Understanding the shortage and maldistribution of pediatric subspecialty care in the United States:

An application of the Institutional Analysis and Development framework

By

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ABSTRACT

In the United States, the number of children and adolescents with chronic health conditions is rapidly expanding. At present both medical and surgical pediatric subspecialists are in short supply and are poorly distributed regionally (Basco and Rimsza 2013; Goodman 2005; Mayer and Skinner 2009). The current system for allocation of pediatric subspecialty care is unsustainable and may result in worsening health outcomes for children who face barriers to access.

The Institutional Analysis and Development Framework is a policy framework that can be used to both evaluate outcomes achieved within the current system and predict outcomes that would be achieved with specific policy reforms. When pediatric subspecialty care is viewed as an economic good, the IAD framework can be applied to devise ways to better allocate this precious resource to all American children.
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INTRODUCTION

In the United States, the number of children and adolescents with chronic health conditions is rapidly expanding. While the number of children with chronic conditions remains small compared to the adult population with chronic conditions, these children account for a very large proportion of overall child health costs. Almost 30% of children in our country are suffering from chronic conditions like asthma, obesity, diabetes, or mental health disorders (Van Cleave, Gortmaker, and Perrin 2010). The approximately 7 million children who suffer from chronic and complex conditions in this country receive more than 80% of their complex care from children’s hospitals and subspecialists, and this care is largely financed by Medicaid (O’Donnell 2013). Of children enrolled in Medicaid and CHIP, an estimated 10%, two-thirds of whom have chronic conditions, account for 72% of total spending on children’s health (Kenney, Ruhter, and Selden 2009). In a recent Workforce Policy Statement, the AAP states, “to achieve optimal health and well-being for all infants, children, adolescents, and young adults, sufficient numbers of appropriately trained primary care pediatricians, pediatric medical subspecialists, and pediatric surgical subspecialists … must be available to provide care” (Basco and Rimsza 2013, 390). However, at present both medical and surgical pediatric subspecialists are in short supply (Basco and Rimsza 2013). The pediatric field is plagued not only by workforce shortages, but also by geographic maldistribution of primary care providers and subspecialists (Goodman 2005; Mayer and Skinner 2009). General pediatricians are predominately sited in urban areas, while pediatric subspecialists tend to concentrate in academic medical centers and children’s hospitals. Because of the short supply of pediatric specialists and the maldistribution of pediatric providers, pediatric patients encounter access issues, sometimes waiting weeks or even months for appointments (Jewett, Anderson, and Gilchrist 2005), traveling great distances (Mayer 2006) to receive care, and facing other barriers to care (Henrickson 2011; Pletcher et al. 2010).
One avenue to increase access to pediatric subspecialists is through system-wide policy changes that increase both the numbers of subspecialists overall and especially in underserved areas. The Institutional Analysis and Development (IAD) framework, developed by Elinor Ostrom and her colleagues in the 1970s and comprehensively described by Ostrom in *Governing the Commons* (1990), is meant to explain governance and preservation of limited collective resources by cooperative communities and institutions without resorting to complete centralization or privatization of those resources. The framework has since been modified, expanded, and applied to a number of different resource settings, from forest governance to child care delivery. I will use the IAD framework to analyze the allocation of pediatric subspecialty care in the United States. To my knowledge, no one has yet analyzed allocation of health care as a resource unit within the IAD framework. That is precisely what I seek to do in the following paper.

**BACKGROUND AND SIGNIFICANCE**

**The Pediatric Subspecialty Workforce**

In 2005, the American Academy of Pediatrics (AAP) Pediatric Workforce Committee created a conceptual framework to illustrate the workforce-related variables leading to health outcomes for children (*Figure 1*) (Goodman 2005).

*FIGURE 1 ABOUT HERE*

While many variables are included in the workforce framework, one variable that is especially dynamic is the number of pediatric subspecialists. As seen in the framework, the number of pediatric subspecialists depends on the number of medical students, the number of pediatric residents, and the number of subspecialty fellows. In addition, some subspecialty-trained pediatricians will go into teaching, research, or administration, while others will eventually return to practicing general pediatrics, making it more difficult to predict the true number of subspecialists who actually continue to practice subspecialty medicine. I argue that the
framework should also account for general pediatricians who later decide to pursue fellowship, thus eventually joining the medical subspecialist workforce. In addition, pediatric subspecialists also may be temporarily or permanently removed from the active workforce due to personal leave, retirement/disability, or death. Figure 2 shows a modified version of Goodman’s figure, with an emphasis on the components of the workforce related to production and retention of pediatric medical subspecialists.

**FIGURE 2 ABOUT HERE**

A similar set of variables contributes to production of pediatric surgical subspecialists, who must complete fellowship in pediatric surgery following general surgery residency. The AAP contends that we have a shortage of both medical and surgical pediatric subspecialists (Basco and Rimsza 2013). The pediatric subspecialist group is overall a very heterogeneous group in terms of type of practice, workforce size, and future opportunities (Goodman 2005). Generally, however, pediatric subspecialists are more likely to be based in academic centers than are general pediatricians or adult subspecialists (Goodman 2005). The geographic maldistribution of the pediatric subspecialist workforce worsens the aforementioned shortages by creating barriers to access for many children and families who live in rural locations. Because pediatric subspecialists are in short supply and are maldistributed geographically, the supply of pediatric subspecialty care often does not meet the demand. Many children are forced to wait weeks to months to receive specialty health care (Jewett, Anderson, and Gilchrist 2005), or to get care from adult subspecialists who may not be as experienced with or appropriately trained to treat pediatric patients with chronic disorders. While the AAP has encouraged better primary care management and coordination of care between subspecialists and primary care providers to better allocate the resource of subspecialty health care, current health delivery models have limited the ability of providers to use the pediatric subspecialist workforce most efficiently.
Common Pool Resources

In economic theory, four main types of goods exist, and they are differentiated by excludability and rivalry. Excludable goods or services are ones that people can be prevented from accessing, while non-excludable goods are enjoyed by everyone. Rivalrous, or subtractable, goods are goods that diminish when consumed by one user, preventing simultaneous consumption of the same resource unit by other users. Table 1 below displays the four categories of goods widely recognized in economics.

**TABLE 1 ABOUT HERE**

Though excludability and rivalry are often characterized as dichotomous properties, they may be applied more effectively to real-life economic goods by considering each property as a spectrum. While economic goods are generally classified as private, public, common, or club goods, this classification can limit the description of the true dynamics underlying the availability and accessibility of resources.

Common goods, or common pool resources (CPRs) are traditionally considered to be vulnerable to the “Tragedy of the Commons,” as originally described by Garrett Hardin in 1968 (Hardin 1968). The tragedy of the commons is a social dilemma in which individuals act rationally and independently in their own, immediate best interest, resulting in the depletion of a commons resource, an outcome that is at odds with the long-term best interests of each individual and of the overall group. According to Hardin, “ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all” (Hardin 1968, 1244)). Many people initially agreed with Hardin’s metaphor, and used his arguments to justify centralized control or complete privatization of CPRs. Hardin and other supporters of his theory believe that rational users of a CPR are inevitably caught in a process that leads to destruction of the resource upon which they depend and therefore cannot govern the use of the resource themselves (Ostrom et al. 1999).
The IAD Framework

Since the publication of Hardin’s article almost fifty years ago, a number of academics have challenged his theory. Elinor Ostrom and her colleagues found that the prevalence of the tragedy of the commons had been exaggerated and that many communities have found effective ways to self-govern resources without central regulation or privatization (Ostrom et al. 1999). They argued that in some situations, individuals are able to solve commons dilemmas without external intervention (Ostrom 2002). Ostrom examined several communities who either failed or succeeded in their efforts to devise solutions to commons problems with natural resources, and she elucidated the conditions shared by the successful communities, regarding the nature of the resource and the resource users. The result of her examination was her development of a theoretical framework, called Institutional Analysis and Development (IAD), which provides a systematic approach to analyze institutions that govern action and outcomes within collective action arrangements (Ostrom 2002).

Figure 3 shows the basic framework developed by Ostrom and her colleagues, which is, in essence, a conceptual map that presents the major types of structural variables that are present in all institutional arrangements (Ostrom 2011). Central to the framework is the “action situation,” which can be used to “describe, analyze, predict, and explain behavior within institutional arrangements” (Ostrom 2011, 11).

Figure 4 displays the internal structure of an action situation. Within an action situation, a number of individuals or (groups functioning as corporate actors) “interact, exchange goods and services, solve problems, dominate one another, or fight” (Ostrom 2011, 11), among other things. These individuals who interact within an action situation are referred to as “actors,” and each actor brings his/her own resources to an action situation, assigns different values to different actions, acquires and uses knowledge in unique ways, and uses distinctive processes.
for the selection of each course of action (Ostrom 2011). The structure of an action situation can be described using a common set of variables:

(i) the set of actors, (ii) the specific positions to be filled by participants, (iii) the set of allowable actions and their linkage to outcomes, (iv) the potential outcomes that are linked to individual sequences of actions, (v) the level of control each participant has over choice, (vi) the information available to participants about the structure of the action situation, and (vii) the costs and benefits – which serve as incentives and deterrents – assigned to actions and outcomes (Ostrom 2011, 11).

Solving appropriation problems with a CPR using the IAD framework requires employing the variables above to formulate a series of questions to aid analysis. These questions ask the analyst about the nature of the actors who withdraw resource units from the system, the existing positions within the system, the set of allowable actions, the potential outcomes within each region affected and the chain of actions that leads to outcomes, whether actors act on their own initiative or with permission from others such as a regulatory board, the amount of information available to each actor about the resource and the actions of other appropriators of the resource, and the costs and benefits of possible actions and outcomes for each actor and the collective group (Ostrom 2011).

The actors within an action situation are also affected by a number of other variables, including the biophysical conditions, the attributes of the community, and the rules-in-use. The biophysical conditions at play may affect resource mobility within the community, while the attributes of the community provide an understanding of how the actors within a community function amongst each other. The rules-in-use further characterize how actors interact with each other by providing a framework within which actors must conform to commonly accepted rules about use of the resource. In some ways, the rules-in-use mirror the variables that describe the action situation. The rules can be grouped into seven categories: the boundary rules, which
determine who can use the resource (based on race, ethnicity, age, sex, permit ownership, etc.); the position rules, which determine the mobility of appropriators (i.e. an appropriator could become a chair of a committee through some process); scope rules, which determine the geographic area in which the actors can appropriate or allocate the resource; choice rules, which determine the choices actors can make in “harvesting” the resource; aggregation rules, which build upon choice rules and deal with whether choices must be made with permission from or agreement with others; information rules, which determine which, if any, information must be made public; and payoff rules, which determine how the other rules are monitored, how appropriators can be sanctioned for breaking rules, and whether rewards are offered for certain actions (Ostrom 2011, 21).

Because a number of ecologists have used the IAD framework to examine resource governance, Ostrom adapted the framework to a broader Social-Ecological-Systems (SES) framework, which reorganizes the framework by thinking of the “Actors interacting in Action Situations generating Interactions and Outcomes that are affected by and affect a Resource System, Resource Units, Governance System, which then affect and are affected by Social, Economic, and Political Setting and Related Ecosystems” (Ostrom 2011, 22). The IAD/SES framework can be utilized to both predict and evaluate outcomes for a variety of SESs. Prediction of outcomes depends upon all the variables discussed previously, as well as the nature of the resource. For CPRs, as mentioned earlier, an analyst would predict that the collective community would eventually use up the resource if no communication or shared information exists between the actors. However, an open-access CPR can be effectively allocated and shared amongst a community if the actors are given the opportunity to repeatedly meet with each other and collaborate to achieve positive joint outcomes (Ostrom 2011) Over time, Ostrom and others have developed a set of ten variables that affect the likelihood of actors within a community organizing to overcome a CPR dilemma, including “the size, productivity, and predictability of the resource system; the extent of mobility of the resource units; the
existence of collective-choice rules that the users may adopt authoritatively in order to change their own operational rules; and four attributes of actors (the number, the existence of leadership, knowledge about the SES, and the importance of the SES to the actors” (Ostrom 2011, 23). Beyond predicting outcomes, an analyst can also evaluate current outcomes and likely outcomes under alternative institutional arrangements, using a set of evaluative criteria. These criteria include economic efficiency, fiscal equivalence, redistributitional equity, accountability, conformance to values of local actors, and sustainability (Ostrom 2011). While it is nearly impossible to perfectly achieve each of these criteria for a given institutional arrangement, communities can achieve better outcomes by utilizing institutional arrangements that maximize the components most important to the community for a particular resource.

**FINDINGS AND DISCUSSION**

**Pediatric Subspecialty Care as a Common Pool Resource**

Currently in the United States, many health policy stakeholders are grappling with whether health care should be considered a public or private good. In order to determine the classification of health care as an economic good, one must determine the nature of the resource, in terms of its excludability and rivalry (refer again to Table 1). If health care is defined as a pure public good, it must be both non-excludable and non-rivalrous, meaning that no one can be prevented from accessing it and that consumption of health care by one individual does not prevent consumption by other individuals simultaneously. If defined as a pure private good, health care must be both rivalrous and excludable, meaning that people can be excluded from use of health care and that use by one person prevents simultaneous use by another consumer. One could also argue that health care in the United States is currently a toll good, in that it is excludable, but non-rivalrous. In this case, anyone who does not have money or insurance can be refused health care services (other than the limited emergency medicine services mandated by the Emergency Medical Treatment and Active Labor Act), but the consumption of health care
by one person has no effect on simultaneous use by others. Last, health care could be defined as a common good or CPR. When seen as a CPR, health care is non-excludable but rivalrous. In this definition, everyone has access to health care, but use by one individual prohibits use by others simultaneously. While our current health care system is hybrid in nature, with some goods provided publicly (e.g. emergency services, as noted above) and others provided privately (e.g. elective care), I argue that health care can be best characterized as a common good. I believe that this is especially true in the case of pediatric subspecialty care, henceforth referred to as “PSC.” The pediatric population is an especially sympathetic one. Many Americans believe that all children should have access to all health care, regardless of socioeconomic status, health status, legal status, race, gender, or religion. A 2007 New York Times/CBS News poll found that 84% of Americans polled supported expansion of CHIP to all uninsured children in the United States (Toner & Elder 2007). These data support the argument for classifying PSC as a non-excludable good. In addition, many pediatric subspecialty fields are plagued by workforce shortages and geographic maldistribution, limiting the availability of subspecialty care and making it a rivalrous good. If pediatric subspecialty care is non-excludable and rivalrous, it falls into the category of CPRs.

**Pediatric Subspecialty Care within the IAD Framework**

In order best to use the IAD Framework for policy analysis and design, Polski and Ostrom (1999) have suggested using a stepwise procedure. The steps are these: (1) Define the policy analysis objective and the analytic approach; (2) Analyze physical and material conditions; (3) Analyze community attributes; (4) Analyze rules-In-use; (5) Integrate the analysis; (6) Analyze patterns of interaction; and (7) Analyze outcomes.

Given that the PSC policy situation is well-established, the framework can be used as a diagnostic tool to gain understanding of the structure of the policy, evaluate outcomes in the current arena, and develop policy reforms. In the current arena, a shortage and maldistribution
of pediatric subspecialists exists. The main outcome of interest in this arena is the health and safety of American children. Unfortunately, the goal of pediatricians to provide high quality, effective care for children with complex conditions is being compromised by limited access to PSC. Thus, the main policy analysis objective in this case is to examine how the current policy environment shapes current allocation of PSC, determine the effect this allocation has on outcomes, and explore possible alternatives to current policies.

The physical and material conditions of the PSC policy situation include all resources and capabilities related to provision and production of PSC. First, it is important to define the economic nature of PSC. I have already shown that PSC is a CPR - a good that is both non-excludable and rivalrous. The provision of PSC is largely shaped by scheduling of appointments, whether through referrals from general pediatricians and other primary care providers or directly by patients. The provision of PSC also depends on insurance coverage and reimbursement capability, access to care, and availability of the pediatric subspecialist. The production of PSC stems from the production of pediatric subspecialists. The variables contributing to the production of pediatric subspecialists were discussed in a previous section and displayed in Figure 2. The analysis of the economic nature, provision, and production of PSC allows us to realize the capabilities of policy for allocating this good.

The attributes of the community help demonstrate how the resource of PSC is governed in the community and provides us with cultural context. Community attributes include demographic features of the community, accepted norms about policy activities, the degree of shared understanding between potential participants, and the homogeneity or heterogeneity of participants' values and beliefs. It is very difficult to define the community attributes of the participants in the PSC policy arena, given that they are so incredibly diverse. Still, some community attributes are clearly definable. Patients using the resource of PSC all have some characteristics in common; for example, they all desire the best care in the shortest amount of time. Providers referring to pediatric subspecialists often have the same goals for their patients
as the patients have for themselves. Pediatric subspecialists, the providers of PSC, have goals in line with those of the referring physicians and patients, though they may also be motivated by a desire to make a living, to provide access for underserved patients, or the intellectual challenge of managing rare diseases, among other things. Participants’ knowledge of the policy situation and of the effects of their own actions on the policy situation would likely vary widely in the case of PSC. On the whole, providers would likely have a better knowledge of the overall status and outcomes occurring within the PSC arena, though many patients may also have firsthand experience of the major consequences of shortages and maldistribution. Though it is possible to assume some community attributes in this case, many attributes of the community remain largely unknown, as is often the case in IAD analysis.

The next step is to analyze the rules-of-use in the action arena. Position rules specify the roles that participants assume in an action situation. In PSC, roles include those of the patient, the numerous kinds of providers, and payers, among others. (A more comprehensive discussion of actors within the PSC is to follow.) Boundary rules specify how participants enter or leave positions; for example, pediatric subspecialists must achieve credentialing prior to providing PSC. Authority rules specify the actions participants in positions may take. In the case of PSC, only pediatric subspecialists provide PSC, while other providers may not be qualified to provide specific forms of care. Sometimes, patients may self-refer, while in other instances, referrals can only come from other health care providers. Aggregation rules determine how decisions are made in an action situation. A general pediatrician may refer to a pediatric subspecialists based on guidelines created by a professional society, for example. Scope rules specify jurisdiction of rules, and may depend on the state’s laws in the case of PSC. Information rules affect the information available to participants. If general pediatricians were given information on how to appropriately use general and subspecialist care, they may change their self-referral patterns. Last, payoff rules determine how costs and benefits are apportioned in the action arena. Payoff rules are poorly defined in the case of PSC, though it seems that patients with certain
characteristics, like those on Medicaid or in rural areas, are currently positioned to reap the most “costs” when the system breaks down.

While these rules-in-use can help us analyze the action situation of patients receiving PSC from pediatric subspecialists, the full policy arena of PSC involves much more than this central action situation. Because of the complexity of the health policy arena, I argue that the IAD framework can best be applied to evaluate allocation of PSC using the network of adjacent action settings (NAAS), as described by Michael D. McGinnis (2011). This network (Figure 5), builds upon the IAD framework by acknowledging several action situations adjacent to the focal action situation. The focal action situation is identical to that presented earlier in the background section on the IAD framework. Surrounding the focal action situation are the sets of rules-in-use, also described earlier in this paper. The boxes around the outside are examples of possible adjacent action situations that could generate outcomes that define the rules-in-use and, ultimately, the components of the focal action situation (Mcginnis 2011). While the focal action situation is at the operational level, the adjacent situations may be occurring simultaneously at the operational level (i.e. “actions of other groups which directly affect outcomes”), or instead at the collective-choice level (i.e. “policies that define feasible options and shape incentives”) or the constitutional choice level (i.e. “construction of collective entities and/or definition of jurisdictions”). Thus, NAAS incorporates all levels of action that occur within the IAD framework.

Although certain actors may participate in various action situations, it is important to note that the action situations themselves remain adjacent and therefore are analyzed separately (Mcginnis 2011). In a remote, self-organized community, these adjacent situations may collapse into a single action situation. In most situations, however, no one actor (whether it be a person or group) is responsible for all aspects of governance; thus, the NAAS model is useful in the analysis of policy arenas that are characterized by polycentric governance (Mcginnis 2011). Such is the case with policy regarding PSC.
To continue with the steps outlined by Ostrom and Polski (1999), we next need to integrate the analysis and analyze patterns of interaction. These two steps involve identifying the participants, or actors, and their roles, examining the actions they can take and how these actions affect outcomes, and examining how different actors or actor groups interact with each other across all levels of policy development. A number of stakeholders, or actors, are active at all levels of governance of PSC. Their concurrent actions in several different action situations have resulted in the current model for allocation of PSC. Key actor groups include patients and their families, pediatric subspecialists and other health care providers, elected officials and bureaucrats, professional and advocacy organizations, and insurance providers. Table 2 summarizes the motivations and roles of the key actors.

**TABLE 2 ABOUT HERE**

Licensing and accrediting organizations are responsible for the licensure and accreditation of both health care providers and facilities. Within the PSC policy arena, these organizations have the power to license pediatric providers, including pediatric subspecialists. They also grant accreditation to Children's hospitals and academic medical centers, where most pediatric subspecialists are located. Thus, accrediting organizations like the Joint Commission and the National Board of Medical Examiners often have some control over the production of pediatric subspecialists and PSC. Many of these organizations, including the Joint Commission, also have deeming power for Medicare and Medicaid, meaning that they can determine which institutions meet requirements for Medicare and Medicaid requirements.

The primary consumers of PSC, the patients and their families, obviously play a very important role in the consumption of the resource within the focal action situation, though they may also be involved in other aspects of the NAAS, including advocacy.

Health care providers (HCPs), including medical and surgical pediatric subspecialists, as well as other physician and non-physician pediatric providers, also play a large and somewhat varied role in the action network. Primary care providers (PCPs) could be considered secondary
consumers of PSC, given that they refer patients to subspecialists, thereby increasing utilization of PSC. Pediatric subspecialists themselves “produce” the resource of PSC, and also control the provision of this resource to patients. For example, some pediatric subspecialists may not accept Medicaid patients, which limits public provision of PSC. In their patient referral and acceptance patterns, both PCPs and pediatric subspecialists are involved in the coordination of care. All providers can also be involved at the policymaking and advocacy levels.

Elected officials and bureaucrats are primarily involved in the rule-making and financing portions of the PSC policy arena. First, elected officials create laws that govern many aspects of health care provision, financing, and oversight. Policy at the state and national levels is constructed and enacted by lawmakers. For example, the recent passage of the Affordable Care Act had considerable implications for access to PSC, given that it prohibits insurer denials for pre-existing conditions in children and extends Medicaid coverage to millions of people. Of note, the constitutionality of Medicaid expansion was ruled upon by the Supreme Court and state governments were given the power to accept or reject this provision of the ACA. This example illustrates the plethora of actors within this actor group, at all levels and in all branches of government. A number of government agencies, most notably the Center for Medicare and Medicaid Services (CMS), also exercise power over the provision and financing of health care. The funding allotted by the federal government to CMS affects PSC through the insurance coverage of children with Medicaid, as well as reimbursements for pediatric subspecialists and funding for pediatric Graduate Medical Education (GME) in some cases. Freestanding Children’s Hospitals receive GME funding through the Children’s Hospital Graduate Medical Education Payment Program, also financed by the federal government. Funding for pediatric GME affects the number of residents that can be trained in pediatrics and the number of fellowship positions available in the various pediatric subspecialty fields.

Professional and advocacy organizations play several roles in the network of adjacent action settings. First, professional organizations like the AAP are often committed to developing
guidelines for the provision of pediatric health care. The AAP and other pediatric organizations have been active in creating guidelines for general pediatricians in the treatment of many disorders, which helps these providers to triage referrals to pediatric subspecialists. In this way, professional organizations can help allocate PSC to those patients who need it most. Organizations like the AAP also serve to advocate for patients and their families through lobbying and political activism. Other organizations, such as the Children’s Health Fund and the Children’s Hospital Association (formerly the NACHRI), are committed to advocacy for children’s health at all levels of government and within communities. Advocacy organizations may influence child health policy, and can therefore play a significant role in the PSC policy arena.

Insurance providers are the chief financiers of the provision of PSC, through reimbursement of pediatric subspecialists. The government is perhaps the most important insurance provider for PSC, given that many pediatric patients with complex conditions are covered by Medicaid. In addition, a number of private payers across the country provide insurance coverage to children receiving PSC. The allocation of PSC is limited by both public and private insurers, because only certain procedures and medications are covered. Criteria for drug coverage are often dependent on FDA approval, once again showing the large role that the government plays in all aspects of the PSC network.

Clearly, a large number of actors and actor groups participate in the PSC NAAS. Some participants may fall into more than one actor group; for example, a pediatric subspecialist could also have a child receiving PSC or a Congresswoman could also be a general pediatrician who happens to have policy discussions with a private insurer. The interactions between these actor groups are plentiful and are difficult to define clearly and independently of one another. Still, the structure of economic and political participation by actor groups and the ways in which information flows between actor groups can be used to examine current outcomes and predict future outcomes within this NAAS.
The last, and arguably most crucial, step set forth by Polski and Ostrom (1999) is to analyze outcomes. Evaluation of current outcomes and prediction of likely outcomes under alternative institutional arrangements can be determined using the following set of criteria: economic efficiency, fiscal equivalence, redistributinal equity, accountability, conformance to values of local actors, and sustainability (Ostrom 2011).

It seems that the current institutional arrangements in the PSC policy arena leave much room for improvement under these evaluative criteria. Economic efficiency in PSC is extremely important, given that a very small proportion of pediatric patients are responsible for the majority of Medicaid spending (Kenney, Ruhter, and Selden 2009). As mentioned previously, many patients currently face barriers to access for PSC. Delays in ambulatory access may in turn lead to increased utilization of emergency room care and even hospitalization, ultimately resulting in increased costs of care. Fiscal equivalence within PSC is examined by looking at whether those who are contributing financially to the provision of PSC are also benefiting from that service. The current institutional arrangements seem to be fairly successful in maintaining fiscal equivalence, although it is somewhat difficult to evaluate given that children are the principal beneficiaries of PSC and they themselves are not bearing the burden of financing the care they receive. Redistributional equity is also present to some degree in the current system, as poorer families are able to access PSC for their children if they are Medicaid beneficiaries. However, as discussed before, there is some evidence that children with Medicaid suffer most from delays in access to care created by the subspecialty shortage and maldistribution (Jewett, Anderson, and Gilchrist 2005). Some pediatric subspecialists may deny or only conditionally accept patients with Medicaid. In addition, poorer patients often face difficult social situations and may have more difficulty traveling great distances to obtain PSC. The current system is failing the most vulnerable pediatric populations in this regard. The next evaluative criterion, accountability, means that decision-makers and officials must receive information about citizens' preferences and allocate resources accordingly. Though it is clear that Americans, in general, say they
support financing of children’s health programs, many policymakers are cutting funding to such programs in attempts to balance the federal budget. Cuts made to pediatric GME programs limit the production of PSC by limiting the number of pediatric subspecialists seeking certification. The blockage of Medicaid expansion in many states also may limit access to PSC, as children are more likely to have insurance if their parents are also covered. Overall, policymakers have not been accountable to American children suffering from complex medical conditions, as they have inadequately addressed concerns about the shortage and maldistribution of pediatric subspecialists.

Conformance to values of local actors can also be problematic in the case of PSC, given competing interests in national policy advocacy and lobbying. Because children are not a wealthy or particularly unified group and often cannot advocate for themselves, child health care often receives less attention from policymakers who may feel pressured to act along party lines and/or on behalf of their campaign contributors. Sustainability is perhaps the most challenging criterion to meet for any institutional arrangement involving a CPR, and this is certainly the case for arrangements involving PSC. Currently, the production and provision of PSC is limited by the relatively low supply and poor distribution of pediatric subspecialists, coupled with the growing population of children with complex medical conditions. The current arrangement for allocation of PSC is simply not sustainable, as evidenced by lengthening wait times and barriers to access for many children.

It is clear that there is currently a shortage and maldistribution of pediatric subspecialists in the United States but it is unclear how these workforce issues affect health outcomes for children. Several researchers have looked at the effects of adult primary care physicians (PCPs) and adult specialists, and have generally found that greater supply of and access to PCPs is associated with better health outcomes, while greater supply of adult specialists does not improve the outcomes studied (Chang et al. 2012; Macinko, Starfield, and Shi 2007; Phillips, Dodoo, and Green 2005; Starfield et al. 2005). Others have found that the relationship between
adult PCP and specialist supply and health outcomes is disparate for different regions (Ricketts and Holmes 2007). Because both the pediatric workforce and the pediatric population are characteristically different from their adult counterparts, it is unclear whether these data apply to pediatric care.

Although it seems logical that a larger, more widely distributed pediatric subspecialist workforce would result in better health outcomes, especially for children with complex needs, we lack strong data to support that assumption. It seems that in some specialties, like neonatology, the picture is mixed (Goodman et al. 2002), while in other fields, like pediatric gastrointestinal surgery, access to specialists does lead to better health outcomes (McAteer et al. 2013). In the case of primary care, access to general pediatricians leads to higher immunization coverage (LeBaron et al. 2001). Despite the paucity of data at this time, it still seems prudent to invest in strategies that address pediatric subspecialist workforces, given the considerable barriers to access that many children and families face. It will also be important to evaluate and monitor outcomes in the future, in order identify problems and make informed policy changes.

Because framing them in terms of the IAD evaluative criteria reveals such significant obstacles, as well as the concern for child health outcomes, it is imperative that all stakeholders work to construct new or modified institutional arrangements so that PSC can be appropriately and effectively allocated to American children.

**Considerations for future PSC policy**

A number of pediatrician groups, policymakers, and workforce analysts have suggested possible mechanisms by which to address the pediatric subspecialist workforce shortages and maldistribution. McManus, Fox, Limb, et al (2009) suggested four major changes to improve access to pediatric subspecialty care: expansion of the role of PCPs in managing chronic conditions, enhancement of training opportunities for PCPs, extension of the reach of existing pediatric subspecialists, and an increased supply of pediatric subspecialists. Several of the
recommendations made by McManus, Fox, Limb, et al were echoed or expanded upon in the 2013 AAP Workforce Policy Statement (Basco and Rimsza 2013). The AAP created a Statement of Principles on Pediatrician Workforce Policy, designed to address workforce problems in both general and subspecialty pediatrics. Some of their recommendations for addressing subspecialist shortages and maldistribution include increasing loan forgiveness, increasing the number of general pediatric residency positions, increasing targeted GME funding for medical subspecialty training in those subspecialties with the worst shortages, incentivizing subspecialty practices that provide care for underserved pediatric populations, revising payment structures, and advocating for payment parity between pediatric subspecialists and their adult counterparts (Basco and Rimsza 2013). These recommendations address the many variables thought to be associated with the current shortage and maldistribution of pediatric subspecialists in the United States. These reforms would help alleviate subspecialty access problems through a multifaceted approach that addresses the evaluative criteria put forth by Ostrom (2011). First, these recommendations attempt to improve the sustainability of the institutional arrangement by increasing supply of pediatric subspecialists and improving distribution in underserved areas. By incentivizing subspecialty practices that care for underserved populations, the AAP is targeting the redistributional equity criterion. Several of the recommendations also work to hold policymakers accountable and seek to advocate for payment and financing reforms that will make PSC more accessible to children with complex medical conditions. The recommendations encouraging the expansion of the role and training of PCPs also seeks to use existing resources and improve economic efficiency. If general pediatricians and other PCPs are more comfortable treating complex and/or chronic conditions and coordination of care is improved, it is likely that fewer unnecessary referrals will be made and delays in access to care can be reduced. These changes could ultimately reduce utilization of emergent services, thereby reducing overall child health care costs.
Some bodies have suggested that supplementing the pediatric workforce with nurse practitioners (NPs) or physician assistants (PAs) may help ease the burden of pediatric patients seeking subspecialty care (Institute of Medicine). However, the AAP does not view this as a feasible solution. The AAP cites low participation by NPs in pediatrics currently, and also notes that the percentage of NPs who wish to work in areas with physician shortages is very small. In addition, very few NPs work in rural communities and a minority of NPs provides emergency or inpatient care. Because of all these factors, the AAP believes that “it is unlikely that pediatric PAs and NPs can play a significant role in addressing the shortage/maldistribution of primary care pediatricians or pediatric medical subspecialists” (Basco and Rimsza 2013, 392). Though it may be true that investing in the training of more pediatric NPs and PAs is not a feasible stand-alone solution to the pediatric subspecialty shortage and maldistribution, I do believe that it could be an important piece of comprehensive reform. The utilization of more NPs and PAs may help to alleviate the demand for PSC and can be useful in triaging patients who truly require the services of a pediatric subspecialist physician. Such reform could improve the sustainability of the PSC system and also increase economic efficiency.

In an attempt to more wisely allocate PSC, Di Guglielmo, Plesnick, Greenspan et al (2013) implemented a new model at DuPont Hospital for Children. Their chief goal was to improve wait times in their gastroenterology clinic. Patients with certain clinical complaints were scheduled with a general pediatrician instead of a subspecialist, in order to reduce inappropriate use of the resource of subspecialist care. The general pediatrician saw approximately 40% of the new patients who presented during the study period, and referred about 10% of those patients on to the GI specialists. The clinic saw time-to-appointment wait decreased from 25 days to <1 day, and family satisfaction was high for those patient who saw the general pediatrician. While this study did not examine health outcomes, the clinic was able to reduce wait times by reducing the need for subspecialist evaluation. This model is a wonderful illustration of an innovative way to address the under-supply of subspecialists, and could serve
as an example for other academic medical centers dealing with barriers to access due to excessive wait times for subspecialist care.

Some physicians have indicated the need for health services research to improve practice coordination and systems performance, saying that “research can be the engine that accelerates coordination of care at the family and systems levels, helping clinicians meet children’s health care needs more responsively than ever before” (Davis and Riebschleger 2011, 1068). Others emphasize the importance of implementing action-based strategies now and believe the subspecialty care system should be reformed using the foundation of the medical home structure, which is designed to improve coordination and quality of care, among other things (McManus, Fox, Limb, et al). The pediatric field has long made efforts to improve coordination of care with commitment to the family-centered medical home (FCMH) structure (AAP 2002) and the AAP has recently re-emphasized its support of medical homes and the Accountable Care Organization (ACO) model (AAP 2010). Pediatric ACOs will ultimately be evaluated on whether they reduce spending and improve health outcomes for children, especially those with complex medical needs. In theory, they could improve the sustainability, economic efficiency, and fiscal equivalence of the current arrangement.

CONCLUSION

Defining pediatric subspecialty care as a CPR and examining this commons problem through the lens of IAD has important implications for child health policy. Members of the pediatric health care community should encourage policy that improves quality of care and outcomes for children, despite the workforce shortage and geographic maldistribution of pediatric subspecialists. Examining the characteristics of the resource of PSC, as well as all actors involved in the provision and consumption of PSC, allows for the generation of innovative solutions to the problem of the shortage and maldistribution of pediatric subspecialists in the United States. A multitude of policy changes have already been proposed from a number of
different actors within the PSC NAAS, all of which seek to improve the allocation of PSC amongst American children. Using the IAD framework, it is possible to predict that many of these recommendations can improve the current institutional arrangement. I believe that policy reforms based upon these recommendations have the potential to improve health outcomes for children by reducing the shortage of pediatric subspecialists and extending the distribution of those subspecialists into underserved areas. However, it will be important to build a body of research to determine how health outcomes are affected by any policy reforms that are enacted. The IAD framework can be used to monitor new institutional arrangements at all levels of the NAAS. As a database of evidence is gathered, outcomes can be better predicted, which will allow for the creation of more effective policy in the future. Our health care system must adapt to the growing number of children with complex medical needs, and the precious CPR resource that is PSC must be sustained.
### TABLE 1: Classes of economic goods and services.

<table>
<thead>
<tr>
<th></th>
<th>excludable</th>
<th>non-excludable</th>
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</thead>
<tbody>
<tr>
<td><strong>rivalrous</strong></td>
<td>Private goods</td>
<td>Common goods or Common Pool Resources</td>
</tr>
<tr>
<td></td>
<td><em>(cars, food, houses)</em></td>
<td><em>(fish stocks, waterways, timber)</em></td>
</tr>
<tr>
<td><strong>non-rivalrous</strong></td>
<td>Club or Toll goods</td>
<td>Public goods</td>
</tr>
<tr>
<td></td>
<td><em>(cable TV, private parks, movie theaters)</em></td>
<td><em>(air, knowledge, national defense)</em></td>
</tr>
</tbody>
</table>
TABLE 2: Actor Types and Actor Situations.  
*Source:* Table format adapted from McGinnis (2011, p. 63)

<table>
<thead>
<tr>
<th>Actor Types</th>
<th>Primary Motivations</th>
<th>Consumption</th>
<th>Production</th>
<th>Provision, Financing, and Monitoring</th>
<th>Rule-Making</th>
<th>Dispute Resolution</th>
<th>Coordination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Licensing and Accrediting orgs</td>
<td>Safe and appropriate provision of care</td>
<td></td>
<td>Licensure and accreditation of PSC providers (physicians and hospitals)</td>
<td>Medicare/Medicaid deeming power</td>
<td>Disciplinary action</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Economic gains</td>
<td>Primary consumers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patients/families</td>
<td>Timely and high-quality health care</td>
<td>Primary consumers</td>
<td>Advocacy</td>
<td></td>
<td></td>
<td></td>
<td>Families often coordinate care amongst providers</td>
</tr>
<tr>
<td>Primary care providers</td>
<td>Health of patients</td>
<td>Secondary consumers</td>
<td>Advocacy</td>
<td></td>
<td></td>
<td></td>
<td>Coordinate with patients, PSC providers</td>
</tr>
<tr>
<td>Pediatric subspecialists</td>
<td>Health of patients</td>
<td>Primary producers of PSC</td>
<td>Advocacy</td>
<td>Providers of PSC Advocacy</td>
<td>Referral acceptance/denial</td>
<td></td>
<td>Coordinate with PCPs, patients</td>
</tr>
<tr>
<td>Elected officials, bureaucrats, andgov’t agencies</td>
<td>Health of children</td>
<td>GME and medical education</td>
<td>Child health policy CMS Public provision Monitoring</td>
<td>Legislation</td>
<td>Federal and state judicial systems</td>
<td></td>
<td>Coordination for Medicaid patients in some states</td>
</tr>
<tr>
<td>Professional and advocacy orgs</td>
<td>Child health advocacy and other special interests</td>
<td>Monitoring of workforce Advocacy</td>
<td>Professional guidelines</td>
<td></td>
<td></td>
<td></td>
<td>Proposal of reforms to improve coordination</td>
</tr>
<tr>
<td>Insurance providers</td>
<td>Economic gains</td>
<td>Financing of consumption</td>
<td>Determine covered meds/procedures</td>
<td>Claims disputes, initially</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
FIGURE 1: AAP Child Health Workforce. 
FIGURE 2: Pediatric Medical Subspecialist Workforce. *Source:* adapted from Goodman (2005, p.e158)
FIGURE 3: A Framework for Institutional Analysis.  
*Source: Ostrom (2011, p.10)*
FIGURE 4: The Internal Structure of an Action Situation.
Source: Ostrom (2011, p. 10)
FIGURE 5: Action Situations Adjacent to a Focal Action Situation with Connections to Working Parts and Associated Rules.  
*Source:* McGinnis (2011, p. 55)
REFERENCES


APPENDIX A: Limited Systematic Review

Introduction

The concern for a shortage of primary care physicians in adult medicine dominates the current medical workforce policy landscape. In pediatric medicine, however, the workforce is experiencing a much different set of problems. The pediatric population with chronic and complex medical conditions is rapidly expanding, raising the question of whether the pediatric subspecialist workforce will be able to adequately meet the needs of American children in the future. I am interested in uncovering recent literature related to the pediatric subspecialist shortage in order to understand the greatest challenges to the workforce and the common recommendations for future policy reforms.

Methods

I conducted a systematic review of the literature to examine current data and recommendations related to the shortage and maldistribution of pediatric subspecialists in the United States. I completed a PubMed search on May 29th, 2014 with the terms “(pediatric or pediatrics) AND (workforce or manpower) AND (specialty or subspecialty) AND (policy) AND (shortage or supply or maldistribution).” This original search returned 58 articles. In order to obtain the most relevant data, I limited my review to articles published in English within the last ten years, which excluded 30 articles. I chose this time period because the workforce is constantly changing and articles written more than ten years ago likely would be based on workforce data that is no longer accurate. I excluded seven other articles because their titles revealed that they were assessing foreign workforces and thus were not relevant to the U.S. pediatric subspecialty workforce. I abstracted the remaining 21 articles. Of the remaining articles, 11 did not have pediatric subspecialist shortage or maldistribution as a primary focus, so I also excluded those articles. Two of the remaining ten articles were AAP Workforce Policy Statements, one from 2005 and one from 2013. Since the 2013 is more recent and thus is
based on the most current workforce data, I excluded the 2005 Statement and its accompanying technical report, bringing the number of remaining articles to nine. Henrickson’s 2011 article entitled “Policy challenges for the pediatric rheumatology workforce” was published in three parts, two of which are relevant to this review; I will consider these two parts as a single article for the purposes of this limited systematic review. Thus, the total number of articles reviewed is seven.

**Discussion**

Of the seven articles selected for my review, three deal with the respective workforces of specific pediatric subspecialties (Henrickson, 2011; Schwend, 2009; Durham, Lane, & Shipman, 2009), one is a review of pediatric subspecialty workforce literature (Mayer & Skinner, 2004), one is a discussion of forces for change within the pediatric subspecialist workforce and a coinciding policy agenda (Jewett, Anderson, & Gilchrist, 2005), one is an analysis of the distribution of pediatric subspecialists entering the workforce (Mayer & Skinner, 2009), and the last one is an AAP Workforce Policy Statement (Basco & Rimsza, 2013). Because my review is focused on workforce data and policy recommendations rather than scientific research, I assessed the papers based on the strength of data analyzed and thoughtfulness of policy considerations. The following discussion presents the main results, recommendations, and quality considerations from each paper included in the review; these findings are summarized in Table 1.

**Henrickson 2011**

This article is a three-part policy statement that seeks to discuss the policy challenges that currently exist for the pediatric rheumatology (PR) workforce. As mentioned previously, two parts of the paper are relevant to this review; Part I focuses on education and economics, while
Part II focuses on health care system delivery and workforce supply. I will consider these two parts jointly.

Henrickson draws upon data from a variety of different studies, both in pediatric and adult populations. The majority of his findings are based on ABP Workforce Data and PR-specific workforce reports. He identifies a number of barriers to the PR workforce, including limited exposure to PR amongst residents, poor reimbursement and institutional support, a rising demand for PR care that has exceeded supply, lengthy wait times for patients, and limited distribution of pediatric rheumatologists. Henrickson makes a variety of policy recommendations based upon the challenges identified. His suggestions include mandatory musculoskeletal training during the first two years of residency, reimbursement reform such as parity between Medicare and Medicaid and support for chronic care, increased access to telemedicine, a two-year fellowship option, flexible scheduling, and diversification of the workforce.

This article provides a comprehensive look at the variables affecting the PR workforce, and puts forth specific and concise policy goals to address current challenges. It is well-written and very easy to follow, even without prior knowledge of the PR workforce. One potential issue is the inclusion of data on adult chronic care models; these data may not be generalizable to pediatric populations. Still, Henrickson does an excellent job in detailing the barriers currently faced by the PR workforce and offers thoughtful suggestions for future policy within this field.

Schwend 2009

Like Henrickson, Schwend examines the current and future workforce needs of a particular pediatric subspecialty, pediatric orthopedics (PO). This policy statement summarizes the findings of the Pediatric Orthopaedic Society of North America (POSNA) Practice Management Committee. Schwend draws workforce data from the RAND Corporation and the Council on Graduate Medical Education (COGME), as well as survey data from POSNA.
The POSNA Practice Management Committee found that 12 states reported PO shortages in 2005, but that orthopedic residents with pediatric subspecialty interest had been relatively stable since 2000 and that an adequate amount of fellowship positions existed for the number of residents interested. Residents included in the POSNA survey cited a number of reasons for not becoming a PO surgeon, including greater interest in another specialty, perceived low reimbursement, the need to care for children with disabilities, a high volume of non-operative problems, and lack of private practice opportunities. Schwend also includes COGME that estimates that future physician shortages could justify an additional 7-20 PO fellows trained per year from 2008-2020. Based on these survey and workforce data, Schwend and the POSNA committee recommend continuous data monitoring and analysis of the workforce, encouragement of medical students and residents to enter into PO through mentorship programs, improvement in practice efficiencies and the safe use of physician extenders, and improved coordination and collaboration between PCPs and PO specialists.

Schwend emphasizes changes that can be made by the PO workforce independent of major policy changes at the legislative level, which are likely quite feasible within the current framework. Given that data drawn upon are from POSNA surveys and COGME projections, Schwend acknowledges the difficulties in predicting the future PO workforce and emphasizes the need for continuous data monitoring and analysis of the workforce.

**Durham, Lane, & Shipman 2009**

The final subspecialty-specific paper is a cross-sectional survey performed to determine the size, demographic, and practice characteristics of the pediatric neurosurgical (PNS) workforce and to compare this workforce to the adult neurosurgical (ANS) workforce. Durham, Lane, and Shipman used multiple databases to identify American neurosurgical practitioners and administered a 30-question survey to all of those identified. They then performed primary analyses of pediatric vs. non-pediatric practitioners and subgroup analyses within the pediatric
group. Of the 342 practitioners who received the survey, 267 (71.8%) responded; 158 were PNS practitioners, 92 were ANS practitioners, and 17 were excluded. PNS practitioners were defined as those with >75% pediatric patients.

In their primary analysis, the authors found that PNS practitioners were more likely than their ANS counterparts to be women, be ABPNS certified, do fewer operative cases per year, have a more frequent call schedule, practice in a freestanding children’s hospital, be in academic practice, and be in need of recruiting additional faculty. The subgroup analysis showed that amongst the PNS practitioners, younger groups were more likely than older groups to have completed PNS fellowship but less likely to be ABPNS and ABNS certified. In addition, the 27 females within the PNS group were more likely than the males to have completed pediatrics fellowship and to have performed fewer operative cases per year. The non-academic PNS practitioners were more likely than the academic PNS practitioners to have relative value unit-based salary incentive, be reimbursed for call coverage, and spend more hours per week in patient care.

While the response rate of the survey was fairly high, the analyses were performed appropriately, and the results provide useful information about the PNS workforce, the authors note several limitations to this study. First, it was difficult to determined PNS practitioners, and the definition of “pediatric practitioner” may not have been fully inclusive. Second, there was a high potential for reporting bias, especially with those who may have over-reported case numbers in order to report a more “desirable” or “appropriate” figure. Other limitations of this study include inadequate description of the exclusion criteria and a discrepancy in survey collection techniques. It seems that mail respondents were not sent the survey as many times as email respondents; while I am unsure of whether this had any effect on the results, the authors have not made any mention of the discrepancy and have not shown whether the mail respondents and email respondents displayed any important group differences.
**Mayer & Skinner 2004**

The first article by Mayer and Skinner is a systematic review of pediatric subspecialty workforce analyses. They performed a MEDLINE search of literature published between 1992 and 2002 and found 41 relevant articles, 24 of which were based on physicians survey and 8 of which made future workforce projections. Of the 41 articles, 35 were specialty-specific studies, while the other six were multispecialty studies.

In their review, the authors find that some studies suggest a shortage of pediatric subspecialists exists, while others show that additional pediatric subspecialists are not needed. Mayer and Skinner resolve that little is known about the size and distribution of the pediatric subspecialty workforce, and conclude that further studies are needed to determine if the workforce is adequate to meet the demand for patient care, research, and teaching. They suggest that future research assess the availability of pediatric subspecialists relative to the needs for subspecialty care.

Mayer and Skinner used an excellent search strategy and explain their methods well. They include a good discussion of specific considerations for future research. Unfortunately, they are unable to draw conclusions about the pediatric subspecialist workforce overall. Though this review is ten years old, it provides an excellent basis for understanding the progress that has been made recently in analyzing the pediatric subspecialty workforce.

**Jewett, Anderson, & Gilchrist 2005**

This article is a policy analysis that discusses the key variables affecting the pediatric subspecialty workforce and encourages policy reform in a number of areas. The authors gathered data from the AMA masterfile to determine the number of pediatric and adult subspecialists and the 2000 US Census to determine the number of children and adults in the country. They also used the NACHRI survey to report wait times for patients.
Jewett, Anderson, and Gilchrist identify five key variables affecting the workforce: changing physician and patient demographics, debt load and lifestyle considerations for graduating residents, competition among providers of subspecialty care, equitable reimbursement for subspecialty services, and policy regulating physician supply. The authors’ analysis shows that the size of both the pediatric subspecialist workforce and the pediatric patient population are smaller than their adult counterparts, respectively. In addition, adult subspecialists’ salaries are 20-40% higher than pediatric subspecialists in fields including allergy, cardiology, gastroenterology, and hematology-oncology. Survey data from the NACHRI demonstrates that 75% of respondents had to wait for longer than one month to see a pediatric subspecialist in pulmonology, gastroenterology, endocrinology, neurology, and child/adolescent psychiatry. Barriers to subspecialist care identified by the authors include geographic distance and Medicaid coverage. The authors also note that one pediatric subspecialty workforce, neonatology, continues to grow and may have an oversupply. The authors put forth several considerations for future workforce policy, including new recruitment strategies, education of the public, payers, and policymakers about the need for pediatric subspecialists for pediatric patients, training of non-pediatric subspecialists in certain common pediatric conditions, reimbursement reform, and stable funding for pediatric GME programs.

Jewett, Anderson, and Gilchrist wisely focus on five main variables and suggest policy considerations within these main areas. They do not create a precise policy agenda, and instead call upon stakeholders in the pediatric subspecialty realm to craft a thorough agenda. The authors use a number of different data sources, which in some ways strengthens their findings. However, the AMA masterfile is considered by many researchers to have more discrepancies than the ABP workforce data, and therefore may not be the most accurate source for information on the pediatric subspecialty workforce. Still, the paper is an excellent analysis of the state of the pediatric subspecialist workforce in 2005, and the authors’ policy considerations are wide-ranging and well-constructed.
The second article by Mayer and Skinner within this review is a series of cross-sectional analyses of patterns of entry into the pediatric subspecialist workforce. The authors looked to determine the effects of entry patterns on distribution of available care, to determine whether increasing pediatric subspecialist supply actually improved distribution of providers and access to care. They used ABP pediatric subspecialist diplomate data from 2003 and 2006 and examined market areas based on Medicare hospital referral regions (HRRs). They then used t-tests to compare supply within HRRs between 2003 and 2006 in each subspecialty and used the Fisher exact test to compare new workforce entrants to their counterparts.

The analyses show that there was an overall increase in the number of board certified pediatric subspecialists between 2003 and 2006, and that ten subspecialties experienced increases in supply. However, in all but four subspecialties, the percentage of HRRs containing subspecialists was virtually unchanged over that same time period. Mayer and Skinner conclude that some increase in the number of pediatric subspecialists results simply in increased density of subspecialists in areas that already have subspecialists. Thus, the increase in supply may actually exacerbate existing maldistribution of pediatric subspecialists.

Mayer and Skinner’s methods are explained well and they rely on the best data available. The authors discuss their findings and possible explanations, and acknowledge several limitations to their research. First, they note that uncertified specialists and diplomates over the age of 65 years are excluded, although these providers may be a significant part of the pediatric workforce providing subspecialty care. In addition, Mayer and Skinner discuss the drawbacks of using HRRs to define market areas, given that these HRRs rely on Medicare data, which may not be the best predictor for market areas in pediatric care. The last limitation noted is the short time span of the analysis. Overall, the authors do very well to examine the effects of
recent increasing workforce supply on the distribution of pediatric subspecialists, which may
direct future policy changes.

**Basco & Rimsza 2013**

This Workforce Policy Statement, written by Basco and Rimsza on behalf of the AAP Committee on Pediatric Workforce, is an extensive discussion of variables affecting the pediatric workforce and recent trends in provision of pediatric health care. The Workforce used 2011 NMRP data to report the number of first year fellowship positions filled, AAP member surveys for demographic data about the workforce, and ABP workforce data for information about pediatric nurse practitioners (NPs) and physician assistants (PAs).

The workforce states that there is currently a shortage of both pediatric medical and surgical subspecialists in the United States, and also that the number of PCPs is insufficient to meet pediatric health needs in rural areas. The workforce recommends a number of policy reforms including an increase in the number of general pediatric residency program graduates, the revision of payment structures to encourage better treatment and coordination for children with chronic health conditions, payment parity between adult and pediatric subspecialists, increased pediatric GME funding, and incentivization of practice in underserved areas. At the end of the article, the authors include a “Statement of Principles,” which details the AAP’s commitment to workforce issues and succinctly lays out their suggested directions for policy reform.

The AAP is a well-respected body and this policy statement therefore carries much weight. This statement updates a similar statement released in 2005, given the changes in the workforce since that time. The authors consider a number of workforce-related issues and acknowledge the difficulty in addressing these issues through policy solutions. The authors do not produce substantial data to support the AAP’s claims of subspecialist shortages and maldistribution and do not include any data on health outcomes resulting from the perceived
undersupply of subspecialists. However, the AAP Workforce effectively discusses the most significant variables affecting the pediatric workforce and presents a clearly defined set of policy goals to address current workforce issues. In addition, this article provides a succinct description of the current state of pediatric subspecialty care in the United States.

**Conclusion**

This systematic review shows that concerns about shortages and maldistribution of the pediatric subspecialist workforce are well-founded, though it is unclear whether the challenges currently faced by the workforce have resulted in poor health outcomes for children with complex medical conditions. Despite this, a number of patients report lengthy wait times or long travel distances to see pediatric subspecialists. The authors of the papers within this review discuss myriad barriers to increasing pediatric subspecialist supply and correcting the maldistribution of practicing providers. They also suggest several policy reforms that could address these barriers across all pediatric subspecialties. Common recommendations include reimbursement reform, new recruitment strategies, increased pediatric GME funding, and improved coordination of care between PCPs and pediatric subspecialists. It is clear from this review that continuous monitoring of the pediatric subspecialist workforce is needed in order to craft effective and adaptive policy that encourages safe medical care for our nation’s children.
<table>
<thead>
<tr>
<th>Authors, Year</th>
<th>Study Purpose</th>
<th>Study Design</th>
<th>Methods/Data</th>
<th>Significant Results and Policy Recommendations</th>
<th>Quality Considerations/Other Comments</th>
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<tbody>
<tr>
<td>Basco WT, Rimsza ME, 2013</td>
<td>To examine variables affecting the pediatrician workforce and recent trends in the provision of pediatric health care, on behalf of the AAP Committee on Pediatric Workforce</td>
<td>Policy statement</td>
<td>2011 NMRP data for 1st year positions filled - AAP member surveys for demographics (gender, part-time vs. full-time, etc.) - ABP workforce data on pediatric NPs/PAs</td>
<td>Problems identified: currently there is a shortage of pediatric medical and surgical subspecialists in the US - number of PCPs is insufficient to meet needs in rural areas Policy recommendations: US must increase # of general pediatric residency program grads to incr the supply of medical subspecialists and maintain supply of PCPs - payment structures should be revised to encourage better tx/coordination for children with chronic health conditions - “Statement of Principles” details AAP’s commitments to workforce issues and includes several other policy recommendations/directions for improvement, incl. payment parity for adult/pediatric specialists, increased pediatric GME funding, and support of Title VII health professions education funding, National Health Service Corps, and loan forgiveness to incentivize practice in underserved areas</td>
<td>+ AAP is a highly respected body and generally produces high-quality materials + “Statement of Principles” is helpful and clear + considers a number of workforce-related issues and acknowledges that there is no simple policy solution that addresses all of these issues - no health outcomes data discussed</td>
</tr>
<tr>
<td>Henrickson M, 2011</td>
<td>To discuss policy challenges for the pediatric rheumatology (PR) workforce, with regard to education and economics (Part I), health care system delivery and workforce</td>
<td>Policy statement</td>
<td>included data from a variety of studies, both in adult and pediatric populations - workforce data came from ABP Workforce Data 2010-2011, as well</td>
<td>Barriers to PR workforce: Limited exposure to PR amongst residents/general pediatricians - market competition, poor reimbursement (esp. Medicaid), poor institutional support - Limited patient access to self-</td>
<td>+ provides a comprehensive look at myriad variables affecting the PR workforce + each barrier discussed clearly and followed by policy “solutions” for that</td>
</tr>
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supply (Part II), and offer proposed solutions to these challenges.

| Schwend RM, 2009 | To summarize the current and future pediatric orthopaedic workforce needs, as evaluated by the Pediatric Orthopaedic Society of North America (POSNA) Practice Management Committee, and to make recommendations for improvement of the pediatric orthopaedic (PO) workforce | Policy statement | Workforce data and challenges:  
- 12 states reported PO shortages in 2005; high density in CA, TX, NY, FL  
- ortho residents with pediatric subspecialty interest has remained relatively stable since 2000  
- there is an adequate number of fellowship positions available for US ortho residents interested in peds  
- common reasons given by residents for not becoming a PO surgeon: the need to care for children with disabilities, greater interest in another field  
- acknowledges difficulties in predicting future peds orthopaedic workforce  
+ emphasizes changes that can be made by PO workforce independent of major policy changes at the legislative level | Management programs and multidisciplinary team care  
- workforce shortage: in 2005, PR demand exceeded supply by 25-50%; 16% of states have no PR  
- average wait times for 6% of patients is over 2 weeks; 50% of US children live 50+ miles from a PR  
Policy recommendations:  
- mandatory MSK training during first two years of residency  
- limited low-risk referrals with positive auto-antibody testing  
- reimbursement reform, incl. parity with Medicaid and Medicare payments and focus on chronic care  
- increased access to telemedicine  
- consolidation of services  
- public awareness initiatives  
- broad implementation of the chronic care model  
- 2 year fellowship option  
- diversification of workforce  
- flexible (i.e. part-time) scheduling  
- academic promotion reform  
+ offers numerous policy recommendations to address the numerous challenges that PR faces  
- many of the studies referenced (esp. in discussion of chronic care) were done in adult study populations and may not be generalizable to pediatric populations |

+ acknowledges difficulties in predicting future peds orthopaedic workforce  
+ emphasizes changes that can be made by PO workforce independent of major policy changes at the legislative level
| Mayer ML, Skinner AC, 2009 | To analyze patterns of entry into the pediatric subspecialist workforce and determine the effects of these patterns on distribution of available care | Multiple cross-sectional analyses | - ABP pediatric subspecialty diplomat data from 2003 and 2006 - market areas determined using Medicare hospital referral regions (HRRs) - t-tests used to compare supply at HRR between 2003 and 2006 for each subspecialty - Fisher exact test used to compare new workforce entrants to their counterparts | 3.3% overall incr. in # of board-certified pediatric subspecialists younger than 65 years between 2003 and 2006 - 10 subspecialties experienced increases in supply; 5 experienced decreases - in all but 4 subspecialties, the percentage of HRRs with subspecialists was virtually unchanged between 2003 and 2006 - some incr. in subspecialists results in incr. density in areas that already have subspecialists \rightarrow incr. in supply may exacerbate existing maldistribution of subspecialists | + used most accurate source of pediatric workforce data (ABP); performed sound analysis + good discussion of findings and possible explanations/implications + acknowledgement and clear description of limitations Limitations noted by authors: - exclusion of uncertified specialists - use of HRRs to define subspecialties |
Durham SR, Lane JR, Shipman SA, 2009
To determine the size, demographic, and practice characteristics of the pediatric neurosurgical (PNS) workforce and to compare this workforce to the adult neurosurgical (ANS) workforce

Cross-sectional survey
- multiple databases used to identify neurosurgical practitioners
- 30-question survey administered to all identified practitioners and responses collected for 6 mo
- primary analysis of pediatric vs. non-pediatric practitioners
- subgroup analyses within pediatric group

- 342 received survey, 267 (71.8%) responded – 158 PNS, 92 ANS, 17 excluded
- PNS defined as practitioners with >75% pediatric patients

primary analysis:
- PNS more likely than ANS to be women, ABPNS certified, do fewer operatives cases/yr, have a more frequent call schedule, practice in a freestanding children’s hospital, be in academic practice, and in need of recruiting additional faculty

PNS subgroup analyses:
- younger groups more likely than older groups to have completed PNS fellowship, less likely to be ABPNS and ABNS certified, more likely to anticipate retirement by age 65, spend fewer hours/week in teaching/admin duties
- 27 females and 131 males
- women more likely than men to have completed peds fellowship and performed fewer operative cases/yr
- non-academic practitioners more likely to have relative value unit-based salary incentive, be reimbursed for call coverage, and spend more hours/week in patient care

+ response rate was fairly high, at 78%
+ analyses performed appropriately and provide useful information about the PNS vs. ANS workforce and within different subgroups of the PNS workforce

- exclusion criteria not clear
- mail respondents were not sent the survey as many times as email respondents – would like to know if this could have affected results, or if these two groups significantly differed from each other in any way

Limitations noted by authors:
- difficulty identifying pediatric neurosurgical practitioners
- definition of “pediatric practitioner” (i.e. PNS) may not have been fully inclusive
- potential for reporting bias, esp. with those who may over-report case numbers

market areas
- short time span, exclusion of diplomats >65 years
To discuss variables affecting the future supply of pediatric subspecialists and patient access to pediatric subspecialty care and suggest areas for reform

Policy analysis

- AMA masterfile used to identify # of pediatric and adult subspecialists
- 2000 US Census used to determine child and adult populations
- NACHRI survey used to determine wait time data
- various other data sources used throughout the paper

- five key variables affecting pediatric subspecialty workforce: changing physician and patient demographics, debt load and lifestyle considerations, competition among providers of subspecialty care, equitable reimbursement for subspecialty services, and policy to regulate physician supply
- the size of the pediatric subspecialist workforce and the pediatric patient population are much smaller than the adult subspecialist workforce and adult patient population, respectively
- adult subspecialists’ salaries are from 20% to 40% higher than their pediatric counterparts in fields including allergy, cardiology, GI, and hem-onc
- evidence shows physician undersupply in many pediatric subspecialties, due to recruitment difficulties, burnout, research/teaching obligations, etc.
- an NACHRI survey found that more than 75% of respondents indicated average wait times for appts of >1 mo in pediatric pulmonology, GI, endocrinology, neurology, and child/adolescent psychiatry
- barriers to access for pediatric patients include geographic distance and Medicaid coverage
- neonatology workforce continues to grow, with possible oversupply

Considerations for future policy:
- recruitment strategies must address issues related to diversity, training and practice options, debt load and

+ focus on five main “forces for change” in the pediatric subspecialist workforce, with mention of several other important variables
+ suggests considerations for policy, but authors clearly state that it is not their intent to actually create a precise policy agenda → calls on stakeholders (medical and specialty societies, pediatric subspecialists, researchers, child advocates, policymakers) to craft that agenda
- AMA masterfile may not be as accurate in predicting numbers of practicing physicians as using ABP workforce data
- discuss indicators of undersupply incl. barriers to access, wait times, and recruitment difficulty, but no discussion of outcomes
| Mayer ML, Skinner AC, 2004 | To review pediatric subspecialty workforce analyses | Systematic review | - MEDLINE search of literature published between 1992 and 2002
- 41 relevant articles
- 24 studies were based on physician survey data
- 8 studies made future workforce projections
- of the 41 articles, 6 were multispecialty studies and 35 were specialty-specific studies | - some studies suggest that additional pediatric subspecialists are not needed, while others report shortages of supply
- little is known about the size, distribution, and adequacy of the pediatric subspecialty workforce; further studies are needed to determine if the size of the workforce is adequate to meet the demand for patient care and meet the teaching and research requirement of specialty fields
- future research should assess the availability of peds subspecialists relative to need for subspecialty care
- nonclinical activities should be accounted for in workforce projections | + excellent search strategy and explanation of methods
+ good discussion of the specific considerations for future research
- data relatively old
- no conclusions able to be drawn about the pediatric subspecialist workforce overall |
REFERENCES


