice, general internal medicine, general pediatrics, or geriatrics.[3] To address the fact that the AMA Masterfile undercounts retirees, we adjusted the figures after comparing the age distribution of physicians in the AMA Masterfile with the subset of these physicians who could be matched in the National Provider Identifier database. We then decreased general internist counts by 20% to account for hospitalists and those in non–primary care settings[4] and decreased counts for family physicians, pediatricians, and geriatricians by 5% to account for those working primarily in urgent or emergency care.[5]

Step 3. Implications of Changes in Population Size and Age Distribution

The latest state projections by age and sex available from the US Census Bureau were based on Census 2000 and were released in 2005. The Census Bureau has not created nor plans to create state-level estimates based on Census 2010. Instead, a number of states have produced their own population projections based on 2010 Census (see list in Figure 1). We collated these estimates and created a uniform 2010-2030 series, in five year intervals. Where possible, we used the state level projections based on 2010 Census data; otherwise, we used the Census Bureau estimates using 2000 Census data. Using these population projections and the mean number of primary care visits by age and sex (calculated in Step 2), we calculated the expected total number of primary care visits from 2015 to 2030. Specifically, we multiplied the projected population for each year by mean PC visits for each age-sex group. These numbers for each group are summed within a year to obtain the expected total number of PC visits in a year. These calculations for Alaska in 2010 and 2015 are illustrated below (Table 2).

[3] Geriatricians are included in our list of primary care specialties to be consistent with national estimates. This is not included as a specialty in the MEPS. We assume that in identifying the speciality of their physician, geriatricians were classified as either family physicians/general practitioners or as general internists. Nationwide there are about 3,000 geriatricians.

[4] 5. Kuo YF, Sharma G, Freeman JL, Goodwin JS. Growth in the care of older patients by hospitalists in the United States. N Engl J Med. 2009;360(11):1102-1112.

[5] This figure is based on an analysis of American Board of Family Medicine data showing that roughly 5% to 6% of family physicians report spending more than 50% of their time in urgent or emergency care.

Step 4. Implications of the ACA on Demand for Primary Care

To estimate the impact of the ACA on the volume of primary care visits, we again use mean number of primary care visit rates for insured persons (calculated in Step 1). Using state-level 2010 Census estimates of the age and sex distribution of the uninsured, we calculated the additional visits that would occur *if all the uninsured had the same visit rates as the insured.*

Calculaton of Projected Total Number of Primary Care Visits in 2010 and 2015, Alaska

		Population		Current Insurance Coverage (Step 3)	PC Visits		Universal Coverage (Step 4)	PC Visits	
sex	Age	2010	2015	PC Visit Rate	2010	2015	PC Visits Insured Rate	2010	2015
M	0-4	28,049	30,650	2.38	66,867	73,068	2.49	69,908	76,391
F	0-4	26,244	29,393	2.16	56,676	63,476	2.23	58,467	65,482
M	5-19	79,802	82,271	0.82	65,105	67,119	0.90	71,575	73,789
F	5-19	74,890	77,019	0.89	66,703	68,600	0.98	73,654	75,748
M	20-24	29,869	27,576	0.41	12,103	11,174	0.58	17,273	15,947
F	20-24	24,848	23,588	0.78	19,455	18,468	0.92	22,949	21,786
M	25-44	103,109	110,357	0.67	69,434	74,315	0.86	89,052	95,312
F	25-44	94,071	101,482	1.14	107,425	115,889	1.27	119,540	128,957
M	55-64	103,882	104,584	1.52	158,068	159,136	1.68	174,194	175,371
F	55-64	94,141	95,822	1.85	173,787	176,890	1.97	185,552	188,865
M	65+	26,952	38,264	2.78	75,001	106,480	2.82	76,066	107,991
F	65+	28,285	38,238	2.79	78,844	106,587	2.82	79,668	107,701
		714,142	759,244	-	949,468	1,041,202	-	1,037,899	1,133,342

According to these projections, the total population is expected to grow in Alaska by about 45,000 persons, from 714,142 to 759,244. (Nearly half of this growth occurs in the 65+ age group.) The Mean PC rates for each group are carried over from the calculations in Table 1. The results for Step 3 assume no change in the percent of persons insured. In this illustration, we estimate that 0-4 year old boys in Alaska will have a total of 73,068 visits in 2015, the product of 2.38 and 30,650. Summing across all age groups, we estimated that all else equal there will be 1,041,202 primary care visits in 2015.

For step 4, we assume universal coverage and that the primary care use for the entire population resembles of the currently insured (calculated in Step 1 and reproduced in Table 2). In this case, our 2015 estimates for 0-4 year old boys increase to 76,391 (=30,650*2.49). In this scenario, the total number of PC visits in 2015 equals 1,133,342, about 92,000 more visits than under the total calculate assuming current insurance coverage rates.

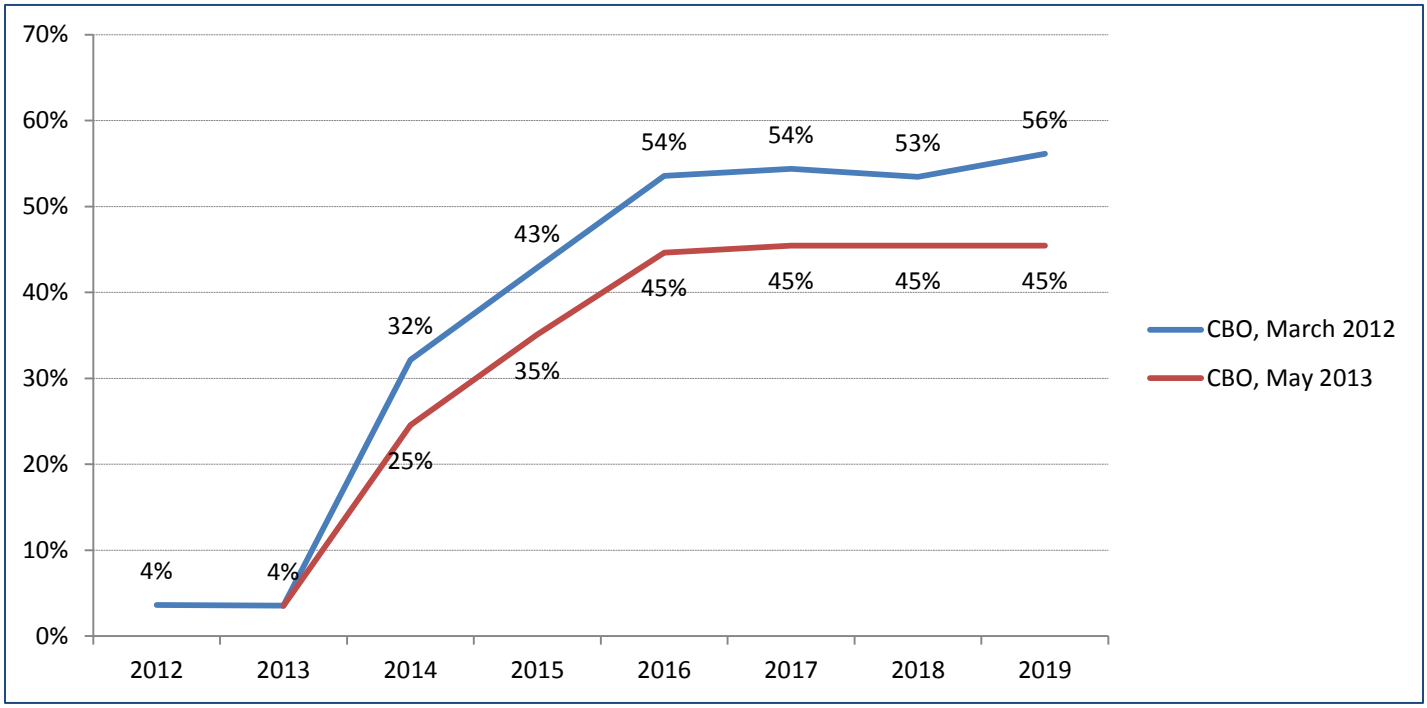
Step 5. The Implications of the ACA

Of course, under the ACA not all of the uninsured will obtain insurance. Moreover, there will be substantial variation across states in the proportion of the uninsured that are likely to become insured. This reflects such state-level factors as current levels of coverage, the composition of the uninsured population in terms of income, employment and immigrant status. In addition, there remains considerable uncertainty as to how likely the uninsured will be to obtain coverage even if they become eligible for Medicaid or if they can purchase health insurances from the health exchanges at a subsidized rate. Finally and perhaps most importantly, a large number of states have indicated that they will not participate in the ACA's provision to expand Medicaid. While there are many national estimates of the increase in the number of insured, to our knowledge only one study has attempted to rigorously estimate *state-level* variation in

changes in coverage (Holan, Buettgens, Carroll and Dorn, 2012). The report prepared for the Kaiser Commission on Medicaid uses the Urban Institute's Health Insurance Policy Simulation Model (HIPSM) to provide state estimates of the impact of the ACA on Medicaid costs and enrollment as well as the number of uninsured. The HIPSM used data from the Current Population Survey (CPS) and MEPS model. Our use of their findings is limited to their estimates of changes in the number of insured at a state-level to adjust downward the "universal coverage" estimates obtained in Step 4. Moreover, because of the current uncertainty across states associated with the expansion of Medicaid, we calculated two sets of estimates, the first assumes a state will expand Medicaid and the second assumes no expansion (see Table 2).

In Alaska, for instance, we estimated that "Universal Coverage" would increase the number of primary care visits by more than 100,000. The Kaiser study reports that an estimated 52% of the uninsured in Alaska will be covered under the ACA assuming Medicaid expansion, but just 33% will be covered without Medicaid expansion. Using these rates, after adjusting the universal coverage rate, we would expect that there would be a total of roughly 53,000 additional visits with Medicaid expansion and (102,100*0.53) and 34,000 visits (102,100*0.33) without Medicaid expansion.

The coverage estimates from the Kaiser study are based on the full implementation of the provisions of the ACA and do not reflect the gradual phasing in of the different provisions. To capture this process we used figures from the Congressional Budget Office (CBO) that provide a year-by-year estimate of the proportion of the uninsured that will be covered nationwide. We use estimates that assume full Medicaid expansion (CBO 2012 estimates) rather than estimates based on CBO's projection at a national level of state-level decisions to expand or not expand Medicaid (2013 estimates). As shown in Figure X, by 2012-2013 4% of the uninsured will be covered; this percentage increases to 32% by 2014, 43% in 2015 and stabilizes around 54-56% afterwards. Likewise, the 2013 estimates show stabilization around 45%.



Step 6. State-Level Projections of Needed Primary Care Physicians, 2010-2030

The final step was to convert changes in the number of visits across years into corresponding projections of increases in the number primary care physicians required to meet increased demand. For this, we calculate a "productivity" rate—the mean number of visits per primary care physicians--using state-level data from 2010. The number of primary care physicians required under different scenarios was obtained by the corresponding projections of total visits by the constant visit rate. By dividing the state population figure across years by the baseline (2010) population/provider ratio, we also calculated the number of primary care physicians required for population growth or decline alone, separate from the change in the state's age composition. This permits us to estimate the proportion of the change that is attributable to population growth alone and aging alone.

Alaska: Projection of Primary Care Visits and Demand for Primary Care Physicians (Step 6)

	2010	2015	2020	2025	2030
Visits					
Current Insurance Coverage (Age+Population)	949,468	1,041,202	1,128,799	1,208,568	1,280,857
Total number of PC visits insured	1,037,899	1,133,342	1,223,507	1,305,527	1,380,594
Average number of PC visits	1.45	1.49	1.52	1.55	1.57
Estimated State Population	714,142	759,244	802,762	842,899	879,823
Estimated Population/Provider Ratio	1,214	1,177	1,148	1,126	1,109
Visit per Physician (Constant Productivity)	1,615	1,615	1,615	1,615	1,615
Required PC Physicians	643	702	758	809	855
Baseline	588	588	588	588	588
Population Growth Only	588	625	661	694	724
Current Insurance Coverage (Age+Population)	588	645	699	748	793
Universal Coverage	588	702	758	809	855
ACA, Medicaid Expansion	588	675	730	780	825
ACA, No Medicaid Expansion	588	664	718	768	814
Change (Relative to Baseline)					
Increase due to Aging	-	20	38	54	69
Increase due to Population Growth	-	37	73	106	136
Increase due to Higher Insurance Coverage	-	57	59	60	62
ACA, Medicaid Expansion	-	30	31	31	32
ACA, No Medicaid Expansion	-	19	19	20	20

Note: For Alaska the estimated reduction in uninsured is 52% assuming Medicaid Expansion and 33% assuming no Medicaid Expansion.

Step 6 calculations for Alaska are shown below. In 2010, Alaska had an estimated 588 PCPs responsible for 949,468 visits, implying an average visit rate of 1,615 visits per PCP. The "Population Growth Only" estimates across years were obtained by dividing the state population projection for each future year by the 2010 population-to-physician ratio: this is equal to 625 (=759,244/1,214) in 2015 and 724 (=879,823/1,214) in 2030. Estimates that take into account the aging of the population but assuming 2010 insurance coverage rates are equal to the estimated number of visits across years divided by 1,615 (e.g. in 2015, 645=1,041,202/1,615). The number of primary care physicians needed to meet need associated with universal coverage is equal to 702 in 2015 (1,113,342/1,615). After, adjusting these figures for state-level estimates of coverage of the uninsured, the 2015 demand for PCPs equals 675 with Medicaid expansion and 664 without the expansion.

The table below shows state-by-state projections of the number of PCPs required by 2030 with and without Medicaid expansion.

Estimates of PCPs Need in 2030, With and Without Medicaid Expansion

		2003 Projections				
name	BASE_2010	POP Only	POP+AGE	UNIV COVERAGE	EXPANSION	NO EXPANSION
Alabama	2,646	2,970	3,156	3,316	3,259	3,206
Alaska	588	724	793	855	825	814
Arizona	3,808	5,277	5,622	5,993	5,737	5,722
Arkansas	1,739	1,959	2,074	2,204	2,148	2,116
California	25,153	29,852	32,503	34,795	33,396	33,007
Colorado	3,604	4,321	4,535	4,823	4,668	4,616
Connecticut	2,580	2,661	2,827	2,908	2,863	2,845
Delaware	635	747	802	830	813	811
District of Columbia	920	753	756	779	764	758
Florida	12,228	18,220	19,750	21,239	20,510	20,197
Georgia	5,497	6,889	7,310	7,869	7,595	7,467
Hawaii	1,137	1,336	1,436	1,474	1,455	1,442
Idaho	865	1,123	1,207	1,286	1,247	1,229
Illinois	8,833	9,186	9,668	10,143	9,896	9,791
Indiana	3,906	4,304	4,590	4,828	4,723	4,650
Iowa	1,997	1,960	2,100	2,163	2,116	2,111
Kansas	1,797	1,883	2,000	2,094	2,045	2,019
Kentucky	2,521	2,876	3,056	3,217	3,145	3,106
Louisiana	2,556	2,662	2,837	3,022	2,948	2,891
Maine	1,244	1,242	1,343	1,385	1,365	1,356
Maryland	4,481	5,132	5,435	5,669	5,533	5,491
Massachusetts	5,807	6,124	6,517	6,598	6,531	6,531
Michigan	7,060	7,239	7,708	8,032	7,857	7,805
Minnesota	4,216	4,904	5,200	5,368	5,264	5,249
Mississippi	1,475	1,648	1,775	1,890	1,842	1,808
Missouri	3,786	4,110	4,348	4,552	4,472	4,407
Montana	686	753	792	847	822	810
Nebraska	1,188	1,222	1,296	1,348	1,321	1,310
Nevada	1,428	2,273	2,447	2,655	2,541	2,501
New Hampshire	1,111	1,320	1,421	1,470	1,444	1,435
New Jersey	6,237	6,844	7,214	7,544	7,353	7,297
New Mexico	1,377	1,460	1,647	1,760	1,703	1,684
New York	14,858	15,178	15,846	16,476	16,079	16,041
North Carolina	5,917	7,170	7,575	8,047	7,802	7,693
North Dakota	499	475	518	535	526	521
Ohio	7,784	7,767	8,241	8,596	8,457	8,358
Oklahoma	2,192	2,388	2,503	2,685	2,601	2,567
Oregon	3,027	3,785	4,068	4,328	4,201	4,131
Pennsylvania	9,097	9,292	9,980	10,281	10,136	10,067
Rhode Island	830	857	915	948	930	923
South Carolina	2,732	3,164	3,425	3,639	3,547	3,491
South Dakota	580	679	727	758	743	735
Tennessee	4,072	4,782	5,030	5,297	5,180	5,118
Texas	13,140	17,761	18,596	20,462	19,566	19,249
Utah	2,376	3,191	3,359	3,565	3,470	3,435
Vermont	606	661	720	737	726	725
Virginia	5,471	6,711	7,057	7,391	7,230	7,164
Washington	5,142	6,779	7,127	7,494	7,226	7,197
West Virginia	1,330	1,364	1,472	1,545	1,521	1,500
Wisconsin	4,168	4,674	5,030	5,184	5,110	5,078
Wyoming	341	404	432	456	445	440