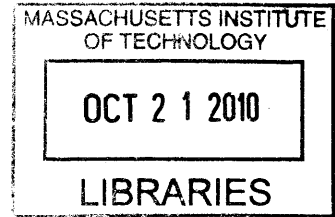# An Analysis of the Differences Between National and Local Coverage Determinations of Medical Procedures in the US

by

**Rafael Díaz Treviño**

B. Eng. Chemical Engineering
Universidad Iberoamericana, Mexico City, 2000

MBA
Instituto Panamericano de Alta Dirección de Empresa (IPADE), Mexico City, 2002

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Massachusetts Institute of Technology

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Signature of Author _____

ᐧ/Biomedical Enterprise Program
Harvard-MIT Division of Health Sciences and Technology

Certified by _____

Richard Anders, JD
Mass Medical Angels
Thesis Supervisor

Certified by _____

Teo Forcht Dagi, MD, MPH, MBA
Senior Lecturer, Harvard-MIT Division of Health Sciences and Technology
Thesis Supervisor

Accepted by _____

Ram Sasisekharan, PhD
Edward Hood Taplin Professor of Health Sciences and Technology and Biological
Engineering
Director, Harvard-MIT Division of Health Sciences and Technology·

# An Analysis of the Differences Between National and Local Coverage Determinations of Medical Procedures in the US

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## Rafael Díaz Treviño

Submitted to the Harvard-MIT Division of Health Sciences and Technology on September, 2010 in Partial Fulfillment of the Requirements for the Degree of Master of Science in Health Sciences and Technology at the Massachusetts Institute of Technology

## Abstract

Medicare coverage policies of medical procedures can be promulgated at a national level by the Centers of Medicare and Medicaid Services (CMS) as National Coverage Determinations (NCDs) or at a local level by Medicare contractors as Local Coverage Determinations (LCDs).

Although LCDs shouldn't contradict NCDs, they can differ. In the present study, I analyze some factors that could partially account for the differences between NCDs and LCDs.

Using the Medicare Coverage Database from CMS, I searched for differences between NCDs and LCDs in five benefit categories: inpatient hospital services, durable medical devices, diagnostic laboratory tests, physician's services and other diagnostic tests.

There is a reasonable degree of homogeneity in coverage policies for procedures for which an NCD has been issued: 82% are exactly the same. Most of the differences took the form of exclusions from LCDs, but not from NCDs.

For each state, I computed the number of times that LCDs were issued and the number of times that LCDs differed from NCDs and searched for possible linear or exponential correlation models. The following factors were initially hypothesized to account for these differences: number of Schools of Medicine, number of physicians, GDP per capita by state, state ranking according to number of Level 1 and Level 2 Trauma Centers and the profile of MEDCAC members.

At a national level, I found no correlation between the number of LCDs issued or the number of differences between LCDs and NCDs and any of these variables. However, on a sub-analysis at a local level, in some regions I found a positive correlation ($r^2 > .94$) between the following three variables: 1) number of Schools of Medicine, 2) number of physicians, and 3) state ranking according to the number of Level 1 and Level 2 Trauma Centers and the following two parameters: 1) the level of LCD issuing activity, and 2) the number of times that LCDs differ from NCDs.

The correlations shown by the performed sub-analysis within regions may imply that more LCDs are issued to restrict coverage when there is a local need to control the excessive demand partially driven by the higher number of hospitals and physicians that are active in pursuing their interests. The fact that these correlations were shown only at a regional level may indicate that when local factors are disregarded, the original hypothesized factors do influence LCD activity, however, at a national level, other hypothetical local factors may have a greater influence on LCD activity and policy discrepancies.

In order to have a better understanding of my results and the factors that could account for the differences between NCDs and LCDs, I interviewed four Contractor Medical Directors (CMDs). These interviews indicated that other factors could account for these differences, including the following: a history of abuse and fraud, contractor's budgets, the CMD's special interests and experience, data analysis capabilities, the number of claims and the novelty of the procedure. The impact of these variables on the differences between national and local coverage policies can be an interesting topic for future research on the subject.

*To my wife Luisa: thanks for your infinite love and daily support;*

*to my parents, Norah and Rafael, who have nurtured me with a great education, human values and love; and*

*to the ones, alive or passed away, who have influenced my thinking and passion for science through their ideas and courage to search for the truth.*

## Acknowledgements

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## I. Introduction

Reimbursement is often cited by healthcare entrepreneurs, investors and managers as a key factor for the success or failure of adoption of medical technologies. In terms of value creation, reimbursement is more important for medical devices and diagnostics for which FDA approval usually represents a lower risk than pharmaceuticals or biologics. Manufacturers of medical technologies often report that Medicare is the most influential payer not only in terms of market power but also in its influence on other payer's coverage policies. In the same way, positive coverage decisions by the largest and most influential private payers can also influence decisions from other private payers.

### Research Objectives

In some cases, Medicare or its contractors issue coverage policies to determine if a specific procedure or medical technology will receive reimbursement and under which circumstances. These policies can be stated at a national or at a local level.

National Coverage Determinations (NCDs) are policies developed by the Centers for Medicare and Medicaid Services (CMS) to direct the nationwide conditions for Medicare coverage for a specific item or service. The decision is usually made at CMS Staff discretion based on benefit categories and statutory exclusions previously defined by the Social Security Act and on an assessment of whether the service or item is reasonable and necessary. For some services, CMS bases its decisions on Technology Assessments (TAs) or on the judgment of the Medicare Evidence Development & Coverage Advisory Committee (MEDCAC).

On the other hand, Local Coverage Determinations (LCDs) are coverage policies developed by Medicare contractors to decide whether to cover a particular service in their jurisdiction. They can be developed in the absence of an NCD or as a supplement to an NCD as long as the LCD policy does not conflict with national policy. The contractor makes the decision based on an assessment of whether the service is reasonable or necessary. LCDs are more specific administrative and educational tools to assist providers in submitting correct claims for payment, including the acceptable billing codes, which usually are not mentioned in NCDs because they are broader in scope. The vast majority of coverage policies are developed by contractors locally. Sometimes NCDs are released after various LCDs have been issued for the same service by different contractors, indicating the necessity to regulate

coverage at a national level. This is the reason why there are more than five thousand LCDs and only 314 NCDs currently in effect. LCDs are used as a way to implement automated review for those circumstances under which coverage for a service will always be denied. LCDs take significantly less time than NCDs to develop (approximately 4 months vs 9-12 months), particularly if NCDs require TAs or MEDCACs.

According to CMS, LCDs shouldn't contradict NCDs, but in reality they present some differences, although not strictly contradictions. The ultimate aim of this research is to describe the factors that account for the differences between local and national coverage determinations of medical procedures in the US.

## Significance, utility and implications of this research

The present thesis will be relevant for any person interested in the US health care industry. It will help policy makers and payers understand the drivers of coverage disparities between different US regions or states, to propose new administrative or policy tools that improve their cost, effectiveness, quality, uniformity and accessibility standards. It will help health technology entrepreneurs, investors and managers by shedding light on the factors that have to be taken into account in order to obtain more favorable reimbursement. For the general population, this study will help to explain the variables that account for the difference in coverage decisions and policies, for insurance purchasing or other purposes.

## Background

## Medicare Coverage Decisions

With a 2010 budget of approximately $460 billion and serving nearly 46 million beneficiaries, the Centers for Medicare & Medicaid Services (CMS) are a key player in the US health care system. CMS defines coverage, coding, and payment processes and how they relate to each other. Payment for many new medical technologies can be made under one of Medicare's payment methodologies without being preceded by an explicit coverage determination, coding change, and/or payment decision by CMS. However, the Agency will specifically evaluate issues involving coverage, coding, and/or payment with respect to certain technologies. According to the CMS Innovator's Guide to Navigating Medicare (Version 2.0, 2010), the basic analytical framework that CMS uses for each of these issues is as follows[i]:

### 1) Coverage

Medicare's authority to cover or exclude certain items or services is governed by the Social Security Act (the Act) and implementing regulations.

*Benefit Category* – Does the new technology fall into at least one defined benefit category or categories under the Act?

*Statutory Exclusion* – Does the new technology involve an item or service that is specifically excluded by the Act?

*Reasonable and Necessary* – Is the new technology "reasonable and necessary" for the diagnosis or treatment of illness or injury, or to improve the functioning of a malformed body member?

### 2) Coding

*Clinically Different* – Are changes in coding needed to accommodate the new technology? In most cases, new items and services are adequately described in existing codes. However, some new technologies may warrant differentiation through the creation of new codes.

### 3) Payment

*Payment System* – Which fee-for-service payment system(s) does the new technology fit into (e.g., hospital inpatient prospective payment system, physician fee schedule)?

*Payment Amount* – If the new technology warrants a new code, how will the payment amount be determined?

## Coverage[ii]

Fiscal intermediaries and carriers are legal entities that have contracted with CMS to process Medicare claims for Part A and Part B. In December 2003, Congress passed the Medicare Prescription Drug, Improvement, and Modernization Act (MMA) of 2003. Under section 911 of the MMA, Congress requires that, between year 2005 and 2011, CMS replace the current fiscal intermediary (FI) and carrier contracts with competitively procured contracts that conform to the Federal Acquisition Regulation (FAR). New contracting entities known as Medicare Administrative Contractors (MACs) will merge Part A and Part B claims processing under a single authority. The provisions contained under section 911 are collectively referred to as Medicare Contracting Reform and its main purpose is to make Medicare's administrative structure more dynamic, competitive and performance-based. Under the new structure, most beneficiaries will have their claims processed by only one contractor, which will be required to develop an integrated and consistent approach to medical coverage across its service area. The full fee-for-service (FFS) program functional environment vision includes functional contractors working with the MACs. The major business functions of the MACs are: claims processing, beneficiary and provider customer service, appeals, provider education, financial management, provider enrollment, reimbursement, payment safeguards and information systems security. They will serve as the providers' primary point-of-contact for enrollment, training on Medicare coverage and billing requirements, and the receipt, processing, and payment of Medicare FFS claims within their respective jurisdictions.

The new contracting reform created new jurisdictions to be administered by the MACs, which were assigned to balance the allocation of workloads (the number of fee-for-service beneficiaries and providers) and promote competition[iii]. CMS has awarded 19 MACs through a competitive bidding process during the initial implementation phase. These include 15 A/B MACs servicing the majority of all types of providers (both Part A and Part B), and four specialty MACs servicing durable medical equipment suppliers.

The fifteen jurisdictions and its A/B contractors are[iii]:

- Jurisdiction 1 (J1) – American Samoa, California, Guam, Hawaii, Nevada, Northern Mariana Islands- Awarded to Palmetto GBA
- Jurisdiction 2 (J2) - Alaska, Idaho, Oregon, Washington Awarded to National Heritage Insurance Company
- Jurisdiction 3 (J3) - Arizona, Montana, North Dakota, South

Dakota, Utah, Wyoming- Awarded to Noridian Administrative Services

- Jurisdiction 4 (J4) - Colorado, New Mexico, Oklahoma, Texas- Awarded to Trailblazers Health Enterprises
- Jurisdiction 5 (J5) - Iowa, Kansas, Missouri, Nebraska- Awarded to Wisconsin Physician Services Health Insurance Corporation
- Jurisdiction 6 (J6) - Illinois, Minnesota, Wisconsin. Awarded to Noridian Administrative Services, LLC
- Jurisdiction 7 (J7) - Arkansas, Louisiana, Mississippi. Awarded to Pinnacle Business Solutions Inc.
- Jurisdiction 8 (J8) - Indiana, Michigan. Awarded to National Government Services, Inc. On January 26, 2009, a protest against the award was filed. CMS is undertaking corrective action on the award. The legacy fiscal intermediaries and carriers will continue to service the providers in those workloads until further notice.
- Jurisdiction 9 (J9) - Florida, Puerto Rico, United States Virgin Islands. Awarded to First Coast Service Options, Inc.
- Jurisdiction 10 (J10) - Alabama, Georgia, Tennessee. Awarded to Cahaba Government Benefit Administrators, LLC (Cahaba GBA)
- Jurisdiction 11 (J11) - North Carolina, South Carolina, Virginia, West Virginia Awarded to Palmetto Government Benefits Administrator, LLC (Palmetto GBA). On June 1, 2010 CIGNA Government Services filed a protest against the award. The legacy fiscal intermediaries and carriers will continue to service the providers until further notice.
- Jurisdiction 12 (J12) - Delaware, District of Columbia, Maryland, New Jersey, Pennsylvania –Awarded to Highmark Medicare Services Inc.
- Jurisdiction 13 (J13) - Connecticut, New York- Awarded to National Government Services
- Jurisdiction 14 (J14) - Maine, Massachusetts, New Hampshire- Awarded to National Heritage Insurance Corporation (NHIC)
- Jurisdiction 15 (J15) - Kentucky, Ohio. Awarded to Highmark Medicare Services, Inc. (HMS). Two protests against the award were filed. CMS is undertaking corrective action on the award. The legacy fiscal intermediaries and carriers will continue to service the providers in those jurisdictions until further notice.

The four jurisdictions for Durable Medical Equipment (DME) Specialty MAC carriers are[iii]:

- Jurisdiction A- Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. Awarded to National Heritage Insurance Company
- Jurisdiction B- Illinois, Indiana, Kentucky, Michigan, Minnesota, Ohio, and Wisconsin. Awarded to AdminaStar Federal
- Jurisdiction C- Alabama, Arkansas, Colorado, Florida, Georgia, Louisiana, Mississippi, New Mexico, North Carolina, Oklahoma, Puerto Rico, South Carolina, Tennessee, Texas, U.S. Virgin Islands, Virginia, and West Virginia. Awarded to CIGNA Government Services
- Jurisdiction D- Alaska, American Samoa, Arizona, California, Guam, Hawaii, Idaho, Iowa, Kansas, Missouri, Montana, Nebraska, Nevada, North Dakota, Northern Mariana Islands, Oregon, South Dakota, Utah, Washington, and Wyoming. Awarded to Noridian Administrative Services

CMS and its administrative contractors, have the authority to develop coverage determinations for particular items or services or to decide claims on a case-by-case basis. Most coverage policies are developed at a local level by contractors, but sometimes CMS may choose to develop a national coverage policy to ensure that similar claims will be adjudicated under uniform criteria. Coverage policies are more likely to be developed when the item or service produces significant clinical consequences for beneficiaries, when the medical community is divided about the merits of an item or service for a particular population, or when the item or service has a significant impact on the Medicare program[i].

A Medicare administrative contractor develops Local Coverage Determinations (LCDs) that apply only within their jurisdictions. Administrative Law Judges (ALJs) consider LCDs but are not bound to follow them. CMS makes National Coverage Determinations (NCDs) that are binding policies for all fiscal intermediaries, carriers, MACs, Quality Improvement Organizations (QIOs), Quality Independent Contractors (QICs), ALJs, and the Medicare Appeals Council[i].

## Coding[i]

Currently, CMS uses the International Classification of Diseases, 9th Edition, Clinical Modification (ICD-9-CM) and the Healthcare Common Procedure Coding System (HCPCS) for processing Medicare claims. The updated International Classification of Diseases, 10th Edition (ICD-10) is scheduled for implementation on October 1, 2013. In contrast to coverage decisions, changes to coding systems are made strictly at the national level. New technologies are sometimes adequately described by existing codes. Under the Health Insurance Portability and Accountability Act of 1996 (HIPAA), contractors can no longer establish local codes, although new technologies are sometimes accommodated by 'not otherwise classified' codes pending determination of a new code assignment.

## Payment[i]

Payment levels for most of Medicare's fee-for-service payment systems are structured to gradually adjust to the use of a new technology, and in general do not require major modifications. In the end, the relative use of a new technology will be reflected in payments for the service using the technology. However, in certain cases, payment adjustments for new technologies are appropriate. Medicare's inpatient and outpatient prospective payment systems include provisions designed to provide an extra payment amount for certain new technologies, based on whether the new technology represents a substantial clinical improvement relative to existing technologies and meet specific cost thresholds. However, under the outpatient prospective payment system, a service may be assigned to a new technology Ambulatory Payment Classification (APC) group and a new drug may receive "pass-through" payment without demonstrating substantial clinical improvement.

## Timing of Policy Decisions[i]

Coverage, coding, and payment decisions are not necessarily made in any particular order. Sometimes a new technology manufacturer secures a new code before Medicare coverage, or applies for a new technology hospital inpatient add-on payment before FDA has approved the device, anticipating that FDA will grant approval before CMS makes its coverage decisions. Timelines for Medicare coding, coverage and payment decisions may often span a 12-month period. Local and national coverage decisions are made under statutory timeframes, usually taking between 4 and 12 months. Coding changes are commonly made on an annual basis, while some payment changes may occur quarterly.

## National Coverage Determination (NCD)[i]

NCDs are developed by CMS to describe the nationwide conditions for Medicare coverage for a specific item or service. NCDs generally outline the conditions for which an item or service is considered to be covered (or not covered) under section 1862(a)(1) of the Social Security Act or other applicable provisions of the Act. NCDs are issued as program instructions. Once published in a CMS program instruction, an NCD is binding on all Medicare Administrative Contractors (MACs), fiscal intermediaries, carriers, Quality Improvement Organizations (QIOs), Qualified Independent Contractors (QICs), Administrative Law Judges (ALJs), the Medicare Appeals Council and Program Safeguard Contractors (PSCs). Medicare Advantage (Part C) health plans are required to cover all items and services that are offered under Part A and Part B, which comply with NCDs, while Medicare Part D plans are excluded from the requirement of following NCDs.

*NCD Process[iiv]*

The NCD process consists of three major steps: initiation, review, and completion. A formal request for an NCD can be initiated either by an outside party or internally by CMS staff. However, CMS formally initiates the NCD process by "opening" the NCD. This is announced to the public by posting a "tracking sheet" on the CMS coverage web site. After that, CMS reviews the particular items and services to determine whether they meet the statutory requirements.

Time frames required for the NCD process are statutory, as mandated by the Medicare Modernization Act (MMA). The time frame does not begin until CMS formally accepts an NCD request. When the volume of formal requests is heavy, CMS may set priorities – reviewing applications for technologies likely to have a greater impact on the Medicare program and its beneficiaries before those with lesser impacts. Once a completed request is accepted, CMS notifies the requester and posts a tracking sheet announcing the NCD review on the CMS coverage website.

For NCD requests not requiring an external technology assessment (TA) or Medicare Evidence Development & Coverage Advisory Committee (MEDCAC) review, CMS must post a proposed decision no later than six months after the date CMS accepts the completed formal request. For NCDs that require either a TA or MEDCAC review, or both, the proposed decision must be posted no later than nine months after the date CMS accepts the completed request.

Before the final decision is reached, CMS staff considers any public comments that may be relevant to the policies. When an NCD currently exists, any individual or entity may request CMS to reconsider any provision of that NCD. The reconsideration request must contain additional medical or scientific information that was not considered during the NCD process or arguments to prove that the NCD misinterpreted the existing evidence. There is also a process by which aggrieved parties may elect to challenge an existing NCD.



The NCD process and some factors that may influence it
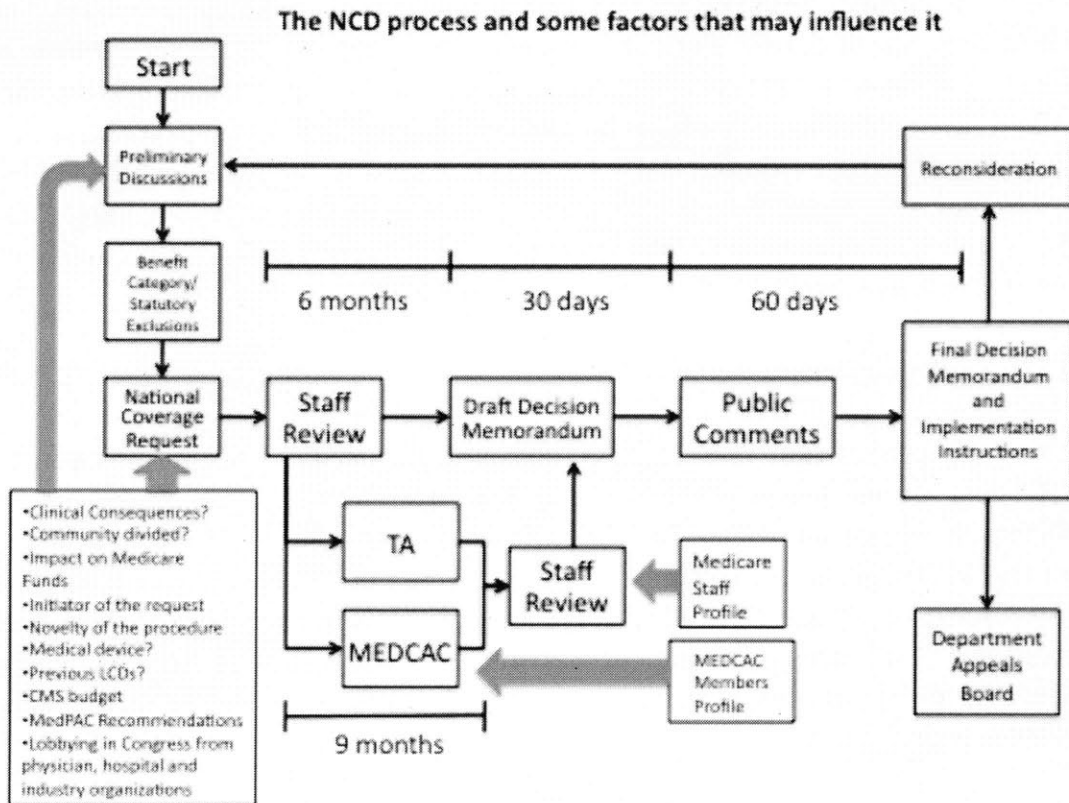
*Technology Assessments[i]*

Technology Assessments (TAs) are systematic reviews, conducted and coordinated by CMS staff to review relevant evidence and inform a determination if the item or service is reasonable and necessary. CMS usually requests TAs when there is conflicting or complex medical and scientific literature available, or when CMS believes an independent analysis of all relevant literature will assist them determine whether an item or procedure is reasonable and necessary[iv]. To minimize bias, systematic reviews emphasize a comprehensive search of all potentially relevant medical and scientific articles and use explicit, reproducible criteria in the selection of articles for review. Primary research designs and study characteristics are appraised in accordance with a hierarchy of medical evidence. Data are summarized and the evidence is appraised to assess its validity (how credible it is), clinical relevance (its applicability in real health care settings), and weight (magnitude of effect). CMS staff generally performs TAs internally but may contract with an external party to perform a TA.

*Medicare Evidence Development & Coverage Advisory Committee (MEDCAC)[i]*

For coverage topics that are highly controversial or have a major potential impact (cost being an important factor) on the Medicare program or its beneficiaries, CMS may draw on the expertise of the MEDCAC. The primary role of the MEDCAC is to provide independent, expert advice to assist CMS in making sound coverage decisions for the topic under review. The MEDCAC reviews and evaluates medical literature and TAs, listens to testimony, deliberates, and provides CMS with recommendations as to the strength of the evidence reviewed.

The MEDCAC is composed of 100 experts in clinical and administrative medicine, biologic and physical sciences, public health administration, patient advocacy, health care data and information management and analysis, health care economics and medical ethics. For each MEDCAC meeting, approximately 15 members are selected with knowledge specific to the topic in question. These can be non-MEDCAC members who have relevant expertise to provide additional input to panel members. The panel meets in a public forum approximately 6 times a year to review medical evidence for the topic under deliberation, listen to public testimony, and provide advice about the quality of the evidence.

*Medicare Payment Advisory Commission (MedPAC)[v]*

The Medicare Payment Advisory Commission (MedPAC) is an independent Congressional agency established by the Balanced Budget Act of 1997 (P.L. 105-33) to advise the US Congress on issues affecting the Medicare Program. The Commission's statutory mandate is quite broad: in addition to advising the Congress on payments to private health plans participating in Medicare and providers in Medicare's traditional fee-for-service program, MedPAC is also tasked with analyzing access to care, quality of care, and other issues affecting Medicare.

The Commission has 17 members, who have diverse expertise in the financing and delivery of health care services. Commissioners are appointed to three-year terms (subject to renewal) by the Comptroller General and serve part time. Appointments are staggered; the terms of five or six Commissioners expire each year. The Commission is supported by an executive director and a staff of analysts, who typically have backgrounds in economics, health policy, public health or policy.

MedPAC meets publicly to discuss policy issues and formulate its recommendations to the Congress. In the course of these meetings, Commissioners consider the results of staff research, presentations by policy experts, and comments from interested parties. Commission members and staff also seek input on Medicare issues through frequent meetings with individuals interested in the program, including staff from congressional committees and CMS, health care researchers, health care providers, and beneficiary advocates.

Two reports - issued in March and June each year - are the primary outlet for Commission recommendations. In addition to these reports and others on subjects requested by the Congress, MedPAC advises the Congress through other avenues, including comments on reports and proposed regulations issued by the Secretary of the Department of Health and Human Services, testimony, and briefings for congressional staff.

Currently, MedPAC is only an advisory Commission with no formal power to make decisions. However, a 2009 bill introduced by Senator Jay Rockefeller and endorsed by the Obama administration, proposes moving decisions from Congress to MedPAC, turning it into an executive agency. The bill has caused a lot of controversy, because, among other things, it would cease the influence that industry, hospitals and physicians play in policy making through lobbying with members of Congress.

*NCD Implementation[i]*

The NCD is the formal instruction to the Medicare claims processing contractors regarding how to process claims (e.g., when to pay, when not to pay, pay only when certain clinical conditions are met). Appropriate payment or other changes to accommodate the coverage decision are effective at the time a final decision is posted to the CMS website. In some instances CMS implements an NCD through the change management process and provides detailed coding and billing instructions. The instructions specify appropriate coding and detail how the NCD criteria are to be implemented in the claims processing systems. Those instructions have a specific effective date dictating when claims will be processed according to the new criteria. The contractors implement the NCD within their own jurisdictions and may subsequently develop LCDs or policy articles to supplement the NCD.

*Coverage with Evidence Development[i]*

Coverage with Evidence Development (CED) is a coverage decision made through an NCD. These NCDs require additional data collection, such as data collected in a clinical trial, as a condition of coverage. The purpose of CED is to provide Medicare coverage for a particular item or service and to develop evidence of its impact on the health of Medicare beneficiaries. Examples of NCDs that require CED are Continuous Positive Airway Pressure Therapy for Obstructive Sleep Apnea and Positron Emission Tomography for Solid Tumors and Myeloma.

## Local Coverage Determination (LCD)[vi]

Section 522 of the Medicare, Medicaid, and SCHIP Benefits Improvement and Protection Act of 2000 (BIPA) created and defined the term "local coverage determination" (LCD) as a decision by a contractor whether to cover a particular service on a contractor-wide basis. LCDs may be developed in the absence of an NCD or as a supplement to an NCD as long as the LCD policy does not conflict with national policy. Since Administrative Law Judges (ALJs) are bound by NCDs but not LCDs, simply repeating an NCD as an LCD will cause confusion as to the standing of the policy. Contractors are supposed to apply NCDs when reviewing claims for services addressed by NCDs. The contractor should ensure that all LCDs are consistent with all statutes, rulings, regulations, and national coverage, payment, and coding policies.

LCDs specify the clinical circumstances under which a service is considered to be reasonable and necessary. They are administrative and educational tools which assist providers in submitting correct claims for payment and guide the medical community and others within their jurisdictions. Contractors develop LCDs by considering medical literature, the advice of local medical societies and medical consultants, public comments, and comments from the provider community. Contractors educate the provider community on new or significantly revised LCDs through such things as training sessions, speaking at meetings or writing articles in the newsletters.

Medicare contractors previously developed Local Medical Review Policies (LMRPs) as vehicles for local policy. In 2003, CMS instructed the contractors to create LCDs and convert all LMRPs into LCDs. The difference between LMRPs and LCDs is that LCDs consist of only "reasonable and necessary" information, while LMRPs may also have contained benefit category and statutory exclusion provisions. Therefore, CMS further instructed that all other guidance from contractors should be published in a contractor article.

Codes describing what is covered and what is not covered can be part of the LCD. This includes lists of HCPCs codes that spell out which services the LCD applies to, lists of ICD-9-CM codes for which the service is covered, lists of ICD-9 codes for which the service is not considered reasonable and necessary, etc. These coding descriptions are only included if they are integral to the discussion of medical necessity. However, coding guidelines are not elements of LCDs and Medicare states that they should be deleted from the LCDs and instead published in articles.

When a new or revised LCD is needed, contractors do the following:
- Contact the CMD facilitation contractor, other contractors, the local carrier or intermediary, the Durable Medical Equipment Regional Carrier (DMERC) (if applicable), the Medicare Coverage Database or QIOs to inquire if a policy which addresses the issue in question already exists;
- Adopt or adapt an existing LCD, if possible; or
- Develop a policy if no policy exists or an existing policy cannot be adapted to the specific situation.

A contractor with LCD jurisdiction for two or more states is strongly encouraged by CMS to develop uniform LCDs across all its jurisdictions. To ensure that all LCDs remain accurate and up-to-date at all times, at least annually, contractors review and revise LCDs based upon CMS NCDs,

coverage provisions in interpretive manuals, national payment policies and national coding policies.

Contractors may review claims on either a prepayment or post-payment basis regardless of whether an NCD, coverage provision in an interpretive manual, or LCD exists for that service. However, automated denials can be made only when a clear policy exists. The use of an LCD helps avoid situations in which claims are paid or denied without a provider having a full understanding of the basis for payment and denial. In this way, contractors develop LCDs when they have identified a service that is never covered under certain circumstances and wish to establish automated review in the absence of an NCD or coverage provision in an interpretive manual that supports automated review.

Contractors have the option to develop LCDs when any of the following occur:
- A validated widespread problem demonstrates a significant risk to the Medicare trust funds (identified or potentially high dollar and/or high volume services). Multi-state contractors may develop uniform LCDs across all its jurisdictions even if data analysis indicates that the problem exists only in one state.
- An LCD is needed to assure beneficiary access to care.
- A contractor has assumed the LCD development workload of another contractor and is undertaking an initiative to create uniform LCDs across its multiple jurisdictions; or is a multi-state contractor undertaking an initiative to create uniform LCDs across its jurisdiction.
- Frequent denials are issued (following routine or complex review) or frequent denials are anticipated.

According to CMS, LCDs are supposed to be clear, concise, properly formatted and not restrict or conflict with NCDs or coverage provisions in interpretive manuals. Coverage provisions in interpretive manuals are instructions that are used to further define when and under what circumstances services may be covered (or not covered). If an NCD or coverage provision in an interpretive manual states that a given item is "covered for diagnoses/conditions A, B and C," contractors are not supposed to use that as a basis to develop LCDs to cover **only** "diagnoses/conditions A, B and C." When an NCD or coverage provision in an interpretive manual does not exclude coverage for other diagnoses/conditions, contractors usually allow for individual consideration unless the LCD supports automatic denial for some or all of those other diagnoses/conditions.

In order to be covered under Medicare, a service shall be reasonable and necessary. According to the CMS Manual System, contractors shall consider a service to be reasonable and necessary if the contractor determines that the service is:

- Safe and effective;
- Not experimental or investigational (exception: routine costs of qualifying clinical trial services with dates of service on or after September 19, 2000 which meet the requirements of the Clinical Trials NCD are considered reasonable and necessary); and
- Appropriate, including the duration and frequency that is considered appropriate for the service, in terms of whether it is:
  - Furnished in accordance with accepted standards of medical practice for the diagnosis or treatment of the patient's condition or to improve the function of a malformed body member;
  - Furnished in a setting appropriate to the patient's medical needs and condition; or
  - Ordered and furnished by qualified personnel;
  - One that meets, but does not exceed, the patient's medical need; and
  - At least as beneficial as an existing and available medically appropriate alternative.

LCDs are based on the strongest evidence available. The initial action in gathering evidence to support LCDs has to be always a search of published scientific literature for any available evidence pertaining to the item/service in question. In order of preference, LCDs are based on:

- Published authoritative evidence derived from definitive randomized clinical trials or other definitive studies, and
- General acceptance by the medical community (standard of practice), as supported by sound medical evidence based on:
  - Scientific data or research studies published in peer-reviewed medical journals;
  - Consensus of expert medical opinion (i.e., recognized authorities in the field); or
  - Medical opinion derived from consultations with medical associations or other health care experts.

Contractors sometimes implement new Least Costly Alternative (LCA) determinations through an LCD. "Least Costly Alternative" is a national policy provision that is applied by contractors when determining payment for all durable medical equipment (DME). Contractors have the discretion to apply

this principle to payment for non-DME services as well. When strong clinical justification exists, contractors may also develop LCDs that contain absolute words such as "is never covered" or "is only covered for". When phrases with absolute words are clearly stated in LCDs, contractors are not required to make any exceptions or give individual consideration based on evidence. Contractors create edits/parameters that are as specific and narrow as possible to separate cases that can be automatically denied from those requiring individual review.

Acceptance by individual health care providers, or even a limited group of health care providers, normally does not indicate general acceptance by the medical community. Testimonials indicating such limited acceptance, and limited case studies distributed by sponsors with financial interest in the outcome, are not sufficient evidence of general acceptance by the medical community. LCDs that challenge the standard of practice in a community and specify that an item is never 'reasonable and necessary', should be based on sufficient evidence to convincingly refute evidence presented in support of coverage. Less stringent evidence is needed when allowing for individual consideration or when the used criterion is the least costly alternative.

The Medicare Prescription Drug, Improvement, and Modernization Act of 2003 (MMA), section 731, requires the Centers for Medicare & Medicaid Services (CMS) to develop a plan to evaluate new LCDs to decide which local decisions should be adopted nationally. CMS currently has policies in place that address the MMA requirements to promote greater consistency among LCDs, require Medicare contractors within an area to consult on new local coverage policies, and to disseminate information on LCDs among Medicare contractors.

When assessing whether an LCD topic should be referred to the 731 Advisory Group for NCD consideration, contractors consider the following criteria:
- Net impact on clinical health outcomes;
- Current and projected local utilization patterns outside of perceived reasonable and necessary boundaries;
- Current and projected national utilization patterns outside of perceived reasonable and necessary boundaries;
- Unit cost;
- Collateral costs;
- Associated quality and access to care issues including capacity of health system to use technology safely; and
- Medicare payment error rate impact.

*The Carrier Advisory Committee (CAC)[vi]*

Carriers usually establish one CAC per state. Where there is more than one carrier in a state, the carriers jointly establish a CAC. If there is one carrier for many states, each state has a full committee and the opportunity to discuss draft LCDs and issues presented in their state. Carriers that develop identical policies for their entire jurisdiction may sometimes establish a single CAC. A contractor with LCD jurisdiction for two or more states is strongly encouraged to develop uniform LCDs across all its jurisdictions.

The purpose of the CAC is to provide:
- A formal mechanism for physicians in the state to be informed of and participate in the development of an LCD in an advisory capacity;
- A mechanism to discuss and improve administrative policies that are within carrier discretion; and
- A forum for information exchange between carriers and physicians.

While the CAC reviews all draft LCDs, the final implementation decision about LCDs rests with the Contractor Medical Director (CMD).

The CAC is to be composed of physicians, a beneficiary representative, and representatives of other medical organizations. CAC members serve to improve the relations and communication between Medicare and the physician community. Specifically, they:
- Disseminate proposed LCDs to colleagues in their respective state and specialty societies to solicit comments;
- Disseminate information about the Medicare program obtained at CAC meetings to their respective state and specialty societies; and
- Discuss inconsistent or conflicting policies.

Each specialty has one member and a designated alternate with approval of committee co-chairs. Additional members sometimes attend when policies that require their expertise are under discussion. The CAC is co-chaired by the CMD and one physician selected by the committee. Co-chairs present all proposed LCDs to the CAC for discussion. The CAC holds a minimum of 3 meetings a year, with no more than 4 months between meetings. Each meeting should include a discussion and presentation of comparative utilization data that has undergone preliminary analysis by the carrier and

relates to discussion of the proposed LCD. Carriers solicit input from CAC members to help explain or interpret the data and give advice on how overutilization should be addressed. Sometimes the Committee uses data to illustrate the extent of problem billing (e.g., average number of services per 100 patients) to help justify the need for a particular policy. Participation in the CAC is considered a service to physician colleagues. Carriers do not provide an honorarium or other forms of compensation to members. Expenses are the responsibility of the individuals or the associations they represent.

### The LCD process and some factors that may influence it
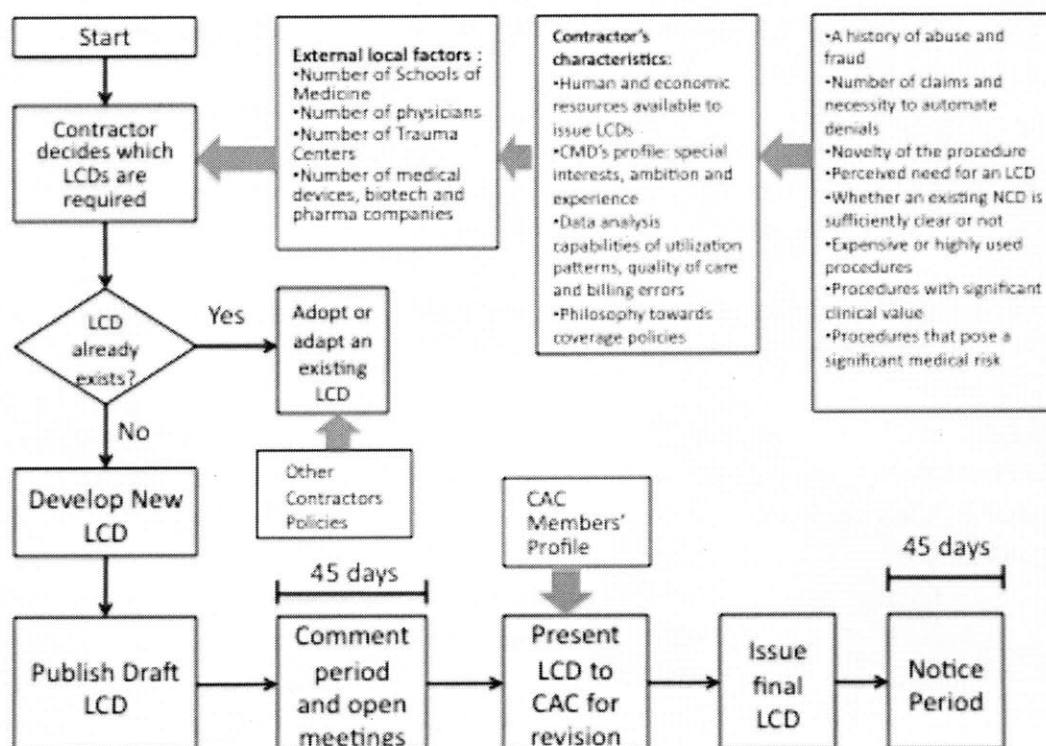


*Local Coverage Determination Time Frames[i]*

Unlike the NCD time clock that begins with the acceptance of a formal request to open an NCD, the time clock for an LCD begins with the initiation of a minimum 45-day comment period following publication of a draft LCD. During this time, comments on the draft LCD must be solicited from several outside parties, including affected health professionals, other contractors,

providers, and QIOs. In addition to the draft LCD comment period, contractors provide open meetings for the purpose of discussing draft LCDs prior to presenting the policy to the Contractor Advisory Committee (CAC). Once the contractor has considered all the comments and developed the final LCD, it must be published on Medicare's coverage website. A minimum notice period of 45 days is required prior to the effective date of implementation.

## Principal differences between NCDs and LCDs

| | NCD | LCD |
|---|---|---|
| **Developed by** | CMS | Contractors |
| **Geographical applicability** | Nation-wide | Contractor-wide |
| **Binding to** | MACs, Fis, Carriers, QIOs, QICs, ALJs, PSCs and Medicare Appeals Council | MAC Jurisdiction |
| **Not binding to** | Medicare Part D plans | ALJs |
| **Process initiated internally or externally** | Both | Internally, by the MACs |
| **Process open to the public?** | Yes | Yes |
| **Time to complete** | 9-12 months after NCD is accepted, statutory | 45 days after draft LCD is issued and 45 days of notice period before it is effective. Total process takes about 4 months |
| **Base of decision** | CMS Staff Review and sometimes TAs and MEDCACs | Medical literature, CMS, other contractors and CACs |
| **Contains applicable codes?** | No | Yes |
| **Conditions and limitations** | More general | More restrictive |
| **Number of policies currently in effect publicated in CMS website** | 314 | More than 5'000 |

## Private payers coverage decisions

The private US health care system works mainly through employer-based insurance contracted either through traditional indemnity insurance or Managed Care Organizations (MCOs). Managed Care refers to a constellation of networks, payment policies, utilization review and other functions wrapped around the traditional insurance function whose goal is to rationalize the care received and reduce its cost. Managed Care Organizations include:

- Health Maintenance Organizations (HMOs), which manage health plans with a closed network of physicians outside of which care is not reimbursed.
- Point of Service (POS) health plans, which is the same as an HMO but with the option to go out of network with substantial additional coverage.
- Preferred Provider Organizations (PPOs), which manage health plans that contract with a network of "preferred" physicians but also offers reduced coverage outside of that network.

Most of the private health in the US is provided by MCOs either directly or because insurers subcontract their services with an MCO. There are hundreds of Managed Care Organizations in the United States and each has different structures and procedures for making coverage decisions. For a technology to be eligible for reimbursement by a Managed Care Organization, usually the technology must not be excluded by the language of the health insurance contract between the MCO and insurers, who are the payers at the end. This generally means that the technology must contribute to provision of one of the broad categories of services specified as being covered (hospital services, physician office visits, durable medical equipment), must be "medically necessary" under the particular circumstances of the case, and must not be "experimental" or "investigational". In addition, many contracts exclude or limit coverage for various more-or-less specific services. The contractual framework is typically determined through negotiations between purchasers (employers) and MCOs. Within this framework, MCO personnel, such as a medical director and utilization review staff, interpret contracts to make decisions about coverage and payment for emerging technologies[vii].

Sometimes an MCO undertakes a formal process to determine whether a technology should be covered under any circumstance. Such decisions can require judgments about whether the technology pertains to a covered benefit or is investigational, or about the conditions under which its use is safe and effective. Many of these issues can be informed by a Technology

Assessment (TA), which is a somewhat structured effort to judge the clinical effectiveness and sometimes the cost-effectiveness of medical technologies, similar to Medicare TAs. It usually involves critical evaluation and synthesis of evidence available from clinical studies and other systematic evidence; often, expert opinion is incorporated. On top of peer-reviewed journals, local academics and physicians leaders, MCOs often obtain assessments from public and private organizations like the Health Care Financing Administration (HCFA), the Agency of Healthcare Research and Quality (AHRQ), the National Institutes of Health (NIH), the Emergency Care Research Institute (ECRI), Hayes Inc. and the Blue Cross, Blue Shield Technology Institute for Health Care Management Research and Educational Foundation. If medical directors, committees, or other staff determines that a technology is covered, patient-selection criteria are often developed. These criteria specify the circumstances under which use of the technology is viewed as medically necessary. On medical necessity determinations sometimes it is difficult to distinguish between medical factors such as mortality, and non-medical factors, like quality of life and convenience[vii].

Formal TAs are typically performed by large payers, which usually have several affiliated health plans operating in various locations; however, a positive coverage decision by one of these large MCOs does not guarantee coverage by its affiliated plans. Formal coverage decisions may not be crucial to how extensively a new technology is used. Sometimes new technologies are reimbursed without MCO personnel even being aware of that fact, usually because it is being used by a plan's providers and billed under a pre-existing Current Procedural Terminology (CPT) code, so that the bill is paid without anyone within the MCO being aware that a new technology is involved[vii].

A positive decision on coverage does not mean that every enrollee has access to the procedure; MCOs have processes for determining whether the procedure is medically necessary in particular cases. These processes are performed at a local level, even if coverage decisions are made nationally. MCOs that provide care through contracts with capitated medical groups may delegate medical-necessity decisions to them. This is because capitated medical groups bear the financial risk by accepting a flat fee to provide covered benefits to a specific group of individuals[vii].

MCOs generally lack systematic surveillance mechanisms for new technologies. They tend to react to triggers such as physician and patient demand, prior-authorization requests and claims submitted without a CPT code. MCOs also base their coverage decisions on their competitor's decisions. When several of their physicians report receiving payment from one of their

competitors, an MCO is likely to assess whether it should cover the procedure. The importance of MCOs has grown in the last two decades due to concerns of increased cost. MCOs have different degrees to which they -or their providers- bear the financial risk for use of some procedures or medical technologies[vii].

MCOs also consider nonmedical factors in making coverage decisions, including[vii]:

- State insurance mandates and other state regulatory requirements
- Publicity about and controversy surrounding a procedure or medical device
- Demand for a technology among patients and physicians
- Potential for litigation

Denials of coverage can be difficult in cases of life-threatening illnesses in which patients have the right to appeal for denial of coverage. Typically, indemnity insurers are more willing to cover some procedures and in many cases, they reimburse more generously[vii].

## II. Hypothesis

The hypothesis of the present research is that disparities between local and national coverage policies are influenced in a statistically significant manner at the state level by the following variables:

- Number of Schools of Medicine;
- Number of physicians;
- Gross Domestic Product (GDP) per capita by state, which is the state's economic output divided by its number of inhabitants (also called Gross State Product per capita);
- State Ranking according to number of Level 1 and Level 2 Trauma Centers + Population density per square mile;
- MEDCAC member's characteristics.

We would expect the correlations to be as follows:

Negatively Correlated Variables:

- Number of Schools of Medicine and number of physicians: Because LCDs are usually more restrictive than NCDs, and don't contradict them, an LCD tends to restrict physician's ability to use new tools and therefore would be against their interests. The more medical schools there are, the more active physicians there would be to advocate for their interests, which would be reflected in less discrepancies between LCDs and NCDs and less LCD issuing activity.

- GDP per capita per state. In a similar way, a higher GDP per capita is expected to be correlated with a more inclusive coverage policy, which would be reflected in less discrepancy between LCDs and NCDs and less LCDs issued. The reasoning here is that greater purchasing power usually leads to higher consumption levels for health care services.

- State Ranking according to number of Level 1 and Level 2 Trauma Centers, adjusted for population density. A better ranking in number of Level 1 and Level 2 Trauma Centers (which means a lower number in the ranking) is also expected to be correlated with a more inclusive coverage policy (less discrepancy between LCDs and NCDs and less issued LCDs), because more sophisticated Medical Centers have a wider offering of health services and advocate for their reimbursement.

Finally, for procedures that require a MEDCAC to make a decision, it is expected that the MEDCAC composition will influence the number and characteristics of issued LCDs, according to the MEDCAC's member's profile.


## III. Research methods

### Data

The Centers for Medicare and Medicaid Services (CMS) have a Medicare Coverage Database accessible by the Internet at http://www.cms.gov/mcd. Using the Advanced Search option, I found 314 matches for National Coverage Decisions (NCDs) that are currently in effect. From those, I narrowed my search to all NCDs currently in effect in the following benefit categories, which I think are the most important areas in terms of market size for development of health technologies:
- Inpatient Hospital Services
- Durable Medical Devices
- Diagnostic Laboratory Tests
- Physician's Services
- Diagnostic Tests (other)

The previous search narrowed the NCDs to 193 matches. On these matches, I gathered the following information to assemble a database for this research purposes:
- National Coverage Determination (NCD) section
- NCD title
- Implementation date
- National Decision (Covered=1 or Not Covered=0)
- National Coverage Limitations
- Technology Assessment (TA) (0=no TA to make decision, 1=TA)
- MEDCAC (0= no MEDCAC required, 1=MEDCAC required)
- Local Coverage Determination (LCD) number
- Contractor
- Contractor Type
  - FI=Fiscal intermediary
  - Carrier
  - MAC Part A=Medicare Administrative Contractor Part A
  - MAC Part B=Medicare Administrative Contractor Part B
  - DME MAC= Durable Medical Equipment Medicare Administrative Contractor

- RHHI= Regional Home Health and Hospice Intermediary
- State where LCD is applicable
- Effective date of LCD
- Local Coverage Decision (0=Not covered, 1=Covered)
- Local Coverage limitations
- Difference of Coverage Limitations between NCD and LCD
  (0=Different, 1= the same)
- Difference of Coverage Limitations between different states (0=at
  least one state has a different policy, 1=all states have the same
  policy)
- Base of Decision (Journals, CMS, specific sources, etc)

After the previous information was obtained (see Tables 1 to 5), I computed for each state the number of times that LCD Coverage Limitations coincided with their NCD counterparts, the number of times that they were different and the total number of times that a state issued an LCD (see Table 6). For this research purposes, different Coverage Limitations between LCDs and NCDs means there is at least one different criterion for coverage.

As shown in Table 7, I collected the following data for each state from their indicated sources:

- Number of Schools of Medicine, from the Association of American Medical Colleges (AAMC)
- Number of physician's, from the United States Department of Labor, Occupational Employment Statistics, May 2009. It doesn't include self-employed doctors.
- Gross Domestic Product (GDP) per capita by state, from the US Department of Commerce, Bureau of Economic Analysis, 2008
- Number of Level 1 and Level 2 Trauma Centers, from DataMasher (www.datamasher.org)
- Population density per square mile, from DataMasher (www.datamasher.org)
- Number of Level 1 and Level 2 Trauma Centers + Population density per square mile, from DataMasher (www.datamasher.org)
- State Ranking according to Number of Level 1 and Level 2 Trauma Centers + Population density per square mile, from DataMasher (www.datamasher.org)

Once I assembled the database I used the Excel LINEST, LOGEST and PEARSON functions to find possible linear or exponential correlation models

and the Pearson product-moment correlation coefficient between various pairs of variables for each State. The pairs of variables I analyzed were:

- Number of times an LCD differed from an NCD versus:
    - Number of schools of medicine
    - Number of physicians
    - GDP per capita
    - Ranking according to number of Level 1 and 2 Trauma Centers adjusted for population density
- Number of times an LCD was the same as an NCD versus:
    - Number of schools of medicine
    - Number of physicians
    - GDP per capita
    - Ranking according to number of Level 1 and 2 Trauma Centers adjusted for population density
- Total number of times an LCD was issued versus:
    - Number of schools of medicine
    - Number of physicians
    - GDP per capita
    - Ranking according to number of Level 1 and 2 Trauma Centers adjusted for population density

I quantified the number of times an LCD was the same as an NCD because it is not exactly the difference between the total LCDs and the number of times an LCD differed from NCDs, since for some procedures the difference couldn't be determined due to lack of information. On the other hand, although the total number of times an LCD was issued was expected to be highly correlated with the number of times an LCD differed from an NCD, I measured its correlation with the chosen variables separately because it may not always be the case.

To analyze the MEDCAC members characteristics, first I downloaded the members list from the CMS website at https://www.cms.gov/FACA/02_MedCAC.asp, under the archive "Roster" (updated 05/05/2010). The list includes name, academic grades, occupation and organization affiliation. I gathered the following information from various Internet public sources:

- Specialty
- Age (In some cases, it was available at www.healthgrades.com or it was approximated when the number of years since graduation was provided)
- State where the organization to which the member is affiliated is located
- Sex

From the MEDCAC database I obtained the Committee profile, according to the members characteristics.

In order to test my conclusions further and to understand more the local and national coverage determination processes and other possible factors that influence them, I interviewed four Contractor Medical Directors (CMDs), who are the key players in the LCD process. The interview questions and responses can be found in Appendix A.

## Limitations of the approach

The present research is focused on discrepancies between NCDs and LCDs. It doesn't analyze discrepancies between LCDs. As most of the currently issued policies are LCDs, this research approach fails to assess most of the discrepancies at the local level. However, with the Medicare contractor's consolidation taking place in the last seven years as part of the Medicare Contracting Reform, national policies are gaining importance as means to homogenize the current disparities in coverage. Analyzing discrepancies between local policies, although an interesting exercise, would give a picture of the past state of affairs of coverage policies, instead of the expected future trends.

A second limitation of the present approach is its focus on Medicare coverage policies. The other big player in coverage policies is the private insurance sector. But due to the difficulty in collecting information from the private sector, as well as the chosen limits for this research, the present research study is limited in that regard to the public sector. However, because Medicare coverage policies influence to a great extent coverage decisions of private payers, the present approach is of great importance to understand the system as a whole. Also, private payers are generally happy to rely on Medicare coverage guidelines in developing their own.

## Data limitations and challenges

The data necessary for this research were easily accessible from public sources in the Internet, mainly from the CMS website. However, detecting the differences between NCDs and LCDs coverage limitations posed a greater challenge for assembling the database. It meant reading the different national and local policies for 193 procedures, which was very time-consuming and

required a lot of concentration and sometimes a subjective judgment to decide if the difference was real or only in terms of the language used. If at least one coverage criterion or condition was different or additional (usually in the LCD), I defined it as different.

## IV. Results

I analyzed a total of 193 procedures with NCDs currently in effect. From these, 137 (71%) received a positive decision, while 56 (29%) denied coverage. Only two procedures, Nesiritide for Treatment of Heart Failure Patients and Lymphocyte Mitogen Response Assays, had a clear difference between the NCD and LCDs. The first procedure was not covered under the NCD while it was covered by the LCDs. For the Mitogen Response Assays the difference in coverage policies was the opposite: covered according to the NCD and not covered by the LCDs. For all other procedures the difference was in the coverage policy and limitations. Usually, LCDs are more specific in their criteria and have more limitations than NCDs. However, having different policies and coverage limitations between NCDs and LCDs doesn't necessarily mean they contradict each other.

From the 193 analyzed procedures, only 69 had issued LCDs, leaving the majority of procedures (nearly two thirds) with a homogeneous coverage policy dictated by the NCD. From the total LCDs issued for these 69 procedures, 51% differ in one way or another from the corresponding NCD, while 46% of the LCDs were exactly the same as the NCD (for 3% of the LCDs, the difference from the NCD couldn't be assessed due to lack of information). From the 193 procedures, only 10 required Technology Assessments and only 12 required MEDCACs as support to make the decision.

The procedures that required Technology Assessments are:
- Acupuncture for fibromyalgia (not covered, no LCD)
- Acupuncture for osteoarthritis (not covered, no LCD)
- Vertebral Artery Surgery (covered, no LCD)
- Fecal Occult Blood Test (covered, LCDs different from NCD)
- Assessing Patient's Suitability for Electrical Nerve Stimulation Therapy (covered, no LCD)
- Hyperbaric Oxygen Therapy (covered, LCDs different from NCD)
- Magnetic Resonance Spectroscopy (not covered, LCDs same as NCD)
- Ambulatory Blood Pressure Monitoring (covered, no LCD)
- Computed Tomography (covered, LCDs different from NCD)

The procedures that required a MEDCAC are:
- Bariatric Surgery for Treatment of Morbid Obesity (covered, LCDs different from NCD)
- Percutaneous Transluminal Angioplasty (PTA) (covered, LCDs different from NCD)
- Stem Cell Transplantation (covered, LCDs different from NCD)
- Transmyocardial Revascularization (TMR) (covered, LCD same as NCD)
- Continuous Positive Airway Pressure (CPAP) Therapy for Obstructive Sleep Apnea (OSA) (covered, LCDs different from NCD)
- Home Blood Glucose Monitors (covered, LCDs different from NCD)
- Noncontact Normothermic Wound Therapy (NNWT) (not covered, LCD different from NCD)
- Electrical Stimulation (ES) and Electromagnetic Therapy for the Treatment of Wounds (covered, LCDs different from NCD)
- Ocular Photodynamic Therapy (OPT) (covered, LCD same as NCD)
- Ambulatory Blood Pressure Monitoring (covered, no LCD, also required a TA)
- Positron Emission Tomography (FDG) for Oncologic Conditions (covered, LCD same as NCD)
- Positron Emission Tomography (PET) Scans (under review)

The benefit category with most issued NCDs and LCDs is physician's services, while the benefit category with least issued NCDs and LCDs is laboratory services.

As shown in Table 6, the states with most issued LCDs are (in descending order): Virginia, West Virginia, Illinois, Wisconsin, Ohio, Michigan, Kentucky, Indiana and Connecticut, mostly states from the East Coast and Great Lakes region. The states with the least issued LCDs are (in ascending order): Idaho, Alaska, Arizona, Oregon, Washington, Alabama, Georgia, Minnesota, Mississippi, Tennessee, New Jersey, District of Columbia, Montana, North Dakota, South Dakota, Utah and Wyoming.

The states with the higher number of differences between NCDs and LCDs are (in descending order): Virginia, West Virginia, Ohio, Kentucky, Illinois, Michigan, Kansas, Indiana, Connecticut and New York. The states with the higher number of equal policies between NCDs and LCDs are (in descending order): Virginia, Virgin Islands, Florida, Illinois, Michigan, North Carolina, Wisconsin, West Virginia, Ohio, Kentucky, South Carolina, Indiana and Connecticut.

Most states that are very active in producing LCDs also have a high number of both, policies that differ from NCDs and policies that are the same as NCDs. Kansas and New York are average states with respect to producing LCDs but they have high rates of discrepancies between NCDs and LCDs. On the other hand, Florida, the Virgin Islands, North Carolina and South Carolina are also average states with respect to LCD issuing activity but most of their local policies are equal to NCDs.

I also analyzed whether there is a pattern of association between the previous LCDs results and Medicare Part A and Part B contractors. As shown in table 11, I only found a possible link between the states with the least issued LCDs and their respective contractors. From 17 states, six (Arizona, Montana, North Dakota, South Dakota, Utah and Wyoming) receive administrative service for Medicare Part A and Part B by Noridian Administrative Services, while four states (Idaho, Alaska, Oregon and Washington) are serviced by the National Heritage Insurance Company. However, these two contractors also service other states that don't have a low LCD activity. Based on this preliminary analysis, LCD activity and discrepancies with NCDs don't appear to be related to the jurisdiction or contractor to which the states belongs, but further research would be needed to study a possible link.

The linear and exponential correlation models between the various pairs of variables that I analyzed for each state didn't demonstrate any significant relationship between any of these variables (see Table 8). For both the linear and the exponential models, the coefficient of determination ($r^2$), which is the square of the correlation coefficient between the two variables, had a very low value (less than 0.15), indicating a very poor description of the correlation of the two variables with the models used. The Pearson product-moment correlation coefficient is a measure of the strength of the linear correlation between the two variables. It is obtained by dividing the covariance of the two variables by the product of their standard deviations. For all the pairs of variables analyzed, the Pearson product-moment correlation coefficient had a very low value indicating a very weak correlation between them.

*Sub-analysis*

To search further for possible correlation patterns, I narrowed my analysis to representative states from three strategic geographical areas: the East Coast, the Center and the West Coast. I performed the same statistical analysis for the following states: Massachusetts, New York, Maryland, Georgia, Florida,

Illinois, Missouri, Texas, California, Oregon and Washington. The states and regions for the sub-analysis were chosen based on their relevance in terms of number of patients and health care industrial and regulation activity. There wasn't any significant correlation between the same pair of variables for these states (see Table 9).

To find possible disparities drivers between regions, I divided the previous states in their respective regions as follows:

> East Coast:
> > Massachusetts
> > New York
> > Maryland
> > Georgia
> > Florida
> Center:
> > Illinois
> > Missouri
> > Texas
> West Coast:
> > California
> > Oregon
> > Washington

I performed the same statistical analysis between regions, taking average values for each region, to correct for the difference in the number of states from each one (see Table 9). I found that the number of Medical Schools and the state's ranking according to the number of Level 1 and 2 Trauma Centers (adjusted for population density) are positively correlated with the number of LCDs that are different from NCDs, the number of LCDs that are the same as NCDs and the total number of issued LCDs. As the number of Medical Schools increases and the ranking is better (lower ranking number), the total number of issued LCDs increases, including the ones that are different from NCDs and the ones that are the same. These correlations are best explained by an exponential model, with $r^2 > 0.94$.

I also performed the same statistical analysis within each region, to see if there were any significant correlations between the same variables when comparing states of the same region (see table 9). In the East Coast, I didn't find any significant correlation. In the Central US, there was a correlation between the state's ranking according to the number of Level 1 and 2 Trauma Centers (adjusted for population density) and the number of LCDs differ from

NCDs and the total number of issued LCDs. The better the ranking (lower ranking number), the greater the number of LCDs which differed from NCDs, and the more LCDs were issued. These correlations were very well explained by both linear and exponential models, with $r^2>0.95$. Finally, in the West Coast, I found that the number of Schools of Medicine and the number of physicians are positively correlated with the number of LCDs that are different from NCDs and the total number of issued LCDs. As the number of Schools of Medicine and physicians increases, LCDs that are different from NCDs and total issued NCDs also increase. Both correlations were very well explained by linear and exponential models, with $r^2>0.99$.

*MEDCAC Members Analysis*

The MEDCAC analysis shows the following characteristics of its current members, shown in Table 10:

*Professional profile.* 69% of the members hold Medical Doctor (MD) degrees, 20% have a PhD, 11% a Master of Science, 11% a Master of Public Health and 10% hold a Master of Business Administrations (MBA). There are only 4 Registered Nurses in the Committee and 3 members with a JD degree. With the exception of one MD member that is a general practitioner, all the other MDs are specialists. The main specialties are, in descending order:
- Internal medicine (12 members)
- Cardiology (7)
- Pathology (4)
- Anesthesiology, emergency medicine, orthopedic surgery, geriatrics, surgery, neurology, ophthalmology, pharmacology, family medicine, epidemiology, gastroenterology and immunology (3 members each).

The following specialties are not represented in the Committee:
- Obstetrics/Gynecology
- Intensive care medicine
- Oral/maxillofacial surgery
- Otolaryngology
- Dermatology
- Pediatrics
- Pulmonology
- Rheumatology

Although for each MEDCAC meeting 15 additional members (which can be non-MEDCAC members) are selected with knowledge specific to the

topic in question to provide additional input, the absence of permanent members that represent very important specialties such as obstetrics/gynecology, dermatology, pediatrics and pulmonology is very notable.

*Age profile.* I could obtain or approximate the age for 1/3 of the members, with an average age of 53 years.

*Sex profile.* 67% of members are men.

*Geographical profile.* The data shows the prominence of some states on which most of the members work. In descending order, these are: Illinois, Massachusetts, New York, California, Pennsylvania, Michigan, New Jersey, Connecticut, Florida, Washington, Ohio, Georgia, District of Columbia, Maryland and Minnesota. The data shows most members are concentrated in the East Coast and the Great Lakes area.

*Academics vs non-academics.* 78% of members are academics while 22% are non-academics.

*Academia versus industry.* 59% of the members work in academic institutions, while 41% work in industry.

*Patient advocates and industry representatives.* There are 6 members representing patient advocate organizations and 6 members representing industry, of which two are from Pfizer.

*Contractor Medical Directors (CMDs) Interviews*

The following is a summary of the main opinions shared by most of the CMDs interviewed:

There is not a direct correlation between the time frames for issuing NCDs and LCDs. Some LCDs are issued without any NCD preceding them and later an NCD is issued for the procedure, after many LCDs have made clear the necessity for an NCD. Sometimes NCDs are issued without any LCD previously in place and LCDs come later to adapt it to the specific coverage circumstances of the contractor. The main reason to issue an LCD after an NCD is already in place is to specify the billing codes that apply according to the contractor's criteria. NCDs don't specify billing codes, because CMS doesn't have the human and economic resources necessary to do it.

Consistency between LCDs from different contractors is required only for the four DME contractors (due to their limited number it is relatively easy for them to agree on coverage policies). For other benefit categories, consistency is harder to achieve. One CMD mentioned that the original idea of CMS wasn't to achieve consistency between different contractors but to let them adapt policies to the local standards of medical practice. But today, with evidence-based medicine, there is no reason to have variation between medical practice across states, so LCDs should be consistent across contractors.

CMDs made very clear that LCDs shouldn't contradict NCDs. However, they recognize that LCDs present differences from NCDs, mainly in the form of exclusions not specified in NCDs. These exclusions are specified through billing codes applicable for LCDs. CMS intentionally leaves these exclusion decisions open to the contractor's discretion. These exclusions are supposed to be adaptations of the NCD to local circumstances, like detected local aberrant billing patterns and local standards of medical practice. Using the exclusions specified in LCDs streamline the denial of claims, decreasing the need for assessing claims one by one, which is more costly for contractors than issuing an LCD.

The following were mentioned as drivers of LCD issuing activity:
- The necessity to automate legitimate denials
- A history of abuse and fraud for the procedure or in the geographical area
- The CMD's special interests according to his/her specialty
- Human and economic resources available to issue LCDs
- When there are new procedures, to make clear coverage conditions
- Contractor's philosophy towards coverage policies. Some contractors prefer to leave coverage decisions in the hands of physicians, while others have a different approach to coverage decisions.
- How clear is the NCD. If it is sufficiently clear, contractors have less need to issue an LCD.
- Perceived need for an LCD, which can depend on the population density and the number of Trauma Centers, physicians and Schools of Medicine.
- Ambition and experience of the CMD. More experienced CMDs issue more LCDs
- Data analysis of medical necessity criteria based on:

- Quality of care
- History of claim's billing errors
- Billing abuse
- Historical problematic areas
- Comparison of utilization patterns between states

The decision to issue an LCD rests in the CMD. Although the CAC has only an advisory role, its composition and level of activity and expertise of its members influence the LCD process. Usually, CAC members are proposed by the local medical associations. CACs meet approximately every four months, reviewing 6 to 8 LCDs in two hours, with approximately 30 physicians from the specialties impacted by the particular LCDs discussed in each meeting. Each LCD takes about 90 days to complete. According to one CMD, because joining a CAC is not compensated or reimbursed, it requires time and often money from the physicians, making it difficult to recruit opinion leaders. For this and other reasons, CMDs without enough staff or efficient CACs often copy other contractor's LCDs. In the future most CMDs interviewed think contractors will end up with one CAC per jurisdiction.

The CMDs prioritize LCDs to issue according to the following criteria:
- Data analysis of medical review;
- New technologies that might pose a risk to the Medicare funds;
- Procedures with perceived overutilization;
- Procedures where there is concern for abuse;
- The number and type of claims received;
- Procedures that are expensive or very highly used;
- Procedures that have a significant clinical value or that pose a significant medical risk.

Situations can arise where there are LCDs issued for some, but not all states in a jurisdiction because some of the LCDs have been issued by different contractors before Medicare Contracting Reform. But once contractor consolidation takes place, contractors should issue LCDs for all states in their jurisdiction.

Medicare Contracting Reform will cause more homogeneous policies between states due to the decreasing number of contractors, but there will still be differences between states belonging to different contractors. There will no longer be differences between Medicare Part A and Part B policies because they will be issued by the same contractor.

When an LCD challenges the standard of practice, there is pressure from the profession, industry and consumers to change it. If other contractors cover the procedure, the pressure to change the LCD will be higher. This political pressure can push the contractor to put the LCD on hold. However, if the decision is based on clinical evidence from respected journals or expert opinion, it will prevail.

The Least Costly Alternative (LCA) coverage criterion is not used anymore even for DMEs due to a recent court decision (Hays vs. Sebelius) and legal pressure from the medical device and pharmaceutical industries.

Most NCDs are not based on TAs or MEDCACs because they are costly to CMS and because many NCDs are not issued for new technologies, which are more prone to require TAs or MEDCACs. According to one CMD, procedures that require medical devices (as opposed to drugs) are more subject to NCDs where TAs or MEDCACs are used, since the FDA approval for medical devices can be less stringent than that for drugs, and may assess the safety of the device more than its clinical value. Thus, further clinical evidence is needed to justify coverage, and this is usually based on TAs or MEDCACs. This was confirmed by my analysis, which shows that of the 22 procedures requiring TAs or MEDCACs, 14 involve medical devices.

A lot of policy activity is carried on at the local level because contractors issue LCDs faster than CMS issues NCDs and because CMS doesn't have the resources to make all policy decisions. However, the level of expertise and structure of the evaluation mechanism are lower at the local level. One CMD mentioned that the medical device and pharmaceutical industries prefer to convince local contractors of the benefits of their technologies at the local level instead of CMS, because it is easier in terms of the evidence required and time invested. Once a contractor issues a policy in favor of the procedure, other contractors are pressured to do the same.

## V. Discussion of results

The present discussion of results is based on an analysis of 193 (61%) procedures from 314 with NCDs currently in effect.

LCDs agree, with the exception of very few decisions (2 from 193), with NCDs in the ultimate question they are trying to address: is the procedure covered? However, a more meticulous analysis reveals that approximately half (51%) of LCDs differ from NCDs in the conditions, circumstances and specific criteria that set the limits of that coverage decision. The main difference between NCDs and LCDs is in the form of exclusions specified in LCDs through applicable billing codes that are not specified in NCDs. CMS intentionally leaves these exclusion decisions open to the contractor's discretion to adapt the NCDs to their local needs and because CMS doesn't have the resources and speed to manage all this policy activity. States that don't issue LCDs have to adhere to the respective NCD. 64% of procedures (124/193) that have an NCD don't have any LCD at all. According to CMDs, this could mean that most NCDs are sufficiently clear and don't require specific billing coding information or that any of the other drivers of LCD issuing activity are usually absent (aberrant billing patterns, new procedures, etc.). If we take into account that from 193 procedures that have NCDs only 69 (36%) have at least one LCD and that from these, 46% are exactly the same as their NCDs counterparts (while 51% are different), only 18% (69/193 x 0.51) of procedures have local policies that are to some extent different from the national policies. This means there is a reasonable degree of homogeneity in coverage policies (82%) across the United States for procedures for which an NCD has been issued. However, most procedures have LCDs without an NCD in place, in which case the differences in coverage policies depend on the degree of variability between LCDs issued by different contractors.

Going through an NCD process is not necessarily bad from the perspective of the medical technology advocates, since 71% of procedures received a favorable national and local coverage decision. I expect this to be particularly true when the NCD process is initiated by a company or individual with an interest in a favorable coverage decision, since once they initiate the process they are usually well prepared to present the evidence in favor of reimbursement. However, future research is needed to find a possible correlation between the identity of the initiator of an NCD process and its outcome. This may be difficult, as gathering the information for such a research is not available, to the best of my knowledge, from the CMS website.

That the National Coverage Decision process is somehow not very structured is demonstrated by the fact that from 193 procedures that underwent coverage decisions, only 10 required a Technology Assessment and only 12 required a Medicare Evidence Development & Coverage Advisory Committee (MEDCAC). According to CMDs this is mainly because CMS has budget constraints and limits the use of TAs and MEDCACs to new technologies that require clear national coverage guidance, most of which are medical devices due to the lack of clinical effectiveness information in FDA device trials. None of the 12 procedures requiring an evaluation from the MEDCAC involved a specialty not represented in the MEDCAC, which could mean one of two things: that the MEDCAC composition is adequate or that there aren't procedures from these specialties evaluated by the MEDCAC precisely because they are not represented in it. From the 22 decisions involving TAs or MEDCACs, only 4 were not approved, which means that going through one of these more structured processes is not necessarily bad for reimbursement advocates. The reason for this might be that the basis for the evaluation is clearer and known in advance, resulting in better preparation to present the evidence from the parties interested in coverage. All other national decisions were taken at the discretion of CMS authorities, many without information disclosure of the criteria used to evaluate the clinical value of the procedure. On the other hand, most LCDs mention the basis of their decision, which usually are journals, CMS, external organizations or other carriers' decisions.

The states with a higher number of issued LCDs are mainly located in the East Coast and the Great Lakes areas. It is interesting to note that the majority of MEDCAC members are also concentrated in these two regions, although, to the best of my knowledge, they are not supposed to be involved with Local Coverage Determinations, so this would be a coincidental finding. Apart from the analyzed variables thought to be related to LCD issuing activity in the present study, these states might share common characteristics that could reveal other possible variables that explain a greater LCD issuing activity and in some cases more coverage discrepancies. As was explained in the Results section, on a preliminary analysis, I hypothesized that contractors may be one of these variables. However, I didn't find any indication of this. Future research is needed to find possible predictors of LCD issuing activity based on characteristics common to these states. One common characteristic shared by these states is that they are home to many of the most influential medical device, biotechnology and pharmaceutical companies. Some other possible drivers mentioned by CMDs of such LCD issuing activity that could have local variations and that merit further research, are:
- The necessity to automate legitimate denials
- A history of abuse and fraud

- CMD's experience, ambition and interests
- Human and economic resources available to the contractor to issue LCDs
- Contractor's philosophy towards coverage policies
- Perceived need for an LCD
- Level of sophistication of data analysis of utilization patterns, quality of care and billing errors

Kansas and New York are of particular interest due to their large number of discrepancies between LCDs and NCDs not explained by greater LCD issuing activity. Since most of these discrepancies are exclusions not mentioned in NCDs, some possible factors that merit further research are: a history of abuse and fraud, a greater perceived need for an LCD, the CMD profile and a greater data analysis capability in these states. On the other hand, Florida, the Virgin Islands, North Carolina and South Carolina have a greater rate of LCDs equal to NCDs. The same variables, pointing in the opposite direction, can be responsible for these differences. Further research is needed to find possible drivers of these coverage discrepancies and similarities.

On a national level, the present study shows that discrepancies between NCDs and LCDs coverage limitations are not explained by the hypothesized factors. However, some sub-analysis results showed some possible correlations when comparing the same variables between regions and between states from the same region. As I mentioned in the Results section above, the analysis between regions showed that as the number of Medical Schools increases and the ranking of Level 1 and 2 Trauma Centers (adjusted for population density) is better (lower ranking number), the total number of issued LCDs increases, including those that differ from NCDs as well as those that are the same. This is contrary to hypothesis, since having more issued LCDs is not supposed to be in favor of physician's and hospitals interests, if it is the case that this excess LCD activity limits reimbursement for them. However, it could be the case that this higher number of LCDs somehow favors physician's and hospital's interests for these procedures.

In the statistical analysis within each region I found some interesting correlations in the Central and West Coast regions, as mentioned in the Results section. In the Central US I found that that with a better ranking of Level 1 and 2 Trauma Centers (lower ranking number), more LCDs differed from NCDs and more LCDs were issued. These results were unexpected according to the initial hypothesis. Somehow hospital's interests in this region have generated a greater LCD activity. In the West Coast, I found that the number of Schools of Medicine and the number of physicians are

positively correlated with the number of LCDs that are different from NCDs and the total number of issued LCDs. Again, this is the contrary of what was initially expected: a lower policy discrepancy and a lower number of LCDs.

The correlations founded in the sub-analysis have to be taken with caution and merit further research, since the number of states in the samples is too small to arrive to a conclusion based on these data points.

Although few analyzed procedures have required MEDCACs, an analysis of its membership profile can be important if decisions are supposed to be more structured in the future with the Medicare Contracting Reform. The typical MEDCAC member is a 53 years old male MD with a specialty doing research on an academic Institution located in the East Coast or the Great Lakes area. Beyond this stereotype, the general composition of the MEDCAC is comprehensive with respect to the different points of view and areas of expertise required to evaluate the clinical value of medical procedures, including industry representatives, patient advocates and experts in health policy, health outcomes, epidemiology, biostatistics, pharmacology, nursing, occupational, preventive and family medicine, public policy, law, psychology, sociology and at least one representative of the most important medical specialties, with the previously mentioned important exceptions. Although a majority of members (59%) work in academic Institutions, there is an important representation from the medical industry, private health systems and health quality organizations. At the local level, on the other hand, CACs fulfill only an advisory role and are not as influential as MEDCACs. CACs are often composed of physicians who are not necessarily opinion leaders and very often the evidence required to convince a CAC of the clinical value of a procedure is lower than the evidence required to convince a MEDCAC.

## VI. Conclusions and recommendations

The following conclusions and recommendations can be drawn from the previous analysis and discussion of results:

- o The majority of procedures (64%) that have an NCD don't have any LCD at all. Further research is needed to determine the factors that characterize the procedures for which LCDs are issued having an NCD already in place. These could be any of the drivers of LCD issuing activity discussed in the previous section.

- o There is a reasonable degree of homogeneity in coverage policies (82% are exactly the same) for procedures for which an NCD has been issued. The degree of homogeneity or variability between LCDs from different states is beyond the scope of this study and would be interesting to explore in the future.

- o The majority of differences between NCDs and LCDs come in the form of conditions and diagnosis that are **not excluded** in the NCD, while being **excluded** in the LCD, restricting coverage to certain CPT and ICD-9 codes. CMS is clear that when an NCD mentions a covered condition or diagnosis, it doesn't mean they should be the only ones covered, it leaves that decision to the discretion of the contractors through the LCDs. Thus, although LCDs don't openly contradict NCDs (they never deny coverage for conditions specified in NCDs as covered, except for the Mitogen Response Assays already mentioned), they use the open space left by NCDs to restrict coverage according to their local demands. According to CMDs, the reason why CMS leaves many exclusion decisions open to contractor's discretion is because it doesn't have the resources and speed to manage all this policy activity and because CMS wants to let contractors adapt the NCDs to their local needs. A future interesting research topic could be to explore whether shifting this policy activity back to CMS, making exclusion decisions and assigning billing codes directly in NCDs, could decrease coverage policy variability, if this could be feasible from an operational and administrative perspective and even if homogeneity in coverage policies is desirable.

- o The majority of the procedures (71%) that go through an NCD process receive a positive coverage decision. The degree of limitations on this positive coverage decision and its adequacy to standard medical

practice or clinical evidence is not assessed on this study and would be an interesting question to ask in future coverage research.

o If the majority of procedures (82%) for which an NCD has been issued have exactly the same coverage policies for all states and the majority of NCDs are positive (in 71% of cases the procedure is covered), it follows that, for the majority of procedures, reimbursement advocates - including hospitals, physicians, industry and consumers- should pursue NCDs instead of LCDs. On top of that, if LCDs are more restrictive than NCDs, then, reimbursement advocates shouldn't be in favor of LCD issuing activity. The only parties favored by LCD issuing activity are clearly Medicare and to some extent its contractors, who, by automating the denial of some claims, may decrease their operating costs.

o In the majority of cases, the NCD process is left to the discretion of CMS authorities, without any TA or MEDCAC involved in the decision process. Some possible explanations for this are CMS budget constraints or limiting the use of TAs or MEDCACs strictly to new technologies, the majority of which are medical devices.

o Although MEDCACs are composed mostly of academic MD specialists, the general composition of the MEDCAC is comprehensive with respect to the different points of view and areas of expertise required to evaluate the clinical value of medical procedures. On the other hand, at the local level, CACs are often composed of physicians who are not necessarily opinion leaders. In many cases, the evidence required to convince a CAC of the clinical value of a procedure is lower than the evidence required to convince a MEDCAC. That's one of the reasons why many medical device manufacturers and pharmaceutical companies prefer the local route to gain coverage for their products. Other reasons are that LCDs take less time than NCDs to complete and once a contractor accepts coverage of a procedure, it is easier to convince other contractors.

o From a public policy perspective, clearer rules on coverage decisions at the national level (meaning increased use of TAs or MEDCACs) would incentivize industry leaders to pursue the national route for coverage and this might attract more investment towards cost-effective medical innovations, as reimbursement risk decreases.

o The states with a higher degree of LCD issuing activity are located in the East Coast and the Great Lakes areas. These states might share common characteristics that account for this greater LCD issuing activity and that merit further research, including: the necessity to automate legitimate denials; a history of abuse and fraud; CMD's experience, ambition and interests; budget size for issuing LCDs; contractor's philosophy towards coverage policies; perceived need for an LCD and level of sophistication of data analysis of utilization patterns, quality of care and billing errors.

o Two states, Kansas and New York, have a higher rate of discrepancy not explained by an increase in LCD issuing activity, while four states, Florida, the Virgin Islands, North Carolina and South Carolina, have a lower rate of discrepancies not explained by a lower LCD issuing activity. Some possible drivers of this higher or lower rate of discrepancies that need to be studied in the future could be: history of abuse and fraud, perceived need for an LCD, the CMD profile and data analysis capability.

o On a national level, **discrepancies between NCDs and LCDs are not explained by the hypothesized factors**: number of Schools of Medicine, number of physicians, GDP per capita, State Ranking according to number of Level 1 and Level 2 Trauma Centers, population density per square mile and MEDCAC members characteristics.

o A sub-analysis between regions showed a significant positive correlation ($r^2 > 0.94$) between the number of issued LCDs and the number of Schools of Medicine and between the number of issued LCDs and the ranking of Level 1 and Level 2 Trauma Centers. Having a greater LCD issuing activity could favor physicians' and hospitals' interests.

o A sub-analysis between states of the same region showed that in the Central US, a better ranking according to Level 1 and 2 Trauma Centers is correlated ($r^2 > 0.95$) with a higher LCD issuing activity and a greater degree of differences between LCDs and NCDs. Having more sophisticated hospitals could be a driver of LCD issuing activity and greater differences between LCDs and NCDs. In the West Coast, the number of Schools of Medicine and the number of physicians are positively correlated ($r^2 > 0.99$) with the total number of LCDs and the number of LCDs that differ from NCDs, showing again that physician's

interests could be a driver of LCD issuing activity and of differences between LCDs and NCDs.

o The correlations shown by the performed sub-analysis within regions may imply that more LCDs are issued to restrict coverage when there is a local need to control the excessive demand partially driven by the higher number of hospitals and physicians that are active in pursuing their interests. The fact that these correlations were shown only at a regional level may indicate that when local factors are disregarded, the original hypothesized factors do influence LCD activity, however, at a national level, other hypothetical local factors may have a greater influence on LCD activity and policy discrepancies. The higher LCD issuing activity in the East Coast and Great Lakes areas confirm the geographical nature of these other hypothetical factors.

o Medicare Contracting Reform will cause more homogeneous policies between states but there will still be differences between states belonging to different contractors. After Contracting Reform, there will no longer be differences between Part A and Part B policies.

# VII. Tables

## Table 1. Inpatient Hospital Services

| NCD | | | | LCD | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| NCD title | Covered (0=N, 1=Y) | TA (0=N, 1=Y) | MEDCAC (0=N, 1=Y) | Contractor | Contractor Type | States | Covered? | Limitations different to NCD? (0=different, 1=same) | Limitations different to other LCDs? (0=different, 1=same) | Base of Decision |
| Abarelix for the treatment of prostate cancer | 1 | 0 | 0 | First Coast Serv | MAC Part A and | Florida | 1 | 1 | 1 | CMS |
| | | | | First Coast Serv | MAC Part A and | Puerto Rico, Virg | 1 | 1 | 1 | CMS |
| Acupuncture | 0 | 0 | 0 | | | | | | | |
| Acupuncture for fibromyalgia | 0 | 1 | 0 | | | | | | | |
| Acupuncture for Osteoarthritis | 0 | 1 | 0 | | | | | | | |
| Adult liver transplantation | 1 | 0 | 0 | | | | | | | |
| Anesthesia in Cardiac Pacemaker Surgery | 1 | 0 | 0 | | | | | | | |
| Arthroscopic Lavage and Arthroscopic Debridement for the Osteoarthritic Knee | 0 or 1 | 0 | 0 | | | | | | | |
| Bariatric Surgery for Treatment of Morbid Obesity | 1 | 0 | 1 | Wisconsin Phys | MAC Part A | Iowa, Kansas, M | 1 | 1 | 1 | CMS |
| | | | | Palmetto GBA | MAC Part B | California North | 1 | 1 | 1 | CMS |
| | | | | National Govern | FI/Carrier/MAC | Indiana, Illinois, | 1 | 1 | 1 | CMS |
| | | | | CIGNA Govern | Carrier | North Carolina, | 1 | 0 | 0 | Journals |
| Blood Brain Barrier Osmotic Disruption for Treatment of Brain Tumors (Effective March 20, 2007) | 0 | 0 | 0 | | | | | | | |
| Blood Platelet Transfusions | 1 | 0 | 0 | | | | | | | |
| Blood Transfusions | 1 | 0 | 0 | | | | | | | |
| Cardiac Pacemakers | 1 | 0 | 0 | | | | | | | |
| Closed-Loop Blood Glucose Control Device (CBGCD) | 1 | 0 | 0 | | | | | | | |
| Cryosurgery of Prostate | 1 | 0 | 0 | First Coast Opti | MAC Part A | Florida, Puerto | 1 | 0 | 1 | Journals |
| Dental Examination Prior to Kidney Transplantation | 1 | 0 | 0 | | | | | | | |
| Extracranial-Intracranial (EC-IC) Arterial Bypass Surgery | 0 | 0 | 0 | | | | | | | |
| Granulocyte Transfusions | 1 | 0 | 0 | | | | | | | |
| Heart Transplants | 1 | 0 | 0 | | | | | | | |
| Inpatient Hospital Pain Rehabilitation Programs | 1 | 0 | 0 | | | | | | | |
| Inpatient Hospital Stays for Treatment of Alcoholism | 1 | 0 | 0 | | | | | | | |
| Intestinal and Multi-Visceral Transplantation | 1 | 0 | 0 | | | | | | | |
| Intestinal Bypass Surgery | 0 | 0 | 0 | | | | | | | |
| Intraoperative ventricular mapping | 1 | 0 | 0 | | | | | | | |
| Invasive Intracranial Pressure Monitoring | 1 | 0 | 0 | | | | | | | |
| Islet Cell Transplantation in the Context of a Clinical Trial | 1 | 0 | 0 | | | | | | | |
| Laparoscopic Cholecystectomy | 1 | 0 | 0 | | | | | | | |
| L-Dopa | 1 | 1 | 0 | | | | | | | |
| Lumbar Artificial Disc Replacement (LADR) | 0 | 0 | 0 | Noridian Admini | Carrier, MAC Pa | Alaska, Oregon, | 0 | 0 | 1 | Technology Ass |
| Lung Volume Reduction Surgery (Reduction Pneumoplasty) | 1 | 0 | 0 | First Coast Serv | MAC Part A | Florida, Puerto | 1 | 1 | 1 | CMS |
| Nesiritide for Treatment of Heart Failure Patients | 0 | 0 | 0 | First Coast Serv | MAC Part A, MA | Florida, Puerto | 1 | 0 | 0 | Journals |
| | | | | National Govern | FI, Carrier, MAC | Indiana, Illinois, | 1 | 0 | 0 | Journals |
| | | | | Palmetto GBA | MAC Part A | California, Amer | 1 | 0 | 0 | Journals |
| Nonselective (Random) Transfusions and Living Related Donor Specific Transfusions (DST) in Kidney Transplantation | 1 | 0 | 0 | | | | | | | |
| Pancreas Transplants | 1 | 0 | 0 | | | | | | | |
| Pediatric Liver Transplantation | 1 | 0 | 0 | | | | | | | |
| Percutaneous Image-Guided Breast Biopsy | 1 | | | | | | | | | |
| Percutaneous Transluminal Angioplasty (PTA) | 1 | 0 | 1 | Palmetto GBA | Carrier | Ohio, West Virgi | 1 | 0 | 1 | Journals |
| Postural Drainage Procedures and Pulmonary Exercises | 1 | 0 | 0 | | | | | | | |
| Stem Cell Transplantation | 1 | 0 | 1 | National Govern | FI, Carrier, MAC | Indiana, Illinois, | 1 | 0 | 1 | Journals |
| Stereotactic Cingulotomy as a Means of Psychosurgery | 0 | 0 | 0 | | | | | | | |
| Thoracic Duct Drainage (TDD) in Renal Transplants | 1 | 0 | 0 | | | | | | | |
| Transcutaneous Electrical Nerve Stimulation (TENS) for Acute Post-Operative Pain | 1 | 0 | 0 | CIGNA Govern | DME MAC | Alabama, Arkan | 1 | 0 | 1 | NA |
| | | | | Noridian Admini | DME MAC | Alaska, America | 1 | 0 | 1 | NA |
| | | | | NHIC Corp | DME MAC | Connecticut, Dis | 1 | 0 | 1 | NA |
| | | | | National Govern | DME MAC | Illinois, Indiana, | 1 | 0 | 1 | NA |
| Transmyocardial Revascularization (TMR) | 1 | 0 | 1 | First Coast Serv | MAC Part B | Florida, Puerto | 1 | 1 | 1 | Journals |
| Ultrafiltration, Hemoperfusion and Hemofiltration | 1 | 0 | 0 | | | | | | | |
| Ultrasound Diagnostic Procedures | 1 | 0 | 0 | | | | | | | |
| Vertebral Artery Surgery | 1 | 1 | 0 | | | | | | | |

# Table 2. Durable Medical Equipment

| NCD | | | | LCD | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| NCD title | Covered (0=N, 1=Y) | TA (0=N, 1=Y) | MEDCAC (0=N, 1=Y) | Contractor | Contractor Type | States | Covered? | Limitations different to NCD? (0=different, 1=same) | Limitations different to other LCDs? (0=different, 1=same) | Base of Decision |
| Continuous Positive airway Pressure (CPAP) Therapy for Obstructive Sleep Apnea (OSA) | 1 | 0 | 1 | Noridian Admini | DME MAC | Alaska, America | 1 | 0 | 1 | NA |
| | | | | CIGNA Governn | DME MAC | Alabama, Arkan | 1 | 0 | 1 | NA |
| | | | | NHIC Corp | DME MAC | Connecticut, Dis | 1 | 0 | 1 | NA |
| | | | | National Govern | DME MAC | Illinois, Indiana, | 1 | 0 | 1 | NA |
| Home Blood Glucose Monitors | 1 | 0 | 1 | Noridian Admini | DME MAC | Alaska, America | 1 | 0 | 1 | NA |
| | | | | CIGNA Governn | DME MAC | Alabama, Arkan | 1 | 0 | 1 | NA |
| | | | | NHIC Corp | DME MAC | Connecticut, Dis | 1 | 0 | 1 | NA |
| | | | | National Govern | DME MAC | Illinois, Indiana, | 1 | 0 | 1 | NA |
| Independence iBOT 4000 Mobility System | 1 | 0 | 0 | | | | | | | |
| Infrared Therapy Devices | 0 | 0 | 0 | | | | | | | |
| Infusion Pumps | 1 | 0 | 0 | NHIC Corp | DME MAC | Connecticut, Dis | 1 | 0 | 1 | NA |
| | | | | CIGNA Governn | DME MAC | Alabama, Arkan | 1 | 0 | 1 | NA |
| | | | | Noridian Admini | DME MAC | Alaska, America | 1 | 0 | 1 | NA |
| | | | | National Govern | DME MAC | Illinois, Indiana, | 1 | 0 | 1 | NA |
| Intrapulmonary Percussive Ventilator (IPV) | 0 | 0 | 0 | NHIC Corp | DME MAC | Connecticut, Dis | 0 | NA | NA | NA |
| | | | | CIGNA Governn | DME MAC | Alabama, Arkan | 0 | NA | NA | NA |
| | | | | Noridian Admini | DME MAC | Alaska, America | 0 | NA | NA | NA |
| | | | | National Govern | DME MAC | Illinois, Indiana, | 0 | NA | NA | NA |
| Mobility Assistive Equipment (MAE) | 1 | 0 | 0 | | | | | | | |
| Nebulized Beta Andrenergic Agonist Therapy for Lung Diseases | No NCD is appr | 0 | 0 | | | | | | | |
| Noncontact Normothermic Wound Therapy (NNWT) | 0 | 0 | 1 | Wisconsin Phys | Carrier, MAC A, | Wisconsin, Illino | 0 | 0 | 1 | Journals |
| Non-Implantable Pelvic Floor Electrical Stimulator | 1 | 0 | 0 | National Govern | Fl, Carrier, MAC | Indiana, Illinois, | 1 | 1 | 1 | Journals |
| | | | | 0 NHIC Corp | MAC A, MAC B | Maine, New Har | 1 | 1 | 1 | Journals |
| | | | | Wisconsin Phys | Carrier, MAC B | Wisconsin, Illino | 1 | 1 | 1 | Journals |
| Osteogenic Stimulators | 1 | 0 | 0 | First Coast Serv | MAC B | Florida, Puerto F | 1 | 1 | 1 | NA |
| Pneumatic Compression Devices | 1 | 0 | 0 | CIGNA Governn | DME MAC | Alabama, Arkan | 1 | 1 | 1 | NA |
| | | | | Noridian Admini | DME MAC | Alaska, America | 1 | 1 | 1 | NA |
| | | | | NHIC Corp | DME MAC | Connecticut, Dis | 1 | 1 | 1 | NA |
| | | | | National Govern | DME MAC | Illinois, Indiana, | 1 | 1 | 1 | NA |
| Self-Contained Pacemaker Monitors | 1 | 0 | 0 | | | | | | | |
| Speech Generating Devices | 1 | 0 | 0 | Noridian Admini | DME MAC | Alaska, America | 1 | 0 | 1 | NA |
| | | | | CIGNA Governn | DME MAC | Alabama, Arkan | 1 | 0 | 1 | NA |
| | | | | NHIC Corp | DME MAC | Connecticut, Dis | 1 | 0 | 1 | NA |
| | | | | National Govern | DME MAC | Illinois, Indiana, | 1 | 0 | 1 | NA |
| Tinnitus Masking | 0 | | | | | | | | | |
| Vagus Nerve Stimulation (VNS) | 1 | 0 | 0 | TrailBlazer Healt | MAC Part A, MA | Colorado, New I | 1 | 0 | 1 | Journals |

# Table 3. Diagnostic Laboratory Tests

| NCD | | | | LCD | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| NCD title | Covered (0=N, 1=Y) | TA (0=N, 1=Y) | MEDCAC (0=N, 1=Y) | Contractor | Contractor Type | States | Covered? | Limitations different to NCD? (0=different, 1=same) | Limitations different to other LCDs? (0=different, 1=same) | Base of Decision |
| Alpha-fetoprotein | 1 | 0 | 0 | | | | | | | |
| Blood Counts | 1 | 0 | 0 | | | | | | | |
| Blood Glucose Testing | 1 | 0 | 0 | Palmetto GBA | FI | North Carolina | 1 | 1 | 0 | Burtis and Ashw |
| Carcinoembryonic antigen | 1 | 0 | 0 | | | | | | | |
| Collagen Crosslinks | 1 | 0 | 0 | | | | | | | |
| Diagnostic Pap Smears | 1 | 0 | 0 | Palmetto GBA | FI | South Carolina, | 1 | 1 | 1 | Carr B. Bradsha |
| Digoxin Therapeutic Drug Assay | 1 | 0 | 0 | | | | | | | |
| Fecal Occult Blood Test | 1 | 1 | 0 | Palmetto GBA | FI | North Carolina, | 1 | 0 | 0 | Fauci AS, Braun |
| | | | | Pinnacle Busine | Carrier, FI | Arkansas, Louis | 1 | 0 | 0 | American Socie |
| | | | | National Govern | FI, Carrier, MAC | Indiana, Illinois, | 1 | 1 | 0 | CMS |
| | | | | Palmetto GBA | MAC Part A | California, Amer | 1 | 1 | 0 | CMS |
| | | | | First Coast Serv | MAC Part A, MA | Florida, Puerto F | 1 | 0 | 0 | Fauci, A., Braun |
| | | | | NHIC Corp | MAC Part B | Maine, New Har | 1 | 1 | 0 | CMS |
| Gamma Glutamyl Transferase | 1 | 0 | 0 | | | | | | | |
| Glycated Hemoglobin/Glycated Protein | 1 | 0 | 0 | | | | | | | |
| Hepatitis Panel/Acute Hepatitis Panel | 1 | 0 | 0 | | | | | | | |
| Histocompatibility Testing | 1 | 0 | 0 | | | | | | | |
| Human Chorionic Gonadotropin | 1 | 0 | 0 | | | | | | | |
| Human Immunodeficiency Virus (HIV) Testing (Diagnosis) | 1 | 0 | 0 | | | | | | | |
| Human Immunodeficiency Virus (HIV) Testing (Prognosis Including Monitoring) | 1 | 0 | 0 | | | | | | | |
| Human Tumor Stem Cell Drug Sensitivity Assays | 0 | 0 | 0 | Palmetto GBA | Carrier | South Carolina, | 0 | 1 | 1 | Journals |
| Lipid Testing | 1 | 0 | 0 | National Govern | FI, Carrier, MAC | Indiana, Illinois, | 1 | 0 | 1 | Journals |
| Lymphocyte Mitogen Response Assays | 1 | 0 | 0 | National Govern | FI, MAC Part A, | Indiana, Illinois, | 0 | 0 | 1 | Journals |
| | | | | Highmark Medic | MAC Part A, MA | Delaware, Distri | 0 | 0 | 1 | Bernstein I, Li J, |
| Partial Thromboplastin Time (PTT) | 1 | 0 | 0 | National Govern | FI, MAC Part A, | Indiana, Illinois, | 1 | 0 | 1 | Journals |
| Pharmacogenomic Testing for Warfarin Response | 1 | 0 | 0 | | | | | | | |
| Prostate Specific Antigen | 1 | 0 | 0 | Palmetto GBA | MAC Part B | California, Amer | 1 | 0 | 0 | Journals |
| | | | | TrailBlazer Healt | MAC Part A, MA | Colorado, New I | 1 | 0 | 0 | TrailBlazer adop |
| | | | | National Govern | FI | Indiana, Illinois, | 1 | 0 | 0 | Journals |
| Prothrombin Time (PT) | 1 | 0 | 0 | National Govern | FI, MAC Part A, | Indiana, Illinois, | 1 | 0 | 1 | Journals |
| Serologic Testing for Acquired Immunodeficiency Syndrome (AIDS) | 1 | 0 | 0 | | | | | | | |
| Serum Iron Studies | 1 | 0 | 0 | | | | | | | |
| Thyroid Testing | 1 | 0 | 0 | | | | | | | |
| Tumor Antigen by Immunoassay - CA 125 | 1 | 0 | 0 | | | | | | | |
| Tumor Antigen by Immunoassay - CA 15-3/CA 27.29 | 1 | 0 | 0 | | | | | | | |
| Tumor Antigen by Immunoassay - CA 19-9 | 1 | 0 | 0 | | | | | | | |
| Urine Culture, Bacterial | 1 | 0 | 0 | | | | | | | |

# Table 4. Physician's Services

| NCD title | Covered (0=N, 1=Y) | Limitations | TA (0=N, 1=Y) | MEDCAC (0=N, 1=Y) | Contractor | Contractor Type | States | Covered? | Limitations different to NCD? (0=different, 1=same) | Limitations different to other LCDs? (0=different, 1=same) | Base of Decision |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Abortion | 0 | Abortions are nc | 0 | 0 | | | | | | | |
| Apheresis (Therapeutic Pheresis) | 1 | See policy | 0 | 0 | NHIC Corp | MAC Part B, MA | Maine, New Har | 1 | 0 | 1 | Journals |
| Assessing Patient's Suitability for Electrical Nerve Stimulation Therapy | 1 | See policy | 1 | 0 | | | | | | | |
| Autogenous Epidural Blood Graft | 1 | Autogenous epic | 0 | 0 | | | | | | | |
| Biofeedback Therapy | 1 | Biofeedback the | 0 | 0 | Wisconsin Phys | Carrier | Wisconsin, Illino | 1 | 0 | 0 | Journals |
| | | | | | First Coast Serv | MAC Part B, MA | Florida, Puerto F | 1 | 1 | 0 | Journals |
| | | | | | Cahaba Govern | MAC Part A | Alabama, Georg | 1 | 0 | 0 | Journals |
| | | | | | National Govern | Fl, Carrier | Indiana, Illinois, | 1 | 0 | 0 | Journals |
| | | | | | NHIC Corp | MAC Part B, MA | Maine, New Har | 1 | 0 | 0 | Journals |
| Breast Reconstruction Following Mastectomy | 1 | Reconstruction | 0 | 0 | Wisconsin Phys | Carrier | Wisconsin, Illino | 1 | 1 | 1 | Journals |
| Carotid Body Resection/Carotid Body Denervation | 0 | Carotid body res | 0 | 0 | | | | | | | |
| Cellular Therapy | 0 | Cellular therapy | 0 | 0 | | | | | | | |
| Chelation Therapy for Treatment of Atherosclerosis | 0 | EDTA chelation | 0 | 0 | Trailblazer Healt | MAC Part B, MA | Colorado, New I | 0 | 1 | 1 | CMS, TrailBlaze |
| Cochleostomy with Neurovascular Transplant for Meniere's Disease | 0 | While there are I | 0 | 0 | | | | | | | |
| Collagen Meniscus Implant | 0 | The Centers for | 0 | 0 | | | | | | | |
| Colonic Irrigation | 0 | There are no cor | 0 | 0 | | | | | | | |
| Deep Brain Stimulation for Essential Tremor and Parkinson's Disease | 1 | See policy | 0 | 0 | | | | | | | |
| Dermal Injections for the Treatment of Facial Lipodystrophy Syndrome (LDS) | 1 | Dermal injection | 0 | 0 | | | | | | | |
| Diagnosis and Treatment of Impotence | 1 | Program payme | 0 | 0 | National Govern | Fl, Carrier | Indiana, Illinois. | 1 | 0 | 1 | Journals |
| Diagnostic Endocardial Electrical Stimulation (Pacing) | 1 | Diagnostic endc | 0 | 0 | | | | | | | |
| Diathermy Treatment | 1 | High energy puls | 0 | 0 | Palmetto GBA | Fl, MAC Part A | North Carolina, : | 1 | 1 | 0 | CMS |
| | | | | | National Govern | Fl, Carrier, MAC | Indiana, Illinois, | 1 | 0 | 0 | Journals |
| | | | | | NHIC Corp | MAC Part B, MA | Maine, New Har | 1 | 0 | 0 | Journals |
| | | | | | Highmark Medic | MAC Part B, MA | Delaware, Distri | 1 | 0 | 0 | Journals |
| | | | | | Pinnacle Busine | Fl, Carrier | Arkansas, Louis | 1 | 0 | 0 | Journals |
| | | | | | Cahaba GBA, LI | RHHI | Colorado, Distri | 1 | 0 | 0 | Journals |
| Electrical Aversion Therapy for Treatment of Alcoholism | 0 | Electrical aversi | 0 | 0 | National Govern | Fl, Carrier, MAC | Indiana, Illinois, | 0 | 1 | 1 | CMS |
| | | | | | Palmetto GBA | MAC Part A, Fl | California, Amer | 0 | 1 | 1 | CMS |
| | | | | | First Coast Serv | MAC Part A | Florida, Puerto F | 0 | 1 | 1 | CMS |
| | | | | | NHIC Corp | MAC Part B, MA | Maine, New Har | 0 | 1 | 1 | CMS |
| | | | | | Wisconsin Phys | MAC Part A, Fl | Alaska, Alabama | 0 | 1 | 1 | CMS |
| Electrical Stimulation (ES) and Electromagnetic Therapy for the Treatment of Wounds | 1 | ES and electrom | 0 | 1 | Pinnacle Busine | Fl | Louisiana, Missi | 1 | 0 | 0 | Journals |
| | | | | | Cahaba GBA, LI | MAC Part A | Alabama, Georg | 1 | 0 | 0 | Journals |
| | | | | | National Govern | Fl, Carrier, MAC | Indiana, Illinois. | 1 | 0 | 0 | Journals |
| | | | | | NHIC Corp | MAC Part B, MA | Maine, New Har | 1 | 0 | 0 | Journals |
| | | | | | Cahaba GBA, LI | RHHI | Colorado, Distri | 1 | 0 | 0 | Journals |
| | | | | | Wisconsin Phys | Carrier, MAC A, | Wisconsin, Illino | 1 | 1 | 0 | CMS |
| | | | | | TrailBlazer Healt | MAC Part B, MA | Colorado, New I | 1 | 1 | 0 | CMS |
| Electroencephalographic Monitoring During Surgical Procedures Involving the Cerebral Vasculature | 1 | The EEG monitc | 0 | 0 | | | | | | | |
| Electronecephalographic (EEG) Monitoring During Open-Heart Surgery | 0 | Medicare does r | 0 | 0 | | | | | | | |
| Electrosleep Therapy | 0 | Until scientific a | 0 | 0 | National Govern | Fl, Carrier, MAC | Indiana, Illinois. | 0 | 1 | 1 | CMS |
| | | | | | Palmetto GBA | MAC Part A, Fl | California, Amer | 0 | 1 | 1 | CMS |
| | | | | | First Coast Serv | MAC Part A | Florida, Puerto F | 0 | 1 | 1 | CMS |
| | | | | | NHIC Corp | MAC Part B, MA | Maine, New Har | 0 | 1 | 1 | CMS |
| | | | | | Wisconsin Phys | MAC Part A, Fl | Alaska, Alabama | 0 | 1 | 1 | CMS |
| Electrotherapy for Treatment of Facial Nerve Paralysis (Bell's Palsy) | 0 | Electrotherapy f | 0 | 0 | | | | | | | |
| Ethylenediamine-Tetra-Acetic (EDTA) Chelation Therapy for Treatment of Atherosclerosis | 0 | The use of EDTA | 0 | 0 | | | | | | | |
| External Counterpulsation (ECP) Therapy for Severe Angina | 1 | See policy | 0 | 0 | First Coast Serv | MAC Part A | Florida, Puerto F | 1 | 1 | 0 | CMS and Journ |
| | | | | | Pinnacle Busine | Carrier, Fl | Arkansas, Louis | 1 | 1 | 0 | CMS |
| | | | | | Palmetto GBA | MAC Part B | California, Amer | 1 | 0 | 0 | Journals |
| | | | | | TrailBlazer Healt | MAC Part A, MA | Colorado, New I | 1 | 1 | 0 | TrailBlazer Healt |
| | | | | | Cahaba GBA, LI | MAC Part A | Alabama, Georg | 1 | 0 | 0 | Journals |
| Extracorporeal Photopheresis | 1 | The CMS has de | 0 | 0 | | | | | | | |
| Fabric Wrapping of Abdominal Aneurysms | 0 | Fabric wrapping | 0 | 0 | | | | | | | |
| Fluidized Therapy Dry Heat for Certain Musculoskeletal Disorders | 1 | Use of fluidized | 0 | 0 | Palmetto GBA | Fl, MAC Part A | North Carolina, : | 1 | 1 | 1 | CMS |
| | | | | | National Govern | Fl, Carrier, MAC | Indiana, Illinois. | 1 | 1 | 1 | CMS |
| | | | | | NHIC Corp | MAC Part B, MA | Maine, New Har | 1 | 1 | 1 | CMS |
| | | | | | First Coast Serv | MAC Part A, MA | Florida, Puerto F | 1 | 1 | 1 | CMS |
| Gastric Balloon for Treatment of Obesity | 0 | The use of the g | 0 | 0 | Wisconsin Phys | MAC Part A | Iowa, Kansas, N | 0 | 1 | 1 | CMS |
| | | | | | Palmetto GBA | MAC Part B | California North | 0 | 1 | 1 | CMS |
| | | | | | National Govern | Fl/Carrier/MAC | Indiana, Illinois, | 0 | 1 | 1 | CMS |
| | | | | | TrailBlazer Healt | MAC Part A, MA | Colorado, New I | 0 | 1 | 1 | CMS |

| NCD title | Covered (0=N, 1=Y) | Limitations | TA (0=N, 1=Y) | MEDCAC (0=N, 1=Y) | Contractor | Contractor Type | States | Covered? | Limitations different to NCD? (0=different, 1=same) | Limitations different to other LCDs? (0=different, 1=same) | Base of Decision |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Gastric Freezing | 0 | Gastric freezing | 0 | 0 | | | | | | | |
| Gastrophotography | 1 | Gastrophotogra | 0 | 0 | | | | | | | |
| Heat Treatment, Including the Use of Diathermy and Ultra-Sound for Pulmonary Conditions | 0 | There is no phys | 0 | 0 | Cahaba GBA, LI | MAC Part A, RH | Alabama, Georg | 0 | 1 | 1 | CMS |
| | | | | | Palmetto GBA | Fl, MAC Part A | North Carolina, : | 0 | 1 | 1 | CMS |
| | | | | | National Govern | Fl, Carrier, MAC | Indiana, Illinois, | 0 | 1 | 1 | CMS |
| | | | | | NHIC Corp | MAC Part B, MA | Maine, New Har | · 0 | 1 | 1 | CMS |
| | | | | | Wisconsin Phys | Carrier, MAC Pa | Wisconsin, Illino | 0 | 1 | 1 | CMS |
| | | | | | Highmark Medic | MAC Part B, MA | Delaware, Distri | 0 | 1 | 1 | CMS |
| | | | | | Pinnacle Busine | Fl, Carrier | Arkansas, Louis | 0 | 1 | 1 | CMS |
| | | | | | Palmetto GBA | RHHI | Alabama, Arkan | 0 | 1 | 1 | CMS |
| | | | | | First Coast Serv | MAC Part A, MA | Florida, Puerto F | 0 | 1 | 1 | CMS |
| Hemodialysis for Treatment of Schizophrenia | 0 | Scientific evider | 0 | 0 | National Govern | Fl, Carrier, MAC | Indiana, Illinois, | 0 | 1 | 1 | CMS |
| | | | | | Palmetto GBA | MAC Part A, Fl | California, Amer | 0 | 1 | 1 | CMS |
| | | | | | First Coast Serv | MAC Part A | Florida, Puerto F | 0 | 1 | 1 | CMS |
| | | | | | NHIC Corp | MAC Part B, MA | Maine, New Har | 0 | 1 | 1 | CMS |
| | | | | | Wisconsin Phys | MAC Part A, Fl | Alaska, Alabama | 0 | 1 | 1 | CMS |
| Hyperbaric Oxygen Therapy | 1 | See policy | 1 | 0 | First Coast Serv | MAC Part A, MA | Florida, Puerto F | 1 | 0 | 0 | |
| | | | | | Palmetto GBA | Fl | North Carolina, : | 1 | 0 | 0 | Journals |
| | | | | | National Govern | Fl, Carrier, MAC | Indiana, Illinois, | 1 | 0 | 0 | Journals |
| Hyperthermia for Treatment of Cancer | 1 | Local hyperthen | 0 | 0 | | | | | | | |
| Implantation of Anti-Gastroesophageal Reflux Device | 1 | The implantatior | 0 | 0 | | | | | | | |
| Induced Lesions of Nerve Tracts | 1 | Surgically induc | 0 | 0 | Noridian Admini | Carrier, MAC Pa | Alaska, Oregon, | 1 | 1 | 1 | Journals |
| | | | | | Palmetto GBA | MAC Part B | California, Amer | 1 | 1 | 1 | Journals |
| Injection Sclerotherapy for Esophageal Variceal Bleeding | 1 | No limitations | 0 | 0 | | | | | | | |
| Intraocular Photography | 1 | Intraocular phot | 0 | 0 | | | | | | | |
| Intravenous Histamine Therapy | 0 | There is no scier | 0 | 0 | | | | | | | |
| Laser Procedures | 1 | Medicare recogr | 0 | 0 | | | | | | | |
| Magnetic Resonance Angiography | 1 | See policy | 0 | 0 | Palmetto GBA | Fl | North Carolina, : | 1 | 1 | 0 | CMS |
| | | | | | CIGNA Governn | Carrier | North Carolina, I | 1 | 1 | 0 | CMS |
| | | | | | Pinnacle Busine | Carrier | Arkansas, Louis | 1 | 0 | 0 | |
| | | | | | National Govern | Fl, Carrier, MAC | Indiana, Illinois, | 1 | 0 | 0 | Journals |
| | | | | | First Coast Serv | MAC Part A, MA | Florida, Puerto F | 1 | 1 | 0 | CMS |
| | | | | | Wisconsin Phys | MAC Part B | Iowa, Kansas, N | 1 | 0 | 0 | Other LCDs |
| | | | | | NHIC, Corp | MAC Part B | Maine, New Har | 1 | 0 | 0 | |
| Magnetic Resonance Spectroscopy | 0 | CMS has detern | 1 | 0 | National Govern | Fl, Carrier, MAC | Indiana, Illinois, | 0 | 1 | 1 | CMS |
| Manipulation | 1 | See policy | | | | | | | | | |
| Multiple Electroconvulsive Therapy (MECT) | 0 | The clinical effer | 0 | 0 | National Govern | Fl, Carrier, MAC | Indiana, Illinois, | 0 | 1 | 1 | CMS |
| | | | | | Palmetto GBA | MAC Part A, Fl | California, Amer | 0 | 1 | 1 | CMS |
| | | | | | First Coast Serv | MAC Part A | Florida, Puerto F | 0 | 1 | 1 | CMS |
| | | | | | NHIC Corp | MAC Part B, MA | Maine, New Har | 0 | 1 | 1 | CMS |
| | | | | | Wisconsin Phys | MAC Part A, Fl | Alaska, Alabama | 0 | 1 | 1 | CMS |
| Ocular Photodynamic Therapy (OPT) | 1 | See policy | 0 | 1 | First Coast Serv | MAC Part A, MA | Florida, Puerto F | 1 | 1 | 0 | Journals |
| | | | | | TrailBlazer Healt | MAC Part A, MA | Colorado, New I | 1 | 0 | 0 | |
| Outpatient Intravenous Insulin Treatment | 0 | See policy | 0 | 0 | | | | | | | |
| Oxygen Treatment of Inner Ear/Carbon Therapy | 0 | Oxygen (95 perc | 0 | 0 | | | | | | | |
| Partial Ventriculectomy | 0 | Since the morta | 0 | 0 | | | | | | | |
| Phaco-Emulsification Procedure - Cataract Extraction | 1 | In view of recorr | 0 | 0 | | | | | | | |
| Prolotherapy, Joint Sclerotherapy, and Ligamentous Injections with Sclerosing Agents | 0 | The medical effe | 0 | 0 | Palmetto GBA | MAC Part B | California, Amer | 0 | 1 | 1 | CMS |
| | | | | | Wisconsin Phys | MAC Part A, MA | Alaska, Alabama | 0 | 1 | 1 | CMS |
| Smoking and Tobacco-Use Cessation Counseling | 1 | See policy | | | | | | | | | |
| Sterilization | 1 | Payment may be | 0 | 0 | | | | | | | |
| Surgery for Diabetes | 1 | Open and lapar | 0 | 0 | | | | | | | |
| Therapeutic Embolization | 1 | Therapeutic emt | 0 | 0 | | | | | | | |
| Thermal Intradiscal Procedures (TIPs) | 0 | The Centers for | 0 | 0 | | | | | | | |
| Thermogenic Therapy | 0 | Regardless of th | 0 | 0 | | | | | | | |
| Transcendental Meditation | 0 | After review of tl | 0 | 0 | | | | | | | |
| Transsexual Surgery | 0 | Transsexual sur | 0 | 0 | | | | | | | |
| Transvenous (Catheter) Pulmonary Embolectomy | 0 | It is not covered | 0 | 0 | | | | | | | |
| Treatment of Actinic Keratosis | 1 | No limitations | 0 | 0 | Highmark Medic | MAC Part A, MA | Delaware, Distri | 1 | 1 | 0 | CMS |
| | | | | | Noridian Admini | MAC Part B | Arizona, Montar | 1 | 0 | 0 | Other LCDs |
| Treatment of Decubitus Ulcers | 1 | Hydrotherapy (w | 0 | 0 | | | | | | | |

# Table 5. Diagnostic Tests

| | NCD | | | LCD | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| NCD title | Covered (0=N, 1=Y) | TA (0=N, 1=Y) | MEDCAC (0=N, 1=Y) | Contractor | Contractor Type | States | Covered? | Limitations different to NCD? (0=different, 1=same) | Limitations different to other LCDs? (0=different, 1=same) | Base of Decision |
| Ambulatory Blood Pressure Monitoring | 1 | 1 | 1 | | | | | | | |
| Ambulatory EEG Monitoring | 1 | 0 | 0 | Pinnacle Busine | Carrier, FI | Arkansas, Louis | 1 | 0 | 1 | Journals |
| | | | | Wisconsin Phys | MAC Part B | Iowa, Kansas, M | 1 | 0 | 1 | Journals |
| | | | | NHIC Corp | MAC Part A, MA | Maine, New Har | 1 | 0 | 1 | Journals |
| Cardiac Output Monitoring by Thoracic Electrical Bioimpedance (TEB) | 1 | 0 | 0 | National Govern | FI, Carrier, MAC | Indiana, Illinois, | 1 | 0 | 0 | Journals |
| | | | | Palmetto GBA | MAC Part A | California, Amer | 1 | 0 | 0 | Journals |
| | | | | CIGNA Govern | Carrier | North Carolina | 1 | 0 | 0 | Journals |
| | | | | TrailBlazer Healt | MAC Part A, MA | Colorado, New | 1 | 1 | 0 | |
| | | | | First Coast Serv | MAC Part A, MA | Florida, Puerto | 1 | 0 | 0 | Journals |
| Cardiac Pacemaker Evaluation Services | 1 | 0 | 0 | | | | | | | |
| Cardiointegram (CIG) as an Alternative to Stress Test or Thallium Stress Test | 0 | 0 | 0 | | | | | | | |
| Cavernous Nerves by Electrical Stimulation with Penile Plethsmography | 0 | 0 | 0 | | | | | | | |
| Challenge Ingestion Food Testing | 1 | 0 | 0 | Wisconsin Phys | MAC Part A, MA | Alaska, Alabama | 1 | 0 | 1 | Journals |
| Computed Tomography | 1 | 1 | 0 | National Govern | FI, Carrier, MAC | Indiana, Illinois, | 1 | 0 | 1 | Journals |
| Computer Enhanced Perimetry | 1 | 0 | 0 | | | | | | | |
| Cytogenetic Studies | 1 | 0 | 0 | CIGNA Govern | Carrier | North Carolina | 1 | 0 | 0 | Journals, CMS |
| | | | | Noridian Admini | MAC Part B, Ca | Alaska, Oregon, | 1 | 0 | 0 | Journals |
| | | | | Palmetto GBA | MAC Part B | California, Amer | 1 | 0 | 0 | Journals |
| | | | | Wisconsin Phys | MAC Part A, MA | Alaska, Alabama | 1 | 0 | 0 | Journals |
| Cytotoxic Food Tests | 0 | 0 | 0 | Wisconsin Phys | FI | Alaska, Alabama | 0 | 1 | 1 | Journals |
| Diagnostic Breath Analyses | 1 | 0 | 0 | | | | | | | |
| Digital Subtraction Angiography | 1 | 0 | 0 | | | | | | | |
| Displacement Cardiography | 1 | 0 | 0 | | | | | | | |
| Electrocardiographic Services | 1 | 0 | 0 | Palmetto GBA | FI | North Carolina, | 1 | 1 | 1 | CMS |
| Electron Microscope | 1 | 0 | 0 | | | | | | | |
| Electroencephalographic (EEG) Monitoring During Open-Heart Surgery | 0 | 0 | 0 | | | | | | | |
| Endothelial Cell Photography | 1 | 0 | 0 | | | | | | | |
| Esophageal Manometry | 1 | 0 | 0 | | | | | | | |
| Evoked Response Tests | 1 | 0 | 0 | | | | | | | |
| Food Allergy Testing and Treatment | 0 | 0 | 0 | First Coast Serv | MAC Part B | Florida, Puerto | 0 | 1 | 1 | CMS |
| Gravlee Jet Washer | 1 | 0 | 0 | | | | | | | |
| Hair Analysis | 0 | 0 | 0 | CIGNA Govern | Carrier | Idaho, North Ca | 0 | 1 | 1 | Journals, CMS |
| Heartsbreath Test for Heart Transplant Rejection | 0 | 0 | 0 | | | | | | | |
| Hemorheograph | 1 | 0 | 0 | | | | | | | |
| HIS Bundle Study | 1 | 0 | 0 | | | | | | | |
| Mammograms | 1 | 0 | 0 | Wisconsin Phys | Carrier | Wisconsin, Illino | 1 | 0 | 0 | |
| | | | | National Govern | FI, Carrier, MAC | Indiana, Illinois, | 1 | 0 | 0 | Journals |
| | | | | NHIC, Corp. | MAC Part B, MA | Maine, New Har | 1 | 0 | 0 | Journals |
| | | | | Palmetto GBA | FI | South Carolina, | 1 | 0 | 0 | Journals, CMS |
| | | | | TrailBlazer Healt | Carrier, MAC Pa | Virginia, Colorad | 1 | 0 | 0 | |
| | | | | First Coast Serv | MAC Part B, MA | Florida, Puerto | 1 | 0 | 0 | |
| Microvolt T-Wave Alternans (MTWA) | 1 | 0 | 0 | | | | | | | |
| Noninvasive Tests of Carotid Function | 1 | 0 | 0 | Highmark Medic | MAC Part A, MA | Delaware, Distri | 1 | 0 | 0 | |
| | | | | Palmetto GBA | MAC Part B, Ca | California, Amer | 1 | 0 | 0 | Journals |
| | | | | Pinnacle Busine | Carrier | Arkansas, Louis | 1 | 0 | 0 | Journals |
| | | | | National Govern | FI, Carrier, MAC | Indiana, Illinois, | 1 | 0 | 0 | Journals |
| | | | | Wisconsin Phys | Carrier, MAC Pa | Alaska, Alabama | 1 | 0 | 0 | Journals |
| Nuclear Radiology Procedure | 1 | 0 | 0 | | | | | | | |
| PET for Perfusion of the Heart | 1 | 0 | 0 | Palmetto GBA | Carrier | Ohio, West Virgi | 1 | 0 | 0 | Journals |
| | | | | National Govern | FI, Carrier, MAC | Indiana, Illinois, | 1 | 0 | 0 | Journals |
| | | | | NHIC, Corp. | MAC Part B, MA | Maine, New Har | 1 | 0 | 0 | Journals |
| | | | | First Coast Serv | MAC Part A, MA | Florida, Puerto | 1 | 1 | 0 | CMS |
| | | | | TrailBlazer Healt | Carrier, MAC Pa | Virginia, Colorad | 1 | 1 | 0 | CMS |
| Plethysmography | 1 | 0 | 0 | | | | | | | |
| Positron Emission Tomography (FDG) for Oncologic Conditions | 1 | 0 | 1 | TrailBlazer Healt | Carrier, MAC Pa | Virginia, Colorad | 1 | 1 | 1 | CMS |
| Positron Emission Tomography (NaF-18) to Identify Bone Metastasis of Cancer | 0 | 0 | 0 | | | | | | | |
| Positron Emission Tomography (PET) Scans | Under review | 0 | 1 | First Coast Serv | MAC Part A, MA | Puerto Rico, Virg | 1 | 0 | 1 | NA |
| Single Photon Emission Computed Tomography (SPECT) | 1 | 0 | 0 | NHIC, Corp | MAC Part B, MA | Maine, New Har | 1 | 0 | 1 | Other LCDs |
| Stereotaxic Depth Electrode Implantation | 1 | 0 | 0 | | | | | | | |
| Sweat Test | 1 | 0 | 0 | | | | | | | |
| Thermography | 0 | 0 | 0 | Pinnacle Busine | FI, Carrier | Arkansas, Louis | 0 | 1 | 1 | Journals |
| | | | | Highmark Medic | MAC Part A, MA | Delaware, Distri | 0 | 1 | 1 | |
| | | | | Palmetto GBA | MAC Part B, Ca | California, Amer | 0 | 1 | 1 | Journals |
| | | | | First Coast Serv | MAC Part A | Florida, Puerto | 0 | 1 | 1 | Journals |
| | | | | National Govern | FI, Carrier, MAC | Indiana, Illinois, | 0 | 1 | 1 | Journals |
| | | | | CIGNA Govern | Carrier | North Carolina | 0 | 1 | 1 | Journals |
| Transillumination Light Scanning or Diaphanography | 0 | 0 | 0 | | | | | | | |
| Uroflowmetric Evaluations | 1 | 0 | 0 | | | | | | | |
| Vabra Aspirator | 0 | 0 | 0 | | | | | | | |
| Xenon Scan | 1 | 0 | 0 | | | | | | | |

# Table 6. NCD and LCD Statistics by State

| State | Inpatient Hospital Services<br>Limitations different to NCD?<br>(0=different, 1=same) | | | Durable Medical Devices<br>Limitations different to NCD?<br>(0=different, 1=same) | | | Diagnostic Laboratory<br>Limitations different to NCD?<br>(0=different, 1=same) | | | Physician's Services<br>Limitations different to NCD?<br>(0=different, 1=same) | | | Diagnostic Tests<br>Limitations different to NCD?<br>(0=different, 1=same) | | | Total<br>Limitations different to NCD?<br>(0=different, 1=same) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of 0 | Number of 1 | Total | Number of 0 | Number of 1 | Total | Number of 0 | Number of 1 | Total | Number of 0 | Number of 1 | Total | Number of 0 | Number of 1 | Total | Number of 0 | Number of 1 | Total |
| Alaska | 2 | 0 | 2 | 5 | 1 | 7 | 0 | 0 | 0 | 1 | 7 | 8 | 4 | 1 | 5 | 12 | 9 | 22 |
| Alabama | 1 | 0 | 1 | 5 | 1 | 7 | 0 | 0 | 0 | 3 | 8 | 11 | 3 | 1 | 4 | 12 | 10 | 23 |
| American Samoa | 2 | 1 | 3 | 4 | 1 | 6 | 1 | 2 | 3 | 2 | 11 | 13 | 3 | 1 | 4 | 12 | 16 | 29 |
| Arkansas | 1 | 0 | 1 | 5 | 1 | 7 | 1 | 0 | 1 | 2 | 9 | 11 | 5 | 2 | 7 | 14 | 12 | 27 |
| Arizona | 2 | 0 | 2 | 5 | 1 | 7 | 0 | 0 | 0 | 1 | 7 | 8 | 4 | 1 | 5 | 12 | 9 | 22 |
| California | 2 | 1 | 3 | 4 | 1 | 6 | 1 | 2 | 3 | 2 | 11 | 13 | 3 | 1 | 4 | 12 | 16 | 29 |
| Colorado | 1 | 0 | 1 | 6 | 1 | 8 | 1 | 0 | 1 | 3 | 11 | 14 | 4 | 4 | 8 | 15 | 16 | 32 |
| Connecticut | 3 | 1 | 4 | 5 | 2 | 8 | 5 | 2 | 6 | 6 | 14 | 20 | 8 | 2 | 10 | 27 | 21 | 48 |
| District of Columbia | 1 | 0 | 1 | 5 | 1 | 7 | 1 | 0 | 1 | 2 | 8 | 10 | 4 | 2 | 6 | 13 | 11 | 25 |
| Delaware | 1 | 0 | 1 | 5 | 1 | 7 | 1 | 0 | 1 | 3 | 9 | 12 | 4 | 2 | 6 | 14 | 12 | 27 |
| Florida | 3 | 3 | 6 | 5 | 2 | 8 | 1 | 0 | 1 | 1 | 17 | 18 | 6 | 4 | 10 | 16 | 26 | 43 |
| Georgia | 1 | 0 | 1 | 5 | 1 | 7 | 0 | 0 | 0 | 3 | 8 | 11 | 3 | 1 | 4 | 12 | 10 | 23 |
| Guam | 2 | 1 | 3 | 4 | 1 | 6 | 1 | 2 | 3 | 4 | 9 | 13 | 3 | 1 | 4 | 14 | 14 | 29 |
| Hawaii | 2 | 1 | 3 | 4 | 1 | 6 | 1 | 2 | 3 | 4 | 9 | 13 | 3 | 1 | 4 | 14 | 14 | 29 |
| Iowa | 1 | 1 | 2 | 5 | 2 | 8 | 0 | 0 | 0 | 4 | 9 | 13 | 4 | 1 | 5 | 14 | 13 | 28 |
| Idaho | 2 | 0 | 2 | 5 | 1 | 7 | 0 | 0 | 0 | 0 | 7 | 7 | 3 | 2 | 5 | 10 | 10 | 21 |
| Illinois | 3 | 1 | 4 | 5 | 3 | 9 | 5 | 1 | 6 | 7 | 17 | 24 | 9 | 2 | 11 | 29 | 24 | 54 |
| Indiana | 3 | 1 | 4 | 5 | 2 | 8 | 5 | 1 | 6 | 6 | 15 | 21 | 8 | 2 | 10 | 27 | 21 | 49 |
| Kansas | 2 | 1 | 3 | 9 | 3 | 14 | 1 | 0 | 1 | 9 | 10 | 19 | 6 | 2 | 8 | 27 | 16 | 45 |
| Kentucky | 6 | 2 | 8 | 5 | 2 | 8 | 5 | 1 | 6 | 6 | 15 | 21 | 8 | 2 | 10 | 30 | 22 | 53 |
| Louisiana | 1 | 0 | 1 | 4 | 1 | 6 | 1 | 0 | 1 | 3 | 8 | 11 | 5 | 2 | 7 | 14 | 11 | 26 |
| Massachusetts | 1 | 0 | 1 | 5 | 2 | 8 | 0 | 1 | 1 | 4 | 12 | 16 | 7 | 1 | 8 | 17 | 16 | 34 |
| Maryland | 1 | 0 | 1 | 5 | 1 | 7 | 1 | 0 | 1 | 5 | 7 | 12 | 4 | 2 | 6 | 16 | 10 | 27 |
| Maine | 1 | 0 | 1 | 5 | 2 | 8 | 0 | 1 | 1 | 5 | 12 | 17 | 7 | 1 | 8 | 18 | 16 | 35 |
| Michigan | 3 | 1 | 4 | 5 | 3 | 9 | 5 | 1 | 6 | 7 | 16 | 23 | 9 | 2 | 11 | 29 | 23 | 53 |
| Minnesota | 1 | 0 | 1 | 5 | 2 | 8 | 0 | 0 | 0 | 2 | 7 | 9 | 4 | 1 | 5 | 12 | 10 | 23 |
| Missouri | 1 | 1 | 2 | 5 | 2 | 8 | 0 | 0 | 0 | 4 | 9 | 13 | 4 | 1 | 5 | 14 | 13 | 28 |
| Mississippi | 1 | 0 | 1 | 5 | 1 | 7 | 0 | 0 | 0 | 2 | 7 | 9 | 4 | 2 | 6 | 12 | 10 | 23 |
| Montana | 2 | 0 | 2 | 5 | 1 | 7 | 0 | 0 | 0 | 3 | 8 | 11 | 4 | 1 | 5 | 14 | 10 | 25 |
| North Carolina | 2 | 0 | 2 | 5 | 1 | 7 | 1 | 0 | 1 | 3 | 16 | 17 | 6 | 4 | 10 | 15 | 23 | 23 |
| North Dakota | 2 | 0 | 2 | 5 | 1 | 7 | 0 | 0 | 0 | 3 | 8 | 11 | 4 | 1 | 5 | 14 | 10 | 25 |
| Nebraska | 1 | 1 | 2 | 5 | 2 | 8 | 0 | 0 | 0 | 4 | 9 | 13 | 4 | 1 | 5 | 14 | 13 | 28 |
| Nevada | 2 | 1 | 3 | 4 | 1 | 6 | 1 | 2 | 3 | 3 | 11 | 14 | 3 | 1 | 4 | 13 | 16 | 30 |
| New Hampshire | 1 | 0 | 1 | 5 | 2 | 8 | 0 | 1 | 1 | 5 | 12 | 17 | 7 | 1 | 8 | 18 | 16 | 35 |
| New Jersey | 1 | 0 | 1 | 5 | 1 | 7 | 1 | 0 | 1 | 1 | 8 | 9 | 4 | 2 | 6 | 12 | 11 | 24 |
| New Mexico | 1 | 0 | 1 | 6 | 1 | 8 | 1 | 0 | 1 | 1 | 11 | 12 | 4 | 4 | 8 | 13 | 16 | 30 |
| New York | 3 | 1 | 4 | 4 | 2 | 7 | 5 | 1 | 6 | 6 | 8 | 14 | 5 | 1 | 6 | 23 | 13 | 37 |
| Northern Mariana Islands | 2 | 1 | 3 | 4 | 1 | 6 | 1 | 2 | 3 | 2 | 11 | 13 | 3 | 1 | 4 | 12 | 16 | 29 |
| Ohio | 4 | 1 | 5 | 5 | 2 | 8 | 5 | 1 | 6 | 6 | 15 | 21 | 10 | 3 | 13 | 30 | 22 | 53 |
| Oklahoma | 1 | 0 | 1 | 6 | 1 | 8 | 1 | 0 | 1 | 1 | 11 | 12 | 4 | 4 | 8 | 13 | 16 | 39 |
| Oregon | 2 | 0 | 2 | 5 | 1 | 7 | 0 | 0 | 0 | 1 | 7 | 8 | 4 | 1 | 5 | 12 | 9 | 22 |
| Pennsylvania | 1 | 0 | 1 | 5 | 1 | 7 | 1 | 0 | 1 | 3 | 9 | 12 | 4 | 2 | 6 | 14 | 12 | 27 |
| Puerto Rico | 3 | 3 | 6 | 4 | 2 | 7 | 1 | 0 | 1 | 1 | 10 | 11 | 3 | 3 | 6 | 12 | 18 | 31 |
| Rhode Island | 1 | 0 | 1 | 5 | 2 | 8 | 0 | 1 | 1 | 5 | 12 | 17 | 7 | 1 | 8 | 18 | 16 | 35 |
| South Carolina | 2 | 0 | 2 | 5 | 1 | 7 | 1 | 2 | 3 | 1 | 15 | 16 | 6 | 3 | 9 | 15 | 21 | 37 |
| South Dakota | 2 | 0 | 2 | 5 | 1 | 7 | 0 | 0 | 0 | 3 | 8 | 11 | 4 | 1 | 5 | 14 | 10 | 25 |
| Tennessee | 1 | 0 | 1 | 5 | 1 | 7 | 0 | 0 | 0 | 3 | 8 | 11 | 3 | 1 | 4 | 12 | 10 | 23 |
| Texas | 1 | 0 | 1 | 6 | 1 | 8 | 1 | 0 | 1 | 1 | 10 | 11 | 4 | 4 | 8 | 13 | 15 | 29 |
| Utah | 2 | 0 | 2 | 5 | 1 | 7 | 0 | 0 | 0 | 3 | 8 | 11 | 4 | 1 | 5 | 14 | 10 | 25 |
| Virginia | 4 | 1 | 5 | 6 | 2 | 9 | 5 | 1 | 6 | 7 | 17 | 24 | 11 | 6 | 17 | 33 | 27 | 61 |
| Virgin Islands | 1 | 5 | 6 | 5 | 2 | 8 | 1 | 0 | 1 | 1 | 16 | 17 | 6 | 4 | 10 | 14 | 27 | 42 |
| Vermont | 1 | 0 | 1 | 5 | 2 | 8 | 0 | 1 | 1 | 4 | 12 | 16 | 7 | 1 | 8 | 17 | 16 | 34 |
| Washington | 2 | 0 | 2 | 5 | 1 | 7 | 0 | 0 | 0 | 1 | 7 | 8 | 4 | 1 | 5 | 12 | 9 | 22 |
| Wisconsin | 3 | 1 | 4 | 5 | 3 | 9 | 5 | 1 | 6 | 7 | 16 | 23 | 9 | 2 | 11 | 29 | 23 | 53 |
| West Virginia | 4 | 1 | 5 | 5 | 2 | 8 | 5 | 1 | 6 | 8 | 15 | 23 | 10 | 3 | 13 | 32 | 22 | 55 |
| Wyoming | 2 | 0 | 2 | 5 | 1 | 7 | 0 | 0 | 0 | 3 | 8 | 11 | 4 | 1 | 5 | 14 | 10 | 25 |
| SUM | 105 | 32 | 137 | 280 | 83 | 420 | 73 | 32 | 104 | 189 | 595 | 784 | 287 | 106 | 393 | 934 | 848 | 1808 |

## Table 7. State Statistics

| State | Number of Schools of Medicine (AAMC) | Number of physicians (1) | GDP per capita (2) | Level 1 and Level 2 Trauma Centers | Population Density per sq mile | Result | Ranking (Number of Level 1 and 2 Trauma Centers adjusted for population density) |
|---|---|---|---|---|---|---|---|
| Alaska | 0 | 270 | 43640 | 1 | 1.2 | 2.2 | 56 |
| Alabama | 2 | 2880 | 29411 | 2 | 91.87 | 93.87 | 34 |
| American Samoa | 0 | 50 | 8000 | 0 | 872 | 872 | 5 |
| Arkansas | 1 | 2920 | 27753 | 0 | 54.84 | 54.84 | 43 |
| Arizona | 1 | 4160 | 32343 | 1 | 57.2 | 58.2 | 41 |
| California | 8 | 21830 | 42064 | 41 | 235.68 | 276.68 | 18 |
| Colorado | 1 | 3100 | 41102 | 11 | 47.62 | 58.62 | 40 |
| Connecticut | 2 | 2500 | 50758 | 13 | 722.65 | 735.65 | 9 |
| District of Columbia | 3 | 1310 | 126407 | 3 | 9639 | 9642 | 1 |
| Delaware | 0 | 1220 | 56401 | 1 | 446.82 | 447.82 | 13 |
| Florida | 6 | 18930 | 32925 | 17 | 339.87 | 356.87 | 14 |
| Georgia | 4 | 3890 | 34017 | 9 | 167.27 | 176.27 | 24 |
| Guam | 0 | 50 | 19000 | 0 | 839.74 | 839.74 | 6 |
| Hawaii | 1 | 820 | 38644 | 1 | 200.56 | 201.56 | 20 |
| Iowa | 1 | 1530 | 36773 | 12 | 53.74 | 65.74 | 39 |
| Idaho | 0 | 920 | 29890 | 1 | 18.42 | 19.42 | 50 |
| Illinois | 7 | 12830 | 40006 | 61 | 232.11 | 293.11 | 17 |
| Indiana | 1 | 4440 | 32917 | 3 | 177.79 | 180.79 | 23 |
| Kansas | 1 | 1600 | 35013 | 3 | 34.25 | 37.25 | 47 |
| Kentucky | 2 | 2370 | 29740 | 2 | 107.46 | 109.46 | 29 |
| Louisiana | 3 | 3630 | 32842 | 2 | 101.25 | 103.25 | 33 |
| Massachusetts | 4 | 8950 | 48088 | 5 | 828.82 | 833.82 | 7 |
| Maryland | 3 | 9020 | 39205 | 7 | 576.39 | 583.39 | 10 |
| Maine | 0 | 1450 | 30637 | 3 | 42.66 | 45.66 | 45 |
| Michigan | 4 | 11030 | 32601 | 12 | 176.1 | 188.1 | 22 |
| Minnesota | 2 | 5060 | 41573 | 6 | 65.57 | 71.57 | 36 |
| Missouri | 4 | 4160 | 32779 | 19 | 85.82 | 104.82 | 32 |
| Mississippi | 0 | 550 | 24403 | 6 | 62.65 | 68.65 | 37 |
| Montana | 0 | 890 | 28170 | 3 | 6.65 | 9.65 | 54 |
| North Carolina | 4 | 6090 | 35719 | 9 | 189.33 | 198.33 | 21 |
| North Dakota | 1 | 490 | 37832 | 5 | 9.3 | 14.3 | 52 |
| Nebraska | 2 | 1560 | 37326 | 3 | 23.2 | 26.2 | 48 |
| Nevada | 1 | 1010 | 39687 | 2 | 23.68 | 25.68 | 49 |
| New Hampshire | 1 | 1540 | 38420 | 5 | 146.72 | 151.72 | 27 |
| New Jersey | 2 | 9980 | 44957 | 10 | 1170.64 | 1180.64 | 2 |
| New Mexico | 1 | 740 | 30935 | 1 | 16.35 | 17.35 | 51 |
| New York | 13 | 41030 | 49499 | 45 | 412.81 | 457.81 | 12 |
| Northern Mariana Islands | 0 | 38 | 12500 | 0 | 485.62 | 485.62 | 11 |
| Ohio | 6 | 12690 | 33568 | 20 | 280.5 | 300.5 | 16 |
| Oklahoma | 1 | 2640 | 29359 | 3 | 53.04 | 56.04 | 42 |
| Oregon | 1 | 4250 | 38801 | 7 | 39.48 | 46.48 | 44 |
| Pennsylvania | 7 | 11060 | 35641 | 25 | 277.76 | 302.76 | 15 |
| Puerto Rico | 4 | 980 | 17100 | 1 | 1162.07 | 1163.07 | 3 |
| Rhode Island | 1 | 1560 | 36283 | 1 | 1005.54 | 1006.54 | 4 |
| South Carolina | 2 | 2520 | 28364 | 6 | 148.79 | 154.79 | 26 |
| South Dakota | 1 | 220 | 37690 | 2 | 10.6 | 12.6 | 53 |
| Tennessee | 4 | 4960 | 33825 | 9 | 150.78 | 159.78 | 25 |
| Texas | 8 | 17820 | 38044 | 21 | 92.92 | 113.92 | 28 |
| Utah | 1 | 1520 | 32049 | 4 | 33.31 | 37.31 | 46 |
| Virginia | 4 | 7490 | 41769 | 7 | 196.22 | 203.22 | 19 |
| Virgin Islands | 0 | 40 | 22998 | 0 | 821.03 | 821.03 | 8 |
| Vermont | 1 | 630 | 34924 | 1 | 67.16 | 68.16 | 38 |
| Washington | 1 | 4530 | 40407 | 11 | 98.42 | 109.42 | 30 |
| Wisconsin | 2 | 5970 | 35239 | 5 | 103.63 | 108.63 | 31 |
| West Virginia | 2 | 1380 | 25533 | 4 | 75.36 | 79.36 | 35 |
| Wyoming | 0 | 210 | 40837 | 2 | 5.49 | 7.49 | 55 |

1) Doesn't include self employed doctors. Based on United States Department of Labor, Occupational Employment Statistics, May 2009
2) US Department of Commerce. Bureau of Economic Analysis, 2008

# Table 8. Regressions All States

| State | Number of Schools of Medicine (AAMC) | Number of times LCD=NCD | Number of Schools of Medicine (AAMC) | Number of times LCD different from NCD | Number of Schools of Medicine (AAMC) | Total number of times LCDs were issued | Number of physicians (1) | Number of times LCD=NCD | Number of physicians (1) | Number of times LCD different from NCD | Number of physicians (1) | Total number of times LCDs were issued |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alaska | 0 | 12 | 0 | 9 | 0 | 22 | 270 | 12 | 270 | 9 | 270 | 22 |
| Alabama | 2 | 12 | 2 | 10 | 2 | 23 | 2880 | 12 | 2880 | 10 | 2880 | 23 |
| American Samoa | 0 | 12 | 0 | 16 | 0 | 29 | 50 | 12 | 50 | 16 | 50 | 29 |
| Arkansas | 1 | 14 | 1 | 12 | 1 | 27 | 2920 | 14 | 2920 | 12 | 2920 | 27 |
| Arizona | 1 | 12 | 1 | 9 | 1 | 22 | 4160 | 12 | 4160 | 9 | 4160 | 22 |
| California | 8 | 12 | 8 | 16 | 8 | 29 | 21830 | 12 | 21830 | 16 | 21830 | 29 |
| Colorado | 1 | 15 | 1 | 16 | 1 | 32 | 3100 | 15 | 3100 | 16 | 3100 | 32 |
| Connecticut | 2 | 27 | 2 | 21 | 2 | 48 | 2500 | 27 | 2500 | 21 | 2500 | 48 |
| District of Columbia | 3 | 13 | 3 | 11 | 3 | 25 | 1310 | 13 | 1310 | 11 | 1310 | 25 |
| Delaware | 0 | 14 | 0 | 12 | 0 | 27 | 1220 | 14 | 1220 | 12 | 1220 | 27 |
| Florida | 6 | 16 | 6 | 26 | 6 | 43 | 18930 | 16 | 18930 | 26 | 18930 | 43 |
| Georgia | 4 | 12 | 4 | 10 | 4 | 23 | 3890 | 12 | 3890 | 10 | 3890 | 23 |
| Guam | 0 | 14 | 0 | 14 | 0 | 29 | 50 | 14 | 50 | 14 | 50 | 29 |
| Hawaii | 1 | 14 | 1 | 14 | 1 | 29 | 820 | 14 | 820 | 14 | 820 | 29 |
| Iowa | 1 | 14 | 1 | 13 | 1 | 28 | 1530 | 14 | 1530 | 13 | 1530 | 26 |
| Idaho | 0 | 10 | 0 | 10 | 0 | 21 | 920 | 10 | 920 | 10 | 920 | 21 |
| Illinois | 7 | 29 | 7 | 24 | 7 | 54 | 12630 | 29 | 12630 | 24 | 12630 | 54 |
| Indiana | 1 | 27 | 1 | 21 | 1 | 49 | 4440 | 27 | 4440 | 21 | 4440 | 49 |
| Kansas | 1 | 27 | 1 | 16 | 1 | 45 | 1600 | 27 | 1600 | 16 | 1600 | 45 |
| Kentucky | 2 | 30 | 2 | 22 | 2 | 53 | 2370 | 30 | 2370 | 22 | 2370 | 55 |
| Louisiana | 3 | 14 | 3 | 11 | 3 | 26 | 3630 | 14 | 3630 | 11 | 3630 | 26 |
| Massachusetts | 4 | 17 | 4 | 16 | 4 | 34 | 8950 | 17 | 8950 | 16 | 8950 | 34 |
| Maryland | 3 | 16 | 3 | 10 | 3 | 27 | 9020 | 16 | 9020 | 10 | 9020 | 27 |
| Maine | 0 | 18 | 0 | 16 | 0 | 35 | 1450 | 18 | 1450 | 16 | 1450 | 35 |
| Michigan | 4 | 29 | 4 | 23 | 4 | 53 | 11030 | 29 | 11030 | 23 | 11030 | 53 |
| Minnesota | 2 | 12 | 2 | 10 | 2 | 23 | 5060 | 12 | 5060 | 10 | 5060 | 23 |
| Missouri | 4 | 14 | 4 | 13 | 4 | 28 | 4160 | 14 | 4160 | 13 | 4160 | 28 |
| Mississippi | 0 | 12 | 0 | 10 | 0 | 23 | 550 | 12 | 550 | 10 | 550 | 23 |
| Montana | 0 | 14 | 0 | 10 | 0 | 25 | 890 | 14 | 890 | 10 | 890 | 25 |
| North Carolina | 4 | 15 | 4 | 23 | 4 | 39 | 6090 | 15 | 6090 | 23 | 6090 | 39 |
| North Dakota | 1 | 14 | 1 | 10 | 1 | 25 | 490 | 14 | 490 | 10 | 490 | 25 |
| Nebraska | 2 | 14 | 2 | 13 | 2 | 28 | 1560 | 14 | 1560 | 13 | 1560 | 28 |
| Nevada | 1 | 13 | 1 | 16 | 1 | 30 | 1010 | 13 | 1010 | 16 | 1010 | 30 |
| New Hampshire | 1 | 18 | 1 | 16 | 1 | 35 | 1540 | 18 | 1540 | 16 | 1540 | 35 |
| New Jersey | 2 | 12 | 2 | 11 | 2 | 24 | 9980 | 12 | 9980 | 11 | 9980 | 24 |
| New Mexico | 1 | 13 | 1 | 16 | 1 | 30 | 740 | 13 | 740 | 16 | 740 | 30 |
| New York | 13 | 23 | 13 | 13 | 13 | 37 | 41030 | 23 | 41030 | 13 | 41030 | 37 |
| Northern Mariana Islands | 0 | 12 | 0 | 16 | 0 | 29 | 38 | 12 | 38 | 16 | 38 | 29 |
| Ohio | 6 | 30 | 6 | 22 | 6 | 53 | 12690 | 30 | 12690 | 22 | 12690 | 53 |
| Oklahoma | 1 | 13 | 1 | 16 | 1 | 30 | 2640 | 13 | 2640 | 16 | 2640 | 30 |
| Oregon | 1 | 12 | 1 | 9 | 1 | 22 | 4250 | 12 | 4250 | 9 | 4250 | 22 |
| Pennsylvania | 7 | 14 | 7 | 12 | 7 | 27 | 11060 | 14 | 11060 | 12 | 11060 | 27 |
| Puerto Rico | 4 | 12 | 4 | 18 | 4 | 31 | 980 | 12 | 980 | 18 | 980 | 31 |
| Rhode Island | 1 | 18 | 1 | 16 | 1 | 35 | 1560 | 18 | 1560 | 16 | 1560 | 35 |
| South Carolina | 2 | 16 | 2 | 21 | 2 | 37 | 2520 | 16 | 2520 | 21 | 2520 | 37 |
| South Dakota | 1 | 14 | 1 | 10 | 1 | 25 | 220 | 14 | 220 | 10 | 220 | 25 |
| Tennessee | 4 | 12 | 4 | 10 | 4 | 23 | 4960 | 12 | 4960 | 10 | 4960 | 23 |
| Texas | 8 | 13 | 8 | 15 | 8 | 29 | 17820 | 13 | 17820 | 15 | 17820 | 29 |
| Utah | 1 | 14 | 1 | 10 | 1 | 25 | 1520 | 14 | 1520 | 10 | 1520 | 25 |
| Virginia | 4 | 33 | 4 | 27 | 4 | 61 | 7490 | 33 | 7490 | 27 | 7490 | 61 |
| Virgin Islands | 0 | 14 | 0 | 27 | 0 | 42 | 40 | 14 | 40 | 27 | 40 | 42 |
| Vermont | 1 | 17 | 1 | 16 | 1 | 34 | 630 | 17 | 630 | 16 | 630 | 34 |
| Washington | 1 | 12 | 1 | 9 | 1 | 22 | 4530 | 12 | 4530 | 9 | 4530 | 22 |
| Wisconsin | 2 | 29 | 2 | 23 | 2 | 53 | 5970 | 28 | 5970 | 23 | 5970 | 53 |
| West Virginia | 2 | 32 | 2 | 22 | 2 | 55 | 1380 | 32 | 1380 | 22 | 1380 | 55 |
| Wyoming | 0 | 14 | 0 | 10 | 0 | 25 | 210 | 14 | 210 | 10 | 210 | 25 |
| AVERAGE | 2 | 17 | 2 | 15 | 2 | 33 | 4,916 | 17 | 4,916 | 15 | 4,916 | 33 |

1) Doesn't include self employed doctors. Based on United States Department of Labor, Occupational Employment Statistics, May 2009
2) US Department of Commerce, Bureau of Economic Analysis, 2008

**Exponential**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| slope | 1.032855473 | 14.59637125 | intercept | 1.029923948 | 13.36726639 | 1.031216062 | 29.18578535 | 1.000011125 | 14.91580669 | 1.000006079 | 13.77132916 | 1.000008733 | 29.91287364 |
| | 0.016480092 | 0.057189923 | | 0.017070492 | 0.059009852 | 0.014923561 | 0.051850364 | 6.08643E-06 | 0.051735157 | 6.3607E-06 | 0.054096512 | 5.54933E-06 | 0.047169777 |
| r2 | 0.068669245 | 0.314413804 | s(y) | 0.052355322 | 0.326067344 | 0.072642661 | 0.285058436 | 0.050260999 | 0.315826884 | 0.029011797 | 0.330059075 | 0.053693092 | 0.287956674 |
| F | 3.857302701 | 54 | Degrees of freedom | 2.983580412 | 54 | 4.242554302 | 54 | 3.340728113 | 54 | 1.61344801 | 54 | 3.0760505 | 54 |
| Regression ss | 0.381317671 | 5.33822617 | residual ss | 0.317193298 | 5.741279514 | 0.344742801 | 4.387948848 | 0.333226339 | 5.386317500 | 0.175767184 | 5.822709628 | 0.255063173 | 4.477628477 |

**Linear**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| slope | 0.620595148 | 15.21574002 | intercept | 0.452623336 | 14.07595926 | 1.070477662 | 30.29815975 | 0.000207573 | 15.6561002 | 0.000127886 | 14.5141399 | 0.000535125 | 31.17368334 |
| | 0.324266288 | 1.126636489 | | 0.268474245 | 0.332785883 | 0.540662719 | 1.879588272 | 0.00012907 | 1.020601268 | 9.98903E-05 | 0.849075895 | 0.000201128 | 1.709603229 |
| r2 | 0.063520281 | 6.193924463 | s(y) | 0.050003113 | 5.1281864 | 0.067607795 | 10.33343753 | 0.052443827 | 6.230450288 | 0.029459325 | 5.183341857 | 0.048869218 | 10.43659076 |
| F | 3.662754335 | 54 | Degrees of freedom | 2.842291537 | 54 | 3.91551102 | 54 | 2.988645671 | 54 | 1.639090063 | 54 | 2.776317555 | 54 |
| Regression ss | 140.5204721 | 2071.693814 | residual ss | 74.74751091 | 1420.109632 | 418.0979975 | 5766.116288 | 116.0147705 | 2096.199515 | 44.03748309 | 1450.61966 | 302.4032453 | 5681.61104 |

| Pearson product-moment correlation coefficient | 0.252032301 | | 0.223613759 | | 0.260014028 | | 0.229136042 | | 0.17157216 | | 0.22117872 |
|---|---|---|---|---|---|---|---|---|---|---|---|

| State | GDP per capita (2) | Number of times LCD≠NCD | GDP per capita (2) | Number of times LCD different from NCD | GDP per capita (2) | Total number of times LCDs were issued | Ranking (Number of Level 1 and 2 Trauma Centers adjusted for population density) | Number of times LCD≠NCD | Ranking (Number of Level 1 and 2 Trauma Centers adjusted for population density) | Number of times LCD different from NCD | Ranking (Number of Level 1 and 2 Trauma Centers adjusted for population density) | Total number of times LCDs were issued |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alaska | 43640 | 12 | 43640 | 9 | 43640 | 22 | 55 | 12 | 56 | 9 | 56 | 22 |
| Alabama | 29411 | 12 | 29411 | 10 | 29411 | 23 | 34 | 12 | 34 | 10 | 54 | 23 |
| American Samoa | 8000 | 12 | 8000 | 16 | 8000 | 29 | 5 | 12 | 5 | 16 | 5 | 29 |
| Arkansas | 27753 | 14 | 27753 | 12 | 27753 | 27 | 43 | 14 | 43 | 12 | 43 | 27 |
| Arizona | 32343 | 12 | 32343 | 9 | 32343 | 22 | 41 | 12 | 41 | 9 | 41 | 22 |
| California | 42064 | 12 | 42064 | 16 | 42064 | 29 | 18 | 12 | 18 | 16 | 18 | 29 |
| Colorado | 41102 | 15 | 41102 | 16 | 41102 | 32 | 40 | 15 | 40 | 16 | 40 | 22 |
| Connecticut | 50758 | 27 | 50758 | 21 | 50758 | 48 | 9 | 27 | 9 | 21 | 9 | 48 |
| District of Columbia | 126407 | 13 | 126407 | 11 | 126407 | 25 | 1 | 13 | 1 | 11 | 1 | 25 |
| Delaware | 56401 | 14 | 56401 | 12 | 56401 | 27 | 13 | 14 | 13 | 12 | 13 | 27 |
| Florida | 32926 | 16 | 32926 | 26 | 32926 | 43 | 14 | 16 | 14 | 26 | 14 | 48 |
| Georgia | 34017 | 12 | 34017 | 10 | 34017 | 23 | 24 | 12 | 24 | 10 | 24 | 23 |
| Guam | 19000 | 14 | 19000 | 14 | 19000 | 29 | 6 | 14 | 6 | 14 | 6 | 29 |
| Hawaii | 38644 | 14 | 38644 | 20 | 38644 | 29 | 20 | 14 | 20 | 14 | 20 | 29 |
| Iowa | 36773 | 14 | 36773 | 13 | 36773 | 28 | 30 | 14 | 30 | 13 | 30 | 28 |
| Idaho | 29890 | 10 | 29890 | 10 | 29890 | 21 | 50 | 10 | 50 | 10 | 50 | 21 |
| Illinois | 40006 | 29 | 40006 | 24 | 40006 | 54 | 17 | 29 | 17 | 24 | 17 | 54 |
| Indiana | 32917 | 27 | 32917 | 21 | 32917 | 49 | 23 | 27 | 23 | 21 | 23 | 49 |
| Kansas | 35013 | 27 | 35013 | 16 | 35013 | 45 | 27 | 27 | 27 | 16 | 27 | 45 |
| Kentucky | 29740 | 30 | 29740 | 22 | 29740 | 53 | 29 | 30 | 29 | 22 | 29 | 53 |
| Louisiana | 32842 | 14 | 32842 | 11 | 32842 | 28 | 33 | 14 | 33 | 11 | 33 | 28 |
| Massachusetts | 48088 | 17 | 48088 | 16 | 48088 | 34 | 7 | 17 | 7 | 16 | 7 | 34 |
| Maryland | 39205 | 18 | 39205 | 10 | 39205 | 27 | 10 | 18 | 10 | 10 | 10 | 27 |
| Maine | 30437 | 18 | 30437 | 16 | 30437 | 35 | 45 | 18 | 45 | 16 | 45 | 35 |
| Michigan | 32601 | 29 | 32601 | 25 | 32601 | 53 | 22 | 29 | 22 | 25 | 22 | 53 |
| Minnesota | 41573 | 12 | 41573 | 19 | 41573 | 23 | 36 | 12 | 36 | 10 | 36 | 23 |
| Missouri | 32779 | 14 | 32779 | 13 | 32779 | 28 | 32 | 14 | 32 | 13 | 32 | 28 |
| Mississippi | 24403 | 12 | 24403 | 10 | 24403 | 23 | 37 | 12 | 37 | 10 | 37 | 23 |
| Montana | 28170 | 14 | 28170 | 10 | 28170 | 25 | 54 | 14 | 54 | 10 | 54 | 25 |
| North Carolina | 35719 | 15 | 35719 | 23 | 35719 | 39 | 21 | 15 | 21 | 23 | 21 | 39 |
| North Dakota | 37632 | 14 | 37632 | 10 | 37632 | 25 | 52 | 14 | 52 | 10 | 52 | 25 |
| Nebraska | 37326 | 14 | 37326 | 13 | 37326 | 28 | 48 | 14 | 48 | 13 | 48 | 28 |
| Nevada | 39687 | 13 | 39687 | 16 | 39687 | 30 | 49 | 13 | 49 | 16 | 49 | 30 |
| New Hampshire | 38420 | 18 | 38420 | 16 | 38420 | 35 | 27 | 18 | 27 | 16 | 27 | 35 |
| New Jersey | 44957 | 12 | 44957 | 11 | 44957 | 24 | 2 | 12 | 2 | 11 | 2 | 24 |
| New Mexico | 30935 | 13 | 30935 | 16 | 30935 | 30 | 51 | 13 | 51 | 16 | 51 | 30 |
| New York | 49499 | 23 | 49499 | 13 | 49499 | 37 | 12 | 23 | 12 | 13 | 12 | 37 |
| Northern Mariana Islands | 12500 | 12 | 12500 | 16 | 12500 | 29 | 11 | 12 | 11 | 16 | 11 | 29 |
| Ohio | 33568 | 30 | 33568 | 22 | 33568 | 53 | 16 | 30 | 16 | 22 | 16 | 53 |
| Oklahoma | 29359 | 13 | 29359 | 16 | 29359 | 30 | 42 | 13 | 42 | 16 | 42 | 30 |
| Oregon | 36801 | 12 | 36801 | 9 | 36801 | 22 | 44 | 12 | 44 | 9 | 44 | 22 |
| Pennsylvania | 35641 | 14 | 35641 | 12 | 35641 | 27 | 15 | 14 | 15 | 12 | 15 | 27 |
| Puerto Rico | 17100 | 12 | 17100 | 18 | 17100 | 31 | 3 | 12 | 3 | 18 | 3 | 31 |
| Rhode Island | 36283 | 18 | 36283 | 35 | 36283 | 35 | 4 | 18 | 4 | 35 | 4 | 35 |
| South Carolina | 28364 | 15 | 28364 | 21 | 28364 | 25 | 28 | 15 | 28 | 21 | 28 | 25 |
| South Dakota | 37660 | 14 | 37660 | 10 | 37660 | 25 | 53 | 14 | 53 | 10 | 53 | 25 |
| Tennessee | 33825 | 12 | 33825 | 10 | 33825 | 23 | 26 | 12 | 26 | 10 | 26 | 23 |
| Texas | 38044 | 13 | 38044 | 15 | 38044 | 29 | 28 | 13 | 28 | 15 | 28 | 29 |
| Utah | 32049 | 14 | 32049 | 10 | 32049 | 25 | 46 | 14 | 46 | 10 | 46 | 25 |
| Virginia | 41769 | 33 | 41769 | 27 | 41769 | 61 | 19 | 33 | 19 | 27 | 19 | 61 |
| Virgin Islands | 22996 | 14 | 22996 | 27 | 22996 | 42 | 8 | 14 | 8 | 27 | 8 | 42 |
| Vermont | 34924 | 17 | 34924 | 16 | 34924 | 34 | 38 | 17 | 38 | 16 | 38 | 34 |
| Washington | 40407 | 12 | 40407 | 9 | 40407 | 22 | 30 | 12 | 30 | 9 | 30 | 22 |
| Wisconsin | 35239 | 29 | 35239 | 23 | 35239 | 53 | 31 | 29 | 31 | 23 | 31 | 53 |
| West Virginia | 25533 | 32 | 25533 | 22 | 25533 | 55 | 35 | 32 | 35 | 22 | 35 | 55 |
| Wyoming | 40837 | 14 | 40837 | 10 | 40837 | 25 | 55 | 14 | 55 | 10 | 55 | 26 |
| AVERAGE | 36,186 | 17 | 36,186 | 15 | 36,186 | 33 | 29 | 17 | 29 | 15 | 29 | 33 |

**Exponential**

| slope | 1.000000683 | 15.38706941 intercept | 0.999960002 | 16.44058271 | 0.999930322 | 33.27115933 | 0.996660021 | 17.33037602 | 0.992087359 | 17.97622786 | 0.994929411 | 36.68930857 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  | 2.91938E-06 | 0.114233592 | 2.86141E-06 | 0.115878115 | 2.64783E-06 | 0.105608088 | 0.002651881 | 0.086687039 | 0.002549524 | 0.083253341 | 0.002330953 | 0.076372054 |
| r2 | 0.001028571 | 0.325282564 sey | 0.029963006 | 0.329863378 | 0.006868474 | 0.286086216 | 0.026630114 | 0.320756694 | 0.132398542 | 0.309376553 | 0.082921972 | 0.281939254 |
| F | 0.055481827 | 54 Degrees of freedom | 1.645034482 | 54 | 0.373462734 | 54 | 1.591593639 | 54 | 9.768952571 | 54 | 5.538377291 | 54 |
| Regression ss | 0.006871521 | 5.713872321 residual ss | 0.179106667 | 5.870896144 | 0.032606371 | 4.700186278 | 0.16375119 | 5.555792651 | 0.923283507 | 5.135183504 | 0.440244312 | 4.292447337 |

**Linear**

| slope | 7.5634E-05 | 16.40415973 intercept | -6.73003E-05 | 17.21643271 | -6.06893E-05 | 34.88644491 | -0.062064252 | 18.4474026 | -0.119064958 | 18.56188831 | -0.179425837 | 37.93560484 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  | 5.7435E-05 | 2.247395565 | 4.85724E-05 | 1.822350573 | 6.57942E-05 | 3.748367376 | 0.052238564 | 1.711560493 | 0.04031967 | 1.321092709 | 0.035039054 | 2.786263286 |
| r2 | 0.000322731 | 6.395090560 sey | 0.007271065 | 5.180181706 | 0.000210118 | 10.67355519 | 0.009474176 | 6.318491391 | 0.140834879 | 4.876871186 | 0.076160495 | 10.28603202 |
| F | -0.017433089 | 54 Degrees of freedom | 0.283310967 | 54 | 1.411564003 | 54 | 1.415564b-03 | 54 | 8.851713449 | 54 | 4.451712182 | 54 |
| Regression ss | 0.713949679 | 2211.500336 residual ss | 40.76037563 | 1454.000767 | 32.27614315 | 6151.998143 | 56.3343404 | 2155.859948 | 210.9260246 | 1264.329118 | 470.992823 | 5713.221493 |

| Pearson product-moment correlation coefficient | 0.060015371 | | -0.206189796 | | -0.086220737 | | -0.161846981 | | -0.398893488 | | -0.288020714 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

# Table 9. Regressions for Sub-analysis

## Analysis between all selected states

| State | Number of Schools of Medicine (AAMC) | Number of times LCD=NCD | | Number of Schools of Medicine (AAMC) | Number of times LCD different from NCD | | Number of Schools of Medicine (AAMC) | Total number of times LCDs were issued | | Number of physicians (1) | Number of times LCD=NCD | | Number of physicians (1) | Number of times LCD different from NCD | | Number of physicians (1) | Total number of times LCDs were issued |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Massachusetts | 4 | 17 | | 4 | 16 | | 4 | 34 | | 8950 | 17 | | 8950 | 16 | | 8950 | 34 |
| New York | 13 | 23 | | 13 | 13 | | 13 | 37 | | 41030 | 23 | | 41030 | 13 | | 41030 | 37 |
| Maryland | 3 | 16 | | 3 | 10 | | 3 | 27 | | 9020 | 16 | | 9020 | 10 | | 9020 | 27 |
| Georgia | 4 | 12 | | 4 | 10 | | 4 | 23 | | 3890 | 12 | | 3890 | 10 | | 3890 | 23 |
| Florida | 6 | 16 | | 6 | 26 | | 6 | 43 | | 18930 | 16 | | 18930 | 26 | | 18930 | 43 |
| Illinois | 7 | 29 | | 7 | 24 | | 7 | 54 | | 12630 | 29 | | 12630 | 24 | | 12630 | 54 |
| Missouri | 4 | 14 | | 4 | 13 | | 4 | 28 | | 4160 | 14 | | 4160 | 13 | | 4160 | 26 |
| Texas | 8 | 13 | | 8 | 15 | | 8 | 29 | | 17820 | 13 | | 17820 | 15 | | 17820 | 29 |
| California | 8 | 12 | | 8 | 16 | | 8 | 29 | | 21830 | 12 | | 21830 | 16 | | 21830 | 29 |
| Oregon | 1 | 12 | | 1 | 9 | | 1 | 22 | | 4250 | 12 | | 4250 | 9 | | 4250 | 22 |
| Washington | 1 | 12 | | 1 | 9 | | 1 | 22 | | 4530 | 12 | | 4530 | 9 | | 4530 | 22 |

**Exponential**

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| slope | 1.044655013 | 12.12425701 | intercept | 1.051657375 | 10.48292112 | | 1.046135515 | 23.64337942 | | 1.000012061 | 13.04088671 | | 1.000012061 | 11.68683738 | | 1.000012419 | 25.76467524 |
| r2 | 0.276186426 | 0.263089868 | s(y) | 0.2361484692 | 0.358079795 | | 0.338286706 | 0.244507527 | | 0.213518859 | 0.274277468 | | 0.137213958 | 0.358138432 | | 0.239234761 | 0.262286283 |
| F | 3.43414099 | 9 | Degrees of freedom | 2.782394756 | 9 | | 4.60105666 | 9 | | 2.440467465 | 9 | | 1.431322888 | 9 | | 2.830193515 | 9 |
| Regression ss | 0.23076984E | 0.622946508 | residual ss | 0.315955901 | 1.021996441 | | 0.275271788 | 0.538451581 | | 0.183591802 | 0.677053185 | | 0.183585984 | 1.154368358 | | 0.194670908 | 0.619052431 |

**Linear**

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| slope | 0.786561314 | 11.77950204 | intercept | 0.654014509 | 11.12846715 | | 1.440675912 | 23.9080292 | | 0.000209513 | 13.20895458 | | 0.000158789 | 12.51086916 | | 0.000367309 | 26.71985374 |
| r2 | 0.441901396 | 2.798003977 | | 0.4991479291 | 3.160474029 | | 0.798097441 | 5.063344084 | | 0.000145696 | 2.497787987 | | 0.000162706 | 2.789438097 | | 0.000265759 | 4.556112386 |
| r2 | 0.290351484S4 | 4.93161672 | s(y) | 0.1601966031 | 5.570487638 | | 0.265871102 | 8.906762241 | | 0.185386647 | 5.176072648 | | 0.095695836 | 5.780448266 | | 0.175081508 | 8.441461335 |
| F | 3.170630527 | 9 | Degrees of freedom | 1.716786689 | 9 | | 3.259427502 | 9 | | 2.04815619 | 9 | | 0.952403578 | 9 | | 1.910168614 | 9 |
| Regression ss | 77.11240878 | 218.8875912 | residual ss | 53.27246184 | 279.2729927 | | 258.5717319 | 713.9737226 | | 54.87444745 | 241.1255526 | | 31.82321518 | 300.7222394 | | 170.2747252 | 802.2707293 |

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| State | GDP per capita (2) | Number of times LCD=NCD | | GDP per capita (2) | Number of times LCD different from NCD | | GDP per capita (2) | Total number of times LCDs were issued | | Ranking (Number of Level 1 and 2 Trauma Centers adjusted for population density) | Number of times LCD=NCD | | Ranking (Number of Level 1 and 2 Trauma Centers adjusted for population density) | Number of times LCD different from NCD | | Ranking (Number of Level 1 and 2 Trauma Centers adjusted for population density) | Total number of times LCDs were issued |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Massachusetts | 48096 | 17 | | 48096 | 16 | | 48096 | 34 | | 7 | 17 | | 7 | 16 | | 7 | 34 |
| New York | 49499 | 23 | | 49499 | 13 | | 49499 | 37 | | 12 | 23 | | 12 | 13 | | 12 | 37 |
| Maryland | 39205 | 16 | | 39205 | 10 | | 39205 | 27 | | 10 | 16 | | 10 | 10 | | 10 | 27 |
| Georgia | 34017 | 12 | | 34017 | 10 | | 34017 | 23 | | 24 | 12 | | 24 | 10 | | 24 | 23 |
| Florida | 32925 | 16 | | 32925 | 26 | | 32925 | 43 | | 14 | 16 | | 14 | 26 | | 14 | 43 |
| Illinois | 40006 | 29 | | 40006 | 24 | | 40006 | 54 | | 17 | 29 | | 17 | 24 | | 17 | 54 |
| Missouri | 32779 | 14 | | 32779 | 13 | | 32779 | 28 | | 32 | 14 | | 32 | 13 | | 32 | 26 |
| Texas | 38044 | 13 | | 38044 | 15 | | 38044 | 29 | | 26 | 13 | | 26 | 15 | | 26 | 29 |
| California | 42064 | 12 | | 42064 | 16 | | 42064 | 29 | | 18 | 12 | | 18 | 16 | | 18 | 29 |
| Oregon | 38801 | 12 | | 38801 | 9 | | 38801 | 22 | | 44 | 12 | | 44 | 9 | | 44 | 22 |
| Washington | 40407 | 12 | | 40407 | 9 | | 40407 | 22 | | 30 | 12 | | 30 | 9 | | 30 | 22 |

**Exponential**

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| slope | 1.000021454 | 6.550131182 | intercept | 0.99997441 | 15.20007138 | | 1.0000097 | 20.71929925 | | 0.98545024 | 20.97354295 | | 0.984411945 | 19.23955305 | | 0.984866384 | 42.08755846 |
| r2 | 1.628196-05 | 0.650734522 | | 2.21563E-06 | 0.885515098 | | 1.80867E-05 | 0.678902197 | | 0.007225767 | 0.17322672 | | 0.009622550 | 0.228288794 | | 0.00681240 | 0.16331E306 |
| r2 | 0.161718921 | 0.283129803 | s(y) | 0.001480271 | 0.34808111 | | 0.349836E0 | 0.295385356 | | 0.31274473E | 0.256359727 | | 0.232213912 | 0.337848568 | | 0.353891719 | 0.24189E179 |
| F | 1.730255686 | 9 | Degrees of freedom | 0.013542192 | 9 | | 0.320073861 | 9 | | 4.09557084 | 9 | | 2.722014952 | 9 | | 4.529653698 | 9 |
| Regression ss | 0.139182576 | 0.721462392 | residual ss | 0.001980535 | 1.390873806 | | 0.028450762 | 0.786272577 | | 0.289162183 | 0.591482785 | | 0.310691612 | 1.02726273 | | 0.287969651 | 0.525753368 |

**Linear**

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| slope | 0.000276383 | 1.087178965 | intercept | -0.00011503 | 19.22661446 | | 0.00036048 | 21.31579143 | | -0.238305982 | 21.1133015 | | -0.225769175 | 19.48013867 | | -0.464105157 | 41.56052880 |
| r2 | 0.000304969 | 12.18960720 | | 0.00034742 | 13.88624869 | | 0.000691467 | 23.6386136E | | 0.140773812 | 3.374824798 | | 0.153719208 | 3.689977549 | | 0.248830224 | 5.965323948 |
| r2 | 0.144720664 | 5.305895542 | s(y) | 0.012715262 | 6.041368646 | | 0.001095606 | 10.25498708 | | 0.741555738 | 4.294432517 | | 0.192934511 | 5.450829509 | | 0.278775447 | 8.28613469E |
| F | 1.822678116 | 9 | Degrees of freedom | 0.111296875 | 9 | | 0.190955742 | 9 | | 2.886411703 | 9 | | 2.151E114 | 9 | | 3.478776504 | 9 |
| Regression ss | 42.8373224 | 253.1626776 | residual ss | 4.062129739 | 328.4833248 | | 20.51682442 | 962.0256901 | | 71.50079445 | 224.4992055 | | 64.1594947 | 268.3859598 | | 271.1217843 | 701.4236603 |

# Analysis between regions

## By Region

| | Number of Schools of Medicine (AAMC) | Number of times LCD=NCD | | Number of Schools of Medicine (AAMC) | Number of times LCD different from NCD | | Number of Schools of Medicine (AAMC) | Total number of times LCDs were issued | | Number of physicians (1) | Number of times LCD=NCD | | Number of physicians (1) | Number of times LCD different from NCD | | Number of physicians (1) | Total number of times LCDs were issued |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| East Coast | 6 | 17 | | 6 | 15 | | 6 | 33 | | 81,820 | 84 | | 81,820 | 75 | | 81,820 | 164 |
| Center | 6 | 19 | | 6 | 17 | | 6 | 37 | | 34,810 | 56 | | 34,810 | 52 | | 34,810 | 111 |
| West Coast | 3 | 12 | | 3 | 11 | | 3 | 24 | | 30,610 | 36 | | 30,610 | 34 | | 30,610 | 73 |

### Exponential

| slope | 1.149335838 | 7.519431955 | intercept | 1.139123662 | 7.362051379 | | 1.137755048 | 15.75408751 | | 1.000013259 | 28.86060239 | | 1.000012271 | 27.92249467 | | 1.000012693 | 58.96833423 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.018023242 | 0.397182907 | | 0.031189295 | 0.168173865 | | 0.023679287 | 0.127579615 | | 6.80943E-06 | 0.363705288 | | 6.58371E-06 | 0.357449932 | | 6.44999E-06 | 0.350190075 |
| r2 | 0.983506364 | 0.041910946 | sy | 0.943640709 | 0.072527065 | | 0.967431778 | 0.065063418 | | 0.791292661 | 0.273793593 | | 0.776484306 | 0.264717613 | | 0.794762558 | 0.259341162 |
| F | 59.6367967 | 1 | Degrees of freedom | 16.74330325 | 1 | | 29.70477858 | 1 | | 3.791056035 | 1 | | 3.47395877 | 1 | | 3.572465301 | 1 |
| Regression ss | 0.104753566 | 0.001756527 | residual ss | 0.088072709 | 0.005260175 | | 0.090064296 | 0.00303198 | | 0.284214335 | 0.074962931 | | 0.243436101 | 0.070076416 | | 0.260449609 | 0.067257636 |

### Linear

| slope | 2.060273973 | 5.063013699 | intercept | 1.760273973 | 5.363013699 | | 3.820547945 | 11.4260274 | | 0.000795531 | 19.62201037 | | 0.000671425 | 20.71313705 | | 0.001507458 | 42.01394041 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.360046190 | 1.944618 | | 0.533851276 | 2.878546382 | | 0.894497472 | 4.823164382 | | 0.000293767 | 15.94954279 | | 0.000626769 | 14.59374457 | | 0.000558456 | 30.32041822 |
| r2 | 0.970260305 | 0.838640634 | sy | 0.915770063 | 1.241408633 | | 0.84803269 | 2.080049467 | | 0.880001313 | 11.8117938 | | 0.862847121 | 10.76329249 | | 0.873519479 | 22.45446987 |
| F | 32.63837238 | 1 | Degrees of freedom | 10.87226337 | 1 | | 18.24286622 | 1 | | 7.333424649 | 1 | | 6.291133899 | 1 | | 7.286341417 | 1 |
| Regression ss | 22.95297818 | 0.703316113 | residual ss | 16.75520041 | 1.54109589 | | 78.92565051 | 4.326606784 | | 1023.146194 | 139.5184728 | | 726.8182015 | 115.8484651 | | 3673.796763 | 504.203217 |

<br>

| | GDP per capita (2) | Number of times LCD=NCD | | GDP per capita (2) | Number of times LCD different from NCD | | GDP per capita (2) | Total number of times LCDs were issued | | Ranking (Number of Level 1 and 2 Trauma Centers adjusted for population density) | Number of times LCD=NCD | | Ranking (Number of Level 1 and 2 Trauma Centers adjusted for population density) | Number of times LCD different from NCD | | Ranking (Number of Level 1 and 2 Trauma Centers adjusted for population density) | Total number of times LCDs were issued |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| East Coast | 40,747 | 84 | | 40,747 | 75 | | 40,747 | 164 | | 67 | 84 | | 67 | 75 | | 67 | 164 |
| Center | 36,943 | 56 | | 36,943 | 52 | | 36,943 | 111 | | 77 | 56 | | 77 | 52 | | 77 | 111 |
| West Coast | 40,424 | 36 | | 40,424 | 34 | | 40,424 | 73 | | 92 | 36 | | 92 | 52 | | 92 | 73 |

### Exponential

| slope | 1.000010486 | 36.72472588 | | 1.00000635 | 39.71382291 | | 1.000010762 | 71.9682041 | | 0.967014612 | 774.2081694 | | 0.969194303 | 602.1436677 | | 0.968481505 | 1365.583266 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.000200857 | 7.907660901 | | 0.000187613 | 7.380622927 | | 0.000191162 | 7.551553601 | | 0.003033184 | 9.240636843 | | 0.003269595 | 0.180057754 | | 0.003034436 | 0.240736169 |
| r2 | 0.002683292 | 0.596500392 | | 0.001144173 | 0.555603253 | | 0.003144584 | 0.571556397 | | 0.99188869 | 0.053375804 | | 0.994797146 | 0.040367748 | | 0.991102416 | 0.053998184 |
| F | 0.002690501 | 1 | | 0.0011145484 | 1 | | 0.003154505 | 1 | | 122.2845447 | 1 | | 191.2022141 | 1 | | 111.3900873 | 1 |
| Regression ss | 0.000963774 | 0.358213490 | | 0.000356715 | 0.310155601 | | 0.001930504 | 0.326676644 | | 0.356263868 | 0.002913386 | | 0.311883345 | 0.00160117 | | 0.324791643 | 0.002915804 |

### Linear

| slope | 0.00_962528 | -18.60059698 | | 0.001426135 | -2.482085872 | | 0.000697684 | -29.59036595 | | -1.573684211 | 206.0631579 | | -1.605263158 | 179.9473684 | | -3.552631579 | 395.4736842 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.011261987 | 443.8218504 | | 0.009838709 | 379.8545659 | | 0.021352568 | 841.4810821 | | 0.401106503 | 31.82167756 | | 0.308929877 | 23.86625824 | | 0.756632721 | 60.02725558 |
| r2 | 0.029472148 | 33.59167132 | | 0.021422533 | 28.75016117 | | 0.029116754 | 63.68941705 | | 0.56180589 | 7.13774253 | | 0.966071948 | 5.353306897 | | 0.956668551 | 13.46437795 |
| F | 0.030367133 | 1 | | 0.021891504 | 1 | | 0.029992087 | 1 | | 21.82093664 | 1 | | 28.47413629 | 1 | | 22.04601539 | 1 |
| Regression ss | 34.26028458 | 1128.400582 | | 18.09489955 | 826.5717671 | | 121.6581556 | 4056.341644 | | 1111.719298 | 50.94736842 | | 816.0087719 | 28.65789474 | | 3996.710526 | 181.2894737 |

# Analysis within regions

## Within region

### East Coast

| | Number of Schools of Medicine (AAMC) | Number of times LCD=NCD | | Number of Schools of Medicine (AAMC) | Number of times LCD different from NCD | | Number of Schools of Medicine (AAMC) | Total number of times LCDs were issued | | Number of physicians (1) | Number of times LCD=NCD | | Number of physicians (1) | Number of times LCD different from NCD | | Number of physicians (1) | Total number of times LCDs were issued |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Exponential** | | | | | | | | | | | | | | | | | |
| slope | 1.046415491 | 12.52260359 | intercept | 1.013676666 | 12.91845732 | | 1.031785699 | 26.52840352 | | 1.000013747 | 13.12871361 | | 1.000006184 | 12.68659157 | | 1.000010525 | 26.94330492 |
| | 0.019922313 | 0.139740508 | | 0.055993082 | 0.39275066 | | 0.030596341 | 0.214611032 | | 4.27575E-06 | 0.090063232 | | 1.50713E-06 | 0.317458213 | | 7.60365E-06 | 0.160161192 |
| r2 | 0.633539457 | 0.181849630 | s(y) | 0.019240941 | 0.454889947 | | 0.258612784 | 0.248505849 | | 0.775061492 | 0.126803146 | | 0.953135598 | 0.446960424 | | 0.399760454 | 0.225496495 |
| F | 5.186420223 | 3 | Degrees of freedom | 0.058855264 | 3 | | 1.045922757 | 3 | | 10.33697829 | 3 | | 0.168352293 | 3 | | 1.916102325 | 3 |
| Regression ss | 0.135859862 | 0.078585917 | residual ss | 0.012178615 | 0.620774592 | | 0.064622318 | 0.185354943 | | 0.162206665 | 0.048237114 | | 0.033632347 | 0.599320861 | | 0.097431253 | 0.152546008 |
| **Linear** | | | | | | | | | | | | | | | | | |
| slope | 0.833333333 | 11.8 | intercept | 0.136363636 | 14.18181818 | | 0.96969697 | 26.98181818 | | 0.000244621 | 12.79701746 | | 8.02389E-05 | 13.68697023 | | 0.00032486 | 27.48398769 |
| | 0.292728946 | 2.053280204 | | 0.939516121 | 6.590020639 | | 0.991493898 | 6.884464351 | | 6.2088E-05 | 1.307804953 | | 0.000254084 | 5.351950083 | | 0.00024624 | 5.186730021 |
| r2 | 0.729830149 | 2.378141198 | s(y) | 0.00697314 | 7.632665049 | | 0.245492904 | 7.973694124 | | 0.838038208 | 1.841303932 | | 0.032173074 | 7.535196061 | | 0.367156278 | 7.302577008 |
| F | 8.104125737 | 3 | Degrees of freedom | 0.02106632 | 3 | | 0.976105745 | 3 | | 15.52288723 | 3 | | 0.09972777 | 3 | | 1.740506853 | 3 |
| Regression ss | 45.83333333 | 16.96666667 | residual ss | 1.227272727 | 174.7727273 | | 62.06060606 | 190.7393939 | | 52.62879948 | 10.17120051 | | 5.862460958 | 170.337539 | | 92.81710714 | 159.9828929 |

### Central

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Exponential** | | | | | | | | | | | | | | | | | |
| slope | 1.04265131B | 13.35417594 | intercept | 1.077540658 | 10.42322391 | | 1.05894151 | 24.53545424 | | 1.000004527 | 16.51996385 | | 1.000017181 | 13.70370398 | | 1.000010714 | 31.14042727 |
| | 0.20886387 | 1.369611995 | | 0.134774561 | 0.8837759 | | 0.187998548 | 1.101640153 | | 6.39872E-05 | 0.825630387 | | 4.31062E-05 | 0.556201359 | | 5.23689E-05 | 0.675719517 |
| r2 | 0.038450984 | 0.614878588 | s(y) | 0.234917706 | 0.396765565 | | 0.10411065 | 0.494574335 | | 0.004960969 | 0.625488523 | | 0.137077788 | 0.421372047 | | 0.040176229 | 0.511917893 |
| F | 0.039998584 | 1 | Degrees of freedom | 0.307048938 | 1 | | 0.116209273 | 1 | | 0.005005923 | 1 | | 0.158853007 | 1 | | 0.041857923 | 1 |
| Regression ss | 0.015118711 | 0.378075678 | residual ss | 0.048336539 | 0.157422914 | | 0.028425227 | 0.244603773 | | 0.001958497 | 0.391235892 | | 0.028205051 | 0.177554402 | | 0.010968278 | 0.262059724 |
| **Linear** | | | | | | | | | | | | | | | | | |
| slope | 0.961534462 | 12.57692308 | intercept | 1.230769231 | 9.538461538 | | 2.192307692 | 23.11538462 | | 0.000127501 | 17.187231 | | 0.000271328 | 14.18502947 | | 0.000398828 | 32.37226047 |
| | 4.196892341 | 27.52086352 | | 2.531458873 | 16.59688593 | | 6.726351214 | 44.12074946 | | 0.001290407 | 16.65002921 | | 0.000803113 | 10.36292121 | | 0.002093521 | 27.01282442 |
| r2 | 0.048672227 | 12.35531651 | s(y) | 0.191187453 | 7.452413135 | | 0.095876604 | 19.80772965 | | 0.009668379 | 12.61401128 | | 0.102445902 | 7.850508132 | | 0.03502155 | 20.46461941 |
| F | 0.052490132 | 1 | Degrees of freedom | 0.236380425 | 1 | | 0.106166082 | 1 | | 0.009762769 | 1 | | 0.114138972 | 1 | | 0.036292572 | 1 |
| Regression ss | 8.012820513 | 152.6538462 | residual ss | 13.12820513 | 55.53846154 | | 41.65384615 | 392.3461538 | | 1.553386199 | 159.1132805 | | 7.034618622 | 61.63204804 | | 15.19935248 | 418.8006475 |

### West Coast

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Exponential** | | | | | | | | | | | | | | | | | |
| slope | 1 | 12 | intercept | 1.085667362 | 8.289831966 | | 1.040253848 | 21.14868408 | | | 12 | | 1.000032985 | 7.78702489 | | 1.000015837 | 20.52277289 |
| | 0 | 0 | | 8.62637E-33 | 4.04613E-32 | | 0 | 0 | | | 0 | | 4.58622E-07 | 0.006009707 | | 2.20201E-07 | 0.00288548 |
| r2 | 0 | 0 | s(y) | 1 | 4.93038E-32 | | 0 | 0 | | | 0 | | 0.999806714 | 0.006531266 | | 0.999806714 | 0.0031359 |
| F | 0 | 1 | Degrees of freedom | 9.0789E+61 | 1 | | 0 | 1 | | | 1 | | 5172.680272 | 1 | | 5172.680272 | 1 |
| Regression ss | 0 | 0 | residual ss | 0.220695933 | 2.43087E-63 | | 0.050877289 | 0 | | | 0 | | 0.220653275 | 4.26574E-05 | | 0.050867452 | 9.83387E-06 |
| **Linear** | | | | | | | | | | | | | | | | | |
| slope | 0 | 12 | intercept | 1 | 8 | | 1 | 21 | | 0 | 12 | | 0.000401299 | 7.238750294 | | 0.000401299 | 20.23875029 |
| | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 5.57969E-06 | 0.073115348 | | 5.57969E-06 | 0.073115348 |
| r2 | 0 | 0 | s(y) | 1 | 0 | | 0 | 0 | | 0 | 0 | | 0.999806714 | 0.079460742 | | 0.999806714 | 0.079460742 |
| F | 0 | 1 | Degrees of freedom | 0 | 1 | | 0 | 1 | | 0 | 1 | | 5172.680272 | 1 | | 5172.680272 | 1 |
| Regression ss | 0 | 0 | residual ss | 32.66666667 | 0 | | 32.66666667 | 0 | | 0 | 0 | | 32.66035266 | 0.00631401 | | 32.66035266 | 0.00631401 |

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| | GDP per capita (2) | Number of times LCD=NCD | | GDP per capita (2) | Number of times LCD different from NCD | | GDP per capita (2) | Total number of times LCDs were issued | | Ranking (Number of Level 1 and 2 Trauma Centers adjusted for population density) | Number of times LCD=NCD | | Ranking (Number of Level 1 and 2 Trauma Centers adjusted for population density) | Number of times LCD different from NCD | | Ranking (Number of Level 1 and 2 Trauma Centers adjusted for population density) | Total number of times LCDs were issued |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

### East Coast

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Exponential** | | | | | | | | | | | | | | | | | |
| slope | 1.000023219 | 6.383066828 | | 0.999992784 | 18.80649014 | | 1.00000786G | 23.20476167 | | 0.976787983 | 22.55516957 | | 1.046415491 | 12.52260359 | | 1.046415491 | 12.52260359 |
| | 1.09084E-05 | 0.450763118 | | 2.93966E-05 | 1.214961641 | | 1.80938E-05 | 0.747810359 | | 0.01555346 | 0.226995275 | | 0.019922313 | 0.139740508 | | 0.019922313 | 0.139740508 |
| r2 | 0.661719968 | 0.186730032 | | 3.019891397 | 0.454785471 | | 0.369645225 | 0.278821008 | | 0.434159464 | 0.201115319 | | 0.633539457 | 0.161849639 | | 0.633539457 | 0.161849639 |
| F | 4.532385582 | 3 | | 0.06026081 | 3 | | 0.190285277 | 3 | | 2.301847081 | 3 | | 5.186420223 | 3 | | 5.186420223 | 3 |
| Regression ss | 0.125036307 | 0.065409471 | | 0.01246G733 | 0.620469475 | | 0.01490995 | 0.235067311 | | 0.093103664 | 0.121342114 | | 0.135859862 | 0.078585917 | | 0.135859862 | 0.078585917 |
| **Linear** | | | | | | | | | | | | | | | | | |
| slope | 0.000399118 | 0.537210737 | | -0.000291149 | 24.3370867 | | 0.000169969 | 25.67429744 | | 0.350478489 | 21.49641148 | | -0.197368421 | 17.64473684 | | -0.54784689 | 40.14114833 |
| | 0.000186374 | 7.861510307 | | 0.906477088 | 19.71806695 | | 0.000595189 | 24.18587644 | | 0.290269929 | 4.236291769 | | 0.585365142 | 8.483577503 | | 0.635564187 | 9.275735904 |
| r2 | 0.607108762 | 2.867863034 | | 3.071407442 | 7.38085394 | | 0.0073516 | 9.053277725 | | 0.327038826 | 3.753307991 | | 0.037005579 | 7.516356433 | | 0.198507813 | 8.218216045 |
| F | 4.635594065 | 3 | | 0.23069502 | 3 | | 0.084362244 | 3 | | 1.457909485 | 3 | | 0.11529608 | 3 | | 0.743018396 | 3 |
| Regression ss | 32.12608486 | 24.57391514 | | 12.56757452 | 163.4323255 | | 6.914484589 | 245.8855154 | | 20.53803828 | 42.26196172 | | 6.513157885 | 189.4868421 | | 50.18277512 | 202.6172249 |

### Central

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Exponential** | | | | | | | | | | | | | | | | | |
| slope | 1.000076957 | 1.015041199 | | 1.000072873 | 1.133111611 | | 1.000073405 | 2.342255111 | | 0.947680888 | 89.15580826 | | 0.955571945 | 48.24197046 | | 0.954570813 | 116.298481 |
| | 9.03187E-05 | 3.348006836 | | 4.53429E-05 | 1.680844037 | | 6.62307E-05 | 2.485092990 | | 0.019256259 | 0.509166696 | | 0.001463656 | 0.038667023 | | 0.010051388 | 0.265744799 |
| r2 | 0.420482164 | 0.477350145 | | 0.720876446 | 0.33965039 | | 0.551225316 | 0.350640716 | | 0.846204821 | 0.211526891 | | 0.808743665 | 0.016078022 | | 0.955349046 | 0.110412882 |
| F | 0.725572429 | 1 | | 2.582542834 | 1 | | 1.228289685 | 1 | | 7.787718522 | 1 | | 794.9660464 | 1 | | 21.39593956 | 1 |
| Regression ss | 0.165331227 | 0.227863162 | | 0.148327143 | 0.06743231 | | 0.150500467 | 0.122928503 | | 0.348450763 | 0.044743626 | | 0.20550095 | 0.000258560 | | 0.260637995 | 0.012191004 |
| **Linear** | | | | | | | | | | | | | | | | | |
| slope | 0.001605409 | -46.6419639 | | 0.001285036 | -30.1097577 | | 0.002080445 | -69.76172126 | | -1.096663083 | 46.81491713 | | -0.751381215 | 36.61878453 | | -1.848066296 | 84.43370168 |
| | 0.001781714 | 86.04602548 | | 0.000896529 | 33.29833661 | | 0.002680013 | 99.948621 | | 0.358850305 | 9.487502604 | | 0.069985399 | 1.771000486 | | 0.428836696 | 11.25850309 |
| r2 | 0.448088015 | 9.416671298 | | 0.871743298 | 4.747661902 | | 0.53772273 | 14.15433332 | | 0.902696261 | 3.941912484 | | 0.982115003 | 0.735823664 | | 0.949582453 | 4.677773614 |
| F | 0.811886384 | 3 | | 2.046396203 | 1 | | 1.163209916 | 1 | | 0.339792503 | 1 | | 125.8231293 | 1 | | 18.83436435 | 1 |
| Regression ss | 71.99096833 | 88.67369833 | | 48.12637313 | 22.54029354 | | 233.371666 | 200.628335 | | 145.1279926 | 15.53867403 | | 68.1252302 | 0.541436464 | | 412.1187845 | 21.88121547 |

### West Coast

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Exponential** | | | | | | | | | | | | | | | | | |
| slope | 1 | 12 | | 1.00017725 | 0.008433899 | | 1.0000651 | 0.773510662 | | 1 | 12 | | 0.978710368 | 21.09307376 | | 0.989720884 | 33.11493734 |
| | 0 | 0 | | 0.000130205 | 4.052874702 | | 4.8112E-05 | 1.946933426 | | 0 | 0 | | 0.013792125 | 0.445677453 | | 0.006560296 | 0.213686051 |
| r2 | 0 | 0 | | 0.757773546 | 0.231210712 | | 0.757773546 | 0.111012222 | | 0 | 0 | | 0.710629921 | 0.252710901 | | 0.710629921 | 0.121335749 |
| F | 0 | 1 | | 3.128588245 | 1 | | 3.128368246 | 1 | | 0 | 1 | | 2.455782313 | 1 | | 2.455782313 | 1 |
| Regression ss | 0 | 0 | | 0.16723754 | 0.053458393 | | 0.0385534B1 | 0.012323824 | | 0 | 0 | | 0.156833133 | 0.063862799 | | 0.036154921 | 0.014722364 |
| **Linear** | | | | | | | | | | | | | | | | | |
| slope | 0 | 12 | | 0.002155266 | -75.83157107 | | 0.002156266 | -62.83157107 | | 0 | 12 | | -0.261811004 | 19.36229472 | | -0.261811004 | 32.36229472 |
| | 0 | 0 | | 0.001216112 | 49.30811759 | | 0.001219112 | 49.30811759 | | 0 | 0 | | 0.167067893 | 5.422204699 | | 0.167067893 | 5.422204699 |
| r2 | 0 | 0 | | 0.757773546 | 2.812957665 | | 0.757773546 | 2.812957665 | | 0 | 0 | | 0.710629921 | 3.074533445 | | 0.710629921 | 3.074533445 |
| F | 0 | 1 | | 3.128368246 | 1 | | 3.128368246 | 1 | | 0 | 1 | | 2.455782313 | 1 | | 2.455782313 | 1 |
| Regression ss | 0 | 0 | | 24.75393584 | 7.912730823 | | 24.75393584 | 7.912730823 | | 0 | 0 | | 23.21391076 | 9.452755906 | | 23.21391076 | 9.452755906 |

# Table 10. MEDCAC Analysis

| Name | MD (0=No, 1=Yes) | Other degrees | Academic (1)/Non-academic (0) | Specialty | Age | State | University/Hospital | Industry or Academy/Hospital (0=industry, 1=Academy) | Sex (0=Female, 1=Male) |
|---|---|---|---|---|---|---|---|---|---|
| Ray Baker | 1 | | 1 | Anesthesiology | 51 | Washington | University of Washington | 1 | 1 |
| Michael Blaivas | 1 | RDMS | 1 | Emergency Medicine | | Georgia | Northside Hospital, Forsyth | 1 | 1 |
| Ross Bogey | 0 | DO | 1 | Physical medicine and rehabilitation | | Illinois | Northwestern University Feinberg School of Medicine | 1 | 1 |
| Patricia A. Bomba | 1 | FACP | 0 | NA | | New York | Excellus Blue Cross Blue Shield | 0 | 0 |
| Kevin J. Bozik | 1 | MBA | 1 | Orthopaedic Surgery | | California | University of California, San Francisco School of Medicine | 1 | 1 |
| Raul Braylan | 1 | | 1 | Hematopathology | | Florida | Caris Diagnostics | 0 | 1 |
| Virginia C. Calega | 1 | MBA | 0 | Internal Medicine and Geriatrics | | Pennsylvania | Highmark Inc. (Medicare Carrier) | 0 | 0 |
| Charles S. Carignan | 1 | | 0 | General Surgery | | Maryland | Novasys Medical, Inc. | 0 | 1 |
| Mark D. Carlson | 1 | MA | 0 | Cardiology | 55 | Minnesota | St. Jude Medical | 0 | 1 |
| John Chae | 1 | | 1 | Physical medicine and rehabilitation | | Ohio | MetroHealth Medical Center | 1 | 1 |
| Catherine Cheng | 1 | FACP | 1 | Internal Medicine | 47 | California | On Lok Senior Health Services | 0 | 0 |
| Jeptha P. Curtis | 1 | | 1 | Internal Medicine, Cardiology | 38 | Connecticut | Yale University School of Medicine | 1 | NA |
| Marion Danis | 1 | | 1 | Internal Medicine | | Maryland | NIH Clinical Center | 1 | 0 |
| Helen Darling | 0 | MA | 0 | NA | | District of Columbia | National Business Group on Health | 0 | 0 |
| Charles Davis | 1 | PhD | 1 | Orthopaedic Surgery | | Pennsylvania | The Milton S. Hershey Medical Center | 1 | 1 |
| William T. Denman | 1 | | 1 | Anesthesiology | | Massachusetts | Massachusetts General Hospital | 1 | 1 |
| Roger Dmochowski | 1 | | 1 | Urology and Surgery | | Tennessee | Vanderbilt University | 1 | 1 |
| Mark H. Ebell | 1 | MS | 1 | | 48 | Georgia | University of Georgia | 1 | 1 |
| Josef E. Fischer | 1 | | 1 | Surgery | | Massachusetts | Harvard Medical School | 1 | 1 |
| Clifford Goodman | 0 | PhD | 0 | NA | | Virginia | The Lewin Group | 1 | 1 |
| Philip B. Gorelick | 1 | MPH | 1 | Neurology | | Illinois | University of Illinois at Chicago College of Medicine | 1 | 1 |
| Leslie Grammer | 1 | | 1 | Allergy-Immunology | | Illinois | Northwestern University Feinberg School of Medicine | 1 | 0 |
| Laura H. Gunn | 0 | PhD | 1 | | | Georgia | Georgia Southern University | 1 | 0 |
| Steve Gutman | 1 | MBA | 1 | Pathology | | Illinois | Blue Cross Blue Shield Association Technology Evaluation Center | 0 | 1 |
| Willard K. Harms | 1 | MBA | 1 | Ophtalmology | | Illinois | BlueCross BlueShield of Illinois | 0 | 1 |
| Paula E. Hartman-Stein | 0 | PhD | 1 | Psychology | | Ohio | Center for Healthy Aging | 1 | 0 |
| Daniel F. Hayes | 1 | | 1 | Breast Oncology | | Michigan | University of Michigan Comprehensive Cancer Center | 1 | 1 |
| I. Craig Henderson | 1 | | 1 | Hematology/Oncology | | California | University of California, San Francisco School of Medicine | 1 | 1 |
| Peter Haseltine | 1 | | 1 | Internal Medicine, Infectious Disease | 63 | California | Beckman Coulter, Inc. | 0 | 1 |
| James M. Hevezi | 0 | PhD | 1 | Medical Physics | 70 | Florida | CyberKnife Center of Miami | 0 | 1 |
| Alice Jacobs | 1 | | 1 | Cardiology | 65 | Massachusetts | Boston Medical Center | 1 | 0 |
| Saira A. Jan | | MS, PharmD | 1 | NA | | New Jersey | Horizon Blue Cross Blue Shield of NJ | 0 | 0 |
| Jeffrey G. Jarvick | 1 | MPH | 1 | Radiology and Neurosurgery | | Washington | University of Washington Medical Center | 1 | 1 |
| Sarah H. Kagan | 0 | PhD, RN | 1 | NA | | Pennsylvania | University of Pennsylvania School of Nursing | 1 | 0 |
| Norman S. Kato | 1 | | 1 | Thoracic Surgery | 54 | California | Cardiac Care Medical Group, Inc. | 0 | 1 |
| Karen Kaul | 1 | PhD | 1 | Pathology | 55 | Illinois | NorthShore University HealthSystem Evanston Hospital | 1 | 0 |
| Edward Kim | 1 | MBA | 1 | Psichiatry | 48 | New Jersey | Eisai, Inc. | 0 | 1 |
| Roger D. Klein | 1 | JD | 1 | Pathology | 43 | Wisconsin | Molecular Oncology BloodCenter of Wisconsin | 1 | 1 |
| Bruce Leff | 1 | | 1 | Geriatrics | 50 | Maryland | Johns Hopkins University School of Medicine | 1 | 1 |
| Susan A. Levine | 0 | DVM, MS, PhD | 1 | Pharmacology | 60 | Pennsylvania | Hayes, Inc. | 0 | 0 |
| Courtland G. Lewis | 1 | | 1 | Orthopedic Surgery | 57 | Connecticut | Orthopaedic Associates of Hartford, PC | 0 | 1 |
| Frederick A. Masoudi | 1 | MSPH | 1 | Cardiology | 45 | Colorado | Denver Health Medical Center | 1 | 1 |
| Karl Matuszewski | 0 | MS, PharmD | 1 | Pharmacology | 56 | Illinois | Elsevier/Gold Standard | 1 | 1 |
| Robert McDonough | 1 | JD | | | | Connecticut | National Medical Services Aetna, Inc. | 0 | 1 |
| Barbara McNeil | 1 | PhD | 1 | Radiology | 69 | Massachusetts | Harvard Medical School | 1 | 0 |
| Diane E. Meier | 1 | | 1 | Geriatrics | | New York | Mount Sinai School of Medicine | 1 | 0 |
| Peter Metropoulos | 0 | DO, MPH, FACC | 0 | Occupational Medicine | 45 | Michigan | Independent Medical Consultants, Benchmark Health, OccuNET | 0 | 1 |
| David M. Mintzer | 1 | | 1 | Hematology/Oncology | 55 | Pennsylvania | University of Pennsylvania | 1 | 1 |
| Theresa Miskimen | 1 | | 1 | Psichiatry | 45 | New Jersey | University of Medicine & Dentistry of New Jersey | 1 | 0 |
| Arden M. Morris | 1 | MPH | 1 | Surgery | | Michigan | University of Michigan | 1 | 0 |
| Mauro Moscucci | 1 | | 1 | Cardiology | 50 | Florida | University of Miami Miller School of Medicine | 1 | 1 |

| Name | MD (0=No, 1=Yes) | Other degrees | Academic (1)/Non-academic (0) | Specialty | Age | State | University/Hospital | Industry or Academy/Hospital (0=industry, 1=Academy) | Sex (0=Female, 1=Male) |
|---|---|---|---|---|---|---|---|---|---|
| Sharon-Lisa T. Normand | 0 | PhD | 1 | Biostatistics | 48 | Massachusetts | Harvard Medical School | 1 | 0 |
| Parashar B. Patel | 0 | MPA | 0 | NA | | Massachusetts | Boston Scientific | 0 | 1 |
| Stephen Pauker | 1 | MACP, FACC | 1 | Cardiology | 67 | Massachusetts | Tufts Medical Center | 1 | 1 |
| William R. Phillips | 1 | PhD | 1 | Family medicine | 56 | Washington | University of Washington | 1 | 1 |
| Leonard M. Pogach | 1 | MBA, FACP | 1 | Endocrinology | | New Jersey | Veterans Health Administration | 1 | 1 |
| Louis Potters | 1 | FACR | | Prostate cancer/Radiation Oncology | | New York | North Shore – Long Island Jewish Health | 1 | 1 |
| James E. Puklin | 1 | | 1 | Ophtalmology | 69 | Michigan | Wayne State University School of Medicine | 1 | 1 |
| Juan Quintana | 0 | CRNA, DNP | | | | | Sleepy Anesthesia Associates, PLLC | 0 | 1 |
| Thomas Ratko | 0 | PhD | 1 | Pharmacology | 55 | Illinois | Blue Cross Clue Shield Association Technology Evaluation Center | 0 | 1 |
| Prabashni Reddy | 1 | | | | | | Independent Consultant | 0 | NA |
| Mathew J. Reeves | 0 | BVSc, MS, PhD | 1 | Epidemiology | | Michigan | College of Human Medicine | 1 | 1 |
| Ryan H. Saadi | 1 | MPH | 1 | Health Outcomes | | New York | CORDIS Corporation, Johnson & Johnson | 0 | 1 |
| Ralph Sacco | 1 | MS | 1 | Neurology | 52 | Florida | University of Miami Miller School of Medicine | 1 | 1 |
| David J. Samson | 0 | MS | 1 | Preventive Medicine | | Illinois | Blue Cross and Blue Shield Association | 0 | 1 |
| Saty Satya-Murti | 1 | FAAN | 1 | Neurology | | Kansas | Health Policy Consultant | 0 | 1 |
| Maren T. Scheuner | 1 | MPH | 1 | Internal Medicine | | California | RAND Corporation and VA Greater Los Angeles | 1 | 0 |
| J. Sanford Schwartz | 1 | | 1 | Internal Medicine | 58 | Pennsylvania | University of Pennsylvania | 1 | 1 |
| Elaine M. Scorza | 0 | MSN RN, APRN | 1 | Psychiatry Nurse | | Illinois | Rush University Medical Center | 1 | 0 |
| Deborah Shatin | 0 | PhD | 0 | Sociology | | Minnesota | Shatin Associates, LLC | 0 | 0 |
| Paul R. Sierzenski | 1 | RDMS | 1 | Emergency Medicine | | Delaware | Christiana Care Health System | 0 | 1 |
| Eric Z. Silfen | 1 | MSHA, MA | 1 | Internal Medicine/Emergency Medicine | 57 | New York | Philips Healthcare | 0 | 1 |
| Ajay Singh | 0 | MBBS, FRCP, M | 1 | Nephrology | | Massachusetts | Brigham and Women's Hospital, | 1 | 1 |
| Gurkirpal Singh | 1 | | 1 | Gastroenterology | | California | Stanford University School of Medicine, | 1 | NA |
| Andrew Sloan | 1 | FACS | 1 | Neurosurgery | 47 | Ohio | University Hospitals of Cleveland | 1 | 1 |
| John Spertus | 1 | MPH | 1 | Cardiology | 46 | Missouri | University of Missouri | 1 | 1 |
| Robert L. Steinbrook | 1 | | 1 | Family medicine | | New Hampshire | Dartmouth Medical School | 1 | 1 |
| Steven Teutsch | 1 | MPH | 1 | Epidemiology | | California | LA County Public Health Department | 1 | 1 |
| Marita Titler | 0 | PhD, RN, FAAN | 1 | | | Michigan | University of Michigan Health System | 1 | 0 |
| James C. Tsai | 1 | MBA, FACS | 1 | Ophtalmology | | Connecticut | Yale University School of Medicine | 1 | 1 |
| Craig Umscheid | 1 | MSCE | 1 | Internal Medicine | 36 | Pennsylvania | University of Pennsylvania School of Medicine | 1 | 1 |
| Michael B. Wallace | 1 | MPH | 1 | Gastroenterology | 44 | Florida | College of Medicine Mayo Clinic | 1 | 1 |
| Jed I. Weissberg | 1 | | 1 | Internal medicine/Gastroenterology | | California | The Permanente Federation, LLC | 0 | 1 |
| David P. Winchester | 1 | FACS | 1 | Breast Oncology | 69 | Illinois | Evanston Hospital | 1 | 1 |
| Ying Xie | 0 | PhD, MS | 1 | Immunology | | Indiana | Biomet, Inc. | 0 | 1 |
| Way Yin | 1 | | 1 | Anesthesiology | 48 | Washington | Bellingham Spine Pain Specialists, PS | 0 | 1 |
| Cherie Y. Zachary | 1 | | 1 | Internal medicine/Allergie and Immunology | 49 | Minnesota | Minnesota Allergy & Asthma Consultants, PLLP | 0 | 0 |
| **Patient Advocates** | | | | | | | | | |
| Mindy L. Aisen | 1 | | | | | District of Columbia | United Cerebral Palsy Research and Education Foundation | 1 | 0 |
| Phyllis Atkinson | 0 | RN, MS, GNP-B | 1 | | | Ohio | Advanced Geriatric Education & Consulting, LLC | 1 | 0 |
| Diane E. Dorman | 0 | | | | | Connecticut | National Organization for Rare Disorders | 1 | 0 |
| Susan Kendig | 0 | JD, MSN | | | | Missouri | University of Missouri-St. Louis | 1 | 0 |
| Curtis A. Mock | 1 | MBA | 0 | Family medicine | | Tennessee | UnitedHealthcare | 0 | 1 |
| Teresa M. Schroeder | 0 | BS, MBA | 1 | | | New York | Musculoskeletal Clinical Regulatory Advi | 0 | 0 |
| **Industry Representatives** | | | | | | | | | |
| Peter Juhn | 1 | MPH | 0 | Internal Medicine | | New Jersey | Therapeutic Resource Centers Medco Health Solutions, Inc. | 0 | 1 |
| Lester D. Paul | 1 | MS | 0 | | | District of Columbia | Clinical and Scientific Affairs National Pharmaceutical Council | 0 | 1 |
| Eleanor M. Perfetto | 0 | PhD, MS | 0 | Health Policy/Epidemiology | | New York | Pfizer, Inc. | 0 | 0 |
| G. Gregory Raab | 0 | PhD | 0 | Public Policy | | | Health Policy Consultant Raab Associates | 0 | 1 |
| Brian Seal | 0 | PhD | 0 | | | New Jersey | Sanofi Aventis, US | 0 | 1 |
| Neal Thomas | 0 | PhD | 0 | | | New York | Pfizer Inc | 0 | 1 |
| Total | 69 | | 78 | | 53 | | | 58 | 67 |

## Table 11. Some States and their Medicare Contractors

| States with higher number of LCDs | Medicare Contractor Part A/Part B | States with lower number of LCDs | Medicare Contractor Part A/Part B |
|---|---|---|---|
| Virginia | Palmetto GBA | Idaho | National Heritage Insurance Corporation |
| West Virginia | Palmetto GBA | Alaska | National Heritage Insurance Corporation |
| Illinois | Noridian Administrative Services, LLC | Arizona | Noridian Administrative Services, LLC |
| Wisconsin | Noridian Administrative Services, LLC | Oregon | National Heritage Insurance Corporation |
| Ohio | Highmark Medicare Services Inc. | Washington | National Heritage Insurance Corporation |
| Michigan | National Government Services | Alabama | Cahaba GBA |
| Kentucky | Highmark Medicare Services Inc. | Georgia | Cahaba GBA |
| Indiana | National Government Services | Mississippi | Pinnacle Business Solutions Inc. |
| Connecticut | National Government Services | Tennesse | Cahaba GBA |
| | | New Jersey | Highmark Medicare Services Inc. |
| | | DC | Highmark Medicare Services Inc. |
| | | Montana | Noridian Administrative Services, LLC |
| | | North Dakota | Noridian Administrative Services, LLC |
| | | South Dakota | Noridian Administrative Services, LLC |
| | | Utah | Noridian Administrative Services, LLC |
| | | Wyoming | Noridian Administrative Services, LLC |

| States with higher number of LCDs different from NCDs | Medicare Contractor Part A/Part B | States with higher number of LCDs equal to NCDs | Medicare Contractor Part A/Part B |
|---|---|---|---|
| Virginia | Palmetto GBA | Virgin Islands | First Coast Service Options Inc. |
| West Virginia | Palmetto GBA | Florida | First Coast Service Options Inc. |
| Ohio | Highmark Medicare Services Inc. | Illinois | Noridian Administrative Services, LLC |
| Kentucky | Highmark Medicare Services Inc. | Michigan | National Government Services |
| Illinois | Noridian Administrative Services, LLC | North Carolina | Palmetto GBA |
| Michigan | National Government Services | Wisconsin | Noridian Administrative Services, LLC |
| Indiana | National Government Services | West Virginia | Palmetto GBA |
| Connecticut | National Government Services | Ohio | Highmark Medicare Services Inc. |
| Kansas | Wisconsin Physician Services Health Insurance Corporation | Kentucky | Highmark Medicare Services Inc. |
| New York | National Government Services | South Carolina | Palmetto GBA |
| | | Indiana | National Government Services |
| | | Connecticut | National Government Services |

## VIII. Appendix A.

## Interviews with Contractor Medical Directors (CMDs)

### Interview 1. Dr. George Waldmann, former Contractor Medical Director of Noridian Administrative Services, Medicare Part B. August, 2010

*1. According to your experience, are the majority of LCDs for a specific procedure issued before the corresponding NCD? Do NCDs come later after the necessity to have a policy becomes national?*

Many LCDs are issued before NCDs. Once many contractors have issued a series of LCDs describing the same procedure, CMS often considers the necessity to issue a NCD. The original idea of LCDs was to have a mechanism to respond to coverage issues specific to a location.

*2. What are the main reasons to issue an LCD in the cases where there is already an NCD?*

If there is already an NCD in place, the main reason to issue an LCD is to define the CPT and ICD-9 codes that apply to the procedure. I have suggested to CMS that they should issue the covered ICD-9 codes together with the NCD in order for all contractors to have the same covered codes at the national level. Unfortunately, today different contractors may apply different codes for the same procedures. One example is PET Scan policies, where codes and LCDs present a significant degree of variation among contractors.

*3. According to the Medicare Program Integrity Manual Chapter 13-Local Coverage Determinations (04-25-08) "the DME MACs shall ensure that the adopted LCDs are identical among the DME MACs". Why is consistency between LCDs (by different MACs) required for Durable Medical Equipment and not for other benefit categories?*

Consistency is required for DME MACs because they are only four and administratively is not difficult to achieve it this consistency. For other benefit categories it is not done because it is difficult to coordinate among multiple contractors.

*4. According to my analysis (based on the CMS Coverage Database), there is consistency between different DME MACs LCDs (all are the same), however, LCD criteria and limitations differ from NCDs in many cases. For other benefit*

*categories LCDs coverage criteria and limitations differ between MACs and between LCDs and NCDs. According to your opinion, what do you think are the causes of these discrepancies if LCDs shouldn't differ from NCDs? (In most of the cases, LCDs narrow the criteria or change limitations without necessarily contradicting the NCD)*

*5. According to the same manual, "When an NCD or coverage provision in an interpretive manual does not exclude coverage for other diagnoses/conditions, contractors shall allow for individual consideration unless the LCD supports automatic denial for some or all of those other diagnoses/conditions". Most of the discrepancies between NCDs and LCDs that I have detected in my study are of this type (the NCD didn't exclude coverage for certain diagnosis or conditions while the LCD did). Why do you think this happens?*

4, 5.Most LCDs are issued as a mechanism to restrict or describe coverage, using CPT and ICD-9 codes. Without an LCD, contractors can't deny a claim automatically, but it must be done on a case-by-case basis, which administratively requires personnel time and other resources, significantly increasing costs to contractors. Thus, LCDs are issued to reduce contractor's administrative costs and reduce claim errors. Discrepancies between LCDs and NCDs can occur because NCDs are often less specific about covered conditions and limitations and LCDs specify them with specific codes.

*6. According to my analysis, some states are more active in issuing LCDs. Which do you think are the main drivers of LCD issuing activity?*

The main drivers of LCD activity are:
- The main reason is to limit payment to medically necessary diagnoses and conditions by automating legitimate denials.
- A history of abuse and fraud. LCDs are issued to be very specific about coverage conditions and limitations to avoid payment for areas of abuse and fraud.
- The Contractor Medical Director (CMD) specialty. Some times LCDs will be issued in the medical specialty or area of expertise of the CMD.
- More LCDs will be issued in states were contractors have assigned more personnel to creating and maintaining LCDs. Although CMS used to encourage large numbers of LCDs this doesn't seem to be the case any more.
- New procedures, to educate and assist physicians when they are submitting incorrect claims

*7. In your opinion, does the current model to issue LCDs taking into account the input from the Carrier Advisory Committee (CAC) from each state works? Does the CAC reflects state-by-state medical practice differences when issuing LCDs? Are these differences desirable? How does the CAC prioritizes for which procedures is an LCD required?*

Some CACs are more interactive than others and some contractors give much importance to the CAC-submitted LCD comments than others. The utility of having a CAC per state is not so great because in the end LCDs don't seem to reflect state-by-state differences in medical practice. CACs are also a cost to CASC members who must travel and take time away from their practices with no remuneration for attending the CAC.,. These costs in time and money invested in CACs make it difficult for CMDs to convince physicians to join CACs. In many cases the physicians who join are not opinion leaders in their specialties. For these and other reasons CMS and contractors may be moving toward having only a single CAC for each jurisdiction.

*8. Why do some contractors issue LCDs only for some states of their jurisdiction and not all?*

I haven't seen this happen.

*9. In your opinion, does Medicare Contractor Reform will cause more homogeneous policies between states or more divergent ones?*

Yes, Medicare Contractor Reform should produce more homogeneous policies due to decreasing numbers of Medicare contractors and increasing the numbers of states within each contractor jurisdiction.

*10. Did you have an experience of issuing an LCD that challenged the standard of practice? Did the LCD have to be changed later?*

Yes, I and other CMDs have personally experienced a lot of pressure from consumers and industry when policies have restricted coverage due to questionable efficacy and a lack of published evidence for the procedure.

*11. According to the Medicare Program Integrity Manual, "Contractors shall implement new Least Costly Alternative (LCA) determinations through an LCD. "Least Costly Alternative" is a national policy provision that shall be applied by contractors when determining payment for all durable medical equipment (DME). Contractors have the discretion to apply this principle to payment for*

*non-DME services as well". Why is the LCA principle mandatory only for DME and not for other benefit categories?*

The "Least Costly Alternative" (LCA) principle is very difficult to implement because of pressure from industry and patients. Also, courts have recently ruled against LCAs and contractors have had to rescind previously existing LCA LCDs.

*12. According to my analysis, from 193 procedures with NCDs currently in effect (from the following benefit categories: Inpatient Hospital Services, Durable Medical Devices, Diagnostic Laboratory Tests, Physician Services and Diagnostic Tests), only 10 required Technology Assessments and only 12 required a Medicare Evidence Development & Coverage Advisory Committee (MEDCAC), leaving the majority of national decisions to the discretion of CMS authorities. According to your opinion, should there be more decisions based on Technology Assessments and MEDCACs? What is the main reason most decisions are not based on them?*

I suppose the main reason is that CMS has limited resources and Technology Assessments and MEDCACs are costly. This is also the reason why a lot of the policy activity is carried on at the local level, primarily because LCDs can be implemented faster than NCDs. However, the level of expertise at the local level is usually less than at the national level. Also the evaluation mechanism is more structured and slower at the national level. In my experience, the medical device and drug industries prefer to try to convince local contractors of the benefits of their technologies at the local level instead of CMS, because it is easier in terms of evidence required and time invested. Once a contractor issues a policy in favor of a procedure, other contractors are pressured to do the same.

*Do you allow that your opinions appear on my thesis, which will be a publicly available document?*

Yes

*Do you want to maintain your identity as confidential while allowing your opinions to appear on my thesis?*

I allow the disclosure of my identity

**Interview 2. Contractor Medical Director, August 2010**

*1. According to your experience, are the majority of LCDs for a specific procedure issued before the corresponding NCD? Do NCDs come later after the necessity to have a policy becomes national?*

Not necessarily. The issuing process of NCDs and LCDs are independent of each other. Sometimes LCDs are issued before NCDs (or without any NCD) and sometimes the NCD is issued first.

*2. What are the main reasons to issue an LCD in the cases where there is already an NCD?*

To specify the billing codes(which are not specified in NCDs) and to define the circumstances under which automatic coverage denials apply.

*3. According to the Medicare Program Integrity Manual Chapter 13-Local Coverage Determinations (04-25-08) "the DME MACs shall ensure that the adopted LCDs are identical among the DME MACs". Why is consistency between LCDs (by different MACs) required for Durable Medical Equipment and not for other benefit categories?*

Because many of the DME suppliers operate nationwide and in that way there is no discrimination for access to them among beneficiaries from different regions.

*4. According to my analysis (based on the CMS Coverage Database), there is consistency between different DME MACs LCDs (all are the same), however, LCD criteria and limitations differ from NCDs in many cases. For other benefit categories LCDs coverage criteria and limitations differ between MACs and between LCDs and NCDs. According to your opinion, what do you think are the causes of these discrepancies if LCDs shouldn't differ from NCDs? (In most of the cases, LCDs narrow the criteria or change limitations without necessarily contradicting the NCD).*

The main difference between NCDs and LCDs is that NCDs apply nationally, where LCDs are at local contractor discretion and may address a variety of things, including clarification of an LCD, ie, specific codes, etc. LCDs specify exclusions (usually defining the billing codes allowed for coverage) not specified by NCDs, according to the contractor's specific requirements. For example, NCDs for PET Scans have caused a lot of

differences between contractors because each one defines different billing codes for the conditions mentioned in the NCD.

*5. According to the same manual, "When an NCD or coverage provision in an interpretive manual does not exclude coverage for other diagnoses/conditions, contractors shall allow for individual consideration unless the LCD supports automatic denial for some or all of those other diagnoses/conditions". Most of the discrepancies between NCDs and LCDs that I have detected in my study are of this type (the NCD didn't exclude coverage for certain diagnosis or conditions while the LCD did). Why do you think this happens?*

Most of the differences between LCDs and NCDs are in the form of exclusions not specified in NCDs. This happens because NCDs don't specify billing codes and contractors determine exclusions according to their local circumstances, as long as they don't conflict with NCDs. This only applies to those NCDs and LCDs that address the same topic, of course.

*6. According to my analysis, some states are more active in issuing LCDs. Which do you think are the main drivers of LCD issuing activity?*

In no particular order...
    - The economic and human resources that the contractor has available to issue LCDs. Contractors with more economic and human resources available for LCDs will usually issue more LCDs. Each LCD consumes resources not only when it is issued but also later because it has to be reviewed and enforced.

    - Contractor's philosophy towards coverage policies. Some contractors prefer to leave the coverage decisions in the hands of physicians, others have a different approach to coverage decisions.
    - How clear are the NCDs? Sometimes the contractor doesn't need a new LCD because the NCD is clear and serves its needs.
    - Fraud. In states with a greater history of fraud, more LCDs are issued, to make clear the circumstances under which coverage will be automatically denied and in that way reduce fraud.
    - Perceived need for an LCD. As examples and not all inclusive, in states with low population density, low number of Trauma Centers, low number of physicians and few or no Schools of Medicine, the need for LCDs may be lower than in states with the opposite characteristics.

*7. In your opinion, does the current model to issue LCDs taking into account the input from the Carrier Advisory Committee (CAC) from each state works? Does*

*the CAC reflects state-by-state medical practice differences when issuing LCDs? Are these differences desirable? How does the CAC prioritizes for which procedures is an LCD required?*

The issuing of LCDs is not a democratic process, the decision is ultimately made by the contractor, mainly by the CMD. Usually the CMD consults with a variety of sources before the meeting with the CAC. CAC meetings take place approximately every four months. They last about two hours with approximately 30 physicians from the specialties impacted by the particular LCDs discussed in each meeting. Each LCD takes about 90 days to complete. I think that in the future there are going to be 1 or 2 CACs per contractor.

The CMD prioritizes which LCDs to issue according to the following criteria:
  - New technologies that might pose a risk to the Medicare funds.
  - Procedures with perceived overutilization
  - Procedures where there is concern for abuse
  - The number and type of claims received

*8. Why do some contractors issue LCDs only for some states of their jurisdiction and not all?*

Because in the past there were more contractors. After Contracting Reform, LCDs will be issued for all the states of the contractor's jurisdiction.

*9. In your opinion, does Medicare Contractor Reform will cause more homogeneous policies between states or more divergent ones?*

Contracting Reform will cause more homogeneous policies.

*10. Did you have an experience of issuing an LCD that challenged the standard of practice? Did the LCD have to be changed later?*

Yes, as long as the LCD is based on clinical evidence from respected journals or expert opinion, it will prevail. However, if other contractors cover a procedure that we don't cover, it will build pressure on us to cover it.

*11. According to the Medicare Program Integrity Manual, "Contractors shall implement new Least Costly Alternative (LCA) determinations through an LCD. "Least Costly Alternative" is a national policy provision that shall be applied by contractors when determining payment for all durable medical equipment (DME). Contractors have the discretion to apply this principle to payment for*

*non-DME services as well". Why is the LCA principle mandatory only for DME and not for other benefit categories?*

LCAs are not used anymore even for DMEs, mainly due to a court case/decision and legal pressure from the medical device and pharmaceutical industry.

*12. According to my analysis, from 193 procedures with NCDs currently in effect (from the following benefit categories: Inpatient Hospital Services, Durable Medical Devices, Diagnostic Laboratory Tests, Physician Services and Diagnostic Tests), only 10 required Technology Assessments and only 12 required a Medicare Evidence Development & Coverage Advisory Committee (MEDCAC), leaving the majority of national decisions to the discretion of CMS authorities. According to your opinion, should there be more decisions based on Technology Assessments and MEDCACs? What is the main reason most decisions are not based on them?*

TAs and MEDCACs are expensive, that's why they are only used in NCDs and even at a national level, they are used only for special cases. In addition to being costly, this process is lengthy, and many times there is insufficient evidence to sustain a majority consensus opinion.

*Do you allow that your opinions appear on my thesis, which will be a publicly available document?* Yes

*Do you want to maintain your identity as confidential while allowing your opinions to appear on my thesis?* Yes, absolutely.

**Interview 3. Dr. Richard Baer, Contractor Medical Director, National Government Services, August 2010**

*1. According to your experience, are the majority of LCDs for a specific procedure issued before the corresponding NCD? Do NCDs come later after the necessity to have a policy becomes national?*

There is not a direct correlation between the time frames for issuing NCDs and issuing LCDs. NCDs are issued to establish whether something is covered or not, and usually don't assign billing codes. LCDs define under which circumstances the items already covered by NCDs are reimbursed.

*2. What are the main reasons to issue an LCD in the cases where there is already an NCD?*

To assign billing codes and in that way automate coverage decisions in the computer system. Assigning billing codes at a national level would be too much work for CMS, so it lets contractors to decide on that.

*3. According to the Medicare Program Integrity Manual Chapter 13-Local Coverage Determinations (04-25-08) "the DME MACs shall ensure that the adopted LCDs are identical among the DME MACs". Why is consistency between LCDs (by different MACs) required for Durable Medical Equipment and not for other benefit categories?*

Since there are only four DME contractors, is easier for them to agree on coverage policies. Instead of issuing NCDs, which is very costly to CMS, it allows DME contractors to issue LCDs, which are the same for all and would be the equivalent to issue an NCD. For other benefit categories, consistency is not required because when the whole coverage system was planned, the idea was to let contractors adapt coverage policies according to the local standards of medical practice. But now, there is no reason to have variation in medical practice across states, because medical practice is based on evidence and it should be the same at a national level.

*4. According to my analysis (based on the CMS Coverage Database), there is consistency between different DME MACs LCDs (all are the same), however, LCD criteria and limitations differ from NCDs in many cases. For other benefit categories LCDs coverage criteria and limitations differ between MACs and between LCDs and NCDs. According to your opinion, what do you think are the causes of these discrepancies if LCDs shouldn't differ from NCDs? (In most of the*

*cases, LCDs narrow the criteria or change limitations without necessarily contradicting the NCD)*

*5. According to the same manual, "When an NCD or coverage provision in an interpretive manual does not exclude coverage for other diagnoses/conditions, contractors shall allow for individual consideration unless the LCD supports automatic denial for some or all of those other diagnoses/conditions". Most of the discrepancies between NCDs and LCDs that I have detected in my study are of this type (the NCD didn't exclude coverage for certain diagnosis or conditions while the LCD did). Why do you think this happens?*

4 and 5. I wouldn't call these discrepancies, since an LCD should never contradict an NCD. What an LCD does, is to define more precisely coverage exclusions not specified on an NCD, according to detected aberrant billing patterns by the contractor. CMS leaves these exclusion decisions open to the contractor's discretion. LCDs are different between different contractors or different states because sometimes more active members in the CACs influence the accepted billing codes according to their specialties.

*6. According to my analysis, some states are more active in issuing LCDs. Which do you think are the main drivers of LCD issuing activity?*

- Ambition of the CMD
- Staff available to the CMD for LCD issuing purposes
- More experienced CMDs are very active in issuing LCDs
- Contractors perform data analysis to detect aberrant billing patterns and compare utilization patterns between states (CMS doesn't perform these kind of analysis). These aberrant billing patterns drive LCD issuing activity.
- I think issuing more LCDs is good for physicians, contractors and CMS.

*7. In your opinion, does the current model to issue LCDs taking into account the input from the Carrier Advisory Committee (CAC) from each state works? Does the CAC reflects state-by-state medical practice differences when issuing LCDs? Are these differences desirable? How does the CAC prioritizes for which procedures is an LCD required?*

The current model works well. Is not that CACs reflect state-by-state medical practice differences, what happens is that CAC members have different levels of expertise. CMDs without enough staff or efficient CACs copy other contractor's LCDs.

The CAC doesn't set the priorities for issuing LCDs. The contractor through its CMD sets the priorities according to:

- Data analysis of medical review, overutilization and possible abuse. The CMD gives priority to procedures that represent a significant amount of money, that have significant clinical value or that pose a significant medical risk. Contractors issue about 6 to 8 LCDs per session, having 3 sessions per year.

*8. Why do some contractors issue LCDs only for some states of their jurisdiction and not all?*

The discrepancies between LCDs in different states that are serviced by the same contractor are due in the majority of cases to the state of affairs before Contracting Reform. Contractor's consolidation has homogenized LCDs that were previously issued by different contractors. In general, there is consistency between LCDs in states of the same jurisdiction.

*9. In your opinion, does Medicare Contractor Reform will cause more homogeneous policies between states or more divergent ones?*

There will still be differences between states belonging to different contractors but there will be no longer differences between Medicare Part A and Part B policies because they will be serviced by the same contractor.

*10. Did you have an experience of issuing an LCD that challenged the standard of practice? Did the LCD have to be changed later?*

When you challenge the standard of practice, you have to defend your position with strong evidence. However, when there is strong political pressure driven mainly from the industry, sometimes the contractor puts the LCD on hold.

*11. According to the Medicare Program Integrity Manual, "Contractors shall implement new Least Costly Alternative (LCA) determinations through an LCD. "Least Costly Alternative" is a national policy provision that shall be applied by contractors when determining payment for all durable medical equipment (DME). Contractors have the discretion to apply this principle to payment for non-DME services as well". Why is the LCA principle mandatory only for DME and not for other benefit categories?*

Due to recent legal issues, contractors no longer base their LCDs on LCAs.

*12. According to my analysis, from 193 procedures with NCDs currently in effect (from the following benefit categories: Inpatient Hospital Services, Durable Medical Devices, Diagnostic Laboratory Tests, Physician Services and Diagnostic Tests), only 10 required Technology Assessments and only 12 required a Medicare Evidence Development & Coverage Advisory Committee (MEDCAC), leaving the majority of national decisions to the discretion of CMS authorities. According to your opinion, should there be more decisions based on Technology Assessments and MEDCACs? What is the main reason most decisions are not based on them?*

Many NCDs are not issued for new technologies, so they don't require a TA or a MEDCAC. Procedures where medical devices are used (as opposed to drugs) are more subject to NCDs where TAs or MEDCACs are used, since the FDA approval for medical devices assess the safety of the device more than its clinical value, so further clinical evidence is needed to justify coverage, usually based on TAs or MEDCACs.

*Do you allow that your opinions appear on my thesis, which will be a publicly available document?*

Yes

*Do you want to maintain your identity as confidential while allowing your opinions to appear on my thesis?*

I agree to disclose my identity

**Interview 4. Contractor Medical Director, August 2010**

*1. According to your experience, are the majority of LCDs for a specific procedure issued before the corresponding NCD? Do NCDs come later after the necessity to have a policy becomes national?*

There is not a direct correlation between the time frames for issuing NCDs and issuing LCDs. LCDs are issued to clarify coverage issues that are problematic for providers and that increase the number of claims. These issues are not specific in NCDs.

*2. What are the main reasons to issue an LCD in the cases where there is already an NCD?*

To describe indications through billing codes not specified in NCDs. Applicable billing codes are not contained in NCDs because CMS doesn't have the economic resources to determine billing codes, which is expensive. That's why it is left to contractor's discretion.

*3. According to the Medicare Program Integrity Manual Chapter 13-Local Coverage Determinations (04-25-08) "the DME MACs shall ensure that the adopted LCDs are identical among the DME MACs". Why is consistency between LCDs (by different MACs) required for Durable Medical Equipment and not for other benefit categories?*

This is a question for CMS.

*4. According to my analysis (based on the CMS Coverage Database), there is consistency between different DME MACs LCDs (all are the same), however, LCD criteria and limitations differ from NCDs in many cases. For other benefit categories LCDs coverage criteria and limitations differ between MACs and between LCDs and NCDs. According to your opinion, what do you think are the causes of these discrepancies if LCDs shouldn't differ from NCDs? (In most of the cases, LCDs narrow the criteria or change limitations without necessarily contradicting the NCD)*

*5. According to the same manual, "When an NCD or coverage provision in an interpretive manual does not exclude coverage for other diagnoses/conditions, contractors shall allow for individual consideration unless the LCD supports automatic denial for some or all of those other diagnoses/conditions". Most of the discrepancies between NCDs and LCDs that I have detected in my study are*

*of this type (the NCD didn't exclude coverage for certain diagnosis or conditions while the LCD did). Why do you think this happens?*

4 and 5. LCDs don't contradict NCDs, they clarify coverage limitations not specified in NCDs.

*6. According to my analysis, some states are more active in issuing LCDs. Which do you think are the main drivers of LCD issuing activity?*

The main driver of LCD issuing activity is data analysis of medical necessity criteria based on:
- Quality of care
- History of claims billing errors
- Billing abuse
- Historical problematic areas

An other driver, secondary to data analysis is budget and staff constraints. LCDs and LCD edits are very costly to issue, to maintain and to update. Once you have a new LCD you have to put it in the system. You have to choose very well which procedures merit an LCD. But once you have an LCD in place, it diminish the number of claims that have to be attended individually, decreasing costs for contractors. LCDs diminish claims because the system automatically looks for billing codes applicable to the procedure and automatically denies or authorizes claims based on that.

*7. In your opinion, does the current model to issue LCDs taking into account the input from the Carrier Advisory Committee (CAC) from each state works? Does the CAC reflects state-by-state medical practice differences when issuing LCDs? Are these differences desirable? How does the CAC prioritizes for which procedures is an LCD required?*

LCDs and CACs reflect differences between states in medical practice. But the priority of LCDs is data analysis. The CAC works only as an advisor to the MCD and the contractor. This specific contractor uses work groups composed of physicians, hospital administrators and advisors on top of the CAC.

*8. Why do some contractors issue LCDs only for some states of their jurisdiction and not all?*

This doesn't happen any more. When a contractor has LCDs that apply only for some states, usually is because other states were previously managed by a different contractor and they haven't homogenized their policies. But new policies should be issued for all states serviced by the same contractor.

*9. In your opinion, does Medicare Contractor Reform will cause more homogeneous policies between states or more divergent ones?*

Medicare Contractor Reform will produce more consistency between states.

*10. Did you have an experience of issuing an LCD that challenged the standard of practice? Did the LCD have to be changed later?*

Not answered.

*11. According to the Medicare Program Integrity Manual, "Contractors shall implement new Least Costly Alternative (LCA) determinations through an LCD. "Least Costly Alternative" is a national policy provision that shall be applied by contractors when determining payment for all durable medical equipment (DME). Contractors have the discretion to apply this principle to payment for non-DME services as well". Why is the LCA principle mandatory only for DME and not for other benefit categories?*

CMS doesn't allow contractors to use LCA criteria to issue LCDs because recently there was a legal case (Hays vs Sebelius) won by a drug manufacturer over a policy issued under LCA criteria.

*12. According to my analysis, from 193 procedures with NCDs currently in effect (from the following benefit categories: Inpatient Hospital Services, Durable Medical Devices, Diagnostic Laboratory Tests, Physician Services and Diagnostic Tests), only 10 required Technology Assessments and only 12 required a Medicare Evidence Development & Coverage Advisory Committee (MEDCAC), leaving the majority of national decisions to the discretion of CMS authorities. According to your opinion, should there be more decisions based on Technology Assessments and MEDCACs? What is the main reason most decisions are not based on them?*

CMS has a limited budget and limited staff, so it is very selective when it uses a TA or a MEDCAC to issue an NCD.

*Do you allow that your opinions appear on my thesis, which will be a publicly available document?*

Yes

*Do you want to maintain your identity as confidential while allowing your opinions to appear on my thesis?*

Yes, confidential identity

## IX. Statement of conflicts of interests

I don't have any current or potential conflicts of interests between the subject of the present thesis and my professional or academic activities.

## X. Glossary of abbreviations

AAMC- Association of American Medical Colleges
AHRQ-Agency of Healthcare Research and Quality
ALJ-Administrative Law Judge
APC-Ambulatory Payment Classification
CAC-Carrier Advisory Committee
CED-Coverage with Evidence Development
CMD-Contractor Medical Director
CMS-Centers for Medicare and Medicaid Services
CPT code-Billing code according to Current Procedural Terminology
DME MAC-Durable Medical Equipment Medicare Administrative Contractor
DME-Durable Medical Equipment
DMERC-Durable Medical Equipment Regional Carrier
ECRI-Emergency Care Research Institute
FAR-Federal Acquisition Regulation
FDA- Food and Drug Administration
FFS-Fee for service
FI-Fiscal Intermediary
GDP-Gross Domestic Product
HCFA- Health Care Financing Administration
HCPCS- Healthcare Common Procedure Coding System
HIPPA- Health Insurance Portability and Accountability Act
HMO-Health Maintenance Organization
ICD-9 code-Billing code according to the International Classification of Diseases, 9th edition
IPPS-Inpatient Prospective Payment System
LCA-Least Costly Alternative
LCD-Local Coverage Determination
LMRP-Local Medical Review Policy
MAC-Medicare Administrative Contractor
MCO-Managed Care Organization
MEDCAC-Medicare Evidence Development & Coverage Advisory Committee
Medicare Contracting Reform- Provisions contained under section 911 of the MMA
MedPAC-Medicare Payment Advisory Commission
MMA- Medicare Prescription Drug, Improvement, and Modernization Act
NCD-National Coverage Determination
NIH-National Institutes of Health
OPPS-Outpatient Prospective Payment System
POS-Point of Service
PPO-Preferred Provider Organization

PSC-Program Safeguard Contractor
QIC-Qualified Independent Contractor
QIO-Quality Improvement Organization
RHHI- Regional Home Health and Hospice Intermediary
TA-Technology Assessment
The Act-Social Security Act

## XI. References

i Innovator's guide to navigating Medicare, Centers for Medicare and Medicaid Services, Version 2.0, 2010

ii http://www.cms.gov/MedicareContractingReform

iii Medicare Administrative Contractor (MAC) Jurisdictions Fact Sheet, July 2009

iv Medicare Program; Revised Process for Making Medicare Coverage Determinations, Department of Health and Human Services, Centers for Medicare and Medicaid Services, Federal Register, Vol. 68, No. 187, September 26, 2003

v Medicare Payment Advisory Commission website: www.medpac.gov

vi Medicare Program Integrity Manual, Chapter 13-Local Coverage Determinations (Rev. 253, 04/28/08), Department of Health and Human Services and Centers for Medicare and Medicaid Services. http://www.cms.gov/manuals/downloads/pim83c13.pdf

vii Managed Care and the Evaluation and Adoption of Emerging Medical Technologies, Garber, Steven; Ridgely, M. Susan; Taylor, Roger S.; Robin Meili, RAND Health