MHCC Extramural Report

Maryland Physician Workforce Study: Applying the Health Resources and Services Administration Method to Maryland Data.

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Executive Summary

This report uses data on Maryland medical license renewals to assess the level of physician supply in Maryland. We adopt the same standards and methods that the U.S. Health Resources and Services Administration (HRSA) uses to assess the adequacy of U.S. physician supply (HRSA 2008). In effect, we assume that U.S. physician supply and demand were roughly in balance in 2000, then compare Maryland physicians per capita to that year 2000 U.S. average benchmark.

Existing research gives conflicting views of Maryland's supply of physicians. HRSA and the Association of American Medical Colleges (AAMC) both show Maryland among the states with the highest physician-to-population ratios, roughly 25 to 29 percent above the U.S. average (HRSA 2008, page 72; AAMC 2009, Figure 2 and Table 2). By contrast, a study sponsored by the Maryland Hospital Association and the Maryland State Medical Society (henceforth the MHA/MedChi study) found that Maryland physician supply was 15 percent *below* the national average, with significant and widespread physician shortages now and in the future (Boucher and Associates, 2008, page 4).

Technically, the most important point of this study is that we are comparing two completely different sources of data: Maryland license renewals and the American Medical Association (AMA) Physician Masterfile. Before we compare counts of physicians from these two files, we have to account for the large and systematic differences between them.

We must make two substantial adjustments to the physician counts, for hospital residents and file completeness. First, we must **drop hospital residents** from both counts, because they are (almost entirely) excluded from the Maryland license renewal data file. This reduces the physician counts by about 4 percent (Maryland licensure) and 14 percent (Masterfile). Second, we must adjust for different levels of file completeness in the Masterfile and the Maryland license renewal file. The Masterfile over-counts active physicians by about 10 percent due to lags in capturing physician retirements (Staiger et al., 2009). By contrast, we calculate that the Maryland license renewal file under-counts active physicians by about 4 percent, due to omission of data for about one year's newly licensed physicians.

After these adjustments to make the two data sources comparable, our study agrees closely with the HRSA and AAMC analyses. **We estimate that Maryland has 27 percent more active non-federal patient-care physicians per capita than the U.S. year 2000 average** (HRSA's benchmark). That is nearly identical to the estimates of Maryland physician supply developed by HRSA and the AAMC (HRSA 2008, page 72; AAMC 2009, Figure 2 and Table 2). **In addition, after adjustment, the two data sources give nearly identical counts of active non-federal patient-care physicians in Maryland**. While these estimates could easily be off by a few percentage points in either direction, they demonstrate that Maryland's physician-to-population ratio is substantially above the U.S. average.

Maryland active non-federal patient-care physicians appear to provide roughly as many patient-care hours per physician as the U.S. average. Using the U.S. Current Population Survey, the total work week for Maryland and U.S. physicians was essentially the same, averaging 51 hours. Using two different sources of survey data, the fraction of work hours devoted to patient care was roughly the same, around 85 percent. On balance, the data suggest that the average Maryland physician may provide slightly fewer patient-care hours than the U.S. average. Our confidence in these results is limited by the small sample size of the surveys and the need to compare results across different surveys. A more precise statement might be that, when we looked at the information that physicians themselves reported, we found no evidence that patient-care hours of Maryland active non-federal patient-care physicians were substantially below the U.S. average.

We looked at some differences between Maryland and the U.S. that might account for lower or higher average demand for physicians in Maryland. None of them would have changed the results materially.

- Based on the age mix of the population, Maryland might require 2 percent fewer physicians per capita than the U.S. average.
- Using Medicare claims, patients crossing the state border for care appeared to be a non-issue. The net inflow and outflow of patients (for fee-for-service Medicare) was almost exactly in balance.

Beneath the broad averages, we found significant differences by specialty and region. For the entire state, physician-to-population ratios exceeded the U.S. average for broad categories of physicians (primary care, medical specialists, surgical specialists, and others). By region, we found that physicians tended to work slightly longer hours in areas with low physician supply. But even after adjusting for variation in patient-care hours, **the supply of physicians in Southern Maryland was significantly below the HRSA benchmark for all four broad categories of physicians that we studied.** All other regions were at or above the HRSA benchmark, with the Eastern Shore ranking just at the HRSA benchmark for some types of physicians.

We did not, however, find systematic evidence of reduced access to care in Southern Maryland, on average, using the limited data available for this study. Physicians in Southern Maryland were as likely to be accepting new Medicare and Medicaid patients as physicians in the rest of the state. Fee-for-service Medicare beneficiaries in that region received as much physician care as those in other regions of Maryland, but were more likely to travel outside the region for care.

These results are averages for all areas within these regions, combining urbanized areas with relatively high physician supply and rural areas with lower physician supply. **A finding that average physician supply in a region exceeds the HRSA benchmark does *not* imply that supply exceeds the HRSA benchmark for all areas or populations within that region.**

This is a limited study, focusing on state- and region-level supply of broad classes of physicians. It should *not* be construed as showing that Maryland has no physician supply problems. In particular, we did *not* look at:

- counties or sub-county areas;
- individual physician specialties;
- vulnerable populations;
- Health Professional Shortage Areas or Medically Underserved Areas;
- expected future changes in physician supply and demand based on retirement of the baby boom generation and the implementation of health reform legislation;
- market-based indicators of supply and demand for physicians, such as unfilled vacancies; or
- indicators of the process and outcomes of care, such as waiting times for care, reported difficulty in obtaining needed care, or effects on health status of Maryland residents.

That said, we believe the results of this study can be helpful in two ways. First, the results confirm the historical view of Maryland as a state with substantial physician resources. Prior to 2008, Maryland was typically judged to have a physician-to-population ratio well above the national average. Our results suggest that remains true. Second, the results can help focus policy discussion. The absence of evidence for widespread, severe, state-wide shortage means that policy makers can return attention to a more traditional view, looking for the small geographic areas and specific specialties or patient populations for which there is strong, objective evidence of problems with access to physicians' services.

The next study of this issue needs to do more than count physicians. For a given physician specialty, a low physician-to-population ratio in an area *may* flag an access problem within the health care system. But it also *may* reflect low prevalence of particular disease, desirable regionalization of some specialized services, substitution between non-surgical and surgical interventions, or other factors. Conversely, above-average supply may suggest either a lack of access issues, or merely above-average need for health care.

Ideally, we would like to have enough information in hand to sort these cases out and focus on the ones that matter most. That requires more than just the count of physicians.

Policy makers should ask, pro-actively, what information would be helpful for making informed decisions in this area. Maryland has access to a wealth of information on the provision of health care, starting with claims data for the Medicare, Medicaid, and privately insured populations. Given that, it is inefficient to look at physician supply data in isolation. Future studies should bring these and other sources of information together. As a start, coupling the analysis of physician supply to measures of service use and patient travel (as was done here using Medicare claims) seems a reasonable way to ask whether and where low levels of physician supply are adversely affecting the health care of citizens of Maryland.

1 Introduction and Outline of the Analysis

This study examines the supply of physicians in Maryland, using the most recent available (2009/2010) Maryland physician license renewal database. For broad classes of physicians, we compare measures of active non-federal patient-care physicians per capita in Maryland (and sub-regions) to a level that is used by the Federal Government as the benchmark for adequate physician supply for the U.S. as a whole.

The goal is to determine whether the supply of physicians in Maryland falls below this national benchmark, and if so, where and for what specialties. That requires not only analyzing Maryland physician supply data, but also clearly showing how the Maryland data differ from data used for national benchmarks, and how closely our calculation matches the calculation behind the national benchmarks.

1.1 Recent history of this issue

The final report of the Maryland Task Force on Health Care Access and Reimbursement (HCAR) recommended that the state improve its ability to measure physician supply (HCAR 2008, page 40). Specifically, HCAR suggested that the Maryland licensure survey be improved to capture information on patient-care time, site of service, admitting privileges and other factors useful for measuring the effective supply of physician services in Maryland.

The HCAR recommendation was driven by sharply conflicting information received by the Task Force regarding the adequacy of Maryland physician supply. Traditionally, Maryland has been considered a well-supplied state. Using active patient-care physician counts from the American Medical Association Physician Masterfile, the U.S. Health Resources and Services Administration (HRSA) singled out Maryland as one of a handful of states with physician-to-population ratios unambiguously higher than the national average (HRSA 2008, page 72.) A similar analysis by the Association of American Medical Colleges (AAMC) showed Maryland as having the second-highest active patient-care physician-to-population ratio in the country (AAMC 2009, Figure 1). This was also the core of the testimony presented to HCAR by CareFirst Blue Cross Blue Shield who, in addition, noted that use of physician services among privately-insured Maryland residents was 20 percent above the U.S. average (Navigant, 2008).

By contrast, a study sponsored by the Maryland Hospital Association and the Maryland State Medical Society (henceforth, the MHA/MedChi study) concluded that Maryland faces significant and widespread physician shortages now and in the future (Boucher and Associates, 2008). This was due mainly to the use of Maryland licensure data (not AMA Masterfile data) for the Maryland physician counts, further reduced by an average of 15 percent to account for low patient-care hours of Maryland physicians. The 15 percent reduction was based on estimates provided by medical directors of teaching hospitals regarding typical physician patient-care time (Boucher and Associates, 2008). The lower average patient-care time of Maryland physicians was attributed loosely to an above-average fraction of physicians in teaching and research, and possibly to a higher proportion of female physicians in Maryland (HCAR 2008, page 40).

The now-improved licensure data are the basis for the physician supply estimates in this report. We used newly-obtained information on 2009 and 2010 license renewals to count the active non-federal patient-care physicians practicing in Maryland.

1.2 Conceptual issues for identifying adequate physician supply, and the HRSA method.

This section of the introduction briefly summarizes approaches that have been used to define "an adequate supply of physicians", then describes the HRSA methodology that we will be adopting here. The material is all drawn from HRSA's most recent analysis (HRSA 2008).

Almost all analyses of physician adequacy follow the same broad outline. They estimate the supply of physicians, estimate the need for or demand for physicians, then compare the two to identify shortage and surplus of physicians.

The population's need for physicians is an inherently imprecise concept. And, unsurprisingly, the methods used to quantify the need for physicians have changed over time.

The earliest formal studies of physician shortage worked from a medical model of need. They multiplied the average prevalence of diseases, the time required to treat the average person with each disease, and the U.S. population, to arrive at total physician time needed to treat the U.S. population. The time estimates were, by and large, based on the opinions of experts, and the only factors considered were medical -- disease prevalence and time required for treatment.

Later approaches recognized that economic and organizational factors affect the amount of physician time that patients actually demand. For example, higher income increases use of physician services, managed care enrollment reduces it, and lack of any insurance reduces it still further. These latter approaches are more in the spirit of estimating the population's effective economic demand for physician services, rather than measuring need based solely on medical criteria.

Focusing on the uninsured provides a clear contrast between these two different approaches. The uninsured use substantially less care than those with insurance. The earlier, strictly-medical approaches assumed those populations need as much physician care as the insured population. Effectively, they assumed the population would (or perhaps, should) be served as well as the insured population. Later approaches accept the presumed under-service of this population when generating an estimate of physician requirements. In effect, they accept that these populations may need care in some absolute clinical sense, but we do not need physicians to provide it, because the uninsured population will, in fact, use less health care than the insured population.

Some have gone further in this direction, to a purely economic model of the need for physicians. That approach bases the projected need for physicians on pre-existing trends and projected changes in income and demographics. It does not even attempt to reference a specific underlying medical model of need. Instead, it implicitly assumes that the principal limitation on the use of physician services has become *willingness to pay*, rather than prevalence of disease.

At present, the mainstream approach for modern studies of the adequacy of physician supply is something of a hybrid. In effect, the modern methods stipulate that some observed level of physician supply is adequate, then extrapolate from that baseline level. The baseline could be physicians per capita as observed in the U.S. in some base year, physicians per capita as used in efficient managed care plans, or even physicians per capita observed in some foreign nation whose health care system appears to provide adequate access to care. This is then trended forward in time using whatever factors appear to be relevant to estimating requirements – projected changes in demographics, insurance, income, technology, and similar factors.

HRSA's most recent projections of physician requirements fall into this now-mainstream approach. For national planning purposes, HRSA's method boils down to this:

- Assume that physician supply was adequate in some base year (in this case, 2000).
- Adjust for growth and aging of the population (because older persons use more care).
- Adjust for changes in insurance coverage (because the uninsured use less care, and managed care plans use fewer physicians per enrollee).
- Show how the projected requirements would change if other factors influencing the demand for physician time were included, for example, growth in income (HRSA 2008).

Using HRSA's approach, the adequacy of physician supply (at some later date, or in some small area) is based on a comparison between actual supply and that projected need for physicians. If the projected need for physicians exceeds the projected supply, that is deemed to be a shortage, and if supply exceeds needs, that is deemed to be a surplus.

The main advantage of HRSA's approach is that it is both concrete and objective. It does not rely on expert opinion on the time required to treat patients or as to the level of services that a population requires.

Further, it appears to be the basis for many physician supply studies both nationally (e.g., AAMC 2009) and for individual states (e.g., Virginia 2010).

While we adopt HRSA's benchmarks, we should repeat the shortcomings that HRSA mentions. Mainly, this approach effectively assumes a static and geographically uniform health care system. With only small exceptions, the pattern of physician supply per capita observed in the base year is the pattern required for all subsequent years and across all areas. The only variation built into the system is that driven by changes in demographics (both of physicians and the population), health care coverage, and, in some scenarios, income. In particular, changes in medical practice and changes in underlying medical technology may be discussed as a type of sensitivity analysis, but are not part of the main projections of adequacy of physician supply. Variation in prevalence of disease across geographic areas (for example, areas of above-average cancer prevalence) does not factor into the analysis.

As an essentially static model of physician supply, the HRSA approach would not pass a hindcast (as opposed to forecast) test. Empirically, U.S. physician-to-population ratios have risen steadily, beyond what would be forecasted with demographics or insurance changes. If we were to apply the year 2000 HRSA standard to the decades prior to 2000, the U.S. would appear increasingly under-supplied the further back in time we looked. The best we can say is that the HRSA approach is widely used, and that it makes reasonable sense for the type of short-term analysis done in this report (how the 2009/2010 Maryland supply compares to some standard).

Finally, we note that "shortage" in this sense has nothing to do with Health Professional Shortage Areas (HPSAs).[1] Absent any other factors, a geographically-defined primary care HPSA must have fewer than 0.29 full-time-equivalent (FTE) primary care physicians per 1000 population.[2] By contrast, in 2000, HRSA estimates that the U.S. had 0.95 FTE primary care physicians per capita (HRSA 2008, page 33).[3] The "primary care HPSA" threshold is more than three times lower than the HRSA threshold for identifying a shortage of primary care physicians.

1.3 Plan of this report

In broad outline:

- First, we focus on getting the aggregate, total-physicians-per-capita number calculated properly. Mainly, that is a detailed accounting for the differences between the AMA Physician Masterfile data and the Maryland license renewal data.
- Then, we can proceed to do the detailed analysis by specialty group and region.

The next section of the report (Section 2) works out the mechanics of getting a comparable count of Maryland and U.S. physicians in the aggregate (all physicians, for the entire state). In that section, we are merely trying to get a correct "apples-to-apples" comparison between the Maryland license renewal data and the HRSA U.S. benchmark. The section ends with comparisons of the count of physicians per 1000 population in Maryland and the US.

Section 3 of the report asks whether we need to adjust those counts for other factors that may materially affect supply of, or demand for, physicians in Maryland. Most importantly, in response to the MHA/MedChi analysis, we ask whether Maryland physicians provide fewer patient-care hours than the U.S. average. In addition, we ask whether differences between U.S. and Maryland population demographics would materially affect the estimated demand for physicians. Finally, we demonstrate that patient border-crossing into and out of Maryland would not materially affect the demand for physician services, using fee-for-service Medicare patients as a proxy for all patients.

[1] Geographic HPSA status qualifies an area for certain types of Federal aid, including additional Medicare physician payments.
[2] That is, one physician for every 3500 residents, as shown here: http://bhpr.hrsa.gov/shortage/primarycare.htm .
[3] These are not strictly comparable, because they use two different definitions of FTE. The HPSA analysis counts 40 or more hours of patient-care per week as full time, and any fraction of that as a pro-rata fraction of an FTE. The HRSA analysis, by contrast, defines FTE to be the mean patient-care hours actually observed in the base year, by specialty, for active patient-care physicians.

Section 4 presents the detailed results by broad physician class and region of Maryland. We group physicians into primary care, medical specialists, and surgical specialists, then compare physician to population ratio in the five regions of Maryland to HRSA's benchmarks. The differences in the two data sources (Maryland license renewal and AMA Masterfile) place some significant limitations on this analysis.

Section 5 briefly presents a summary of the results. We also present the general caveat that we have only looked at broad classes of physicians and large geographic areas, and show that there is evidence for some physician supply issues in Maryland. We close with some remarks about ways to proceed with more targeted analysis of the adequacy of physician supply in Maryland.

2 Counting Active Non-Federal Patient-care Physicians

This section of the report accounts for the differences between the American Medical Association Physician Masterfile and the Maryland license renewal database. These files are the sources for the two physician counts we will compare: HRSA's national benchmark and the number of physicians in Maryland.

The bulk of this section is a lengthy discussion of methods. Readers who are only interested in detailed tables of results should skip to section 2.7.

2.1 Overview

Most analyses of physician supply rely on *one uniform source of data*. For example, HRSA's analysis of U.S. physician supply compares counts from the AMA Masterfile from a baseline year (2000) to the same counts in subsequent years. The HRSA and AAMC state-level analyses noted above compare AMA Masterfile counts in the states to identically-calculated counts for the US.

In those cases, the analyst can largely ignore any overall bias or consistent flaws in the data. As long as the error is consistent across time and uniform across states, analysis of the Masterfile will show the correct relationship of one year relative to another or one state relative to the U.S. average. Consistent errors in the data are largely "a wash" and typically do not need to be specifically addressed.

Here, by contrast, we are comparing counts of physicians derived from *two completely different data sources*, the Maryland license renewal file and the AMA Physician Masterfile. To get an accurate comparison, we must account for the significant differences between these two data sources.

Accordingly, the initial portion of the analysis consists of documenting the adjustments we must make to get comparable numbers from these two data sources. This requires several different assessments of the data sources.

- What are the important differences between the Maryland license renewal data and the AMA Masterfile data (HRSA's source)? Do we have enough information to make an accurate adjustment for those differences?
- How can we select physicians from the Maryland license renewal file in a way that matches the HRSA/AMA definition of active patient-care non-federal physicians?

2.2 Brief summary of findings

The main findings are as follows:

Hospital Residents. HRSA's baseline *includes* hospital residents. The Maryland license renewal file almost completely *excludes* residents. (Maryland tracks most residents as Unlicensed Medical Practitioners or UMPs.) This is a major difference, because residents account for about 14 percent of U.S. active non-federal patient-care physicians. For the aggregate comparison (all physicians in Maryland), we have the option to add some rough count of residents to the Maryland data, based largely on the count of UMPs. But for any detailed analysis (e.g., by specialty or region), **our only option is to exclude residents from both the U.S. benchmark and the Maryland data.**

Retired physicians/new physicians, AMA Masterfile. The AMA Masterfile is widely known to overstate the number of active physicians in the U.S. (Staiger et al., 2009). The Masterfile survey occurs every four years, and so retains (up to) four years of retirees as if they were active physicians. By contrast, it captures most new physicians in a timely manner, taking information from graduate medical education programs and state licensure data. When compared to equivalent counts from the U.S. Current Population Survey, the Masterfile appears to overstate active physicians by about 10 percent, with the degree of over-count

increasing with physician age (Staiger et al., 2009). Our calculation from other sources, based on completely different methods, yields estimated over-counts ranging from 7.3 percent to 15 percent. **We reduced the Masterfile data by 10 percent to account for its average *over*-count of active physicians.**

Retired physicians/new physicians, Maryland renewal file. Residents aside, the Maryland license renewal file undercounts total active physicians by about 4 percent. Retirees are not an issue. On net, the person-years of care that the file omits (from physicians active in this period but retiring prior to re-licensure) should balance the person-years that the file over-counts (from physicians who retire during this period after re-licensure). Newly-licensed physicians are the issue. New physician licenses are tracked separately from renewals. The license renewal file omits nearly one year's worth of active newly-licensed physicians, on average. (Those physicians only enter the renewal file as they synchronize with their scheduled time of re-licensure). **We increased the licensure file data by 4 percent for the *under*-count of newly licensed physicians in the license renewal data.**

Other technical issues in identifying physicians. We performed a sensitivity analysis to see whether modest changes in the way we defined active, patient-care, non-federal, and Maryland physician mattered. **These had little material effect on the aggregate results.**

No reduction of the HRSA baseline for physicians whose activity status is unknown. Finally, we note that HRSA's year 2000 baseline is higher than comparable estimates (including other estimates from HRSA). It also exceeds the count of active non-federal patient-care physicians calculated from the Area Resource File (ARF), which itself is a summary of Masterfile data. We believe that HRSA included both active physicians and physicians of unknown activity status in its baseline. **We make no adjustment for the unusually high HRSA year 2000 baseline.**

After adjustment, we find that Maryland's physician supply exceeds the HRSA baseline by 27 percent. This is virtually identical to findings from prior analyses by HRSA and the AAMC (HRSA 2008, AAMC 2010). Correspondingly, we also find that, after adjustment, the Masterfile and the Maryland license renewal database provide very similar counts of Maryland physicians.

2.3 Preliminary definitions

Before discussing data sources, we need to clarify a handful of issues relating to the count of physicians. Among these are the inclusion of DOs with MDs, and defining "residents" to include individuals who might informally be termed "interns".

"Physicians" includes MDs and DOs. Almost all U.S. physicians are doctors of medicine (MDs), with only about 5 percent of the U.S. physician supply consisting of doctors of osteopathy (DOs.) Throughout, when we refer to "physician supply", we are referring to the sum of MDs and DOs. And, while we refer to comparisons from the AMA Masterfile, we mean the Masterfile as augmented, where necessary, using an equivalent file from the American Osteopathic Association.

"Residents" includes interns and fellows. A second source of confusion is failure to define interns, residents and fellows. Traditionally, interns are medical school graduates in their first year of postgraduate training; residents are those in their second and later years; and fellows are those who have completed residency and are continuing training for a sub-specialty. Typically, one year of internship is required before an individual *may* apply for a medical license. Residents are typically not *required* to apply for license while they continue their post-graduate medical training.

Various sources of data differ in the treatment of interns, residents, and fellows. Most sources of physician supply information include interns, residents, and fellows under the rubric of "residents". In those cases, "residents" means residents, interns, and fellows (e.g., AAMC 2010, ACGME 2009). By direct calculation, we verified that the AMA Physician Masterfile count of "residents" includes what might informally be called interns and residents. **Thus, for purposes of counting physicians, there is no such thing as an "intern," since "resident" includes both interns and residents.**

In addition, we group self-reported fellows with residents. We have to do this because one of our sources (the ARF) includes clinical fellows with residents.[4] Other studies of graduate medical education (e.g., ACGME 2010) follow that standard as well. As we note below, the licensure status of fellows is somewhat ambiguous in the Maryland data.

2.4 Characteristics of the AMA Masterfile and Area Resource File

The AMA Physician Masterfile is the principal source of information on the number of physicians in the United States. It is the main data source for HRSA's physician supply estimates. The Masterfile tracks U.S. physicians from entry into medical school through death, using a variety of sources, including medical school enrollments, state licensure data, graduate medical education rosters, and surveys of physicians.[5]

The Area Resource File (ARF) is a publicly-available dataset that contains a detailed summary of the Masterfile data. Physician counts from either the Masterfile or the ARF will reflect the strengths or weaknesses of the Masterfile data. In principle, physician counts taken from the ARF should closely match those developed directly from the Masterfile.

New and retiring physicians. It is well established that the Masterfile overstates the number of active physicians in the US.[6] This occurs due to lags in recognizing the retirement status of older physicians. The AMA surveys physicians every four years, and therefore may include some physicians as active up to four years past their actual date of retirement.

Compared to surveys of the current U.S. workforce, the Masterfile appears to overstate active U.S. physicians by about 10 percent (Staiger et al. 2009). That is the difference between a modest understatement of younger (presumably newly-licensed) physicians and a much larger overstatement of older (presumably retired) physicians, compared to surveys of the current U.S. workforce (Staiger et al., 2009).[7]

Other information also suggests a significant over-count. For 2008, using a variety of sources, the U.S. Bureau of Labor Statistics estimated just 661,000 working U.S. physicians, including the self-employed.[8] That is 15 percent below HRSA's estimate of active patient-care physicians for that year (including residents, interpolated from the data on HRSA 2008, page 32). By contrast, the AAMC modeled the likely non-retired physician population based on their own survey data showing typical retirement behavior (AAMC 2010). We estimate that the AAMC method would have resulted in a roughly 7.3 percent reduction in the Masterfile count of active patient-care physicians.[9]

The rough correspondence of these estimates (10 percent based on the CPS, 15 percent based on Bureau of Labor Statistics tabulations, 7.3 percent based on AAMC survey data) is adequate evidence that the AMA Masterfile significantly overstates the count of active physicians. We therefore must reduce the Masterfile-based counts before comparing to other data sources. We adopt the CPS-based 10 percent adjustment because that is the easiest to understand, being a simple contrast between the Masterfile count and a count

[4] The ARF user documentation states that clinical fellows are included with residents (DHHS 2010). The ARF shows 108,000 U.S. hospital residents in 2008, identical to the ACGME count that is clearly identified as including interns, residents, and fellows (ACGME 2010, page 4).

[5] Taken from the AMA's description of the Masterfile, located at: http://www.ama-assn.org/ama/pub/about-ama/physician-data-resources/physician-masterfile.shtml.

[6] See the introductory material in Staiger et al. (2009) for a summary, or see the sections on adjustment for retirements in AAMC (2010). Kletke (2004) is a summary of the issue from the standpoint of a senior AMA staff member with full access to all details of the processing behind the Masterfile. HRSA (2006, page 5), suggests that the problem is both large and increasing over time.

[7] Although not explicitly stated in that paper, this appears to be after removing all physicians age 75 and over from the sample (Staiger et al., 2009, page 1677). That would be consistent with the methodology HRSA adopts when using the Masterfile.

[8] The data are from on-line tabulations supplied by the U.S. Bureau of Labor Statistics. As of 4/1/2011, the relevant table could be accessed at http://www.bls.gov/oco/ocos074.htm.

[9] "After adjusting for workforce activity probability, there were an estimated 782,200 active physicians under age 75 in 2006 (approximately 29,000 fewer than were listed as active in the Masterfile despite using a broader definition of active for older physicians)." (AAMC 2009, page 84). We used 29,000/782,200 = 3.7 percent as the raw estimate, to which we added a further 3.6 percent for our estimate of the difference between the AAMC active definition (> 1 hour) compared to the AMA active definition (> 20 hours), based on the Maryland licensure file data.

based on ongoing surveys of the U.S. population. It is also in the middle of the range of adjustments we have noted, and was published in a major U.S. medical journal.

Residents and fellows. Finally, we note that residents and fellows are included in HRSA's year 2000 baseline (HRSA 2008). By direct calculation, we verified that all of the active patient-care counts on the ARF also include residents and fellows. Thus, by default, all of the Masterfile-based statistics shown here include residents unless we specifically adjust the data to remove them.[10]

2.5 Characteristics of the Maryland license renewal survey file.

Physicians licensed to practice in Maryland must renew their licenses every two years. The most recent version of the Maryland license renewal survey database contains information on all successful physician license renewals in Maryland in 2009 and 2010.

Currently, at time of renewal, physicians are required to complete a survey summarizing their professional activities. The data from this survey form the basis for the estimates of Maryland physician supply presented here.

As with many state licensure databases, many individuals licensed in the state of Maryland actually practice elsewhere. Thus, the raw count of active license renewals is not a reasonable proxy for active patient-care physicians practicing in Maryland.

This database does not contain information on all Maryland physicians, and is not directly comparable to U.S. estimates based on the Masterfile data. The file does not contain records for most hospital residents (including interns) and fellows. And it does not contain records for physicians obtaining their initial license, only for license renewals. These points are discussed below.

Residents and fellows. Residents and fellows who have not yet been granted a medical license are tracked by Maryland as Unlicensed Medical Practitioners (UMPs). These individuals are registered as UMPs for the duration of an individual post-graduate contract, typically one year.

The Maryland UMP count can only be used as an approximate estimate for the number of interns in Maryland. Based on the literal text of state regulations, residents and fellows who are fully licensed should be excluded from the UMP file, while out-of-state physicians performing a temporary rotation in a Maryland hospital should be counted as UMPs.[11] The licensure rate for fellows might reasonably be expected to be higher than that of interns, which should remove them from the UMP file (and, eventually, place them in the license renewal file).

The Maryland UMP count is similar to other estimates of hospital residents (or residents plus fellows) in Maryland. In 2010, Maryland registered (or re-registered) 2,638 UMPs.[12] We also found approximately 600 physicians in the license renewal database who would be counted as Maryland active patient-care non-federal physicians, and who self-identified as residents or fellows.[13] At present, we have no way to know the extent to which those individuals were already counted in the UMP file. This suggests between 2600 (UMP) and 3200 (UMP plus license renewal) residents and fellows in Maryland hospitals.[14] The Accreditation Council for Graduate Medical Education (ACGME) estimates 2693 residents, interns, and fellows in residencies in Maryland for the 2009-2010 academic year (ACGME August 2010, page 95). By contrast, the Area Resource File shows 3215 Maryland total hospital residents and fellows for 2008. At

[10] The HRSA summaries and the ARF place residents and fellows into two different categories. As a practical matter, we can only remove residents from the HRSA or ARF estimates. Counts of fellows are commingled with full-time hospital staff.
[11] Code of Maryland, 10.32.07.01 B(10)a, http://www.dsd.state.md.us/comar/comarhtml/10/10.32.07.01.htm
[12] Mark Higby, Chief, Information Systems Division, Maryland State Board of Physicians, personal communication, 3/2/2011.
[13] It is also possible that the term "fellow" was misinterpreted by some applicants to include "postdoctoral research fellows" and similar positions that are not part of a graduate medical education program. Nearly one-quarter of the license renewals for Maryland-based "fellows" were for physicians employed by the Federal government.
[14] These counts ignore the potential to miss some newly-licensed residents, who might not be counted in either the UMP or license renewal files.

best, we are able to say that the data sources roughly agree, showing between 2600 and 3200 residents and fellows in Maryland.

New and retiring physicians. Maryland physician license renewal takes place every two years. Thus, at any time, there will be a pool of retired physicians who have retired after their last renewal, but who still appear to be active based on the most current data in the license renewal file. In addition, information on newly licensed physicians is not included in the renewals file. Those physicians only enter the file as they obtain their first scheduled license renewal.

For retiring physicians, while the issue for the Maryland licensure file appears *similar in concept* to the well-documented AMA Masterfile over-count discussed above, is quite *different in practice*. The licensure file does not over-count physicians due to retirements. The reason for this is simple: unlike the Masterfile, the Maryland license renewal file both omits some active physician time and includes some inactive physician time. On net, these two factors should roughly balance.

The AMA Masterfile always carries a record for every physician, up to the time of retirement. The bias in that file is all in the direction of over-count. It never under-counts a retiree, but may over-count one as active until the subsequent survey round reveals that a physician has retired. The Maryland license renewal file, by contrast, *only shows those physicians who renew their licenses during the period*. Similar to the Masterfile, the Maryland license renewal file will incorrectly count physicians who retire after their most recent license renewal. But, unlike the Masterfile, the Maryland license renewal file will omit physicians who are active early in the licensure cycle but retire prior to re-licensure. This file will have no record of their period of activity because they did not renew the license or were retired at time of license renewal.

The simplest way to see this is to consider an active patient-care physician retiring on 1/1/2010 (precisely in the middle of the two-year file period). This analysis will either under-count that physician (count as retired for the entire period) or over-count that physician (count as active for the entire period) *based on the first letter of the physician's last name*. That is what determines whether the physician renewed the license in 2009 (and was counted as active) or 2010 (and was counted as retired or omitted entirely). The under-counts and over-counts should more-or-less cancel each other.[15,16]

For newly licensed physicians, the situation is quite different. The Maryland license renewal file does not contain initial license applications. Initial applications are tracked separately, and newly-licensed physicians are captured only as they synchronize with the correct date for the two-year renewal cycle. This means that there are some newly-licensed physicians practicing in Maryland who are not captured on the renewal file.

Given that roughly half of physicians renew their licenses each year (based on first letter of the last name), we would expect about half of the newly licensed physicians in Maryland to be missing from the renewal file.[17] And in fact, when we matched an extract of the 2009/2010 new physician file to the license renewal file, we found that 42 percent (just under half) of the two years' worth of newly licensed physicians was missing from the renewal file. Stated differently, the license renewal file understates the count of active physicians by 84 percent of *one year's* average new license cohort. One year's license renewals amounted to 6.2 percent of the total count of physicians on the file. **Thus, on net, the Maryland license renewal file *undercounts* Maryland physicians by 4 percent, from the omission of an average of (nearly) one year's worth of newly licensed physicians.** To put this on the same basis as the AMA Masterfile after adjustment, we need to account for that adjustment in our calculation in some fashion.

[15] As long as physicians retire in some fairly uniform fashion throughout the year, regardless of re-licensure date, this will be true. Because re-licensure involves little expense or effort (while retirement is a major decision), it seems plausible to assume that the physicians do not typically make their retirement date dependent on their re-licensure date. We cannot, however, test this in any direct fashion using the available license renewal data.

[16] This is based on having enough retiring physicians to ensure a close average match between the incorrectly omitted and incorrectly included active physician count. For a small area with few annual retirements (for example, a sparsely populated rural county) this need not be true.

[17] In fact, because the re-licensure year is determined by first character of the last name, and because the physician population continues to increase slightly, 2010 renewals (A-L) accounted for about 55 percent of all renewals, 2009 renewals (M-Z) accounted for about 45 percent.

Finally, we note two caveats. First, this new physician adjustment is only correct in the aggregate, and may not be correct separately for every Maryland region and specialty. In theory, a different adjustment would be needed for regions or specialties with particularly rapid (or slow) growth in physician supply. The adjustment is small enough, however, that we are going to use one adjustment for the entire analysis.

Second, we made no distinction between the count from the license renewal file (physicians active as of the specific point in time, the renewal date) and the count of new physicians (physicians who became active over a two year span of time). This appears to be conventional for analysis of physician supply. (We have not found a study that attempts to distinguish between physicians active at one point in time and physicians with any activity over a span of time.) In other health care contexts, however, that distinction can increase or decrease the population count by several percent.[18] Arguably, in this case, the missing 4 percent of *physicians* might account for closer to 2 percent of the total *physician-years of service* if they were typically active for roughly half the time span. But the adjustment is small and this distinction is routinely ignored in the literature on physician supply. Accordingly, we are leaving the adjustment at 4 percent of physicians, and note that one could make a reasonable argument for an adjustment of 2 percent of physician-years instead. As with the retirement issue, there is no way to test the accuracy of that alternative adjustment directly from the data available for this analysis.

2.6 Defining active, patient-care, non-Federal Maryland physicians using the Maryland licensure survey data.

HRSA's physician supply benchmarks are derived (ultimately) from counts of physicians on the American Medical Association (AMA) Physician Masterfile (HRSA 2008). The same Masterfile data are provided in summary form on HRSA's Area Resource File (ARF, 2010). We need to know how the Masterfile (and therefore HRSA and the ARF) define active, patient-care, and non-Federal physicians in order to perform the matching calculation on the Maryland licensure data.

Key elements of the Masterfile data are based on periodic AMA surveys of U.S. physicians. In some instances, we will need to note the wording of questions to understand differences between the Masterfile based definitions and the analogous definitions on the Maryland licensure survey.

Throughout this section, we first describe what we actually used in the calculation. Then, at the end of the section, we demonstrate the effect that alternative choices would have had, and compare our choices to those in the MHA/MedChi report.

Active physician: The HRSA study (following the AMA definition) includes physicians working 20 or more hours per week in professional activities, under age 75 (HRSA 2008, footnote 5). The age restriction is due to an acknowledged problem with the Masterfile data. Every U.S. physician is surveyed every four years, so the Masterfile is slow to reflect physician retirements and may not do so at all for non-respondents to the survey underlying the Masterfile data (HRSA 2008, footnote 13). While the ARF documentation lists this restriction (age 75), that may be shorthand for "age 75 and no positive evidence of non-retirement" (HRSA 2008, footnote 13).

For the Maryland survey data, we define active physicians as those with at least 20 reported work hours per week, under age 75. Following the AMA model, this is defined in terms of total hours of work.[19]

Patient-care physician: The HRSA study inherits the AMA/ARF classification of "patient-care" physicians. The AMA physician survey asks physicians to self-designate their principal professional activity as "Patient Care" or "Other Professional Activity". To make the Maryland data analogous, patient-care physicians were defined as those having the plurality of work hours in patient care. (That is, of the

[18] For example, in Medicare, the population enrolled on July 1 of a year is typically 5 percent less than the population ever enrolled over the course of a year, due to the turnover of new enrollees and decedents (the equivalent of new physicians and retirees in this analysis.) Illustrative data can be found here: http://www.resdac.org/docs/Always_Ever_Enrolled_Table.pdf

[19] As noted below, we believe HRSA also included physicians with unknown activity status in their baseline counts of active physicians. We, by contrast, exclude all physicians reporting zero work hours in the license renewal survey, even though about a third of those physicians are less than 55 years of age.

categories of hours on the Maryland survey, patient care had to be as large as or larger than any other category.)

Federal physician: Although the HRSA report never states this and never labels any totals as non-federal physicians, we initially *assumed* that HRSA dropped federal physicians from their counts, because that is how physician supply analyses have typically been done. HRSA has typically compared non-federal physicians to the U.S. civilian population.[20,21]

We must drop federal physicians from the Maryland counts, or risk significantly overstating the supply of physicians available to treat the Maryland civilian population. Federal physicians account for just 2.9 percent of all active physicians, so the treatment of federal physicians matters relatively little for HRSA's U.S. estimates. In Maryland, by contrast, the ARF shows federal physicians accounting for 8.2 percent of active physicians in the state.[22]

The ARF documentation defines a Federal physician as a "Physician whose principal employer is the federal government. This includes physicians in the armed services, U.S. Public Health Service, Indian Health Service, and the Department of Veterans Affairs" (DHHS 2010).

The Maryland license renewal survey, by contrast, asks a much broader question: "Are you employed by the Federal government?" Analysis of the data shows (below) that many physicians have *some* federal employment but had a *principal* practice that was not a Federal practice. We restrict Federal physicians to those who answered "yes' to the federal employment question and whose principal practice is not a private practice.

The issue of federal physicians seems straightforward, but, by inference, it brings up a potential confounding issue for any regional analysis. HRSA traditionally calculated non-federal physicians per 1000 *civilian* population. This gave a proper match between numerator and denominator. On average, active-duty armed forces account for a negligible fraction of the population. In counties with large military facilities, however, that may not be the case. We could not find any current data source showing active-duty military residents as a fraction of population by state or county, so we cannot address this issue. We merely note that we may misstate local physician supply requirements in counties that have a large cohort of active-duty military personnel that are counted as residents of that county.

Residents and fellows: The ARF/Masterfile counts include residents, and so effectively counts residents on the same basis as any other physician. HRSA's estimate of physicians per capita includes interns and residents in the physician count (verified by direct calculation, Exhibits 21 and 22, HRSA 2008). We have the option of removing residents from any counts derived from the ARF.

Treatment of residents and fellows in the Maryland license renewal file is problematical for many reasons. First, as noted above, most residents are probably counted as UMPs. Second, a small number of residents can be found on the license renewal file. Third, residents may be over-represented among the initial license applications that are not included in the license renewal file. Fourth, based on the large fraction of self-reported "fellows" who were federal physicians, there is a chance that some survey respondents counted research fellowship positions as "fellows", instead of restricting that term to mean the final years of post-graduate medical education. Finally, self-identified residents and fellows do not report some of the fields on the survey, including detailed practice data. Including them requires placing them in counties based on the ZIP code of their "public" address (typically, but not always, a recognizable medical institution).

To analyze residents and fellows in the license renewal file, we first cross-walked Maryland ZIP codes to the counties accounting for the plurality of the population in the ZIP code. (ZIP codes frequently span county boundaries.) Residents and fellows were then tracked geographically in the same way as all other physicians in the database.

[20] E.g., http://bhpr.hrsa.gov/healthworkforce/reports/factbook02/FB201.htm.
[21] That assumption is examined in section 2.8 below. It is not clear that HRSA did, in fact, drop those physicians in its baseline.
[22] Both federal physician figures were calculated from 2008 data in the 2009/2010 release of the ARF.

Ultimately, for the final estimates, we removed any self-identified resident or fellow from the Maryland license renewal file. We removed them from the HRSA baseline as well.

Maryland physician. We have three fields from which to identify physicians practicing in Maryland:

- Number of practice locations in Maryland.
- County of location of principal practice
- County of location of secondary practice

Of these options, we delineated a physician as a Maryland physician only if the principal practice was located in Maryland. In a little over a thousand cases, individuals had a principal practice in Maryland and a secondary practice outside of Maryland, or vice-versa. These were split roughly equally between those with a principal practice in Maryland and a principal practice outside of Maryland.

Incomplete surveys and missing values. Because this is survey data, we need to state explicitly what we do with individuals who appear not to have filled in critical portions of the survey. We only gap-filled the fields necessary to defined Maryland active non-federal patient-care physicians.

Work hours: no gap-fill. More than 1100 physician license renewals had zero work hours reported. Of those, about a third are less than 55 year of age. We ignore the possibility that those younger, non-working individuals reflect misreporting, and count them as inactive physicians.

The AMA faces a similar problem, in that physicians with unknown activity status are carried on the Masterfile. As with all our other adjustments, if the non-response rates differ across the files, then the Masterfile and licensure data are not strictly comparable. On the ARF, for 2008, physicians of unknown status amounted to 6 percent of active non-federal physicians on the file. For the Maryland licensure data, persons with zero reported work hours amounted to 5 percent of active non-federal physicians. Thus, although we cannot tell whether or not these are active physicians (so there is no clear way to adjust the file counts based on this), roughly the same percentage of the file is missing. We count these physicians as inactive, by analogy, with the omission of persons with unknown activity status from the Masterfile active physician counts.[23]

Primary practice county: gap-fill with primary practice ZIP or public address ZIP. We found about 3000 active physicians for whom the county of location for the primary practice was not reported. We gap-filled that information based on the ZIP of principal practice, if present. If not, we used the "public" (presumably, workplace) ZIP, if present. All residents and fellows required this imputation because they are not required to report data on their practices.

Age 75 or older: no gap-fill needed. The file appears to have birth date or calculated age for all entries.

Federal physician: gap-fill with the "any federal employment" field. Individuals who did not fill in the principal practice information have no information on whether or not that practice location is a federal facility. In those cases, we gap-filled using the question on any federal employment, and assigned those with missing practice data to the federal status if they had any federal employment.

2.7 Results: Physicians per 1000 population, Maryland versus the HRSA Baseline.

In this section of the analysis we show our baseline count of active, non-federal Maryland patient-care physicians. First, we show that, with adjustments, Maryland has about 27 percent more active non-federal patient-care physicians per capita than the HRSA benchmark. Second, we show that the same adjustments result in a close match between Maryland physicians as counted on the ARF, and Maryland physicians as counted from the license renewal file. Finally, we provide a sensitivity analysis to show that alternative

[23] Note, however, that it appears that HRSA included a significant portion of these physicians as "active" in its year 2000 baseline. The result of excluding them from the Maryland count may be a small under-count of Maryland physicians, to the extent that some fraction of those with missing data are actually active patient-care physicians.

ways of counting physicians from the Maryland license renewal file would have little material affect on the results.

Table 1 shows the results of the analysis. The top portion of the table starts from the data as published by HRSA, and then makes the adjustments to remove hospital residents and to remove the effects of the average over-count of active physicians. This takes the data from 2.53 active non-federal patient-care physicians per 1000, to 1.93 physicians per 1000 population, excluding residents, adjusted for the Masterfile over-count. The bottom portion of the table makes the equivalent adjustments to the Maryland license renewal file, taking out the (few) residents with license renewals, and adjusting the data up 4 percent for the average undercount of newly licensed physicians. This takes the Maryland license renewal data to 2.51 active non-federal patient-care physicians per 1000, excluding residents, adjusted for undercount of new licenses.

The result, on the bottom line of Table 1, is that Maryland has 27 percent more physicians than the HRSA baseline, after adjustments. That compares to estimates from HRSA and the AAMC in the range of about 25 to 29 percent (HRSA 2008, AAMC 2009). In contrast to this analysis, those studies were done entirely from AMA Masterfile data. The upshot is that when the Masterfile and Maryland license renewal data are correctly adjusted to provide a proper "apples-to-apples" comparison, one obtains the same result that has been shown previously using Masterfile data for both Maryland and the U.S.

Table 1: Adjusting HRSA Masterfile and Maryland License Renewal Data to a Common Basis			
	Value	Source	Line ID
HRSA Baseline, 2000			
1: Active (non-federal) patient-care physicians, 2000			
HRSA, active "clinical" physicians, 2000	713,810	HRSA 2008, exhibit 21	A
HRSA physicians/capita, 2000	2.53	HRSA 2008, exhibit 22	B
Check that calculation:			
Memo: 2000 U.S. population, 1000s	281,422	US Census Bureau	C
Memo: Calculated total physicians/1000 (A/C)	2.54	Calculated, A/C	D
2: Remove Hospital Residents (and Fellows)			
HRSA, active "clinical" physicians less residents, 2000	597,430	HRSA 2009, exhibit 20	E
HRSA physicians/capita, excluding residents	2.12	Calculated, E/C	F
3: Adjust for Masterfile over-count of active physicians			
AMA Masterfile over-count	10%	Staiger et al., 2009	G
Adjustment factor for over-count	0.91	Calculated, (1/(1+G))	H
Adjusted physicians/1000	1.93	Calculated, F*H	I
Maryland License Renewals, 2009/2010			
4: Maryland license renewal file, all physicians	25,687	MD lic. Renewal file	J
5: Active non-federal patient-care physicians	14,278	MD lic. Renewal file	K
6: Remove hospital residents	13,779	MD lic. Renewal file	L
7: Adjust for missing initial license data	4%	Discussed in text	M
8: Adjusted Maryland license renewal data	14,330	Calculated, L*(1+M)	N
Maryland resident population, 2009, 1000s	5,844	US Census	O
Maryland resident population, 2010, 1000s	5,905	US Census	P
Average, 000s	5,875	Calculated, (O+P)/2	Q
Maryland physicians/1000, excluding residents	2.44	Calculated (N/Q)	R
Difference, Maryland less HRSA standard, %	**27%**	**Calculated (R/I)-1**	**S**
Source: HRSA (2008), analysis of Maryland license renewal file 2009/2010, U.S. Bureau of the Census			

Table 2 applies the same set of adjustments to 2008 Maryland physician supply data from the ARF. The ARF data are summaries of the Masterfile. If these adjustments are roughly correct, then the ARF, for Maryland, should give roughly the same estimated count as the Maryland license renewal file, after adjustments. The bottom section of Table 2 shows that it does. The 2009/2010 Maryland license renewal file, with adjustments, shows about 2.3 percent more active non-federal patient-care physicians (excluding residents) than the ARF shows, for Maryland, for 2008. Based on the difference in timing, we would have expected to see about 2 percent more physicians. On net, the two files, after adjustment, differ by just 0.7 percent in their count of active non-federal patient-care physicians, excluding residents.

Table 2: Compare Maryland License Renewal Count to Maryland 2008 ARF Count (Same Adjustments as Table 1, Applied to Maryland Counts)

Label (using ARF file label where available)	**ARF variable**	**Value**
Active non-federal patient-care physicians, 2008		18,774
Total M.D.s, 2008	f1121508	18,358
Total D.O.s, 2007	f1398507	416
Active non-federal patient care residents, 2008		3,215
Total M.D.s, 2008	f1249908	3,056
Total D.O.s, 2007	f1412507	159
Active non-federal patient-care physicians, less residents		15,559
Adjustment for Masterfile over-count		91%
Estimated Maryland physicians, ARF with adjustments		14,145
Estimated Maryland physicians, license renewal file with adjustments		14,330
Discrepancy, Maryland less ARF:		1.3%
Memo:		
Active non-federal patient-care M.D.s, 2000	f1121500	16,487
Annual physician growth rate, 00 to 08		1.4%
1.5 years of growth -- expected discrepancy		2.0%
Unexplained difference, Maryland versus ARF		**-0.7%**
Source: ARF 2009 for ARF data, Maryland 2009/2010 license renewal file.		

Finally, Table 3 shows the impact of modest changes in our definition of Maryland active non-federal patient-care physicians under age 75. None of these changes would materially change our conclusion that Maryland has far more physicians per capita than the HRSA standard based on the year 2000 U.S. average. There is additional uncertainty that is not captured here (for example, in the discussion of missing values for the work hours data, above). But, the main point seems clear: any reasonable modification of the method will still show that Maryland has substantially more physicians per capita than the U.S. average.

Table 3: Active Maryland Non-Federal Patient-Care Physicians Under Age 75		
Showing sensitivity to changes in the definition		
	Physicians	**Impact of Change**
Active Maryland non-federal patient-care physicians under age 75, excluding residents (from Table 1)	13,770	0.0%
Testing variations on the definition		
Remove age restriction	13,995	1.6%
Any Maryland practice, not just principal	14,388	4.5%
Alternative Federal employment definitions:		
No non-federal restriction	14,253	3.5%
Exclude any Federal employment, not just principal	13,642	-0.9%
Require majority (not plurality) of time in patient care	13,359	-3.0%
Memo: Remove patient care restriction (all active)	15,423	12.0%
Source: Analysis of Maryland license renewal data 2009/2010		

2.8 Addendum: Attempting to Validate the HRSA Baseline

One of the more puzzling aspects of this analysis was our inability to replicate HRSA's baseline numbers, using ARF data and adopting a standard approach to counting physicians. The ARF contains a summary of the same underlying Masterfile data using the same AMA definitions as the HRSA analysis. In principle, summaries from the ARF should closely match the HRSA baseline. Yet, we found that HRSA's baseline count of year 2000 active (presumably) non-federal patient-care physicians was higher than we could obtain from the ARF, and much higher than other published sources, including publications from HRSA.[24]

This matters because we would like to use ARF data for the analysis of specific specialties and regions in Maryland. If HRSA summarized the physician counts in a way that cannot be duplicated, in detail, from the ARF (the only source of AMA Masterfile data available for this analysis), that will introduce a discrepancy into all subsequent analysis. Therefore, we would like a better understanding of how the ARF data compare to the HRSA baseline, and what, exactly, HRSA appears to have included in the physician counts in its baseline.

Our prime candidate for the additional physicians is those with unknown activity status. The Area Resource File identifies a number of U.S. physicians for whom the AMA does not know whether they are active or inactive. These are carried on the file as "not classified". This pool of "not classified" physicians is roughly 6 percent as large as the pool of active physicians. Many of these "not classified" physicians may be recent residency graduates for whom the AMA has not yet determined practice status (Rittenhouse et al. 2004). While the ARF documentation is not clear, by adding the data fields we verified that the ARF carries "not classified" physicians as a subset of *inactive* physicians. That is, total physicians is the sum of active and inactive, not the sum of active, inactive, and not classified. By default, counts based on the ARF active physician data fields will *exclude* physicians with unknown activity status. However, this practice is not uniformly used. Some analyses of physician supply appear to include the physicians of unknown status together with active physicians (e.g., Staiger et al 2009, page 1675). Other analyses clearly exclude them (Health U.S. 2010, page 518). The only way to know whether or not an estimate of active physicians includes the "not classified" physicians is to examine the details of the underlying study.

[24] For example, for the year 2000, other HRSA reports show 718,000 total active non-federal physicians, not restricted to patient care (http://bhpr.hrsa.gov/healthworkforce/reports/factbook02/FB201.htm). That count of *all active non-federal physicians* is about 20,000 *less* than the HRSA (2008) report of active *patient-care* physicians *under age 75*.

Our second candidate for the discrepancy is federal physicians. Federally-employed physicians have been traditionally excluded from physician supply estimates. They are devoted to treating a particular subset of the population (e.g., active military, veterans) and they tend to be highly clustered in a few locations (e.g,, Veterans Administration hospitals, military bases). The HRSA report, however, never used the term non-federal to describe their patient counts. That suggests that either the writing was imprecise, or, for some reason, they did not exclude federal physicians in their most recent analysis.

To match the HRSA baseline, we must augment the standard ARF active non-federal patient-care physician count with *both* the federal physicians and the physicians with unknown activity status (Table 4). When we do that, we get within 1 percent of the HRSA baseline count. This does not prove that the HRSA baseline includes both federal physicians and physicians of unknown activity status. But, given the language of HRSA's report (no use of the term non-federal) and the occasional practice of including unknown activity status with active, this seems to be a plausible explanation.

Table 4: HRSA 2000 Baseline Compared to ARF Data

	ARF variable	Value
HRSA: Baseline With age 75 and older physicians added, 2000		738,158
HRSA: Active "clinical" physicians, 2000 (from HRSA 2008)		713,810
Estimate of active patient-care over age 75, 2000		24,348
ARF: Initial Count, Active Non-Federal Patient Care Physicians, 2000		676,432
ARF: M.D.s, 2000	f1121500	631,236
ARF: D.O.s, Active Non-Federal, 2001	f1325701	45,196
ARF: Estimated Physicians With Unknown Activity Status, 2000		36,009
Non-Federal Physicians, Not Classified, 2005	f0481905	39,931
Ratio, patient-care M.D.s 2000/patient-care M.D.s 2005 (from ARF)		0.90
ARF: Active Federal physicians, 2005		20584
Augmented ARF total: Active non-federal plus unknown activity status and federal		733,025
Discrepancy, HRSA versus initial ARF total		**9%**
Discrepancy, HRSA versus *augmented* ARF total		**1%**

We choose not to modify our baseline analysis based on these findings, but note that if we did, it would only increase the measured supply of Maryland physicians relative to the US. As shown above, including active patient-care federal physicians would increase the Maryland count by about 4 percent. Including physicians with unknown activity status (due to missing data on work hours) would raise the count roughly another 5 percent. As it stands, we have already made the point that Maryland's active non-federal patient-care physicians per capita greatly exceed the HRSA year 2000 standard.[25]

[25] Adding these physicians to the count would result in a ratio of Maryland physicians to the HRSA baseline that was about 9 percent higher than either the HRSA or AAMC studies showed. However, *we* are comparing 2008 Maryland data to the HRSA 2000 U.S. baseline, while *those studies* were contemporaneous comparisons of Maryland and the US. Growth in Maryland physician supply in the intervening eight years could plausibly account for the additional 9 percentage point discrepancy that would occur from including these physicians in the counts.

Finally, this creates an odd situation for updating the national benchmark data to a later year. We took the most recently available data (2008 physician supply) from the ARF and constructed a national estimate that was *completely* analogous to the Maryland licensure file data. That is, we omitted federal physicians and those with unknown activity status. Doing that, we found an average of 2.48 active non-federal patient-care physicians per 1000 (including residents). This is nearly identical to the HRSA baseline number of 2.53. In short, the HRSA *2000* baseline *including* those extra physician groups is very nearly identical to a traditionally-calculated *2008* baseline *excluding* those groups. In aggregate, we would get essentially the same result whether we used the published HRSA year 2000 baseline or generated a more traditional comparison (excluding federal physicians and those of unknown activity status) for the Maryland file using 2008 ARF data.

3 Accounting for Differences Between Maryland and the U.S.

This section of the report looks at three potential adjustments to account for differences between Maryland and the U.S. as a whole. We ask three questions:

- Do Maryland active non-federal patient-care physicians provide fewer patient-care hours, on average, than the typical U.S. physician?
- Would we expect the population of Maryland to require more physicians per capita than average, based on its demographics compared to the U.S. average?
- Is there a net flow of patients into or out of Maryland that would require more or fewer physicians than the U.S. average?

3.1 Overview

Thus far, we have shown that Maryland's physician-to-population ratio greatly exceeds the HRSA benchmark. But the per-capita physician count does not tell the entire story. We should ask whether any other factors suggest a higher need for physician care in Maryland or a lower effective supply of patient-care hours per physician. If Maryland patients need more care, or Maryland physicians supply less care per person, that would partially account for the high physician-to-population ratio in Maryland.

3.2 Summary of main findings

The answer to all three questions is no. As far as we can tell, for the state as a whole, adjusting for these three factors would make no material difference in the results shown in Section 2 above.

- **Patient-care time per active non-federal patient-care physician might be slightly lower in Maryland than for the U.S. as a whole, but the size of that effect is both small and uncertain.**
- **The age distribution of Maryland's population suggests no significant difference in demand for physicians per capita, relative to the U.S. average.**
- **Using Medicare fee-for-service claims as a proxy for all patients, the flow of patients into and out of Maryland has essentially no impact on the demand for physician services in the aggregate.**

3.3 Patient-care hours per active non-federal patient-care physician

The MHA/MedChi analysis identified a substantial physician shortage based, in part, on an estimate that Maryland physicians average 15 percent less patient-care time per physician than the national average. If true, Maryland would require more than the national average of physicians per capita to meet the need for care. Thus, the assertion that Maryland physicians provide much less patient care than average played a key role in the estimated shortage of physicians in the MHA/MedChi analysis.

The MHA/MedChi adjustment was unusual in many respects. First, as far as we can tell, studies of state-level physician supply typically make no adjustment for actual hours worked, but sometimes adjust for the expected difference in hours based on physician demographics. This is true of the HRSA and AAMC state-level analyses (HRSA 2008, AAMC 2009). This is also true for a recent analysis of Virginia's physician needs, even though, in that case, they had survey data showing typical work effort (Virginia 2010, page 13).

Second, the adjustment was not based on physician surveys that could, in theory, be compared to a comparable national standard.[26] Instead, the reduction was based on a unique survey of Maryland teaching hospital medical directors and, possibly, equivalent persons in Maryland's medical schools (MHA/MedChi 2008b). In effect, it was based on what the relevant medical directors believed about staff work hours.

[26] The MHA/MedChi analysis pre-dates the current version of the licensure survey in which physicians report their typical weekly work hours, so that information was not available.

Further, the choice to count most hospital residents as equivalent to 0.1 full-time-equivalent (FTE) physician appears to have been arrived at by consensus or by an expert panel, although it has some precedent (MHA/MedChi 2008).[27] In particular, that choice would (nearly) eliminate residents from the Maryland portion of the calculation while leaving them in the HRSA benchmark.

Third, there is no such FTE approach in either the 2008 final HRSA report or an earlier 2006 report (HRSA 2008, HRSA 2006). In both cases, HRSA defines an FTE physician of a given specialty as the average patient-care hours actually observed for physicians of that specialty in the base year (2000, but in fact, 1998 survey data). HRSA does not define FTE physicians in terms of a fixed number of hours per week (e.g., 40 or more hours per week), but instead simply uses the FTE concept to track changes in average physician patient-care hours after the base year.[28] In HRSA's analysis, the average physician in 2000 is 1.0 FTE, by definition.

Although the MHA/MedChi approach no longer applies to the current HRSA analysis, it nevertheless raises a serious question: Do Maryland physicians provide as many patient-care hours as similar physicians in other states?

The 15 percent reduction reported by the MHA/MedChi study was loosely explained as being due to the number of teaching and research slots in Maryland, the above-average number of interns and fellows, and, possibly, the higher proportion of physicians who are female (HCAR 2008). Recall, however, that we are looking solely at *active non-federal patient-care* physicians. We have already excluded physicians whose principal employment is in teaching, research, or administration, or in federal employment of any type, as well as residents and fellows.

Further, we can directly show that the higher percentage of female physicians in Maryland has no material impact on the hours we would expect for Maryland physicians vis-à-vis the U.S. average. Female physicians work shorter hours on average. An AAMC survey estimated that, at most, male physicians work an average of 19 percent more hours than female physicians (AAMC 2009, page 58.) (That difference would narrow if adjusted for specialty.) But for 2008, for all active physicians, the ARF shows 31 percent of U.S. physicians and 36 percent of Maryland physicians were female (calculated from the 2009/2010 ARF). That difference is not large enough to matter much. The 5 percentage points of additional female physicians in Maryland would predict less than 1 percent fewer patient-care hours per physician, on average ($0.05 \times 0.19 \approx 0.01$).

Even though there appears to be no clear a priori reason to expect lower hours, and although we found no state studies that adjusted for observed differences in patient-care hours per physician, this still seems like a reasonable question to ask. If Maryland physicians do, in fact, provide fewer patient-care hours, that would need to be accounted for in the analysis.

This turns out to be remarkably difficult to answer. For Maryland, we have excellent data on work hours. Physicians had to answer work hour questions to renew their license, so nearly all active physicians in Maryland answered the same work hour questions asked in the same way.[29] The problem is that we have nothing directly comparable for the U.S., because *estimates of average U.S. physician patient-care hours vary widely across data sources*. The answer to the question "how many hours do you work" appears to depend on when, how, and by whom the question was asked.

[27] For purposes of HPSA designation, a primary care resident is counted as 0.1 FTE (http://bhpr.hrsa.gov/shortage/hpsaguidepc.htm). As noted earlier, the HPSA designation rules have no bearing on HRSA's assessment of adequacy of U.S. physician supply.

[28] We believe this in part explains why the HRSA standard used here (2.53 physicians per 1000) is substantially higher than the national standards the MHA/MedChi analysis attributes to HRSA. It was not possible to tell where the MHA/MedCHI study obtained their HRSA standards. The October 2006 draft HRSA analysis cited there is no longer available on line, and neither the 2006 nor 2008 versions that are still available contained the numbers cited by MHA/MedChi. The MHA/MedChi study assumed that the average U.S. active patient-care physician amounted to 0.79 FTE physicians, while in the final HRSA analysis, the average physician in the year 2000 is 1.0 FTE *by definition*.

[29] Although we have excellent data on hours per week, the survey does not ask for typical weeks per year, so we have to assume that average work days per year does not vary widely across physicians.

Table 5 shows the magnitude of the problem. Three roughly contemporaneous surveys of U.S. physicians (restricted to active patient-care physicians) yield very different estimates of work hours. Sample sizes are large enough in each case that this cannot be attributed to sampling error, but instead must reflect systematic differences from the surveys themselves, such as the way in which physicians were selected and questions were asked. In particular, the difference in the two estimates of patient-care hours, for the U.S. as a whole, is larger than the 15 percent difference we are trying to identify for Maryland. In other words, the systematic noise that arises from comparing data across survey sources is larger than the effect we are trying to identify. This makes it methodologically risky to compare counts of hours across different surveys.

Table 5: Poor Agreement of Physician Work Hours Data

	Total Hours	Patient-Care Hours	Source
Health Systems Change, 1999	55	45	A
American Medical Association, 1998		52	B
CPS, 2000, Typical Hours Worked	54		C
CPS, 2000, Average Hours Actually Worked	51		C
Largest difference observed	-6%	17%	

Sources: A: Trude (2003), B: Calculated from Table 10, HRSA (2008), C: Calculated from 2000 CPS Data Files

In keeping with this, we broke the analysis into two tasks. For *total* work hours per week, the U.S. Current Population Survey provides one uniform data source within which we can compare Maryland physicians to the U.S. average. For *the fraction of total hours devoted to patient care*, by contrast, we have no choice but to compare the Maryland license renewal data to some other survey source.

Maryland physicians appear to work perhaps 2 percent fewer hours than the U.S. average (Table 6). The U.S. Current Population Survey (CPS) gathers information on work hours for roughly 50,000 U.S. residents monthly, of which roughly 300 are physicians. Individuals stay in the survey up to six months. To achieve adequate sample size, we pooled eleven years of monthly data (2000 to 2010). We selected physicians and surgeons, excluding those employed by the federal government or working under 20 hours per week. This yielded just over 1200 observations on Maryland physicians (which would be, in fact, just over 200 unique individuals). Within the limits of this relatively small sample, the data suggest that Maryland physicians work just slightly fewer *total* hours than the average U.S. physician.[30]

Table 6: Active Non-Federal Physicians, Average Work Hours Per Week, 2000 to 2010

	Observations	**Average hours**	**Difference from US**
U.S. Physicians			
Typical hours worked, weekly	41,655	52.7	
Actual hours worked, last week	41,655	49.9	
Maryland Physicians			
Typical hours worked, weekly	1,241	51.9	-1.4%
Actual hours worked, last week	1,241	48.9	-2.1%

Source: Analysis of U.S. Current Population Survey monthly data files, 2000-2010.

[30] The CPS analysis also suggested why the question of actual hours per physician is seldom addressed in state studies. Even with the assumed sampling errors in the survey, average hours were within 5 percent of the U.S. average for 80 percent of the states. That suggests that state-to-state variation in physician work effort is typically small.

Table 7 shows that the fraction of hours spent on patient care in Maryland is similar to that shown in an ongoing national survey, although the hours of care are not. The Center for Studying Health Systems Change (CSHSC) physician survey gathers information on a sample of active patient-care physicians, using the AMA Masterfile and definitions as the framework (CSHSC 2008). It is not clear that the sample, methods, or questions from that survey are comparable to those in the Maryland license renewal survey. (For example, the early years of the survey are clustered in just a handful of U.S. communities). But, with that caveat, the fraction of work time devoted to direct patient care in Maryland appears within the range of estimates shown by the ongoing CSHSC study. At worst, Maryland active patient-care physicians appear to devote perhaps a 4 percent smaller fraction of total work time to patient care.

Table 7: Patient Care as Percent of Total Work Hours, Active Patient-Care Physicians

Survey and Subset of Active Patient-Care Physicians Included	Year	Total hours	Patient-Care Hours	% patient care	Source
CSHSC					
All	1997	55.5	44.7	81%	A
All	1999	54.5	44.7	82%	A
All	2001	54.4	46.6	86%	A
All	2004	53.0	46.0	87%	B
All	2008	51.4	N/A	N/A	C
Maryland					
Non-federal, excl, residents	2009/2010	49.2	41.6	84%	D
Non-federal	2009/2010	49.6	41.8	84%	D
All	2009/2010	49.7	41.6	84%	D
Memo: Maryland versus 2004 CSHSC				96%	
N/A: Survey was redesigned, question was not asked.					
Sources: A = Trude (2003), B = CSHSC summary file 2005, C = CSHSC summary file 2008, D = Analysis of Maryland license renewal file.					

Given that the data sources either have a small sample size (CPS) or are not necessarily comparable (CSHCS survey and Maryland license renewal data), it is difficult to say what we should do with this result. Both parts of the analysis suggest that Maryland active non-federal patient-care physicians may work fewer hours than the U.S. average. That seems like a sensible result, given the apparently abundant supply of physicians in Maryland. But the estimated effect is nowhere near large enough to offset Maryland's high physician-to-population ratio. On net, given the uncertainties involved, we think these results should best be viewed as providing a small caveat to the main analysis. It is reasonable to suggest that some modest portion of Maryland's high physician-to-population ratio is offset by fewer patient-care hours per active non-federal patient-care physician. Nothing in the available physician survey data suggests that the portion should be as high as 15 percent.

3.4 Maryland population demographics compared to the US.

HRSA (2008) estimates need for physicians for subsets of the population split by age and gender. Using Census 2009 population projections, we estimated that physician requirements in Maryland would be about 1.5 percent lower than for the nation as a whole, based on the age distribution of the Maryland population relative to the U.S. average (Table 8). This seems small enough that it is not worth including as a separate adjustment in the analysis.

We note further that HRSA assumes lower physician needs for populations enrolled in managed care. Given the relatively high managed care penetration in the state, we believe that this would also argue for a further slight downward adjustment in the expected need for physicians. We again expect that any such adjustment would be small compared to the extent to which Maryland physicians per capita exceeds the national average.

Table 8: Demographic Influences on Physician Requirements, Maryland Compared to the US

	HRSA Physicians/1000 Population Requirements					2009 Population Estimate	
	Primary Care	Medical Specialties	Surgical Specialties	Other	Total	U.S. population, 2009	Maryland Population, 2009
0–17 years	95	10	16	29	149	74,202,891	1,398,554
18–24 years	43	15	54	48	159	30,257,490	599,470
25–44 years	59	23	52	62	196	82,769,818	1,601,780
45–64 years	89	41	59	81	270	79,560,530	1,541,721
65–74 years	175	97	125	145	543	20,713,282	375,066
75+ years	270	130	161	220	781	18,768,384	327,584
Total	95	33	55	70	253	306,272,395	5,844,175
Population Weighted Averages, 2009							
US 2009	95	35	57	73	259		
MD 2009	93	35	56	72	256		
% difference	-2%	-2%	-1%	-1%	-2%		

Source: Requirements are from HRSA 2008, exhibit 29. Population data are U.S. Census Bureau, Population Division, Interim State Population Projections, 2005.

3.5 Maryland patient border crossing.

We used Medicare 2009 5 percent sample limited data set standard analytic file claims to assess the extent to which patients travel across Maryland borders. While the elderly may not be an ideal proxy for all patients, this should give us some notion of whether or not a border-crossing adjustment would change the results of the analysis significantly.

For traditional (fee-for-service) Medicare patients, the net flows into and out of Maryland are almost exactly in balance (Table 9). There is a small net inflow of fee-for-service Medicare patients into the state, but an imbalance of patient flows of this size would have no material effect on the results.

Table 9: Medicare Fee-for-Service physician Services, Maryland Border Crossing, 2009		
	Millions of services	Millions of dollars
Non-Maryland resident served in Maryland	1.70	$ 171
Maryland resident served outside Maryland	1.62	$ 167
Maryland resident served in Maryland	17.89	$ 1,659
Memo: Outflow less inflow as % of total care delivered in Maryland	0.4%	0.2%
Source: Analysis of Medicare 5 percent sample LDS SAF claims, 2009. Data inflated by a factor of 20 to estimate actual totals from 5% sample claims.		

4 Estimates by broad specialty group and region.

This section of the report looks separately at four broad groups of physicians within five sub-regions of Maryland. We compare them to the (adjusted) HRSA standards, and, as with the state-level analysis, ask whether regional adjustments would make a significant difference in the results.

4.1 Overview and caveats.

In this section we look separately at four groups of physicians: primary care, medical specialists, surgical specialists, and all others. We calculate physicians per 1000 population in the five regions of Maryland and compare them to the relevant HRSA benchmarks by specialty group.

Moving from the state-level analysis to the regional analysis raises several caveats. We process the regional data exactly as we have done nationally, dropping residents and inflating by a uniform factor of 4 percent to account for missing new physicians, then making no further adjustments. Each of these steps could be questioned for the regional analysis.

First, the removal of residents from the analysis raises a significant caveat for a regional analysis because residents are highly concentrated in the Baltimore and National Capital regions. We will significantly under-state the true variation in available physician resources across regions. But to address this using Maryland's own data, we would have had to obtain and integrate the Maryland UMP registry data with the license renewal file.

Second, as noted earlier, there could be specialty or regional variation in the adjustment for newly licensed physicians omitted from the license renewal file. The 4 percent adjustment is a statewide all-specialty average. We suspect that any variation in a specialty-specific or region-specific adjustment would be fairly small, but we do not investigate whether or not that is true. We would have needed to make an additional request for more detail on newly licensed physicians to be able to make such an adjustment.

Third, we demonstrated that population demographics should have little effect on the demand for physician services in Maryland as a whole. We do not test that separately for each region of Maryland.

Finally, while border-crossing for care was not a significant issue for the state as a whole, it is a major issue for a regional analysis. In general, people living in rural areas travel to urban areas for a significant portion of their care. In this analysis, we merely tabulate the extent of intra-state border crossing (for the Medicare population), but we do not adjust the regional data to account for care delivered out-of-region.

4.2 Summary of main findings

After all adjustments, including adjustment for variation in average patient-care hours per physician, **Southern Maryland is below the HRSA benchmark for all categories of physicians.** The Eastern Shore is roughly at the HRSA standard for primary care physician and surgeons. All other areas exceed the HRSA standards. All of these are regional averages and do not address the issue of supply problems for small areas or specific populations within those regions.

Physicians and patients appear to have adapted somewhat to the low physician supply in Southern Maryland. Physicians in that region work longer hours, and patients tend to travel outside the region for a significant portion of their care. Medicare beneficiaries residing in that region got as much physician care as beneficiaries in the rest of Maryland.

4.3 Regional Analysis

Table 10 shows the distribution of physicians per 1000 population by broad specialty category and region.[31] The results should be unsurprising to anyone roughly familiar with the distribution of physicians in Maryland.

- In the Baltimore region, physician-to-population ratios exceed the HRSA benchmarks.
- Southern Maryland has physician-to-population ratios below the HRSA benchmark for all types of physicians.
- The National Capital area exceeds the HRSA benchmark for all types of physicians, but is only modestly above the HRSA benchmark for primary care.
- The Eastern Shore is below the HRSA benchmark for primary care physicians and surgeons.
- The Western region has a physician-to-population ratio below the HRSA benchmark for surgeons.

Table 10: Maryland Supply by Type of Physician and Region, 2009/2010

	Total	Primary Care	Medical Specialties	Surgical Specialties	All Other
Maryland physicians per 1000, residents excluded, with all adjustments					
Baltimore Metro	2.85	0.86	0.48	0.61	0.90
Eastern Shore	1.86	0.62	0.27	0.39	0.57
National Capital	2.25	0.72	0.41	0.48	0.64
Western	2.17	0.73	0.39	0.42	0.63
Southern	1.34	0.53	0.25	0.26	0.30
Total	2.44	0.77	0.42	0.52	0.74
Memo: HRSA baseline, interns excluded, with all adjustments	1.93	0.69	0.27	0.43	0.53
Percent difference from HRSA baseline					
Baltimore Metro	48%	24%	76%	41%	70%
Eastern Shore	-4%	-10%	0%	-11%	8%
National Capital	17%	4%	49%	11%	21%
Western	12%	5%	41%	-4%	19%
Southern	-31%	-24%	-8%	-40%	-43%
Total	27%	11%	54%	19%	39%

Source: Analysis of Maryland 2009/2010 license renewal database, calculations from HRSA 2008, population counts from U.S. Bureau of the Census

We can adjust these data for variations in average patient-care hours per physician. First, we used the license renewal data to create an index of patient-care hours by region and specialty, normalizing the average patient-care hours by region and specialty to the state average for that specialty. We can see a slight tendency for physicians to offset variations in physician supply with variation in an average work week. On average, hours are slightly higher in the areas with fewer physicians per capita (Table 11).

[31] Appendix A lists the counties in each region.

Table 11: Average Patient-care Hours per Physician, and Hour Index					
	Total	**Primary Care**	**Medical Specialties**	**Surgical Specialties**	**All Other**
Average hours per week					
Baltimore Metro	40.68	40.08	41.15	44.41	38.47
Eastern Shore	45.14	45.83	46.47	49.30	40.95
National Capital	41.97	40.92	44.74	43.76	40.05
Western	44.33	43.52	44.77	48.15	42.47
Southern	44.40	43.60	43.37	49.44	42.30
Total	41.71	41.10	42.87	44.90	39.44
Hour index					
Baltimore Metro	0.98	0.97	0.96	0.99	0.98
Eastern Shore	1.08	1.12	1.08	1.10	1.04
National Capital	1.01	1.00	1.04	0.97	1.02
Western	1.06	1.06	1.04	1.07	1.08
Southern	1.06	1.06	1.01	1.10	1.07
Total	1.00	1.00	1.00	1.00	1.00
Source: Analysis of Maryland 2009/2010 license renewal database					

After adjusting the count of physicians per 1000 by the hour index above, we still see low physician-to-population ratios in Southern Maryland. In all other areas, low supply has been offset by higher patient-care hours per physician, other than a smaller value for surgeons on the Eastern Shore (Table 12).

Table 12: Difference From HRSA Baseline, After Adjustment for Variation in Average Patient-care Hours					
	Total	**Primary Care**	**Medical Specialties**	**Surgical Specialties**	**All Other**
Baltimore Metro	44%	21%	69%	40%	66%
Eastern Shore	4%	0%	8%	-2%	13%
National Capital	18%	4%	56%	8%	23%
Western	20%	12%	48%	3%	29%
Southern	-26%	-19%	-7%	-34%	-39%
Total	27%	11%	54%	19%	39%
Source: Analysis of Maryland 2009/2010 license renewal database, calculations from HRSA 2008, population counts from U.S. Bureau of the Census					

While Southern Maryland has a physician-to-population ratio that is well below the HRSA benchmark, this does not affect physicians' willingness to accept new Medicare and Medicaid patients. Table 13 shows that, on net, the percent of practices treating some Medicaid or Medicare patients exceeds the state average

substantially. Of those taking such patients, perhaps 1 percent more practices are closed to new patients than for the state as a whole. On net, the low physician-to-population ratio in that area has not resulted in any material increase in practices closed to new patients.

Table 13: Acceptance of Medicaid and Medicare Patients, by Region

	Medicaid		Medicare	
Region	% of practices accepting Medicaid	Of those, % accepting new Medicaid patients	% of practices accepting Medicare	Of those, % accepting new Medicare
Percent of physicians				
Baltimore Metro	80%	88%	85%	94%
Eastern Shore	89%	90%	91%	94%
National Capital	61%	85%	79%	93%
Western	80%	85%	86%	91%
Southern	86%	86%	89%	93%
Total	75%	87%	84%	94%
Percent difference from state average				
Baltimore Metro	6%	1%	2%	1%
Eastern Shore	18%	4%	8%	1%
National Capital	-19%	-2%	-6%	-1%
Western	6%	-3%	2%	-3%
Southern	15%	-1%	6%	0%
Total	0%	0%	0%	0%
Source: Maryland license renewal survey, 2009/2010				

One more significant question remains: do residents of Southern Maryland simply use less care than the state average, or do they travel to regions outside of Southern Maryland to get care? We can get some idea of the answer to this by looking at Medicare claims. While this (largely) includes only elderly individuals, it is a population with uniformly good health insurance coverage. We would expect that differences in use and travel patterns would therefore reflect the interaction with the supply of physicians, rather than, for example, variations in coverage.

Physician services spending per capita for Medicare fee-for-service beneficiaries in Southern Maryland is not much different from the rest of the state. Instead, these beneficiaries are more likely to travel to get their care. The physicians located in Southern Maryland only provided 67 percent of the care their residents received (Table 14). The rest was obtained from physicians in the National Capital Area, physicians out-of-state, and to some degree, physicians in the Baltimore area. For Medicare, at least, the low physician-to-population ratio in Southern Maryland has largely been handled by a greater degree of patient travel for care.

Table 14: Intrastate Travel for Care, Medicare Fee-for-Service Part B Beneficiaries, 2009								
Maryland Residents, Physician Services Spending Per Capita								
	Physician Location							
Beneficiary Residence	Baltimore Metro	Eastern Shore	National Capital	Western	Southern	Out of state	Total	% of spending in own region
Baltimore Metro	$ 2,503	$ 12	$ 56	$ 23	$ 7	$ 74	$ 2,675	94%
Eastern Shore	$ 299	$ 1,712	$ 26	$ 6	$ 2	$ 318	$ 2,362	72%
National Capital	$ 159	$ 4	$ 2,335	$ 15	$ 73	$ 595	$ 3,181	73%
Western	$ 121	$ 8	$ 101	$ 1,834	$ 3	$ 224	$ 2,290	80%
Southern	$ 182	$ 4	$ 378	$ 6	$ 1,806	$ 316	$ 2,692	67%
Source: Analysis of Medicare 5% sample limited data set standard analytic files and denominator file, 2009								

5 Summary

This chapter presents a brief summary. This includes the results the analysis *did* show, a quick reminder of what it *did no*t show, and some suggestions for further research.

5.1 Summary of findings

This study was motivated by conflicting information on physician supply presented to the Maryland HCAR taskforce. Traditional studies, based solely on AMA Masterfile data, showed Maryland physician supply much higher than the U.S. average. The 2008 MHA/MedChi report, by contrast, compared Medicare license renewal data to a standard based on AMA Masterfile data, and concluded that there were significant shortages of physicians in Maryland.

The purpose of this study was to estimate an accurate count of physicians delivering patient care. As such, it has been an exercise in tracking down important details of methods. Exactly what physicians are included or excluded, and by what criteria? How do the data sources differ in completeness? How were interns, residents, and fellows handled? How are federal physicians defined, and were they excluded or not? How rapidly are physician retirees removed from the counts, and how rapidly are newly licensed physicians included in the counts? Can we determine, from objective data of any sort, whether Maryland physicians work more or fewer hours than the U.S. average?

These details mattered substantially. The resulting adjustments were large. At root, the conflicting information arose from the large differences between the Maryland license renewal data and the AMA Masterfile data.

Once we properly reconciled those differences, we arrived at two completely unremarkable conclusions:

- Our estimates align with those made by the premier U.S. organizations for modeling physician supply and demand, HRSA and the AAMC, who state that Maryland's physician-to-population ratio is well above the U.S. average.
- The gold standard for U.S. physician supply information, the AMA Masterfile, appears to match the Maryland license renewal data well, as long as we make the necessary and relevant adjustments to account for differences between the files.

Beyond that, for the state as a whole, our results boil down to "no further adjustments appear warranted at this time". In particular, based on relatively scant data, we found nothing to suggest that Maryland active patient-care non-federal physicians provide substantially fewer patient-care hours than the U.S. average. In a uniform national survey of total work hours, a small sample of Maryland physicians reported a slightly lower work week than the U.S. average. Contrasting two different surveys, Maryland physicians seemed little different from the U.S. average in terms of the fraction of work hours devoted to patient care. Both of those results are methodologically weak (one for the use of a small sample, the other for contrasting two different physician surveys). But that appears to be the best available information on physicians' own estimates of time spent treating patients.

Taken together, these findings should be reassuring. For the state as a whole, a proper comparison of Maryland licensure data with AMA Masterfile data suggests no immediate state-wide crisis in physician supply. Instead, the historical estimates of Maryland as a relatively well-supplied state appear to remain true.

By region and specialty, we identified a low physician-to-population ratio in Southern Maryland. Again, that was a completely unremarkable conclusion, as Southern Maryland has long been an area of concern in this regard. (In addition, supply for some types of physicians was at the U.S. benchmark for the Eastern Shore.)

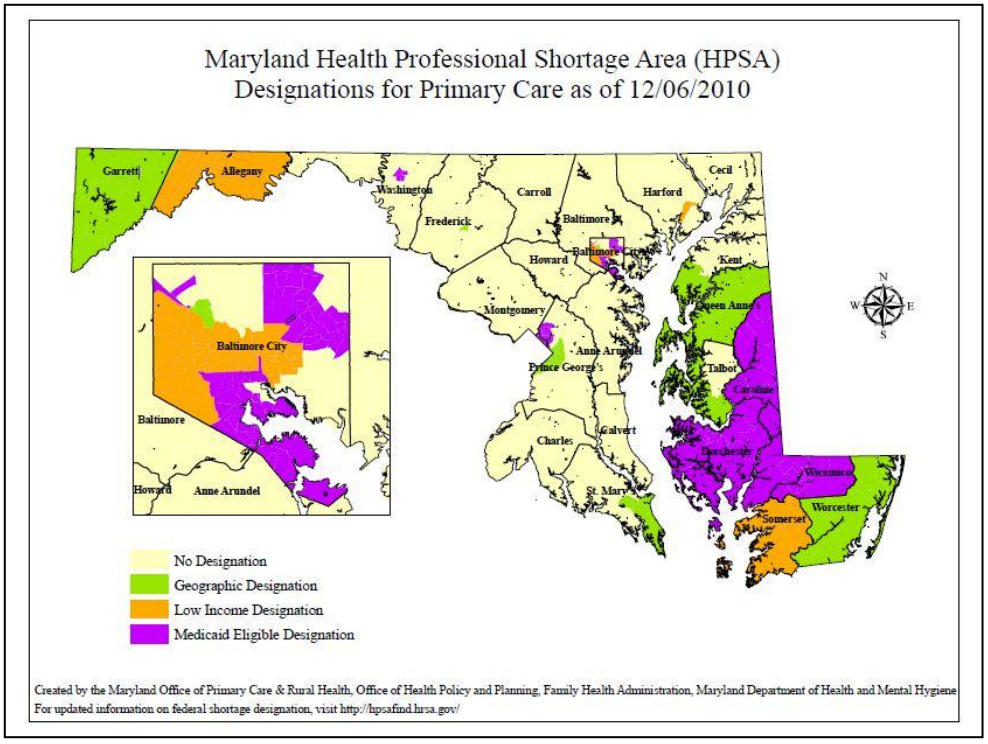
We provided some genuinely new information on the reaction of the health care system to these regional variations in physician supply. The low physician supply in Southern Maryland did not cause physicians to

close their practices to new patients. Instead, they tended to work longer hours, on average. For the Medicare population, residents of Southern Maryland were more likely to travel outside the region to get care, but there was no reduction in the total amount of physician care they received relative to the state average.

5.2 What we did *not* do in this study, and what we did *not* conclude

The overall conclusion of this report should not be used to argue that there are no physician supply problems in Maryland. This has been a broad-brush study, focused on areas no smaller than regions, and on broad classes of physicians. In particular, this study did not address the issue of shortages for small geographic areas or individual physician specialties. Nor does it address the potential for physician supply issues to develop as the baby boom generation retires or as health care reform reduces the number of uninsured persons in Maryland.

First, Maryland clearly has some geographic areas with severe primary care physician shortages. The map below shows federally recognized primary care Health Professional Shortage Areas (HPSAs). Green areas are geographically defined HPSAs, meaning that they qualify solely due to low physician-to-population ratios for primary care physicians. As noted earlier in the report, an area must be well below the national average primary care physician-to-population ratio to qualify as a geographically defined HPSA. In Maryland, as in most states, geographic HPSAs (where HPSA status applies to all residents of the area) tend to be located in rural areas. Here, the entire counties of Garrett, Queen Anne's, and Wicomico qualify as geographic HPSAs, along with a few more limited areas elsewhere in the state. (The remaining HPSA areas are based on levels of under-service for the population in poverty, not the general population.)



There is no inconsistency between Maryland's above-average total physician supply and the presence of localized shortage areas within the state. Maryland ranks fourth lowest among states in terms of the fraction of the population living in primary care HPSAs, having 4.7 percent of the population in those areas, compared to a national average of 11.8 percent (Kaiser 2010). The relatively modest extent of HPSA designation in Maryland could be consistent with the finding of above-average overall physician supply in the State.

The low proportion of Maryland population in HPSAs may, however, reflect the way in which HPSAs are defined. Under the current HPSA definition, states with populations that suffer from income-based or, more broadly speaking, social-determinants-driven access issues are less likely to obtain HPSA designations. The Patient Protection and Affordable Care Act of 2010 requires HRSA to use a negotiated rulemaking process to define HPSAs (and other shortage area designations) on a broader range of criteria.[32]

Second, Maryland may have shortages in some specialty areas. In general, the long lead time from medical school entry to licensure means that the mix of physicians responds slowly to changes in demand for services. Any rapid changes in medical technology or shifts in patterns of service use can place pressure on the existing supply of specialists.

Identifying those shortages in a HRSA-type approach may be difficult. HRSA uses average U.S. health care in 2000 as the standard. This may be sufficient to gauge overall supply, and might even provide a reasonable yardstick for broad categories of physicians. But it will not reflect changes in patterns of service use since 2000, for example, the rapid growth in use of advanced imaging (CT, MRI, and nuclear) since 2000, or rapid growth in hospital emergency department use. And it will not reflect state-specific factors such as variation in prevalence of disease. For example, that approach would not predict a greater need for oncologists in states with high prevalence of cancer.

We did not display physician supply data for individual specialties. The results appeared mixed, and we had no way to validate or refute the findings. For example, on the one hand, general and thoracic surgeons appeared among specialties having the lowest supply in Maryland relative to the year 2000 national average. HRSA had projected ongoing declines in physician supply for these specialties (HRSA 2008, Table 20). So, low supply in Maryland in 2010 seems at least plausible. On the other hand, emergency medicine physicians were among the specialties in most abundant supply relative to the HRSA standard. But Maryland consistently ranks near the bottom of states in terms of average hospital emergency department waiting times (MHCC 2007). On the face of it, that seems substantially less plausible. Yet both sets of results come from the same underlying methodology. That suggests that the methodology needs to be improved or replaced with some alternative before becoming the basis for policy action at the level of individual specialties.

Third, this study did not project future physician requirements or supply for Maryland. Historically, Maryland's physician supply has risen roughly in step with U.S. physician supply. Using ARF data on all active patient-care MDs (including residents), U.S. per-capita physician supply increased 5.6 percent from 2000 to 2008. For Maryland, the comparable figure was 4.7 percent. Excluding residents, the comparable figures were 5.7 percent and 5.1 percent, respectively.[33] Consistent with slightly slower growth, Maryland's physician workforce appears slightly older than the US average. Physicians age 60 and older account for about 27 percent of active Maryland physicians, compared to roughly 25 percent for the U.S. as a whole (AAMC 2009, Table 7). Based on that comparison, Maryland may face modestly higher pressures on physician supply from the retirement of baby boomer physicians.

Nationally, HRSA has projected a leveling off of physicians per capita in this decade, and an absolute decline in full-time-equivalent physicians per capita due to reductions in average patient-care hours over time (HRSA 2008, figures 22 and 23). Over the same period, they project steady, modest increases in the number of physicians per capita needed (HRSA 2009, Figure 40). HRSA suggests that, absent a modest increase in medical school graduates, these conditions will lead to some degree of shortage of physicians required to maintain current standards of care (HRSA 2008, page 100). The AAMC, by contrast, looked at the same underlying data but concluded that a more aggressive expansion of medical education was required (AAMC 2009, page 5). If either view is correct, Maryland will likely experience at least some of the pressure on physician supply that is projected for the U.S. as a whole.

[32] The current status of the rulemaking process can be found at: http://www.hrsa.gov/advisorycommittees/shortage/index.html
[33] These figures were all calculated from the 2009/2010 ARF using data for MDs and Census population counts.

5.3 Suggestions for further analysis

To bring this full circle, the Maryland HCAR task force recommendation to improve Maryland's physician supply data was an excellent first step in this area. Thanks to that decision, we can now categorize active non-federal patient-care Maryland-licensed physicians in a way comparable to national data sources, and, with adjustments, make a reasonably accurate comparison between Maryland and U.S. physician-to-population ratios. Based on the results of this analysis, we offer three general suggestions to policy makers for further work in this area.

First, use a broader array of indicators where possible. We could have more confidence in the results of an analysis if we could triangulate across a diverse set of indicators. A low physician-to-population ratio provides some indication of potential difficulties in the health care system. But, consider how much stronger the case for policy intervention would be if that same low ratio were found in combination with reduced service use, increased emergency use of care, rising physician salaries, higher rates of unfilled positions, increased patient travel for care, increased wait times for care, higher rates of practices being closed to public patients, higher impacts on the poor and those with mobility limitations, and so on. Many of those indicators could be made available from sources that Maryland can access now (such as hospital, physician, and other claims data), or could readily develop in partnership with medical providers in the state.

In short, basing policy decisions on a single study or a single measure of adequate physician supply is needlessly risky. Instead of looking at the information that happens to be made available, policy makers need to decide, pro-actively, what information they want to see in order to be comfortable making policy interventions in this area. Asking for better information on physician work hours and practice location was a good start. Having now looked at that new information, it may be time to assess what other information, which is feasible to obtain, that would be helpful in making decisions in this area. As a start, we suggest that coupling the analysis of physician supply to measures of service use and patient travel (as was done here using Medicare claims) is a relatively easy way to start determining whether low physician supply is adversely affecting patient care and, potentially, patient health.

Second, use a more sophisticated approach for analysis of individual physician specialties. In a very real sense, all the work in this report was performed so that Maryland policy makers could see an accurate physician head count. Somehow, given the sophistication and complexity of the health care system, it hardly seems reasonable that a simple head count really provides the information policy makers need to know.

In particular, when the analysis gets down to the level of individual physician specialties, it is no longer plausible to assume that all areas need the same level of physician supply. First, the prevalence of most diseases varies widely across areas. For example, death rates from cardiovascular disease vary more than two-fold across states.[34] What use is improving the accuracy of the count of Maryland cardiovascular or thoracic surgeons without knowing the prevalence of heart disease in Maryland relative to the US? In addition, regionalization appears desirable for some types of services, including a wide variety of surgeries where higher surgical volume is associated with better patient outcomes ("practice makes perfect"). From a quality standpoint, it is far from clear that you want to see every specialty equally represented in every geographic area of the state, which is what a HRSA-type analysis implicitly assumes. Assessment of physician supply, by region, probably needs to incorporate any official Maryland policies regarding triage or regionalization of certain types of cases. Finally, as shown here, travel for care within the state can ease the effects of low physician supply. But that only applies to patients who have the mobility, resources, and time to travel. That means that a complete analysis of the adequacy of regional physician supply might need to distinguish emergency from elective care, and might concentrate on the oldest and poverty populations for indications of the minimum physician supply levels required for adequate access to care.

[34] Calculated from Kaiser state health facts, http://www.statehealthfacts.org/comparemaptable.jsp?ind=77&cat=2

Third, pay adequate attention to the details of methodology in this area. Physicians lead complex work lives that can be hard to quantify. Significant numbers split their time across professional roles, provide care in multiple locations and multiple sub-specialties, or work for several employers. Their training takes a long time, and their timing of professional retirement is hard to predict. They can work part time, full time, or substantially more than what most people would call full time. And worst of all, they tend to be busy people, yet we only get detailed information on any of that when they take the time to fill out a survey, either mandated by the state or suggested by the AMA.

The upshot of that is that anyone who thinks counting physicians is a straightforward task will be in for a surprise. In this report, we took pains to write out all the details of methods that appeared to be relevant. Most of those, we found only by accident, from sets of numbers that should have "added up" but did not. Despite the length of this report, we hope that the next organization to look at this issue for Maryland will benefit from having all the detail organized in one place, so that the next study in this area can improve on this one.

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Appendix A: Maryland Regions

Maryland Regions		
County Name	**Code**	**Region**
ALLEGANY	01	Western
ANNE ARUNDEL	02	Baltimore Metro
BALTIMORE CITY	30	Baltimore Metro
BALTIMORE COUNTY	03	Baltimore Metro
CALVERT	04	Southern
CAROLINE	05	Eastern Shore
CARROLL	06	Baltimore Metro
CECIL	07	Eastern Shore
CHARLES	08	Southern
DORCHESTER	09	Eastern Shore
FREDERICK	10	Western
GARRETT	11	Western
HARFORD	12	Baltimore Metro
HOWARD	13	Baltimore Metro
KENT	14	Eastern Shore
MONTGOMERY	15	National Capital
PRINCE GEORGE'S	16	National Capital
QUEEN ANNE'S	17	Eastern Shore
ST. MARY'S	18	Southern
SOMERSET	19	Eastern Shore
TALBOT	20	Eastern Shore
WASHINGTON	21	Western
WICOMICO	22	Eastern Shore
WORCESTER	23	Eastern Shore