

# **State Health Expenditure Accounts: Methodology Paper, 1980-2014**

Definitions, Sources, and Methods

June 2017

## **OVERVIEW**

Periodically, the Office of the Actuary (OACT) estimates health spending by state of provider and by state of residence, which provide tools for policy discussions at the state and national levels, as well as for measuring health care spending attributed to interstate border crossing (Table 1).<sup>1</sup> The State Health Expenditure Accounts (SHEA) are an extension of the National Health Expenditure Accounts (NHEA) and represent a consistent set of estimates that utilize the same methodology for all states and all years included in the timeseries (1980-2014 for state of provider estimates, and 1991-2014 for state of residence estimates).

The SHEA is estimated at the Personal Health Care (PHC) level. PHC is the component of total national health care spending that includes all health care goods and services consumed and excludes administration and the net cost of private health insurance, government public health activities, and investment in research and structures & equipment.<sup>2</sup> In the SHEA, total U.S. health spending for each type of service or good is distributed among states using various nationally-available state level data sources.<sup>3</sup> In addition, state-by-state distributions of personal health care expenditures are developed for Medicare, Medicaid, and private health insurance.

Estimating health care expenditures by state is a multi-step process. First, expenditures by state of provider (or the state where health care goods and services are consumed) are developed for each PHC service using provider-based survey data. Second, estimates of spending by payer (Medicare, Medicaid, and private health insurance) are developed using a combination of administrative claims data and survey data. Third, the provider-based expenditures for each service and for Medicare are converted to a state of residence basis using information on health care expenditure patterns (or flows) between states. Expenditure estimates for Medicaid and for private health insurance are both assumed to be already on a state of residence basis.

## **SERVICE-SECTOR METHODOLOGY**

### **Developing Service-Sector Estimates by State of Provider**

In the first step of developing state health expenditure estimates, provider-based survey data are used to estimate spending by type of service or good by state. Thus, these data represent state health expenditures by state of provider. Estimates by state of provider reflect the revenues received by health care providers in a state for providing health care goods and services to both residents and non-residents, and are useful for measuring the portion of a state's economy (or Gross State Product) that is accounted for by health care.

Because some individuals cross state borders to receive health care services, health care spending by provider location is not necessarily an accurate reflection of spending on behalf of persons residing in that state. Therefore, computing per capita health spending using state of provider expenditure data and resident population is not advised because of the misalignment between state of provider and state of residence expenditures.

### **Data Sources for Service-Sector Estimates**

The primary data source that is used to develop state-by-state distributions of health care spending by service for all payer sources is the quinquennial Economic Census.<sup>4</sup> The Economic Census contains data for all 50 states and the District of Columbia, is available every five years, and covers all health care services as defined in the North American Industry Classification System (NAICS).<sup>5</sup> Other data sources that are used to allocate national personal health care spending estimates among states include population;<sup>6</sup> per capita personal income;<sup>7</sup> wages and salaries;<sup>8</sup> business receipts for sole proprietorships, partnerships, and corporations;<sup>9</sup> hospital revenue;<sup>10</sup> and retail prescription drug payments.<sup>11</sup>

### **Hospital Care**

Hospital Care (NAICS 622) reflects spending for all services that are provided to patients and that are billed by the hospital. Expenditures include revenues received to cover room and board, ancillary services such as operating room fees, services of hospital residents and interns, inpatient pharmacy, hospital-based nursing home care, care delivered by hospital-based home health agencies, and fees for any other services billed by the hospital. The value of hospital services is measured by total net revenue, which equals gross patient revenues (charges) less contractual adjustments, bad debts, and charity care. It also includes government tax appropriations as well as non-patient and non-operating revenues. Excluded are expenditures of physicians who bill independently for services delivered to patients in hospitals. These independently-billing physicians are included in the physician sector.

State expenditures for Hospital Care are estimated in two pieces: (1) non-federal hospitals and (2) federal hospitals.

Non-federal hospital expenditures for 1980-2014 are estimated using American Hospital Association (AHA) Annual Survey data that capture information from registered and non-registered hospitals for each state.<sup>10</sup> To estimate spending in federal hospitals, state level data from federal agencies that administer such hospitals are used for each year 1980 through 2014. The federal and non-federal hospital spending estimates by state are then summed and controlled to the national hospital care total as reported in the NHEA.

### **Physician and Clinical Services**

Physician and Clinical Services include expenditures for services provided in establishments operated by Doctors of Medicine (M.D.) and Doctors of Osteopathy (D.O.), outpatient care centers, plus the portion of medical laboratories services that are billed independently by the laboratories. This category also includes services rendered by a doctor of medicine (M.D.) or doctor of osteopathy (D.O.) in hospitals, if the physician bills independently for those services. Clinical services provided in freestanding outpatient clinics operated by the U.S. Department of Veterans' Affairs, the

U.S. Coast Guard Academy, the U.S. Department of Defense, and the U.S. Indian Health Service are also included. The establishments included in Physician and Clinical Services are classified in NAICS 6211-Offices of Physicians, NAICS 6214-Outpatient Care Centers, and a portion of NAICS 6215-Medical and Diagnostic Laboratories.

State expenditures for Physician and Clinical Services are estimated in three pieces: (1) expenditures in private physician offices and clinics and specialty clinics;<sup>12</sup> (2) fees of independently-billing laboratories; and (3) expenditures in clinics operated by the U.S. Coast Guard, Department of Defense, Indian Health Service, and the U.S. Department of Veterans Affairs.

Expenditures in private physician offices, clinics, and specialty clinics are based on business receipts/revenues for taxable and tax-exempt establishments as reported in the 1977, 1982, 1987, 1992, 1997, 2002, 2007, and 2012 Economic Census.<sup>4</sup> For taxable establishments (NAICS 6211 and 6214), expenditures for non-Census years through 2006 are estimated using growth in business receipts of sole proprietorships, partnerships, and corporations.<sup>9</sup> For non-Census years from 2008 forward, taxable expenditures are extrapolated using growth in wages and salaries paid in Offices of Physicians (NAICS 6211) and Outpatient Care Centers (NAICS 6214).<sup>8</sup> For tax-exempt establishments (NAICS 6214), expenditures for non-Census years are estimated using growth in the resident population.<sup>6</sup>

Estimates of expenditures for independently-billing laboratories are based on business receipts for taxable establishments of Medical and Diagnostic Laboratories (NAICS 6215) as reported in the 1977, 1982, 1987, 1992, 1997, 2002, 2007, and 2012 Economic Census.<sup>4</sup> For non-Census years, laboratory expenditures are estimated using growth in taxable physician offices and clinics expenditures.

Estimates of expenditures for clinics operated by the U.S. Coast Guard, Indian Health Service, and the U.S. Department of Veterans Affairs are estimated using state level data from the federal agencies that administer such facilities. Data for Indian Health Service and Department of Veterans Affairs clinics are available for each year 1980-2004. For 2005 forward, the 2004 distributions of state to total expenditures for each type of federal clinic are held constant. For estimates of expenditures for clinics operated by the Department of Defense, program data are available through 2005, and the 2005 distributions by state are held constant thereafter.

The separate spending estimates by state for physician and clinical services, independently-billing laboratories, U.S. Coast Guard clinics, Department of Defense clinics, Indian Health Service clinics, and U.S. Department of Veterans Affairs clinics are each controlled to national totals as reported in the NHEA.

Some physicians may receive professional fees paid by hospitals. These professional fees are included with hospital expenditures and not with physician expenditures; therefore, they are subtracted from the physician estimates. The estimates of professional fees by state are based on professional fee expenses from the AHA Annual Surveys for 1980, 1985, and 1990-1993. Using AHA community hospital revenues, professional fees are interpolated and extrapolated for intervening years and for 1994-2014.

### **Other Professional Services**

Other Professional Services include expenditures for services provided in establishments operated by health practitioners other than physicians and dentists. These professional services include those provided by private-duty nurses, chiropractors, podiatrists, optometrists, and physical, occupational and speech therapists, among others. These establishments are classified in NAICS 6213-Offices of Other Health Practitioners.

State expenditures for Other Professional Services are estimated in two pieces: (1) employer-based expenditures, and (2) non-employer expenditures.

Employer-based expenditures for the services of licensed professionals (such as chiropractors, optometrists, podiatrists, and independently practicing nurses) are based on business receipts for taxable establishments of Offices of Other Health Practitioners (NAICS 6213) as reported in the 1977, 1982, 1987, 1992, 1997, 2002, 2007, and 2012 Economic Census.<sup>4</sup> An estimate of optical goods sales that occur in optometrist's offices are removed from NAICS 6213 taxable receipts and are counted in Durable Medical Products. For non-Census years prior to 1997, expenditures are estimated using growth in business receipts of sole proprietorships, partnerships, and corporations.<sup>9</sup> For non-Census years subsequent to 1997, expenditures are estimated using growth in wages and salaries paid in Offices of Other Health Practitioners.<sup>8</sup>

Non-employer expenditures for Other Professional Services are based on data from the Census Bureau's Non-employer Statistics program for 1997 through 2013.<sup>13</sup> For years prior to 1997, the 1997 distributions of state non-employer expenditures to total expenditures are held constant. For 2014, non-employer expenditures are estimated using the growth in aggregate non-employer expenditures of Other Professional Services.

Separately, employer and non-employer-based spending estimates by state for Other Professional Services are controlled to national totals as reported in the NHEA.

### **Dental Services**

Dental Services include expenditures for services provided in establishments operated by a Doctor of Dental Medicine (D.M.D.), Doctor of Dental Surgery (D.D.S.), or Doctor of Dental Science (D.D.Sc.). These establishments are classified as NAICS 6212-Offices of Dentists.

State expenditures for Offices of Dentists are based on business receipts for taxable establishments as reported in the 1977, 1982, 1987, 1992, 1997, 2002, 2007, and 2012 Economic Census.<sup>4</sup> For non-Census years before 2013, expenditures are estimated using growth in business receipts of sole proprietorships, partnerships, and corporations.<sup>9</sup> For 2013 and 2014, expenditures are estimated using growth in wages and salaries paid in dental establishments.<sup>8</sup> Finally, the dental spending estimates by state are controlled to national totals as reported in the NHEA.

### **Home Health Care**

Home Health Care services include expenditures for medical care services provided in the home by freestanding home health agencies (HHAs) that are classified in NAICS 6216-Home Health Care Services. The HHAs included in this category are private sector

establishments primarily engaged in providing skilled nursing services in the home along with a range of the following: personal care services; homemaker and companion services; physical therapy; medical social services; medications; medical equipment and supplies; counseling; 24-hour home care; occupation and vocational therapy; dietary and nutritional services; speech therapy; audiology; and high-tech care, such as intravenous therapy. Medical equipment sales or rentals not billed through HHAs and non-medical types of home care (e.g., Meals on Wheels, chore-worker services, friendly visits, or other custodial services) are excluded. Also excluded are hospital-based home health agencies.

State expenditures for Home Health Care services are estimated in two pieces: (1) employer-based expenditures, and (2) non-employer expenditures.

Employer-based expenditures for private freestanding home health agencies are based on business receipts/revenues for taxable and tax-exempt establishments as reported in the 1987, 1992, 1997, 2002, 2007, and 2012 Economic Census.<sup>4</sup> Because government-supplied home health services are not surveyed by the Economic Census, an add-on is developed for estimates of government-owned home health agencies by state using Medicare statistical data. For non-Census years prior to 1992, employer-based home health expenditures by state are estimated using growth in Medicare and Medicaid home health spending. For non-Census years subsequent to 1992 expenditures are estimated using growth in private wages and salaries paid by home health care establishments.<sup>8</sup>

Non-employer expenditures for Home Health Care services are based on data from the Census Bureau's Non-employer Statistics program for 1997 through 2014.<sup>13</sup> For years prior to 1997, the distributions of state non-employer expenditures to total expenditures are held constant at the 1997 level.

Separately, employer and non-employer-based spending estimates by state for Home Health Care Services are controlled to national totals as reported in the NHEA.

### **Nursing Care Facilities and Continuing Care Retirement Communities**

Expenditures for Nursing Care Facilities and Continuing Care Retirement Communities include spending for inpatient nursing care services, rehabilitative services, and continuous personal care services to persons requiring nursing care that are provided in freestanding nursing home facilities. These establishments are classified in NAICS 6231-Nursing Care Facilities and NAICS 623311-Continuing Care Retirement Communities with on-site nursing care facilities. These services are generally provided for an extended period of time by registered or licensed practical nurses and other staff. Expenditures for care received in state and local government facilities and nursing facilities operated by the U.S. Department of Veterans Affairs are also included. Excluded are nursing home services provided in long-term care units of hospitals.

State expenditures for Nursing Care Facilities and Continuing Care Retirement Communities are estimated in three pieces: (1) private freestanding nursing care facilities and continuing care retirement communities; (2) state and local government nursing homes; and (3) nursing homes operated by the U.S. Department of Veterans Affairs.

Expenditures for private freestanding nursing care facilities (NAICS 6231) and continuing care retirement communities (NAICS 623311) are based on business receipts/revenues for taxable and non-taxable establishments as reported in the 1977, 1982, 1987, 1992, 1997, 2002, 2007, and 2012 Economic Census.<sup>4</sup> For non-Census years, nursing home expenditures by state are estimated using growth in wages and salaries paid in private nursing home establishments.<sup>8</sup>

For all years 1980-2014, expenditures for state and local government-owned nursing homes are estimated by inflating wages and salaries paid in state and local nursing home establishments using the ratio of private nursing home revenues to private nursing home wages and salaries.<sup>8</sup>

Expenditures for nursing homes operated by the U.S. Department of Veterans Affairs (DVA) are estimated using state level data furnished by the DVA for each year 1980-2014.

Separately, spending estimates by state for private freestanding nursing care facilities and continuing care retirement communities, state and local government nursing homes, and nursing homes operated by the U.S. Department of Veterans Affairs are controlled to national totals as reported in the NHEA.

### **Prescription Drugs and Other Non-Durable Medical Products**

Prescription Drugs include expenditures for the “retail” sales of human-use dosage-form drugs, biological drugs, and diagnostic products that are available only by a prescription. Other Non-Durable Medical Products include expenditures for the “retail” sales of non-prescription drugs and medical sundries.

State expenditures for Prescription Drugs and Other Non-Durable Medical Products are estimated in two pieces: (1) expenditures for prescription drugs, and (2) expenditures for other non-durable medical products (non-prescription medicines and sundries).

For both pieces, expenditures are based on retail sales data as reported in the 1977, 1982, 1987, 1992, 1997, 2002, 2007, and 2012 Census of Retail Trade, Merchandise Line Sales.<sup>14</sup> Expenditures for prescription drugs in non-Census years are estimated using data from the IMS Health Retail Prescription Method of Payment Report.<sup>11</sup> Expenditures for other non-durable medical products in non-Census years are estimated using growth in personal income per capita.<sup>7</sup>

Separately, spending estimates by state for Prescription Drugs and Other Non-Durable Medical Products are controlled to national totals as reported in the NHEA.

### **Durable Medical Products**

Durable Medical Products include expenditures for the “retail” sales of items such as contact lenses, eyeglasses and other ophthalmic products, surgical and orthopedic products, hearing aids, wheelchairs, and medical equipment rentals.

State expenditures for Durable Medical Products are estimated in two pieces: (1) durable goods sold in retail outlets, excluding those sold in Offices of Optometrists, and (2) expenditures for optical goods sold in Offices of Optometrists (NAICS 621320).

Expenditures for durable goods sold in retail outlets, excluding those sold in Offices of Optometrists, are based on retail sales of optical goods as reported in the 1977, 1982, 1987, 1992, 1997, 2002, 2007, and 2012 Census of Retail Trade, Merchandise Line Sales.<sup>14</sup>

Expenditures for optical goods sold in Offices of Optometrists (NAICS 621320) are based on business receipts for taxable establishments as reported in the 1977, 1982, 1987, 1992, 1997, 2002, 2007, and 2012 Economic Census.<sup>4</sup>

For Census years, expenditures by state for durable goods sold in both retail and non-retail establishments are summed. For non-Census years, these expenditures are interpolated and extrapolated using growth in per capita personal income.<sup>7</sup>

Finally, spending estimates for Durable Medical Products by state are controlled to national totals as reported in the NHEA.

### **Other Health, Residential, and Personal Care**

Other Health, Residential, and Personal Care services include those for care provided in residential care facilities, ambulance services, and for services provided in non-traditional settings.

State expenditures for Other Health, Residential, and Personal Care services are estimated in three pieces: (1) private residential facilities for the intellectually disabled and residential mental health and substance abuse facilities, as classified in NAICS 62321-Residential Facilities for the Intellectually Disabled, and NAICS 62322-Residential Mental Health and Substance Abuse Facilities; (2) private expenditures for ambulance services, as classified in NAICS 62191-Ambulance Services; and (3) services provided in non-traditional settings.

Private spending by Residential Facilities for the Intellectually Disabled (NAICS 62321), and Residential Mental Health and Substance Abuse Facilities (NAICS 62322) are based on business receipts/revenues for taxable and tax-exempt establishments as reported in the 1997, 2002, 2007, and 2012 Economic Census.<sup>4</sup> For non-Census years subsequent to 1990, expenditures by state are estimated using growth in wages and salaries paid in private residential establishments.<sup>8</sup> For non-Census years prior to 1990, expenditures by state are estimated using the distribution of state to total spending for Nursing Care Facilities and Continuing Care Retirement Communities.

Private spending by Ambulance Services (NAICS 62191) are based on business receipts/revenues for taxable and tax-exempt establishments as reported in the 1997, 2002, 2007, and 2012 Economic Census.<sup>4</sup> For non-Census years subsequent to 1990, expenditures by state are estimated using growth in wages and salaries paid for private ambulance providers.<sup>8</sup> For non-Census years prior to 1990, expenditures by state are

estimated using the distribution of state to total spending for Medicare ambulance services.

Services provided in non-traditional settings include spending for worksite healthcare, school health, and other types of miscellaneous care funded by federal or state programs. The largest component of spending in this category is home and community-based waivers under the Medicaid program. Under this program, states may apply for waivers of some of the statutory provisions in order to provide care to beneficiaries who would otherwise require long-term inpatient care in a hospital or nursing home. Examples of types of services provided are habilitation, respite care, and environmental modifications. This care is frequently delivered in community centers, senior citizen centers and through home visits by various kinds of medical and non-medical personnel. Expenditures by state for this program are developed using data from CMS-64 reports that are filed by state Medicaid agencies for all years 1980-2014.

For other types of funding classified in Other Health, Residential, and Personal Care, distributions by state are obtained using data from the CMS-64's and other program funding. Medicaid make up the majority of this funding but other examples include care funded by the Indian Health Service, Maternal and Child Health Bureau, Department of Veterans Affairs, Children's Health Insurance Program, school health programs, worksite healthcare, and Substance Abuse and Mental Health Services Administration.

Separately, spending estimates by state for residential care facilities, ambulance services, and for care provided in non-traditional settings are summed and controlled to national totals as reported in the NHEA.

## **PAYER METHODOLOGY**

### **Developing Payer Estimates**

The second major step in developing state health expenditures is to estimate state health expenditures by source of funds. In order to obtain estimates of state-level personal health care spending by *payer*, data are sourced from public program administrative data and multiple surveys on health spending, which is in contrast to the primary data source used to derive state-by-state *service* distributions (quinquennial Economic Census).

The data sources that are used to develop state-by-state distributions of health care spending by payer for Medicare and Medicaid are based on administrative claims data. The estimates obtained from Medicare are on a provider basis, which means that these estimates represent provider revenues by state paid for by Medicare. On the other hand, Medicaid estimates are assumed to represent both provider revenues and spending by residents. Because a state's Medicaid program serves the residents of that particular state, Medicaid expenditures are already tabulated on a state of residence basis in the SHEA.

For private health insurance, the state distributions are derived from multiple surveys together with federal employee data: the Agency for Healthcare Research and Quality's (AHRQ) Medical Expenditure Panel Survey (insurance and household components), data



from the Office of Personal Management, and data from the National Association of Insurance Commissioners on Medicare supplemental insurance. Note that the sources for private health insurance are used to develop per policy spending estimates by state, which implies that the estimated spending is associated with state residents. However, unlike Medicaid, it is not assumed that spending by residents is equivalent to provider revenues for a given state. Given the methodology used to develop these private health insurance estimates, private health insurance spending by state is not available by state of provider.

### **Medicare**

Medicare is a health insurance program for individuals age 65 or older, certain disabled individuals under the age of 65, and anyone with End-Stage Renal Disease. Estimates of Medicare spending for personal health care are based on information prepared by the Office of the Actuary (OACT) for the Medicare Trustees Report, reports submitted by Medicare contractors, and administrative and statistical records. Medicare spending is estimated in two pieces, fee-for-service (FFS) and managed care.

Medicare fee-for-service expenditures by state are based on state of provider payments recorded in Medicare's National Claims History (NCH) files. These detailed claim records, which were tabulated for 1991-1993, 1996, 1999, 2002, 2005, 2009, and 2013, are assembled for each Medicare service category. For intermittent years where NCH data are not available, Medicare claims-based statistical records are used, along with interpolation and extrapolation techniques, to obtain estimates of state-level Medicare expenditures based on provider location.<sup>15</sup> When state of provider data are unavailable, NCH data is extrapolated using state of beneficiary residence reimbursement information. The resulting fee-for-service payments by state are then controlled to the national level of Medicare fee-for-service expenditures for each service.

Expenditures by state for Medicare managed care services, known as "Medicare Advantage", are estimated separately from fee-for-service expenditures. Because Medicare expenditures on behalf of managed care organizations are not reported to CMS by type of service, spending is estimated by type of service and by state using data from forms that managed care plans submit annually to CMS. Aggregate capitated payments by type of service and by state are obtained from Adjusted Community Rating (ACR) proposals (1998-1999, 2001-2005) and from the Bid Pricing Tools (BPT's) (2007-2014). For 1980-1994, Part A and Part B reimbursements for group health plans are used to estimate managed care spending by state. For years where managed care spending data is not available, expenditures are estimated by interpolating per enrollee managed care spending. The resulting payments to managed-care organizations by state are then controlled to the national level of Medicare managed care payments for each service.

### **Medicaid**

Medicaid is a joint state and federal insurance program that is available only to certain low-income individuals and families who fit into an eligibility group that is recognized by federal and state law. Since states pay only for residents of their state, estimates of Medicaid spending by state primarily reflect spending by state of residence. Medicaid estimates are based primarily on financial information reports filed by the state Medicaid agencies on CMS-64 reports. These state level reports provide total program net expenditures by Medicaid program category, including premiums.<sup>16</sup>

Reported program data from the CMS-64 reports are adjusted to fit the estimates into the framework of the SHEA. First, Medicaid expenditures are classified according to SHEA service categories by state. Second, adjustments are made for prior period payments. Third, an estimate of hospital-based nursing home expenditures is added to hospital care expenditures and subtracted from nursing home care expenditures. Fourth, an estimate of hospital-based home health care spending is added to hospital care expenditures and subtracted from home health care expenditures. Fifth, an estimate of Medicaid buy-ins to Medicare is deducted to avoid double counting with Medicare. Finally, an estimate for durable medical equipment is developed from the Medicaid Analytic eXtract file (MAX) — a set of person-level Medicaid data files including payments by service — and this estimate is removed from other services payments included in the other health, residential, and personal care category. In addition, durable medical equipment estimates are smoothed to account for inconsistencies between MAX and CMS-64 reporting.

Excluded from Medicaid estimates by state for some years are portions of Medicaid Disproportionate Share Hospital (DSH) payments to hospitals and Upper Payment Limit (UPL) payments to nursing homes. These excluded payments are offset either by taxes and donations paid by the receiving facilities or by intergovernmental transfers from the receiving facilities and state governments. Such payments are excluded because they do not contribute additional state funds to overall hospital and nursing home operations.<sup>17</sup>

Lastly, Medicaid managed care premiums are allocated to the SHEA service categories based on the distribution of FFS spending by state. The second series of adjustments create NHEA service distributions for capitated and other insurance premium payments recorded on the Form CMS-64. Medicaid premiums payments are reduced by administrative costs and then allocated to NHEA service categories historically based on the distribution of FFS spending for selected services in the state. Adjustments to these service distributions are made in more recent years to account for states that have a large percentage of spending from managed care. Other sources of Medicaid spending are used to supplement the CMS-64s including data from the AHA, MEPS, MAX, and Medicaid Drug Rebate System as well as historic spending patterns. In certain states, adjustments are made to account for specific services or products that are carved out of premiums. These carve-outs typically occur for prescription drugs and dental services.

### **Private Health Insurance**

Private health insurance (PHI) expenditures in the NHEA are defined to include benefits and the net cost of private health insurance which includes administrative costs, and in some cases, additions to reserves, rate credits and dividends, premium taxes and fees, and net underwriting gains or losses. To estimate PHI expenditures by state, premiums must be separated between employer-sponsored insurance (ESI) and directly-purchased insurance. Employer-sponsored insurance is offered through employment and is paid for by the combination of contributions from both employers and employees. Health insurance obtained through employment-related union affiliations or trade organizations is also included in the ESI category. Directly-purchased insurance premiums are paid by individuals for policies that are not available through employment. These include Medigap policies, Marketplace plans, and other directly-purchased health insurance. In addition, the expenditures for the medical portion of property and casualty insurance policies are included this category.

Premiums for employer-sponsored insurance and directly-purchased insurance plans are estimated separately for each state and then summed to create total PHI premiums by state.<sup>18</sup> ESI premiums are further disaggregated into non-federal ESI (Private and State & Local governments) and federal ESI. Non-federal ESI premiums are estimated by multiplying average per policy premiums by state from the MEPS-IC<sup>19</sup> by the number of policy holders from the Current Population Survey (CPS).<sup>20</sup> The resulting premiums are then controlled to the national levels from the historical national health expenditure accounts.<sup>3</sup> Federal ESI premiums are based on data from the Office of Personnel and Management (OPM)<sup>21</sup> and then controlled to the historical NHEA levels.

Premiums for directly-purchased insurance plans are estimated separately for Medigap, Marketplace (in 2014 only), and other directly-purchased health insurance plans (including the medical portion of property and casualty insurance policies). Medigap premiums by state are estimated using data from the Medicare Supplemental Experience Exhibit that is submitted to the National Association of Insurance Commissioner<sup>22</sup> and Medicare Current Beneficiary Survey.<sup>23</sup> Marketplace premiums by state are estimated based on CMS (CCIIO)<sup>24</sup> data and then controlled to the historical NHEA levels. Finally, other directly-purchased health insurance is estimated using MEPS-HC<sup>25</sup> and under-65 population from the Enhanced CPS (eCPS)<sup>26</sup> and CPS data.<sup>27</sup>

Final premiums are evaluated further, and in some cases are adjusted to remove outliers. All final estimates are controlled to total private health insurance personal health care expenditure levels reported in the latest historical NHEA.

In order to develop PHI personal health care spending (or benefits) by state, net cost ratios<sup>28</sup> of PHI<sup>29</sup> are estimated and applied to premiums to create a net cost level that are then removed from each state's total PHI premium estimates. To do this, non-federal ESI premiums by state are separated into self-insured and fully-insured premiums using state enrollment and premium data from the MEPS-IC.<sup>30</sup>

For 2001-2014, the national net cost ratio for self-insured plans is applied to all states to derive self-insured ESI benefits (because of a lack of detailed data on premiums and benefits by state). For directly-purchased Medigap plans, premiums are converted to benefits using a net cost ratio based on data from the Medicare Supplemental Experience Exhibit that is submitted to the NAIC.

For 2001-2013, premiums for fully-insured non-federal ESI, federal ESI, and directly-purchased insurance are converted to benefits by applying<sup>31</sup> separate net cost ratios to each. Fully-insured non-federal ESI and federal ESI plans are developed using a net cost ratio for group plans from NAIC data.<sup>32</sup> The directly-purchased non-Medigap individually-purchased plan benefits and the medical portion of property and casualty insurance policies are derived using a net cost ratio for non-group plans based on data from the NAIC.

The 2014 estimates for fully-insured non-federal ESI, federal ESI, and directly-purchased insurance (excluding Medigap plans) are developed using a different method to convert PHI premiums to benefits due to newly created marketplace plans and data limitations by state. Aggregate PHI premiums for fully-insured non-federal ESI premiums, federal ESI premiums, Marketplace premiums, other directly-purchased health insurance (excluding

Medigap plans) and the medical portion of property and casualty insurance policies are converted to benefits using a net cost ratio that reflect aggregate premiums and benefits (for all types of coverage) from the NAIC.

Finally, for all years, all PHI benefits by state are controlled to total private health insurance personal health care expenditure levels reported in the latest historical NHEA.

Though several sources of state PHI enrollment are used to develop the spending estimates, eCPS and CPS enrollment are controlled to national PHI enrollment from the latest historical NHEA to calculate per enrollee PHI spending.

## **STATE OF PROVIDER TO STATE OF RESIDENCE ADJUSTMENT METHODOLOGY**

### **Developing Estimates by State of Residence**

The third major step in developing state health expenditure estimates is to adjust estimates by state of provider to obtain spending by state of residence. Estimates by state of residence reflect all health care expenditures made by, or on behalf of, the residents of a state, regardless of whether the care is provided in-state or out-of-state, and are useful for making comparisons of per capita spending between states. The difference between spending estimates based on state of provider and state of residence reflect the effects of border crossing, or crossing state lines to receive health care, which typically occurs when a person's residence is located near a state border or if specialized care is not available locally.

In order to convert provider-based estimates to a residence basis, a data set that contains expenditures for both of these dimensions is used. Medicare is the only nationwide insurer with publicly available claims files containing a large pool of service-specific records upon which to base interstate flows of spending between provider and beneficiary-residence locations. Therefore, Medicare data is the primary data source used to adjust the provider data to a residence basis.

Like the Medicare estimates by state of provider, Medicare estimates by state of residence are based on tabulations by service from the National Claims History (NCH) files.<sup>33</sup> These tabulations were prepared simultaneously on both a state of provider and state of beneficiary residence basis for the years 1991-1993, 1996, 1999, 2002, 2005, 2009, and 2013 and were mapped into NHEA service categories.<sup>34</sup> The result is a 51-by-51 matrix of total dollars spent by residents of a state (and the District of Columbia) and the corresponding dollars received by the providers of that state. Using the dollar levels in these matrices, residence-based expenditures are divided by provider-based expenditures, yielding ratios that represent the "net flow" of spending between states. Net flow ratios measure the extent to which states are net importers or exporters of services. For intermittent years where NCH data are not available, net flow ratios for each type of service are imputed using linear interpolation. For 2014, net flow ratios are held constant based on the last available year of data (2013).

### **Applying the Residence Adjustment**

To convert Medicare spending by state of provider to spending by state of residence, each Medicare service's state of provider estimates are multiplied with the corresponding Medicare service's matrix of net flow ratios (Table 2). The residence-adjusted expenditures are then summed into NHEA categories and represent total Medicare expenditures by state of residence.

For Medicaid, spending estimates by service are developed using state-based data from CMS-64 forms that are filed by the state Medicaid agencies to CMS. Because a state's Medicaid program serves the residents of that particular state, Medicaid expenditures are already tabulated on a state of residence basis in the SHEA.

Expenditures by service other than those paid for by Medicare and Medicaid ("all other payers") are adjusted using net flow ratios from Medicare to account for patterns of consumption that vary between the over-65 and the under-65 population. In general, we assume that travel patterns for the Medicare and non-Medicare populations are similar at a service-specific level. However, when services are combined, variation may exist due to differences in the mix of services consumed between these two groups.<sup>35</sup> Therefore, Medicare ratios are used as the basis for residence-adjustment for most services that are paid by non-Medicare, non-Medicaid payers (Table 3). The only exceptions are for inpatient hospital spending and physician and clinical services spending, which are converted from a provider to a residence basis using a re-weighted matrix of Medicare expenditures.

For inpatient hospital and physician and clinical services spending, travel patterns for the Medicare and non-Medicare populations may vary according to the mix of services consumed, primarily because of the age distribution of the population among states.<sup>36</sup> For inpatient hospital services, Medicare expenditure flows are adjusted for service-mix using a database of private hospital inpatient discharges.<sup>37</sup> For physician and clinical services, Medicare expenditure flows are adjusted for service-mix using a database of private physician claims.<sup>38</sup>

Finally, the ratios applicable to each "all other payer" service estimate are multiplied by their respective provider-based expenditures, yielding expenditures based on state of residence. As with the Medicare net flow ratios, for intermittent years where data is not available, net flow ratios by service are imputed using linear interpolation and for 2014, ratios are held constant based on 2013 data.

The final step involved in converting state of provider estimates to a state of residence basis is to re-aggregate all of the service categories after the individual pieces have been residence-adjusted, where applicable (Table 4).

### **Seasonal Migration**

Seasonal migration refers to the tendency of residents in northern states to travel to southern (or other) states to maintain temporary residency during the winter months. In the Medicare data that is used to adjust expenditures to account for travel patterns between states, only the primary residence is used because Medicare does not account for a beneficiary's secondary residence. Therefore, seasonal migration is not incorporated in

the Medicare flow ratios that represent both inflows and outflows of health care spending. Thus, because residents may consume health care in other states for a greater part of a year, and because they are not accounted for in the SHEA, expenditures for a resident's primary state may be slightly overstated. For the non-Medicare population, seasonal migration accounts for a small percentage of overall spending.<sup>39</sup> Nonetheless, for both the Medicare and non-Medicare populations, patterns of seasonal migration are not included in the SHEA.

### **State Border-Crossing Patterns in 2014**

Ultimately, the payer and service-level adjustments, discussed above, allow for analysis of the impact of state border-crossing patterns on spending (Table 5). Specifically, net flow ratios can be estimated and represent the net of state spending inflows (spending incurred by out-of-state residents in a state) and outflows (spending incurred by a state's residents for services outside of their own state). To calculate these net flow ratios, aggregate spending by state of residence are divided by aggregate spending by state of provider. Net-flow ratios greater than 100 percent indicate that spending incurred by the state's residents were more than the revenues received by the state's health care providers; ratios less than 100 percent indicate that provider revenues were higher than spending incurred by residents.

As mentioned earlier, there are many reasons why consumers use healthcare outside of their state of residence, whether it's proximity of residence or employment to a state border or a lack of available specialized care locally. Given that hospital and physician and clinical services make up the largest shares of personal health care spending, respectively, it is not surprising that the border crossing adjustment tends to be largest for those two services.

Net flow ratios were highest for the following states in 2014: Wyoming, Vermont, West Virginia, New Mexico, and Iowa. For these states, residents spent more, collectively, on health care than revenues collected by health care providers within their respective state—ranging from 6.4 percent more in Iowa to 24.1 percent more in Wyoming. For example, in addition to care received within the state, residents of Wyoming also traveled to adjacent states including Montana, Utah, Colorado, and South Dakota (data not shown)<sup>40</sup> to obtain medical care, leading to incurred spending by residents that was 24.1 percent higher than its provider revenues.

Net flow ratios were lowest for the District of Columbia, North Dakota, Utah, Tennessee, and South Dakota. For these areas, provider revenues exceeded health care spending by residents. Notably, the most substantial border crossing occurs in the District of Columbia, with 28.6 percent of provider revenues arising from non-residents in 2014. The District of Columbia is unique because it is an entirely urban area and provides a large amount of health care to residents of Maryland and Virginia (data not shown). On the other hand, in North Dakota, 7.0 percent of provider revenues were from non-resident patients, primarily from rural areas in adjacent states along North Dakota's eastern and southern borders (Minnesota and South Dakota, data on specific state-to-state travel patterns not shown).

Finally, in 2014, for the vast majority of states, the magnitude of the border crossing adjustment is less than 10 percent (48 states), except for Wyoming, Vermont, and the District of Columbia. The number of states with a border crossing adjustment below 10 percent remains somewhat stable over time, meaning that the magnitude of the annual adjustments for the nearly all the states is bounded by 10 percent, with the exception of the District of Columbia and one to two outlier states per year.

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## **ENDNOTES**

<sup>1</sup> Due to data limitations, our state estimates do not adjust for imports or exports of health care spending (i.e. services consumed by U.S. residents in other countries and health care provided to non-U.S. residents of foreign countries).

<sup>2</sup> Centers for Medicare & Medicaid Services: *National Health Expenditure Accounts: Definitions, Sources, and Methods, 2015*. <https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/Downloads/DSM-15.pdf>. December 2, 2016.

<sup>3</sup> Personal health care expenditures by state are controlled to estimates presented in the following NHEA paper: A. Martin et al., “National Health Spending: Faster Growth in 2015 as Coverage Expands and Utilization Increases,” *Health Affairs* 36, no.1 (2017): 166-176.

<sup>4</sup> U.S. Census Bureau, Department of Commerce: *Economic Census: Health Care and Social Assistance: Geographic Area Series* Washington, D.C. 2012. Available from: <https://www.census.gov/programs-surveys/economic-census/year.html>

<sup>5</sup> Office of Management and Budget: *Standard Industrial Classification Manual, 1987*. Executive Office of the President. Washington, D.C. U.S. Government Printing Office, 1987 and Office of Management and Budget: *North American Industrial Classification System, 1997*. Executive Office of the President. Washington, D.C. U.S. Government Printing Office, 1997.

<sup>6</sup> U.S. Census Bureau, Population Division: *Annual Estimates of the Population for the United States and States*. Washington, D.C. Available from: <https://www.census.gov/data/datasets/2016/demo/popest/state-total.html> 1977-2014. December 2016.

<sup>7</sup> U.S. Bureau of Economic Analysis: *State per Capita Personal Income*. Washington, D.C. Available from: <http://www.bea.gov/bea/regional/data.htm>. 1980-2014. March 2016.

<sup>8</sup> U.S. Bureau of Labor Statistics: *Quarterly Census of Employment and Wages*. Washington, D.C. Available from: <http://www.bls.gov/cew/home.htm>. 2002-2014.

<sup>9</sup> U.S. Internal Revenue Service: *Business Master File*. Unpublished. Washington, D.C. U.S. Department of the Treasury, 1977-2014.

<sup>10</sup> American Hospital Association: *Annual Survey*. Chicago. 1980-2015.

<sup>11</sup> IMS Health: *Retail Prescription Method of Payment Report*. Plymouth Meeting, PA. 1990-2014.

<sup>12</sup> Specialty clinics include family planning centers, outpatient mental health and substance abuse centers, all other outpatient care facilities, and kidney dialysis centers.



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- <sup>13</sup> U.S. Census Bureau, *Nonemployer Statistics*, Washington, D.C. Available from: <http://www.census.gov/econ/nonemployer/index.html>.
- <sup>14</sup> U.S. Census Bureau: Census of Retail Trade, Merchandise Line Sales Report. Washington, D.C. U.S. Government Printing Office, 1977, 1982, 1987 and 1992 and U.S. Census Bureau: Census of Retail Trade, Merchandise Line Sales Report, 1997, 2002, 2007, and 2012. Washington, D.C. Available from: <https://www.census.gov/data/tables/2012/econ/census/retail-trade.html>. May 2016.
- <sup>15</sup> Centers for Medicare & Medicaid Services, Medicare Provider Analysis & Review (MEDPAR) files, Current Utilization tables, Part B Analytics, the Health Care Information System (HCIS), and the Denominator file (for enrollment).
- <sup>16</sup> Centers for Medicare & Medicaid Services, Center for Medicaid and State Operations: *Medicaid State Financial Management Report*. (CMS-64). Baltimore, MD. 1980-2009. Available from: <https://www.cms.gov/Research-Statistics-Data-and-Systems/Computer-Data-and-Systems/MedicaidBudgetExpendSystem/>.
- <sup>17</sup> Coughlin, T.A., Ku, L., and Kim, J.: *Reforming the Medicaid Disproportionate Share Hospital Program in the 1990s*. The Urban Institute. Washington, D.C. January 2000.
- <sup>18</sup> Levit, Katherine, “Estimates of Private Health Insurance by State of Residence: 2001-2003,” (dated 12 November 2006), Contract no. HHSM-500-2005-00153P, prepared for the Centers for Medicare & Medicaid Services, Baltimore, 2006, and Actuarial Research Corporation, “Estimates of Private Health Insurance: by State of Residence 2001-2006,” (dated 17 December 2009), Contract no. HHSM-500-2008-00411G, prepared for the Centers for Medicare & Medicaid Services, Baltimore, 2009.
- <sup>19</sup> Agency for Healthcare Research and Quality: *Medical Expenditure Panel Survey-Insurance Component*. 2001-2006 and 2008-2014. [http://www.meps.ahrq.gov/mepsweb/survey\\_comp/Insurance.jsp](http://www.meps.ahrq.gov/mepsweb/survey_comp/Insurance.jsp). AHRQ did not produce a survey for 2007; therefore, we estimated values for 2007 by using straight averages from 2006 and 2008 data.
- <sup>20</sup> U.S. Bureau of Labor Statistics and U.S. Census Bureau. Current Population Survey (CPS). 2000-2014. <http://dataferrett.census.gov/> and <https://www.census.gov/cps/data/cpstablecreator.html>.
- <sup>21</sup> Office of Personnel Management (OPM). Unpublished data. 2001-2014.
- <sup>22</sup> National Association of Insurance Commissioners (NAIC) Medicare Supplemental Insurance Experience Exhibit. 2001-2014. An adjustment was made to California by using Medicare Current Beneficiary Survey because not all insurers in California file with the NAIC.
- <sup>23</sup> Centers for Medicare & Medicaid Services. Medicare Current Beneficiary Survey. 2001-2014. <http://www.cms.gov/Research-Statistics-Data-and-Systems/Research/MCBS/index.html>.

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<sup>24</sup> Centers for Medicare & Medicaid Services. Unpublished 2014 data from CCIIO.

<sup>25</sup> Agency for Healthcare Research and Quality: *Medical Expenditure Panel Survey-Household Component*. 2001-2014.

[http://www.meps.ahrq.gov/mepsweb/survey\\_comp/household.jsp](http://www.meps.ahrq.gov/mepsweb/survey_comp/household.jsp)

<sup>26</sup> State Health Access Data Assistance Center. 2000-2008. Minneapolis MN: University of Minnesota. <http://cps.ipums.org/cps/>

<sup>27</sup> U.S. Bureau of Labor Statistics and U.S. Census Bureau. Current Population Survey (CPS). 2009-2013.

[https://factfinder.census.gov/faces/nav/jsf/pages/download\\_center.xhtml](https://factfinder.census.gov/faces/nav/jsf/pages/download_center.xhtml). We excluded ACA enrollment from 2014 and 2015 by extrapolating 2013 CPS U.S. total by NHEA other direct overall growth rates. The 2014 and 2015 overall levels were then distributed to the states based on a 3 year average.

<sup>28</sup> National Association of Insurance Commissioners (NAIC) Medicare Supplemental Insurance Experience Exhibit. 2001-2014 and A.M. Best A.M. Best's *Financial Suite, Statement Products*. Oldwick, NJ. 2003-2014.

<http://www.ambest.com/sales/bironline/h/default.asp> and <http://www.ambest.com/sales/Statement/default.asp>. Net cost ratios in several states were adjusted to reflect a more consistent time series.

<sup>29</sup> The net cost of PHI represents the difference between premiums and benefits and includes administrative expenses, changes in reserves, and profit margins. The net cost ratio is the net cost level divided by the premium.

<sup>30</sup> Agency for Healthcare Research and Quality: *Medical Expenditure Panel Survey-Insurance Component*. 2001-2006 and 2008-2014. Unpublished data. AHRQ did not produce a survey for 2007; therefore, we estimated values for 2007 by using straight averages from 2006 and 2008 data.

<sup>31</sup> We “apply” the net cost ratio by multiplying the premium by 1 minus the ratio.

<sup>32</sup> National Association of Insurance Commissioners (NAIC) Medicare Supplemental Insurance Experience Exhibit. 2001-2014 and Department of Managed Health Care (DMHC) 2001-2014. The net cost ratio for fully insured plans in California was developed by using total revenue and total medical expenses for all plans. An adjustment was made to California using California's Department of Managed Health Care data because not all insurers in California file with the NAIC.

<sup>33</sup> National Claims History file data was tabulated for the following Medicare service categories: inpatient hospital, outpatient hospital, physicians, ESRD clinics, freestanding home health, hospital-based home health, freestanding skilled nursing facilities, hospital-based skill nursing facilities, hospice, hospital-based hospice, other professionals, ambulance services, durable medical equipment, prescription drugs, and other non-durable medical products.

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<sup>34</sup> Fu Associates, Ltd. “Interstate Flows of Health Spending: Update for 2013,” (Memoranda dated March 2015), Contract no. HHSM-500-2014-00446G, prepared for the Centers for Medicare & Medicaid Services, Baltimore, MD, 2015.

<sup>35</sup> Fu Associates, Ltd. “Interstate Flows of Health Spending: Updates for 1996.” Contract no. RFP HCF 98-004/ELA, prepared for the Health Care Financing Administration, Baltimore, MD, 1998.

<sup>36</sup> Variations in travel patterns are attributable to differences in the mix of specific procedures and services purchased by various age cohorts with broader inpatient hospital and physician service categories, rather than to differences in travel patterns exhibited by each age cohort for the same procedure. Fu Associates, Ltd. “Interstate Flows of Health Spending: Updates for 1992 and 1993” (Memorandums dated 8 October 1996, 7 November 1996, and 29 January 1997), Contract no. HCFA 500-95-0036, prepared for the Centers for Medicare & Medicaid Services, Baltimore, MD, 1996.

<sup>37</sup> 1991 inpatient hospital service-mix adjusted ratios were developed using inpatient hospital discharge data from the Codman Research Group. Ratios for 1992, 1993, 1996, 1999, 2002, 2005, 2009, and 2013 were developed using data from the Healthcare Cost and Utilization Project (HCUP), Nationwide Inpatient Sample (NIS) maintained by the Agency for Healthcare Research and Quality, obtained under contract by Fu Associates, Ltd. Contract no. HHSM-500-2014-00446G, prepared for the Centers for Medicare & Medicaid Services, Baltimore, MD, 2015.

<sup>38</sup> 1991-1993, 1996, 1999, 2005, 2009, and 2013 physician service-mix adjusted ratios were developed using non-Medicare physician services claims records from Truven Health Analytics (formerly Thomson Reuters) MarketScan Commercial Database, obtained under contract by Fu Associates, Ltd. Contract no. HHSM-500-2014-00446G, prepared for the Centers for Medicare & Medicaid Services, Baltimore, MD, 2015.

<sup>39</sup> Basu, J. “Border Crossing Adjustment and Personal Health Care Spending by State.” *Health Care Financing Review* 18 (1): 215-236, Fall 1996.

<sup>40</sup> Additional analysis was conducted for 2014 by reviewing the resident adjustment ratios (a 51 by 51 matrix) by sector to reveal the pattern of travel of patients across specific states to obtain health care. This detailed view of the data reveals which states patients travelled to or from to receive care, which is not possible from viewing the net flow data alone. Given the volume of ratios across sectors and years, only the summary net flows are shown in Table 5.