Technical Report for Psychologist Workforce Projections for 2015-2030: Addressing Supply and Demand

Prepared for:

American Psychological Association

Prepared by:

IHS Markit

July 2018

Description of American Psychological Association

APA is the leading scientific and professional organization representing psychology in the United States, with more than 115,700 researchers, educators, clinicians, consultants and students as its members. APA's mission is to advance the creation, communication and application of psychological knowledge to benefit society and improve people's lives.

Description of IHS Markit

IHS Markit is a publicly traded information services firm providing industry analyses to support decision-making processes. IHS Markit conducts health workforce studies for federal and state governments, associations and non-profit organizations, and health systems.

Acknowledgements

IHS Markit: Timothy M. Dall, MS; Ritashree Chakrabarti, PhD; Ryan Reynolds, MA

American Psychological Association: Jaime Diaz-Granados, PhD; Karen Stamm, PhD; Peggy Christidis, PhD; Luona Lin, MPP, Katherine Nordal, PhD

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Recommended citation for the report

IHS Markit. (2018). *Psychologist workforce projections for 2015-2030: Addressing supply and demand*. Washington, DC: American Psychological Association.

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Acronyms and Glossary

Acronym/Term	Name	Definition
ACA	Affordable Care Act	The Patient Protection and Affordable Care Act signed into law by President Obama in 2010.
Active	Active in the workforce	Defined as working in a psychology-related field or a relevant non-patient setting (e.g., teaching, research, management).
ACO	Accountable Care Organization	A group of doctors, hospitals, and other health care providers who organize to jointly provide coordinated, high quality care to their patients.
ACS	American Community Survey	Large survey of families and individuals conducted annually by the U.S. Census Bureau. Approximately 3 million people are surveyed annually.
Baseline	Baseline scenario	For modeling, the baseline scenario projects future supply and demand if current trends continue. For supply this scenario models a continuation of the current number of new psychologists trained, current patterns of hours worked, and retirement by age and gender. For demand this scenario models continuation of current care use and delivery patterns.
BCRA	Better Care Reconciliation Act of 2017	A version of health reform currently being considered by Congress and the current Administration.
BRFSS	Behavioral Risk Factor Surveillance System	Large survey of families and individuals conducted annually by the Centers for Disease Control and Prevention in conjunction with individual state Departments of Health.
CMS MDS	Nursing Home Minimum Dataset	Database of screening assessments for individual patients in nursing facilities; patients are screened quarterly. Administered in all nursing facilities that receive reimbursement from the Centers for Medicare and Medicaid Services.
Demand	Demand for psychologists or services	Demand for psychologists (and psychologist services) is defined as the number of psychologists (and services) used or projected to be used based on patient utilization and care delivery patterns.
DPMM	Disease Prevention Microsimulation Model	Computer model that simulates health outcomes for patients under alternative disease prevention and management scenarios
Equity 1	Demand scenario modeled	This hypothetical scenario modeled how demand for psychologists might increase by removing geographic and financial barriers to care. Specifically, it models demand if people in non-metropolitan areas had access to care similar to their peers in metropolitan areas, and if people without medical insurance had access similar to their peers with medical insurance.

Acronyms and Glossary, continued

Acronym/Term	Name	Definition
Equity 2	Demand scenario modeled	This hypothetical scenario builds on the Equity 1 scenario, but also models demand if minority populations had similar care use patterns as their White non-Hispanic peers.
FTE	Full-time equivalent	Psychologist working 39 hours per week in professional activities (including patient and non-patient care activities), the estimated 2015 weekly average among psychologists active in the workforce.
Graduates	Supply scenarios of the number of new graduates	Supply is projected under multiple scenarios, including scenarios if the number of psychologists trained and entering the workforce were to change by ±10% relative to current numbers
HDMM	Healthcare Demand Microsimulation Model	A computer simulation model that forecasts future demand for health care services and providers
MEPS	Medical Expenditure Panel Survey	Large national survey of families and individuals on health care use and medical expenditures conducted annually by the Agency for Healthcare Research and Quality
MSA	Metropolitan	The United States Office of Management and Budget (OMB) delineates metropolitan statistical areas according to published standards that are applied to Census Bureau data. According to the current standards, each metropolitan statistical area must have at least one urbanized area of 50,000 or more population.
Need	Need for psychologists or services	Need for psychologists and psychologist services differs from demand in that need is based on clinical and epidemiological considerations whereas demand is based on actual or projected utilization. One demand scenario modeled is based on a Substance Abuse and Mental Health Services Administration estimate that 20% of behavioral health needs are unmet.
Non-MSA	Non-metropolitan	Non-metropolitan areas refer to those that do not meet the criteria of metropolitan area designated by the OMB.
PC	Primary care	Primary care is defined by internal and family medicine, general pediatrics, and obstetrics and gynecology.
Retirement	Retirement scenarios	Future supply is modeled under multiple scenarios, including if psychologists delay retirement by two years or retire earlier by two years, on average. These scenarios illustrate sensitivity of supply projections to retirement patterns that could shift over time.

Executive Summary

Psychologists trained at the doctoral level are a key component of the mental health workforce helping to meet the nation's mental health needs. Psychologists work in many roles and settings—including clinical, health, counseling, and school psychologists as well as psychologists in specialty practice (e.g., geropsychology, rehabilitation psychology, sleep psychology), and in non-patient care roles (e.g., government, administration, teaching and research). Better understanding current and projected future needs and demand for psychologists' services and the supply of psychologists informs policies and strategies to help ensure an adequate supply.

Between 2015 and 2030 the U.S. population is projected to grow from 321 million to 359 (12% growth). The population under age 18 is projected to grow by less than 4%; the population aged 65 and older is projected to grow by 55%; and the population age 75 and older is projected to grow by 73%. The growing and aging population will change both the level and types of psychological services demanded in the future.

The American Psychological Association (APA) commissioned IHS Markit, an analytics consulting company, to conduct a study on the U.S. psychologist workforce to project future supply and demand through 2030 at the national and state level. This study is the first time that psychologist workforce projections have been undertaken by APA. This study used the most current data available on the psychologist workforce, and simulation models that are used by the federal government, states, health systems, and trade and professional associations for workforce analysis.

Key research questions guiding this study include:

1. What is the current and projected future supply of psychologists, taking into account trends in supply determinants, such as number of psychologists trained, the changing demographics of the psychologist workforce, and labor force participation patterns?
2. What is the current and projected future demand for psychologists, taking into account trends in demand determinants such as changing demographics and evolving patterns of care use and delivery?
3. To what extent does supply adequacy vary geographically and over time?
4. What are barriers to accessing care, and what are the implications to the psychologist workforce if such barriers were removed?

The statistics presented, unless otherwise specified, are for full-time equivalent (FTE) psychologists, where an FTE is defined as the average total professional hours worked by psychologists in 2015 (39 hours per week). The study covers doctoral-level psychologists across the many industries and roles in which psychologists work.

Supply

- In 2015 there were an estimated 104,944 licensed doctoral-level psychologists in the U.S., with 95,184 actively working in the profession. Two thirds (68%) of the workforce is female, rising to 74% female by 2030. Psychologists within the traditional retirement age between 65 and 74 were 16% of the active workforce, and those between age 55 and 64 made up 27% of the active workforce. Therefore, it is possible that two fifths, or more, of all currently active psychologists could retire within the next decade.
- In 2015, the national supply of active psychologists was 29 per 100,000 population, but this ratio varied substantially across regions and states. The ratio was highest for the Northeast region (49) and lowest for the South region (22). The ratio was highest in the District of Columbia (134) and Vermont (89), and lowest in Mississippi (11), South Carolina (12), and Louisiana (13).
- An estimated 3,695 doctoral-level psychologists are trained each year, with almost 75% female. Supply projections suggest between 2,500 and 3,000 psychologists will retire each year between 2015 and 2030.
- Between 2015 and 2030, the supply of psychologists is projected to increase.
    - Under the baseline scenario where current trends persist, total psychologist supply increases to 101,200 psychologists in 2025, and 107,410 in 2030—a 12,230 FTE (13%) increase between 2015 and 2030. Projected supply growth is similar to the 12% projected growth in the U.S. population over this period, suggesting a stable psychologist-to-population ratio around 29 per 100,000 population.
    - Supply projections are sensitive to key supply determinants. If the number of new graduates entering the workforce each year changed by ±10% relative to current graduation numbers, then by 2030 supply would reach 113,190 (high graduate scenario) or 101,620 (low graduate scenario).
    - Supply projections are sensitive to changes in retirement patterns. Of 100 psychologists who enter practice, by age 60 approximately 85 remain active, dropping to 61 by age 65, and 19 by age 75. If psychologist retirement patterns shifted by ±2 years, then supply in 2030 would reach 111,330 under the delayed retirement scenario and 103,450 under the early retirement scenario.

Demand

- The baseline scenario projects future demand based on changing demographics alone if care use and delivery patterns were to remain unchanged. Hence, this scenario starts with demand in 2015 where demand is assumed equal to the amount of care provided in 2015 (or current activity levels of 95,184 psychologists). This scenario extrapolates a “2015 level of care” into the future and suggests that psychologist demand will grow to 101,120 (6% growth) by 2030.
- Psychologists work in many industries and settings, with the distribution defined by industry categories in the U.S. Census Bureau’s American Community Survey (ACS).

- The ACS provides valuable data for high-level industry/employment settings but provides more limited information on the *type of work* that psychologists do.
    - 44% of psychologists work in *offices of health practitioners*. This broad category encompasses psychologists in private individual or group practice, as well as psychologists working in primary care and specialty office-based settings. In this setting, the patients seen by psychologists are disproportionately White, non-Hispanic, adolescents and young adults, people with chronic health conditions (e.g., arthritis, asthma, cardiovascular disease, history of cancer), insured (especially insured through Medicaid), and living in a metropolitan area. Other patient characteristics or circumstances likely correlated with use of psychologists—such as experiencing psychiatric disorders or substance abuse disorders—are unavailable in the data sources analyzed. Analysis of current utilization patterns for psychologist visits suggests that based on changing demographics alone the number of psychologist visits is projected to remain relatively constant (growing only 1% between 2015 and 2030), due to slow growth in the adolescent population and other populations that traditionally have had high utilization rates of psychologist services in office settings.
    - 16% of psychologists work in *elementary and secondary schools.* The population age 6 to 17 is projected to grow only 2% between 2015 and 2030.
    - 13% of psychologists work in *hospitals* (including acute care hospitals, long term and specialty hospitals, Veterans Affairs medical centers, and other public hospitals). Demand for mental health inpatient days is projected to grow 26% between 2015 and 2030 due primarily to an aging population. The demand projections assume that demand for psychologists working in hospitals will grow at a similar rate—reflecting both increased demand for inpatient care, and also the growing integration of behavioral health into health care services.
    - For many industries that employ psychologists (e.g., *individual and family services*, *justice public order and safety activities*, *military*, and other industries) there is little available information about how demand might grow over time, so for these industries we use total population growth—which is approximately 12% between 2015 and 2030 to project future demand.
    - Employment settings with high projected growth in patient demand based on changing demographics (*residential care* and *nursing facilities*) currently employ few psychologists, so relatively little growth in terms of FTE numbers is anticipated.
- The projected 5,940 FTE growth in demand between 2015 and 2030 is based solely on changing demographics.
- Similarly, psychologists addressing the needs of older adults will experience high growth in demand as the population age 65 and older is projected to grow by 24.6 million (34%) between 2015 and 2030. Although older adults historically have used psychologist services at rates lower than younger patients, based on current utilization patterns the growth in number of older adults translates into an additional 5,790 psychologists to serve the growing older adult population (nearly all, 98%, of the total national projected increase in demand).

- 4,120 FTEs reflect growth in demand among the Hispanic population, 1,140 FTEs reflect growth in demand among the Black non-Hispanic population, and 1,990 FTEs reflect growth in demand among other (non-Black) non-Hispanic minority populations. Demand for psychology service among the White non-Hispanic population is projected to decline by 1,310 FTEs, as population growth among the White non-Hispanic population is almost entirely for older adults who use relatively fewer psychologist services.
- Demand is projected to grow in the South (3,900 FTEs) and West (3,080 FTEs) regions and decline in the Midwest (-840 FTEs) and Northeast (-220 FTEs) regions based solely on changing demographics.
- Expanded health insurance coverage under the Affordable Care Act appears to have only a small effect on demand for psychologist services. Expanded insurance coverage through 2015 has increased demand by an estimated 1,040 FTEs, and projected continued insurance coverage expansion through 2030 suggests demand for an additional 660 FTEs. Changes in federal policy affecting insurance coverage could reverse this demand.

- We modeled a mental health needs scenario and two hypothetical health care utilization equity scenarios to quantify the implications for psychologist demand if currently underserved populations utilized care at a rate similar to that for populations facing fewer sociodemographic, economic, and geographic barriers to care.
    - **Addressing Estimated 20% Unmet Need**: This scenario is based on the Substance Abuse and Mental Health Services Administration estimate that approximately 20% of the population with any mental illness had unmet mental health needs during the previous year (including 39% of patients with serious mental illness reporting unmet needs). To eliminate this gap in unmet need, the nation would require an additional 20,220 psychologists each year relative to the baseline demand projection.
    - **Equity Scenario 1**: The first scenario models demand implications, assuming that people without medical insurance living in non-metropolitan areas had equivalent care utilization patterns as their insured peers living in metropolitan areas with similar demographics and health risk factors. If this scenario were achieved, then by 2030 demand would be 5% higher (4,900 FTEs) than the baseline projection.
    - **Equity Scenario 2**: The second equity scenario simulates demand projections based on the assumption that everyone in the U.S. had care utilization patterns equivalent to non-Hispanic White, insured populations residing in metropolitan areas. If this scenario were achieved, then by 2030 demand would be 25% higher (25,080 FTEs) than the baseline demand projection.
- Efforts to transform health care delivery include better integrating behavioral health providers into primary care and specialty medical settings, and integrating behavioral health providers into the continuum of care inter-professional teams to address complex patient needs. While such efforts will increase demand for behavioral health providers, there is still little published information quantifying the impact on demand for behavioral health providers overall and demand for psychologists in particular. Furthermore, if mental health and substance abuse disorders are caught earlier in primary care and dealt with effectively, referrals to specialty mental health and substance abuse disorder care might actually decrease.

Supply Modeling

Projections of future supply of psychologists are based on a microsimulation model that incorporates de-identified individual-level data on the current supply as well as the latest figures on the training pipeline and labor force participation patterns. The use of individual-level data (microsimulation) to simulate likely career decisions of psychologists based on demographics and external factors such as wages is a more flexible modeling approach than traditional cohort-based models which attempts to simulate care decisions by groups of people (e.g., defined by sex and age group). This model is described in detail elsewhere and has been used to model a wide variety of health professions for federal and state governments, trade and professional associations, and health plans (Bureau of Health Workforce, 2015; Dall et al., 2013a; Dall et al., 2016; IHS Markit, 2015; IHS Markit, 2017). Future supply starts with information on current supply, adds new entrants to the workforce based on the training pipeline, and models patterns of hours worked, retirement, and state-to-state migration.

A. Current Supply Estimates

Supply modeling starts with the estimated 104,944 licensed doctoral-level psychologists in the United States in 2015, estimated by APA using de-duplicated licensure files obtained from each state (American Psychological Association, 2017). Analysis of APA's 2015 Survey of Psychology Health Service Providers (American Psychological Association, 2016a) suggests 90.7% of licensed psychologists were under age 75 and active in the workforce—where active is defined as the person reports working in a psychology-related field or a relevant non-patient setting (e.g., teaching, research, management). Analysis excludes 137 psychologists age 75 or older, as previous research on the health workforce indicates that older providers tend to work fewer hours per week. The 90.7% estimate from APA's 2015 Survey is similar to the 91.2% estimate from the American Community Survey (ACS) for psychologists under age 75.[a] This provides a starting supply estimate of 95,184 active psychologists in the United States.

Analysis of the ACS of psychologists active in the workforce indicates that on average they work 39 hours in professional activities per week. This is the average hours worked by psychologists and includes time spent providing both patient care and non-patient care activities, and for psychologists who do not provide direct patient care it includes time spent teaching, conducting research, administration, and other activities required by the job. The ACS does not provide information on time spent in direct patient care versus other professional activities. To provide a comparison of current supply to future supply, and to compare supply to demand we use the concept of a full-time equivalent (FTE) provider. To the extent that hours worked patterns of psychologists vary by demographics (in particular, by age and gender), the use of FTEs for modeling captures the impact of changing psychologist demographics on the total supply of psychologist services provided. We defined an FTE as the average total professional hours worked by psychologists in 2015 (39 hours per week).

[a] Analyses using the American Community Survey included only psychologists whose highest educational attainment indicated a doctoral degree: Ph.D., Psy.D. (coded as professional degree within ACS), or Ed.D. Survey respondents whose self-reported education level was master's or baccalaureate were excluded from any analyses.

Nationally we estimate there were 29 FTE psychologists per 100,000 population (including children and adults). However this ratio varied substantially across regions and states (**Error! Reference source not found.** and **Error! Reference source not found.**). The Northeast region averaged 49 FTEs/100,000 population, more than twice the average for the South region (22 FTEs/100,000 population). Such geographic imbalances raise concerns about access to care—especially in those regions or states with relatively low supply. While this study did not analyze supply imbalances within states, for many health professions there are intra-state geographic imbalances which raise concerns about the availability of health workers to meet the health and mental health needs of populations residing in rural areas.

The national ratio is within historical levels, and the state-level ratios reflect imbalances that have persisted over time. Previously reported estimates of national licensed psychologist per 100,000 population ratios were 25 and 33.6 in 1988 and 1995, respectively (Robiner & Crew, 2000). While those numbers reflect total licensed psychologists, our estimates reflect licensed psychologists who are active in their field.[a] These authors estimate that in 1995 the Northeast region had about 49 licensed psychologists per 100,000 population (similar to our estimate), while the South region had about 25 licensed psychologists per 100,000 population (larger than our estimate for 2015).

As suggested by the large number of FTEs/population in Washington DC (134 FTEs/100,000 population), not all active licensed psychologists included in this report are “clinically active,” but they are still of interest as they are likely to be in positions that benefit from the training and experience of a licensed psychologist. This includes psychologists filling roles in government, teaching, administration, research, and other positions that benefit from a person with the knowledge and experience of a licensed psychologist.

The licensure counts lack demographic information needed to model future supply. Therefore, we used the 2013-2015 ACS to identify the demographic characteristics of psychologists with a doctoral degree. The ACS collects data on about 3 million people annually and is representative of the U.S. population. Using the counts of active psychologists from each state, we drew a random sample (with replacement) from the ACS. For 40 states where the ACS sample size was less than 100 active psychologists, we drew our sample from the states’ census division. The resulting starting year file for supply forecasting contained 95,184 records with demographics representative of active licensed psychologists in each state.

In our dataset, two thirds (68%) of the estimated workforce was female. Among psychologists younger than age 40, 82% of the estimated workforce was female. Psychologists within the traditional retirement age between 65 and 74 constituted 16% of the active workforce, and those between age 55 and 64 made up 27% of the active workforce (Exhibit 3). Therefore, it is possible that two fifths, or more, of all currently active psychologists could retire within the next decade.

[a] The estimated licensed psychologists per 100,000 population is 32.5 in 2015.

Exhibit 1: FTE Psychologists per 100,000 Population, 2015

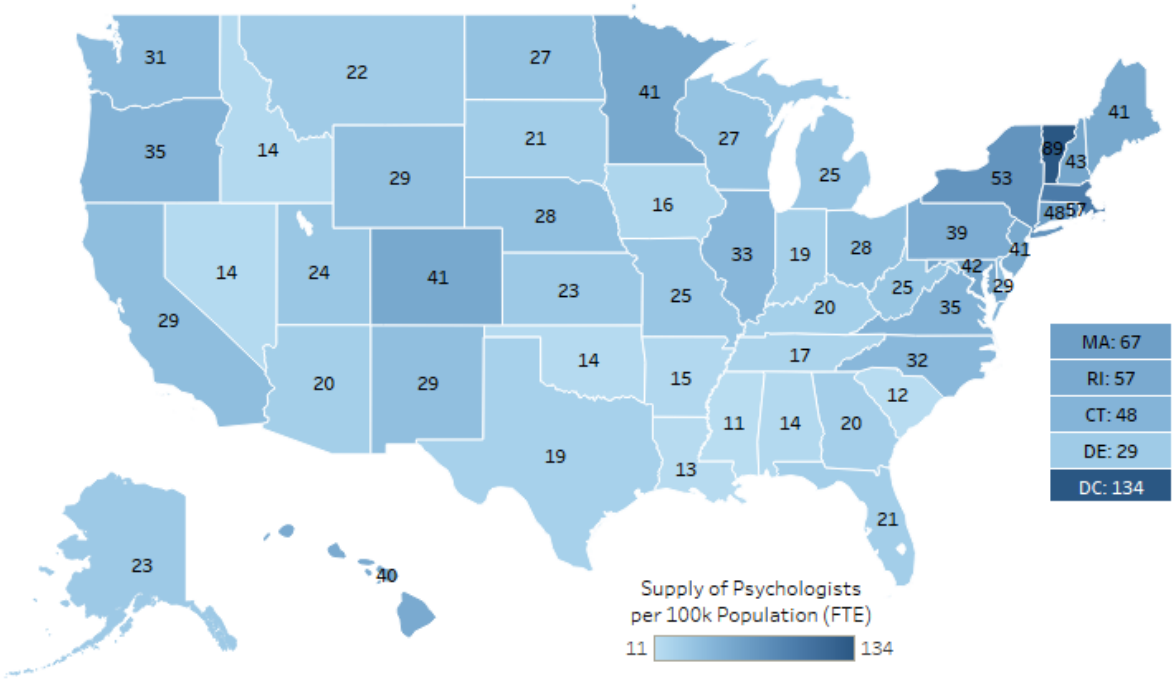
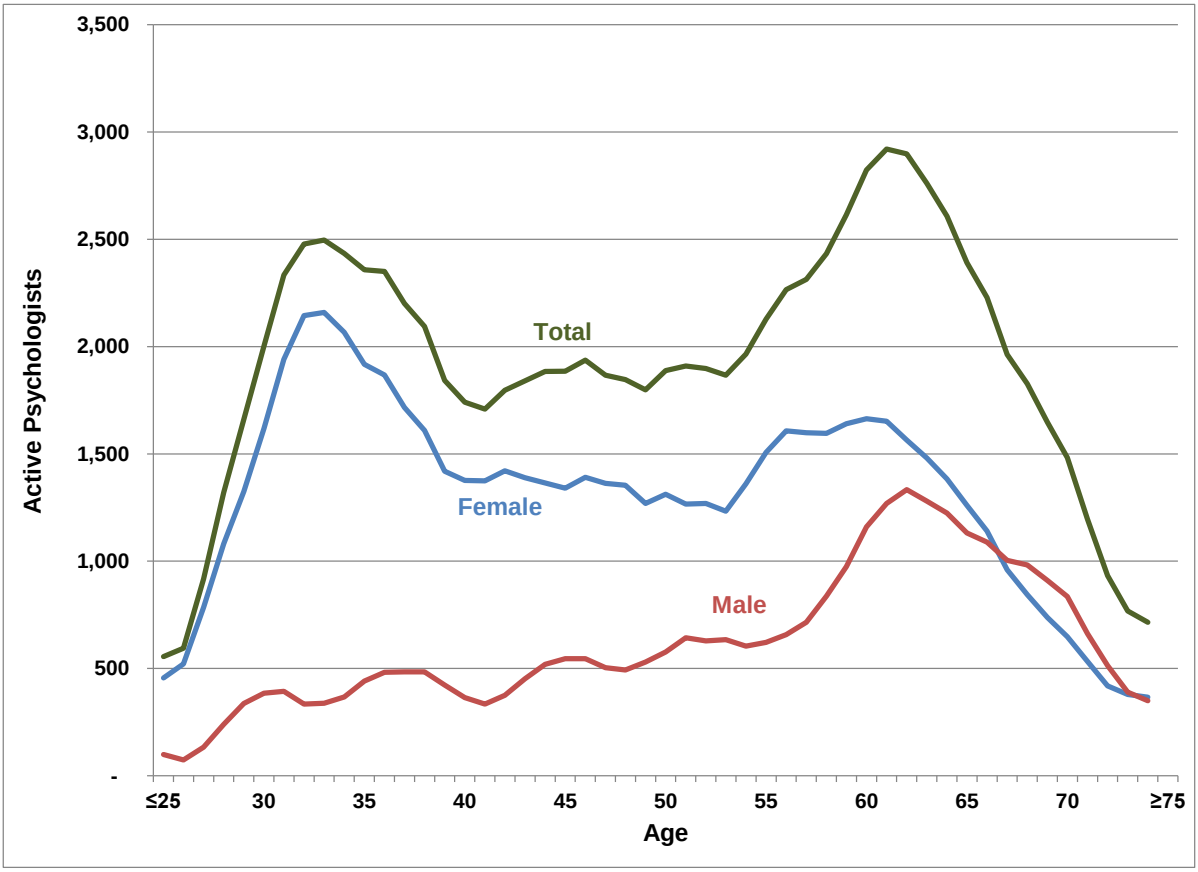


Exhibit 2: Estimated Supply of Doctoral Level Psychologists by Region and State, 2015

Region/State	Licensed[a]	Full-Time Equivalent[b]	FTEs per 100,000 Population
Northeast	**30,276**	**27,271**	**49**
Connecticut	1,909	1,732	48
Maine	602	546	41
Massachusetts	5,127	4,546	67
New Hampshire	613	556	43
New Jersey	4,017	3,629	41
New York	11,191	10,074	53
Pennsylvania	5,556	5,043	39
Rhode Island	653	593	57
Vermont	608	552	89
Midwest	**20,287**	**18,687**	**28**
Illinois	4,596	4,209	33
Indiana	1,418	1,300	19
Iowa	540	502	16
Kansas	737	684	23
Michigan	2,705	2,480	25
Minnesota	2,442	2,266	41
Missouri	1,643	1,527	25
Nebraska	604	561	28
North Dakota	225	209	27
Ohio	3,499	3,225	28
South Dakota	192	179	21
Wisconsin	1,686	1,546	27
South	**29,933**	**27,250**	**22**
Alabama	733	690	14
Arkansas	483	440	15
Delaware	315	285	29
District of Columbia	998	900	134
Florida	4,775	4,309	21
Georgia	2,290	2,067	20
Kentucky	946	892	20
Louisiana	638	584	13
Maryland	2,892	2,571	42
Mississippi	363	344	11
North Carolina	3,643	3,287	32
Oklahoma	576	525	14
South Carolina	674	608	12
Tennessee	1,207	1,139	17
Texas	5,714	5,214	19
Virginia	3,174	2,934	35
West Virginia	512	462	25
West	**24,448**	**21,976**	**29**
Alaska	195	175	23
Arizona	1,534	1,404	20
California	12,856	11,463	29
Colorado	2,543	2,326	41
Hawaii	665	597	40
Idaho	257	236	14
Montana	249	228	22
Nevada	442	404	14
New Mexico	649	593	29
Oregon	1,592	1,425	35
Utah	820	751	24
Washington	2,464	2,207	31
Wyoming	182	167	29
US Total	**104,944**	**95,184**	**29**

Notes: [a] Counts include only doctoral-level psychologists based on state licensure files. As of 2013, some states (VT, WV, KS, KY, and OR) allowed independent practice at the master's level; other states (AK, AL, CA, ME, MD, MI, NE, NM, NC, TX, TN and WY) allowed supervised practice at the master's level under a psychology board. Minnesota, which previously licensed master's level psychologists, grand parented 1,259 master's level psychologists who were not included in this estimate. [b] Approximately 90.7% of licensed psychologists are active in the workforce, and state estimates of full-time equivalents were calculated as projected total hours of psychologist services divided by average hours per active psychologist.

Exhibit 3: Age Distribution of Active Psychologists, 2015



Note: In the American Community Survey, there are 5 respondents under age 25 (with sample weights equal to approximately 200 psychologists). Because of small sample size in the ACS for individual age groups, the numbers in this chart were smoothed (e.g., the number of psychologists age 40 is based on the average of the numbers of psychologists ages 39, 40 and 41).

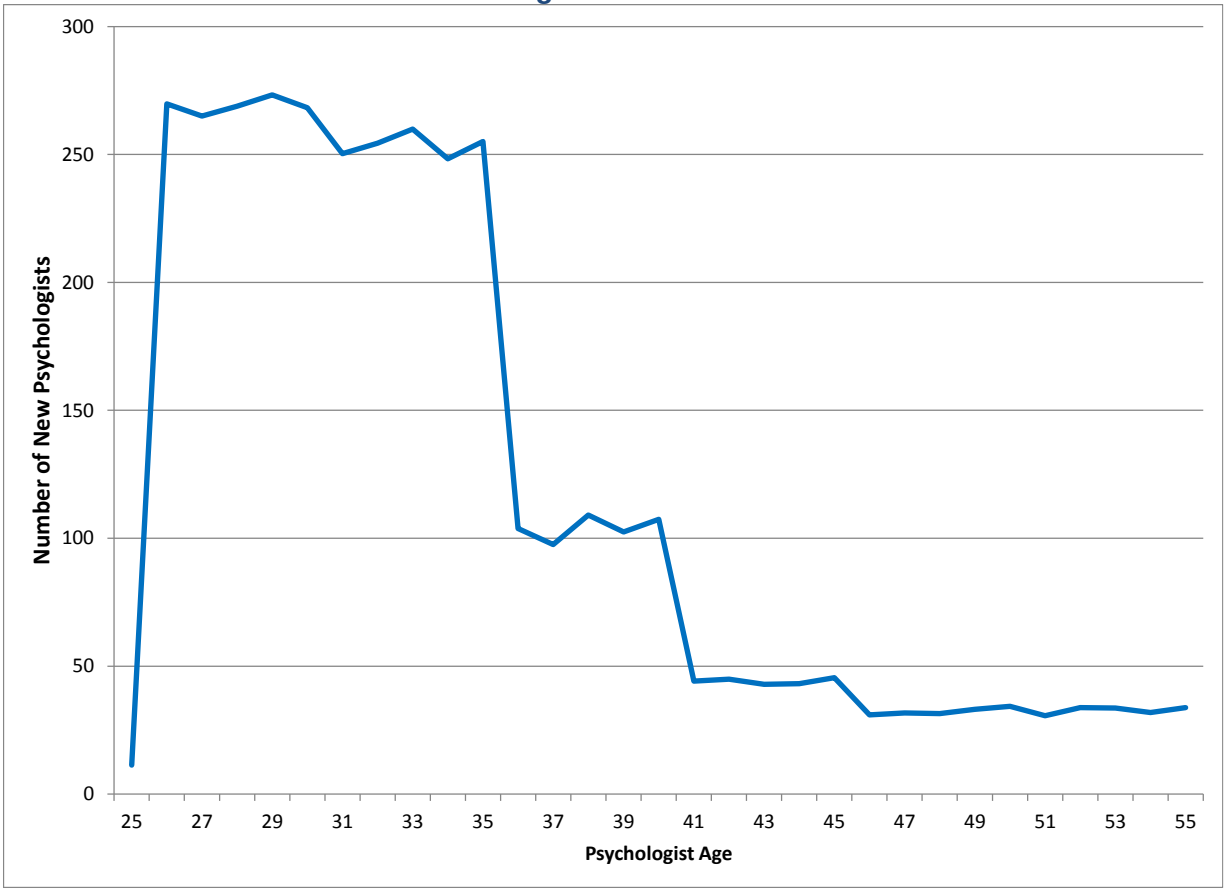
B. The Educational Pipeline

We estimate that approximately 3,695 psychologists completed a doctorate in a health service psychology subfield[a] during academic year 2013-2014. The baseline supply scenario assumes this number of annual new entrants to the workforce in future years. This estimate starts with estimates of the number of psychologists completing their doctorate in health service provider subfields as published by the National Center for Education Statistics (US Department of Education, 2015). To eliminate the doctorates awarded to other subfields, the 6,634 was multiplied by 55.7% based on an APA study of the Integrated Postsecondary Education Data System that separated psychology doctorates awarded into subfields (American Psychological

[a] The health service psychology subfields are applied psychology, applied behavior analysis, clinical psychology, clinical child psychology, counseling psychology, family psychology, forensic psychology, geropsychology, health/medical psychology, school psychology, and other clinical/counseling/applied psychology. See: Psychology Master's and Doctoral Degrees Awarded by Broad Field, Subfield, Institution Type and State (2004-2013), Table1. http://www.apa.org/workforce/publications/2016-postsecondary-data/index.aspx

Association, 2016c). The gender distribution (74.7% female) and age distribution (Exhibit 4) of new psychologists was derived from the National Center for Education Statistics (US Department of Education, 2014) and the National Science Foundation (National Science Foundation, 2017).[a]

Exhibit 4: Estimated Age Distribution of New Graduates



Source: Estimated from National Science Foundation data for social science doctorates in 2013 (National Science Foundation, 2017), and the American Psychological Association's 2015 Survey (American Psychological Association, 2016a).

As a proxy for the geographic distribution of new graduates, we used the geographic distribution of psychologists under age 40 who appear during at least one year in 2011-2015 APA membership data but who were not in the membership data in 2010. For states with 300 or fewer psychologists in the overall licensing counts, the model used the census geographic division's new psychologists in the membership data, multiplied by the state's proportion of the overall count of licensed psychologists in the state's census division (to account for the small sample of new psychologists identified in small population states in the membership data).

[a] To estimate the age distribution of new psychologists we also considered the Survey of Earned Doctorates (SED) and the National Survey of College Graduates (NSCG). Each data source has limitations, and which source is best to use is an area for future research.

C. Workforce Participation

Workforce participation is modeled in terms of hours worked patterns, employment, and retirement patterns—all of which can differ by psychologist demographic and economic or environmental factors.

Hours Worked Patterns were modeled using Ordinary Least Squares regression analysis of 2011-2015 ACS data for psychologists who report working. The analysis found that psychologists' hours worked per week tended to decline with age—especially starting around age 65. Male psychologists worked about 4.6 more hours per week than their female colleagues. Higher wages were correlated with working more hours per week.

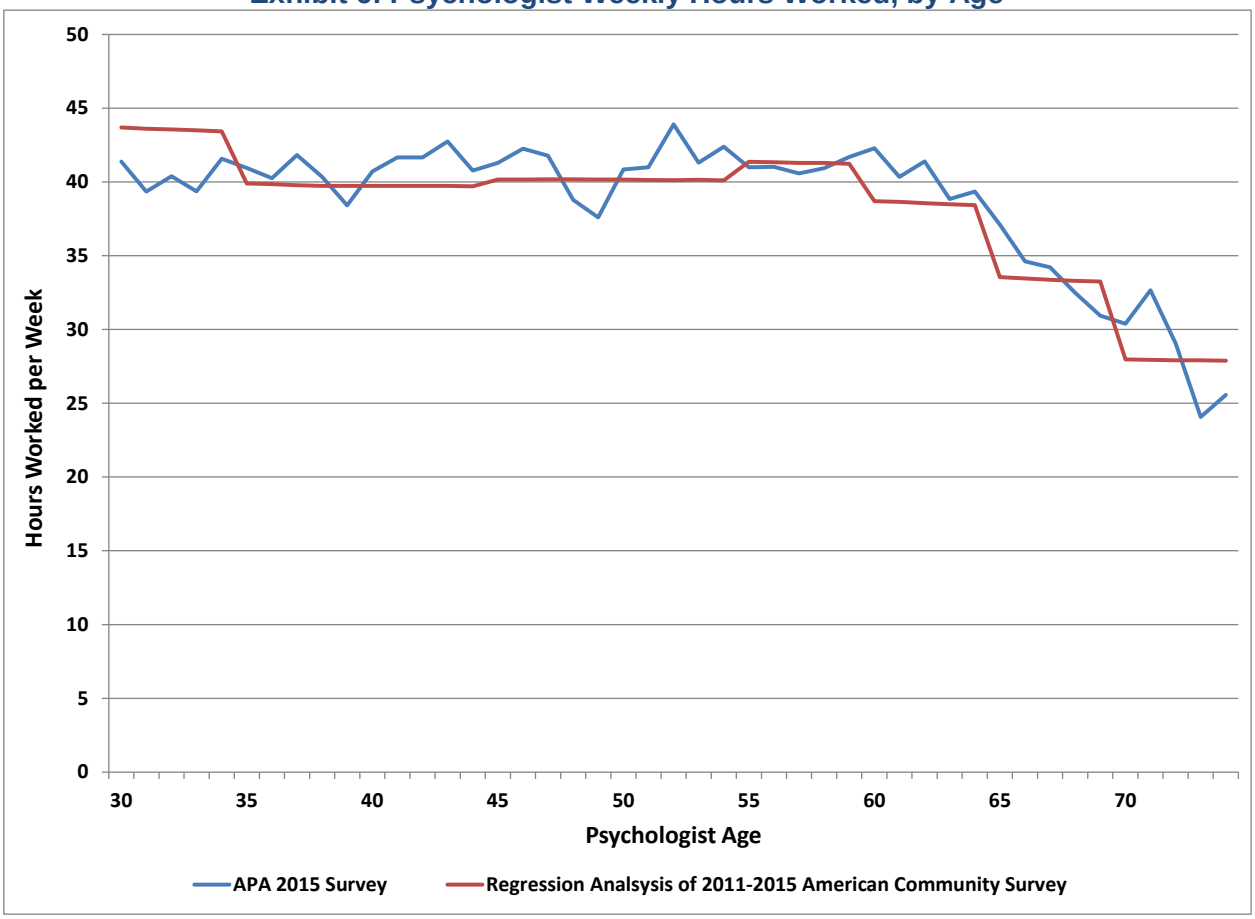
Exhibit 5: OLS Regression Analysis of Weekly Hours Worked Patterns

Parameter[1,2,3]	**Hours**[4]	
Intercept	39.19	**
Unemployment rate	-0.24	
Predicted wage[5]	0.17	**
Age 35 to 44	-4.08	**
Age 45 to 54	-3.38	**
Age 55 to 59	-2.05	**
Age 60 to 64	-4.89	**
Age 65 to 69	-9.35	**
Age 70+	-14.22	**
Male	4.56	**
Year 2012	-1.02	*
Year 2013	-1.03	
Year 2014	-1.30	*
Year 2015	-1.28	
Black, non-Hispanic	1.31	
Other, non-Hispanic	0.70	
Hispanic	0.76	
Population % suburban	0.04	
Population % rural	0.02	

Notes: (1) Comparison groups are: age <35, female, year = 2015, non-Hispanic White, urban. (2) Variables for unemployment rate and proportion of the population in rural, suburban, or urban are state-level averages data. (3) The microsimulation model uses four mutually exclusive race-ethnicity categories: White non-Hispanic, Black non-Hispanic, Other non-Hispanic, and Hispanic. These race/ethnicity categories were selected to reflect that care utilization patterns differ by racial and ethnic population; however, subdividing into smaller racial/ethnic subpopulations encountered issues of small sample size in some databases analyzed. (4) Statistically significant at the 1% (**) or 5% (*) level. R^2=0.14. (5) Predicted wage is based on a separate regression analysis modeling self-reported hourly wage reported in the ACS as a function of psychologist characteristics and state-level variables such as the average hourly wage for psychologists in that state. See additional technical documentation of the model at https://cdn.ihs.com/www/pdf/IHS-HDMM-DocumentationApr2016.pdf.

The predicted hours worked patterns based on ACS data were similar to patterns in APA's 2015 Survey (Exhibit 6).

Exhibit 6: Psychologist Weekly Hours Worked, by Age

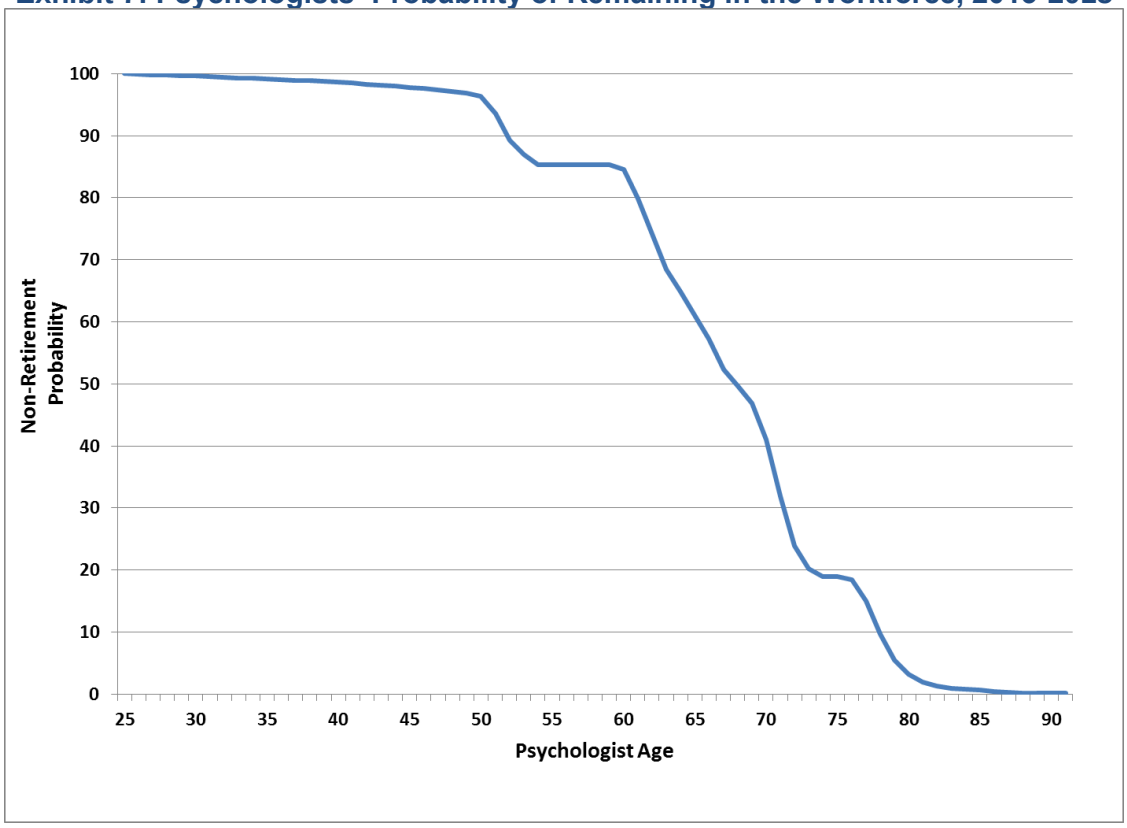


Labor Force Participation: Using the ACS (2011-2015 data), we analyzed labor force participation rates for psychologists reflecting that younger psychologists sometimes temporarily leave the workforce (e.g., for child bearing/rearing). This analysis focused on psychologists through age 50, with psychologists age 50 and older modeled differently (as discussed below). Logistic regression analysis showed little correlation between employment status and psychologist demographics and other factors modeled (e.g., state's overall unemployment rate). Psychologists in states paying higher salaries (using state mean hourly wage for all psychologists as a proxy for earnings), on average, had slightly higher labor force participation rates. Labor force participation rates were higher for the age 45-49 category compared to younger age categories. There was a drop in employment probability in 2014 relative to the other years analyzed.

Retirement Patterns: For psychologists under age 50 there was a small annual probability of attrition from the workforce (due to disability or mortality). For psychologists age 50 and older the supply model used age dependent annual attrition probabilities to simulate providers leaving the workforce. These supply projections use retirement patterns estimated from the ACS by

comparing the aggregated age distribution of employed psychologists across adjacent years and estimating net departures by year (e.g., comparing the number of active psychologists age 62 in 2014 to the number of active psychologists age 63 in 2015). This comparison provided estimates of net departures from the labor force (i.e., fewer psychologists of a given age were employed in a given year relative to the number employed one year prior and one year younger in age). Of 100 psychologists who enter practice, by age 60 approximately 85 remain active, dropping to 61 by age 65, and 19 by age 75 (Exhibit 7). The supply projections predict between 2,500 and 3,000 retirees per year between 2015 and 2030.

Exhibit 7: Psychologists' Probability of Remaining in the Workforce, 2013-2015



D. Cross-state Migration Patterns

The supply model simulates the probability that psychologists in each state might move to another state. This component of the model is particularly important for states with insufficient training capacity and thus are net importers of psychologists—as well as states with a large training pipeline that are net exporters of psychologists. The limited number of states that participate in current licensure mobility mechanisms through the Association of State and Provincial Psychology Boards (ASPPB) is a barrier to movements of psychologists across state lines. It is not known how much these numbers may increase as licensure mobility options expand in the future.

This analysis used logistic regression with ACS data (2011-2015). Similar to work done for modeling other health professions, we limited our cross-state migration analysis to

psychologists under age 50 due both to small sample size concerns and to concerns that for older health professionals it is difficult to distinguish between a person whose move is to work in another state or whose move is related to retirement. The dependent variable is whether the person's current state of residence is different from the previous year's state of residence (1=different, 0=same). The explanatory variables are the same variables used to model other health professions (Bureau of Health Workforce, 2015; Dall et al., 2016) and to model hours worked patterns.

On average, about 6.4% of psychologists move across state lines in a given year. The propensity to move across states, however, differs by a psychologist's demographic characteristics and other factors (Exhibit 8). Psychologists age 30-34 have the highest propensity to move to a different state, with move propensity declining thereafter with age. Men are less likely to move (odds are 0.46 that of women). Non-Hispanic Black psychologists have twice the odds of moving across states as their White colleagues, while Hispanic psychologists have much lower odds of moving compared to their non-Hispanic White colleagues. However, due to the small sample in ACS of psychologists who move to another state each year, many of the estimates are not statistically significant.

Exhibit 8: Logistic Regression Results Modeling State Out-migration Patterns

Parameter	Odds Ratio	
Unemployment rate	1.00	
Predicted wage	1.08	*
Age <30 (comparison)	1.00	
Age 30 to 34	5.97	*
Age 35 to 39	0.87	
Age 40 to 44	0.61	
Age 45 to 49	0.41	
Female (comparison)	1.00	
Male	0.46	*
Year 2011 (comparison)	1.00	
Year 2012	1.06	
Year 2013	0.83	
Year 2014	0.62	
Year 2015	1.26	
White, non-Hispanic (comparison)	1.00	
Black, non-Hispanic	2.01	
Other, non-Hispanic	1.17	
Hispanic	0.59	
Population % suburban	0.37	
Population % rural	0.05	

Note: Analysis based on logistic regression. Odds ratios indicate relative likelihood to move to a new state in relation to the comparison group. * Indicates statistically different from 1.0 at the 5% level. Comparison groups are under age 30, female, White non-Hispanic, in 2011. The low odds ratio for the states' population percent living in suburban and rural areas are low (suggesting that psychologists in states with higher percentages of the population living in non-urban areas have lower odds of moving to another state), but the results are not statistically significant—likely due to the small sample of psychologists moving from such states.

The simulation model assigned the psychologists a new state based on the distribution of destination states of psychologists moving from one state to another in 2010-2015 using de-identified APA membership counts for psychologists working in health service psychology fields (American Psychological Association, 2017) provided to IHS Markit by the APA. For states with 300 or fewer psychologists in the overall licensing counts, the model used the state's count of migrants from the membership data multiplied by the state's proportion of the overall count of licensed psychologists in the state's census division. This is an attempt to correct for the small sample of migrant psychologists identified in small population states.

The full 50 state and District of Columbia in-migration patterns for psychologists are summarized in Exhibit 9, where in-migration is defined as the states to which a psychologist moves. The general trend in the country is for Southern and Western States to have a higher share of in-migration than of the share of in-migration for the overall population of psychologists nationwide, while Northeastern and Midwestern States have a lower share of in-migration than the out-migration for psychologists nationwide. While out-migration from states is modeled based on provider characteristics and external conditions as illustrated in Exhibit 8, model estimates of out-migration are summarized in Exhibit 10.

Some states are projected to be net exporters of psychologists, while others are net importers. States comprising the Northeast Region, for example, are projected to export about 332 psychologists annually but import about 236 psychologists annually reflecting a net loss of about 96 psychologists annually. States comprising the South Region, however, are projected to gain approximately 488 psychologists migrating from other states each year while losing 372 for a net gain of 116 psychologists annually.

Exhibit 9: State In-Migration Patterns

Region/State	Licensed	Percent of Licensed Total	In-Migration 2011-2015	Percent of Total In-Migration
Northeast	**30,276**	**28.8%**	**236**	**19.9%**
Connecticut	1,909	1.8%	23	1.9%
Maine	602	0.6%	8	0.7%
Massachusetts	5,127	4.9%	47	4.0%
New Hampshire	613	0.6%	11	0.9%
New Jersey	4,017	3.8%	20	1.7%
New York	11,191	10.7%	57	4.8%
Pennsylvania	5,556	5.3%	54	4.6%
Rhode Island	653	0.6%	10	0.8%
Vermont	608	0.6%	6	0.5%
Midwest	**20,287**	**19.3%**	**151**	**12.8%**
Illinois	4,596	4.4%	28	2.4%
Indiana	1,418	1.4%	13	1.1%
Iowa	540	0.5%	7	0.6%
Kansas	737	0.7%	9	0.8%
Michigan	2,705	2.6%	16	1.3%
Minnesota	2,442	2.3%	21	1.8%
Missouri	1,643	1.6%	17	1.4%
Nebraska	604	0.6%	2	0.2%
North Dakota*	225	0.2%	2	*0.1%*
Ohio	3,499	3.3%	20	1.7%
South Dakota*	192	0.2%	1	*0.1%*
Wisconsin	1,686	1.6%	15	1.3%
South	**29,933**	**28.5%**	**488**	**41.2%**
Alabama	733	0.7%	8	0.7%
Arkansas	483	0.5%	8	0.7%
Delaware	315	0.3%	9	0.8%
District of Columbia	998	1.0%	34	2.9%
Florida	4,775	4.6%	86	7.3%
Georgia	2,290	2.2%	33	2.8%
Kentucky	946	0.9%	13	1.1%
Louisiana	638	0.6%	8	0.7%
Maryland	2,892	2.8%	45	3.8%
Mississippi	363	0.3%	6	0.5%
North Carolina	3,643	3.5%	50	4.2%
Oklahoma	576	0.5%	4	0.3%
South Carolina	674	0.6%	12	1.0%
Tennessee	1,207	1.2%	25	2.1%
Texas	5,714	5.4%	77	6.5%
Virginia	3,174	3.0%	64	5.4%
West Virginia	512	0.5%	6	0.5%
West	**24,448**	**23.3%**	**310**	**26.2%**
Alaska*	195	0.2%	2.03	*0.2%*
Arizona	1,534	1.5%	37	3.1%
California	12,856	12.3%	101	8.5%
Colorado	2,543	2.4%	37	3.1%
Hawaii	665	0.6%	15	1.3%
Idaho*	257	0.2%	5	*0.5%*
Montana*	249	0.2%	5	*0.4%*
Nevada	442	0.4%	8	0.7%
New Mexico	649	0.6%	18	1.5%
Oregon	1,592	1.5%	30	2.5%
Utah	820	0.8%	16	1.3%
Washington	2,464	2.3%	32	2.7%
Wyoming*	182	0.2%	4	*0.3%*
US Total	**104,944**	**100.0%**	**1,186**	**100.0%**

Notes: States marked with * received a proportional number of movers to their Census Division based on the state's number of licensed psychologists. Therefore, the number of movers to these states is not a whole number. Numbers might not sum to totals in the table because of rounding.

Exhibit 10: State Out-Migration Patterns

Region/State	Licensed	Percent of Licensed Total	Out-Migration 2011-2015	Percent of Total Out Migration
Northeast	**30,276**	**28.8%**	**332**	**28.0%**
Connecticut	1,909	1.8%	35	3.0%
Maine	602	0.6%	4	0.3%
Massachusetts	5,127	4.9%	51	4.3%
New Hampshire	613	0.6%	13	1.1%
New Jersey	4,017	3.8%	34	2.9%
New York	11,191	10.7%	113	9.5%
Pennsylvania	5,556	5.3%	58	4.9%
Rhode Island	653	0.6%	17	1.4%
Vermont	608	0.6%	7	0.6%
Midwest	**20,287**	**19.3%**	**242**	**20.4%**
Illinois	4,596	4.4%	53	4.5%
Indiana	1,418	1.4%	22	1.9%
Iowa	540	0.5%	14	1.2%
Kansas	737	0.7%	14	1.2%
Michigan	2,705	2.6%	18	1.5%
Minnesota	2,442	2.3%	16	1.3%
Missouri	1,643	1.6%	22	1.9%
Nebraska	604	0.6%	12	1.0%
North Dakota	225	0.2%	6	0.5%
Ohio	3,499	3.3%	36	3.0%
South Dakota	192	0.2%	2	0.2%
Wisconsin	1,686	1.6%	27	2.3%
South	**29,933**	**28.5%**	**372**	**31.4%**
Alabama	733	0.7%	7	0.6%
Arkansas	483	0.5%	10	0.8%
Delaware	315	0.3%	7	0.6%
District of Columbia	998	1.0%	24	2.0%
Florida	4,775	4.6%	55	4.6%
Georgia	2,290	2.2%	32	2.7%
Kentucky	946	0.9%	8	0.7%
Louisiana	638	0.6%	9	0.8%
Maryland	2,892	2.8%	45	3.8%
Mississippi	363	0.3%	5	0.4%
North Carolina	3,643	3.5%	35	3.0%
Oklahoma	576	0.5%	12	1.0%
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Tennessee	1,207	1.2%	17	1.4%
Texas	5,714	5.4%	44	3.7%
Virginia	3,174	3.0%	49	4.1%
West Virginia	512	0.5%	4	0.3%
West	**24,448**	**23.3%**	**240**	**20.2%**
Alaska	195	0.2%	10	0.8%
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Oregon	1,592	1.5%	16	1.3%
Utah	820	0.8%	13	1.1%
Washington	2,464	2.3%	40	3.4%
Wyoming	182	0.2%	7	0.6%
US Total	**104,944**	**100.0%**	**1,186**	**100.0%**

Notes: The out-migration estimates in this table are outputs from the model, reflecting the regression modeling in Exhibit 8.

E. Supply Scenarios and Projections

We projected future supply under alternative scenarios to reflect uncertainty in trends in key supply determinants. Differences between these supply projections grow over time, reflecting greater uncertainty the further the time horizon modeled.

- **Baseline**: This scenario assumes continuation of the status quo in terms of number of psychologists newly entering the workforce (3,695 per year), hours worked patterns, and retirement patterns.
- **Early Retirement and Delayed Retirement**: Reflecting uncertainty about when psychologists might retire in the future, we model scenarios assuming psychologists retire two years earlier or two years later, on average, relative to current patterns. Scenario assumptions reflect that psychologists might decide to delay or speed retirement for financial, health, and other reasons. The U.S. Bureau of Labor Statistics reports that, on average, workers are delaying retirement and this trend is likely to continue (Leonesio, Bridges, Gesumaria, & Del, 2012). The scenario in which retirement is delayed approximates a future in which this trend continues.
- **More Graduates and Fewer Graduates**: These scenarios model the implications of increases or decreases in the number of graduates from health service provider subfields. From the baseline estimation of the 2013-2014 graduate count of 3,695, we modeled an increase of 10 percent (to 4,065 annually) and a decrease of 10 percent (to 3,326 annually). In both scenarios as well as the baseline, the number of new graduates is constant for the full range of 2015-2030. Between 2004 and 2013 the number of graduates increased by 34% (American Psychological Association, 2016c); however, future expansion seems unlikely without additional funding sources for training.
- **Most and Least Conservative Projections:** We combined the above scenarios to model a scenario with more graduates and delayed retirement (reflecting an upper bound to the supply projections) and a conservative scenario reflecting fewer graduates and earlier retirement (reflecting a lower bound to the supply projections).

Projections for total psychologist supply under the scenarios modeled are summarized in Exhibit 11. Under the baseline scenario, total psychologist supply increases from approximately 95,180 in 2015, to 101,200 psychologists in 2025, and to 107,410 in 2030—a 12,230 FTE (13%) increase between 2015 and 2030 (Exhibit 12). Two thirds (67%) of the current workforce is female, rising to 74% female by 2030.

Growth in total psychologist supply between 2015 and 2030 ranges from a high of 18,010 additional FTEs under the scenario with increased graduates, to a low of 6,440 additional FTEs under the decreased graduates scenario. Changes in retirement age have a larger immediate impact on supply, while sustained changes in the number of annual graduates will have a larger impact after an extended period of time. Projected growth under the baseline scenario is similar to the 12% projected growth in the U.S. population over this period, suggesting a stable psychologist-to-population ratio around 29 FTEs per 100,000 population.

Exhibit 11: Projected Supply of Psychologists, 2015-2030

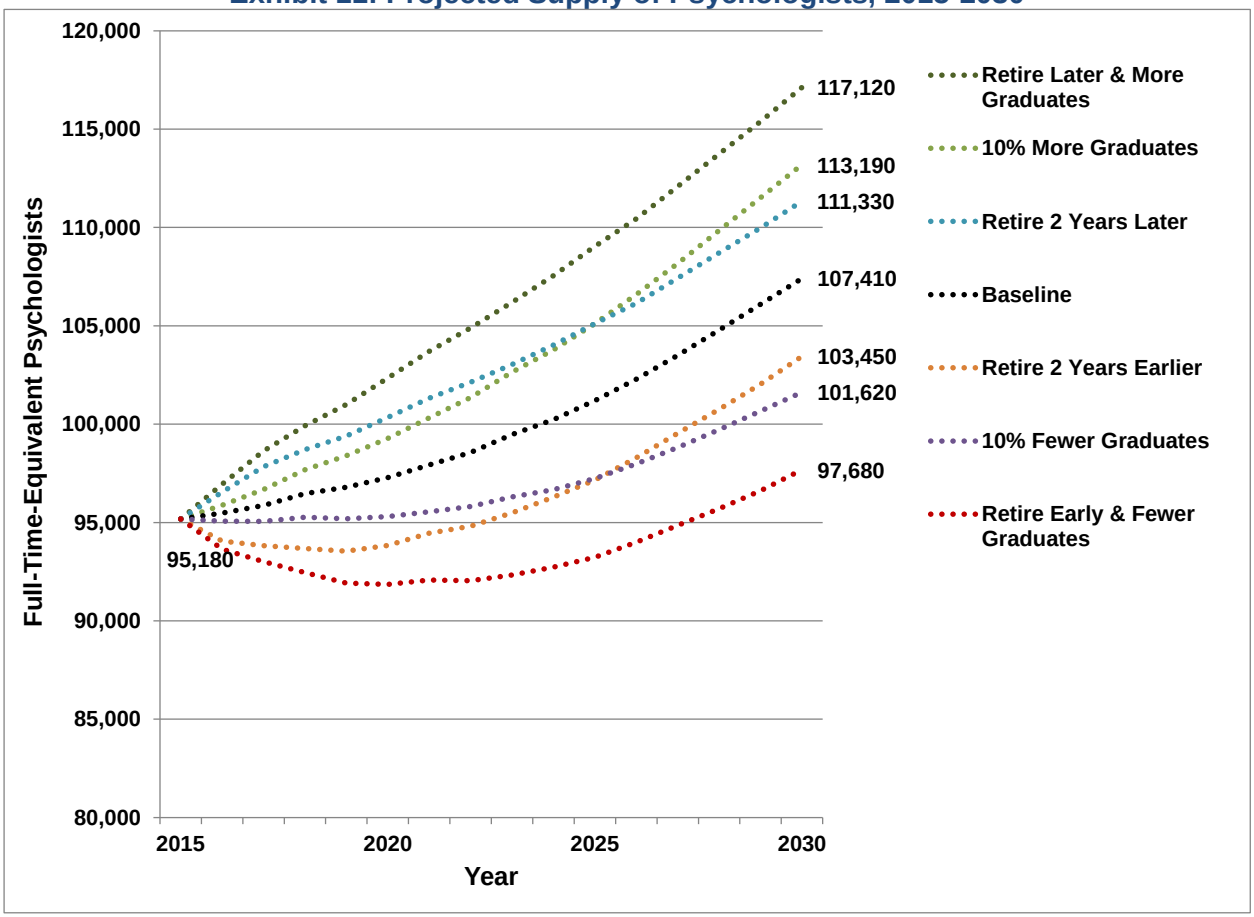
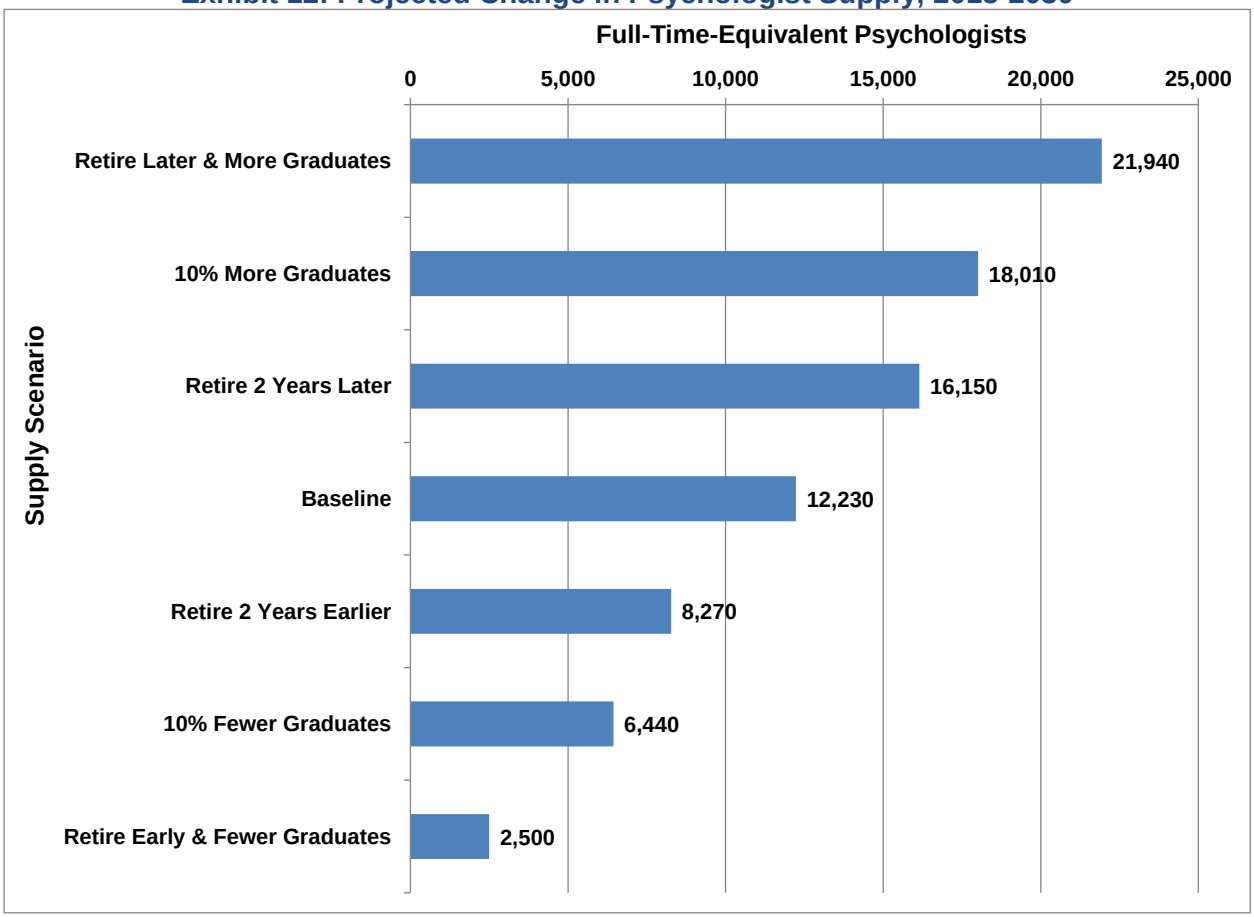


Exhibit 12: Projected Change in Psychologist Supply, 2015-2030



Note: This chart illustrates net growth in psychologist supply between 2015 and 2030 under the scenarios modeled—ranging from net growth of 6,440 to 18,010 under these scenarios modeled separately. Combining scenarios to estimate the most and least conservative provides a range of 2,500 to 21,940 supply growth.

Demand Modeling

This section presents an overview of the data and approach for modeling **demand** for active licensed psychologists, describes the scenarios modeled, and summarizes the demand projections. As discussed previously and also addressed later in this Section, demand is based on utilization of services likely to occur. Modeling "need" presents challenges because need is based on epidemiological considerations and there is no standard definition of need. Still, as discussed later we model a scenario of how many psychologists would be required if barriers to accessing care were removed.

A. Demand Model Overview

The approach for modeling demand consists of three components: 1) developing a representative sample of the population in each state, 2) projecting demand for psychologist services, and 3) projecting the number of psychologists required to meet demand for services

under the various scenarios modeled. We provide a brief description of each model component; detailed information about the microsimulation modeling approach has been published elsewhere (Bureau of Health Workforce, 2015; Dall et al., 2013a, 2013b, 2016).

Population database: The model contains a representative sample of the population in each state constructed by combining data from the U.S. Census Bureau's 2015 American Community Survey, the Centers for Disease Control and Prevention's (CDC) 2014 and 2015 Behavioral Risk Factor Surveillance System (BRFSS) files, the 2013 Medicare Beneficiary Care Survey (MCBS), and Centers for Medicare & Medicaid Services (CMS) 2015 Nursing Home Minimum Dataset (Exhibit 13). The resulting constructed population database has approximately 3.1 million individuals, and for each person contains demographics (age, sex, race/ethnicity), socioeconomic characteristics (household income, medical insurance type), and residence in a metropolitan or non-metropolitan area. For adults, the database also contains health risk factors (body weight category, current smoking status); and disease presence (diagnosed with arthritis, asthma, cardiovascular disease, diabetes, or hypertension; history of heart attack, history of stroke, and history of cancer). Unfortunately, the databases analyzed have little information on mental health and substance abuse.

Using population projections obtained for each state (and calibrated to be consistent with the U.S. Census Bureau's national population projections), we scaled the sample weights for individuals in the population database to reflect projections of the number and demographic characteristics of the population through 2030. The use of data from multiple sources is to help ensure the model contains a representative sample of the population residing in different settings (community, residential care, and nursing homes) and uses the most recent data available.

Exhibit 13: Summary of Demand Modeling Data Sources

Model Component	Data Sources
National/state population files	2015 ACS 2014 & 2015 BRFSS 2015 CMS Nursing Home Minimum Dataset 2013 MCBS
Weights for population projections	2014 U.S. Census Bureau national population projections; State population projections to estimate demand by region and metro/non-metropolitan area
Health care use equations	2010-2014 Pooled MEPS
Hospital inpatient day equations	2014 NIS
Health care use calibration/validation	2014 NIS 2013 NAMCS 2012 NHAMCS
Psychologist staffing ratios	APA supply estimates combined with analysis of the 2013-2015 ACS industry codes mapped to the microsimulation model employment/care delivery settings

Notes: ACS=American Community Survey; BRFSS=Behavioral Risk Factor Surveillance System; NNHS=National Nursing Home Survey; MCBS=Medicare Beneficiary Survey; MEPS=Medical Expenditure Panel Survey; NIS=Nationwide Inpatient Sample; NAMCS= National Ambulatory Medical Care Survey; NHAMCS=National Hospital Ambulatory Medical Care Survey; AMA=American Medical Association

Health care use forecasting equations: Patterns of health seeking behavior come from analysis of approximately 169,000 adults and children in the pooled 2010-2014 files of the Medical Expenditure Panel Survey (MEPS). MEPS is an annual set of large-scale surveys of families and individuals and their medical providers, and employers. Each quarter, individuals are interviewed and information is collected/updated on the individual (e.g., medical conditions and insurance coverage), the family (e.g., family income), and use of health care services during the previous quarter. If a person responds that they visited a psychologist during the previous quarter, for example, MEPS obtains the person's permission to contact the provider and extract information from medical charts regarding type of care received and cost information. Hence, the Medical Provider Component of MEPS collects information from providers of medical care that supplements the information collected from persons in household survey component of MEPS. In MEPS there is no information on the academic credentials of the service provider (e.g., master's or doctoral level psychologist).

The MEPS analysis covers only a subset of the employment settings where psychologists work: hospital inpatient, hospital outpatient, provider office/clinic, and home health. (We discuss other settings later). MEPS defines outpatient department care as any visit made to a hospital outpatient department, such as a unit of a hospital, or a facility connected with a hospital, providing health and medical services to individuals who receive services from the hospital but do not require hospitalization overnight. Examples of outpatient care include family planning clinics, alcohol and drug abuse clinics, physical therapy clinics, and other hospital-based clinics. All other ambulatory visits (including visits to provider offices or clinics not part of a hospital) are categorized under office visits.

To model outpatient and office visits we used Poisson regression where the dependent variable was annual encounters with a psychologist. The explanatory variables used in the microsimulation model are the same variables used to model demand for services of other health professions (e.g., physicians) (Bureau of Health Workforce, 2015; Dall et al., 2016). Unfortunately, some health risk factors that might be correlated with demand for mental health services (e.g., anxiety or depression, substance abuse) are not readily available to include in the regression analysis.

The Poisson regression output in Exhibit 14 is displayed as rate ratios.[a] For example, controlling for other patient characteristics, a Black non-Hispanic person has only 31% as many office visits to a psychologist compared to a White non-Hispanic person but 63% more outpatient/clinic visits to a psychologist. Compared to an older population (age 75+), younger adults have much higher use of psychologist services—for example, adults age 35-44 have almost 8 times as many office visits. (Separate equations not presented here model children's visits to psychologists). The results also reveal gender differences in psychology service usage controlling for other factors. For instance, males tend to have 58% as many office visits to a psychologist compared to a female but 38% more outpatient visits. Other patient characteristics and circumstances correlated with higher use of psychologist services include having insurance (and even higher if Medicaid is the insurer), low income, presence of select chronic diseases,

[a] Office visits are defined as any visit to a psychologist in an office-based setting. Outpatient/clinic visits are defined as visits where there is an encounter with a psychologist in a hospital outpatient department or clinic where the hospital visit does not require an overnight stay. https://meps.ahrq.gov/data_stats/MEPS_topics.jsp?topicid=38Z-1

and living in a metropolitan location. The presence of chronic disease is often correlated with increased visits with a psychologist. Later we describe scenarios modeling the demand implications of removing perceived barriers to accessing care—including financial barriers (modeled by changing people's insurance status), geographic barriers (modeled by changing people's metropolitan status), and cultural barriers (modeled by simulating patterns if minority populations had utilization patterns similar to the non-Hispanic White population).

We used logistic regression with the 2010-2014 MEPS data to model the probability of hospitalization regardless of diagnosis (as psychologists treat patients with a wide range of reasons for hospitalization). Regression output summarized in Exhibit 14 are odds ratios. To model length of stay for patients admitted to a hospital (specialty/long term hospitals, general acute-care hospitals, Veterans Affairs hospitals, or any other type of hospital), we used Poisson regression of over eight million discharge records in the 2014 National Inpatient Sample (NIS). Regression output is reported as rate ratios in Exhibit 14. For the hospital analysis, the MEPS and NIS data do not indicate whether a patient was seen by a psychologist. Therefore, the modeling assumption is that the relationship between psychologists working in hospitals and total inpatient days remains constant over time. That is, demand for hospital-based psychologist services will grow at the same rate as hospital inpatient days.

Exhibit 14: Regression Results Modeling Annual Care Utilization for Adults

	Parameter[1,2]	Psychologist Office Visits[3]	Psychologist Outpatient/Clinic Visits[3]	Hospitalizations[4]	Hospital Inpatient Days[3]
Race-Ethnicity	White, non-Hispanic	1.00	1.00	1.00	1.00
	Black, non-Hispanic	0.31**	1.63**	1.09**	1.15**
	Other, non-Hispanic	0.49**	0.05**	0.84**	1.04**
	Hispanic	0.37**	0.94*	0.95**	0.98**
Sex	Female	1.00	1.00	1.00	1.00
	Male	0.58**	1.38**	0.60**	1.12**
Age	18-34 years	6.07**	7.15**	1.14**	0.63**
	35-44 years	7.95**	4.98**	0.84**	0.76**
	45-64 years	5.38**	15.88**	0.71**	0.91**
	65-74 years	2.51**	6.50**	1.09**	0.97**
	75+ years	1.00	1.00	1.00	1.00
	Smoker	1.13**	0.66**	1.02	Not Applicable
Diagnosed with	Arthritis	1.84**	0.67**	1.34**	
	Asthma	1.80**	1.75**	1.20**	
	Coronary heart disease	1.27**	2.35**	1.74**	
	History of cancer	1.06	1.36**	1.45**	
	History of heart attack	0.54**	3.09**	1.74**	
	History of stroke	0.34**	1.58**	1.81**	
	Hypertension	0.97	0.88**	1.43**	
	Diabetes	0.91*	2.22**	1.41**	1.09**
Body Weight	Normal	1.00	1.00	1.00	
	Overweight	0.99	0.53	0.82	
	Obese	0.82**	0.96	1.00	
	Insured	1.71**	3.00**	1.34**	1.05**
	Medicaid	1.86**	3.21**	2.02**	1.12**
	Managed Care	1.17**	0.81**	1.07**	Not Applicable
Household Income	<$10,000	1.35**	0.96	1.23**	
	$10,000 to <$15,000	1.46**	2.29**	1.10**	
	$15,000 to < $20,000	0.97	0.86**	1.05	
	$20,000 to < $25,000	1.14**	0.37**	0.99	
	$25,000 to < $35,000	1.05	0.40*	0.98	
	$35,000 to < $50,000	1.03	1.00	0.94	
	$50,000 to < $75,000	0.97	0.33**	0.85**	
	$75,000 or higher	1.00	1.00	1.00	
	Metro Area	1.97**	2.44**	0.96	1.02*

Notes: (1) The comparison groups are non-Hispanic White, female, age 75 or older, non-smoker, normal body weight, uninsured, with household income $75,000 or higher. The numbers in this table reflect how a person with the characteristic differs in terms of annual use of health care services relative to someone in the comparison group or someone without the characteristic or risk factor modeled. (2) The microsimulation model is used to project utilization of health care services for a wide variety of health professions, and the age groups in the model are used for all professions modeled and do not vary by individual profession. Separate regressions are modeled for children using age groups: 0-2 years, 3-5 years, 6-12 years, and 13-17 years old. The regressions for children include only a subset of the variables used for the adult regressions—omitting smoker, body weight, and whether diagnosed with hypertension, coronary heart disease, history of heart attack, history of stroke, history of cancer, diabetes, arthritis, and history of cancer. (3) Rate ratios based on Poisson regression. (4) Odds ratios based on logistic regression.

Psychologist staffing patterns: Demand for psychologists is linked to demand for services, taking into account estimates of the portion of time that psychologists spend serving patients in different delivery settings. The approach estimates the proportion of psychologist FTEs by industry based on analysis of the ACS, and how demand for services in each industry is projected to change over time (Exhibit 15).[a]

The baseline demand projections assumed the ratio of psychologists to the workload metrics described in Exhibit 15 remains constant over time. For example, the workload metric for office-based psychologists is total annual office visits to psychologists, the workload metric for hospital-based psychologists is total annual inpatient days (regardless of reason for hospitalization), and the workload metrics for psychologists providing care in nursing homes and residential care facilities is the number of nursing home and residential care residents, respectively. For some industry categories, there are no readily available workload projections. As such, *population growth* was used as a proxy for demand growth in that category. Categories using total population growth as a proxy for demand growth are "other health care," "individual and family services," justice public order and safety activities," and "military."

The largest industry setting is "offices of health practitioners" where 44% of psychologists are working. The ACS data does not distinguish whether psychologists are in private individual or group practice, employed by a hospital or other employer or co-located in the office of a health care provider but not employed. Based on current utilization patterns for psychologist visits (Exhibit 14) and changing demographics alone the number of psychologist visits is projected to remain relatively constant (growing only 1% between 2015 and 2030), due to slow growth in the adolescent population and other populations that traditionally meet with psychologists.

The second largest industry setting is elementary and secondary schools, employing about 16% of psychologists, but the population age 6 to 17 is projected to grow only 2% between 2015 and 2030.

Hospitals constitute the third largest industry, employing about 13% of psychologists. This industry includes all types of hospitals—general, acute care hospitals; long term and specialty hospitals; and Veterans' Affairs and other public hospitals. This industry is projected to experience robust growth, with total inpatient days projected to grow 26% between 2015 and 2030 due largely to population growth and aging.

Employment settings with high projected growth in patient demand based on changing demographics (residential care and nursing home) currently employ few psychologists. Another care setting with high potential demand growth, discussed later under emerging care delivery models, is primary care settings.

[a] We combined three years of American Community Survey data (2013-2015) to identify professionally educated psychologists. We then mapped the industry code variable (Industry recode variable based on NAICS groupings) into appropriate employment settings. We internally went through the industry definitions and mapped into employment settings relevant to the demand model.

Exhibit 15: Psychologist Staffing Assumptions

Industry	FTE Estimate, 2015	FTE Distribution	Workload Metric, 2015	Setting Baseline Growth Projections/Assumptions between 2015 and 2030 (see Exhibit 18)
Offices of Health Practitioners	41,512	44%	30.4 million visits to a psychologist	Total office visits projected to grow 1%
Elementary and Secondary Schools	15,308	16%	49.8 million children age 6 to 17	School age population projected to grow 2%
Hospitals[a]	11,899	13%	146 million total inpatient days	Total inpatient days projected to grow 26%
Medical Outpatient Care Centers[b]	9,943	10%	1.2 million visits to a psychologist	Total outpatient/clinic visits projected to grow 4%
Other Health Care[c]	4,512	5%	321.4 million total U.S. population	Total population projected to grow 12%
Institutions of Higher Education[d]	3,978	4%	75.1 million adults age 18 to 34	Population age 18 to 34 projected to grow 12%
Individual and Family Services[e]	3,681	4%	321.4 million total U.S. population	Use total U.S. population growth of 12%
Justice Public Order and Safety Activities[f]	3,254	3%	6.7 million prison population (Kaeble and Glaze, 2015)	Use total U.S. population growth of 12%
Residential Care	411	<1%	693,500 residents	Total residents projected to grow 55%
Military	340	<1%	1.4 million active military personnel	Use total U.S. population growth of 12%
Nursing Facilities	244	<1%	1,310,200 nursing home residents	Total residents projected to grow 44%
Home Health	102	<1%	22.3 million home health visits (total visits for all reasons)	Total home health visits projected to grow 44%
Total	**95,184**	**100%**		

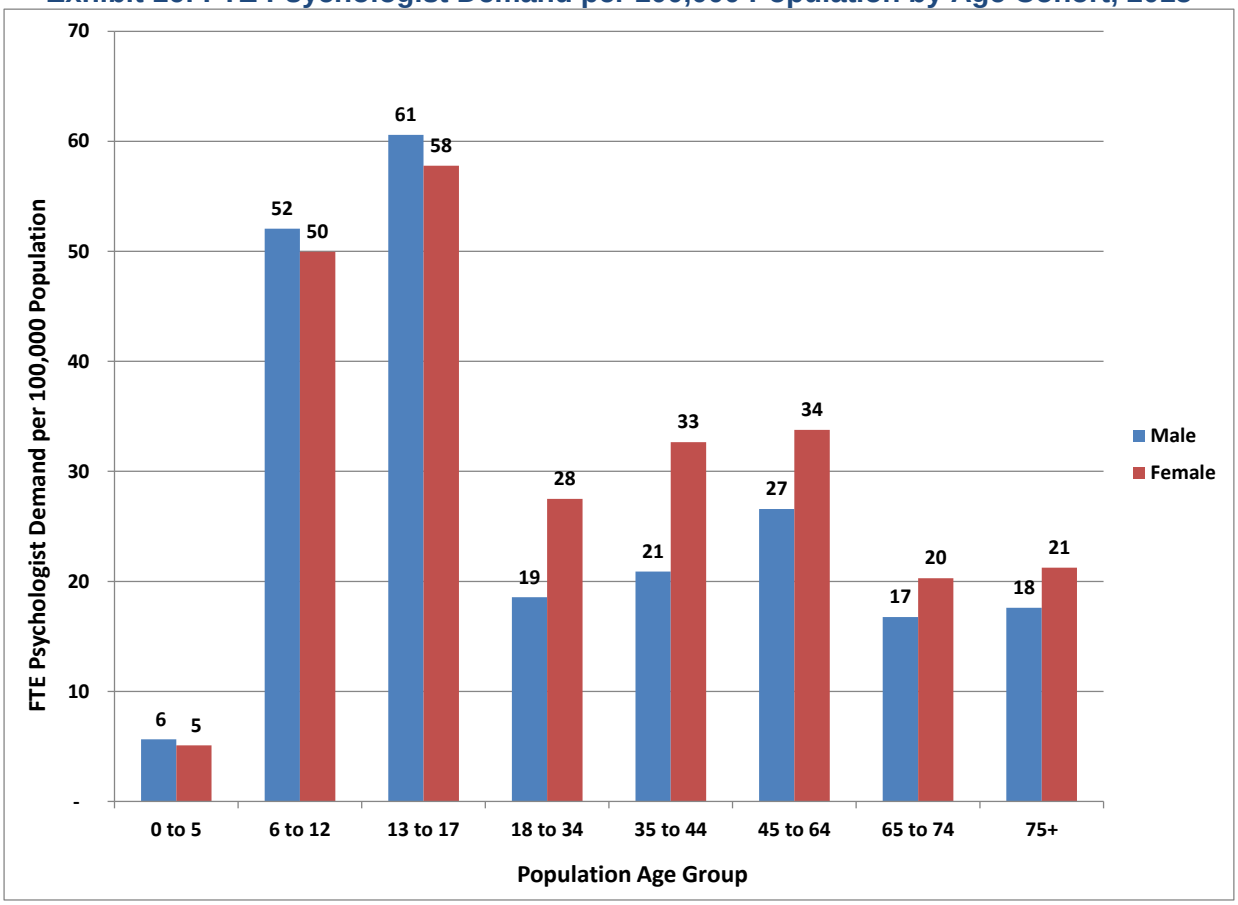
Notes: The aggregate workload measures summarized here are for both adults and children. FTE distribution by employment setting estimated from analysis of professionally educated psychologists in the 2013-2015 American Community Survey mapping the industry recode variable based on NAICS groupings into the microsimulation model employment/care delivery settings. Growth projections based on microsimulation model output or based on population projections. [a] Includes all types of hospitals: general, acute care hospitals; long term and specialty hospitals, and Veterans Affairs and other public hospitals. [b] Includes outpatient departments and clinics that are part of hospital systems—including family planning clinics, alcohol and drug abuse clinics, physical therapy clinics, and other hospital-based clinics. [c] Includes psychologists practicing in businesses and industry, and other settings not categorized elsewhere. [d] Includes psychologists working in universities and processional schools (including junior colleges). The ACS does not distinguish between psychologists who are faculty and providing teaching, research and administration services, versus psychologists providing counseling and treatment to students. [e] A small number of psychologists in this category are listed as Vocational and Rehabilitation Services and Child Day Care Services. [f] One fourth of psychologists in this category work are in the industry “National Security and International Affairs.”

B. Demand Modeling Assumptions and Scenarios

We projected demand for psychologists under scenarios that reflect varying assumptions regarding use of mental health services and care delivery. All scenarios reflect changing demographics from 2015 to 2030. We modeled the projected impact of continued expansion of medical insurance coverage under ACA, or if expansion is reversed through BCRA or other policy initiatives. We also modeled two hypothetical scenarios around removing care access barriers.

- **Baseline scenario**: This scenario extrapolates current care utilization and delivery patterns to future populations based on changing demographics. Between 2015 and 2030 the U.S. population is projected to grow from 321 million to 359 (12% growth). The population under age 18 is projected to grow by less than 4%; the population aged 65 and older is projected to grow by 55%; and the population age 75 and older is projected to grow by 73%. However, as illustrated in Exhibit 16, the older adult population uses relatively few psychologist services—though in percentage terms the demand for services provided to older adults is projected to grow much faster than demand for psychologist services overall.

Exhibit 16: FTE Psychologist Demand per 100,000 Population by Age Cohort, 2015



- **Potential change in demand due to health care reform or other policy initiatives**: The potential workforce impact of changes in Federal and State health care policies is challenging to discern in part because of the political climate and disagreement among policy makers on the best course of action. Parts of the Affordable Care Act had already been implemented—including increased medical insurance coverage, efforts to improve parity between mental health and physical health innovative care delivery models and increased focus on interprofessional teams in primary care. The impact of policy could go in one of multiple directions.
    1. Gains in insurance coverage under ACA could be reversed. Because expanded insurance coverage under ACA already was underway in 2015 and hence is built into the starting year demand estimates, if insurance coverage were to return to pre-ACA levels then demand for psychologists might fall by 1,040 FTEs.
    2. If under the Better Care Reconciliation Act of 2017 coverage levels remain what they are today but we do not realize the additional expanded coverage predicted if ACA were untouched, then the baseline scenario projections would best reflect this political reality.
    3. If ACA were to remain untouched or any replacement policy achieved similar medical insurance coverage levels, then by 2030 demand would increase by an additional 650 FTEs above the baseline projections.
    4. As discussed later, many states are working to redesign their health care systems and behavioral health is a key component of such reforms. Much of this work involves better integration of behavioral health into primary care.

- **Addressing Unmet Need and Health Care Utilization Equity Estimates:** We modeled three scenarios of the demand implications for psychologists if the nation better addressed unmet behavioral health needs. One scenario models estimated unmet need for services, while two hypothetical mental health care utilization equity scenarios quantify the implications for psychologist demand if currently underserved populations utilized care at a rate similar to that for populations facing fewer sociodemographic, economic, and geographic barriers to care. A survey of California residents suggested that patient characteristics associated with unmet need for behavioral health services include Asian, Latino, African American, age 65 or older, age 18-24, and no college degree (Tran and Ponce, 2017).
    - **Addressing Unmet Need**: Results from the 2016 National Survey on Drug Use and Health (which also asks questions about mental health) indicated that only 43% of the estimated 44.7 million adults with any mental illness (AMI) received mental health services in the past year, including only 65% of the 10.4 million adults with serious mental illness (SMI) (Park-Lee, Lipari, Hedden, Kroutil & Porter, 2017). However, not all adults with AMI will seek services—including patients who do not think their condition warrants a visit to a health professional, inability to pay for services, and other reasons. In a survey question asking about perceived unmet need for mental health services over the past year, 11.8 million adults indicated an unmet need—including 9.2 million adults with indications of AMI. Dividing this 9.2 million by the estimated 44.7 million adults with AMI suggests about 20% of adults with AMI

perceive unmet need for mental health services (including 39% of the SMI population with perceptions of unmet need). This modeled scenario quantifies the demand implications if the nation could address the mental health needs of this 20%.

- **Equity Scenario 1**: The first scenario models demand implications assuming that people without medical insurance living in non-metropolitan areas had equivalent care utilization patterns as their insured peers living in metropolitan areas with similar demographics and health risk factors.
- **Equity Scenario 2**: The second equity scenario simulates demand projections based on the assumption that everyone in the U.S. had care utilization patterns equivalent to non-Hispanic White, insured populations residing in metropolitan areas.

While many other factors would need to be addressed to achieve health care utilization equity—minimizing barriers related to insurance coverage, access, trust, stigma, etc.—these estimates highlight the potential scale of currently unmet need. Moreover, the estimates we put forth are by no means deemed definitive; instead, they are intended to stimulate much-needed discussion and analysis about how best to address health care utilization inequity in future projections.

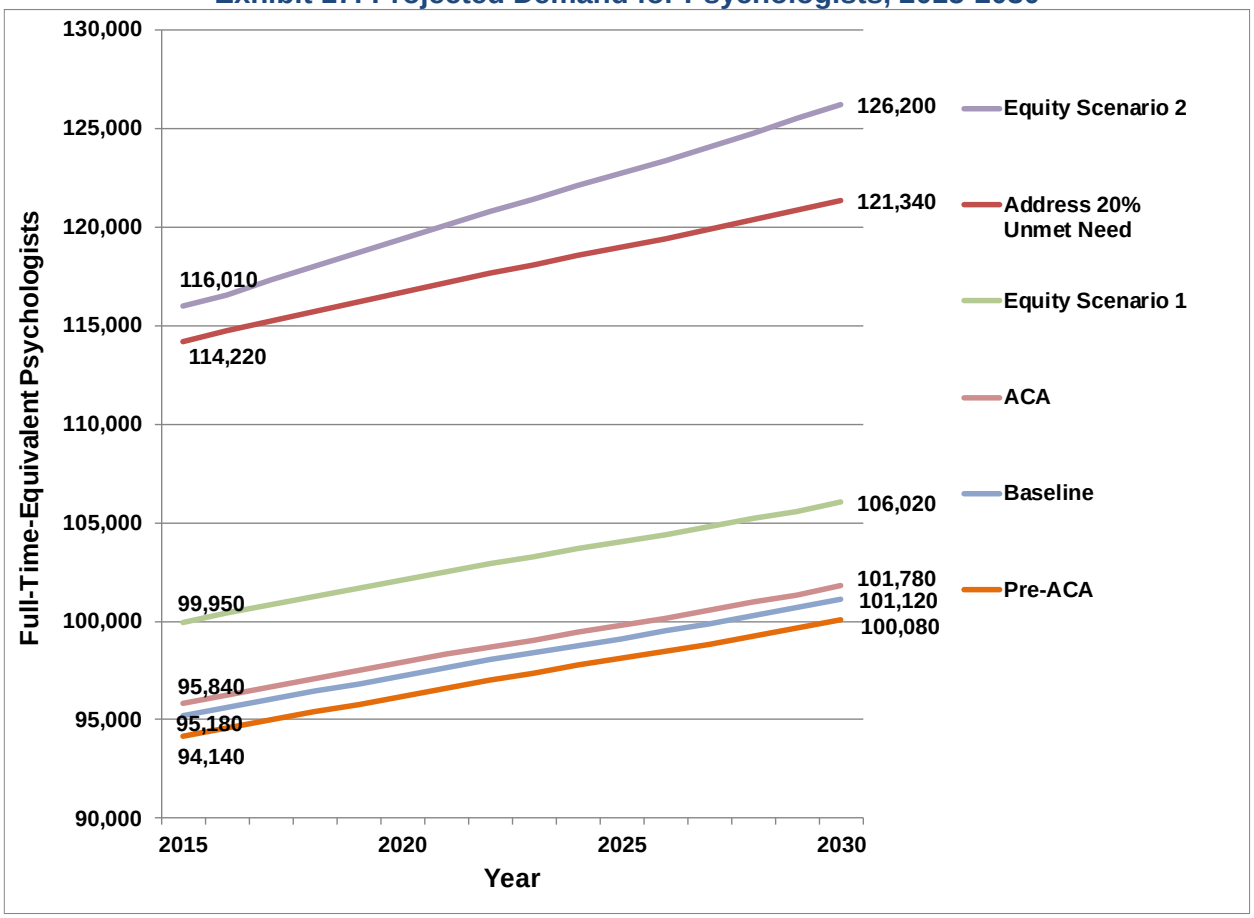
C. Summary Demand Projections

Consumption of per-capita psychologist services is higher for children age 6 to 17 compared to adults (Exhibit 16), but most of the nation's population growth is projected to occur among the population age 65 and older. Hence, between 2015 and 2030 national demand for psychologists is projected to grow slowly based on changing demographics alone—rising by about 5,940 FTEs (6%) (**Error! Reference source not found.**).

The effect of ACA-related expansion in medical insurance coverage was already underway by 2015, and its future is uncertain with the new Administration. However, continued expansion of medical insurance coverage under ACA appears only to have a small impact on the demand for psychologists. If ACA or its replacement were to achieve similar insurance expansion coverage, then eventually an estimated 660 additional FTE psychologists would be required to cover the newly insured. If the nation were to return to pre-ACA medical insurance levels, then demand might fall by about 1,040 FTEs.

The analysis highlights that if underserved populations had care utilization patterns similar to populations with fewer access barriers, demand for psychologists could rise substantially. To address the 20% of people with AMI who have perceived unmet needs, the nation would need approximately 19,000-20,000 more psychologists (assuming that demand for all types of mental health providers increased by about 20%). If people without medical insurance and people living in non-metropolitan areas had equivalent care utilization patterns as their insured peers living in metropolitan areas with similar demographics and health risk factors, then an additional 4,900 FTE psychologists would have been required to meet this increase in demand. If everyone in the U.S. had care utilization patterns equivalent to non-Hispanic White, insured populations residing in metropolitan areas then an additional 26,160 FTE psychologists would be required—with the additional demand growing over time as population growth rates among minority populations are higher than the population growth rate of the non-Hispanic White population.

Exhibit 17: Projected Demand for Psychologists, 2015-2030



D. Detailed Baseline Demand Projections

In this section of the report we provide additional detail on demand for psychologists by employment setting, patient age, patient race and Hispanic ethnicity, state and region of the country, and metropolitan/non-metropolitan area.

1. Psychologist Demand by Employment Setting

Psychologists work in many industries and settings. Under the baseline scenario, the projected growth in demand for psychologists in each employment setting modeled (Exhibit 18) reflects projected growth in the workload driver for each setting (as described in Exhibit 15).

- 44% of psychologists work in *offices of health practitioners*—which includes psychologists working in private individual or group practice, primary care offices, or in offices of other health practitioners. The patients seen by psychologists are disproportionately white, female, non-Hispanic, adolescents and young adults, people suffering from chronic health conditions (arthritis, asthma, cardiovascular disease, history of cancer), insured (especially insured through Medicaid), and living in a metropolitan area. Other patient conditions likely correlated with greater use of

psychologist services—such as suffering from psychiatric disorders or substance abuse disorders—are unavailable in the model due to data limitations. Analysis of current utilization patterns for psychologist visits suggests that based on changing demographics alone the number of psychologist visits is projected to remain relatively constant (growing only 1% between 2015 and 2030), due to slow growth in the adolescent population and other populations that traditionally meet with psychologists. Later we discuss potential growth in demand reflecting greater integration of behavioral health into primary care.[7]

- 16% of psychologists work in *elementary and secondary schools*, but the population age 6 to 17 is projected to grow only 2% between 2015 and 2030.
- 13% of psychologists work in *hospitals* (including acute care hospitals, long term and specialty hospitals, and Veterans Affairs and other public hospitals), and demand for hospital-based care is projected to grow 26% between 2015 and 2030.
- For many industries that employ psychologists (e.g., *individual and family services*, *justice public order and safety activities*, *military*, and *other health care* industries) there is little information about how demand might grow over time, so for these industries we use total population growth—which is approximately 12% between 2015 and 2030. The *other health care* category reflects psychologists in government, advocacy, industry and other roles that might not include patient care.[8]
- Employment settings with high projected growth in patient demand based on changing demographics (residential care and nursing facilities) currently employ few psychologists.

[7] It is not known how the consolidation of healthcare services (e.g., into health systems and Accountable Care Organizations) and the ascendance of team-based care might affect the opportunities for psychologists to function in individual private practice settings.

[8] https://www.ahrq.gov/research/data/meps/index.html

Exhibit 18: Projected FTE Psychologist Baseline Demand by Employment Setting, 2015-2030

Industry	Projected FTEs				Growth, 2015 to 2030	
	2015	2020	2025	2030	FTE	Percent
Offices of Health Practitioners	41,510	41,720	41,770	41,800	290	1%
Elementary and Secondary Schools	15,310	15,200	15,290	15,610	300	2%
Hospitals[a]	11,900	12,870	13,940	14,960	3,060	26%
Medical Outpatient Care Centers[b]	9,940	10,240	10,280	10,300	360	4%
Other Health Care[c]	4,510	4,700	4,880	5,050	540	12%
Institutions of Higher Education[d]	3,980	4,100	4,140	4,120	140	4%
Individual and Family Services[e]	3,680	3,830	3,980	4,120	440	12%
Justice Public Order and Safety Activities[f]	3,250	3,390	3,520	3,640	390	12%
Residential Care	410	460	530	640	230	55%
Military	340	350	370	380	40	12%
Nursing Facilities	240	270	310	360	120	47%
Home Health	100	110	130	150	50	43%
Total	95,180	97,240	99,130	101,120	5,940	6%

Notes: Numbers might not sum to totals because of rounding. [a] Includes all types of hospitals: general, acute care hospitals; long term and specialty hospitals, and Veterans Affairs and other public hospitals. [b] Includes outpatient departments and clinics that are part of hospital systems—including family planning clinics, alcohol and drug abuse clinics, physical therapy clinics, and other hospital-based clinics. [c] Includes psychologists practicing in businesses and industry, and other settings not categorized elsewhere. [d] Includes psychologists working in universities and processional schools (including junior colleges). [e] A small number of psychologists in this category are listed as Vocational and Rehabilitation Services and Child Day Care Services. [f] One fourth of psychologists in this category work are in the industry “National Security and International Affairs.”

2. Psychologist Demand by Patient Age

Based on changing demographics alone (Exhibit 19), under the baseline scenario, demand for psychologists is projected to grow most rapidly among the older adult populations (age 65 to 74, and ages 75 and older). For example, geropsychology, neuropsychology, rehabilitation psychology, and health psychology services may be anticipated to face increased demand. In contrast, demand for services for children is projected to grow slowly—absent changes in policy or interventions specifically designed to increase access to care among a pediatric population. Demand is projected to decline among the population ages 45 to 64 reflecting that at the national level this demographic is projected to decline.

Exhibit 19: Projected FTE Psychologist Demand by Patient Age, 2015-2030

Patient Age	2015	2030	Change, 2015 to 2030
0 to 5	1,770	1,890	110
6 to12	14,860	15,150	290
13 to 17	11,930	11,860	(70)
18 to 34	20,420	20,350	(70)
35 to 44	10,410	11,930	1,510
45 to 64	25,040	23,400	(1,640)
65 to 74	5,860	8,190	2,330
75+	4,890	8,350	3,460
Total	**95,180**	**101,120**	**5,940**

Note: Projected demand for psychologists practicing in non-patient care (e.g., teaching) is distributed proportionately across patient age bands based on utilization of psychologist services in patient care setting.

3. Psychologist Demand by Patient Race and Hispanic Ethnicity

Patterns of health care use and delivery differ systematically by patient race and Hispanic ethnicity, reflecting underlying differences in age distribution, disease prevalence, health-related behavior such as those contributing to obesity and smoking, economic factors including medical insurance coverage and household income, possible cultural differences in care utilization, and supply-related access barriers.

For modeling, we categorize patients in one of four mutually exclusive categories: White non-Hispanic, Black non-Hispanic, All Other non-Hispanic, and Hispanic. In 2015, an estimated 62% of the population was non-Hispanic White and this population accounted for approximately 68% (64,770 FTEs) of total demand (Exhibit 20). The Hispanic population, however, represented 18% of the US population but accounted for about 14% (13,520 FTEs) of psychologist demand. This suggests that the White non-Hispanic population in percentage terms has a higher usage of psychologist services compared to minority populations—and the disparity is actually larger when one considers that minority populations tend to have more risk factors

Two main issues related to health disparities and the mental/behavioral health workforce that should be considered in the context of public policy includes: increasing the number of racial and ethnic minority mental/behavioral health professionals and creating a culturally competent workforce to meet the needs of the expanding minority population of the United States.

associated with greater need for psychologist services (such as larger portion of the population in high-risk age groups).

Between 2015 and 2030 the demand for psychologists is projected to grow by 24% within racial/ethnic minority populations: 11% within the non-Hispanic Black population, 30% within the Hispanic population, and 32% within non-Hispanic Other populations.[9] The demand for psychologists within the non-Hispanic White population is projected to decline by 2%. Based on changing demographics alone (independent of any health care reform initiatives that increase access to care), overall demand for psychologist services is projected to grow by 5,940 FTEs (6%) from 2015 to 2030. This modest demand growth is driven by 4,120 FTEs associated with growth in the Hispanic population, 1,990 FTEs associated with growth in the non-Hispanic Other population, and 1,140 FTEs associated with growth in the non-Hispanic Black population. In contrast, there is a projected 1,310 FTE decline in demand associated with the non-Hispanic White population. These projections indicate that although the non-Hispanic White population has higher per-capita consumption, by 2030 their FTE demand growth shrinks given changing demographic trends. It can be expected that improved medical insurance coverage or removing other barriers to care likely will increase demand by minority populations at a higher rate than any increase in demand for non-Hispanic Whites.

Based on our supply analysis, in 2015 among psychologists whose race or ethnicity was reported, about 4% were non-Hispanic Black and 6% Hispanic, 6% were non-Hispanic Other, and 84% were non-Hispanic White. These findings highlight that minority psychologists are underrepresented in terms of both US population demographics and the demographic mix of patients. Furthermore, demand for psychologist services is projected to grow proportionately faster for minority populations based on national demographic trends.

As noted in an APA statement, "*Two main issues related to health disparities and the mental/behavioral health workforce that should be considered in the context of public policy includes: increasing the number of racial and ethnic minority mental/behavioral health professionals and creating a culturally competent workforce to meet the needs of the expanding minority population of the United States."*[10] Disparities in use of psychologist services by race and ethnicity, and the growing population of racial and ethnic minorities underscores the need for multicultural competence, bilingual psychologists, and competencies in working with language interpreters.

[9] "Other Non-Hispanic" group included American Indian/Alaska native, Asian Indian, Chinese, Filipino, Other Asian/Native Hawaiian/Pacific Islander, and multiple races reported. Due to smaller sample sizes for these populations, it was not possible to achieve meaningful results by race (especially when broken down further by age, sex and other patient characteristics of interest).

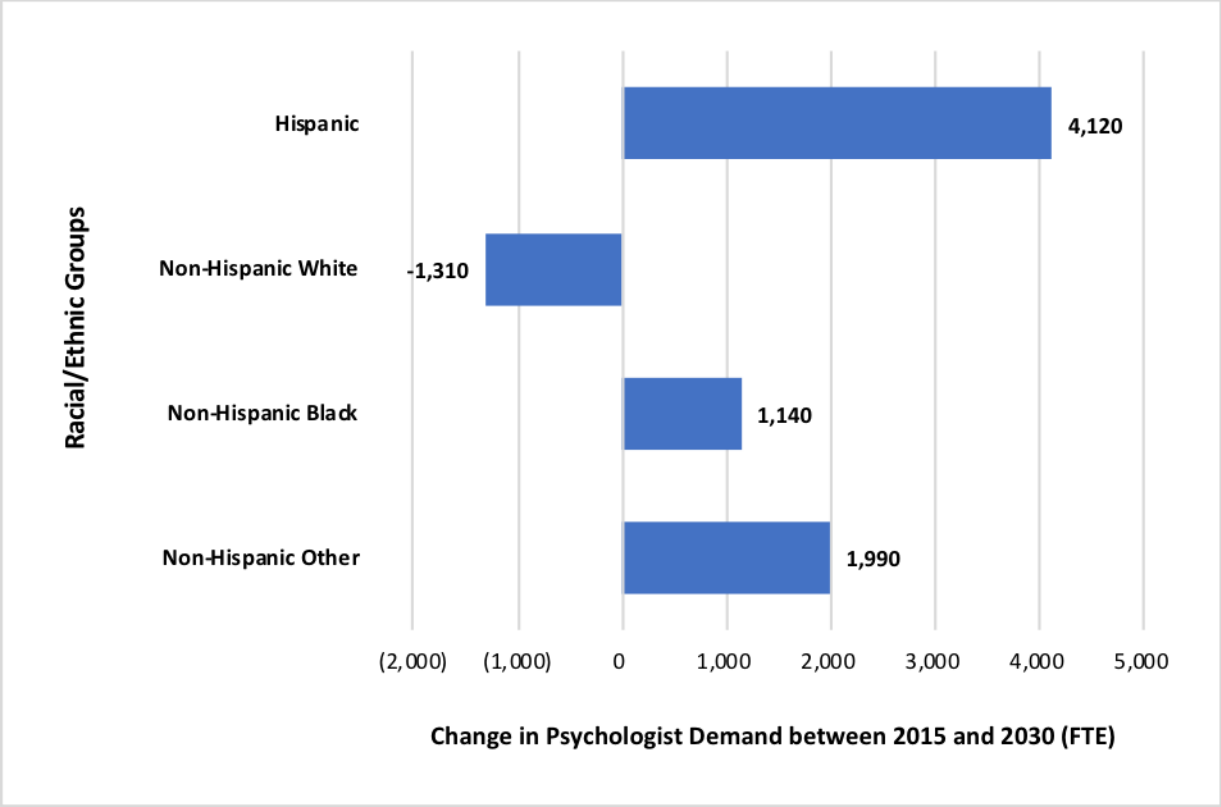
[10] Health Disparities & Mental/Behavioral Health Workforce http://www.apa.org/about/gr/issues/workforce/disparity.aspx

Exhibit 20: Projected Psychologist Demand by Patient Race and Ethnicity, 2015-2030

	Non-Hispanic			Hispanic	Total
Year	White	Black	Other		
2015	64,790	10,730	6,160	13,510	95,180
2030	63,480	11,870	8,150	17,630	101,120
Growth 2015 to 2030	(1,310)	1,140	1,990	4,120	5,940

Note: Projected demand for psychologists in non-patient care distributed proportionately by race/ethnicity.

Exhibit 21: Projected Change in Demand by Patient Race and Ethnicity, 2015-2030



Note: This graph shows that change in FTE psychologist demand is positive for minority populations, whereas for the White non-Hispanic population demand is projected to decline based on changing demographics.

4. Psychologist Demand by Region and Metropolitan/Non-Metro Area

Utilization of psychologist services and the projected growth in FTE demand varies by geographic region due to differences in demographics and projected population growth, insurance coverage and other financial considerations (e.g., household income), health-related behavior and disease prevalence, and care access barriers. For this analysis, we projected national demand to the region level accounting for differences in demographics and other variables in the model (disease prevalence, obesity and smoking prevalence, insurance status, etc.).

If each person in the US had a level of care identical to the national average for a similar person (same demographic, insurance status, disease presence, etc.), then in 2015 demand for

psychologists would be distributed as follows: 34,960 FTEs (37%) in the South Region, 21,830 FTEs (23%) in the West Region, 21,170 FTEs (22%) in the Midwest Region, and 17,230 FTEs (18%) in the Northeast Region (

Exhibit 22 and Exhibit 23). Based on changing demographics, demand is projected to grow in the South (3,900 FTEs) and West (3,080 FTEs) regions and decline in the Midwest (-840 FTEs) and Northeast (-220 FTEs) regions. Detailed demand projections by state are summarized in Appendix Exhibit 32.

Exhibit 22: Psychologist Demand by Region Based on National Average Utilization Patterns, 2015

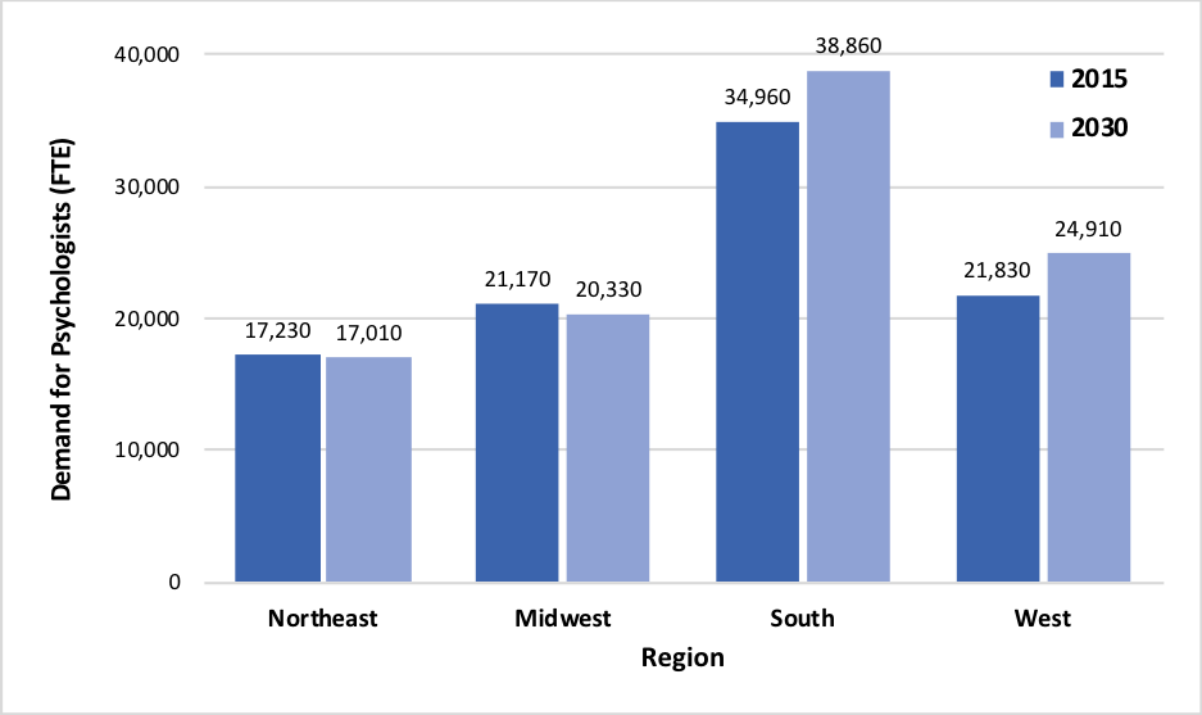


Exhibit 23: Projected Demand by Region, 2015-2030

Year	Region 1: Northeast	Region 2: Midwest	Region 3: South	Region 4: West	Total
2015	17,230	21,170	34,960	21,830	95,180
2030	17,010	20,330	38,860	24,910	101,120
Growth 2015 to 2030	-220	-840	3,900	3,080	5,940

Projected utilization of psychologist services by metropolitan versus non-metropolitan area suggests that approximately 91% of total psychologist FTE demand comes from the population in metropolitan areas (Exhibit 24). Approximately 86% of the US population resides in

metropolitan counties. Under the baseline scenario, between 2015 and 2030 demand will remain relatively constant by metropolitan/non-metropolitan area.

Exhibit 24: Psychologist Demand by Metropolitan/Non-metropolitan Location, 2015-2030

Baseline Scenario	Metropolitan	Non-metropolitan	Total
2015	86,610	8,570	95,180
2030	92,070	9,050	101,120
Growth 2015 to 2030	5,460	480	5,940

E. Demand Implications of Removing Care Access Barriers

We modeled two utilization equity scenarios to quantify the implications for psychologist demand if underserved populations used care at a rate similar to populations perceived to have fewer barriers to accessing mental health services, and one scenario of addressing the estimated 20% of AMI patients with perceived unmet need.

The two utilization equity scenarios are similar to scenarios modeled for the physician workforce for a recent report sponsored by the Association of American Medical Colleges (IHS Markit, 2017). The 20% unmet need scenario is similar to a scenario modeled for the behavioral health workforce for the Health Resources and Services Administration (Bureau of Health Workforce, 2016). The workforce demand implications suggested by these scenarios are not intended to be definitive; rather, the purpose of modeling these scenarios is to stimulate discussion and analysis about how best to address utilization disparities and unmet need. The ultimate goal of reducing disparities is improving patient mental health outcomes, with utilization being an imperfect proxy for patient wellbeing.

These scenarios illustrate that sociodemographic and geographic imbalances in the supply of psychologists and other barriers to accessing care result in lower levels of care received by historically underserved populations beyond utilization differences that can be explained by differences in demographic and other health risk factors included in the demand model. The first utilization equity scenario (Scenario 1) modeled a hypothetical scenario if people without medical insurance and people living in non-metropolitan areas had equivalent care utilization patterns as their insured peers living in metropolitan areas with similar demographics and health risk factors. Under these assumptions, we estimate a 5% gap in total psychologist supply in 2015 compared with the number required under this utilization equity scenario (Exhibit 25 and Exhibit 26). Compared with the supply in 2015, an additional 4,760 psychologists would be required to enable uninsured, non-metropolitan patients to utilize care in the same manner as other patients.

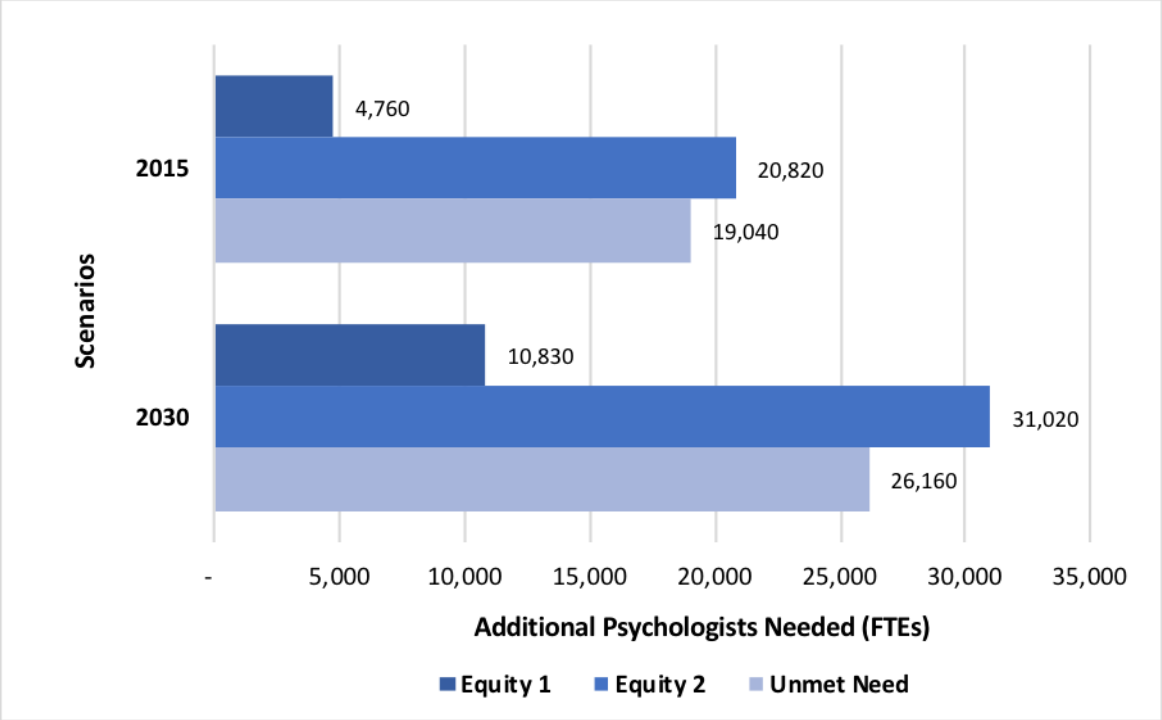
The second utilization equity scenario (Scenario 2) estimated 2015 psychologist demand under a hypothetical scenario if each person in the U.S. utilized psychologist care at the same rate as a similar non-Hispanic White, insured person residing in metropolitan areas. (“Similar” is defined as same age, sex, income level, and presence of the health risk factors modeled). Under this scenario there is an estimated 22% gap (or approximately 20,820 FTE psychologists) between total supply in 2015 and the number of psychologists required.

The unmet need scenario shifts the Baseline demand estimates up by 20% if these unmet needs could be addressed, suggesting about 19,040 increase in demand for psychologists in 2015.

Exhibit 25: FTE Psychologists Required Under Unmet Need and Utilization Equity Scenarios, 2015

	Utilization Equity		
	Scenario 1	**Scenario 2**	**Unmet Need**
Current Supply	95,180	95,180	95,180
Requirements under Equity Scenario	99,940	116,000	114,200
Current Gap	4,760	20,820	19,040
% Gap	5%	22%	20%

Exhibit 26: Additional Psychologists Needed if U.S. Had Achieved Utilization Equity in 2015-2030



The implications of these utilization equity scenarios vary by race/ethnicity and geographic area. Under Scenario 1, demand for psychologists rises by approximately 5%—with the largest FTE amount among the non-Hispanic White population as this race-ethnicity represents the largest segment of the U.S. population (Exhibit 27). Under Scenario 2, the Hispanic population would see a substantial increase in service use (requiring nearly 7,570 FTE psychologists above current use levels) and the non-Hispanic Black population would use services requiring approximately 5,490 FTE additional psychologists above current levels.

Exhibit 27: Additional Psychologists Needed if U.S. Had Achieved Utilization Equity in 2015, by Race/Ethnicity

	Non-Hispanic White	Non-Hispanic Black	Non-Hispanic Other	Hispanic	Total
FTE Demand					
Current Utilization	64,790	10,730	6,160	13,510	95,180
Equity Scenario 1	68,390	11,180	6,310	14,070	99,950
Equity Scenario 2	68,390	16,220	10,330	21,060	116,010
Additional Demand					
Equity Scenario 1	3,600	450	150	570	4,770
Equity Scenario 2	3,600	5,490	4,170	7,570	20,820

Under these utilization equity scenarios, the increase in demand would be greatest in the South Region and lowest in the Northeast Region (Exhibit 28).

Exhibit 28: Additional Psychologists Needed if U.S. Had Achieved Utilization Equity in 2015, by Region

	Region 1: Northeast	Region 2: Midwest	Region 3: South	Region 4: West	Total
FTE Demand					
Current Utilization	17,220	21,170	34,960	21,830	95,180
Equity Scenario 1	17,830	22,330	37,160	22,630	99,950
Equity Scenario 2	20,480	24,520	43,400	27,610	116,000
Additional Demand					
Equity Scenario 1	610	1,160	2,200	800	4,760
Equity Scenario 2	3,260	3,350	8,440	5,780	20,820

Summary of Supply and Demand Findings

If the training levels and other trends recognized in this report continue, psychologist supply is projected to grow faster than the level required to maintain current levels of care utilization and delivery. By 2030, there will be an estimated 6,290 FTE more psychologists available than required to maintain a level of care similar to that provided in 2015 (5,630 FTE surplus if projected expansion of medical insurance under the ACA continues).

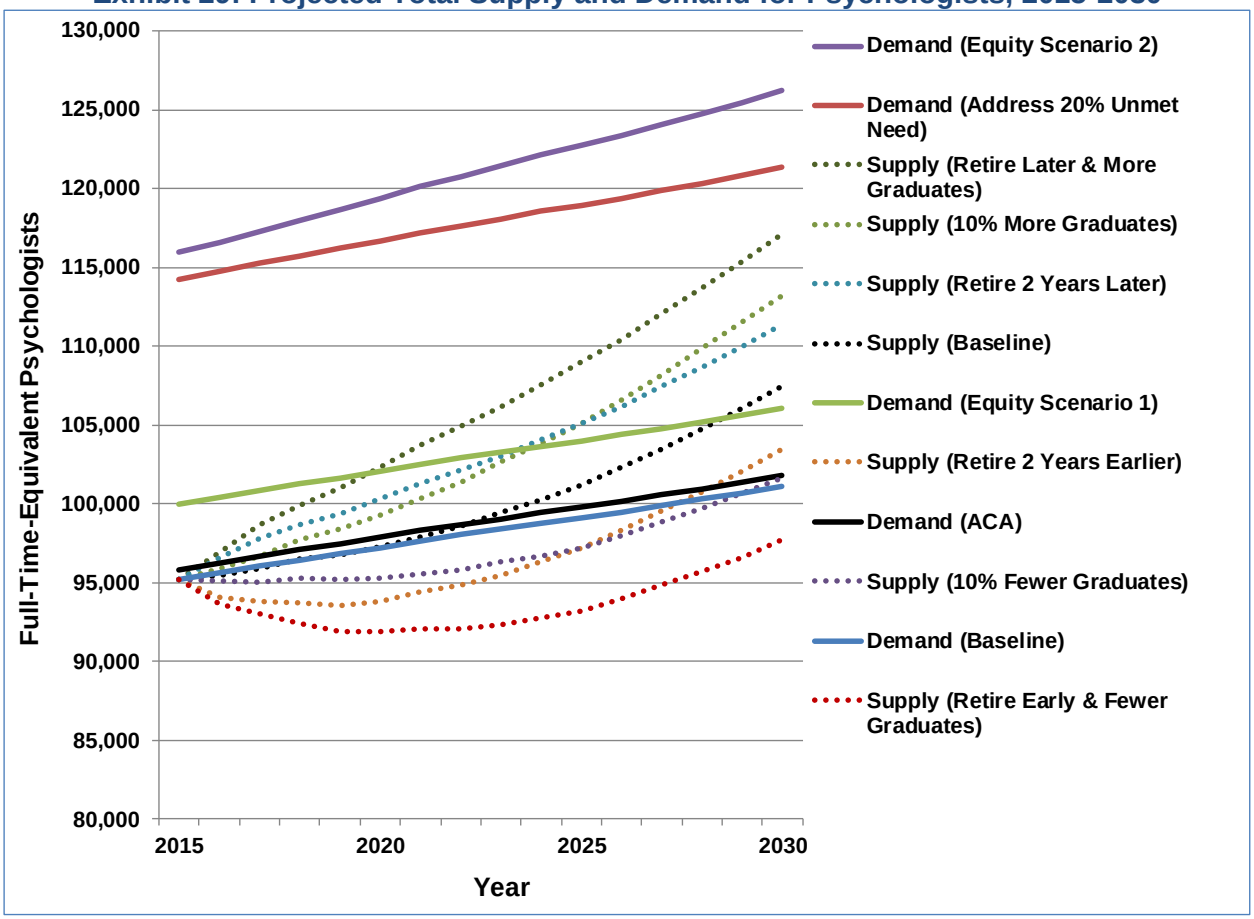
Hypothetical equity scenarios examined demand if geographic and racial/ethnic disparities were addressed. If current supply trends continue, by 2030 supply is projected to be sufficient to meet demand from all the uninsured and people living in non-metropolitan areas with a level similar to current use patterns of insured people living in metropolitan areas (surplus of approximately 1,390 FTEs).

However, there are substantial disparities in use of psychologist services when comparing use patterns of racial and ethnic minority populations to use patterns of the non-Hispanic White

population. These disparities exist even after controlling for family income level, insurance status, demographics, presence of chronic disease, and metropolitan/non-metropolitan residence. To the extent these utilization differences reflect access barriers for racial/ethnic minority populations, then removing such access barriers (financial, social, cultural, and geographic) could increase demand for psychologists in 2030 by approximately 25,080 FTEs above baseline demand projection. Under such a scenario, demand would exceed supply by approximately 18,790 FTEs.

Addressing unmet need requires an additional by 20,220 FTEs above baseline demand by 2030. Under this scenario, demand is projected to exceed supply by 13,930 FTEs.

Exhibit 29: Projected Total Supply and Demand for Psychologists, 2015-2030



References

American Diabetes Association. (2016). Standards of medical care in diabetes--2017: Section 12. *Diabetes Care, 40,* S105.

American Hospital Association. (2014). Integrating behavioral health across the continuum of care. Chicago, IL: Health Research & Educational Trust. Retrieved from http://www.hpoe.org/Reports-HPOE/Behavioral%20health%20FINAL.pdf

American Psychological Association. (2013). Guidelines for the Practice of Telepsychology. American Psychologist, 68; 791-800. Retrieved from http://www.apa.org/practice/guidelines/telepsychology.aspx

American Psychological Association. (2016a). *2015 APA Survey of Psychology Health Service Providers*. Washington, DC: Author. Retrieved from http://www.apa.org/workforce/publications/15-health-service-providers/index.aspx

American Psychological Association. (2016b). 2015 county-level analysis of U.S. licensed psychologists and health indicators. Washington, DC: Author. Retrieved from http://www.apa.org/workforce/publications/15-county-analysis/index.aspx

American Psychological Association. (2016c). Psychology master's and doctoral degrees awarded by broad field, subfield, institution type and state (2004-2013): Findings from the integrated postsecondary education data system. American Psychological Association, Washington DC. Retrieved from http://www.apa.org/workforce/publications/2016-postsecondary-data/index.aspx

American Psychological Association. (2017). *2010-2016 APA member directory* [Unpublished special analysis]. Washington, DC: Author.

Becker A.L. In some primary care offices: The social worker will see you now, Sep 8, 2015. Retrieved from http://ctmirror.org/2015/09/08/in-some-primary-care-offices-the-social-worker-will-see-you-now/

Bureau of Health Workforce. (2015). Technical documentation for Health Resources Service Administation's health workforce simulation model. Health Resources and Services Administration, DHHS. [Retrieved from https://bhw.hrsa.gov/sites/default/files/bhw/nchwa/projections/NCHWA_HWSM_Technical_Report_to_DEA.pdf

Bureau of Health Workforce. (2016). National projections of supply and demand for selected behavioral health practitioners: 2013-2025. Health Resources and Services Administration/National Center for Health Workforce Analysis;Substance Abuse and Mental Health Services Administration/Office of Policy, Planning, and Innovation, Rockville, Maryland. Retrieved from https://bhw.hrsa.gov/sites/default/files/bhw/health-workforce-analysis/research/projections/behavioral-health2013-2025.pdf

Center for Behavioral Health Statistics and Quality. (2017). 2016 National Survey on Drug Use and Health: Detailed Tables. Substance Abuse and Mental Health Services Administration, Rockville, MD. Retrieved from https://www.samhsa.gov/data/sites/default/files/NSDUH-DetTabs-2016/NSDUH-DetTabs-2016.pdf

Congressional Budget Office. (2017). H.R. 1628, Better Care Reconciliation Act of 2017. Retrieved from https://www.cbo.gov/publication/52849

Dall, T. M., Storm, M. V., Chakrabarti, R., Drogan, O., Keran, C. M., Donofrio, P. D. et al. (2013a). Supply and demand analysis of the current and future US neurology workforce. *Neurology, 81,* 470-478.

Dall, T., Gallo, P., Chakrabarti, R., West, T., Semilla, A., & Storm, M. (2013b). An aging population and growing disease burden will require a large and specialized health care workforce by 2025. *Health Aff.(Millwood.), 32,* 2013-2020.

Dall, T. M., West, T., Chakrabarti, R., Iacobucci, W., Semilla, A. P., & Hansari, A. (2016). Health workforce model documentation. IHS Markit. Retrieved from https://cdn.ihs.com/www/pdf/IHS-HDMM-DocumentationApr2016.pdf

Knopf, D., Park, M.J., & Mulye, T.P. (2017). The mental health of adolescents: A national profile, 2008. National Adolescent Health Information Center. Retrieved from http://nahic.ucsf.edu/downloads/MentalHealthBrief.pdf

Department of Health. (2017). Delivery System Reform Incentive Payment (DSRIP) Program. New York State Retrieved from https://www.health.ny.gov/health_care/medicaid/redesign/dsrip/

Department of Vermont Health Access. (2017). Vermont Blueprint for Health. State of Vermont. Retrieved from http://blueprintforhealth.vermont.gov/

Fossum, T. A., Logeais, M. E., & Robiner, W. N. (2016). Related mental health professions. In J. C. Norcross, G. R. VandenBos, D. K. Freeheim, & L. F. Campbell, (Eds.), *APA Clinical Psychology Handbook Volume V: Eduation and Profession* (pp. 455-468). Washington DC: Americal Psychological Association.

Heisler, E. J. & Bagalman, E. (2015). The mental health workforce: A primer. Congressional Research Service. Retrieved from https://fas.org/sgp/crs/misc/R43255.pdf

Hoge, M., Karel, M., Zeiss, A., Alegria, M., & Moye, J. (2015). Strengthening psychology's workforce for older adults: Implications of the Institute of Medicine's report to Congress. *American Psychologist, 70,* 265-278.

Integrated Behavioral Health Partners. (2017). Retrieved from http://www.ibhpartners.org/

IHS Markit. (2015). Florida statewide and regional physician workforce A: Estimating current and forecasting future supply and demand. Safety Net Hospital Alliance of Florida. Retrieved from http://safetynetsflorida.org/wp-content/uploads/Jan-28-IHS-Report-PDF.pdf

IHS Markit. (2017). 2017 Update: The complexities of physician supply and demand: projections from 2015 to 2030. Association of American Medical Colleges. Retrieved from https://aamc-black.global.ssl.fastly.net/production/media/filer_public/a5/c3/a5c3d565-14ec-48fb-974b-99fafaeecb00/aamc_projections_update_2017.pdf

Kaeble, D. & Glaze, L.E. *Correctional Populations In The United States, 2015*. Bureau of Justice Statistics. Retrieved from https://www.bjs.gov/index.cfm?ty=pbdetail&iid=5870

Kessler, R. & Stafford, D. (2008). Primary Care Is the De Facto Mental Health System. In R.Kessler & D. Stafford (Eds.), *Collaborative Medicine Case Studies: Evidence in Practice* (pp. 9-21). New York, NY: Springer New York.

Leonesio, M., Bridges, B., Gesumaria, R., & Del, B. (2012). The increasing labor force participation of older workers and its effect on the income of the aged. *Soial Security Bulletin, 72,* 59-77.

Manderscheid, R. & Kathol, R. (2014). Fostering sustainable, integrated medical and behavioral health services in medical settings. *Annals of Internal Medicine, 160,* 61-65.

Massachusetts Child Psychiatry Access Program. (2017). Massachusetts Child Psychiatry Access Program. Massachuesetts Department of Mental Health. Retrieved from http://www.mcpap.com/

Merikangas, K., He, J., Burstein, M., Swanson, S., Avenevoli, S., Cui, L. et al. (2010). Lifetime prevalence of mental disorders in U.S. adolescents: Results from the National Comorbidity Survey Replication--Adolescent Supplement (NCS-A). *Journal of the American Academy of Child and Adolescent Psychiatry, 49,* 980-989.

Miller, B., Petterson, S., Burge, B., Phillips, R., & Green, L. (2014). Proximity of providers: Colocating behavioral health and primary care and the prospects for an integrated workforce. *American Psychologist, 69,* 443-451.

National Science Foundation. (2017). Science and engineering doctorates, Data Tables. National Science Foundation, Arlington, VA. Retrieved from https://www.nsf.gov/statistics/sed/2013/data-tables.cfm

Park-Lee, E., Lipari R.N., Hedden, S.L., Kroutil, L.A. & Porter, J.D. (2017) Receipt of Services for Substance Use and Mental Health Issues among Adults: Results from the 2016 National Survey on Drug Use and Health. Retrieved from https://www.samhsa.gov/data/sites/default/files/NSDUH-DR-FFR2-2016/NSDUH-DR-FFR2-2016.htm

Robiner, W. N. (2006). The mental health professions: Workforce supply and demand, issues, and challenges. *Clinical Psychology Review, 26,* 600-625.

Robiner, W., Ax, R., Stamm, B., & Harowski, K. (2002). Addressing the supply of psychologists in the workforce: Is focusing principally on demand sound economics? *Journal of Clinical Psychology in Medical Settings, 9,* 273-285.

Robiner, W. N. & Crew, D. (2000). Rightsizing the workforce of psychologists in health care: Trends from licensing boards, training programs and managed care. *Professional Psychology: Research and Practice, 31,* 245-263.

Substance Abuse and Mental Health Services Administration. (2014a). Advancing behavioral health integration within NCQA recognized patient-centered medical homes. SAMHSA-HRSA, Center for Integrated Health Solutions. Retrieved from https://www.integration.samhsa.gov/integrated-care-models/Behavioral_Health_Integration_and_the_Patient_Centered_Medical_Home_FINAL.pdf

Substance Abuse and Mental Health Services Administration. (2014b). Results from the 2013 National Survey on Drug Use and Health: Mental health findings. NSDUH Series H-49, HHS Publication No.(SMA) 14-4887.Rockville, MD: Substance Abuse and Mental Health Services Administration. Retrieved from https://www.samhsa.gov/data/sites/default/files/NSDUHmhfr2013/NSDUHmhfr2013.pdf

Substance Abuse and Mental Health Services Administration. (2017). Promoting integration of primary and behavioral health care. Rockville, MD: Substance Abuse and Mental Health Services Administration. Retrieved from https://www.samhsa.gov/grants/grant-announcements/sm-17-008

Tran, L. D., & Ponce, N. A. (2017). Who Gets Needed Mental Health Care? Use of Mental Health Services among Adults with Mental Health Need in California. Californian Journal of Health Promotion, 15(1), 36–45. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5515380/

U.S. Census Bureau. 2015 American Community Survey. One-Year Public Use Microdata Sample (PUMS) analyzed by IHS Markit. (2017).

US Department of Education. (2014). Integrated postsecondary education data system (IPEDS). Digest of Education Statistics, National Center for Education Statistics, U.S.Department of Education. Retrieved from https://nces.ed.gov/programs/digest/d15/tables/dt15_318.30.asp

US Department of Education. (2015). Table 324.10. Doctor's degrees conferred by postsecondary institutions, by field of study: Selected years, 1970-71 through 2013-14. Digest of Education Statistics, National Center for Education Statistics, U.S.Department of Education. Retrieved from https://nces.ed.gov/programs/digest/d15/tables/dt15_324.10.asp?current=yes

Wang, P. S., Demler, O., Olfson, M., Pincus, H. A., Wells, K. B., & Kessler, R. C. (2006). Changing profiles of service sectors used for mental health care in the United States. *American Journal of Psychiatry, 163,* 1187-1198.

Appendix with Detailed Tables

The following tables provide more detailed projections of supply, demand, and imbalances between supply and demand across years, scenarios, and industry categories.

Exhibit 30: Total Projected Psychologist Supply, 2015-2030

Year	Baseline	Retire 2 Years Earlier	Retire 2 Years Later	10% Fewer Graduates	10% More Graduates
2015	95,180	95,180	95,180	95,180	95,180
2016	95,480	94,050	96,550	95,070	95,880
2017	95,870	93,820	97,840	95,060	96,680
2018	96,470	93,680	98,710	95,270	97,680
2019	96,800	93,550	99,390	95,190	98,390
2020	97,280	93,830	100,350	95,300	99,270
2021	97,930	94,450	101,320	95,550	100,320
2022	98,560	94,810	102,130	95,810	101,350
2023	99,470	95,500	103,040	96,300	102,650
2024	100,230	96,290	104,020	96,670	103,780
2025	101,200	97,160	105,110	97,240	105,120
2026	102,290	98,290	106,150	97,990	106,590
2027	103,500	99,540	107,430	98,810	108,170
2028	104,780	100,760	108,710	99,720	109,850
2029	106,090	102,030	109,970	100,660	111,510
2030	107,410	103,450	111,330	101,620	113,190
% growth 2015-2030	13%	9%	17%	7%	19%

Exhibit 31: Baseline Supply Projections by State, 2015-2030

Region/State	2015	2020	2025	2030	% Growth 2015 to 2030
Northeast	**27,270**	**24,950**	**24,000**	**23,940**	**-12%**
Connecticut	1,730	1,730	1,730	1,790	3%
Maine	550	530	540	570	5%
Massachusetts	4,550	4,490	4,530	4,730	4%
New Hampshire	560	610	670	740	33%
New Jersey	3,630	2,910	2,500	2,260	-38%
New York	10,070	8,640	7,880	7,410	-26%
Pennsylvania	5,040	4,910	5,000	5,220	4%
Rhode Island	590	630	660	720	22%
Vermont	550	500	490	500	-9%
Midwest	**18,690**	**18,650**	**19,220**	**20,120**	**8%**
Illinois	4,210	4,150	4,300	4,560	8%
Indiana	1,300	1,400	1,530	1,690	30%
Iowa	500	540	580	620	24%
Kansas	680	730	790	850	25%
Michigan	2,480	2,360	2,350	2,420	-3%
Minnesota	2,270	2,410	2,540	2,630	16%
Missouri	1,530	1,730	1,920	2,080	37%
Nebraska	560	550	550	560	0%
North Dakota	210	220	230	250	19%
Ohio	3,220	2,880	2,720	2,670	-17%
South Dakota	180	180	190	200	12%
Wisconsin	1,550	1,500	1,520	1,590	3%
South	**27,250**	**30,440**	**33,570**	**37,120**	**36%**
Alabama	690	760	820	870	26%
Arkansas	440	550	640	750	69%
Delaware	280	390	470	550	93%
District of Columbia	900	1,220	1,490	1,780	98%
Florida	4,320	5,000	5,610	6,330	47%
Georgia	2,070	2,270	2,470	2,690	30%
Kentucky	890	1,050	1,220	1,380	54%
Louisiana	580	650	710	770	32%
Maryland	2,570	2,780	3,060	3,390	32%
Mississippi	340	440	540	610	78%
North Carolina	3,290	3,390	3,540	3,750	14%
Oklahoma	530	540	570	610	17%
South Carolina	610	680	750	820	35%
Tennessee	1,140	1,380	1,580	1,760	54%
Texas	5,210	5,490	5,880	6,420	23%
Virginia	2,930	3,360	3,680	4,050	38%
West Virginia	460	490	540	590	27%
West	**21,980**	**23,250**	**24,410**	**26,230**	**19%**
Alaska	180	190	200	220	27%
Arizona	1,400	1,740	2,000	2,300	64%
California	11,450	11,180	10,930	11,200	-2%
Colorado	2,330	2,660	2,910	3,160	36%
Hawaii	600	720	840	960	61%
Idaho	240	290	330	370	56%
Montana	230	290	340	390	73%
Nevada	400	440	480	520	29%
New Mexico	590	730	850	990	68%
Oregon	1,430	1,590	1,780	1,990	39%
Utah	750	910	1,040	1,180	57%
Washington	2,210	2,310	2,470	2,670	21%
Wyoming	170	200	240	280	70%
US Total	**95,180**	**97,280**	**101,200**	**107,410**	**13%**

Note: Numbers might not sum to totals because of rounding.

Exhibit 32: Baseline Demand Projections by State, 2015-2030

Region/State	2015	2020	2025	2030	% Growth 2015 to 2030
Northeast	**17,230**	**17,170**	**17,090**	**17,010**	**-1%**
Connecticut	1,120	1,090	1,070	1,060	-5%
Maine	420	400	380	360	-14%
Massachusetts	2,230	2,230	2,220	2,200	-2%
New Hampshire	410	400	390	380	-8%
New Jersey	2,570	2,610	2,630	2,650	3%
New York	5,900	5,920	5,930	5,930	1%
Pennsylvania	4,020	3,980	3,930	3,910	-3%
Rhode Island	350	340	340	330	-6%
Vermont	210	200	200	190	-7%
Midwest	**21,170**	**20,920**	**20,610**	**20,330**	**-4%**
Illinois	3,900	3,840	3,800	3,800	-3%
Indiana	2,110	2,100	2,070	2,050	-3%
Iowa	960	930	890	850	-12%
Kansas	870	860	860	850	-1%
Michigan	3,300	3,240	3,160	3,070	-7%
Minnesota	1,700	1,700	1,700	1,690	-1%
Missouri	1,890	1,900	1,890	1,880	0%
Nebraska	550	550	550	550	0%
North Dakota	210	210	210	210	-1%
Ohio	3,670	3,570	3,460	3,370	-8%
South Dakota	250	250	250	250	1%
Wisconsin	1,760	1,770	1,770	1,760	0%
South	**34,960**	**36,270**	**37,540**	**38,860**	**11%**
Alabama	1,520	1,510	1,490	1,470	-3%
Arkansas	940	930	930	920	-2%
Delaware	290	290	300	300	4%
District of Columbia	190	210	210	220	13%
Florida	5,680	6,050	6,350	6,630	16%
Georgia	2,860	2,980	3,100	3,230	13%
Kentucky	1,480	1,480	1,480	1,470	-1%
Louisiana	1,410	1,430	1,450	1,480	5%
Maryland	1,720	1,750	1,770	1,790	4%
Mississippi	860	850	840	830	-4%
North Carolina	3,000	3,090	3,190	3,280	9%
Oklahoma	1,170	1,180	1,200	1,220	5%
South Carolina	1,440	1,500	1,560	1,610	12%
Tennessee	2,070	2,100	2,130	2,160	5%
Texas	7,310	7,860	8,440	9,110	25%
Virginia	2,360	2,430	2,490	2,550	8%
West Virginia	660	630	610	590	-11%
West	**21,830**	**22,870**	**23,890**	**24,910**	**14%**
Alaska	200	200	210	220	10%
Arizona	2,010	2,200	2,370	2,530	26%
California	10,910	11,390	11,850	12,360	13%
Colorado	1,630	1,740	1,840	1,930	18%
Hawaii	330	350	380	400	21%
Idaho	500	510	530	550	10%
Montana	290	290	300	300	2%
Nevada	800	850	900	940	18%
New Mexico	580	600	630	660	13%
Oregon	1,310	1,340	1,360	1,370	5%
Utah	900	950	1,000	1,070	18%
Washington	2,210	2,290	2,360	2,420	10%
Wyoming	160	160	160	160	1%
US Total	**95,180**	**97,240**	**99,130**	**101,120**	**6%**

Exhibit 33: Comparison of Baseline Supply and Demand Projections by State, 2015

Region/State	Supply	Demand	Supply - Demand	Supply ÷ Demand
Northeast	**27,270**	**17,230**	**10,040**	**158%**
Connecticut	1,730	1,120	610	154%
Maine	550	420	130	131%
Massachusetts	4,550	2,230	2,320	204%
New Hampshire	560	410	150	137%
New Jersey	3,630	2,570	1,060	141%
New York	10,070	5,900	4,170	171%
Pennsylvania	5,040	4,020	1,020	125%
Rhode Island	590	350	240	169%
Vermont	550	210	340	262%
Midwest	**18,690**	**21,170**	**-2,480**	**88%**
Illinois	4,210	3,900	310	108%
Indiana	1,300	2,110	-810	62%
Iowa	500	960	-460	52%
Kansas	680	870	-190	78%
Michigan	2,480	3,300	-820	75%
Minnesota	2,270	1,700	570	134%
Missouri	1,530	1,890	-360	81%
Nebraska	560	550	10	102%
North Dakota	210	210	0	100%
Ohio	3,220	3,670	-450	88%
South Dakota	180	250	-70	72%
Wisconsin	1,550	1,760	-210	88%
South	**27,250**	**34,960**	**-7,710**	**78%**
Alabama	690	1,520	-830	45%
Arkansas	440	940	-500	47%
Delaware	280	290	-10	97%
District of Columbia	900	190	710	474%
Florida	4,320	5,680	-1,360	76%
Georgia	2,070	2,860	-790	72%
Kentucky	890	1,480	-590	60%
Louisiana	580	1,410	-830	41%
Maryland	2,570	1,720	850	149%
Mississippi	340	860	-520	40%
North Carolina	3,290	3,000	290	110%
Oklahoma	530	1,170	-640	45%
South Carolina	610	1,440	-830	42%
Tennessee	1,140	2,070	-930	55%
Texas	5,210	7,310	-2,100	71%
Virginia	2,930	2,360	570	124%
West Virginia	460	660	-200	70%
West	**21,980**	**21,830**	**150**	**101%**
Alaska	180	200	-20	90%
Arizona	1,400	2,010	-610	70%
California	11,450	10,910	540	105%
Colorado	2,330	1,630	700	143%
Hawaii	600	330	270	182%
Idaho	240	500	-260	48%
Montana	230	290	-60	79%
Nevada	400	800	-400	50%
New Mexico	590	580	10	102%
Oregon	1,430	1,310	120	109%
Utah	750	900	-150	83%
Washington	2,210	2,210	0	100%
Wyoming	170	160	10	106%
US Total	**95,180**	**95,180**	**0**	**100%**

Note: National demand set equal to national supply in 2015 to define demand based on the national average level of care in 2015. Supply is defined as the number of licensed psychologists working in the field, while demand is defined as the level of psychologist services provided.

Exhibit 34: Comparison of Baseline Supply and Demand Projections by State, 2020

Region/State	Supply	Demand	Supply - Demand	Supply ÷ Demand
Northeast	**24,950**	**17,170**	**7,780**	**145%**
Connecticut	1,730	1,090	640	159%
Maine	530	400	130	133%
Massachusetts	4,490	2,230	2,260	201%
New Hampshire	610	400	210	153%
New Jersey	2,910	2,610	300	111%
New York	8,640	5,920	2,720	146%
Pennsylvania	4,910	3,980	930	123%
Rhode Island	630	340	290	185%
Vermont	500	200	300	250%
Midwest	**18,650**	**20,920**	**-2,270**	**89%**
Illinois	4,150	3,840	310	108%
Indiana	1,400	2,100	-700	67%
Iowa	540	930	-390	58%
Kansas	730	860	-130	85%
Michigan	2,360	3,240	-880	73%
Minnesota	2,410	1,700	710	142%
Missouri	1,730	1,900	-170	91%
Nebraska	550	550	0	100%
North Dakota	220	210	10	105%
Ohio	2,880	3,570	-690	81%
South Dakota	180	250	-70	72%
Wisconsin	1,500	1,770	-270	85%
South	**30,440**	**36,270**	**-5,830**	**84%**
Alabama	760	1,510	-750	50%
Arkansas	550	930	-380	59%
Delaware	390	290	100	134%
District of Columbia	1,220	210	1,010	581%
Florida	5,000	6,050	-1,050	83%
Georgia	2,270	2,980	-710	76%
Kentucky	1,050	1,480	-430	71%
Louisiana	650	1,430	-780	45%
Maryland	2,780	1,750	1,030	159%
Mississippi	440	850	-410	52%
North Carolina	3,390	3,090	300	110%
Oklahoma	540	1,180	-640	46%
South Carolina	680	1,500	-820	45%
Tennessee	1,380	2,100	-720	66%
Texas	5,490	7,860	-2,370	70%
Virginia	3,360	2,430	930	138%
West Virginia	490	630	-140	78%
West	**23,250**	**22,870**	**380**	**102%**
Alaska	190	200	-10	95%
Arizona	1,740	2,200	-460	79%
California	11,180	11,390	-210	98%
Colorado	2,660	1,740	920	153%
Hawaii	720	350	370	206%
Idaho	290	510	-220	57%
Montana	290	290	0	100%
Nevada	440	850	-410	52%
New Mexico	730	600	130	122%
Oregon	1,590	1,340	250	119%
Utah	910	950	-40	96%
Washington	2,310	2,290	20	101%
Wyoming	200	160	40	125%
US Total	**97,280**	**97,240**	**40**	**100%**

Exhibit 35: Comparison of Baseline Supply and Demand Projections by State, 2025

Region/State	Supply	Demand	Supply - Demand	Supply ÷ Demand
Northeast	**24,000**	**17,090**	**6,910**	**140%**
Connecticut	1,730	1,070	660	162%
Maine	540	380	160	142%
Massachusetts	4,530	2,220	2,310	204%
New Hampshire	670	390	280	172%
New Jersey	2,500	2,630	-130	95%
New York	7,880	5,930	1,950	133%
Pennsylvania	5,000	3,930	1,070	127%
Rhode Island	660	340	320	194%
Vermont	490	200	290	245%
Midwest	**19,220**	**20,610**	**-1,390**	**93%**
Illinois	4,300	3,800	500	113%
Indiana	1,530	2,070	-540	74%
Iowa	580	890	-310	65%
Kansas	790	860	-70	92%
Michigan	2,350	3,160	-810	74%
Minnesota	2,540	1,700	840	149%
Missouri	1,920	1,890	30	102%
Nebraska	550	550	0	100%
North Dakota	230	210	20	110%
Ohio	2,720	3,460	-740	79%
South Dakota	190	250	-60	76%
Wisconsin	1,520	1,770	-250	86%
South	**33,570**	**37,540**	**-3,970**	**89%**
Alabama	820	1,490	-670	55%
Arkansas	640	930	-290	69%
Delaware	470	300	170	157%
District of Columbia	1,490	210	1,280	710%
Florida	5,610	6,350	-740	88%
Georgia	2,470	3,100	-630	80%
Kentucky	1,220	1,480	-260	82%
Louisiana	710	1,450	-740	49%
Maryland	3,060	1,770	1,290	173%
Mississippi	540	840	-300	64%
North Carolina	3,540	3,190	350	111%
Oklahoma	570	1,200	-630	48%
South Carolina	750	1,560	-810	48%
Tennessee	1,580	2,130	-550	74%
Texas	5,880	8,440	-2,560	70%
Virginia	3,680	2,490	1,190	148%
West Virginia	540	610	-70	89%
West	**24,410**	**23,890**	**520**	**102%**
Alaska	200	210	-10	95%
Arizona	2,000	2,370	-370	84%
California	10,930	11,850	-920	92%
Colorado	2,910	1,840	1,070	158%
Hawaii	840	380	460	221%
Idaho	330	530	-200	62%
Montana	340	300	40	113%
Nevada	480	900	-420	53%
New Mexico	850	630	220	135%
Oregon	1,780	1,360	420	131%
Utah	1,040	1,000	40	104%
Washington	2,470	2,360	110	105%
Wyoming	240	160	80	150%
US Total	**101,200**	**99,130**	**2,070**	**102%**

Exhibit 36: Comparison of Baseline Supply and Demand Projections by State, 2030

Region/State	Supply	Demand	Supply - Demand	Supply ÷

				Demand
Northeast	**23,940**	**17,010**	**6,930**	**141%**
Connecticut	1,790	1,060	730	169%
Maine	570	360	210	158%
Massachusetts	4,730	2,200	2,530	215%
New Hampshire	740	380	360	195%
New Jersey	2,260	2,650	-390	85%
New York	7,410	5,930	1,480	125%
Pennsylvania	5,220	3,910	1,310	134%
Rhode Island	720	330	390	218%
Vermont	500	190	310	263%
Midwest	**20,120**	**20,330**	**-210**	**99%**
Illinois	4,560	3,800	760	120%
Indiana	1,690	2,050	-360	82%
Iowa	620	850	-230	73%
Kansas	850	850	0	100%
Michigan	2,420	3,070	-650	79%
Minnesota	2,630	1,690	940	156%
Missouri	2,080	1,880	200	111%
Nebraska	560	550	10	102%
North Dakota	250	210	40	119%
Ohio	2,670	3,370	-700	79%
South Dakota	200	250	-50	80%
Wisconsin	1,590	1,760	-170	90%
South	**37,120**	**38,860**	**-1,740**	**96%**
Alabama	870	1,470	-600	59%
Arkansas	750	920	-170	82%
Delaware	550	300	250	183%
District of Columbia	1,780	220	1,560	809%
Florida	6,330	6,630	-300	95%
Georgia	2,690	3,230	-540	83%
Kentucky	1,380	1,470	-90	94%
Louisiana	770	1,480	-710	52%
Maryland	3,390	1,790	1,600	189%
Mississippi	610	830	-220	73%
North Carolina	3,750	3,280	470	114%
Oklahoma	610	1,220	-610	50%
South Carolina	820	1,610	-790	51%
Tennessee	1,760	2,160	-400	81%
Texas	6,420	9,110	-2,690	70%
Virginia	4,050	2,550	1,500	159%
West Virginia	590	590	0	100%
West	**26,230**	**24,910**	**1,320**	**105%**
Alaska	220	220	0	100%
Arizona	2,300	2,530	-230	91%
California	11,200	12,360	-1,160	91%
Colorado	3,160	1,930	1,230	164%
Hawaii	960	400	560	240%
Idaho	370	550	-180	67%
Montana	390	300	90	130%
Nevada	520	940	-420	55%
New Mexico	990	660	330	150%
Oregon	1,990	1,370	620	145%
Utah	1,180	1,070	110	110%
Washington	2,670	2,420	250	110%
Wyoming	280	160	120	175%
US Total	**107,410**	**101,120**	**6,290**	**106%**