imshealth™
INTELLIGENCE APPLIED.

The Economic Impact of Physicians in Maryland

State Report

PUBLISHED: March 2014

PREPARED FOR:
The American Medical Association
Chicago, IL

PREPARED BY:
IMS Health
1725 Duke Street
Suite 510
Alexandria, VA 22314

Table of Contents

Executive Summary 3

Economic Impact Analyses 6

Data Sources 9

Economic Impact for Maryland 10

Output 10

Jobs 10

Wages and Benefits 11

Taxes 11

Broad Specialty 12

10 Specialties 13

Comparator Industry Analysis 14

Appendix. Methodological Overview 16

Executive Summary

Physicians are trusted leaders in the health care system, providing care to patients across a variety of settings and within a multitude of specialties and subspecialties. Through the care provided to their patients, physicians can have a positive and lasting impact on the health of their patients and the health of the community as a whole. However, the breadth of a physician's impact reaches far beyond just the provision of patient care. This can be observed by community and state economic benefits (e.g., job creation, purchase of goods/services, and public program support via tax revenues).

This report focuses on physicians (both doctors of medicine (MDs) and doctors of osteopathy (DOs)) who are primarily engaged in patient care activities (as compared to those who focus on research or teaching, for example). Physicians work in a wide range of practice types/sizes. A 2012 American Medical Association survey of physicians found that 53.2% of physicians were self-employed. While 60.1% worked in practices that were wholly-owned by physicians, less than a quarter (23.4%) worked in practices that were at least partly owned by a hospital and another 5.6% were directly employed by a hospital.[1] These figures, in particular, have increased from a 2007/2008 AMA survey which found 16.3% were either directly employed by a hospital or were employed in a hospital-owned practice. Keeping this range in mind, this report focuses on all patient care physicians, regardless of whether they are office- or hospital-based.[2]

[1] Kane CK and Emmons DW. New Data On Physician Practice Arrangements: Private Practice Remains Strong Despite Shifts Toward Hospital Employment. American Medical Association 2013. Accessed at: http://www.ama-assn.org/resources/doc/health-policy/prp-physician-practice-arrangements.pdf

[2] Note that economic impact reports published by the AMA in 2011 included only office-based physicians.

Given the changing health care environment, it is paramount to quantify the economic impact physicians have on society. This report provides key data which may be used by policymakers, legislators and thought leaders in medicine to demonstrate how patient care physicians critically support local economies and enable jobs, growth, and prosperity in addition to ensuring the health of the community.

This report provides estimates of the total economic impact of patient care physicians on Maryland's economy, measuring four vital economic barometers:

- Output,
- Jobs,
- Wages and benefits, and
- State and local tax revenue.

Total economic impact = direct + indirect economic impacts. The *direct* impact is the value of the four vital economic barometers that are produced from physicians while *indirect* impact includes the same barometers which are generated by the industries that are supported by physicians.

In addition, this report examines the economic impact across three broad specialty groups (i.e., primary care, non-surgical and surgical) as well as 10 specialties selected based on data availability (i.e., anesthesiology, cardiology, family medicine, general surgery, internal medicine, obstetrics/gynecology, orthopaedic surgery, otolaryngology, pediatrics and urology).[3] Additionally, this report provides the economic impact of select comparator industries, in order to allow for an assessment of the economic impact of patient care physicians relative to these select industries.

Physician economic impact varies across states and is dependent upon the number of physicians in each state as well as other factors, such as the general economy and the health care environment in particular.

[3] Section II of the Appendix explains how the 10 specialties were selected.

As of December 2012, there were 720,421 patient care physicians within the 50 states and the District of Columbia.[4] Of these, 17,253 physicians practiced in the state of Maryland. The overall findings in the state of Maryland are as follows:

- **Total Output**: In Maryland, physicians created a total of $28.5B in direct and indirect economic output (i.e., sales revenues) in 2012. On average, each physician supported $1,649,180 in output.
- **Jobs**: In 2012, physicians supported 179,511 jobs (including their own), the total of direct and indirect positions. On average, each physician supported 10.40 jobs.
- **Wages and Benefits:** Physicians contributed $16,301.7M in direct and indirect wages and benefits for all supported jobs in 2012. On average, each physician supported $944,861 in total wages and benefits.
- **Tax Revenues**: Physicians supported $1,368.7M in local and state tax revenues in 2012. On average, each physician supported $79,329 in local and state tax revenues.

[4] This count is based on AMA Masterfile data as of December 2012. Based on that data, there were 960,076 post-residency MD and DO physicians with a preferred mailing address in one of the 50 states and the District of Columbia. We identified 710,856 physicians as providing patient care and an additional 61,001 as having an unknown type of professional activity (the remainder were either no longer active, or were engaged in other activities such as research or teaching). We imputed professional activity for those physicians for whom it was missing. Through this methodology an additional 52,050 physicians were identified as providing patient care, yielding a total number of 762,906. Of these, 42,485 had a missing state for their office and were excluded from the final analysis. For further detail on methods, see the Appendix.

Economic Impact Analyses

Economic impact analyses (EIAs) track the reach of revenues, jobs, spending and taxes generated by an activity as they flow through the local economy. EIA's incorporate both direct and indirect benefits.

Direct Benefits

Direct benefits, in the context of the patient care physician "industry" include: 1) medical revenues generated in the course of patient care (i.e., the value of output); 2) jobs created by the physician industry; 3) wages and benefits of physicians and employees who are hired to support the delivery of patient care; and 4) the taxes that are paid by physicians and the positions that they create.

Indirect Benefits

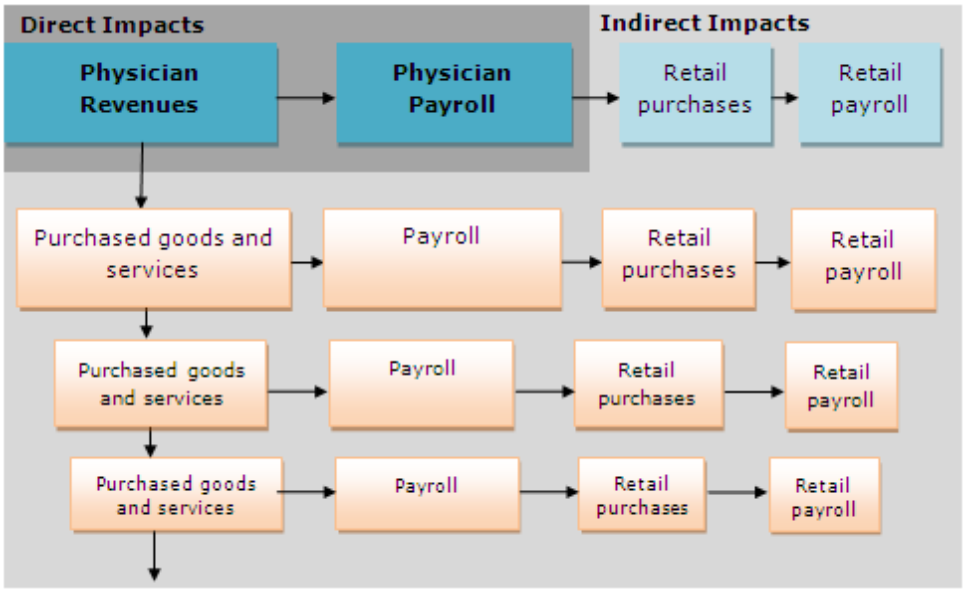
Economic activities supported by patient care physicians outside of their own industry represent the ***indirect*** benefits. These *business-to-business* effects include the supplies/equipment purchased by physicians, practice administrative services, cleaning/property maintenance services, and clinical and laboratory services.

Induced Effects

Additional indirect benefits (i.e., induced effects)[5] arise when the employees of physicians and vendors, in turn, spend their earnings to support local businesses, which pay their employees and pay taxes (See Figure 1). With each cycle of spending there is some "leakage" (i.e., some spending goes outside the community, perhaps to a neighboring state, and as a result, generates no additional local value). This leakage is not captured in this state-level report; however, it is captured in a national level analysis (See the National Economic Impact of Physicians report).

[5] Induced effects are included as a portion of "indirect" effects for brevity.

Figure 1. Economic Multipliers



Economic Impact Multipliers

Both the indirect and direct effects contribute to the "multiplier" used in an EIA. For patient care physicians, the total community impact is a *multiple* of the economic benefit that is generated directly from patient care activities. The multiplier reflects the number of times that each dollar generated in patient care activities circulates through the local economy, supporting local jobs and spending, as described earlier. There are separate multipliers for three of the four vital **direct benefit** economic barometers mentioned earlier.

- An **output multiplier** is used to calculate the total value (i.e., direct and indirect) of output created by an industry. Its value indicates the total economic output generated in an economy for every $1 in direct output.
- A **jobs multiplier** is used to calculate the indirect number of full-time equivalent jobs supported for every $1M in direct output created by an industry. The sum of direct and indirect jobs is the total number of full-time equivalent jobs supported by an industry.

- A **wages and benefits multiplier** is used to calculate the indirect wages and benefits supported for every $1 in direct output. The sum of direct and indirect wages and benefits is the total wages and benefits supported by an industry.

Multipliers are specific to geographic areas and particular industries and their values can vary widely. Multipliers are larger when a dollar earned by a business (e.g., a physician practice) is spent in the community, supporting jobs and other local businesses (who pay their employees, who in turn buy more goods and services, etc.). Multipliers are smaller when business revenues are spent (leak) outside the community or are spent on goods or services that support fewer local jobs.

In general, multipliers for small community areas will be smaller compared to larger areas as establishments in smaller areas must often look outside of their immediate communities to find inputs. As health care is often considered to be 'local', health care multipliers tend to be higher than those for many other industries as physicians and their staff tend to live in the community and their services support the local community.

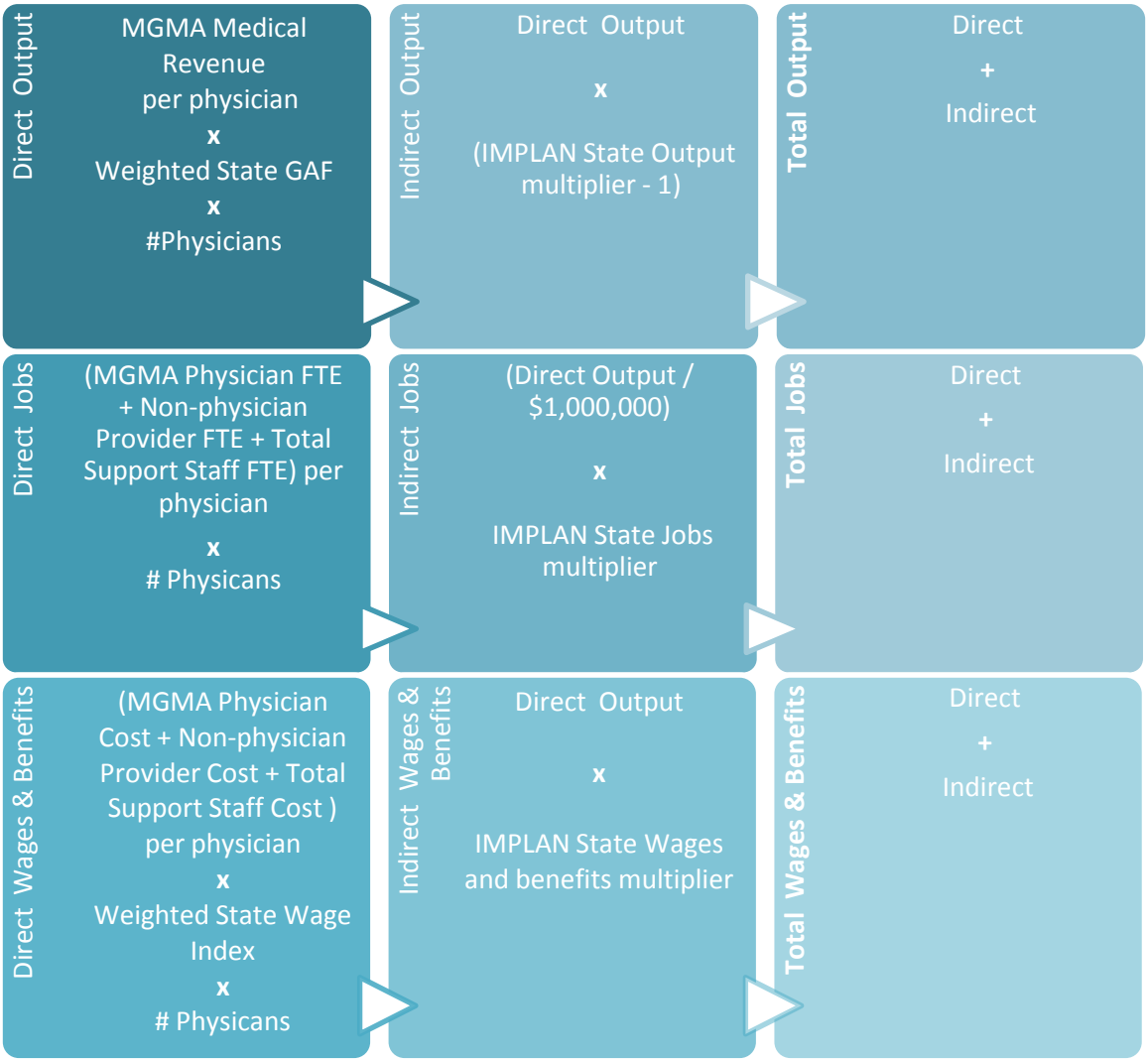
The multipliers for Maryland are as follows:

- Output multiplier: 1.816, indicating an additional $0.82 of indirect output is generated for every $1 in direct output (See the Appendix for a discussion of the observed changes in output multipliers from 2010 to 2011).
- Jobs multiplier: 6.367, indicating an additional 6.37 indirect full time jobs are supported for every $1M in direct output.
- Wages and benefits multiplier: 0.302, indicating an additional $0.30 of indirect wages and benefits is generated for every $1 in direct output.

DATA SOURCES

This study employed three primary data sources: the 2012 AMA Masterfile, the 2012 MGMA Cost Survey, and 2011 IMPLAN. The Masterfile's number of physicians by state was combined with the MGMA's national per-physician revenue and cost data (geographically adjusted by state), and IMPLAN's economic impact multipliers by state, to estimate values for the direct, indirect and total economic impact of the physician industry. See Figure 2 for an overview of methods and the Appendix for specific methodology.

Figure 2. Overview of Methods



Economic Impact for Maryland

Table 1 provides a snapshot of the economic impact of Maryland patient care physicians. Direct and indirect economic benefits for each measure contribute to the overall benefit. Total output, jobs, and wages and benefits are also presented by broad physician specialty (Table 2), as well as for 10 specialties (Table 3).

Table 1: Total Output, Jobs, Wages & Benefits, and State and Local Taxes Supported by Physicians in Maryland, 2012

Economic Measure	Total	Per Physician
Number of Physicians	17,253	-
Output	$28.5 billion	$1,649,180
Jobs	179,511	10.40
Wages & Benefits	$16,301.7 million	$944,861
State and Local Taxes	$1,368.7 million	$79,329

OUTPUT

Physicians generated $15,667.2M in direct output (See the Appendix for a discussion of the observed changes in medical revenue from 2009 to 2012).The total output of patient care physicians sums the direct and indirect output generated by the industry. Physicians generated $28.5B in total output, or an average of $1,649,180 per physician.

JOBS

A total of 17,253 patient care physicians were practicing in Maryland as of December 2012. The number of jobs directly created by patient care physicians (including the number of physicians themselves) in the state was 79,764. The total number of jobs supported by patient care physicians in Maryland was 179,511; the average physician supported 10.40 jobs in the economy, including his or her own.

WAGES AND BENEFITS

Compensation, i.e., the wages and benefits that are paid to local residents, is also an important measure of an industry's value to the local economy.[6] The value of direct wages and benefits in Maryland includes compensation paid to physicians and non-physician staff who are on payroll. This direct amount of wages and benefits totaled to $11,576.0M in the state in 2012. The total amount of wages and benefits supported by patient care physicians in Maryland was $16,301.7M (including the indirect wages and benefits supported by the industry), or an average of $944,861 per physician.

TAXES

The total tax contribution is computed by summing taxation on employee income, proprietor income, indirect business interactions, households, and corporations. Tax revenues are included from the patient care physician industry (direct) and from other affected industries (indirect). These are the "total" tax revenues supported by the industry.

The state and local taxes incorporated in this study include:

- **Social Security taxes**: the state portions of Social Security taxes, both the employee and employer paid portions;
- **Personal taxes**: state and local income taxes, gift and estate taxes, motor vehicles taxes/fees, fishing/hunting and other license fees, property taxes, personal property taxes, and other fines/fees or donations;
- **Business taxes**: corporate profits and dividends taxes; and

[6] For ease of reading, "wages and benefits" is used to mean salaries and wages plus other forms of compensation paid to employees, e.g., benefits, for the remainder of this report. Values include wages and benefits to all support staff, non-physician practitioners and physicians.

- **Indirect business taxes**: property taxes, sales taxes, motor vehicle licensing, severance taxes, non-tax payments (e.g., rents and royalties, special assessments, fines, settlements and donations), and other taxes (including business licenses, documentary and stamp taxes).[7]

The aggregate local and state taxes generated by patient care physicians in 2012 totaled $1,368.7M, or an average of $79,329 per physician.

BROAD SPECIALTY

Due to likely variation between specialties, we examined economic impacts across three broad specialty groups (primary care, non-surgical and surgical) (Table 2).

There were 5,762 physicians classified under the broad specialty of primary care (representing 33.4% of all patient care physicians), 7,004 physicians classified under non-surgical (representing 40.6%), and 4,487 physicians classified under surgical (representing 26.0%).

In each state, non-surgical specialties generated the highest output, jobs, and wages and benefits. This was partly due to physicians in that broad specialty group having the highest direct and total revenue and wages and benefits on a per physician basis. While primary care physicians supported slightly more direct jobs (4.89) on a per-physician basis (slightly higher than non-surgical physicians (4.58)), non-surgical physicians generated the highest total jobs due to more indirect jobs supported by higher non-surgical output. In some states, higher total jobs for non-surgical specialties was also related to a larger number of non-surgical specialists relative to primary care physicians. In Maryland, total output across broad specialties ranged from $6,133.6M for primary care to $13,859.6M for non-surgical. Total jobs ranged from 49,181 for surgical to 80,653 for non-surgical. Total wages and benefits ranged from $3,870.0M for primary care to $8,054.0M for non-surgical.

[7] Olsen DC. Using Social Accounts to Estimate Tax Impacts. MIG, Inc. Available through IMPLAN.com. (Paper originally given at the Mid-Continent Regional Science Association Meetings in Minneapolis, MN; June 11, 1999.)

Table 2: Total Economic Impact of Physicians in Maryland, by Broad Specialty

Broad Specialty	Number of Physicians	Output ($ in millions)	Jobs	Wages & Benefits ($ in millions)
Primary care	5,762	$6,133.6	49,678	$3,870.0
Non-surgical	7,004	$13,859.6	80,653	$8,054.0
Surgical	4,487	$8,460.1	49,181	$4,377.7
Total	17,253	$28,453.3	179,511	$16,301.7

10 SPECIALTIES

Lastly, we examined the economic impacts for 10 specialties (Table 3). In Maryland, the number of patient care physicians ranged from a low of 250 for otolaryngology to a high of 3,764 for internal medicine.

In general, state-level economic impacts were lowest among urologists and otolaryngologists, and highest among family practice and internal medicine specialists. One driver of this phenomenon is specialty size. Those specialties often had the fewest and greatest numbers of physicians, respectively. In Maryland, total output across the 10 specialties ranged from $467.3M for otolaryngology to $4,551.2M for internal medicine. Total jobs ranged from 3,039 for otolaryngology to 34,281 for internal medicine. Total wages and benefits ranged from $256.3M for urology to $2,608.2M for internal medicine.

Table 3: Total Economic Impact of Physicians in Maryland, for 10 Select Specialties

Specific Specialty	Number of Physicians	Output ($ in millions)	Jobs	Wages & Benefits ($ in millions)
Anesthesiology	1,100	$1,796.6	9,136	$1,156.6
Cardiology	633	$1,367.9	8,202	$792.1
Family medicine	1,375	$1,669.4	13,788	$973.8
General surgery	714	$983.3	6,139	$612.9
Internal medicine	3,764	$4,551.2	34,281	$2,608.2
Obstetrics/Gynecology	1,184	$1,953.0	12,967	$1,015.2
Orthopaedic surgery	570	$1,343.7	8,295	$762.8
Otolaryngology	250	$467.3	3,039	$263.7
Pediatrics	1,871	$2,514.4	18,297	$1,285.6
Urology	250	$484.6	3,054	$256.3

Comparator Industry Analysis

To help frame the relative economic impact of patient care physicians, we also assessed the economic impacts of other industries both within and outside the health care industry:

1. Higher education (junior college, university, and professional schools),
2. Nursing home and residential care facilities,
4. Legal services, and
5. Home health.

IMPLAN was instrumental as it provides 2011 output, jobs, and wages and benefits data and multipliers for the following industries: Private junior colleges, colleges, universities, and professional schools (IMPLAN industry code 392), Nursing and residential care facilities (398), Legal services (367), and Home health care services (395).

Table 4: Comparator Industry Total Economic Impacts in Maryland

Industry	Output ($ in millions)	Jobs	Wages & Benefits ($ in millions)
Physicians	$28,453.3	179,511	$16,301.7
Higher Education	$5,937.0	53,105	$2,673.4
Nursing Home/ Residential Care Facilities	$8,218.2	102,266	$3,939.1
Legal Services	$6,385.5	45,639	$2,539.7
Home Health	$1,923.5	24,848	$945.0

OUTPUT

Physicians generated a greater total output than the higher education, nursing home, legal and home health industries in each state. The only exception was the legal industry within the District of Columbia, with a total output of $15.2B compared to $5.6B for physicians. In Maryland, physicians supported $28,453.3M in total output. Across comparator industries, total output ranged from $1,923.5M for home health to $8,218.2M for nursing homes.

JOBS

In most states, physicians supported more jobs than the higher education, nursing home, legal or home health industries. In the District of Columbia, the number of jobs supported by the legal industry was the highest, while in a few states, the number of jobs supported by the nursing home industry was the highest. In Maryland, physicians supported 179,511 total jobs. Across comparator industries, total jobs ranged from 24,848 for home health to 102,266 for nursing homes.

WAGES AND BENEFITS

Physicians supported higher total wages and benefits for all comparator industries across the states, with one exception; the legal industry in the District of Columbia. This suggests that physicians compensate their employees well, who in turn are able to purchase services from other industries in the state, and therefore stimulate their state economy. In Maryland, physicians supported $16,301.7M in wages and benefits. Across comparator industries, total wages and benefits ranged from $945.0M for home health to $3,939.1M for nursing homes.

Appendix. Methodological Overview

Three primary data sources were employed in this study: the 2012 AMA Masterfile, the 2012 MGMA Cost Survey, and 2011 IMPLAN. The Masterfile's number of physicians was combined with the MGMA's per-physician revenue and cost data and IMPLAN's economic impact multipliers to estimate values for the direct, indirect and total economic impact of the physician industry.

AMA Masterfile

The AMA Masterfile contains current and historical data on all physicians, including members and non-members of the AMA, and graduates of foreign medical schools who are in the U.S. and meet educational standards for recognition as physicians. It includes information on geographic location, as well as physician characteristics such as specialty and major professional activity. **Masterfile data as of December 2012 was used for this analysis**.

MGMA's Cost Survey

The MGMA's Cost Survey report provides national data on the financial characteristics of physician practices including total medical revenue and total payroll costs per full-time physician equivalent. Data are provided for a number of common specialties, as well as by three broad specialty types (primary care, surgical and non-surgical specialties). **Data are provided for 2012**. The data provides information to evaluate different aspects of medical practice performance and to help make policy decisions about medical practice operations. The Cost Survey represents data from more than 2,000 MGMA member medical groups representing more than 46,000 providers and is the largest provider population of any cost survey in the United States.

IMPLAN

IMPLAN (IMpact analysis for PLANning) is the input-output economic impact modeling system developed by the Minnesota Implan Group. IMPLAN is used to create models of economies allowing for in-depth examinations of economic impacts. **The 2011 IMPLAN system** estimates output, employment, and labor income multipliers for each industry, at the state and national level, as well as total tax revenues (state and local) generated using a Social Accounting System. Data are taken from a number of sources including the Bureau of Labor Statistics (BLS), the Bureau of Economic Analyses (BEA) and the U.S. Census Bureau.

I. 2012 AMA Masterfile

The AMA Physician Masterfile was used to estimate the number of post-residency physicians who provide patient care in each state, in aggregate and by specialty. Each record within the Masterfile corresponds to one physician.

Patient care physicians

As of December 2012, 960,076 physicians (excluding residents) had a preferred mailing address in one of the 50 states/DC.

The Masterfile categorizes physicians by major professional activity (MPA), a variable based on physician-provided data on present employment and type of practice. In order to arrive at our final sample for analysis, we first limited the Masterfile data to 710,856 (74.0%) physicians whose MPA is the provision of patient care.[8] These physicians are the population of interest, inclusive of both office- and hospital-based physicians as well as locum tenens physicians. Another 61,001 (6.4%) were identified as "not classified" because the AMA had not received any recent information as to their type of practice and present employment.

[8] Note that the prior national and state reports, on "The Economic Impact of Office-Based Physicians" in 2009, and last updated April 2011, focused only on office-based and locum tenens physicians.

Table A-1: 2012 AMA Masterfile Physicians by MPA Description

MPA	N	%
Hospital Based Full-Time Physician Staff	86,607	9.0%
Office-Based Practice	622,840	64.9%
Locum Tenens	1,409	0.1%
Administration	14,004	1.5%
Inactive	146,113	15.2%
Medical Teaching	9,868	1.0%
Not Classified	61,001	6.4%
Other	4,690	0.5%
Research	13,544	1.4%
Total	**960,076**	**100.0%**

For the 61,001 (6.4%) physicians who did not provide any responses indicating whether or not they provide patient care on a regular basis, we imputed the physician's MPA/the provision of patient care. We assume that a portion of these unclassified physicians provide patient care on a regular basis. Therefore, we would underestimate the portion of physicians providing patient care on a regular basis if we were to exclude all unclassified physicians, and we would overestimate the portion of physicians providing patient care on a regular basis if we include all of them. We estimated a binary logit model using GLM parameterization to model the likelihood of providing patient care (as a binary outcome, either providing or not providing patient care).

After examining the variable response distribution between physicians providing patient care, not providing patient care and unclassified, we decided on a final set of independent variables for inclusion and examined co-linearity between potential variables. Our final model included the following categorical variables: 1) age group, 2) gender, 3) physician is or is not board certified, 4) MD or DO, 5) CBSA level of the preferred address (i.e. Metropolitan or Micropolitan), 6) physician does or does not have an NPI number, 7) physician does or does not have a DEA number, 8) primary specialty, 9) physician is or is not an International Medical Graduate and 10) state of the preferred address is or is not the same as the state of the office, in addition to the following interaction terms: 11) age (continuous) * broad specialty, and 12) gender * broad specialty. The resulting model had a *c* statistic of 0.915. For the

output of the model, we specified the creation of a dataset which includes an assigned probability to each physician of whether that physician provides patient care based on his/her available data for the independent variables used in the model. Based on the observed ratio of patient care to non-patient care among physicians with non-missing MPA (79.1 to 20.9), we used this event rate as the predicted probability threshold and categorized physicians with a probability of greater or equal to .791 as providing patient care and physicians with a probability of less than .791 as not providing patient care.

Of the 61,001 physicians with unclassified MPA, 52,050 (85.3%) were imputed as providing patient care, yielding a total number of 762,906 physicians providing patient care. Non-missing state of office location was required for this analysis, as the state is the location of the economic activity. Our final sample consisted of 720,421 physicians with a non-missing state for their office location.

Region

Physicians were classified by state. The AMA Masterfile includes information on office location and preferred professional mailing address, which could be either home or office. Should a physician have an office in one state and reside in another, the office location variable was used because, as stated above, the office is the location of the economic activity.

Specialty

The Masterfile contains physician-reported data on a physician's primary specialty. Using this, physicians were mapped to three broad specialty types (primary care, non-surgical and surgical specialties). Physicians with missing primary specialty within a state were prorated to the three broad specialties in proportion to the number of physicians known to be in those broad specialties in that state.

Additionally, we examined economic impacts for 10 specialties for which MGMA data were available (See Section II of this Appendix):

1) Anesthesiology
2) Cardiology
3) Family medicine
4) General surgery
5) Internal medicine
6) Obstetrics/Gynecology
7) Orthopaedic surgery
8) Otolaryngology
9) Pediatrics
10) Urology

II. 2012 MGMA Cost Survey

MGMA provides physician data at the national level. Reports may be obtained at either the single specialty or the multispecialty level. MGMA data was used to estimate per-physician output (revenue), jobs, and wages and benefits for 2012, by specialty. Only data for single specialty physicians were included in this analysis. Data are provided for overall practices as well as by legal ownership of a practice (physician owned, hospital/integrated delivery system (IDS) owned or other). There were observed differences in medical revenue between physician-owned and hospital-owned practices, related to accounting differences. For hospital-owned practices, medical revenue in the MGMA Cost Survey is underreported, as some practice revenue is accounted for as hospital revenue, particularly that for ancillary services. Therefore, we calculated a weighted average of medical revenue considering both physician-owned and imputed hospital-owned revenue (See the Variables section for more details). Because MGMA data are provided at the national level, output and wages and benefits were geographically adjusted to specific states.

MGMA Specialties

Practices that respond to the MGMA survey record the specialties of their member physicians. Those specialties are then mapped to 110 specialty categories. Specialties that do not fall into the 110 categories are listed as "Other single specialty." However, no specific data are provided for this Other category, as the specialties included may be heterogeneous (combined data may not be meaningful). At the single specialty level, more granular reports may be obtained for 34 individual specialties (data at the individual specialty level are only reported where 10 or more practices of a specialty provide a survey response). Data on single specialties are also reported into 3 broader groupings: primary care, non-surgical and surgical specialties (See Table A-2 for available single specialties and the single specialties that fall under the 3 broader groups). The "Other single specialty" does not feed into any of these 3 groups.

Because physician specialty was used to link MGMA data with AMA data, specialty categories were cross-walked between the two datasets. While the Masterfile data offer flexibility in the creation of aggregate specialties from its 200+ specialty categories, MGMA data software offers limited options with set definitions. MGMA specialties, therefore, were the limiting factor in our specialty-to-specialty match-up across files.

In this analysis, we used the high-level categorization of the three broad specialty categories: primary care, non-surgical and surgical specialties. This is a classification scheme defined by MGMA. We mapped AMA specialties to the three broad specialties following MGMA definitions. Table A-2 shows which specialties MGMA included in the three broad categories, as well as the AMA primary specialties we allocated to each of the three in order to best match the MGMA definitions.

Table A-2: AMA Masterfile and MGMA Specialties, by Broad Specialty

MGMA	AMA
Primary care	
Family Medicine: Sports Medicine	Adolescent Medicine (Family Medicine)
Family Medicine: Urgent care	Adolescent Medicine (Internal Medicine)
Family Medicine: with Obstetrics	Adolescent Medicine (Pediatrics)
Family Medicine: without Obstetrics	Family Medicine
Geriatrics	General Practice
Internal Medicine: General	Geriatric Medicine (Family Medicine)
Internal Medicine: Pediatrics	Geriatric Medicine (Internal Medicine)
Pediatrics: Adolescent Medicine	Hospice & Palliative Medicine (Family Medicine)
Pediatrics: General	Hospice & Palliative Medicine (Internal Medicine)
	Adolescent Medicine (Family Medicine)
	Adolescent Medicine (Internal Medicine)
Non-surgical	
Allergy/Immunology	Advanced Heart Failure And Transplant Cardiology (Internal Medicine)
Cardiology: Electrophysiology	Clinical & Laboratory Immunology (Pediatrics)
Cardiology: Invasive	Clinical And Laboratory Immunology (Internal Medicine)
Cardiology: Invasive/Interventional	Critical Care Medicine (Internal Medicine)
Cardiology: Noninvasive	Hematology (Internal Medicine)
Critical Care: Intensivist	Sleep Medicine (Internal Medicine)
Dentistry	Sleep Medicine (Otolaryngology)
Dermatology	Sleep Medicine (Pediatrics)
Emergency Medicine	Sports Medicine (Emergency Medicine)
Endocrinology/Metabolism	Transplant Hepatology (Internal Medicine)
Gastroenterology	Abdominal Radiology
Gastroenterology: Hepatology	Addiction Psychiatry
Genetics	Allergy
Hematology/Oncology	Allergy And Immunology
Hematology/Oncology: Oncology (only)	Anatomic Pathology
Infectious Disease	Anatomic/Clinical Pathology
Internal Medicine: Hospitalist	Blood Banking/Transfusion Medicine
Nephrology	Cardiothoracic Radiology
Neurology	Cardiovascular Disease
OB/GYN: Maternal and Fetal Medicine	Chemical Pathology
OB/GYN: Reproductive Endocrinology	Child & Adolescent Psychiatry
Occupational Medicine	Child Neurology
Orthopedics: Nonsurgical	Clinical Biochemical Genetics
Pathology: Anatomic	Clinical Cardiac Electrophysiology
Pathology: Anatomic and Clinical	Clinical Cytogenetics
Pathology: Clinical	Clinical Genetics
Pediatrics: Allergy/Immunology	Clinical Laboratory Immunology (Allergy & Immunology)
Pediatrics: Cardiology	Clinical Molecular Genetics
Pediatrics: Child Development	Clinical Neurophysiology
Pediatrics: Clinical and Lab Immunology	Clinical Pathology
Pediatrics: Critical Care Intensivist	Cytopathology
Pediatrics: Emergency Medicine	Dermatology
Pediatrics: Endocrinology	Dermatopathology (Pathology)

Pediatrics: Gastroenterology
Pediatrics: Genetics
Pediatrics: Hematology/Oncology
Pediatrics: Hospitalist
Pediatrics: Infectious Disease
Pediatrics: Neonatal Medicine
Pediatrics: Nephrology
Pediatrics: Neurology
Pediatrics: Pulmonology
Pediatrics: Rheumatology
Physiatry (Physical Medicine and Rehabilitation)
Podiatry: General
Psychiatry: Child and Adolescent
Psychiatry: Forensic
Psychiatry: General
Psychiatry: Geriatric
Pulmonary Medicine: General
Pulmonary Medicine: Critical Care
Radiation Oncology
Radiology: Diagnostic-Invasive
Radiology: Diagnostic-Noninvasive
Radiology: Nuclear Medicine
Rheumatology
Sleep Medicine

Diabetes
Diagnostic Radiology
Emergency Medical Services
Emergency Medicine
Endocrinology, Diabetes & Metabolism
Epilepsy (Neurology)
Forensic Psychiatry
Gastroenterology
Geriatric Psychiatry
Hematology (Pathology)
Hematology/Oncology
Hepatology
Hospitalist
Immunology
Infectious Disease
Interventional Cardiology
Maternal And Fetal Medicine
Medical Biochemical Genetics
Medical Genetics
Medical Oncology
Medical Toxicology (Emergency Medicine)
Medical Toxicology (Pediatrics)
Molecular Genetic Pathology (Medical Genetics)
Molecular Genetic Pathology (Pathology And Medical Genetics)
Musculoskeletal Oncology
Musculoskeletal Radiology
Neonatal-Perinatal Medicine
Nephrology
Neurodevelopmental Disabilities (Pediatrics)
Neurodevelopmental Disabilities (Psychiatry & Neurology
Neurology
Neurology/Diagnostic Radiology/Neuroradiology
Neuromuscular Medicine (Neurology)
Neuromuscular Medicine (Physical Medicine & Rehabilitation)
Neuropathology
Neuropsychiatry
Neuroradiology
Nuclear Cardiology
Nuclear Radiology
Nutrition
Occupational Medicine
Osteopathic Manipulative Medicine
Pain Management
Pain Medicine
Pediatric Allergy
Pediatric Cardiology
Pediatric Critical Care Medicine
Pediatric Dermatology

	Pediatric Emergency Med (Emergency Med) Pediatric Emergency Medicine (Pediatrics) Pediatric Endocrinology Pediatric Gastroenterology Pediatric Hematology-Oncology Pediatric Infectious Disease Pediatric Pathology Pediatric Pulmonology Pediatric Radiology Pediatric Rehabilitation Medicine Pediatric Rheumatology Pediatric Transplant Hepatology Physical Medicine And Rehabilitation Procedural Dermatology Psychiatry Psychiatry/Neurology Psychoanalysis Psychosomatic Medicine Pulmonary & Critical Care Medicine Pulmonary Disease Radiation Oncology Radiology Reproductive Endocrinology And Infertility Rheumatology Selective Pathology Sleep Medicine Sleep Medicine (Psychiatry & Neurology) Undersea & Hyperbaric Medicine (Emergency Medicine) Vascular And Interventional Radiology Vascular Neurology Critical Care Medicine (Emergency Medicine) Hospice & Palliative Medicine (Emergency Medicine) Hospice & Palliative Medicine (Physical Medicine & Rehabilitation) Hospice & Palliative Medicine (Psychiatry & Neurology) Hospice & Palliative Medicine (Radiology) Pain Medicine (Neurology) Pain Medicine (Physical Medicine & Rehabilitation) Pain Medicine (Psychiatry) Spinal Cord Injury Medicine Sports Medicine (Physical Medicine & Rehabilitation) Endovascular Surgical Neuroradiology (Neurology) Endovascular Surgical Neuroradiology (Radiology) Pediatric Nephrology Child Abuse Pediatrics Emergency Medicine/Family Medicine Family Medicine/Preventive Medicine Internal Med/Emergency Med/Critical Care Med Internal Med/Phys Med And Rehabilitation Internal Med/Psychiatry

	Internal Medicine/Dermatology
	Internal Medicine/Emergency Medicine
	Internal Medicine/Medical Genetics
	Internal Medicine/Neurology
	Internal Medicine/Preventive Medicine
	Medical Toxicology (Preventive Medicine)
	Pediatrics/Dermatology
	Pediatrics/Medical Genetics
	Pediatrics/Physical Medicine And Rehabilitation
	Psychiatry/Family Medicine
	Undersea & Hyperbaric Medicine (Preventive Medicine)
	Addiction Medicine
	Aerospace Medicine
	Clinical Pharmacology
	Legal Medicine
	Medical Management
	Medical Microbiology
	Nuclear Medicine
	Pediatrics/Emergency Medicine
	Pediatrics/Psychiatry/Child & Adolescent Psychiatry
	Pharmaceutical Medicine
	Phlebology
	Vascular Medicine
	Developmental-Behavioral Pediatrics
	Epidemiology
	Hospice & Palliative Medicine
	Palliative Medicine
	General Preventive Medicine
	Public Health And General Preventive Medicine
	Forensic Pathology
Surgical	
Anesthesiology	Critical Care Medicine (Anesthesiology)
Anesthesiology: Pain Management	Critical Care Medicine (Obstetrics & Gynecology)
Anesthesiology: Pediatric	Foot And Ankle Orthopaedics
Dermatology: Mohs Surgery	Hand Surgery (Orthopaedics)
OB/GYN: Gynecology (Only)	Hospice & Palliative Medicine (Anesthesiology)
OB/GYN: Gynecological Oncology	Hospice & Palliative Medicine (Obstetrics & Gynecology)
Obstetrics/Gynecology: General	Hospice & Palliative Medicine (Surgery)
Ophthalmology	Orthopaedic Trauma
Ophthalmology: Pediatric	Pain Medicine (Anesthesiology)
Ophthalmology: Retina	Pediatric Orthopaedics
Orthopedic Surgery: General	Sports Medicine (Orthopaedic Surgery)
Orthopedic Surgery: Foot and Ankle	Abdominal Surgery
Orthopedic Surgery: Hand	Adult Cardiothoracic Anesthesiology (Anesthesiology)
Orthopedic Surgery: Hip and Joint	Adult Reconstructive Orthopaedics
Orthopedic Surgery: Oncology	Anesthesiology
Orthopedic Surgery: Pediatric	Colon And Rectal Surgery
Orthopedic Surgery: Spine	Complex General Surgical Oncology (Surgery)

Orthopedic Surgery: Sports Medicine	Congenital Cardiac Surgery (Thoracic Surgery)
Orthopedic Surgery: Trauma	Cosmetic Surgery
Otorhinolaryngology	Craniofacial Surgery
Otorhinolaryngology: Pediatric	Dermatologic Surgery
Podiatry: Surgical Foot and Ankle	Endovascular Surgical Neuroradiology (Neurological Surgery)
Podiatry: Surgical Forefoot only	Facial Plastic Surgery
Surgery: Cardiovascular	Female Pelvic Medicine And Reconstructive Surgery (Obstetrics & Gynecology
Surgery: Cardiovascular Pediatric	General Surgery
Surgery: Colon and Rectal	Gynecological Oncology
Surgery: Endovascular (Primary)	Gynecology
Surgery: General	Hand Surgery
Surgery: Neurological	Hand Surgery (Plastic Surgery)
Surgery: Oncology	Hand Surgery (Surgery)
Surgery: Oral	Head And Neck Surgery
Surgery: Pediatric	Neurological Surgery
Surgery: Plastic and Reconstruction	Obstetric Anesthesiology (Anesthesiology)
Surgery: Plastic and Reconstruction - Hand	Obstetrics
Surgery: Plastic and Reconstruction - Pediatric	Obstetrics & Gynecology
Surgery: Thoracic (Primary)	Ophthalmic Plastic And Reconstructive Surgery (Ophthalmology)
Surgery: Transplant	Ophthalmology
Surgery: Trauma	Oral & Maxillofacial Surgery
Surgery: Trauma - Burn	Orthopaedic Surgery
Surgery: Vascular (Primary)	Orthopaedic Surgery Of The Spine
Urology	Otolaryngology
Urology: Pediatric	Pediatric Anesthesiology (Anesthesiology)
	Pediatric Cardiothoracic Surgery
	Pediatric Ophthalmology
	Pediatric Otolaryngology
	Pediatric Surgery (Neurology)
	Pediatric Surgery (Surgery)
	Pediatric Urology
	Plastic Surgery
	Plastic Surgery Within The Head & Neck
	Plastic Surgery Within The Head & Neck (Otolaryngology)
	Plastic Surgery Within The Head & Neck (Plastic Surgery)
	Proctology
	Surgical Critical Care (Surgery)
	Surgical Oncology
	Thoracic Surgery
	Transplant Surgery
	Traumatic Surgery
	Urology
	Vascular Surgery
	Neurotology (Otolaryngology)

The second categorization of specialties was at a more granular level of detail than that of the 3 broad groups. The availability of MGMA data is limited based on respondent count. We selected 10 specialties for which necessary MGMA data were available. Table A-3 presents the full allocation of AMA primary specialties mapped to the single specialties of interest provided by MGMA. It is a limitation that there may be potentially differing subspecialties grouped under the selected specialties for AMA versus MGMA.

Table A-3: AMA Masterfile Specialties, by Specialties of Interest

Specialties of Interest
Anesthesiology
Anesthesiology
Adult Cardiothoracic Anesthesiology (Anesthesiology)
Critical Care Medicine (Anesthesiology)
Hospice & Palliative Medicine (Anesthesiology)
Pain Management
Pain Medicine (Anesthesiology)
Cardiology
Cardiovascular Disease
Advanced Heart Failure And Transplant Cardiology (Internal Medicine)
Clinical Cardiac Electrophysiology
Interventional Cardiology
Nuclear Cardiology
Family medicine
Family Medicine
Adolescent Medicine (Family Medicine)
Geriatric Medicine (Family Medicine)
Hospice & Palliative Medicine (Family Medicine)
Sports Medicine (Family Medicine)
General surgery
General Surgery
Abdominal Surgery
Complex General Surgical Oncology (Surgery)
Craniofacial Surgery
Dermatologic Surgery
Hand Surgery
Hand Surgery (Surgery)
Head And Neck Surgery
Hospice & Palliative Medicine (Surgery)
Surgical Critical Care (Surgery)
Internal medicine
Internal Medicine
Adolescent Medicine (Internal Medicine)
Clinical And Laboratory Immunology (Internal Medicine)

Critical Care Medicine (Internal Medicine)
Diabetes
Geriatric Medicine (Internal Medicine)
Hematology (Internal Medicine)
Hepatology
Hospice & Palliative Medicine (Internal Medicine)
Medical Oncology
Nutrition
Sleep Medicine (Internal Medicine)
Sports Medicine (Internal Medicine)
Transplant Hepatology (Internal Medicine)

Obstetrics/Gynecology

Obstetrics & Gynecology
Critical Care Medicine (Obstetrics & Gynecology)
Female Pelvic Medicine And Reconstructive Surgery (Obstetrics & Gynecology)
Gynecology
Hospice & Palliative Medicine (Obstetrics & Gynecology)
Obstetric Anesthesiology (Anesthesiology)
Obstetrics
Gynecological Oncology
Maternal And Fetal Medicine
Reproductive Endocrinology And Infertility

Orthopaedic Surgery

Orthopaedic Surgery
Adult Reconstructive Orthopaedics
Foot And Ankle Orthopaedics
Hand Surgery (Orthopaedics)
Musculoskeletal Oncology
Orthopaedic Surgery Of The Spine
Orthopaedic Trauma
Osteopathic Manipulative Medicine
Pediatric Orthopaedics
Sports Medicine (Orthopaedic Surgery)

Otolaryngology

Otolaryngology
Neurotology (Otolaryngology)
Pediatric Otolaryngology
Plastic Surgery Within The Head & Neck (Otolaryngology)
Sleep Medicine (Otolaryngology)

Pediatrics

Pediatrics
Adolescent Medicine (Pediatrics)
Child Abuse Pediatrics
Developmental-Behavioral Pediatrics
Hospice & Palliative Medicine (Pediatrics)
Internal Medicine/Pediatrics
Medical Toxicology (Pediatrics)
Neonatal-Perinatal Medicine
Neurodevelopmental Disabilities (Pediatrics)

Pediatric Anesthesiology (Anesthesiology)
Pediatric Dermatology
Pediatric Rehabilitation Medicine
Pediatric Transplant Hepatology
Sleep Medicine (Pediatrics)
Urology
Urology
Pediatric Urology

Variables

MGMA variables used for each of the broad and 10 specialties included data per physician on output, jobs and wages and benefits. We calculated the following for each of the three broad specialties and the 10 specialties:

1) Medical revenue per physician. MGMA reported medical revenue varies between physician-owned practices vs. hospital-owned practices. Medical revenue is underreported among hospital-owned practices due to accounting differences whereby some practice revenue is accounted for as hospital revenue. To address this, we separately assessed physician-owned practice medical revenue and hospital-owned practice medical revenue. We calculated the ratio of mean wages and benefits to mean revenue among physician-owned practices, assuming this ratio is the same as for hospital-owned practices. We made the assumption that compensation is the same for physician-owned vs. hospital-owned practices, assuming resources are mobile and substitutable between the two types of practices. This assumes that the average productivity of resources (proxied by compensation costs per revenue) is the same across similarly-scaled practices, independent of ownership. We then applied the inverse of this physician-owned practice ratio to hospital-owned practice mean wages and benefits in order to impute hospital-owned practice revenue. We used this imputed value of hospital-owned revenue in place of that reported by MGMA. Finally, we calculated a weighted average of mean physician-owned revenue and mean imputed hospital-owned revenue based on respondent Ns. We did not include the

value of non-medical revenue which was reported for a minority of practices in the MGMA cost survey, and which was minimal compared to medical revenue (approximately 1% when adjusting for non-reported zeros). Because practice revenues vary according to geographic variation in price levels and costs of services, we calculated estimates at the national level and adjusted medical revenue using local medical wage and price indices. Revenues were adjusted using weighted-state values for Medicare's 2012 Geographic Adjustment Factor (GAF). The mean medical revenue in a state was calculated as the national weighted mean for medical revenue **x** the weighted state Medicare GAF.

2) Total jobs per physician (sum of mean physician, non-physician provider and support staff FTEs). For the non-physician and support staff categories, MGMA reports means that are calculated based only on respondents that have staff in that category. The N shown for each mean reflects that. In particular, there was a much lower N for non-physician provider FTEs relative to support staff FTEs, as most reporting practices did not employ non-physician provider staff. For these two categories, we calculated adjusted mean jobs (inclusive of practices with no staff in that category) using the reported N for physician costs as the total N. The reported N for physician costs was slightly higher than the reported N for support staff FTEs. This adjustment lowered the mean non-physician provider FTEs, and slightly lowered the mean support staff FTEs.

3) Total wages and benefits per physician (sum of mean physician, non-physician provider and support staff cost). As with jobs, the mean non-physician provider costs and mean support staff costs per physician that are provided by MGMA are based only on respondents that have staff in that category. We calculated adjusted mean costs for these two categories in a similar fashion as we did adjusted mean FTEs. This adjustment lowered the mean non-physician provider cost and slightly lowered the mean support staff

cost. Because wages and benefits spending varies by local wage levels, the mean per-physician wages and benefits in a state was calculated as the national mean for wages and benefits **x** the weighted state wage index.

All needed data points were available with the exception of mean non-physician provider cost data for physician-owned internal medicine, general surgery and otolaryngology practices, and for hospital-owned urology and otolaryngology practices. These data points were not reported (fewer than 10 practices provided a response, respectively), but were necessary to calculate imputed hospital-owned revenue. In these instances, we used the adjusted non-physician provider cost for the relevant broad specialty as a proxy.

MGMA Geographic Limitation

Physician practice revenues and wages and benefits vary according to geographic variation in price levels and costs of services. However, the MGMA cost survey does not provide data at the state level; therefore, we calculated specialty-specific estimates at the national level and geographically adjusted revenue and wages and benefits.

Medicare uses three Geographic Practice Cost Indices (GPCIs), physician work (PW), practice expense (PE) and malpractice (MP), weighted at approximately 48%, 47% and 4%, respectively in 2012, to arrive at the GAF to adjust payments to physicians. Medicare calculates the three GPCIs for payment areas known as Medicare localities. Each physician payment locality is assigned an index value, which equals the area's estimated input cost divided by the average input cost nationally. The locality-level GAF is calculated as the weighted average of the three county-level GPCIs, where the weights are the percentage of relative value units (RVUs) nationally made up by

the PW, PE, and MP RVUs. For calendar year (CY) 2012, the GAF is calculated as follows: [9]

$$GAF_L = (GPCI_{PW,L} \times 0.48266) + (GPCI_{PE,L} \times 0.47439) + (GPCI_{MP,L} \times 0.04295)$$

There are 89 Medicare payment localities which are defined by state boundaries (e.g., Wisconsin), metropolitan statistical areas (MSAs) (e.g., Metropolitan St. Louis, MO), portions of an MSA (e.g., Manhattan), or rest-of-state areas that exclude metropolitan areas (e.g., Rest of Missouri). [10] To promote transparency, Medicare provides the county-level GPCI file that they used to develop the final CY2012 GPCIs and GAF.

Practice revenues were adjusted using weighted-state values for Medicare's 2012 GAF. Because CMS uses county-level RVUs to scale county-level estimates to the 89 locality level, we calculated a weighted state-level GAF by first weighting the county-level GPCIs by their respective county-level RVUs. The RVUs capture total intensity of services offered by physicians in given areas and therefore are closely correlated with revenues in an area. We then calculated state-level GAF based on the state-level GPCI per the equation described above.

Because wages and benefits varies by geographic region we adjusted national level MGMA wages and benefits spending by a state-level wage index incorporating both physician wages and clinical and administrative office staff wages. Medicare provides relevant county-level data in a county-level GPCI file which they used to develop the final CY2012 GPCIs and GAF. The data are based on the most recent census data for physicians and relates directly to physicians and their practice expenses while other wage indices are based only on acute inpatient care/hospital costs. In order to

[9] Geographic Adjustment of Medicare Payments to Physicians: Evaluation of IOM Recommendations. Available at: http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/PhysicianFeeSched/Downloads/Geographic_Adjustment_of_Medicare_Physician_Payments_July2012.pdf

[10] Revisions to the Sixth Update of the Geographic Practice Cost Index: Final Report. Available at: http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/PhysicianFeeSched/Downloads/CY2012_Revisions_to_the_6th_GPCI_Update-Final_Report.pdf

calculate a wage index incorporating both physician and non-physician compensation, we combined two components used to calculate the GAF: the physician work (PW) GPCI, used to adjust for geographic differences in physician wages, and the Employee Wage Index, used to adjust for geographic differences in wages of clinical and administrative office staff. We first aggregated the PW GPCI to the state level using the PW RVU as weights, and then aggregated the Employee Wage Index to the state level using the practice expense (PE) RVUs as weights. We then combined these two indices into a single wage index using their respective national cost shares. The 2012 national cost share weight for physician compensation is 0.48266 while the weight for non-physician compensation is 0.19153, per the Medicare Economic Index (MEI). Therefore the relative weight for physician compensation (for the state-level PW index) is 0.71591 (0.48266/(0.48266+0.19153)) and for non-physician compensation (for the state-level Employee Wage Index) is 0.28409 (0.19153/(0.48266+0.19153)). We applied these weights of 0.71591 and 0.28409, respectively, to combine the state-level PW index and the Employee Wage Index into a state-level total wage index.

MGMA Data Limitations

Limitations of the MGMA data include: 1) bias towards larger practices that are MGMA members, 2) differences by practice ownership (physician vs. hospital-owned), and 3) availability only at the national level.

We cannot adjust for the possible data bias towards larger practices that are MGMA members. However, we attempted to minimize this bias by including data for all practices with fewer than three physicians instead of relying on MGMA's default setting which only provides data for practices with three or more physicians.

We noted declining trends in MGMA data for mean medical revenue per physician between 2009 and 2012 for the broad specialties. The steepest decline was for surgical (-30.3%), followed by non-surgical (-9.1%) and then primary care (-5.2%). This decline may be related to the underreporting of revenue by hospital-owned

practices as explained earlier, and that hospital-owned practices have increased as a share of total practices in the MGMA data over the 2009 to 2012 period. As explained earlier, we corrected for this underreporting by imputing the mean per physician revenue in hospital-owned practices and using these imputed values rather than the means given by MGMA.

Geographic adjustment was used to address the limitation that MGMA data are only available at the national level.

III. 2011 IMPLAN

IMPLAN data contain industry-based output, employment, and labor income, multipliers, as well as tax data by state and at the national level.

Multipliers

Multipliers are specific to a state and to a particular industry. State-level and national 2011 multipliers for "Offices of physicians, dentists, and other health practitioners" (IMPLAN industry code 394) were used. Upon creation of each model's geographies, the software calculates multipliers for output, employment (based on millions of dollars of output) and labor income (based on dollars of output). Type SAM (Social Accounting Matrix) output multipliers were used to apply to direct revenue. Type SAM multipliers consider the direct, indirect and induced effects where the induced effect is based on information in the Social Account Matrix. Type SAM multipliers tell us how a specific industry responds to an impact on itself (i.e., rounds of indirect and induced purchasing that occur in that industry). Indirect and induced effect multipliers were used to calculate total jobs and total wages and benefits. A jobs multiplier (the sum of indirect and induced effect employment multipliers) was applied to direct revenue in millions of dollars, in order to calculate indirect and induced jobs per million dollars of output. A wages and benefits multiplier (the sum of indirect and induced effect labor income multipliers) was

applied to direct revenue, in order to calculate indirect and induced wages and benefits per dollar of output.

We noted a 6.9% decrease in the national output multiplier from 2010 to 2011. A majority of the service sector multipliers in IMPLAN experienced a decline in their values between 2010 and 2011, and 260 of the 440 sectors in the U.S. economy saw a decline in their output multiplier during this period. The average change in the multipliers of the gaining sectors was 2.7% and of the declining multipliers was 2.7%. The biggest outliers were for Home Health Care (-9.4%), Medical and diagnostic labs and outpatient and other ambulatory care services sectors (-17.9%), followed by Offices of physicians, dentists, and other health practitioners (-6.9%). All state values in the model are forced to sum to U.S. control totals, so a change at the national level will be reflected in all states. This issue holds for the other service sectors as well. Therefore, the overall change in the average output multiplier for the U.S. declined by more than 1% during this period. The observed decreases in health-related national multipliers are consistent with the slowdown in the growth of healthcare spending, and could also be further related to the after-effects of the recession (lower spending in general and greater leakages). A recent study found that healthcare spending, as a share of GDP, dropped in 2012. While there were signs of modest improvement to the economy, GDP grew faster than health care spending, causing the health spending share of the economy to fall slightly—from 17.3% to 17.2%.[11]

[11] Martin, et al, "National Health Spending in 2012: Rate of Health Spending Growth Remained Low for the Fourth Consecutive Year." Health Affairs;2014;33:67-77.

Tax Analyses

Patient care physicians also generate tax revenues at the local and state levels. IMPLAN software also estimates the impact of economic activity on state and local tax revenues, including income, sales, and property taxes. Tax impacts were estimated at the state and national levels using a contribution analysis, where existing total direct output provides the initial effects of the analysis.[12] Tax calculations were based on 2011 IMPLAN modeling presented in 2011 dollars, using calculated 2012 direct output.

The total tax contribution is computed by summing taxation on employee income, proprietor income, indirect business interactions, households, and corporations. Tax revenues are included from physician practices and from other affected industries (indirect); i.e., these are the "total" tax revenues supported by the industry.

The state and local taxes incorporated in this study include:

- Social Security taxes: the state portions of Social Security taxes, both the employee and employer-paid portions;
- Personal taxes: state and local income taxes, gift and estate taxes, motor vehicle taxes/fees, fishing/hunting and other license fees, property taxes, personal property taxes, and other fines/fees or donations;
- Business taxes: corporate profits and dividends taxes; and
- Indirect business taxes: property taxes, sales taxes, motor vehicle licensing, severance taxes, non-tax payments (e.g. rents and royalties, special assessments, fines, settlements and donations), and other taxes (including business licensing, documentary and stamp taxes).

While patient care physicians also generate federal tax revenue, the federal tax revenue is beyond the scope of this analysis.

[12] Estimating the Contribution of a Current Industry Using IMPLAN. MIG, Inc. Available through IMPLAN.com.

IV. Data Analysis

The data from the three source datasets were combined and the following measures were calculated by state:

1) Direct impacts of physicians (state-level total medical output, total jobs and total wages and benefits per physician from MGMA **x** counts from the Masterfile)
2) Indirect impacts of physicians
    a. Calculated direct output **x** (IMPLAN output multiplier – 1)
    b. (Calculated direct output/$1,000,000) **x** IMPLAN jobs multiplier
    c. Calculated direct output **x** IMPLAN wages and benefits multiplier
3) Total impacts of physicians (direct and indirect impacts summed for output, jobs and wages and benefits);
4) Tax revenues obtained from physicians.

At the state level, direct, indirect and total impacts were calculated in aggregate (as the sum of primary care, non-surgical and surgical broad specialties) as well as for the 10 specialties. Direct impacts by state (sum of primary care, non-surgical and surgical broad specialties) were aggregated to the national level, and then national IMPLAN multipliers were applied to calculate national total impacts. Tax revenues were also calculated at the national and state levels.