The 340B Drug Discount Program: Enrollment and Participation among Critical Access Hospitals

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Dedication

This thesis is dedicated to my family: David, Oscar, Cecilia, and our third little Wallack joining us this winter. You all are my whole world and I love you all.

Abstract

The 340B Program is a federal program that provides certain healthcare safety-net providers mandated price reductions on outpatient drugs. In 2010, critical access hospitals (CAHs)—small hospitals in isolated rural communities—became eligible for the program. This project set forth to understand the variables that are important to 340B program enrollment and purchasing through the 340B Prime Vendor Program (PVP), the government's contractor to represent the purchasing volume of all 340B entities. The CAHs with a higher number of total outpatient visits, more staff in the pharmacy department, full implementation of electronic health records, in relatively more urban counties, offer chemotherapy and provide outpatient surgery have higher odds of enrolling in the 340B Program. The CAHs that offer chemotherapy, have a contract pharmacy arrangement and have been enrolled in 340B essentially since program eligibility began are more likely to have made 340B purchases through the PVP. This project has also defined a typology to characterize the spectrum of 340B use by CAHs. The 340B typology is a systematic approach to understanding the differences in how the program may or may not be used and includes categories that range from CAHs never enrolling in the 340B Program to CAHs that are purchasing drugs using the PVP.

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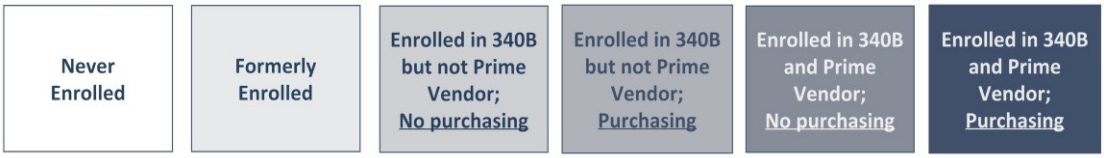
Chapter 1: Introduction

1.1 Overview and Purpose

This study seeks to identify the primary factors that influence critical access hospitals' (CAHs) enrollment and use of the 340B Drug Pricing Program (340B program). The 340B Program is a federal program that provides certain healthcare safety-net providers mandated price reductions on outpatient drugs. The 340B Program was started in 1992 and CAHs became eligible for it in 2010, following health care reform. In addition to understanding which variables are important to program enrollment and use, this study also intends to describe the range of participation within the 340B program to illustrate how entities use—or do not use—the program.

Little is known about the characteristics of 340B Program enrollees or about the extent to which enrolled hospitals are purchasing drugs using the 340B discount. This project has defined a typology to characterize the spectrum of 340B use by CAHs. The 340B typology is a systematic approach to understanding the differences in how the program may or may not be used. This typology includes categories that range from a CAH never enrolling in the 340B Program to CAHs that are purchasing drugs using the 340B Prime Vendor Program (PVP) (Figure 1).

Figure 1: The 340B Typology



The information uncovered through this work is important because it provides insight on the impact that 340B Program regulations and policy have had on program use. It also offers ideas about the complexity of the 340B Program and why not using the discount program might be justified for certain CAHs.

In 2010, the Patient Protection and Affordable Care Act (PPACA) granted CAHs access to the 340B Program; more than two years later, over one-half of the 1,327 eligible CAHs were enrolled. The CAH program was created in 1997 to provide special government reimbursement to support operations for small hospitals in isolated rural communities that face unique financial and staffing challenges. Through the CAH program, these hospitals are able to maintain the necessary infrastructure to provide primary care and emergency services to rural beneficiaries. If utilization of the 340B Program brings cost savings to the hospitals, government healthcare programs and to beneficiaries, why is enrollment not higher?

Among the several potential reasons for modest level of enrollment is that the same law that expanded 340B to CAHs also added new integrity provisions and certain restrictions on the ability to use the discount program. The PPACA requires annual recertification of all 340B enrollees, audits of program participants, and potential penalties for entity noncompliance. Specific to the newly-eligible CAHs, the law excludes from 340B discounts those drugs that have special "orphan" status. Since these drugs are often the highest cost products in the marketplace, this exclusion means that CAHs do not have the same sort of access to the discount program as the thousands of entities eligible pre-PPACA .

In addition to these new requirements, governmental scrutiny of the 340B program has heightened over the last few years. In 2011, two reports issued by government oversight agencies (The Department of Health and Human Service's Office of Inspector General (OIG) and the Government Accountability Office (GAO)) criticized the 340B program's implementation and oversight. In 2012, HRSA's Administrator, Dr. Mary Wakefield, sent an open letter to 340B participants advising of the agency's commitment "to strengthening 340B program integrity efforts, which includes conducting entity audits, ensuring entities are not being overcharged by manufacturers, issuing more policy releases, monitoring participants' eligibility and recertifying enrollees each year (U.S. Department of Health and Human Services Letter to 340B Program Participants, 2012).

The program has also received increased attention from Congressional members, including investigations of certain entities' use of the program and inquiries into the HRSA's operation of the program (U.S. Senate Committee on the Judiciary, 2013; U.S. Department of Health and Human Services Letter to Honorable Charles E. Grassley, 2011). The political dialogue surrounding the integrity of the 340B program and entity compliance was relatively quiet for nearly 20 years, yet the conversation about the intent and use of the program has been pushed to the forefront over the last few years.

The convergence of new program requirements, heightened program scrutiny and an already-high learning curve of a federal program have likely created an interesting decision-making paradigm for CAH executives. The increased program requirements necessitate an increased investment in compliance and these increased compliance costs

should be weighed against the anticipated value of the program. Through the program, covered entities can improve medication access and simultaneously improve finances to sustain or increase care to patients in need, yet pharmacists at CAHs are particularly overextended, have higher vacancies, fewer resources overall and a high percentage of Medicare patients that they serve require more professional time. Thus, the value equation of 340B participation (cost of implementation and ongoing operation versus realized savings) for these hospitals can potentially be positive, neutral, or even negative, depending upon the characteristics of the hospital.

The purpose of this research is to provide a baseline understanding of the differences between those CAHs that have enrolled and not enrolled in the 340B Program. It examines several structural characteristics, types of settings where care is provided, and different categories of services delivered to discover which are most powerful in terms of predicting enrollment. Given the above point about the possible outcomes of the value equation for 340B participation, are there combinations of characteristics that justify non-enrollment for certain CAHs? Are there hospitals that are predicted to enroll based on current experience that are missing out on savings because of non-enrollment? If the presumed intent of the PPACA was to expand access to this program, is the policy a success or will this research reveal valuable insights into limitations?

This study goes a step further by examining the purchases for a subset of enrolled CAHs to shed light on the differences between hospitals that are buying 340B drugs and those who are not yet, despite enrollment. Prior studies of 340B utilization have focused

on enrollment with the program, but not on understanding how entities use the program, defined by whether they are actually making purchases at 340B prices. Does the offering of specific services like chemotherapy or owning a particular type of outpatient clinic increase the likelihood of actually purchasing at 340B prices? Does purchasing look similar across CAHs or is there a spectrum of participation? Why would some hospitals sign up for the 340B program and then decide not to use it for drug purchases?

This first chapter provides the foundation for this research, beginning first with necessary background on the 340B Program and the CAH program. It then provides context for this work and describes the framework for this study.

1.2 The 340B Drug Pricing Program

The 340B Program is a federal program designed to reduce the amount that qualified safety net providers spend on outpatient drugs. The program is named for Section 340B of the Public Health Services Act, which Congress enacted as part of the Veterans Health Care Act of 1992 (VHCA'92).

In the late 1980s and early 1990s, the government was intent on identifying a solution to contain drug costs for the Medicaid program. The problem of high drug costs was becoming too much for the state/federal program and in 1990, the Medicaid Drug Rebate Program (MDRP) was created (The Omnibus Budget Reconciliation Act 1990). The MDRP requires drug manufacturers to pay states a rebate based on a statutorily-mandated formula for prescriptions dispensed to Medicaid beneficiaries. The formula for the rebate calculation is essentially equal to the manufacturer's quarterly average price

sold to the retail class of trade minus the best price offered during the same time frame with an inflation adjustment factor.

After the MDRP was implemented, Congress realized that federal purchasers, namely, Veterans Affairs, the Department of Defense, Indian Health Services, and Public Health Services, were unintentionally being harmed because they were not exempted from manufacturers' calculation of the single best price each quarter. The MDRP had created a disincentive for manufacturers to provide these federal purchasers with the lowest prices, particularly because the Medicaid rebates were a considerable policy change for the drug industry. To address this unanticipated problem, the VCHA'92 was passed and included a new program known as the 340B Drug Discount Program.

The VHCA contains a section to address the disincentive described above by exempting federal purchasers from manufacturers' calculation of "best price" for the MDRP. Section 602 of the VHCA enacted Section 340B of the Public Health Service Act to create a separate drug discount program for PHS grantees and public hospitals. The 340B discount borrows the metrics introduced by the MDRP—namely, average manufacturer's price and best price—to create a ceiling price on drug purchases for qualified entities. As such, in addition to addressing the disincentives created by the MDRP, the VHCA served to limit drug prices charged to the safety net providers tasked with serving the uninsured and underinsured—those qualified for 340B.

The 340B program requires pharmaceutical manufacturers to provide outpatient drugs at or below statutorily defined prices, known as 340B ceiling prices, to specified "covered entities". According to a 1992 committee report for the US House of

Representatives, the legislative intent behind the 340B program was so that covered entities could "stretch scarce Federal resources as far as possible, reaching more eligible patients and providing more comprehensive services" (H.R. Report 1992).

The HRSA's Office of Pharmacy Affairs (OPA) oversees the 340B Program. As of March 2013, there are 20,472 registered 340B sites and according to the latest estimates from 2009, the 340B market size is approximately $6 billion (Office of Pharmacy Affairs' 340B Covered Entity Extract; Pedley, K., 2010). The 340B program covers any drug—either over-the-counter or by prescription—used in an outpatient setting.

HRSA is mandated to establish a prime vendor program for the distribution of outpatient drugs. HRSA has contracted with a non-profit firm, Apexus, Incorporated, since 2004 to administer the 340B Prime Vendor Program (340B PVP). The 340B PVP leverages the volume of 340B participants to secure sub-340B ceiling discounts on eligible drugs, as well as discounts on other non-covered pharmacy related products, such as vaccines or supplies. To date, over 15,500 safety-net providers are receiving additional savings on pharmaceuticals by participating in their program. Apexus also helps establish distribution solutions and networks that improve access to affordable medications (https://www.340bpvp.com/controller.html). The 340B PVP is a voluntary and free program for 340B covered entities, but does require additional registration. Participation in the 340B PVP is free for the purchaser, because the program is funded by the fees charged to distributers and suppliers for their participation.

Prior to Apexus as the 340B PVP, entities' satisfaction with the prime vendor was low. In 1999, HRSA had awarded the 340B prime vendor program to Amerisource Bergen, one of the three main drug wholesalers in the country. Because the award was given to a wholesaler, entities would lose their option to continue to work with their current wholesaler, if not Amerisource. Reports found that there was low participation, no systematic evidence of a difference in 340B savings for entities that did and did not participate in the 340B PVP, and general dissatisfaction with its service (Schmitz, Limpa-Amara, Milliner-Waddell, and Potter, 2004; Schmitz, Quinn, and Williams, 2003). To combat these problems, Amerisource subcontracted with another health care service vendor, HealthCare Purchasing Partners International (HPPI) to expand the number of pharmacy distribution networks and to allow for entities to use their existing wholesaler. In September 2004, HPPI, now known as Apexus, was awarded the contract to serve as prime vendor until 2009. The contract was renewed through September 2013 (Apexus announces HRSA'S 340B Prime Vendor Contract Renewal, 2012).

340B Covered Entities

Organizations eligible for the 340B program are defined in the PHS Act and include six categories of hospitals and eleven categories of non-hospital grantees with federal funding (Office of Pharmacy Affairs website, Eligible Entities link, 2013). Figure 2 shows the current list of types of covered entities.

Figure 2: Types of 340B Eligible Entities as of June 1, 2013

Entity Type	Citation
Federally-Qualified Health Center	42 USC 256b(a)(4)(A)
Federally-Qualified Health Center Look-alike	42 USC 256b(a)(4)(A)
Tribal Contract/Compact with IHS	42 USC 256b(a)(4)(A)
Family Planning	42 USC 256b(a)(4)(C)
Ryan White Part C	42 USC 256b(a)(4)(D)
Ryan White Part B ADAP Direct Purchase	42 USC 256b(a)(4)(E)
Ryan White Part B ADAP Rebate	42 USC 256b(a)(4)(E)
Black Lung	42 USC 256b(a)(4)(F)
Hemophilia diagnostic treatment center	42 USC 256b(a)(4)(G)
Native Hawaiian health center	42 USC 256b(a)(4)(H)
Urban Indian	42 USC 256b(a)(4)(I)
Ryan White Part A	42 USC 256b(a)(4)(J)
Ryan White Part B	42 USC 256b(a)(4)(J)
Ryan White Part D	42 USC 256b(a)(4)(J)
Sexually transmitted disease clinic	42 USC 256b(a)(4)(K)
Tuberculosis clinic	42 USC 256b(a)(4)(K)
Disproportionate share hospital	42 USC 256b(a)(4)(L)
Children's hospital	42 USC 256b(a)(4)(M)
Free-standing cancer hospital	42 USC 256b(a)(4)(M)
Critical access hospital	42 USC 256b(a)(4)(N)
Rural referral center	42 USC 256b(a)(4)(O)
Sole community hospital	42 USC 256b(a)(4)(O)

Eligible hospitals include disproportionate share hospitals (DSHs), children's hospitals exempt from the Medicare prospective payment system, cancer hospitals exempt from the Medicare prospective payment system, sole community hospitals, rural referral centers and critical access hospitals (CAHs). Generally speaking, hospitals must be not-for-profit and either owned or under contract with state or local government to provide health care services to low income individuals who are not entitled to benefits under Medicare or Medicaid. With the exception of CAHs, they must also serve a

disproportionate share of low-income patients by meeting payer mix criteria related to the Medicare DSH program.

The non-hospital covered entities are eligible for the program because of their status as federal grantees and include the following: Federally qualified health centers (FQHCs); FQHC "look-alikes", which are clinics that function similarly to FQHCs but do not receive dedicated Section 330 funds from HRSA; state-operated AIDS drug assistance programs; the Ryan White CARE Act Title I, Title II, and Title III programs; tuberculosis, black lung, family planning and sexually transmitted disease clinics; hemophilia treatment centers; public housing primary care clinics; homeless clinics; Urban Indian clinics; and Native Hawaiian health centers.

In 1992, eleven entity types were included in the original Act. Since then, the program has been expanded to new entity types through legislation three times. First, in 2003, a provision within the Medicare Prescription Drug Improvement and Modernization Act of 2003 (MMA) revised the eligibility criteria for certain hospitals, thus allowing several small rural hospitals to participate. Section 402 of the MMA raised the Medicare adjustment threshold required for participation in 340B from 5.75 to 11.75 percent, applying the 'urban hospital' formula to rural hospitals with fewer than 500 beds, and, for rural hospitals that are not rural referral centers, changing the disproportionate share calculation cap. Prior to this, very few rural hospitals qualified for the 340B program; post-MMA, an estimated 400 of the 950 hospitals in this classification were eligible for the 340B Program. Of these, just over 200 were participating as of October 2007. (Radford, Slifkin, Schur, Cheung & Baernholdt, 2008).

Second, section 6004 of the Deficit Reduction Act (DRA) of 2005 (Pub. L. 109-171) expanded the 340B program to include children's hospitals; however, HRSA did not publish guidelines to implement this expansion until 2009. Prior to the passage of the DRA, only hospitals that participated in the Medicare prospective payment system (PPS) could enroll in 340B, but children's hospitals are exempt from PPS. Section 6004 allows PPS-exempt children's hospitals to participate if they have a Medicaid inpatient payer mix similar to or greater than the minimum levels applicable for DSHs. The Congressional Budget Office (CBO) estimated that this expansion would save the government $50 million over five years (Children's Hospitals Supporters Step Up Pressure on Government to Allow 340B Enrollment, June 2007).

On September 1, 2009, HRSA published new guidelines for the participation of children's hospitals in the 340B Program, formally implementing expansion to an estimated 100 hospitals (Notice regarding 340B Drug Pricing Program—Children's Hospitals). HRSA allowed for retroactive eligibility back to February 8, 2006 for those children's hospitals that enrolled and were admitted to the 340B Program within one year of the final rule.

Third, in 2010, the PPACA amended the PHS Act to add several new hospital types to the definition of covered entities for 340B. Section 340B(a)(4) now includes certain qualifying children's hospitals, free standing cancer centers, critical access hospitals, rural referral centers and sole community hospitals. Although children's hospitals had been added as noted above, the PPACA expressly adds them in section 340(a)(4)(M) of the Public Health Service Act.

With regard to the program expansion created through the PPACA, HRSA Administrator Mary Wakefield commented, "We estimate that as many as 1,500 additional hospitals may not be eligible for discounted medications through the [ACA]. In total, we believe the number of sites participating in the 340B program will rise from more than 14,000 to nearly 20,000 when you also factor in clinics and health centers that will be eligible" (Enrollment in 340B Program to Provide Affordable Medications, 2010).

Under section 340B(a)(4)(N) of the Public Health Service Act, as amended by the ACA, the prohibition against participation in GPO arrangements that applies to 340B-eligible disproportionate share hospitals, children's hospitals, and free-standing cancer hospitals, does not apply to critical access hospitals, rural referral centers or sole community hospitals.

Entity Enrollment and Participation in 340B

For the most part, covered entities choose whether they want to enroll in the 340B program.[1] To enroll, entities register with HRSA's OPA by completing appropriate forms during eligible enrollment periods and, once approved, they are able to begin purchasing at the 340B price at the start of the following quarter.

In the summer of 2012, OPA transitioned from a rolling quarterly enrollment process to limiting enrollment to the 15-day window at the start of each calendar quarter, with eligibility to begin purchasing the following quarter. For example, if an entity wishes to begin purchasing at 340B prices on April 1st, they must enroll with OPA between January 1st and the 15th (Office of Pharmacy Affairs website, Eligible Entities link, 2013).

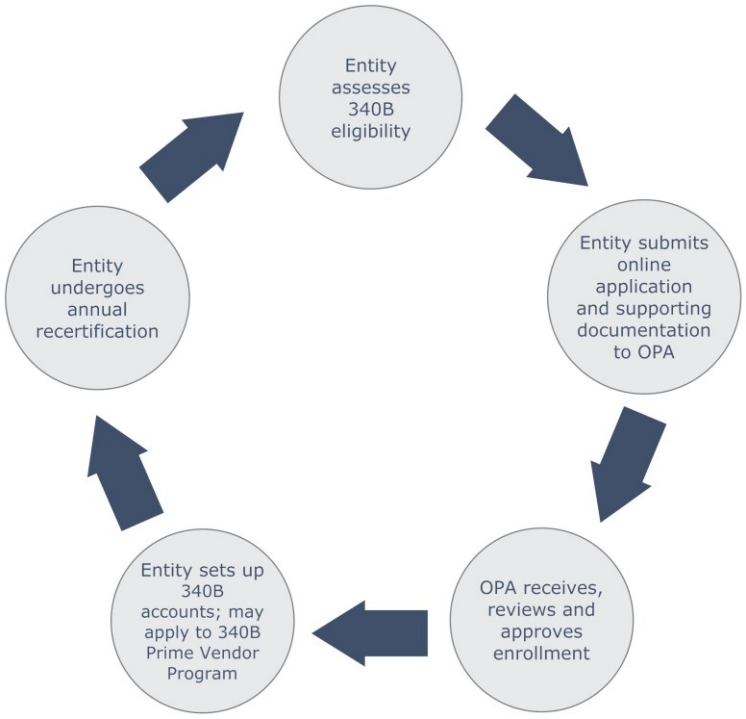
[1] The state of Illinois passed the SMART Act of 2012 requiring all 340B-eligible entities to enroll.

As explained in Figure 2, entities undergo a continuous cycle of determining initial eligibility, registering for the program, and maintaining eligibility for 340B. This cycle begins first with a self-assessment of program eligibility based on the 340B statute. An entity must select an authorizing official (such as the CEO, CFO or COO) that serves as the point of contact and final sign-off on the registration. Registration entails a submission of the online application to OPA along with additional required documents. For CAHs, this includes the most recently filed Medicare cost report, a signed certificate of ownership/operation by a unit of State/Local government or certification of contract to provide services to low-income or uninsured beneficiaries. Entities must also attest to how they will bill Medicaid patients to avoid manufacturers offering two discounts to 340B entities and to the State on behalf of Medicaid beneficiaries. Once all appropriate documentation is obtained, OPA can determine eligibility and either approve the application, request additional information, or deny the application.

Once the application is approved, OPA will send the authorizing official an email confirming successful enrollment in the 340B Program. Included in the email will be the start date to purchase 340B discounted drugs and the entity's 340B identification number, which is the OPA-designated unique number that manufacturers, wholesalers, and others use to verify participation in the 340B Program (Office of Pharmacy Affairs website, Eligible Entities link, 2013). The entity may establish its 340B account using this number as proof of enrollment with its wholesaler and may also apply with the 340B PVP, Apexus, for its value-added services. OPA recommends that entities sign up with Apexus, but it is not required.

Another critical piece to the enrollment process is maintaining eligibility during the course of purchasing. To verify that entities continue to meet the statutory requirements for 340B participation, HRSA conducts annual recertification of all entity types (U.S. Department of Health and Human Services, 2012). If there are changes to any of the entity's information at any point, OPA must be informed because it is the covered entity's responsibility to ensure that covered entity database information is current at all times.

Figure 3. 340B Entity Registration and Continued Eligibility Cycle



An entity's enrollment in the program does not always mean that it is purchasing drugs at the 340B discount. There is no penalty against entities that are enrolled, but not purchasing drugs using the 340B prices. Previous studies have uncovered numerous instances confirming varied participation in actual purchasing of drugs at the 340B price,

despite enrollment (U.S. Department of Health and Human Services, 2004; Schmitz et al 2004). In 1998, HRSA published a proposal in the Federal Register making participation in the 340B program a condition of grant receipt for all covered grantees. After receiving negative feedback, the agency decided to make participation a program expectation, but not a requirement (Notice regarding HRSA Grant Requirement, 2000).

There are two primary conditions required of all covered entities in 340B and these entities must keep records to show that they are in compliance with these requirements. First, the entities may not sell or resell the discounted drugs to anyone other than a patient of the participating entity. Per federal regulations, individuals are considered patients of the covered entity if there is evidence of an established relationship by which the entity can demonstrate it (or a health care professional under contract or by referral) is responsible for the care of that individual (Notice regarding section 602 of the Veterans Health Care Act of 1992: Patient and Entity Eligibility, 1996). In 2007, HRSA proposed regulations to further clarify the definition of a patient, but did not release final regulations (Notice Regarding Section 602 of the Veterans Health Care Act of 1992, Definition of 'Patient', 2007).

Embedded within this first criteria is a requirement that entities which manage "mixed use" inventory—that is, drugs used for both inpatient and outpatient settings—must keep drugs purchased at the 340B price that are eligible for outpatient use only separate from those intended for inpatient use. Patients admitted to the hospital are not considered eligible for drugs acquired at the 340B price.

Second, to protect the drug manufacturers from paying a Medicaid rebate to the State for a drug that was dispensed to a Medicaid beneficiary and acquired at the 340B discount, entities must implement specific inventory controls and safeguards to prevent a "duplicate discount." The 340B program and the Medicaid Drug Rebate Program have significant crossover in terms of the providers and patients covered, but also are connected legislatively in terms of the discount formulas and federal reporting requirements of drug manufacturers. As a result, entity compliance with this second requirement is of high concern to drug manufacturers.

Disproportionate share hospitals, children's hospitals, and freestanding cancer hospitals enrolled in the 340B Program may not utilize a group purchasing organization (GPO) for purchases of outpatient drugs (42 U.S.C. 256b(a)(4)(L)(iii)). The GPO prohibition form, signed by the hospital's authorizing official during enrollment, states that the hospital "...will not participate in a group purchasing organization or group purchasing arrangement for covered outpatient drugs as of the date of this listing on the OPA website." Under section 340B(a)(4)(N) of the Public Health Service Act, as amended by the Affordable Care Act, the prohibition against participation in GPO arrangements does not apply to critical access hospitals, rural referral centers, or sole community hospitals.

Participating entities have the option of contracting with multiple retail pharmacies for the provision of drugs purchased at the 340B discount. When the program was started, entities were required to have an in-house pharmacy to participate. In 1996, HRSA recognized that several covered entities—especially clinics and smaller

hospitals—lacked the infrastructure to participate and published guidelines to allow entities to contract with a single community pharmacy to dispense the discounted products to the patients of the covered entity (Notice regarding 340B Drug Pricing Program-Contract Pharmacy Services, 1996). In 2010, HRSA published revised final guidelines permitting entities to contract with multiple sites, including retail locations and mail order pharmacies (Notice regarding 340B Drug Pricing Program-Contract Pharmacy Services, 2010).

In general, covered entities wishing to contract with a pharmacy create a "bill to-ship to" arrangement, whereby the wholesaler bills the entity for the drug, but delivers the drugs to the contract pharmacy for dispensing on-site. Contract pharmacies are responsible for providing the entity quarterly financial statements, a summary of dispensing records, and tracking reports to protect against diversion to ineligible patients.

The 340B Discount

The discount available to covered entities through the 340B program is determined according to a formula specified in the PHS Act. The 340B price is a ceiling price set according to certain pricing metrics reported by drug manufacturers. The law also allows for negotiation of discounts beyond the calculated price, stating "Nothing in this subsection shall prohibit a manufacturer from charging a price for a drug that is lower than the maximum price" (VHCA Act §340B(a)(10)).

While the specifics of the discount formula are complex, in summary, for each covered drug, manufacturers calculate the average price for sales over a quarter and reduce it by the lower of either its best commercial price during that same quarter ***or*** by a

minimum rebate percentage of 23.1 percent for most brand name prescription drugs, 17.1 percent for brand name pediatric drugs and clotting factor for individuals with blood disorders, and 13 percent for generic and over-the-counter drugs (The Patient Protection and Affordable Care Act 2010).

Due to a provision within the statute to protect 340B entities from drastic price increases, manufacturers must provide additional discounts if the manufacturer's best price for a drug is lower than AMP minus the minimum rebate percentage for that drug and/or the price of the drug has increased faster than the rate of inflation. This is also true for innovator, multi-source drugs, *i.e.,* brand name drugs that now have generic competition (OBRA 1990).

The opportunity that stems from the 340B price results in savings that have been reportedly used in a number of ways, including serving more patients, offsetting the cost of uncompensated care for the uninsured or underinsured and increasing the scope of services offered (Schmidz et al, 2004; Schur et al 2007; U.S. Department of Health and Human Services Government Accountability Office, 2011; Wallack & Herzog 2011). Past surveys of 340B participants have also noted that savings from the discounts can "increase and/or improve services at the hospital, offset losses in other departments, reduce medication prices to the patient, and increase the quantity and/or variety of drugs available" (Schur et al 2007).

1.3 Critical Access Hospitals

Critical Access Hospitals (CAHs) were first defined in federal statute in the 1997 Balanced Budget Act as part of the Medicare Rural Hospital Flexibility Program (H.R.

H.R. 2015--105th Congress: Balanced Budget Act of 1997). One key objective of the Flex Program is to improve the financial status of CAHs through Medicare reimbursement based on each hospital's reported costs. CAHs received 101 percent of its costs for outpatient, inpatient, laboratory and therapy services, and post-acute care in the hospital's swing beds. These special cost-based payments are intended to help small hospitals from being penalized if they lack the economies of scale needed to keep their costs below the prospective payment rates traditionally paid by Medicare (Stensland, Moscovice and Christianson, 2002).

CAHs represent almost 80 percent of all small rural hospitals and over 60 percent of all rural hospitals in the United States (Medicare Payment Advisory Committee, 2012). To qualify for CAH status, hospitals must meet a number of certification and location requirements, but essentially, CAHs are limited to no more than 25 beds, an average patient length of stay of four days, and must be located in a rural area (Centers for Medicare & Medicaid Services, Critical Access Hospital Fact Sheet, 2013).

The Flex program has been successful in preventing some rural and necessary provider hospital closure as a result of the enhanced payments (Rosko and Mutter 2010). According to MedPAC, the CAH program has "helped to preserve access to emergency and inpatient care in isolated areas" (Medicare Payment Advisory Committee 2005). At the same time, because CAHs are small and in isolated locations, they continue to face many challenges, including "limited resources, low volume of patients, small staffs and inadequate information technology" (Casey and Moscovice 2004).

Prior to eligibility for the 340B program, most CAHs purchased drugs through group purchasing organizations (GPOs) to secure a volume based discount off of the retail list price. Unlike other hospitals participating in the 340B program, such as disproportionate share hospitals, CAHs do not have a restriction against participation in both a GPO and the 340B Program (PPACA § 7101(c) 2010). This allows them to make decisions about purchases based on the lower of either discount, even though the 340B price is typically more advantageous.

1.4 Health Reform of 2010: The Patient Protection and Affordable Care Act

After nearly twenty years of little to no government intervention in the 340B program, the 340B statute was reformed as part of Congress' 2010 major healthcare overhaul through the PPACA. This landmark legislation introduced several provisions focused on improving 340B program integrity, expanding access to 340B for new entity types, and introducing the 340B orphan drug exemption.

Changes to 340B: Integrity Improvements

The PPACA addressed several issues related to improving the integrity of 340B program operations on the part of HRSA, covered entities, and drug manufacturers (PPACA Section § 7101). HRSA is required to improve its database of enrolled entities and to ensure that the Medicaid billing information is accurate to prevent duplicate discounts. Congress also required HRSA to develop and publish anti-discrimination policies for entities. With regards to pricing, the bill requires HRSA to improve pricing transparency via an internet resource for entity price verification and to create a system for issuing refunds to entities in instances of overcharges.

The PPACA also provides HRSA with authority to enforce the program through civil monetary policies against manufacturers and through program removal for entities that knowingly violate the 340B provisions. Finally, Congress directed HRSA to develop a mandatory administrative dispute resolution process to assist entities and manufacturers outside of litigation.

Changes to 340B: Program Expansion

As previously stated, PPACA also extended the 340B program to free-standing cancer hospitals, Critical Access Hospitals, Rural Referral Centers, and Sole Community Hospitals. During the health care reform debate, advocacy groups representing rural hospitals pushed for the extension of the 340B program to their members. Matt Fenwick, of the American Hospital Association stated, "The 340B program should be expanded to protect and strengthen the safety net in rural areas. The 340B program was designed to help support safety-net hospitals: rural referral centers, sole community hospitals, Medicare-Dependent Hospitals and critical access hospitals all play critical roles in maintaining access to hospital care in rural areas" (Clark, 2010).

Changes to 340B: the Orphan Drug Exemption

The week following the passage of the PPACA, section 2302 of the Health Care and Education Reconciliation Act included amendments to create the orphan drug exclusion just for the newly-eligible entities under PPACA (Letter to the Honorable Kathleen Sebelius, 2010). In general, the Orphan Drug Act of 1983 provides several financial incentives and market exclusivity to manufacturers to develop drugs for rare diseases that affect a small portion of the population—less than 200,000 people (Orphan

Drug Act). The motivation behind the Act is that because the potential market for such a drug and subsequent ability to recover investment costs might be limited, arguably these orphan drugs would not be as likely to make it to market without the incentives.

The FDA has two orphan drug classifications: an "orphan designation" and "approval for an orphan indication". For products with an orphan designation, the manufacturer must demonstrate that the product is of potential use for a rare condition. As of April 1, 2013, the FDA has granted 2,795 orphan designations (U.S. Food and Drug Administration, 2013). For products with an approval for the orphan indication, the manufacturers met the requirements of a new drug approval (NDA), which is a more rigorous process that leads to marketing approval and includes establishing the safety and efficacy of the drug via clinical trials. Products may obtain approval for more than one orphan indication. The FDA has granted 432 NDA approvals for orphan indication.

Section 2302 (4) of the Health Care and Education and Reconciliation Act amended Section 340B to exclude the 340B discount on orphan drugs for four of the five new entity types. Section 204 of the Act removes Children's hospitals from the orphan drug exclusion in section 340B(e) of the Public Health Service Act. The orphan exception was originally applied to children's hospitals as well, which had a major financial impact on children's hospitals, because orphan drugs often make up a large percentage of the total drug budget at these facilities. However, the discount was reinstated in amendments.

The amended language did not indicate whether the orphan exclusion for these new entities is intended to apply broadly to both categories of orphan classification (orphan designation or NDA approved), or if a narrower interpretation will be required.

On May 20, 2011, HRSA published proposed regulations in the Federal Register outlining how they intend to implement the exclusion under the 340B program (Notice of Proposed Rulemaking, Exclusion of Orphan Drugs for Certain Covered Entities, 2011). Included in the language of the proposed regulations is the statement that, "it is critical that HHS recognizes these covered entities' ability to benefit from the 340B program savings so there is sufficient value for them to participate in the 340B program." As such, under the proposed regulations, HRSA clarifies that orphan drugs, when used for the rare condition or disease for which that orphan drug was designated under the Federal Food, Drug and Cosmetic Act and has received marketing approval by the FDA, are excluded for the newly-eligible entities. Covered entities are to institute "tracking and record-keeping requirements to demonstrate compliance with the limits on the use of orphan drugs…it will be necessary for the covered entities to create separate purchasing accounts and improve inventory and auditing capacity." The proposal states that the government was not able to estimate the costs of the entities' compliance with the new regulations.

The comment period on the proposed regulations closed July 19, 2011; according to news reports, HRSA was expected to issue the final rules in May 2012, but as of June 2013, the rule was put on hold indefinitely (340B Orphan Drug Rule Back on Hold, June 2013).

The lack of final guidance has resulted in varied interpretation and application by pharmaceutical manufacturers. Some manufacturers have expressed that the language in the amendments to the PPACA clearly applies to the drug and not its use. As a result,

some drug manufacturers have withheld the 340B discount to the new entities instead of awaiting guidance from the government (Pink Sheet, 2010).

On July 27, 2011, the 340B Improvement Act of 2011, sponsored by Reps. Cathy McMorris Rodgers (R-Wash.), Bobby Rush (D-Ill.), Jo Ann Emerson (R-Mo.) and five others, was introduced in the U.S. House to lift the restriction on these entities' access to 340B pricing for orphan drugs (U.S. House. 112th Congress, 1st Session. H.R.2674). As of June 2013, this bill had not been enacted.

1.5 Context for the Study

CAHs are essential providers in the rural health safety net. Although they are located in smaller markets than their urban counterparts, the demands are equally or more complex. They are often the only source of care in small communities where the residents are more likely to be uninsured or underinsured with below average income and health status (National Rural Health Association). CAHs have fewer physicians, specialists and advanced clinical capabilities, all while serving more elderly and Medicare patients (Henriksen and Walzer, 2012).

The 340B Program provides an opportunity for CAHs to achieve significant cost savings on outpatient drugs, which is of particular importance given the fiscal and policy pressures on health care for the most vulnerable populations. As the economic crisis continues, Americans turn increasingly to safety net providers utilizing 340B. In fact, since the recession began in the winter of 2007 and unemployment hit 10 percent and now is just under 7 percent (Bureau of Labor Statistics, 2013), providers caring for the nation's most vulnerable patients have seen a 23 percent increase in those who lack

health insurance and have amassed several millions in uncompensated care costs (National Association of Public Hospitals, 2010). The newly unemployed, now without their employer-sponsored health insurance, are enrolling either in public programs or are seeking charitable care. According to the Kaiser Commission on Medicaid and the Uninsured, for every 1 percent rise in national unemployment rate there is an increase of 1.1 million newly uninsured individuals and 1 million additional enrollees for Medicaid and the State Children's Health Insurance Program, which rely heavily on safety net providers (The Kaiser Commission on Medicaid and the Uninsured, 2008).

The economic and health service situation in rural areas is even more critical than in urban areas. There are rural-urban disparities in health conditions associated with several preventable or chronic conditions that are compounded by the parallel disparity in health care infrastructure and professional capacity to attend to these increased needs (Gamm, Hutchinson, Dabney & Dorsey, 2003). Due to the geographic, demographic and cultural obstacles faced by rural providers such as CAHs, the opportunity to capitalize on pharmaceutical savings at this time is even more vital.

Because CAHs' inpatient length of stay and number of beds are limited by law, there is a greater emphasis on outpatient and primary care services—areas for which the 340B program is intended. CAHs, along with other hospital types across the country, have begun to acquire community oncology practices, which could mean an increase in the number of cancer patients treated using drugs purchased under 340B. Within two years, hospitals are expected to treat as many cancer patients as community clinics and medical practices, thus reversing the trend from the last 20 years (Schleif, Edelen & Bowers,

2011). Many cancer treatments are orphan drugs, so the interpretation of the PPACA-exception for orphan drugs and how to best comply with the exception will be critical to CAHs offering outpatient chemotherapy services.

In addition to the challenges faced by the 340B-entity type of interest—the critical access hospital—the political environment in which the 340B Program operates needs more quantitative data on program use. In addition to legislative and regulatory changes to the program, the last two years has seen critical studies of the program, increased Congressional scrutiny, litigation at the Supreme Court level (*Astra USA, Inc. v Santa Clara County*), and contentious debate over the intent and use of the program. At the core of this discussion is a mitigated understanding of complexities of 340B participation; this study aims to provide clarity on 340B participation and present a framework that will aid policymakers in constructing effective 340B guidelines.

1.6 Aims

The objective of this study is to examine the factors that are important to critical access hospitals with respect to 340B enrollment and 340B purchasing. This study defines "340B enrollment" as having registered with HRSA for the 340B Program. A CAH can then enroll with the 340B PVP, thus becoming a PVP participant, but "340B PVP purchasers" are those who have made at least one purchase at the 340B price through the PVP. The data for this distinction comes directly from the PVP, Apexus. Another objective of the study is to demonstrate the importance of a new conceptual framework and definition around 340B Program use. To accomplish these objectives, this study has three aims:

Aim 1: To classify the various ways in which CAHs participate in the 340B program.

Hypothesis 1: Participation in 340B operates along a spectrum that includes enrollment in the 340B program, use of the 340B Prime Vendor Program, and actual purchasing of drug products at 340B prices. Entity participation is more complex than simply "yes" or "no". Entities may enroll in the program, but never purchase and entities' use of the Prime Vendor Program will vary.

Aim 2: To examine how CAHs *enrolled* in 340B differ from those *not enrolled* across variables related to demographics, structure, settings and services and to determine which factors contribute to the greater likelihood of enrollment.

Aim 3: To examine how CAHs *purchasing* through 340B differ from those *not purchasing* across variables related to demographics, structure, settings and services and to determine which factors contribute to the greater likelihood of purchasing.

1.7 Study Design

The research questions and framework are motivated by the desire to understand the characteristics that make 340B enrollment, and purchasing, more likely. The research questions in this study will be addressed through descriptive analysis, classification strategies, and logistic regression analysis of secondary data on 340B enrollment and hospital characteristics.

1.8 Significance

This research will be the first to explore the phenomenon of 340B participation by CAHs, of which little is known. The results will offer a number of benefits to CAH administrators, HRSA and policymakers. Aside from the novelty of this research topic,

there is very limited research on the 340B program overall, despite its presence for nearly twenty years. The results will provide benchmarks for CAH administrators still undecided with regards to participation in a program that could help contain costs. Due to the substantial variation in the number and types of services provided by CAHs and because the orphan drug exemption is unprecedented for public payers, obtaining data on its impact will help to accurately estimate the impact and limitations of this legislation. In fact, it may result in more effective programs and policies related to CAHs.

More broadly, although this project uses one entity type to illustrate the 340B typology, the new framework introduced by this work will hopefully provide policymakers with a more accurate depiction of the various ways in which covered entities use—or do not use—the 340B program.

Chapter 2: Literature Review

2.1 Introduction

The 340B Drug Discount program was created in 1992 to address the problem of rising drug costs for the safety net providers that serve the uninsured and underinsured and thus, bear the burden of uncompensated care. Over the last two decades, the program has expanded and experienced changes in policy and practice. Much of the program change can be attributed to the body of evaluation and other research examining how the 340B program is and is not used, which then has influenced Congress and HRSA on proposed bills, regulations, and policies.

Policy evaluation is a critical component of the policy life cycle as it informs stakeholders on the extent to which a policy is effective. This research seeks to establish that the legislative and evaluative actions taken by the stakeholders to date have been based on the premise that "participation" in 340B has a singular meaning; that is, entities are either purchasing drugs under the program or they are not. There is little systematic research on the distinctions in entity utilization of 340B; yet, it is these differences that make policies difficult to implement and, perhaps even ultimately ineffective. A deeper understanding of 340B participation is necessary for meaningful policy formation; this research intends to establish this framework through the 340B typology.

This chapter begins with an overview of the literature over the 340B program's history from 1992 to 2012. It introduces the conceptual framework of the public policy life cycle to identify the key policies, evaluations and public perceptions that have shaped the dialogue on 340B participation. Through a historical look back at 340B policies, the conceptual framework and participation typology can be constructed to better understand

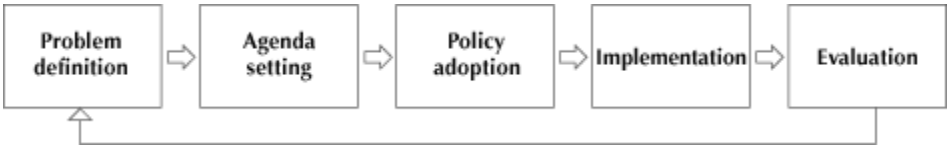
the issues at hand and the types of policies that will be beneficial to 340B safety net providers and to the patients they serve. The chapter then presents and critiques the literature examining how the program has been utilized and answers questions about whether entities are enrolled in and using the 340B Program.

2.2 Policy Life Cycle Framework

Like all policy, the development, implementation, and evaluation of policies relating to the 340B program do not typically occur in linear phase; yet it is useful to have a framework to understand the process and, thus, ways to improve the process. The policy life cycle framework allows for a discussion of the connection between policy creation, implementation, evaluation and amendments over time and serves as the foundation for this chapter's literature review.

The policy life cycle has been characterized by scholars as having a series of five stages: problem definition, agenda setting, policy adoption, implementation, and evaluation (Eyestone 1978). While imperfect, using the stages of the policy life cycle is a convenient way to explain how policies and the political conversations surrounding those policies evolve. Figure 4 below illustrates the five phases.

Figure 4. Phases of the Public Policy Life Cycle



In the first phase, a problem is identified, researched and otherwise explored. Policy development begins with an understanding of an issue that is currently unresolved and focuses on options for resolution. During the second phase, the problem is elevated

and communicated with the public and other decision-makers to place it on the public policy agenda. There are several ways in which the agenda is set—from grassroots advocacy, through media, actions of high-profile stakeholders, or in reaction to a major event (Kingdon 2010; Cobb and Elder 1983).

In the third phase of the policy life cycle, possible solutions are presented and debated by policymakers. Policy adoption can mean introduction of new policy or amendments to existing policy. The fourth cycle, implementation, is where the policy is interpreted and put into action. This is an essential component to the life cycle because this is when programmatic rules and regulations are developed, litigation occurs, and advocates collaborate on or struggle over the issues that impact them.

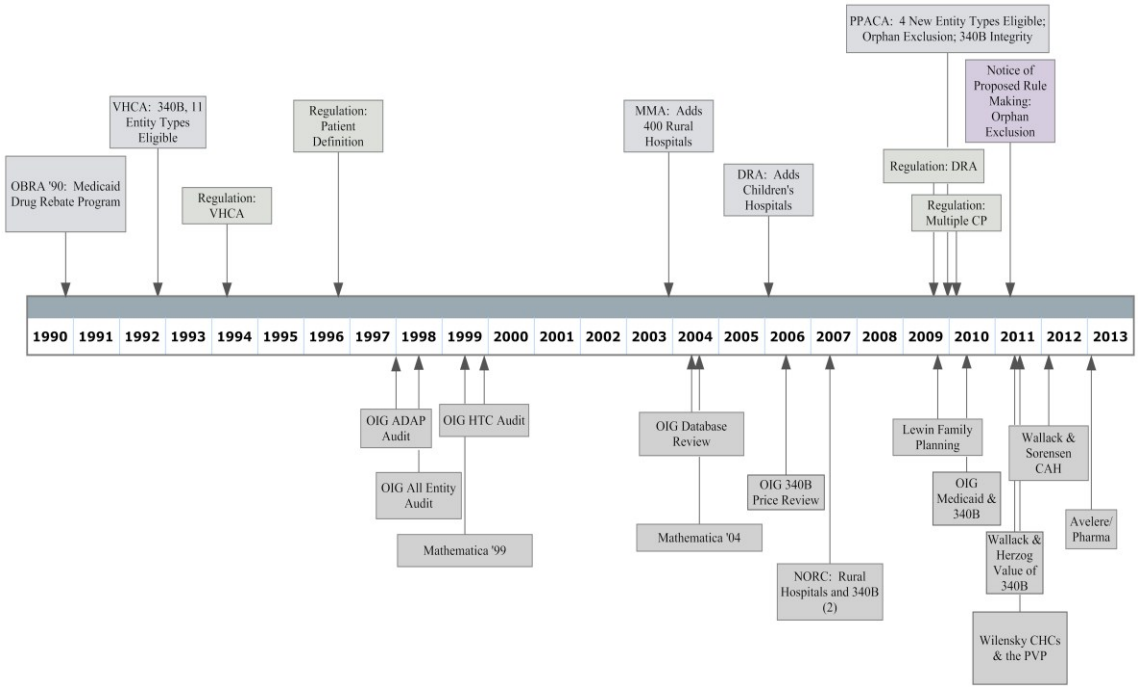
The final stage in the policy life cycle is evaluation. Following the implementation of a policy, its effectiveness—that is, the extent to which it solves the originally defined problem—must be evaluated. Evaluation typically takes the form of policy research and analysis and can be conducted by the government, at the request of Congress, by academic institutions, policy think tanks, or by advocacy organizations. Policy evaluation asks whether the policy meets its original intents and if there are any unanticipated effects that require attention. The results of evaluation may identify new problems, thus returning to the first phase of problem identification and starting a new policy life cycle.

This policy life cycle helps set the stage for the literature review, as the problems identified, policies created and evaluation designs related to the 340B program have been similar and have continuously influenced each other over the last twenty years. Over the

years, a problem was defined, agenda set, policy adopted and implemented and evaluated, thus following the policy life cycle. Because policy change is incremental, this cycle is not linear and the problems and evaluations from the early 2000s are still impacting 340B program operations and thinking today.

In summary, the problem identified with the 340B program has always been about entities' utilization—it is enough? Is it too much? Is it appropriate and compliant? Figure 5 presents the timeline of legislative and regulatory events alongside the evaluations over the 340B program's history.

Figure 5: Legislative, Regulatory and Select Research Milestones in 340B



During the program's initial years, the policies and evaluations in the late 1990s focused on implementation, determining operations and encouraging entities to enroll in 340B. The middle era of 340B problems, policies, and evaluations, occurring just following the program's tenth year of operation (2002) can be described as evaluating optimized utilization of 340B. New entity types were added to the list of eligible for 340B, evaluations focused on whether entities received the full benefit of the program and the broader political dialogue was concerned with protecting the interests of the covered entities.

The final and current era in the 340B program, beginning around 2010, is characterized by the problems of inadequate HRSA oversight, ways to improve program integrity, and unprecedented scrutiny from Congress, governmental watchdog agencies and the pharmaceutical industry on the covered entities. Interestingly, the policies instituted during this phase, including those included in landmark PPACA, are a mix of program expansion and contraction simultaneously.

Because of the accumulative impact that all prior policy activities has on future policy development, it is crucial to look back on these actions chronologically and examine the types of problems explored and the solutions that have come forth thus far. This next section presents and critiques the literature on 340B utilization, as the central problem driving policy and evaluation.

2.3 Evaluations of 340B Utilization

A retrospective look at the literature on the 340B program reveals that studies examined three problems. First, to what extent do entities use the program? Second, is

there sufficient oversight by HRSA with regards to program use? And third, what is the impact of the 340B program? The cycle of problem identification, agenda setting, policy adoption, implementation and evaluation could be broken out by individual actions, but because it is an iterative process, this review suggests a more organic process whereby the evaluations of the 340B Program continuously influenced the other phases of the cycle over time. Using this framework, the evaluations are presented chronologically, but build upon one another, thus furthering the policy life cycle.

Table 1 on the following page presents the 17 studies discussed in this review. The majority of the literature on the 340B program has been conducted by governmental agencies, namely the Office of Inspector General (OIG) and institutions under contract with HRSA, though there have been several other studies focused on the same issues and research questions.

The early 340B program evaluations were initiated by the OIG or at the request of HRSA and looked at a basic question: who is signed up for the program? In 1998 and 1999, the OIG's Office of Audit Services issued three audits focusing on whether covered entities were effectively utilizing the 340B program. (U.S. Department of Health and Human Services, OIG publications, 1998 (2), 1999**).**

Table 1. 340B Program Studies, 1998-2013

Study	Author(s)	Date	Objectives
Audit of ADAP's Use of Drug Price Discounts	Office of Inspector General	Jan1998	To measure ADAP's Use of 340B
Audit of the Utilization of the Public Health Service 340B Drug Pricing Program	Office of Inspector General	July 1998	To measure PHS grantees' use of 340B
An Analysis of Purchases, Savings and Participation in the PHS Drug Pricing Program	Cook & Dong; Mathematica Policy Research	July 1999	To provide a comprehensive review of 340B utilization; to identify reasons for nonparticipation
Audit of Comprehensive Hemophilia Treatment Centers' Utilization of the PHS 340B Drug Pricing Program	Office of Inspector General	Dec1999	To measure HTCs use of 340B and methods for charging Medicaid patients
Deficiencies in the 340B Database	Office of Inspector General	June 2004	To evaluate the quality of HRSA's 340B registration database
The PHS 340B Drug Pricing Program: Results of a Survey of Eligible Entities	Schmidtz, Limpa-Amara, Milliner-Waddell & Potter; Mathematica Policy Research	August 2004	To provide an updated comprehensive review of utilization; identify reasons for nonparticipation
Deficiencies in the Oversight of the 340B Drug Pricing Program	Office of Inspector General	Oct 2005	To evaluate HRSA's ability to oversee the 340B program
Review of 340B Prices	Office of Inspector General	July 2006	To assess whether 340B participants were receiving the benefit of the discount
340B Drug Pricing Program: Results of a Survey of Participating Hospitals	North Carolina Rural Health Research and Policy Analysis Centers	May 2007	To measure rural hospitals' use of 340B and to identify factors that influence participation
340B Drug Pricing Program: Results of a Survey of Eligible but Non-Participating Rural Hospitals	North Carolina Rural Health Research and Policy Analysis Centers	May 2007	To identify reasons for nonparticipation in rural hospitals
Rural hospitals: Are you missing out on drug savings?	Radford, Slifkin, Schur, Cheung, Baernholdt	June 2008	To present the six key reasons for nonparticipation
Analysis of the Effectiveness of Title X Family Planning Providers' Use of the 340B Drug Pricing Program	The Lewin Group & The Guttmacher Institute	Oct 2009	To measure Title X grantees use of 340B
340B Prime Vendor Program: Health Center Decision Making and Barriers to Participation	S. Wilensky	May 2010	To identify the factors that make health centers' participation in the 340B Prime Vendor Program and to evaluate that decision making process in a single state.
340B Drug Pricing Program: Interpreting Regulations and Exploring Opportunities	Eggers, Mark & Weber	May 2011	To provide an overview of 340B to hospital pharmacy directors and to advise them on conducting a cost-benefit analysis to ensure that 340B is right for them.
State Medicaid Policies and Oversight Activities Related to 340B-Purchased Drugs	Office of Inspector General	June 2011	To review the processes in place for State Medicaid Agencies to validate payment practices by 340B entities; done at the request of Senator Grassley
Manufacturer Discounts in the 340B Program Offer Benefits, but Federal Oversight Needs Improvement	Government Accountability Office	Sept 2011	To evaluate entities' use of 340B revenue and identify whether access to certain drugs was hindered by the 340B program; done as requirement of PPACA.
Excluding Orphan Drugs from the 340B Drug Discount Program: the Impact on 18 Critical Access Hospitals	Wallack & Sorensen	March 2012	To gauge the impact of the orphan drug exemption on 18 CAHs.

One audit looked at use of the program for eligible PHS funded entities; the remaining two examined a single entity type in each: AIDS Drug Assistance Programs and Hemophilia Treatment Centers. In each of the reviews, the OIG measured program use based solely on registration in HRSA's database. These evaluations did not explore the various ways in which entities could participate in 340B; rather, they were structured with a more primitive perspective in that they were essentially counts of enrollees.

The OIG's audit on ADAP's use of 340B in 1998 indicated that the program has the "potential to enable eligible nonparticipating entities to provide additional drug therapies that could improve the quality and length of life for individuals with the Human Immunodeficiency Virus (HIV)"; yet 34 of the 53 ADAPs did not participate in the program. Eight of the ten highest dollar volume nonparticipating ADAPs informed the OIG that the reason for nonparticipation was because HRSA's restriction to one contract pharmacy provider was too restrictive. Other reasons for nonparticipation included the belief that the program guidelines were too strict, lack of information about cost benefit because the 340B price is confidential. The OIG recommended that HRSA require ADAPs to use the 340B program unless it is not cost efficient and that HRSA develop guidelines to allow for multiple contract pharmacies.

The OIG's audit on PHS grantees' use of 340B, also issued in 1998, showed that approximately 66 percent (2,351 of 3,574) of eligible HRSA grantees did not participate in the 340B Program. The OIG stated that those entities do not participate in the 340B Program because they: (1) have not requested participation (some entities in this category do not purchase or distribute covered drugs), or (2) do not meet the HRSA's 340B

Program guidelines. The 340B program had been available for entities for about six years and with such a low participation rate, the OIG viewed this as economically inefficient as HRSA's eligible grantees may not be purchasing drugs at the best price available to them. As such and consistent with the OIG's earlier report, the recommendation to HRSA was that should be required to participate in 340B unless they could demonstrate that participation is not cost efficient or not possible.

As discussed in the first chapter, HRSA responded to this recommendation by publishing a Federal Register Notice requesting comments on a proposed grant award condition requiring participation in the 340B Program for all eligible entities, but ultimately decided against this policy.

In 1999, the OIG issued their audit examining utilization of Comprehensive Hemophilia Treatment Centers' (HTCs) use of the 340B Program. This audit included another dimension, which was to determine whether HTCs that were enrolled in the program were participating for all of their patients, including Medicaid beneficiaries. For this study, OIG contacted officials from 23 of the 43 HTCs that HRSA identified as participating in the program and found that all but 6 were using the program for all beneficiaries. Although the VHCA of 1992 does not specifically require entities to purchase drugs at the 340B price for Medicaid beneficiaries, a Congressional conference report from 1998 states, "It is viewed that HTCs choosing to distribute factor to their patients [which includes Medicaid beneficiaries] should purchase factor under the 340B Program to obtain the lowest possible price" (U.S. House of Representatives Report, 1998).

While the initial audits of program use were motivated by the Department's desire to encourage use of an economically efficient drug purchasing program and needed to establish a baseline for utilization, it did not take into account the varying ways in which entities may or may not use the program. What the studies do reinforce is the idea that the different entity types eligible for 340B should not be conceptualized as one. They serve different populations with unique needs and challenges; thus, how they participate or not in the 340B program should not be viewed with a narrow perspective.

Motivated by low participation rates, HRSA contracted with Mathematica Policy Research to conduct a comprehensive review of the 340B program, published in 1999 (Cook and Dong, 1999). The stated objectives of the study were to survey eligible entities about their understanding of the program, their decision to participate or not, and the level of savings that they achieved through participation. The important question to Cook and Dong was why many eligible entities are not participating in 340B.

The study concluded that the overall participation rate was 39 percent. Survey responses for nonparticipation included that outpatient pharmacy services were not provided, outpatient drug purchases were low, that the level of savings using non-340B discounts was satisfactory, that start-up costs of participating in the program were too high, and finally, that there was a lack of understanding of the program.

One major hurdle for Cook and Dong was with the sampling frame. At the time of sampling in 1997, the data provided to them from HRSA listed 4,918 entities as eligible to participate in 340B, with 1,794 listed as participating and 3,123 as nonparticipating. Though they sampled 462 nonparticipants and 474 participants

(according to HRSA's data), several (187) responded with "never heard of the program," Of the 474 classified as participating, 56 responded in this manner. Of the 462 nonparticipants, 131 had not heard of the program. The researchers also had 44 ineligible responses, 37 of which were attributed to the entity no longer in operation. In addition, 156 of the 597 survey responses to the question "Are you currently receiving discount prices in the PHS drug discount program?" did not match HRSA's participation classification. This included 88 of the 271 participating respondents whose response indicated that they were not in the program.

The issue of entity misclassification by HRSA repeats through the years and revealed not only the inability of HRSA to track participants or the problem this meant for researchers hoping for a clean sampling frame, but also a more serious issue with how entity participation in 340B has been typically misunderstood.

Despite the weaknesses of HRSA's data on entity participation, the Mathematica study still provided valuable reasons for nonparticipation, as noted above, and some insight into the characteristics of participants. For example, they estimated that about three-quarters of participants offered pharmacy services on-site, which contrasted sharply with delivery of pharmacy services in nonparticipants where only 31 percent had an on-site pharmacy. This number is roughly equal to the percent of nonparticipants who offered no pharmacy services (29 percent).

In looking at characteristics of participants versus nonparticipants, Cook and Dong relied on survey questions that examined how the entities qualified for 340B and how pharmacy services were delivered. Though these are important variables, this

research project goes significantly further in its exploration of the characteristics that distinguish levels of participation. This study considers many more variables and uses regression to identify the characteristics that make participation more likely whereas the Mathematica study was reporting survey results.

Another important contribution that Cook and Dong's work brought to the field of 340B was an attempt to measure the total purchases under the 340B program. Aside from the issues with accurate participation status, the study also was challenged by self-reported data and the validity and reliability issues that accompany that mode of data collection. Nevertheless, the authors were able to make accommodations to produce the first estimates on spending and savings by entity cohorts and across all participants. For 1997, they estimated that 1,075 participating entities spent $1.08 billion and saved between 19.2 and 22.7 percent through the 340B program.

Another critical input from the Mathematica study was its questions and findings on how participants used 340B savings. Though the political dialogue at the time was very favorable to entities in 340B, the responses helped provide justification for the program years later when entities were under fire. Cook and Dong offered seven purposes of savings and found that, in order of percent of savings allocated to each purpose, 23.6 percent is used to increase the number of patients cared for, 18 percent is used to offset the losses from providing pharmacy services for less than full compensation, 16 percent is used to reduce the price paid by the patient, 15 percent is used to increase the quality and variety of prescription drugs available to patients, 12 percent is used to increase the facility's services, and 6 percent is used to reduce the prices paid by third parties.

In 2004, two key 340B studies were issued; first, the OIG released a study on the material weaknesses of HRSA's database of participating entities; second, HRSA contracted with Mathematica to again survey eligible entities on their participation status.

The OIG study reviewed the quality and timeliness of HRSA's covered entity database (U.S. Department of Health and Human Services, 2004). The agency had originally intended to measure the accuracy of the prices being charged to 340B entities by drug manufacturers, but the objectives could not be reached because of the inaccuracies in the database, which at that point counted 10,500 enrollees.

The OIG found that the poor quality of the database interferes with the successful administration of the 340B Program. For 38 percent of the sample, they were listed as participating, but reported they were nonparticipating, which echoed similar findings from Cook and Dong. A new finding brought to light by the OIG was that several of the entities' addresses—43 percent—were incorrect. Because this is the database that manufacturers rely on to ensure that discounted product is not being diverted, this was a serious finding. The OIG recommended that HRSA develop a strategic plan to improve the data that included: (1) a revalidation of all current information in the database (2) an annual recertification process for entities participating in the discount program (3) a separate listing of newly added or deleted entities (4) a standard reporting format for entities' addresses and (5) an additional field to designate entities with contracted pharmacy arrangement.

This study presented the methodological issues that the incorrect categorization had on their research, but also on the "real" impact of an inaccurate accounting of 340B

participation in the marketplace. The results were only for a sample of entities and the full extent of the issues with the entire database was not presented. At the same time, the results—along with the 1999 Mathematica report and its 2004 follow-up—were enough to produce action by HRSA, who, over the next few years, would make significant improvements to the database.

A few months following the publication of the OIG report, the Mathematica team, this time comprised of Schmitz, Limpa-Amara, Millner-Waddell and Potter (Schmitz et al, 2004, issued its findings on the survey of eligible entities. Like the OIG and their peers before, Schmitz et al found the database of eligible entities to be inaccurate in many respects and confounding to their data collection. Of the 558 entities that completed the survey (384 HRSA-categorized as participants and 174 as nonparticipants), 35 percent of those listed as participating stated they were not using 340B while 39 percent of those listed as nonparticipating stated they were using 340B. This meant that agreement between the two data sources was only 65 percent and, once again, the accuracy of HRSA's data was questioned. Of particular interest was why 39 percent of the nonparticipants would state that they are participating. The authors suggested that it was possible that the respondents were confusing 340B with another discount program, but were unsettled by "such a high level of disagreement." In the end, the study relied on the respondents' selection over the database entry as the measure of participation, but expressed "surprise" over the level of inaccuracy in the database.

Schmitz et al found that the most cited reason for nonparticipation was again lack of an on-site pharmacy. This was followed by high start-up costs, low pharmacy volume,

lack of knowledge about the program, and the perception that the program is too complicated. One of the issues with how this data was presented is that the authors asked entities to select from nine possible reasons for nonparticipation (8 pre-established and 1 open ended "other"), but then presented only three reasons in the body of the report. The reasons in the survey included issues with the various participation requirements (e.g. "preventing drug diversion is too hard" or "difficulties resulting from GPO withdrawal") and would have been very interesting to see itemized instead of grouped together in a catchall that was not originally intended to be the "other" category.

The 2004 attempt to estimate the 340B purchase volume was unsuccessful, as the self-reported figures were far higher than expected and in excess of the much-larger Medicaid market. The authors stated that "these circumstances offer little hope for estimating an unbiased mean for pharmacy expenditures" and adopted a new strategy for discussing volume and came up with a lower bound on aggregate spending for all participants at $2.5 billion. Entities were estimated to have saved between 24 and 27 percent through the 340B program.

One of the new issues explored for the first time by Schmitz et al was participation in the 340B prime vendor program. As stated in the first chapter, the prime vendor at the time was Amerisource Bergen and satisfaction with their operation of the program was low (Schmitz, Quinn, and Williams 2003). According to the survey responses, only 23 percent of enrolled entities were participating in the prime vendor. The savings for PVP enrollees versus non-enrollees was not different, indicating that the prime vendor did not succeed in negotiating discounts on behalf of its members. Given

the widespread dissatisfaction with the prime vendor at the time of this report, it would have been challenging to have a full discussion on the pros and cons of the additional enrollment with Amerisource; however, with Apexus now securely in place as the 340B PVP for the last nine years, it is a key aspect of what it means to participate in 340B.

This key report also examined how entities used their savings and echoed similar findings from the 1999 Mathematica report. The report states that the PHS Act does not require any specific use and that "all entities are free to allocate savings in whatever manner they choose." The authors concluded that if the program did not exist, it is quite likely that providers would serve fewer patients, would charge their patients higher prices for prescription drugs, and would incur greater losses.

In 2005 and 2006, the OIG issued two reports which examined entity participation in 340B from a slightly different angle (U.S. Department of Health and Human Services, 2005; U.S. Department of Health and Human Services, 2006). These studies did not measure the extent of entity participation, but instead looked at HRSA's ability to oversee the program so that entities were receiving the full benefit of the 340B program. More specifically, the 2005 and 2006 studies reviewed whether HRSA could ensure that entities were receiving at or below the 340B ceiling price and then measured the error rate for overpayments by 340B entities who did not receive the correct price, respectively. The recommendations on program integrity improvements stemming from these studies would go on to be included in the PPACA in 2010.

In 2007, the Federal Office of Rural Health Policy contracted with the University of North Carolina's Walsh Center for Rural Health Analysis and the North Carolina

Rural Health Research & Policy Analysis Center to examine the extent to which the 390 rural hospitals made eligible for 340B by the Medicare Modernization Act of 2003 were participating in the program. This research resulted in two reports: one discussing participants and the other discussing nonparticipants (Schur et al 2007, Radford et al 2007). Because the North Carolina reports examine the characteristics of participants and nonparticipants in rural hospital settings, there are many parallels to this current research given the fact that these hospitals are similar in size and location to CAHs.

Both reports surveyed the hospital's pharmacy directors, 150 participants with a 71 percent response rate and 240 nonparticipants with a 39 percent response rate. For the report on hospitals enrolled in 340B, the purpose of the survey was to understand the perspectives of pharmacy, the financial impact of the 340B program, and the specific program features presented barriers to its broader implementation or participation at all. The purpose of the second report was to understand the reasons why eligible hospitals were not enrolled in 340B and to uncover any programmatic barriers to participation.

To identify the rural hospitals that were 340B participants, Schur et al relied on the data in HRSA's covered entity extract. Though their research yielded 150 hospitals, 14 indicated they were not enrolled and 6 indicated that although they had signed up for 340B, they were not yet using the program. This preliminary categorization of entities has influenced this research's 340B participation typology and was yet another publication indicating that enrollment does not equal participation.

This study was first to do more sophisticated analysis of the differences between 340B participating and non-participating hospitals. Though select characteristics of each

group were presented in the Mathematica work, the North Carolina reports delved deeper to examine and contrast the differences in revenue and services offered. Primarily, the authors found that the relationship between total revenue and likelihood of participation was positive, with rates increasing directly with annual revenue. In fact, the proportion of hospitals enrolled in 340B was twice as high for hospitals with over $100 million in annual revenue than for those with less than $50 million in annual revenue.

340B Participating hospitals also provide a much higher volume of outpatient services where drug use is connected, such as ambulatory surgery, emergency departments, primary care clinics, and home health care. The authors surveyed the hospitals about the types of drugs administered to patients and found that participating hospitals were also more likely to administer high cost drugs than nonparticipants. As a result of more services, more volume, and efficient use of the discount on expensive drugs, the potential for savings was much higher.

There was also a considerable difference in the pharmacy staffing between participants and nonparticipants at a rate of 4 full time pharmacists to 2.3 full time pharmacists. Most of the participants (76 percent) also are enrolled with the 340B PVP.

The authors inquired about the pharmacy director's level of understanding of the 340B program and 97 percent responded that they understand the program at least well enough to use it, but many still have questions about the program. The top issue for participants was managing inventory in a mixed-use setting, but the proprietary nature of the 340B price was also cited as frustrating as it makes a cost-benefit analysis challenging. Finally, almost half of participating hospitals indicated that they did not

have sufficient personnel to administer the 340B program. These inquiries and results provide a basis for why an entity might opt to not participate or why it might enroll, but then not actually use the program.

One of the key conclusions of this report was that participation "required extra resources, notably staff time and, in some cases, new computer software…however, considering the amount of potential cost savings and the improved access to affordable medications, the benefits of the 340B program are likely to outweigh the initial start-up costs and logistical planning." While this finding was most certainly the case at the time in 2006, this report was conducted prior to the era of heightened enforcement and predates the 340B compliance software vendor boom following the multiple contract pharmacy regulations and program expansion of the ACA in 2010. There has not been a study since to examine the value equation of 340B when compared to the costs of compliance. This research project does not cover this topic, but hopes to inform future work using the 340B participation typology and the characteristics that make participation more likely.

Because these types of hospitals must comply with the GPO exclusion, the researchers asked the pharmacy directors about the impact of no GPO purchases. The results showed that over half did not know what the financial impact would be. In fact, only three of the 80 survey respondents had conducted a cost benefit analysis of participation in 340B. For about one-third of the respondents who were not planning to complete an analysis, the reasons expressed included insufficient staff time and resources, inability to estimate 340B pricing, not considering participation, and

approximate amount of savings already known. Though CAHs do not have the GPO exclusion as a condition for 340B eligibility, this finding indicates the challenge or resistance to examining the cost-benefit of participation.

For the results on the non-participating rural hospitals, the authors found that awareness of the 340B program was still limited, with over half of the respondents unaware of their eligibility. The report states, "[A] solid understanding of the program is necessary to evaluate the expected cost savings and implementation requirements when considering whether or not to participate in the 340B program." The majority of respondents (71%) reported the need for targeted assistance on maintaining separate inpatient and outpatient records, understanding 340B drug pricing, and conducting a cost-benefit analysis. This could very well be a similar issue for the nonparticipating critical access hospitals reviewed for this study.

Like the studies conducted before, the North Carolina study on nonparticipants found that the key to participation lies primarily with whether the hospital has on in-house pharmacy. Ninety-five percent of respondents reported that their hospital did not have an in-house pharmacy; yet, did report offering services in outpatient settings where the 340B discount is available. The authors further inquired as to the provision of certain expensive medications like Epogen or Remicade to measure if such provision was correlated to benefit of participation. They found that the percent of respondents dispensing these drugs ranged from 20% to 68%. A critical conclusion of this report was that, in general, the hospitals with low or no reported knowledge of the program were just as likely to offer the same types of outpatient services and costly medications that appear

to make participation beneficial. In other words, there are hospitals that should be participating that are not based on their review. This current research seeks to identify the answer to the same question about underutilization of 340B, but will use more variables from which to judge nonparticipating hospitals that should be participating.

The reports conclude that additional outreach is necessary to increase awareness of rural hospitals' eligibility and to help ensure pharmacy directors and administrators can make informed decisions about participation. Entities need to be able to "evaluate the expected cost savings and implementation requirements," which respondents concluded were the most important factors when contemplating participation.

The findings from these reports influenced and justified the choice of variables selected for review. This study relies on secondary data collection and not primary data collection, as was performed by the North Carolina group. For their study, the universe was approximately one-fourth the size of eligible critical access hospitals, making a mailed survey and follow-up efforts more manageable. Use of the AHA's survey data was more time efficient and permitted capture of more variables. At the same time, though the North Carolina studies plotted the relationship between variables such as outpatient drug spend and provision of outpatient services, this current research will be the first to create regression models and identify statistically meaningful relationships on a broader scale.

In October 2009, HHS' Office of Family Planning within the Office of Population Affairs contracted with The Lewin Group and The Guttmacher Institute to better understand the facilitators and barriers to Title X Family Planning Providers' use

of 340B (The Lewin Group & The Guttmacher Institute, 2009). The study found that participation by Title X-supported providers was nearly universal, yet they still reported several challenges, including a "lack of consistently available information about the programs." The foremost reason for universal participation at the time of this study was because the Deficit Reduction Act of 2005 had changed the providers' access to very low ("nominal") drug prices unless they were enrolled in 340B, thereby essentially requiring entities to participate. This law was later amended to allow non-340B family planning providers to access nominal prices, but participation among this entity type remains high.

The Lewin study was one of the first evaluations where a discussion of participation in 340B was segregated by the provider's enrollment in the Prime Vendor Program. Approximately half of the PVPs' enrollment is Title X-supported providers; however, Lewin presented this with the caveat that the total purchasing volume was much lower. The study also concluded that most enrollees were purchasing at least a few pharmaceuticals through the PVP, thus further confirming the variation in entity participation. The limitation of this work was that it was all based on interview data from 40 key informants and did not involve data analysis. At the same time, the lessons learned from the in-depth discussions confirm what had already been established in the literature, but added more understanding of the issues particular to Title-X funded programs.

Following the studies before, the Lewin study found that cost savings and stability of drug prices were among the top priorities for use of the discount program. As for barriers to maximization of the program, informants cited a complex enrollment process,

desire for more targeted and higher quality information from the government and its contractors on the program, challenges with the 340B price changing quarterly and overall issues with budget planning and resource allocation, given the confidentiality of the 340B price.

In 2010, a study on health center decision making as it relates to participation in the 340B Prime Vendor Program was published, adding to the limited work on PVP and 340B (Wilensky, 2010). In this work, the primary question is why the use of the PVP by community health centers was low, despite being a free service. Wilensky reviewed a number of characteristics of health centers to identify which factors were significant in predicting participation in the PVP and further interviewed health centers in the state of Vermont as a case study on participation. The study frame included 871 health centers—579 enrolled in the PVP and 292 not in the PVP. Testing on the dependent variable of participation in the PVP (yes=1, no=0), Wilensky measured the health center's number of patients, geography, revenue per patient, pharmacy status (on-site pharmacy, on-site provider dispensing), race/ethnicity, insurance status and the State's Medicaid spending per enrollee, Medicaid enrollment, state metropolitan area, uninsured population and the poverty ratio.

In the full model's logistic regression, Wilensky found that three variables—total number of patients, privately insured patients and the state's uninsured population—were significant, but that the effect was essentially zero. When the model was adapted to a state fixed effects, the effect was basically the same in that 4 variables were significant, but with no effect on predicting the likelihood of PVP enrollment. Though the results

were not statistically significant, this work contributes to the scant analytical evaluations of 340B. It could be that the statistical differences in health center characteristics would be more apparent between those that do and do not participate in 340B over those that do participate in 340B, but do and do not participate in the PVP. Wilensky's interviews of key decision makers in Vermont reveal more on what drives the more nuanced choice to go from being enrolled in 340B to being enrolled in 340B and the PVP.

For the qualitative piece, Wilensky found that strategic choice theory explains the Vermont health centers' decision making. The individual, organizational, and environmental factors that drive the decision to participate in the PVP are outlined and discussed. This component of the study adds to the literature by using a theoretical framework for understanding health center decision making, but could be applied to any entity.

Wilensky's review was the first of its kind in examining 340B entities' choice to make the additional, albeit free, choice of enrolling with the PVP. As previously stated, the earlier studies (Mathematica 2003, 2004) had studied PVP enrollment and satisfaction prior to Apexus, who has been running the PVP since 2004. As such, this is the first research looking at the relationship between an entity type—health centers—and a particular contractor—Apexus.

Another publication on the 340B program focused on advice to pharmacy leaders looking to expand their practice models to uninsured and underinsured patients (Eggers, Mark & Weber 2011). This article presents program background and rules with the aim of explaining the value equation of 340B participation. The most important contribution

of this article to the literature is the advice extolled, specifically, that when determining whether or not to enroll, "organizations need to weigh the benefits and drawbacks of participating in 340B."

This was one of the first articles written following the PPACA and discusses the additional layers of compliance that might complicate the decision to participate in 340B. The authors recommend that hospitals compute their potential savings and weigh them against the time and costs that will be required to ensure appropriate billing, adequate record keeping and effective inventory management. Specifically, they state, "[t]he complexities of 340B can make compliance with the regulations difficult and can result in utilization of additional organizational resources to maintain compliance. Facilities that expect to see minimal to moderate savings may find that enrollment is not worth the effort and costs associated with compliance."

2011 saw a sizeable contribution to the 340B literature with the publication of two governmental studies. These studies evaluated covered entities' compliance with the duplicate discount provision and HRSA's oversight of the program, but, more importantly, reflect the changing tide of the 340B program toward unprecedented scrutiny following the PPACA and multiple contract pharmacy expansion (U.S. Department of Health and Human Services (OIG), 2011, U.S. Department of Health and Human Services (GAO), 2011).

The OIG conducted its review of how State Medicaid agencies oversee payment for drug purchased under 340B by covered entities at the request of Senator Chuck Grassley. The OIG found that States lack either the policies or the information needed to

oversee that these payments are correct, meaning that the State is not overcharged or that the transaction is not subject to a duplicate discount.

The GAO study was conducted as part of the PPACA to study whether the 340B program should be expanded given the other provisions of the law to expand coverage to millions, whether mandatory sales of certain products by the 340B program could hinder other patients' access to those drugs through any provider, and whether income from the 340B program is used to further program objectives (PPACA §7103). The GAO interviewed 29 covered entities and 61 340B program stakeholders and found that the 340B discount did not hinder other providers' access to certain therapies and that entities were using the revenue generated through the program for purposes consistent with the program's intent. The GAO also concluded that HRSA's oversight of the program was inadequate and recommended HRSA audit entities and issue further program guidance to better monitor the program.

These two studies reviewed specific aspects of 340B program eligibility and compliance, which directly relates to participation. They are limited in scope, but the topics discussed have significantly influenced the political dialogue and the tone of this current review.

Finally, in 2012, the author published a report along with Todd Sorensen to shed light on the 340B orphan drug restriction on 18 critical access hospitals in Minnesota and Wisconsin. Drug spending for 2010 from 18 CAHs in Minnesota and Wisconsin were reviewed to identify the prevalence of orphan drug purchases and to calculate the price differentials between the 340B price and the hospitals' current cost (Wallack & Sorensen,

2012). The study found that the 18 CAHs' purchases of orphan drugs comprise an average of 44% of the total annual drug budgets, but only 5% of units purchased, thus representing a very high proportion of their expenditures. In the aggregate, the 18 hospitals would have saved $3.1 million ($171,000 average per hospital) had purchases of drugs with orphan designations been made at the 340B price. Because CAH claims for Medicare are reimbursed on a cost-basis, the Federal government is losing an opportunity for savings. The study concluded that the high prevalence of orphan drug use and considerable potential for cost reduction through the 340B program demonstrate the loss of benefit to the hospitals, Federal government and the states.

This study's scope covered a limited number of hospitals that are all in the same purchasing network, thus creating issues with external validity for the application of the findings to all CAHs. At the same time, this was the first study to examine and quantify the impact of the orphan drug exemption for any of the PPACA entities. Because this study was conducted by me, it was of course very informative for the design of this current research.

2.4 Industry-Sponsored Publications

Following the publication of the OIG and GAO reports in 2011, there was a sizeable shift in the attention to entities' compliance with 340B and HRSA's capacity to monitor participation and enforce the program rules. As a result, a number of publications from 340B-stakeholders entered the marketplace and contribute not so much to the body of research as they do to the overall environment in which 340B research is conducted today. The publications' key takeaways are discussed below.

In 2011, in the midst of Congressional and agency scrutiny, the Safety Net Hospitals for Pharmaceutical Access commissioned a report on the value of 340B to participating hospitals (Wallack and Herzog 2011). This study surveyed 600 hospitals and presented the ways in which program savings gleaned via participation in the 340B program were used to help vulnerable patients by the 381 respondents. This was the first study where the central question explored was use of savings. This report demonstrates the value of the 340B program to hospital systems in meeting the needs of their low-income, uninsured and underinsured patient populations, while stretching tax dollars. It found that safety net hospitals have been using their program savings to provide, improve and expand services in innovative and cost effective ways and will continue to rely on the program post-health care reform. Without the 340B program, the authors found that many safety net hospitals would have to limit services or even close their pharmacy doors. As a result, patients would lose access to health care and communities would suffer.

The findings were limited just to hospitals that are members of SNHPA, but this represents around 600 of the 700 or so public and private non-profit hospitals that participate in 340B. One criticism was that the data was all self-reported; however, to collect the amount of data on the variety of ways the program was utilized, a survey was the most efficient data collection method.

von Oehsen, Doggett and Davis' 2012 journal article presents the history of the 340B program and appraises several of the controversial aspects of the program, such as the definition of patient (von Oehsen, Doggett and Davis 2012). The article also discusses the impact of the OIG and GAO's 2011 report on covered entities. It further

provides recommendations on how the entities can prepare for heightened program enforcement, stemming from the PPACA and the government's reports. This report does not present findings from analysis; rather, it presents a retrospective on the program and shares best practices in compliance.

In February 2013, a white paper representing the interests of six pharmaceutical industry organizations was published using the research and data analysis from Avalere Health (Avalere, 2013). The six organizations include the Biotechnology Industry Organization, the Community Oncology Alliance, the National Community Pharmacists Association, the National Patient Advocate Foundation, the Pharmaceutical Care Management Association, and the Pharmaceutical Research and Manufacturers of America.

The purpose of the white paper is to explore the history and original intent of the program and highlight key findings to help policymakers ensure that 340B meets its stated purpose. The authors conclude that 340B is important today and going forward, but expresses concern about 340B participants, namely, that some uninsured indigent patients are not experiencing direct benefit from the program and that some non-340B providers—particularly oncology practices—are being displaced as a result of the 340B program. It also discusses anecdotal evidence that clinical decision-making may be influenced by those who want to use the 340B discount. Though increased guidance and monitoring from HRSA on 340B participation is generally agreed upon by all stakeholders, a critique of this white paper is that it focuses on symptoms versus causes and attributes blame to the 340B program where there are several other plausible

explanations. In the end, this publication represents the sentiment from the critics of 340B, which is important for the stage in which this current study plays out.

2.5 Literature Review Conclusion

A review of the literature suggests that entities' participation in 340B still needs to be better understood; this work contributes to the literature by studying several new variables and by using an improved framework for understanding the various degrees in which entities use or do not use the 340B program. Though this evaluation is limited to critical access hospitals as the entity of interest, hopefully the findings will be universally applied to all 340B-eligible entities.

Chapter 3: Methods

This chapter identifies the sources of data used in this analysis and explains the methods used to create logistic regression models, including a discussion of the variables used for the models. The chapter concludes with a discussion on the limitations and delimitations of the study.

3.1 Study Design and Population

This study reviewed secondary data on nearly the complete population of critical access hospitals to identify the primary characteristics driving 340B enrollment and a subset of PVP-enrolled CAHs to evaluate purchasing behavior. The design entailed a retrospective categorization of all CAHs into a typology based on enrollment and purchasing status as of October 2012. Descriptive analysis of each variable and its relationship with the outcome variable was reviewed to provide insight into the model formation. Finally, a logistic model was fit to the data.

Data Sources

The data sources for this study include the list of all critical access hospitals in the country, as compiled by the National Rural Health Resource Center and the Centers for Medicare & Medicaid Services (CMS), the American Hospital Association's (AHA) 2011 Hospital Survey, the AHA's 2010 Electronic Health Record Adoption supplement database, HRSA's Office of Pharmacy Affairs Covered Entity Extract, and data on the 340B Prime Vendor Program (PVP) enrollment and purchasing provided by Apexus. Summary details on the data sources are included in Table 2.

Table 2: Data Sources	
Source	**Description**
Centers for Medicare & Medicaid Services, Rural Resource Center	Database of all CAHs, including location and Medicare Provider Number
The American Hospital Association's Annual Survey, 2011	Annual survey which includes measures of hospital size, system membership, CAH status, size of outpatient departments, presence of oncology departments, etc.
American Hospital Association EHR Adoption Database 2010	Supplement to the AHA survey focused on the depth and level of technology integration at hospitals.
USDA Economic Research Center, 2003 (latest available)	The 2003 Rural-Urban Continuum Codes form a classification scheme that distinguishes metropolitan counties by size and nonmetropolitan counties by degree of urbanization and proximity to metro areas.
HRSA's Covered Entity Database, October 2012	Database listing all CAHs enrolled in 340B, including date of enrollment, contact information, & contract pharmacy data.
Apexus Prime Vendor Participant Database, October 2012	Database listing the entities that are enrolled in 340B & HRSA's Prime Vendor Program, including purchasing history.

The Rural Resource Center maintains a list of all CAHs in the nation based on data from CMS and augmented by information provided by state Flex Coordinators. This was the starting point for establishing the list of CAHs that were eligible for 340B and also informed the variable "bed size" for consideration in the regression.

The AHA 2011 Survey and the EHR Adoption supplement for 2010 are the American Hospital Association's annual data collection initiative and include comprehensive information across several variables. The AHA has surveyed all member and nonmember hospitals in the United States on an annual basis since 1946. It is the most comprehensive data source for hospital information including over 850 elements on hospital services, utilization, staffing, financial, and total facility beds. It has an annual response rate of approximately 85%, but for critical access hospitals, the response rate

was very high at 99 percent. For this study, 12 key variables from the AHA data were used in the regression, described below.

The United States Department of Agriculture (USDA) calculates the Rural-Urban Continuum Codes to form a classification scheme that distinguishes metropolitan counties by size and nonmetropolitan counties by degree of urbanization and proximity to metro areas. For this code, the USDA divides the standard Office of Management and Budget (OMB) metro and non-metro categories into three metro and six non-metro categories, resulting in a 9-part county codification. The codes allow researchers working with county data to break such data into finer residential groups beyond a simple metro/non-metro dichotomy, particularly for the analysis of trends in non-metro areas that may be related to degree of rural and metro proximity. Since this data is based on census data, the latest version of the Rural-Urban Continuum was for 2003.

HRSA's Covered Entity Extract is the agency's database for managing 340B enrollment, enrollment changes, terminations, and the recertification process. The data includes identifying information as well as date of enrollment and any changes, the authorizing official, all relevant addresses and whether the entity uses a contract pharmacy. As previously mentioned, main sites can register outpatient facilities/clinics as "child" sites, thus the complete registration for a single Medicare provider number may be for multiple locations. This study treats the family of registrants as one grouping.

Apexus' data on 340B PVP enrollment and purchases was provided directly by Apexus, who is the only source for such information. Data on purchases made by 340B enrolled, but non-Apexus members would only be available at the individual hospital

level or from the other wholesalers and was not included due to the burden this would present to data collection. The Apexus dataset was provided on October 1st, 2012 and represents all registration and purchases by CAH at the Medicare Provider Number from the start of program eligibility through June 2012. The data included partial information on purchases made during the 3rd quarter (July-September) of 2012, but was excluded because it was incomplete. Of the 406 entities that were enrolled with the Prime Vendor as of 3rd quarter, 2012, this study only discusses the purchase volume for 387 for which there is complete purchasing information. The purchase data for the remaining 19 were excluded because they joined the Prime Vendor in the 3rd quarter, 2012.

Establishing the 340B Enrollment Status of Critical Access Hospitals

To identify the population of all critical access hospitals and the 340B enrollment status of each, data were obtained from the CMS and the Rural Resource Center, the AHA's 2011 Hospital Survey and OPA's Covered Entity Extract. The Rural Resource Center's list of all CAHs in the nation was accessed March 14, 2012 and identified 1,327 critical access hospitals. Unlike other hospital types, critical access hospitals do not have to meet a disproportionate-share adjustment threshold to qualify for 340B, so further confirmation of eligibility was unnecessary.

This list of 1,327 as the baseline was compared to the respondents to the AHA 2011 survey and merged on the Medicare Provider Number. The variables in the AHA survey form the core of the data for this study, so a match was required. The response rate by CAHs was exceptionally high and totaled 1,314, or 99 percent. The 13 CAHs that did not respond to the AHA survey were identified and excluded from the analysis.

Next, the list of the 1,314 CAHs who responded to the AHA survey was compared to HRSA's Office of Pharmacy Affairs' Covered Entity Extract as of October 1, 2012 to determine CAH enrollment in 340B. Enrollment for 340B is again based off of the Medicare Provider Number, so the identification was the same as in the first step. Entities enrolling in 340B must register for the main site (also known as the "parent site") as well as other outpatient facilities where drugs may be utilized and/or shipped ("child sites"), but for the purposes of this study, the unit of analysis is the entire hospital system, and does not take into account the special requirements of 340B registration which generate "child sites" of the parent registrant. The 340B ID is equal to the 3 letter "CAH" prefix, followed by its 6-digit Medicare Provider Number and a two digit number assigned by HRSA to indicate Parent (always "00") and children (e.g., "01", "02"); the match is based on the parent's number, but includes the children. This comparison yielded a list of 759 CAHs that were enrolled, 555 were not enrolled as of October 2012.

Categorizing Hospitals by 340B Participation Status: Typology Development and Defining the Dependent Variable

OPA's Covered Entity Extract provides detail into the history and current status of CAH enrollment as of October 2012. This data revealed 20 hospitals that had formerly been enrolled, but had terminated enrollment with 340B. Enrollment and purchase data provided by Apexus allowed for further categorization of CAHs enrolled with the 340B PVP. It also indicated whether or not purchases had been made by the end of the second quarter, 2012. In the end, analysis of the quantitative data allowed for the creation of a typology with entities classified into 6 distinct categories, as discussed in detail in Chapter 4.

This study examines 340B enrollment as separate from 340B purchasing as described in Chapters 5 and 6, respectively. 340B enrollment is defined as those hospitals that are currently enrolled in the program by October 31, 2012. An entities' enrollment is quarterly and this study considered the history of enrollment from August 2010 through October 1, 2012. The CAHs that applied by October 15, 2012 are eligible to begin participation in January 2013, following the cutoff for this study's analysis. The total number of enrolled hospitals is 739 and the number of non-enrolled is 575. For this analysis, the 575 includes the 20 hospitals that had been enrolled, but terminated enrollment prior to October 2012. The dependent variable of "enrollment" is coded "0" for hospitals that are not enrolled and "1" for those who are.

For this study, 340B purchasing through the 340B PVP is defined as a CAH making at least one purchase at the 340B price by September 30, 2012. The Apexus dataset completely tracked CAH 340B PVP purchases until July 2012 and included partial information through September 2012, so the data on the extent of purchasing is only presented for those with complete 340B PVP purchase history.

Entities that join the PVP have no purchasing restrictions on choice of wholesaler, minimum orders, etc., that might lead the entity to purchase off of a separate contract other than their GPO contract. In other words, if an entity is enrolled with the Prime Vendor, it is almost certain that any purchases made via 340B will be tracked through Apexus. It is possible that a CAH could inadvertently purchase off another account; however, it seems unlikely that a CAH that is fully enrolled and registered with the 340B PVP would not then take advantage of the 340B discount. If a CAH makes purchases

using an account other than its 340B account (whether the 340B PVP account or a stand-alone 340B account), it would not matter for the purposes of this project.

The analysis of 340B participation is a subset of the 739 that are enrolled in the 340B program. Of the 739 that are enrolled with OPA, 406 are also enrolled with the 340B PVP, Apexus, and 333 are not. The data from Apexus only includes the 406 entities enrolled in the 340B, thus limiting the analysis on purchases only to those made through the PVP. This data source does not, however, provide data on whether purchases have been made by the 333 CAHs enrolled in 340B, but not enrolled with the 340B PVP. As previously noted this information is not centrally available and would require primary data collection from each of the 333 CAHs. The dependent variable for "participation" is coded "0" if no 340B PVP purchases have been made through September 2012 and "1" for those with at least one purchase through the 340B PVP.

3.2 Covariates

The independent variables will include several items listed in Table 3. The covariates examined in this research were selected based on the literature review and they fall into 4 broad categories: Structural Measures, Service Measures, Setting Measures and Participation Measures. For the analysis on 340B enrollment, 12 variables come from the AHA data, one from the Rural Resource Center, and another from the USDA. For the analysis on 340B participation, four additional variables from the Covered Entity Extract were included. The logistic regression will be able to rank the relative importance of the independent variables (either continuous or categorical) and evaluate interaction effects.

Table 3: Independent Variables and Basis for Inclusion

Variable Name	Definition	Rationale for Inclusion	Analytic Value
STRUCTURAL FACTORS			
Bed Size	Number of certified beds	Those with more beds will likely offer more services and see more patients, getting more 340B value	0=1-20 beds 1=21-25 beds
Health System Membership	CAHs affiliation with a hospital system.	CAHs within a larger system will likely participate in a manner that reflects the system's other members or a unified approach to participation.	0=no, 1=yes
Total Outpatient Visits	Total outpatient visits including all clinic visits, referred visits, observation services, outpatient surgeries, home health service visits, and emergency room visits.	CAHs with high outpatient activity level will have more qualified prescriptions and will see value of 340B across a broader spectrum of drugs	0=1st quartile 1=2nd quartile 2=3rd quartile 3=4th quartile
Pharmacy Staffing	Sum of full and part time pharmacists and pharmacy technicians	The ability to evaluate whether to participate and then implement 340B is typically driven by the pharmacy department	0=no staff 1-4=small staff 5-9=medium staff 10-20=large staff
Electronic Health Record Implementation	The extent to which electronic health record is implemented	CAHs with EHR are more likely to be technologically savvy and better equipped to manage technical requirements of 340B	0=not implemented 1=partially implemented 2=fully implemented
Rural	Codes along a continuum distinguish metropolitan and nonmetropolitan counties by degree of urbanization and proximity to metro areas.	CAHs with greater community dependence may participate more than those where services are available elsewhere	0=County Code 9 1=County Codes 1 to 8
SERVICES			
Chemotherapy Program	Presence of an organized outpatient program for the treatment of cancer by the use of drugs or chemicals	Drugs used in chemotherapy programs are very high cost, so opportunity for savings via 340B is high.	0=no, 1=yes
Outpatient Surgery	Scheduled surgical services provided to patients who do not remain in the hospital overnight.	CAHs that offer outpatient surgery will yield prescriptions related to surgery that will likely qualify for 340B	0=no, 1=yes
Outpatient Psychiatric Services	Provides medical care, including diagnosis and treatment, of psychiatric outpatients	CAHs that offer outpatient psychiatric treatment would likely include ongoing prescriptions for mental health drugs.	0=no, 1=yes
Swing Services	A hospital bed that can be used to provide either acute or long-term care depending on patient needs.	The ability to provide swing services is another measure of capacity.	0=no, 1=yes

Table 3: Continued

Variable Name	Definition	Rationale for Inclusion	Analytic Value
CARE SETTINGS			
Freestanding Outpatient Clinic	A facility owned and operated by the hospital that is physically separate and provides treatments and diagnostic services on an outpatient basis only.	CAHs with outpatient clinics will likely have greater qualified prescriptions for 340B	0=no, 1=yes
Hospital based Outpatient Clinic	Organized hospital health care services offered by appointment on an ambulatory basis such as outpatient surgery and examination on a nonemergency basis.	CAHs with outpatient clinics will likely have greater qualified prescriptions for 340B	0=no, 1=yes
Rural Health Clinic	A hospital-owned clinic located in a rural, medically underserved area in the US that has a separate reimbursement structure from the standard medical office under the Medicare and Medicaid programs.	CAHs that own an RHC should experience higher outpatient encounters and more primary care encounters, increasing the value of 340B.	0=no, 1=yes
Indigent Care Clinic	Health care services for uninsured and underinsured persons where care is free of charge or charged on a sliding scale.	CAHs serving the uninsured would be able to buy drugs at a lower acquisition cost, lessening the impact of no or low reimbursement.	0=no, 1=yes
PARTICIPATION			
Total Sites Registered	Combination of registered sites main hospital (parent) and a primary care clinic (child).	Indicative of CAH size and outpatient opportunity.	0=1 site 1=2 to 12 sites
Presence of Contract Pharmacy	Retail or specialty pharmacies that the CAH has contracted with to dispense eligible prescriptions via the 340B program.	Contract pharmacy relationships can increase patients' access to therapies and be an efficient point of dispensing for entities with no or low dispensing options.	0=no contract pharmacy 1=One or more contract pharmacy
Quarters Enrolled	The number of total quarters enrolled between 1 and 9	Those in the program longer are more likely to have worked through any issues and will be purchasing.	0=1-3 quarters enrolled 1=4-6 quarters enrolled 2=7-9 quarters enrolled

3.3 Statistical Analysis

Statistical analysis was performed using SPSS. Chi-square tests were used to test the significance of differences between hospitals that are enrolled in 340B and those that are not. One-way analysis of variance (ANOVA) was performed to test the statistical significance of linear patterns in variables with more than two levels.

Data Transformation

The AHA defines the Total Outpatient Visit value as all visits by a patient not lodged in the hospital while receiving medical, dental, or other services. They specify that, "[E]very appearance of an outpatient in each unit constitutes one visit regardless of the number of diagnostic and/or therapeutic treatments that the patient receives. Total outpatient visits should include all clinic visits, referred visits, observation services, outpatient surgeries, home health service visits, and emergency department visits" (AHA 2011).

Three of the hospitals reported values that were considered to be outliers. Two had "zero" and one figure was over 200,000 visits higher than the upper 10%. Because these outliers have such an impact on the mean and on the logistic regression results, further research was conducted on the validity of these responses through internet searches and/or direct inquiries to the hospital. For the two "zero" values, they were nonresponses to the AHA survey and the correct value was replaced. For the highest outlier, the data included in the AHA survey response was off by a comma, thus making the value appear to be ten times the accurate number. This number was also replaced.

The AHA data for "bed size" for all hospitals was also replaced with more consistent and accurate CMS data. After seeing values that exceeded the 25-bed limit,

research on the validity of the AHA data confirmed complications with the response. Discussions with the Director of the University of Minnesota's Rural Research Center (a frequent user of the AHA data and a source for this project) corroborated the decision to use CMS data instead of the AHA data on this variable.

To make more meaningful comparisons between 340B enrolled and non-enrolled hospitals, total outpatient visits and other continuous variables were converted into categorical variables. As reported in Table 3, the data on total outpatient visits was divided into quartiles. Bed size was grouped into different ranges and then compressed into two groups for logistic regression, 0=1 to 20 beds and 1=21 to 25 beds. In this way, the discussion on the improved odds of enrolling in 340B is about the differences between the two categories rather than per bed. Similarly, categories were created for pharmacy staffing (low=0 to 4, medium=5 to 9, and high=10 to 20) and the extent to which an area is rural (0=rural urban continuum codes 1 to 8 for "urban", and 1=code 9 as the most rural). Electronic health record adoption data was likewise put into three categories to indicate no adoption, partial adoption and full adoption.

Recoding into categorical variables was also done for two of the three participation variables. As indicated in Table 3, the total number of sites was grouped into two categories—those with a single site versus those with between 2 and 12 total registered sites. Total length of time in the program was categorized into short (1 to 3 quarters), medium (4 to 6 quarters) and long (7 to 9 quarters) based on the total number of quarters enrolled.

Logistic Regression

Multiple logistic regression analysis was performed to determine the significant factors influencing 340B enrollment and participation. The research question in this study—whether a critical access hospital will enroll or not—is not ideally addressed through the more typical ordinary least squares regression or linear discriminate function analysis because of their strict statistical assumptions about things such as linearity and normality. The central mathematical concept behind logistic regression is the logit—the natural logarithm of an odds ratio. The logit is equal to the regression coefficient; taking the antilog of the logistic model equation on both sides, one derives the equation to predict the probability of the occurrence of the outcome of interest. Because this relationship is nonlinear, the natural log transformation of the odds is necessary to make the relationship between a categorical outcome variable and its predictor(s) linear. Thus, the interpretation of results is rendered using the odds ratios for all predictors. If the odds ratio equals one, it means the independent variable has no effect. Fractions less than one indicate a negative effect. If the odds ratio is more than one, it means a positive effect (Garson 2009).

For the model looking at the characteristics that more likely influence 340B enrollment, 14 variables were included in the model. For the model examining participation characteristics, 17 variables were used. Descriptive analysis of each predictor and its relationship with the outcome variable was reviewed to provide insight into the potentially viable models for the data. Continuous predictors such as size of

pharmacy staff, level of electronic health record adoption and the level of rural measurement were transformed into design variables for inclusion in the logistic model.

For each logistic model, the reporting addresses the overall evaluation of the model, goodness-of-fit statistics, and an assessment of the predicted probabilities (Peng, Lee & Ingersoll, 2002). Confidence intervals (CI) of 95% were calculated for the odds ratios. Each model's fit was measured using the Hosmer-Lemeshow goodness-of-fit tests. This test reports on the difference between actual and predicted values of enrollment and participation, the two dependent variables measured.

In linear regression, R^2 is clearly defined as the proportion of variation in the dependent variable that can be explained by the independent variables in the model. No equivalent exists to measure how successful logistic regression is at explaining the response, but the Cox and Snell R^2 and the Nagelkerke R^2 are indices that are variations of the R^2 concept used in ordinary least squares regression. Though these measures exist, because of the inherent limitations in application, this study just uses the Hosmer-Lemeshow test to indicate the appropriateness of the model selected.

3.4 Study Limitations

Although there were four new entity types made eligible for the 340B program via the PPACA, because CAHs account for the largest number of newly eligible entities and have unique reimbursement and organizational structures, this research will only focus on their use of the 340B. As a result, findings will only be applicable to critical access hospitals. The findings will also not apply to other types of entities whose eligibility for the 340B program pre-dates the PPACA.

One issue that is not of concern is external validity as it relates to the application of findings on the population of CAHs. This is because there was not sampling conducted and the results cover 99 percent of the population.

In addition, as already mentioned, the results of the analysis examining 340B purchases will only be for the subset of those CAHs that are enrolled in 340B and are also enrolled with the 340B PVP. This is because, unlike the PVP's data warehouse, there is not a centralized source of data for non-PVP enrollees aside from primary data collection for each hospital.

A limitation on measurement reliability stems from the manner in which some of the AHA survey data was reported. Although there is an overall response rate of 85%, which is high given the voluntary nature of the survey, the AHA has developed a statistical methodology to estimate missing values for hospitals that do not respond at all, or do not respond fully to the survey. This estimation impacts one covariate—total outpatient visits. The estimate is generated from regression models that include the previous year's data (base year) along with estimation status, percentage change in state median, metropolitan statistical size and bed size as independent variables to estimate the current year's value as the dependent value. According to the AHA, the regression model generates a coefficient for each independent variable, which is then used to estimate the current year's value. In sum, the current year's missing value is "predicted" by multiplying the base year data with the corresponding coefficients derived from the regression model (American Hospital Association, 2012).

Another potential issue with the AHA data could be the accuracy of the hospitals' responses. The AHA's survey instrument has been administered for many years; however, there is always the potential for issues with validity and reliability. The responses are self-reported, which can always introduce response bias. Specifically, the outliers on the total outpatient visit were a result of both error and non-response.

There is incomplete information for some of the variables. For the variable relating to electronic health records, there are 1,098 of 1,314 responses. For the service and the setting variables, all 0 or 1 responses, there were 1,062 responses. The data was missing, so the findings are reported only for these subsets.

The Electronic Health Record supplement is from 2009, which means the data was collected in 2008. This was the most recent data available at the point of request in the spring of 2012. The status of EHR adoption has changed significantly over the last five years. One study found that the share of hospitals with any electronic health record system increased from 15.1 percent in 2010 to 26.6 percent in 2011, and the share with a comprehensive system rose from 3.6 percent to 8.7 percent (DesRoches, Worzala, Joshi, Kralovec and Jha 2012). In 2011, CMS began an EHR incentive program that specifically targets critical access hospitals to use electronic technology to better serve patients (Centers for Medicare & Medicaid Services, Electronic Health Record Incentive Program, 2013). Yet, adoption in small and rural hospitals is still behind their larger and urban counterparts. The same study found that hospitals like CAHs continue to adopt electronic health record systems more slowly than other types of hospitals. As such, having data for one variable that is older than the primary data set of AHA data might not

be as big of an issue as it would be in larger hospitals, although it is still a limitation worth noting.

A common question for all researchers is whether or not all possible variables were captured and then considered in the regression model. Some variables that could have been included, such as the outpatient pharmacy purchases of a hospital, payer mix of the facility, cost of implementation and compliance, would have required primary data collection, which was beyond the scope of this project.

It is also possible that the dependent variable of enrollment based on the assumption that a decision was made to enroll or not is not valid. Program participation is new; however, there have been large scale campaigns by the National Rural Health Association, state hospital associations, HRSA's Pharmacy Services and Support Center and SNHPA to inform and educate eligible CAHs. Furthermore, the extent of reform instituted by the PPACA was major. It is very possible that despite these efforts and the media coverage surrounding health reform, there may be CAH administrators who are unaware of the 340B program and who did not make a conscious decision to not participate; rather, they are unaware of the program. Several prior studies have found that awareness of the 340B program, despite eligibility, is limited and could be improved (Schmitz et al 2004, Schur et al 2007).

Logistic regression, as with all statistical tests, has limitations. With use of the logit transformation, the results predict the probability of group membership against the covariates independent of their distribution. The premise underlying this assumption is that there is an s-shaped dependency between the probabilities of group memberships and

a linear function of the predictor variables. The logistic regression analysis is also based on calculating the odds of the outcome as the ratio of the probability of having the outcome divided by the probability of not having it, so it assumes independency among the observations (Antonogeorgos, Panagiotakos, Priftis and Tzonou, 2009).

For logistic regression to give trustworthy and reliable estimates, it requires a large number of cases. The 1,314 cases in this research meet this criterion. Unlike OLS regression, logistic regression uses maximum likelihood estimation (MLE) rather than ordinary least squares (OLS) to derive parameters. MLE relies on large-sample asymptotic normality which means that reliability of estimates declines when there are few cases for each observed combination of independent variables. The more unequal groups are formed from the dependent variable, the more cases are needed. At the same time, logistic regression does not demand multivariate normality or homoscedasticity for the predictor variable, but if these conditions are fulfilled, the power of the prediction is increased (Wright, 1995).

Logistic regression's goodness-of-fit measures also have limitations. In linear regression, R^2 has a clear definition: It is the proportion of the variation in the dependent variable that can be explained by predictors in the model. Attempts have been devised to yield an equivalent of this concept for the logistic model, but none have been devised. Furthermore, no similar concept corresponds to predictive efficiency or can be tested in an inferential framework (Menard, 2000). The two descriptive measures of goodness-of-fit are considered R^2 indices, defined by Cox and Snell (1989) and Nagelkerke (1991), respectively. These indices are variations of the R^2 concept defined for the OLS

regression model. For these reasons, a researcher can treat these two R^2 indices as supplementary to other, more useful evaluative indices, such as the overall evaluation of the model, tests of individual regression coefficients, and the goodness-of-fit test statistic (Peng, Lee & Ingersoll, 2002). As previously stated, this research will rely on the Hosmer-Lemeshow as the test for goodness-of-fit.

Chapter 4: The 340B Typology:

A New Framework for Informed Research, Policy and Practice

4.1 Context for the 340B Typology

There is a need for a new framework for which to reflect the complexity of what it means to "participate" in 340B. Policies have been and are currently being constructed based upon simplistic assumptions about program use. This typology—developed with critical access hospitals as the exemplar entities, but applicable to all entities—can be used by policymakers to incorporate an increased understanding of the complexities of 340B participation.

There has been little research presenting a systematic way of thinking about a theoretically-based conceptual framework for 340B participation that would serve as a guide to the discussions occurring at the various points along the policy life cycle. In particular, this framework helps to better consider the complexity of problem and the variety of potential outcomes. Classifying the universe of CAHs into groupings upon their interactions with the 340B Program more accurately depicts the complexity and variation of the program. Having an accurate framework and understanding of the range across how entities do and do not utilize 340B will better inform research, policy and practice.

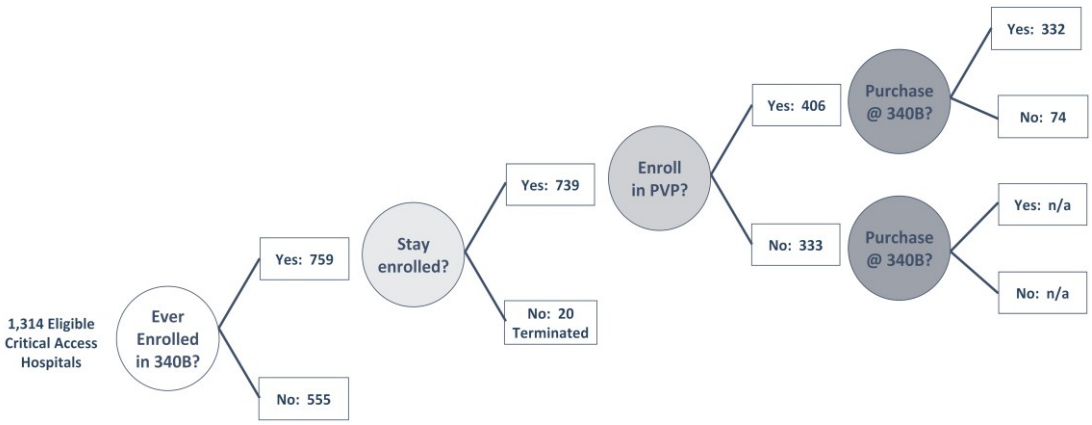
Classification methods, such as grouping cases together into types, helps researchers make sense of the multitude of attributes that a subject group can have and can ultimately improve future research. In many studies, types are constructed in order to comprehend, understand and explain complex social realities (Kluge 2000). The 340B participation typology is based upon various ways in which entities do or do not interact

with the 340B Program. There are other issues that a complete 340B policy framework should explore, such as compliance requirements, etc., but for this research, the framework is focused on classifying entities into categories based on enrollment and purchasing patterns.

4.2 Description of the 340B Typology

The 340B participation typology is grounded in basic decision-making and follows a logical pathway, as shown in Figure 6. Starting at the beginning, there are 1,314 total CAHs. The first decision made by the hospitals is whether or not to enroll. The regression results will help inform what makes a hospital more likely to enroll in 340B, but there are very likely other issues not examined, such as failure to enroll based on a lack of hospital awareness of eligibility. At this juncture, there are 555 CAHs not enrolled and 759 enrolled in the 340B Program.

Figure 6: 340B Participation Pathway, Critical Access Hospitals, 2012



Next, hospitals must determine whether to remain enrolled. This entails a commitment to compliance and the investment to implement and update a new program in the pharmacy department; yet, it could also mean just passively maintaining enrollment and not actually purchasing drugs. By October 2012, 20 hospitals had initially enrolled in the 340B Program but later terminated their enrollment.

OPA's Covered Entity Data Extract maintains a list of entities that have been "terminated" from 340B as well as the reasons for termination. Table 4 presents the count of hospitals and the reasons for dropping out of the program. Termination requires either an active or a passive decision by the hospital leadership. Many hospitals terminated at the time of CAH recertification in July 2012 either at their request or because they were nonresponsive to the recertification process.

Table 4. Termination Codes for Critical Access Hospitals Formerly Enrolled in the 340B Program

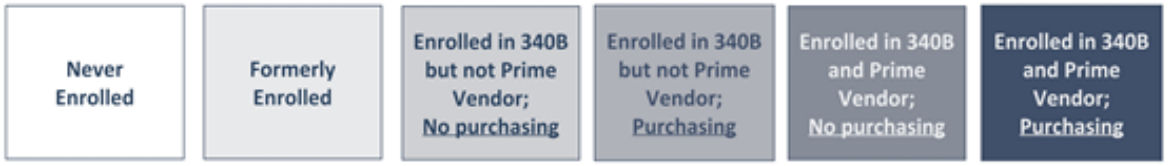
Number of Hospitals	Termination Code & Definition
11	11-At the request of the covered entity
1	12-Site Closed
6	13-Nonresponse to Certification or revalidation request
2	32-Hospital converted to for profit

The next critical point for decision making by hospitals is whether to enroll with the 340B Prime Vendor Program (PVP). Of the 739 enrolled with HRSA, 406 enrolled with the PVP and 333 did not. Data provided by the PVP details enrollees' actual purchases, which more accurately informs the categorization of CAHs by whether they had purchased drugs through the 340B PVP or not. Of the 406 hospitals, 332 are purchasing drugs at the 340B price through the PVP and 74 are not.

There is no centralized source to track the purchases of CAHs that are not enrolled in the 340B PVP and obtaining the data would mean primary collection of invoices from each of the 333 hospitals in this group. .

By the close of 2012, using all data available, the 1,314 CAHs in the study sample can be divided into the following six exhaustive and exclusive categories: (1) never enrolled; (2) formerly enrolled; (3) enrolled in 340B, but with no purchases; (4) enrolled in 340B with purchases; (5) enrolled in 340B and the PVP, but with no purchases; and (6) enrolled in 340B and the PVP and making purchases through the PVP (Figure 7).

Figure 7: Typology of 340B Enrollment and Purchasing: Six Categories



Two interesting cohorts for discussion are those hospitals that were formerly enrolled, but terminated their participation and those hospitals enrolled in 340B and the PVP, but are not yet purchasing. If a hospital loses its eligibility (e.g. converts to for-profit) or closes, notifying OPA of their intent to terminate is necessary; however, further research is in order to explore the reasons for termination by those hospitals whose eligibility for 340B is unchanged.

For the CAHs that are enrolled with 340B and the PVP, but have yet to make purchases, it only appears that they are taking advantage of the 340B program, but real "participation" is not occurring. These hospital decision-makers applied for 340B

initially, registered with the PVP and went through HRSA's July 2012 recertification process, but have not used the program. It could be assumed that these hospitals signed up without a plan for implementation or are waiting on assistance from vendors or contract pharmacies. Primary data collection requesting insights from these hospitals is logical follow up research.

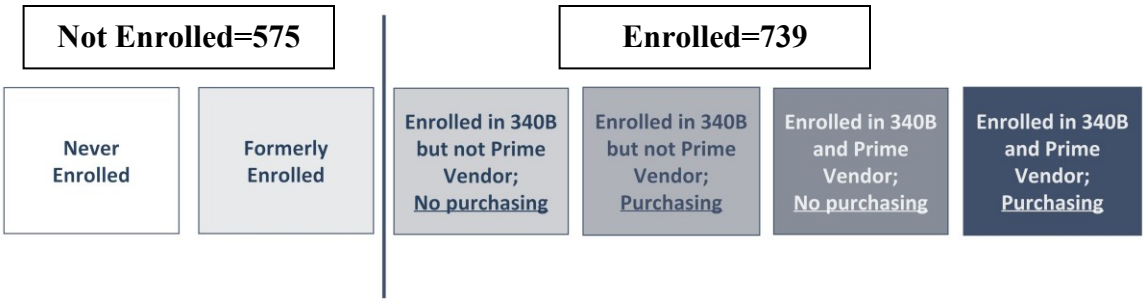
Finally, these are the 6 groupings that could be put together based on descriptive and quantitative data. Preliminary discussions with CAH pharmacy directors suggest that other groupings could be even more nuanced. For example, a hospital could be enrolled in 340B and enrolled in PVP, but only utilizing 340B for a single product rather than using the PVP for most or all of its drug purchases. More extensive quantitative and qualitative data collection would be necessary to further explore more nuanced program use.

Chapter 5: Critical Access Hospitals' Enrollment in the 340B Program

5.1 Introduction

This chapter examines the differences between the 739 CAHs that are currently enrolled in the 340B Program and the 575 that are not enrolled. The breakdown of groups in this comparison according to the 340B typology is highlighted in Figure 8. Descriptive statistics and tests for differences in the group means were performed to examine whether there are certain characteristics that are more associated with those that enroll versus those that do not. To examine which factors are more likely to predict enrollment in 340B, this study relies on logistic regression.

Figure 8: Comparison of Critical Access Hospitals Enrolled and Not Enrolled in the 340B Program



5.2 Quarterly 340B Enrollment Data and State Enrollment Patterns

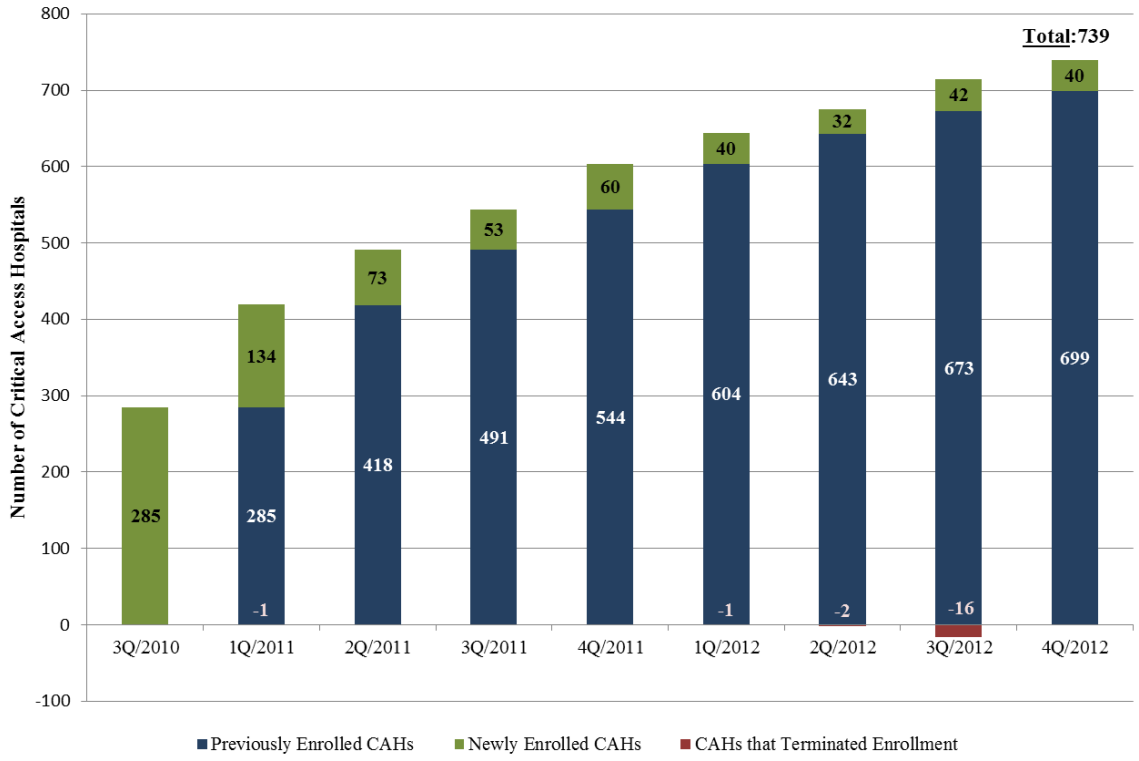
At the close of 2012, 56 percent of eligible critical access hospitals were enrolled in the 340B Program. About one-third of enrollees, 285 CAHs, started with the program in the first two months of program eligibility, August and September 2010. Between the start of August and end of September 2010, entity enrollment and start dates were temporarily accepted on a rolling basis. Starting October 1, 2010, HRSA resumed its practice of quarterly enrollment whereby entities that registered during the 4th calendar quarter of October through December 2010 would be eligible on the first day of the

following calendar quarter, or, January 1, 2011. In other words, the 134 entities that applied between October and December 2010 were eligible to begin using the 340B discount on January 1st, 2011. Figure 9 shows enrollment patterns of CAHs that were approved for the 340B Program between August 2010 and October 2012. There is no data for October through December of 2010 because of the lag in HRSA's quarterly enrollment requirement at the onset of CAH eligibility.

According to Figure 9, following these first two periods of possible enrollment, the number of new enrollees has decreased each calendar quarter. In fact, for all of 2012, the average quarterly enrollment declined to just above 38 enrollees, down by over one-half from the same point in the previous year.

Besides the new enrollees to the 340B Program over the two years tracked in this project, 20 entities terminated their use of the program. The dropped CAHs are indicated as negative numbers at the bottom of the scale. Sixteen of the terminations occurred during the period in which HRSA conducted its first annual recertification of CAHs, July 2012. Inclusive of additions and terminations, the net total of enrolled CAHs at the close of 2012 is equal to 739.

Figure 9: Critical Access Hospital Enrollment in the 340B Program, 2010-2012



Source: Quarterly download of HRSA's Covered Entity Extract, All Enrollment by Critical Access Hospitals, October 2012.

Figure 10 provides a comparison of CAH 340B enrollment levels by state. The total number of CAHs in each state depends largely upon the location requirement, infrastructure and whether the state's governors have granted special CAH designation to hospitals that do not meet all requirements, but are considered essential providers. Not all states have hospitals with the CAH designation, but for the 45 states that do, the total number of designated hospitals ranges from 2 in Alabama to 83 in Kansas. Yet, as illustrated below, the total number of hospitals in the state does not always correlate the percent of hospital enrollment in the 340B Program.

Figure 10 is divided into four quadrants for illustrative purposes. In the first quadrant, nearly one-half of the states have lower numbers of CAHs, but have overall

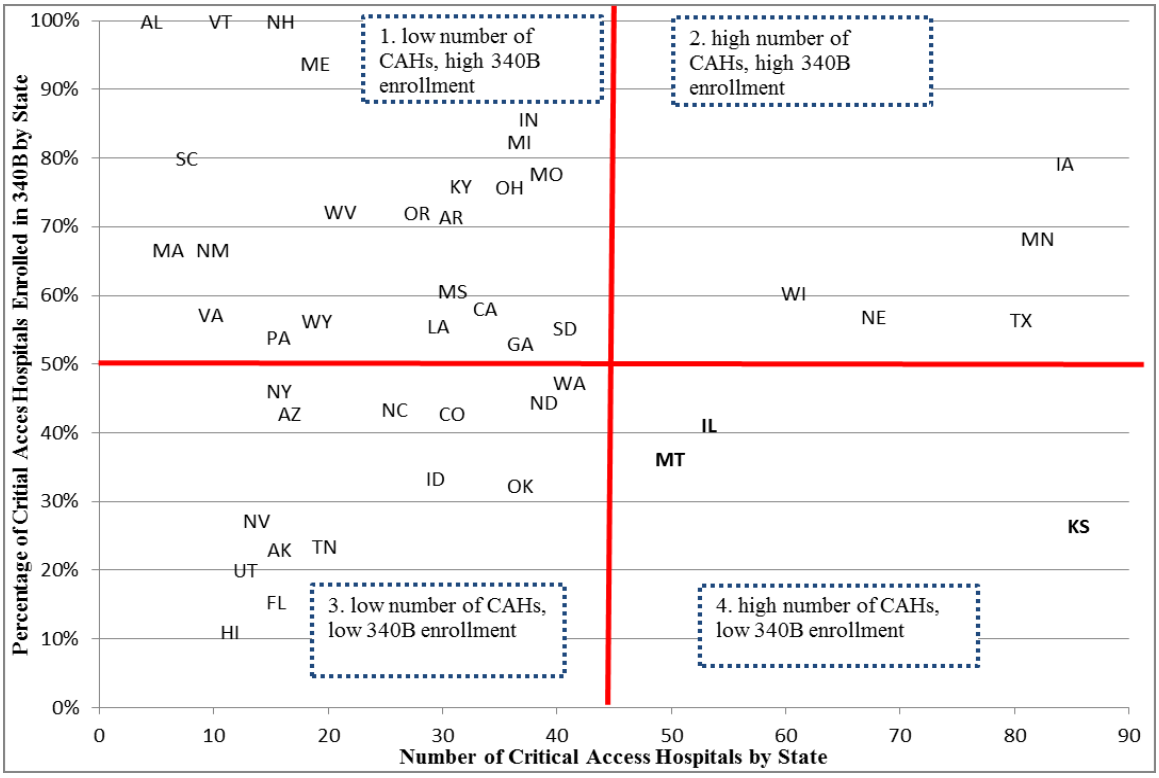
enrollment rates that exceed the national average of 56% enrollment. For example, both of Alabama's CAHs are enrolled in 340B, but its high enrollment rate is moderated by having the lowest number of CAHs in the country. Nonetheless, the states in this quadrant are performing well when it comes to enrollment.

The second quadrant represents states with a high number of CAHs and an above average percent enrollment in the 340B Program. Five states fall into the second quadrant. Iowa serves as an illustration of the pattern in the second quadrant in that it has the second highest number of CAHs in the country and 79% of the CAHs are enrolled in 340B. In the third quadrant, the number of total CAHs per state is below the median and the percent of CAHs enrolled is also below average. Fourteen states fall into the third quadrant.

Finally, in the fourth quadrant, the points represent the states with the highest total number of CAHs, but with the weakest enrollment in 340B. For example, Kansas has the most CAHs at 83, yet Kansas has a poor 340B enrollment rate at 27%. The other two states in this group, Illinois and Montana, are also in the top ten in terms of total number of CAHs, but fall short in 340B enrollment with 41% and 36%, respectively.

While it was not the objective of this study, it would be interesting to further examine state influences or other differences that could impact enrollment rates for CAHs located in various states.

Figure 10: Number of Critical Access Hospitals and Percentage Enrolled in 340B by State



Source: HRSA's Covered Entity Extract, Enrollment by Critical Access Hospitals by State, October 2012

More than one-half of the enrolled CAHs are additionally enrolled with the 340B PVP, administered by Apexus. Of the 739 hospitals enrolled in 340B, 406 have taken the additional, voluntary step of enrolling with the PVP. This PVP enrollment rate of 55% is higher than the majority of measures found in previous studies looking at PVP enrollment (Schmitz et al 2004; Schur et al 2007; Wilensky 2010), but not as high as certain other 340B entity types, such as Family Planning Clinics at nearly 100% (Lewin and the Guttmacher Institute, 2009).

5.3 Characteristics of 340B Enrolled Hospitals

This section explains how each of the 14 variables included in the analysis relate to critical access hospitals that have enrolled in 340B. The 14 variables are organized

into three groupings with 6 structural, 4 setting and 4 service variables. For each variable, the tables first present the 340B enrollment rate for the variable groupings presented. For example, it shows what enrollment looks like for hospitals with no pharmacy staff, 1 to 4 on the pharmacy staff, 5 to 9 staff, and those CAHs with between 10 and 20 on their pharmacy staff. When the variable has two levels (presence or absence of service or setting), the chi-square results are provided. Where there are more than two categories, a two by four or more chi-square test was run; likewise, a one-way ANOVA test was run to determine if the linear trend was significant. The tables then show how all CAHs in the study are distributed by category; for example, how many of the 1,314 CAHs are in the small, medium, and large pharmacy staff groupings. Finally, it shows the percentage of total enrolled, or, how many of the 739 hospitals enrolled in the 340B Program fall into the small, medium and large pharmacy staffing levels.

Structural Variables

The examination of differences between 340B enrolled and non-enrolled CAHs begins with a look at six variables that can represent a hospital's structure and capacity. These variables include: (1) bed size; (2) whether they are part of a health system or a stand-alone hospital; (3) the number of total outpatient visits, including emergency room; (4) the total staffing in the pharmacy department; (5) how fall along the CAH is in implementation of electronic health records; and (6) the category of the community on a rural-urban continuum.

To qualify as a CAH, the facility is limited to 25 beds. The total number of beds per hospital in this sample ranged between 2 and 25 with the vast majority of CAHs having between 21 and 25 beds. Table 5 shows the rate of enrollment in 340B by each

grouping of bed size, percent of enrolled hospitals by bed size, and the distribution of all 1,314 CAHs by bed size.

As the number of beds increases, so does the rate of enrollment within each group, increasing from 20% enrollment at the low end and 62% at the highest end with a significance of p<.001. Proportionately, there are many more 340B-enrolled hospitals in the highest range of bed size and this group of between 21 and 25 beds also makes up the largest percentage of those CAHs across the country.

Table 5: 340B Enrollment Increases with Bed Size

Bed Size Range	Within Group Enrollment Rate*	Percent of Total (1,314)	Percent of Total Enrolled (739)
1-5	20%	1%	0%
6-10	29%	3%	1%
11-15	33%	10%	6%
16-20	47%	10%	8%
21-25	62%	77%	84%

*One-way ANOVA test for trend in differences was significant at the $p < .001$ level; Chi-square test for within group enrollment between groups with bed size of 1 to 20 and 21 and 25 was significant at the $p < .001$ level

Although the within-group enrollment rate is higher for the hospitals that are part of a system, more critical access hospitals (60%) are not affiliated as a member of a health system and more of these non-system members organizations, 57% versus 43%, are enrolled in 340B (Table 6).

Table 6: 340B Enrollment Rate Better for Critical Access Hospitals Affiliated with a Health System

System Affiliation	Within Group Enrollment Rate*	Percent of Total (1,314)	Percent of Total Enrolled (739)
Yes	61%	40%	43%
No	53%	60%	57%

*chi-square test for differences was significant at $\chi 2<.002$

The total number of outpatient visits among all of the 1,314 CAHs ranged from a reported 176 to 352,142 with an average number of visits totaling 33,676. The measure used by the AHA is the sum of outpatient visits, including clinics and emergency room, all sites for which the patients would likely qualify for the 340B discount. The average number of outpatient visits per year for 340B-enrolled hospitals is 40,956 compared to 24,319 for those not enrolled.

The variable measuring total outpatient visits is divided into quartiles to make more meaningful distinctions by groups. As such, the distribution of quartiles is equal at 25% per group of range of visits. Table 7 shows the range of visits included in each quartile, the within group enrollment rate, and the percent of the total enrolled in 340B. By group, as CAHs' number of total outpatient visits increases, so does the rate of enrollment. Moving from the 1st to 4th quartiles, the rate increases from 34% to 77% and the test for trend reveals a significant linear pattern with $p<.001$. The hospitals with outpatient visits that fall into the first quartile make up a smaller percent of total 340B enrollment and those that fall into the fourth quartile make up the most, with the second and third quartiles each taking up around a quarter of the total enrolled.

Table 7: 340B Enrollment Increases as Critical Access Hospitals' Total Outpatient Visits Increase

Total Outpatient Visits by Quartile	Within Group Enrollment Rate*	Percent of Total (1,314)	Percent of Total Enrolled (739)
1st Quartile: 176-12,524 visits	34%	25%	15%
2nd Quartile: 12,537-23,908 visits	52%	25%	23%
3rd Quartile: 24,035-43,267 visits	62%	25%	27%
4th Quartile: 43,269-352,142 visits	77%	25%	34%

*Chi-square test for within group enrollment differences and One-way ANOVA test for trend in differences were significant at the $p < .001$ level

Enrollment in 340B by hospitals also varies by the total number of staff working in the pharmacy department. The 340B program requires significant administration and monitoring, so the total number of both full and part-time pharmacists and pharmacy technicians is an important variable. Across all 1,314 CAHs, two was the most frequent number of full-time and part-time pharmacists and pharmacy technicians reported by 250 hospitals. Comparatively, 218 CAHs reported having no pharmacy staff. Staff of 10 or greater was reported as occurring in 4% of the hospitals.

Table 8 shows 340B enrollment when examined against the capacity of the pharmacy staff at the hospital. Looking at the within-group enrollment rate, the hospitals with 10 or more professionals in the pharmacy department only comprise a small percentage of the total enrolled, yet, 82% of these hospitals were enrolled. The enrollment rate by group increases as the pharmacy staff size grows from 47% to the aforementioned 82%. Of all CAHs, over one-half of the 340B enrolled population comes from CAHs with 1 to 4 on the pharmacy staff.

Table 8: 340B Enrollment Increases as the Pharmacy Staff Increases

Count of Pharmacy Staff	Within Group Enrollment Rate*	Percent of Total (1,314)	Percent of Total Enrolled (739)
0	47%	17%	14%
1-4	52%	57%	53%
5-9	70%	22%	28%
10-20	82%	4%	6%

*Chi-square test for within group enrollment differences and One-way ANOVA test for trend in differences were significant at the $p < .001$ level

The extent to which a hospital has implemented electronic health records appear to play an important role in analyzing a hospital's capacity to manage the technical and compliance requirements of the 340B Program. Across 1,098 respondents for which the AHA had responses, 64% of hospitals have partially implemented EHR. Twenty-four percent of the CAHs have not implemented EHR and only 12% have fully implemented EHR. Of the 644 CAHs enrolled in 340B, the majority (67%) of hospitals fall into the partially-implemented EHR category.

According to Table 9, as adoption of electronic health records increases, so does the within group enrollment in 340B ($p<.001$). For those hospitals that have yet to implement EHR, 43% are enrolled in 340B. The group of CAHs that has fully implemented EHR is the smallest, although the percent of this group enrolled in 340B is highest at 75%. For those hospitals that have partially implemented EHR, 62% are enrolled in 340B.

Table 9: 340B Enrollment Rate Highest for Critical Access Hospitals with Fully Implemented Electronic Health Records

EHR Implementation	Within Group Enrollment Rate*	Percent of Total (1,098)	Percent of Total Enrolled (644)
Not implemented	43%	24%	18%
Partially Implemented	62%	64%	67%
Fully Implemented	75%	12%	15%

*Chi-square test for within group enrollment differences and One-way ANOVA test for trend in differences were significant at the $p < .001$ level

To receive the designation of critical access hospital, one important criterion is the degree of isolation, or how "rural" the service area is. CAHs can also receive their designation regardless of the location requirement if the governor waives it. The CAH program is intended to serve rural Medicare and Medicaid beneficiaries and it is possible that CAHs with greater community dependence that is more rural may participate more than those where services are available elsewhere.

To examine 340B enrollment by how rural the area in which the CAH is located, this study uses the USDA's 2003 Rural-Urban Continuum Codes. This system forms a classification scheme that distinguishes metropolitan counties by size and nonmetropolitan counties by degree of urbanization and proximity to metro areas. These codes range from 1, which is the most urban, to 9, the most rural counties (U.S. Department of Agriculture, 2003).

Within the groups, the 216 hospitals located in the most rural areas (indicated by a "9" and defined as a completely rural county with a population of less than 2,500) have the weakest overall enrollment rate at 39% compared to CAHs in other areas with enrollment in excess of 50%. The most urban category "1" has a CAH 340B Program

enrollment of 62% (Table 10). The completely rural counties included in code 9 are home to the third largest number of CAHs, following counties that fall within the parameters of codes 6 and 7, whose CAHs have enrollment rates of 57% and 63%, respectively. The CAHs in the most rural counties (Code 9) account has the lowest enrollment rate (39%).

Table 10: 340B Enrollment at or Above National Average of 56% for All CAHs Except Those Located in the Most Rural Counties at 39%

Rural-Urban Continuum Code	Within Group Enrollment Rate*	Percent of Total (1,314)	Percent of Total Enrolled (739)
1 (most urban)	62%	4%	5%
2	61%	6%	7%
3	64%	7%	8%
4	61%	6%	6%
5	59%	3%	3%
6	57%	28%	28%
7	63%	22%	25%
8	52%	8%	8%
9 (most rural)	39%	16%	11%

*One-way ANOVA test for trend in differences was significant at the $p < .001$ level; Chi-square test for within group enrollment between groups 1 to 8 and group 9 was significant at the $p < .001$ level

More than one-half of the hospitals designated as a CAH and enrolled in 340B are located in the counties with a code of 6 or 7. Counties in code 6 are defined as non-metro with urban population of 2,500-19,999, but adjacent to a metro area, while those in code 7 have the same population but are not adjacent to a metro area. The hospitals in the two most rural codes—8 and 9—make up both a small overall portion of the total and of those enrolled in 340B.

Service Variables

This study next examined four variables related to the types of services each CAH offers and statistical tests were performed to determine if there were significant differences between those that enrolled in 340B and those that did not. These variables include: (1) chemotherapy; (2) outpatient surgery; (3) outpatient psychiatric services; and (4) swing bed services. These services were selected because they are outpatient services which may involve use of outpatient prescriptions that could be eligible for 340B prices.

The AHA data contained missing data for the same 252 hospitals across the four service variables; thus, the universe is equal to 1,062 CAHs, with 627 enrolled in 340B. Table 11 provides the within group enrollment rate, total percent of hospitals that are providing the service and the percent of 340B enrolled by service across these four areas.

Table 11: Three of Four Service Variables Impact Hospitals' 340B Enrollment

Service Variables	Within Group Enrollment Rate	Percent of Total (1,062)	Percent of Total Enrolled (627)	χ^2
Chemotherapy				<.001*
Yes	71%	34%	41%	
No	53%	66%	59%	
Outpatient Surgery				<.001*
Yes	64%	84%	91%	
No	34%	16%	9%	
Outpatient Psych				.036*
Yes	68%	12%	13%	
No	58%	88%	87%	
Swing Bed Services				.813
Yes	59%	92%	92%	
No	60%	8%	8%	

*chi-square test for differences was significant at at $\chi 2<.05$

The first service reviewed was chemotherapy, which entails the provision of therapies associated with expensive cancer treatment. Only about one-third of hospitals (361 out of 1,062 responses) provide chemotherapy services, not surprising due to the strict storage and administration requirements and potentially the lack of space, personnel or patient demand in certain areas. Although there are fewer hospitals that provide this service, enrollment in 340B sharply differs between the CAHs that offer and do not offer chemotherapy. Even though few CAHs provide chemotherapy, the CAHs that do provide chemotherapy have a 71% enrollment rate in 340B. Of the total 627 enrolled, 41% offer chemotherapy and 59% do not.

Critical access hospitals that provide outpatient surgery had twice the enrollment rate in 340B when compared to CAHs that did not provide outpatient surgery. At the same time, most hospitals in the country are offering this service at 84% and of the total enrolled in 340B, 91% offer outpatient surgery.

Only 12% of the CAHs in this study provide outpatient psychiatric services, but of those that do, 68% are enrolled in 340B, and the difference between groups is significant with a p-value of .036. This could be because hospitals that offer outpatient psychiatric treatment would likely include ongoing prescriptions for mental health drugs. Of the 938 hospitals not providing outpatient psychiatric services, 58% are enrolled. Based on the modest significant difference that this service makes on 340B enrollment, it is likely that providing outpatient psychiatric care does impact the decision to enroll but not as strongly as outpatient surgery does.

Nearly all CAHs provide swing bed services at 92% and the same proportion applies to the total enrolled in 340B. According to the within group data, however, there is little difference in 340B enrollment between those that do and do not provide these services, with the percentage around 60% for both groups and an insignificant p-value. Because swing beds can be used for both inpatient and outpatient use and the 340B Program is for outpatient drugs only, the negligible difference in enrollment whether a CAH offers swing bed services could be attributed to either the difficulty in tracking patient status (inpatient or outpatient) or a low utilization of drugs for patients occupying the swing beds.

Settings Variables

An additional 4 variables related to the settings in which CAHs provide outpatient care were examined and include: (1) whether the hospital offers a freestanding outpatient care center that is separate from the hospital; (2) whether they have a hospital-based outpatient clinic; (3) whether the hospital owns a Federally-designated rural health clinic, and (4) whether the CAH provides an indigent care clinic. Like the service variables, the response to the AHA survey for these questions included 1,062 respondents and the number enrolled was 627.

As Table 12 indicates, the only significant setting variable that impacts 340B enrollment is whether the hospital has a free-standing outpatient center. In general settings do not seem to play a role in the hospitals' choice to enroll in 340B. Only 10% of CAHs in the country have a free-standing outpatient care center but for those that do, 70% are enrolled in 340B. The total distribution of the 340B enrollees is 87% without a

free-standing center versus 12% that do. Within groups, though it is more common for a CAH with this type of center to enroll, the difference is not that notable in the group that does not have a free-standing center at 58%.

Operating a Hospital Based Outpatient Clinic means the CAH offers health care services by appointment on an ambulatory basis. As seen above, only 4% of CAHs reported that they operate a hospital-based outpatient clinic and enrollment in 340B is skewed heavily toward those hospitals that do not have one (96%). The enrollment rate within each group only varies slightly based on having (65%) or not having (59%) a hospital-based outpatient clinic.

Table 12: Of the Setting Variables, Only Presence of A Free-Standing Outpatient Center Impacts 340B Enrollment

Setting Variables	Within Group Enrollment Rate*	Percent of Total (1,062)	Percent of Total Enrolled (627)	χ^2
Free-Standing Outpatient Center				.012*
Yes	70%	10%	12%	
No	58%	90%	88%	
Hospital-Based Outpatient Clinic				.384
Yes	65%	4%	5%	
No	59%	96%	95%	
CAH Owned Rural Health Clinic				.939
Yes	41%	45%	45%	
No	49%	55%	55%	
Indigent Care Clinic				.110
Yes	68%	8%	9%	
No	58%	92%	91%	

*chi-square test for differences was significant at at $\chi^2<.05$

The CAHs without an owned rural health clinic (RHC) participate in 340B slightly more than the hospitals that own a RHC (49% v 41%). Rural Health Clinics were established by the Rural Health Clinic Service Act of 1977 to address an inadequate

supply of physicians serving Medicare beneficiaries in underserved rural areas, and to increase the utilization of nurse practitioners (NP) and physician assistants (PA) in these areas. RHCs are defined in section 1861(a)(2) of the Social Security Act (the Act) as facilities that are engaged primarily in providing outpatient services that are typically furnished in a physician's office.

Rural health clinics can be independent or provider-based, but do not qualify for the 340B Program on their own. If, however a CAH owns the RHC, the prescriptions originating from the primary care provided at the RHC could potentially be eligible for 340B. There are more CAHs that do not own a RHC than those that do at 45% versus 55% and these same percentages are reflected in the quantities of hospitals enrolled in 340B/

Finally, very few CAHs operate indigent care clinics that provide health care services for uninsured and underinsured persons free of charge or charged on a sliding scale. This would include "free clinics" staffed by volunteer practitioners, but could also be staffed by employees with the sponsoring health care organization subsidizing the cost of services. Although the within group enrollment rate for those that do have indigent clinics is 68% versus 58% for those that do not, only about 8% of CAHs administer these clinics.

To see whether there was a connection between providing care through one or more of these settings and 340B enrollment, the sum total of settings per hospital was examined. None of the hospitals examined offered all four options for outpatient clinic settings tracked by the AHA survey. Fifteen of the hospitals (1%) reported offering three

of the clinics, of which 2% are enrolled in 340B. There is about an equal number of CAHs with no outpatient clinics and CAHs with at least 1 of the 4 types of clinics and the 340B enrollment rates were similar. But, for those CAHs with 2 outpatient services offerings, the enrollment rate was 68%. When the number of sites increased to 3 sites for outpatient encounters, the 340B enrollment rate goes up to 80% (Table 13).

Table 13. 340B Enrollment Increases as the Total Number of Outpatient Clinics Increase

Number of Clinics	Within Group Enrollment Rate*	Percent of Total (1,062)	Percent of Total Enrolled (627)
No clinics	58%	45%	44%
1 clinic	58%	44%	43%
2 clinics	68%	10%	11%
3 clinics	80%	1%	2%

*One-way ANOVA test for trend in differences was significant at the p=. 047

5.4 Summary of Unadjusted Comparisons

To examine the extent of differences in the characteristics of the enrolled and non-enrolled hospitals, chi-square tests were performed on the within group differences across all variables.

Table 14 shows that there is a statistically significant difference (at the .05 level or greater) between the mean scores for 10 of the 14 variables for the CAHs that are enrolled in 340B versus those that are not enrolled.

Table 14: Summary of 340B Enrollment for Structural, Service and Setting Variables

Structural Variables	Within Group Enrollment Rate	$\chi 2$
Bed Size Groups		<.001*
1-20	38%	
21-25	62%	
System Affiliation		<.002*
Yes	61%	
No	53%	
Total Outpatient Visits		<.001*
1st Quartile	34%	
2nd Quartile	52%	
3rd Quartile	62%	
4th Quartile	77%	
Count of Pharmacy Staff		<.001*
0	47%	
1-4	52%	
5-9	70%	
10-20	82%	
EHR Implementation		<.001*
Not implemented	43%	
Partially Implemented	62%	
Fully Implemented	75%	
Geographic Location		<.001*
Codes 1-8	60%	
Code 9	39%	
Service Variables		
Chemotherapy		<.001*
Yes	71%	
No	53%	
Outpatient Surgery		<.001*
Yes	64%	
No	34%	
Outpatient Psychiatric Care		<.036*
Yes	68%	
No	58%	
Swing Services		.813
Yes	59%	
No	60%	

Table 14. Continued			
Setting Variables			
Free-Standing Outpatient Center			.012*
	Yes	70%	
	No	58%	
Hospital-Based Outpatient Clinic			.384
	Yes	65%	
	No	59%	
Owned Rural Health Clinic			.939
	Yes	41%	
	No	49%	
Indigent Care Clinic			.110
	Yes	68%	
	No	58%	

*chi-square test on within group enrollment differences significant at $\chi 2<.05$

As discussed in the prior section, each of the 6 variables related to a hospital's capacity are all statistically significant for differences in the mean 340B enrollment rate. The differences suggest that CAHs enrolled in 340B have more beds, are more likely to belong to a health system, have higher numbers of outpatient visits, have more pharmacists on staff and have adopted higher levels of electronic health records. On the other hand, CAHs enrolled in 340B are more likely to be located in less isolated geographic areas, while CAHs in the more rural geographic areas were less likely to be enrolled.

Examining the variables related to the types of services CAHs provide, the results show that there is a statistically significant difference between CAHs that enrolled in 340B for 3 of the 4 types of services (chemotherapy, outpatient surgery, and outpatient psychiatry services). There is no statistically significant difference in the means for

enrolled and non-enrolled CAHs measured by whether or not swing bed services are offered.

Finally, only one of the four variables related to the settings in which outpatient services could be provided had a statistically significant difference in the means between CAHs enrolled and not enrolled in the 340B Program. The one service that made a significant difference in 340B Program enrollment was operation of a freestanding outpatient center.

5.5 Adjusted Rates of 340B Enrollment

To identify the demographic, structural, setting and service factors associated with the higher likelihood of CAH enrollment in 340B, a logistic regression model was fit to the data. The hypothesis of this study is that the likelihood that a hospital that enrolls in 340B is related to its size, greater opportunity for outpatient encounters through various clinic settings, greater capacity to serve patients through more pharmacy staff and higher levels of electronic health record implementation, and a higher number of outpatient encounters. The results were evaluated in an all-covariate model to identify variables that are statistically significant ($p\text{-value}<0.05$). Table 15 presents the results for the 14-variable adjusted associations tested using logistic regression. The analysis was carried out using SPSS version 20.

Table 15: Adjusted Associations with 340B Enrollment Across All Variables

Predictor	Odds Ratio	95% C.I.for Odds Ratio Lower	Upper	*p-value*
STRUCTURAL FACTORS				
Bed Size *(referent: low beds, 1-20)*	1.35	0.93	1.94	.114
Health System Membership	1.13	0.84	1.50	.417
Total Outpatient Visits *(referent 1st quartile)*				
2nd Quartile	1.86	1.22	2.82	.004*
3rd Quartile	1.98	1.29	3.03	.002*
4th Quartile (high visits)	3.47	2.14	5.62	<.001*
Pharmacy Staffing *(referent: no staffing)*				
Low staffing	0.94	0.64	1.37	.733
Medium staffing	1.20	0.74	1.95	.469
High staffing	3.16	1.02	9.76	.046*
EHR Adoption Level *(referent: no adoption)*				
Partial Adoption	1.37	0.98	1.90	.063
Full EHR Adoption	2.47	1.45	4.22	.001*
Geographic Location *(referent=Rural-Urban Code 9)*	1.53	1.01	2.32	.045*
SERVICES				
Chemotherapy Program	1.37	1.00	1.88	.047*
Outpatient Surgery	1.68	1.09	2.60	.019*
Outpatient Psychiatric Services	1.07	0.67	1.71	.789
Swing Bed Services	1.40	0.83	2.37	.204
CARE SETTINGS				
Freestanding Outpatient Clinic	1.30	0.77	2.19	.327
Hospital based Outpatient Clinic	0.74	0.37	1.47	.389
Rural Health Clinic	1.15	0.86	1.53	.353
Indigent Care Clinic	1.54	0.86	2.76	.144

*statistically significant differences at $p < .05$

Hosmer and Lemeshow goodness-of-fit test, $\chi^2 = 4.88$, d.f. 8, $p = .770$

Any odds ratios that are greater than 1 means that variable is contributing to increased odds of 340B enrollment for CAHs; however, select variables are contributing at a statistically significant level. An odds ratio less than 1 indicates that enrollment is less likely to occur.

Although all of the structural factors had significant differences in the crude analysis, the adjustments when accounting for multiple variables simultaneously provides

slightly different results. For example, both bed size and health system membership were significant on their own, but not in the adjusted model. This indicates that that there are other more important variables that are contributing to the likelihood of 340B enrollment. For example, the odds of 340B enrollment increase from nearly 2 to 3.5 times as the number of total outpatient visits increases. The regression treats the lowest level of outpatient visits (first quartile) as the reference group and performs comparisons between it and the groups with higher volumes of outpatient visits (the second, third and fourth quartiles). Taken individually, the odds of enrolling in 340B for those hospitals with outpatient visits falling into the second quartile are 1.86 more likely to enroll in 340B than for the odds of those in the first quartile. Between the first and third quartiles, the significance increases and the odds for enrollment are 1.98 higher. Finally, the odds of enrolling in 340B given total outpatient visits that fall into the fourth quartile was nearly 3.5 that of the odds for the first quartile (OR 3.47, 95% CI: 2.14–5.62), and with significance of $p < .001$.

By pharmacy staff size, though the odds ratio is larger than 1 for the difference between medium and no pharmacy staff size, the statistically significant difference is between those hospitals with high staffing and no staffing, $p = .046$. The odds of enrollment for hospitals with between 10-20 pharmacists and pharmacy technicians on staff increase more than three-fold (OR 3.16) over the odds of enrollment for those hospitals with no pharmacy staff.

Adoption of electronic health records also plays a statistically significant role in increasing the odds of 340B enrollment. The hospitals with full EHR adoption are nearly 2.5 times as likely to enroll in 340B as those with no adoption.

Geographic location is another key factor in influencing 340B enrollment. The results show that the odds of enrollment for less rural countries (codes 1 to 8) coded along the rural-urban continuum are 1.53 times the odds of enrollment for the most rural (code 9), p=.045 .

Two of the four service variables were statistically significant in their association with 340B enrollment: chemotherapy and outpatient surgery. If the CAH offers chemotherapy, the odds of enrollment increase by 1.37 (95% CI: 1.00-1.88). Even more important in the odds of 340B enrollment for CAHs is 1.68 if it offers outpatient surgery.

Finally, none of the four care setting variables are significantly associated with CAHs decision to enroll in 340B. Though it was hypothesized that one or more of these clinics would mean more outpatient visits, it could be possible that CAHs' total outpatient visits calculation is impacted more by the emergency room or other outpatient departments than from these clinics.

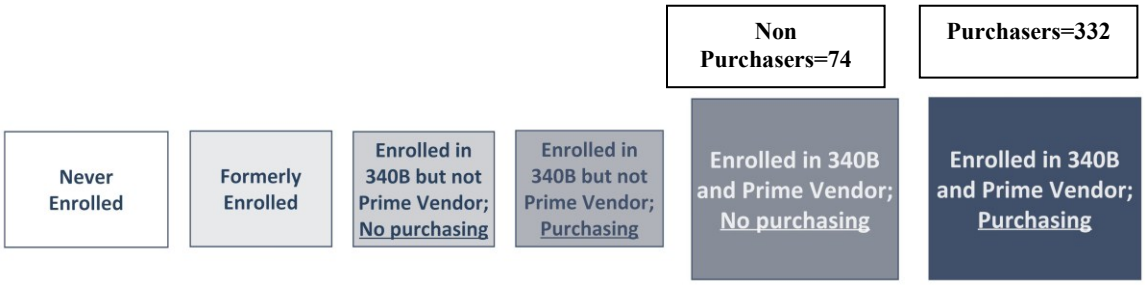
The overall model fit was measured using the Hosmer and Lemeshow goodness-of-fit test, which yielded a $\chi^2(8)$ of 4.88 and was insignificant ($p>.05$), suggesting that the model was fit to the data well. Good model fit is indicated by a non-significant and small χ^2 value, indicating no differences in observed and estimated dependent values (Peng and So 2002).

Chapter 6: Critical Access Hospitals' 340B Prime Vendor Purchasing

6.1 Introduction

Following the discussion on the differences that exist in 340B enrollment among CAHs, this chapter moves on to examine differences in purchases made by the 406 CAHs that are also enrolled in the 340B Prime Vendor Program (PVP). The 406 CAHs fall into two groups based on whether they have made purchases through the 340B PVP and for which data on the extent of 340B purchases is available. Figure 11 illustrates the two groups compared in this chapter in the 340B typology.

Figure 11: Critical Access Hospitals Enrolled in the 340B Prime Vendor, Purchasing and Not Purchasing 340B Drugs



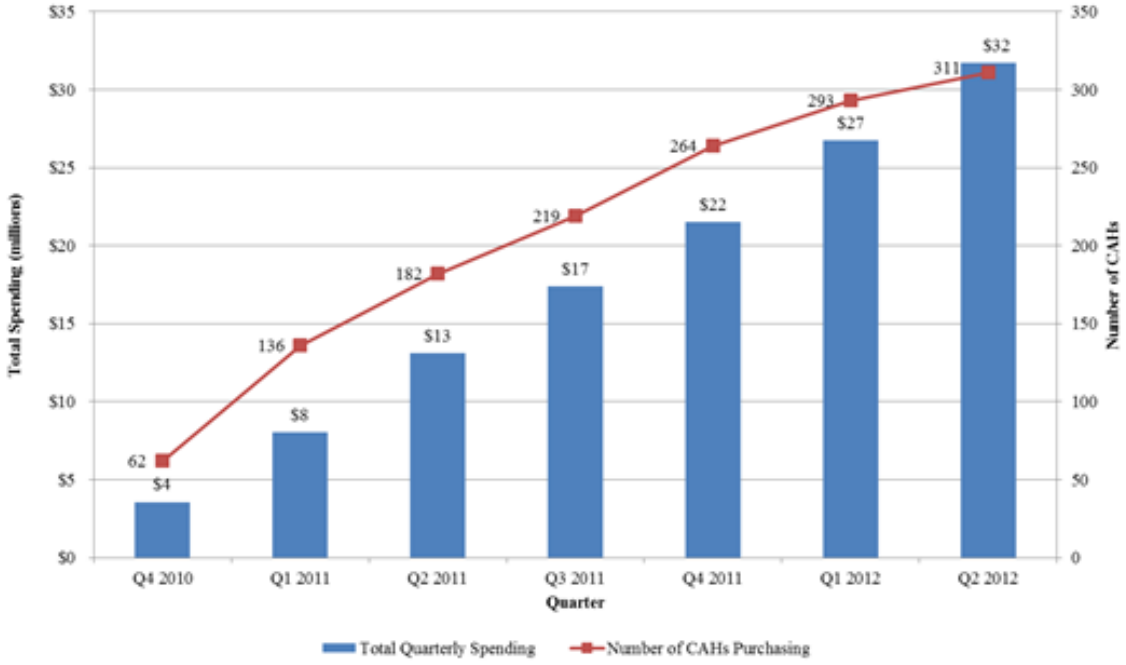
This chapter begins with a description of those 406 entities that are enrolled in 340B and the PVP, regardless of purchasing status. It then provides crude analysis on the differences in the characteristics of those that have purchased and those that have not. Finally, to examine whether certain characteristics contribute to the likelihood of 340B purchasing among the 406, an adjusted analysis of logistic regression was run.

6.2 Enrollment and 340B Purchasing Patterns for 340B Prime Vendor Participants

By the close of 2012, 406 of the 739 critical access hospitals enrolled in 340B were also enrolled with the PVP (56%) operated by Apexus. Although a CAH may enroll in the 340B Program, it may or may not actually use the PVP. Of the 406 enrolled with the PVP, 332 have made at least one 340B purchase through the PVP. However, there are 74 CAHs that have registered the 340B program, have been recertified as of July 2012 and registered with the 340B PVP, but have not actually purchased any 340B drugs through the PVP. It is possible that the CAH could use the 340B Program outside of the PVP with independent contracts, but given the volume-based discounts and other value-added services provided through Apexus, it is unlikely that the CAH would enroll with the PVP and never use it.

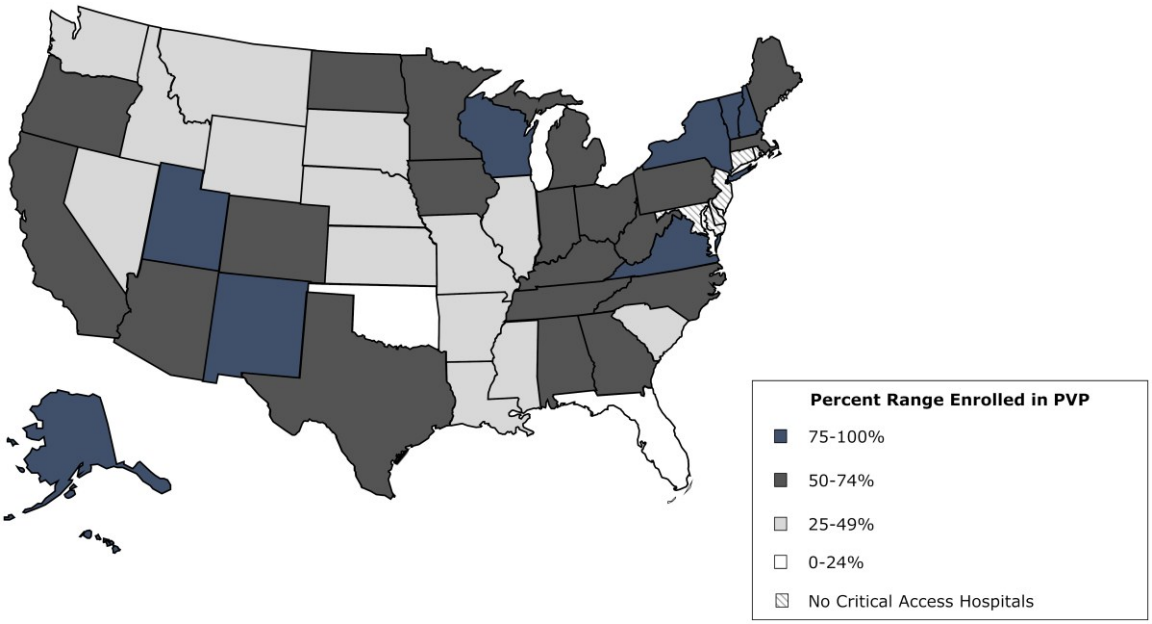
CAH enrollment and purchases made through the Prime Vendor has grown steadily since the beginning of the program in the 4th quarter of 2010. Figure 12 provides purchasing data on 311 of the 332 CAHs with complete purchase data through the close of the 2nd calendar quarter of 2012, or June 2012. For the remaining 21 CAHs where at least one purchase through the PVP was reported, the total sum of purchases was not provided by the PVP for July through September 2012. For the 311 CAHs where data was complete, purchases per quarter have increased from $4 million to $32 million between the 4th quarter of 2010 and the 2nd quarter of 2012.

Figure 12: Total Spending and Number of Critical Access Hospitals Purchasing through the Prime Vendor by Quarter



By state, there are some interesting PVP enrollment patterns, as seen in Figure 13. Alaska, Hawaii, Utah and Virginia each have 100% PVP enrollment, although the total number of CAHs this represents is 10. Twenty-five states have 50% or greater PVP enrollment. At the bottom of the rankings, there are a number of states with low PVP to 340B enrollment ratios. Ten states have 40% or below PVP enrollment, with Kansas, South Carolina and Oklahoma at the lowest rates.

Figure 13: Prime Vendor Enrollment Rates by State, December 2012



6.3 Characteristics of 340B Purchasers

This section provides descriptive data on 17 variables for the 406 hospitals that are enrolled in 340B and in the PVP. Also presented is descriptive information on the 332 CAHs that are making 340B purchases through the PVP. The variables considered here are the same 14 variables (structural, service and setting variables) examined in Chapter 5 as well as three additional variables: (1) the total number of eligible sites registered by the CAH (main hospital and satellite clinics, e.g.); (2) whether the CAH has registered for a contract pharmacy arrangement; and (3) the length of time enrolled in the 340B program. Again, the information presented for each variable includes the purchase rate within groups, which is then tested for a significant trend, the percent of 406 PVP enrollees by group, and the percent of the 332 PVP purchasers by group. The chi-square

is again used to test significance for within-group differences in 340B PVP purchasing behavior among the CAHs enrolled with the PVP. At the close of this section, a summary table of all 17 variables and the significance for each is presented.

Structural Variables

To measure whether there are differences between 340B enrolled and PVP purchasing CAHs and those CAHs that are enrolled in 340B, but not purchasing 340B drugs through the PVP, six variables related to structure and capacity were reviewed. Again, these variables include (1) bed size; (2) whether they are part of a health system or stand-alone; (3) the number of total outpatient visits; (4) the total capacity in the pharmacy department; (5) the extent to which electronic health records have been implemented; and (6) the category of the community on a rural-urban index.

Table 16 shows that there is not much difference between PVP purchasers and non-PVP purchasers as it pertains to bed size and most of the CAHs fall into the maximum number of beds allowed for CAHs—25. With the exception of the first group (0 to 5 beds) where no were present, the within group purchasing rates are each at or above 75% and the test of trend across the groups was not statistically significant. The distribution of total number of beds among the CAHs enrolled in the PVP is also skewed toward the 21-25 bed range, with 87% of the 406 CAHs falling into this grouping. In fact, only 8 CAHs enrolled in the PVP have between 1-15 beds. Of the 332 hospitals that are purchasing drugs through the 340B program via the PVP, 87% are in the 21-25 total bed size range.

Table 16: Bed Size Does Not Contribute to 340B PVP Purchasing Behavior Among Critical Access Hospitals

Bed Size Range	Within Group PVP Purchasing*	Percent of Total PVP Enrollees (406)	Percent of Total PVP Purchasers (332)
1-5	0%	0%	0%
6-10	75%	1%	1%
11-15	100%	4%	5%
16-20	75%	8%	7%
21-25	82%	87%	87%

*One-way ANOVA test for trend in differences was not significant, p =.914; Chi-square test for within group enrollment between groups with bed size of 1 to 20 and 21 and 25 was also not significant, p =.609

There is little difference in 340B purchasing behavior based on whether or not the CAHs are engaged as part of a health system. The within group purchasing rate between the two PVP-enrolled groups is exactly the same—82% and the chi-square is equal to .983. Less than one-half of the 406 in this comparison were part of a "multihospital or a diversified single hospital system" as defined by the American Hospital Association (AHA Fast Facts 2013). Health system membership for all US community hospitals is at about 60%, or nearly 15 percentage points higher than the rate of health system membership for CAHs enrolled with the PVP (Table 17).

Table 17: 340B PVP Purchasing Behavior Among CAHs Not Impacted by Health System Affiliation

System Membership	Within Group PVP Purchasing*	Percent of Total PVP Enrollees (406)	Percent of Total PVP Purchasers (332)
Yes	82%	46%	46%
No	82%	54%	54%

*chi-square test for differences was insignificant at at $\chi 2$<.983

Table 18 shows the range of total outpatient visits by quartile for CAHs that are purchasing and not purchasing through the 340B PVP. In sum, the complete range of total outpatient visits is from 3,094 to 270,398 with an average of 47,070 outpatient visits per CAH. The within group PVP purchasing rate varies slightly, as does the distribution of each group across total purchasers; however, it is not significant at p=.147. The test for trend within group purchasing is also not statistically significant at p=.148.

Table 18: The Number of Total Outpatient Visits Does Not Appear to Impact CAH 340B PVP Purchasing Behavior

Total Outpatient Visits by Quartile	Within Group PVP Purchasing*	Percent of Total PVP Enrollees (406)	Percent of Total PVP Purchasers (332)
1st Quartile: 3,094-22095	75%	25%	23%
2nd Quartile: 22,257-35,918	81%	25%	25%
3rd Quartile: 35,957-61,880	83%	25%	26%
4th Quartile: 62,411-270,398	88%	25%	27%

*Chi-square test for within group differences was not significant, p =.147; One-way ANOVA test for trend in differences was not significant, p =.148

As the number of a CAH's pharmacists and technicians increase, there is not a statistically significant difference between purchasing behavior within groups, p=.077. As seen in Table 19, the percent within group PVP purchasing rate is rather high across all four of the comparison groups, but does not have a linear trend. Nearly one-half of the CAHs enrolled with the PVP have between one and four full-time or part-time pharmacists and pharmacy technicians on staff. Thirty-four of the CAHs have no staff in their pharmacy department. Of the 406 CAHs enrolled in 340B and the PVP, 34% have between 5 and 9 on their pharmacy staff and another 8% have between 10 and 20.

Table 19: CAH 340B PVP Purchasing Not influenced By Higher Pharmacy Staffing

Count of Pharmacy Staff	Within Group PVP Purchasing*	Percent of Total PVP Enrollees (406)	Percent of Total PVP Purchasers (332)
0	82%	8%	8%
1-4	77%	49%	46%
5-9	86%	34%	36%
10-20	91%	8%	9%

*Chi-square test for within group differences was insignificant at p =.077

Adoption of electronic health records among the 406 PVP enrollees varies (Table 20). The majority of the CAHs (67%) have partially implemented EHR, with the remainder falling into similar sized groupings of not implemented and fully implemented, each with 16% of the CAHs. Within group purchasing through the PVP increases only slightly and is not statistically significant, p=.607.

Table 20: Hospitals' Level of Electronic Health Record Implementation Does Not Impact 340B PVP Purchasing

Level of EHR Implementation	Within Group PVP Purchasing*	Percent of Total PVP Enrollees (366)	Percent of Total PVP Purchasers (303)
Not implemented	78%	16%	16%
Partially Implemented	84%	67%	68%
Fully Implemented	83%	16%	17%

*One-way ANOVA test for trend in differences was not significant, p =.607

Analyzing the potential impact that geographic location has on 340B PVP purchasing, the within group purchase rates are all 63% and above and the test for trend was statistically insignificant; that is, there is no linear trend in the rate of purchasing across the continuum of rural-urban codes (Table 21). Similar to the 340B enrollment

patterns, more than one-half of the CAHs fall into the final two categories of counties that the USDA has defined as non-metro with a population of between 2,500 and 19,999 (codes 6 and 7). It follows that these are these same code 6 and 7 groups have CAHs that comprise the majority of the PVP purchases (56%). Critical access hospitals that are in the two most rural county groups only make up a combined 12% of CAHs that are purchasing drugs through the 340B PVP.

Table 21 : Geography Does Not Account for Differences in CAH 340B PVP Purchasing Behavior

Degree of Rural	Within Group PVP Purchasing*	Percent of Total PVP Enrollees (406)	Percent of Total PVP Purchasers (332)
1 (most urban)	100%	5%	6%
2	89%	7%	8%
3	78%	9%	9%
4	79%	7%	7%
5	86%	3%	4%
6	81%	30%	29%
7	85%	25%	27%
8	63%	7%	6%
9 (most rural)	77%	6%	6%

*One-way ANOVA test for trend in differences was not significant, $p = .078$; chi-square test for within group enrollment between groups 1 to 8 and group 9 was not significant, $p = .508$

Service Variables

The comparison between 340B PVP purchasing CAHs and the CAHs that have not made 340B purchases through the PVP also considered four variables related to the types of services the CAH might offer including: (1) chemotherapy; (2) outpatient surgery; (3) outpatient psychiatric services, and (4) swing bed services (Table 23). Of

these four services, the only statistically significant service that influences PVP purchasing is whether or not the hospital offers chemotherapy (Table 22).

Table 22: Among Service Variables, 340B PVP Purchasing Behavior Only Impacted if CAH Offers Chemotherapy

	Within Group PVP Purchasing*	Percent of Total Enrolled in PVP (356)	Percent of Total PVP Purchasers (293)	$\chi 2$
Chemotherapy				>.001*
Yes	91%	46%	51%	
No	75%	54%	49%	
Outpatient Surgery				.449
Yes	83%	94%	95%	
No	76%	6%	5%	
Outpatient Psychiatric Care				.225
Yes	88%	14%	15%	
No	81%	86%	85%	
Swing Services				.438
Yes	82%	89%	89%	
No	87%	11%	11%	

*chi-square test for differences was significant at at $\chi 2<.05$

Outpatient surgery, outpatient psychiatric care and swing bed services are not contributing to whether a critical access hospital purchases drugs from the 340B PVP.

Settings Variables

Four variables related to the settings in which CAHs provide outpatient care were reviewed to determine if there were differences between 340B PVP purchasing CAHs and non-PVP purchasing CAHs (Table 23). These variables include: (1) whether the CAH offers a freestanding outpatient care center; (2) whether the CAH has a hospital-based outpatient clinic; (3) whether the CAH owns a clinic that has been federally-designated as a rural health clinic; and (4) whether the CAH provides an indigent care clinic. To evaluate whether there is a connection between the providing one or more of

these settings and 340B PVP purchasing behavior, the sum total of settings per CAH was examined. Table 24 indicates that none of the four variables related to the care setting was statistically significantly with respect to 340B PVP purchasing behavior.

Table 23: None of the Four Setting Variables Impact 340B PVP Purchasing Behavior

	Percent Within Group Purchasing	Percent of Total Enrolled in PVP (356)	Percent of Total Purchasers (293)	$\chi 2$
Free-Standing Outpatient Center				.216
Yes	89%	13%	14%	
No	81%	87%	86%	
Hospital-Based Outpatient Clinic				.400
Yes	89%	5%	5%	
No	82%	95%	94%	
Owned Rural Health Clinic				.603
Yes	81%	45%	44%	
No	83%	55%	56%	
Indigent Care Clinic				.590
Yes	79%	8%	8%	
No	83%	92%	92%	

*chi-square test for differences was significant at at $\chi 2<.05$

Participation Variables

Among those 406 CAHs enrolled in the PVP, three additional variables were examined for their relationship to purchasing from the 340B PVP. The first variable considers number of sites and asks whether the PVP purchasing behavior of CAHs differs by the total number of registered sites. Next, the role of CAHs contracting with a retail pharmacy in the community was considered to see if this relationship had an effect on the likelihood of PVP purchasing. Finally, length of enrollment in the 340B program, as

measured by the total number of quarters enrolled, was reviewed to see if it was related to the 340B PVP purchasing behavior of the 406 CAHs.

As seen in Table 24, a majority of the CAHs enrolled with the 340B and the PVP have a single site registered (65%), do not utilize a contract pharmacy arrangement (59%) and have been enrolled in the 340B program for between 7 to 9 quarters (76%). Looking more narrowly at the within group trends the rates of PVP purchasing by total sites and CAHs with contract pharmacy relationship are similar at 83% and 87%, respectively. There is a linear trend between PVP purchasing and total quarters enrolled in 340B, with the percent of purchasers going from 27% to 86% as the numbers of quarters enrolled increases.

Table 24: Critical Access Hospital 340B PVP Purchasing Impacted by Presence of Contract Pharmacy and Length of Enrollment in the 340B Program

	Percent Within Group PVP Purchasing*	Percent of Total PVP Enrollees (406)	Percent of Total PVP Purchasers (332)	χ^2
Total Sites Registered				.459
1 site	83%	65%	65%	
2-12 sites	80%	35%	35%	
Presence of Contract Pharmacy				.027*
Yes	87%	41%	44%	
No	78%	59%	56%	
Quarters Enrolled				<.001*
Short (1-3 quarters)	27%	5%	2%	
Medium (4-6 quarters)	78%	18%	17%	
Long (7-9 quarters)	86%	76%	81%	

*chi-square test for differences was significant at at $\chi 2<.05$; One-way ANOVA test for trend on length of time in 340B significant at the *p<.001 level*

Another question of interest in this study is whether length of time enrolled in the 340B program impacts purchases from the PVP. According to Table 24, the majority of entities that are purchasing have been enrolled for a long period, enrolling within the first 3 quarters of eligibility. The PVP purchasing within this group of CAHs is 86%--the highest among PVP enrollees, potentially indicating that those that are purchasing were early adopters.

Of the 332 PVP purchasers, 187 do not have a contract pharmacy established. The remaining 145 (41%) have contract pharmacy relationships ranging from 1 to 24 arrangements with retail partners per CAH (Table 25). The majority of CAHs with contract pharmacies that are purchasing 340B drugs through the PVP (107) have between 1 and 3 contract pharmacies.

Of the 74 CAHs that are enrolled in 340B and in the PVP, but have not made purchases through the PVP, 22 have established one or more contract pharmacy arrangement. HRSA advises entities to register contract pharmacies when they are ready to start utilizing them. For these 22 instances, the contract pharmacy arrangements do not appear to be utilized because of the lack of PVP purchases. One of the PVP non-purchasers has 6 contracts in place, but no associated purchases through the PVP.

Table 25. 340B PVP Purchasing by Critical Access Hospitals by Number of Contract Pharmacy Arrangements

Number of Contract Pharmacies	340B Purchasers	340B Non-Purchasers	Totals
0	187	52	239
1	46	10	56
2	33	7	40
3	28	3	31
4	15	1	16
5	12	0	12
6	3	1	4
7	1	0	1
9	2	0	2
11	2	0	2
12	2	0	2
24	1	0	1
	332	**74**	**406**

6.5 Summary of Unadjusted Comparisons

Table 26 provides a summary of all unadjusted comparisons and 340B PVP purchasing. As previously stated, statistically significant differences in purchasing behavior were noted for the count of pharmacy staff, offering of chemotherapy services, whether contract pharmacies were utilized, and the length of enrollment in the 340B Program.

Table 26: Summary of 340B PVP Purchasing for Structural, Service, Setting and Participation Variables

Structural Variables	Within Group PVP Purchasing Rate*	χ^2
Compressed Bed Size		.609
1-20	79%	
21-25	82%	
System Affiliation		.983
Yes	82%	
No	82%	
Total Outpatient Visits		.147
1st Quartile	75%	
2nd Quartile	81%	
3rd Quartile	83%	
4th Quartile	88%	
Count of Pharmacy Staff		.077
0	82%	
1-4	77%	
5-9	86%	
10-20	91%	
EHR Implementation		.605
Not implemented	78%	
Partially Implemented	84%	
Fully Implemented	83%	
Compressed Measure of rural		.508
Codes 1-8	77%	
Code 9	82%	
Service Variables		
Chemotherapy		<.001*
Yes	91%	
No	75%	
Outpatient Surgery		.449
Yes	83%	
No	76%	
Outpatient Psychiatric Care		.225
Yes	88%	
No	81%	
Swing Services		.438
Yes	82%	
No	87%	

Table 26 Continued

Setting Variables		
Free-Standing Outpatient Center		.216
Yes	89%	
No	81%	
Hospital-Based Outpatient Clinic		.400
Yes	89%	
No	82%	
Owned Rural Health Clinic		.603
Yes	81%	
No	83%	
Indigent Care Clinic		.590
Yes	79%	
No	83%	
Participation Variables		
Total Sites Registered		.459
1 site	83%	
2-12 sites	80%	
Presence of Contract Pharmacy		
Yes	87%	.027*
No	78%	
Quarters Enrolled		<.001*
Short (1-3 quarters)	27%	
Medium (4-6 quarters)	78%	
Long (7-9 quarters)	86%	

*chi-square test on within group enrollment differences significant at $\chi 2<.05$

6.4 Adjusted Rates of 340B Prime Vendor Program Purchasing

To examine the adjusted associations between the variables and 340B PVP purchasing, an all-covariate logistic regression model was run to identify variables that are statistically significant (p-value<0.05). Table 27 shows the results.

Table 27: Adjusted Associations with 340B Prime Vendor Program Purchasing Across All Variables

Predictors	Odds Ratio	95% C.I.for Odds Ratio Lower	Upper	*p-value*
STRUCTURAL FACTORS				
Bed Size *(referent: low beds, 1-20)*	1.21	0.44	3.27	.715
Health System Membership	0.81	0.42	1.55	.520
Total Outpatient Visits *(referent 1st quartile)*				
2nd Quartile	0.89	0.35	2.21	.794
3rd Quartile	0.84	0.33	2.12	.712
4th Quartile (high visits)	0.80	0.26	2.41	.685
Pharmacy Staffing *(referent: no staffing)*				
Low staffing	0.64	0.18	2.24	.484
Medium staffing	0.72	0.19	2.77	.631
High staffing	1.18	0.17	8.36	.868
EHR Adoption Level *(referent: no adoption)*				
Partial Adoption	0.99	0.42	2.33	.973
Full EHR Adoption	1.14	0.37	3.48	.816
Geographic Location *(referent=Rural-Urban Code 9)*	0.92	0.23	3.76	.908
SERVICES				
Chemotherapy Program	3.75	1.82	7.74	<.001*
Outpatient Surgery	0.56	0.12	2.60	.459
Outpatient Psychiatric Services	1.65	0.56	4.89	.367
Swing Bed Services	0.42	0.13	1.39	.154
CARE SETTINGS				
Freestanding Outpatient Clinic	1.39	0.45	4.25	.564
Hospital based Outpatient Clinic	1.18	0.23	6.04	.842
Rural Health Clinic	0.87	0.43	1.75	.691
Indigent Care Clinic	0.68	0.19	2.40	.549
PARTICIPATION				
Total Sites Registered	0.97	0.78	1.22	.817
Presence of Contract Pharmacy	1.36	1.04	1.79	.027*
Quarters Enrolled *(referent: 1-3 quarters)*				
Enrolled for 4-6 quarters	9.14	2.38	35.06	.001*
Enrolled for 7-9 quarters	19.96	5.82	68.52	<.001*

*statistically significant differences at $p < .05$

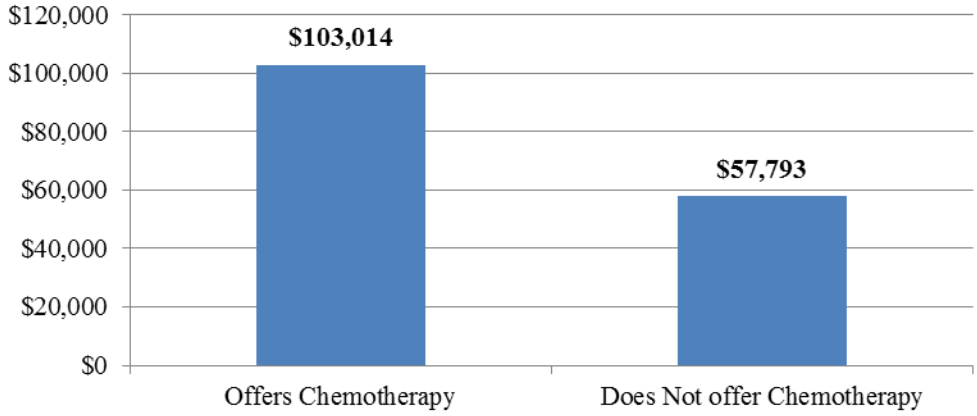
Hosmer and Lemeshow goodness-of-fit test, $\chi 2$ 3.49, d.f. 8, $P = .900$

Unlike the logistic regression model for 340B enrollment, none of the structural variables are significantly contributing to 340B PVP purchasing. This likely indicates that there are not many differences between the purchasers and non-purchasers on these structural variables and that something else is driving purchases.

One variable that contributes to purchasing is the provision of chemotherapy services, with the odds of a CAH being a PVP purchaser are 3.75 times as likely as being a PVP non-purchasers. The drugs provided as chemotherapy are among the most expensive in the market, so hospitals that purchase these drugs should be motivated to use the 340B discount when possible. None of the other service variables are statistically significant.

Figure 14 shows the average quarterly purchases made by the 129 hospitals that do provide chemotherapy versus the 188 that do not. It is highly likely that the increased expenditures for CAHs with chemotherapy services influenced the PVP purchasing behavior of CAHs. A prior study showed that for CAHs offering infusion therapy—for which the AHA variable of chemotherapy is a proxy—the expenditures for those drugs comprise an average of 44% of the total annual drug budgets, but only 5% of units purchased, thus representing a very high proportion of their expenditures (Wallack and Sorensen, 2012).

Figure 14: Average Quarterly PVP Purchases: CAHs that Offer Chemotherapy (N=129) versus CAHs that Do Not (N=188)



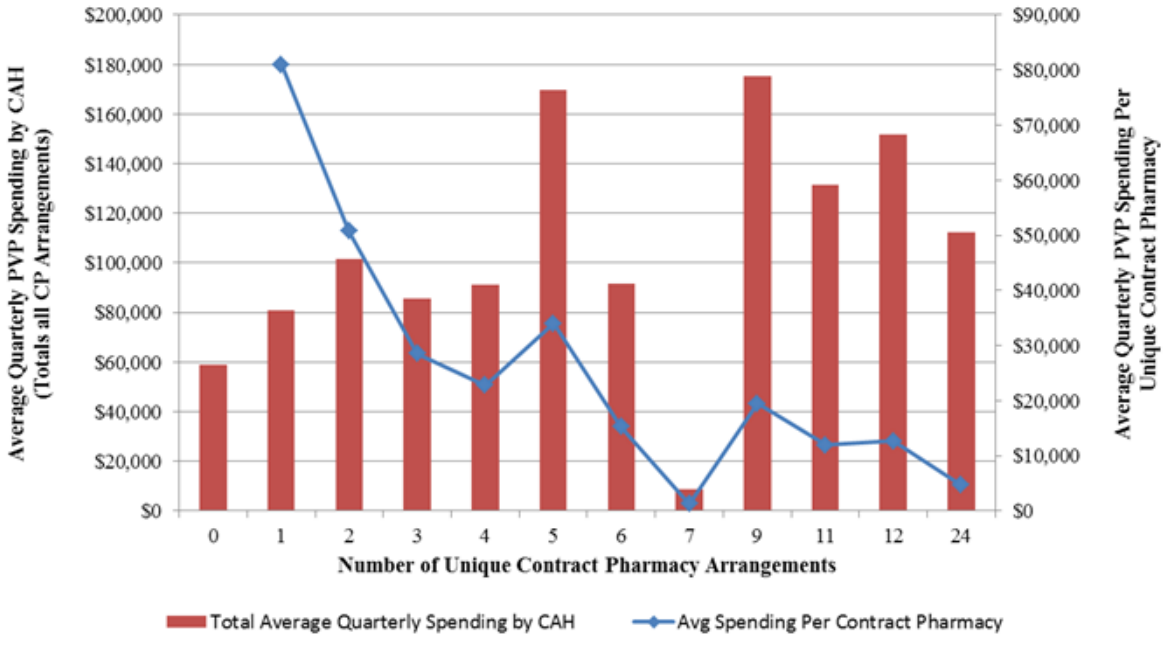
Similar to 340B enrollment, none of the four care settings were influential on PVP purchasing behavior. Once again, not many of the CAHs responded that they provide care through these settings in particular and it does not appear that these variables are important in either the decision to enroll or purchase at 340B prices through the PVP. There are likely other more important considerations.

Two of the three participation variables are statistically significant in their association with a higher likelihood of 340B PVP purchasing among CAHs. First, CAHs that utilize contract pharmacies had an odds ratio of 1.36 indicating that these CAHs are more likely to purchase 340B drugs through the PVP. This finding suggests that strategic partnerships with community pharmacies have been a success in providing better patient access and lower drug costs.

Figure 15 depicts the relationship between total spending and the average spending per contract pharmacy with the number of pharmacy contracts ranging from 0 to 24 registered relationships. This visual offers support for the hypothesis that more

contract pharmacies does not necessarily mean more overall spending for critical access hospitals. On the left side, the figure provides the average quarterly spending by the 332 hospitals purchasing 340B drugs through the PVP. On the right side and tracked in blue, the figure shows the average drug spending per contract pharmacy through the PVP. This analysis considers total PVP purchases reported for the hospital and cannot differentiate the amounts potentially purchased by an on-site pharmacy or eligible department or through a contract pharmacy. Nonetheless, the figure provides important information on the connection between total PVP purchases and the number of contract pharmacies to show that there is not necessarily a linear connection. In other words, having 24 contract pharmacies does not mean more 340B PVP purchases (either total or per pharmacy) than an entity with 5 contract pharmacies.

Figure 15: Average Quarterly PVP Spending by CAHs and Contract Pharmacy Arrangements (N=332)



Second, length of time enrolled in the program is statistically significant. The odds of purchasing 340B drugs through the PVP were 9 times higher for the CAHs that have been enrolled for 4 to 6 quarters rather than only 1 to 3 quarters. Even more telling is the fact that the odds of PVP purchasing were more than two times higher for CAHs that have been enrolled in the 340B Program for 7 to 9 quarters rather than only 1 to 3 quarters. This finding seems to indicate that the early adopters have had time to implement the program and start purchasing through the PVP over those that are more recently enrolled. The final participation variable---the total number of registered sites—is not statistically significant.

Chapter 7: Discussion

The objectives of this dissertation were to classify the various ways in which CAHs participate in the 340B program, to examine how enrollees and non-enrollees and PVP purchasers and PVP non-purchasers differ, and to identify the factors that increase the odds of 340B enrollment and purchasing through the PVP. This chapter outlines the research findings, discusses the key lessons learned, and suggests areas for future research.

7.1 The 340B Typology Shows the Complexity of Program Use

Based on years of research in the 340B Program, the researcher's first hypothesis was that CAHs use or do not use the 340B Program for reasons that are far more complex than a simple "yes" or "no." Focusing on one entity type (CAHs) with near-complete data as they contemplate the 340B decision-making process led to the development of a 340B typology to classify the 340B status of CAHs. After the groupings were created, data from HRSA and the PVP allowed for the assignment of the hospitals to each of the exhaustive and mutually exclusive groups, thereby quantifying the size of each group among the CAH population.

Previous studies had identified situations where entities were registered, but did not use the program, but did not provide further explanation of this non-use (OIG 2004). The usefulness of more detailed and descriptive data about enrollment and purchasing in the 340B Program will provide HRSA and policymakers with a better understanding of how various 340B entities—even within the same entity type—can behave very differently. It is very likely that even within this typology framework, the groupings

could be further divided to consider things like length of time in the 340B program, facility size, geographic location, and volume of PVP drug purchases. With this in mind, the 340B Typology could be expanded by more research, preferably through primary data collection where questions about program perceptions, purchasing patterns and other motivation for using or not using the 340B Program (enrolled and purchasing) could be explored. Typology development should also be performed for other entity types that are eligible for the 340B Program to quantify the number enrolled and purchasing through the PVP.

Interestingly there were twenty hospitals that had enrolled in 340B, but then terminated their enrollment fairly promptly, less than two years. Several questions come to mind: did these CAHs enroll before they analyzed the implementation costs versus the value of the drug savings? Did the orphan drug exception for these CAHs impact termination? Were the recordkeeping requirements overly burdensome? Were there challenges with wholesalers or inventory vendors? Were there other motivations for termination not mentioned above?

Another interesting group was the 74 hospitals that have made the decision to enroll in 340B, enroll in the PVP, but then not make any purchases through the PVP. Of these 74, twenty-two have even registered contract pharmacies, but the CAH has still not procured drugs through the PVP. Because there are very few differences between the PVP purchasers and this group, it is not likely that these entities made the wrong choices to join the 340B Program or to enroll with the PVP; rather, other CAH characteristics appear to explain the failure to act on the 340B PVP purchases. Primary data collection

would be a useful method for determining the reasons for not purchasing from the PVP. Perhaps there are management decisions or vendor delays that are the cause. It is also plausible that the CAH did not anticipate the extent of the compliance requirements of 340B and is working through them prior to purchasing through the PVP.

The natural question that stems from the groups in the 340B Typology is whether there are other interesting differences between typology groups that should be noted and tracked. One thought was that there would be little difference between those that terminated and those that are enrolled with the PVP, but are not purchasing through it. Though not one of the aims of this research, an adjusted comparison of these two groups—2 and 4—showed that there were no significant differences between the groups across the core 14 variables. This likely means that the only difference between the groups is that those that terminated enrollment took the action to dis-enroll from the 340B Program, but were otherwise are similar in size, capacity and structure. The lack of difference between these groups seems to suggest that failure to purchase from the PVP by either group is motivated by factors not explored in this analysis, such as internal decision-making, cost-benefit analysis, regulatory and compliance burden, or other uncovered barriers to 340B program use. Future research using structured interviews and focus groups to discover these other reasons would be useful to 340B Program improvement and effectiveness.

7.2 Enrolled CAHs serve more patients in more settings, use more expensive drugs, and have higher use of electronic records and more pharmacy staff.

The second objective of the research was to examine how CAHs *enrolled* in 340B differ from those *not enrolled*. Several variables related to demographics, structure,

settings and services were examined. It was hypothesized that hospital size, more outpatient visits, more advanced adoption of electronic health records, more pharmacists on staff, offering of more outpatient services, and presence of more outpatient clinic settings would be associated with increased enrollment in the 340B Program.

Comparing the enrolled and non-enrolled CAHs, these hypotheses were fairly close, but there were some surprising results. For example, 340B enrollment was lowest in the geographic areas of the country that are defined as most rural. It would be expected to see a difference between urban and rural counties, but the rate of 340B enrollment is above the national average of 56% in all codes defined by the USDA except for those in the most rural communities (USDA code 9). One simple issue may be a lack of entity awareness or lack of resources, but further research on the reasons for low enrollment rates in the most rural areas might uncover other challenges and issues. For example, maybe CAHs in these very rural regions are not being targeted by 340B vendors or advocacy organizations, including the state hospital association? Or, it could be that the CAHs located in the most rural areas do not possess the administrative and pharmacy staff needed to participate in the 340B Program. Of the CAHs that are located in the most rural region, five are not enrolled in the 340B Program, but have a high number of total outpatient visits, falling into the 4^{th} quartile.

Another surprise was that the type of setting plays a minimal role in 340B enrollment. Because the 340B Program is for outpatient use only, the hypothesis was that the presence of one or more specified outpatient clinic types would influence enrollment. There was a chi-square difference in the unadjusted comparison of 340B enrolled and not

enrolled CAHs; however, once adjusted for other variables, none of the four clinic settings were statistically important contributors to the odds of a CAH being enrolled in 340B.

Another interesting finding in the enrolled versus non-enrolled comparison was the importance of 340B to CAHs that offer a chemotherapy program. There is currently a significant amount of attention on 340B and infusion and specialty drugs because of the extent of the discount and questions about use of 340B drug price savings or suggestions of inappropriate use of discounted drugs (Avalere, 2013; Office of Senator Chuck Grassley, 2013). This research shows that the decision to enroll in 340B is greatly impacted by a service, even in spite of the orphan drug exclusion. At the time of publication, HRSA had yet to publish final rules on the orphan exclusion.

Though this research did not explore the role of rural infusion providers in their communities, it would be very interesting future research. During the course of this research, the author had a number of conversations with the pharmacy directors at CAHs that suggested the 340B Program could be a meaningful way to ensure access in remote geographic locations.

Not surprising was the importance of the pharmacist and pharmacy staff available to assist in 340B enrollment, with those CAHs with a high number of pharmacists more than 3 times as likely to enroll than those with a small number of pharmacists. Multiple studies confirm the shortage of pharmacist time at small rural hospitals. According to survey data, the majority of CAHs (63%) do not have a full time pharmacist, reporting a median of 20 on-site pharmacist hours per week (Casey & Moscovice, 2004). In

addition to the widespread shortage of pharmacists, a pharmacist's time is also often divided among other needs in the community. A survey of rural pharmacists working in Minnesota, North Dakota and South Dakota found that they often spread their time between retail pharmacies, hospitals and nursing homes (Casey, Moscovice & Davidson, 2006). Because of these limitations, pharmacists' time may already be overextended and restricted to filling and dispensing prescriptions, thus restricting the time available to evaluate whether to enroll in a program like 340B.

Another expected result was that hospitals with fully implemented electronic health records were almost 2.5 times more likely to enroll in 340B than those with no implementation. Hospitals are expected to be able to track the appropriateness of patients, providers and the prescriptions that touch 340B, and the electronic health record is a key component to connecting these requirements.

7.3 340B Purchasers provide chemotherapy, have been enrolled in 340B since eligibility began, and are more likely to have a contract pharmacy relationship.

The third aim was to examine how CAHs *purchasing* 340B drugs through the PVP differ from the CAHs that are enrolled, but *not purchasing* through the PVP across variables related to demographics, structure, setting and service variables. Interestingly, these groups had very little differences, which was not what the researcher expected to find. It was expected that there would be real differences between these groups of PVP purchasers and non-purchasers, but that the decision-making process had been the same. In other words, the 74 CAHs enrolled with the PVP, but not purchasing 340B drugs through it had made the wrong choice and actually would look closer to the non-enrollees or the terminated enrollees. Instead, the 74 non-purchasers and the 332 purchasers only

differed in the unadjusted comparisons by four variables: number of pharmacy staff, whether chemotherapy was offered or not, length of time in program and whether they had a contract pharmacy arrangement or not. When adjusted, the difference in the total pharmacy staff was insignificant.

A closer look at the three significant variables following adjustment reveals some interesting findings. First, as with 340B enrollment, a big contributor to whether a CAH is likely to actually purchase drugs through 340B is if they offer chemotherapy services. Given the cost of products used in this area of the CAH, this is expected; however it is remarkable that this was one of the only differences among the 17 variables contemplated in the model. In essence, it indicates the importance of the discount for these drugs for this service.

The 340B price for select drugs dispensed via an infusion center at a critical access hospital is, on average, 31% lower than the group purchasing organization price (Wallack & Sorensen, 2012). Often times, these products are orphan drugs, to which the exception for 340B eligibility could apply, yet, this finding appears to indicate that the CAHs are not deterred by this exclusion. HRSA has yet to finalize its regulations on implementation of the orphan exclusion, but the draft regulations apply the exclusion when the drug is used for the orphan indication. Because of the importance of chemotherapy services in predicting 340B purchasing, maybe this finding shows that these CAHs are not typically seeing patients with rare disorders where the exception would apply.

A CAHs total time enrolled in 340B also impacted whether it would purchase 340B drugs or not. This analysis did not examine when along the nine quarters these entities made the purchases, but compared the likelihood of purchasing at any point among hospitals that were enrolled at different points. It could be that these early adopters enrolled and started purchasing right away; however, it is also possible that the early enrollees were not purchasing for a period of time while they were working on establishing their 340B program and purchased during a later quarter. Because the hospitals that have been enrolled for 7 to 9 quarters are twenty times as likely to purchase than those that have been enrolled for 1 to 3 quarters, it is plausible to conclude that purchasing can take time following enrollment, especially when there are few other differences separating the PVP purchasers from the PVP non-purchasers.

This finding on the differences in time in program and the impact on purchasing can provide valuable feedback to HRSA and policymakers. For example, HRSA may want to further explore how long it takes entities from the time of enrollment to the start of purchasing and what barriers potentially exist that delay the participation. In essence, what is preventing a CAH from moving from one typology to another when they are seemingly similar across other factors?

For policymakers, this finding elicits other types of questions. One issue facing the world of 340B is that of appropriate use of the program. The findings of this research show that enrollment clearly does not equal purchasing, yet critics of the program are relying on enrollment data to show market size and economic impact (Avalere, 2013). Research that appropriately measures purchasing as separate from enrollment across all

entity types is necessary to accurately inform the debate on how 340B influences other areas of the drug market. Another layer of this analysis could focus on the average length of time it takes entities to begin purchasing, if at all. Again, why is purchasing delayed?

In summary, the total time enrolled in the program speaks negatively to the CAH's ability to use 340B at the onset of enrollment and indicates that program operationalization takes time. An opposing theory is that hospitals might wait to enroll in 340B until they develop an implementation plan, but that does not appear to be the case.

Another finding with regards to differences between purchasers and non-purchasers was that the odds of purchasing for CAHs with one or more contract pharmacy relationship were 1.37 times those without a contract pharmacy relationship. Much like the early findings from Mathematica on factors influencing 340B registration, if an entity is limited by lack of an on-site retail pharmacy, it will likely not use the program. Contract pharmacies were intended to increase patient access to 340B and one interpretation of the data is that these relationships are facilitating access in CAHs.

As with 340B and infused products, use of contract pharmacies has received negative attention over the past year (Avalere, 2013; Fein, 2013). The concern is that growth in the number of registered contract pharmacies equals an increase in 340B volume; however, there has not yet been analysis like that shown here that overlays purchase data to determine the net effect of multiple arrangements. The greater likelihood of purchasing with a contract pharmacy might suggest that contract pharmacies allow for purchases, but, as indicated in Chapter 6, does not necessarily mean greater volume—it likely means that purchases are just spread out.

In addition to this financial data, it should be noted that HRSA's requirements for registering contract pharmacies leads to a larger total number of relationships and can be misleading about the actual sum if not interpreted correctly. HRSA requires entities to register contract pharmacies to the parent and child sites to track which facilities are utilizing the pharmacy. In other words, if there are three sites using one contract pharmacy, it is listed in the database three times. The review of CAH's contract pharmacies revealed a 15% duplicate rate: the initial count totaled 738; yet when 108 duplicate entries were removed, the total was 630.

One possible positive benefit of forging a contract pharmacy relationship with a local provider in a rural community is that it serves to reinforce the role of the community pharmacist and to better support the business side of serving the uninsured or underinsured. The upside to a serving as a contract pharmacy is access to the 340B price for appropriate patients that might otherwise pay at retail. For these patients, the out of pocket cost is reduced and the pharmacist is reimbursed their professional fee by the hospital in exchange for serving its patient. These are likely individuals the pharmacist would see regardless of participation in 340B, so an arrangement that mitigates the cost or the loss to the pharmacy could be rewarding.

A final point on this variable is to consider that the CAHs with contract pharmacy relationships may additionally have an on-site pharmacy that is contributing all or part to the hospital's total purchases tracked through the PVP. This study is limited by the lack of information about the presence of an on-site pharmacy, but primary data collection could be conducted for future research.

7.4 Conclusion

At the close of 2012, two years following CAHs' eligibility for 340B, the enrollment rate is at 56%. Is this acceptable? How does this statistic align with what policymakers intended when the PPACA was passed in 2010? The rate of participation—although the exact statistic is unknown—is less than the enrollment rate. Does this change the notion of whether the policy of program expansion is a success or not?

This research examines just a few of the many variables that enter into the decision-making process for CAHs, but manages to tell a good story: that enrollment is likely not where it was expected to be at this point, that enrollment does not equate to actual 340B purchasing, and that there are likely justifiable reasons for non-participation. Conversely, the findings evoke questions about potential underuse of 340B—are entities that should ben purchasing under 340B even enrolled?

For the first time since the program's history, in 2012, select entities are being asked to justify how they utilize or reinvest their savings (U.S. Senate Committee on the Judiciary, 2013). This request assumes two things: first, entities should be accounting for savings; second, that all entities are using the program in similar ways and that all are netting savings. The variation in size, settings, and capacity revealed in this research likely applies to all of the entities eligible for 340B—from AIDS Drug Assistance Programs to different hospital types to community health clinics.

If the purpose of 340B was to allow covered entities to "stretch scarce Federal resources as far as possible, reaching more eligible patients and providing more comprehensive services," it is could be seen as reasonable that such documentation occur.

At the same time, it is critical that policymakers understand the differences both across and within entity types when asking this question.

In addition to inquiries on use of 340B savings, entities are feeling the pressure from States turning increasingly to 340B as an option for Medicaid drug savings. Faced with shrinking budgets and increased numbers of Medicaid beneficiaries due to PPACA, states like Illinois, Arizona and California have passed provisions that require 340B entities to pass discounts on to the State for drugs dispensed to Medicaid beneficiaries. More specifically, in Illinois, entities eligible for 340B are required to enroll and use 340B for Medicaid. This requirement conflicts with the finding in this research that not all entities are necessarily suited for 340B.

Since 2009, California entities have been subject to what is commonly referred to as the "forced carve-in," meaning that hospitals and clinics do not have the option to use non-340B inventory for Medicaid prescriptions, but without increasing the dispensing fee. In May 2013, after legal action filed by the AIDS Healthcare Foundation (AHF) on grounds that the reimbursement cuts did not cover actual dispensing costs, the United States District Court, Central District of California, permanently enjoined the State from enforcing this requirement. The court granted AHF's motion because the State had not made the same cuts to safety net provider's commercial counterparts and did not consider the impact on the providers or the beneficiaries (AIDS Healthcare Foundation Press Release 2013). Since Arizona's 2011 requirement that 340B providers pass through savings to the State Medicaid agency is based on California's reasoning, it will be interesting to see if the regulations are similarly challenged.

In conclusion, the 340B Program covers entity types that are drastically different from one another across the board; it follows that how they use the program—even among similar entities—will also differ. Policies based on assumptions about how the entities are using or not using the program should be reconsidered, given the findings presented here.

7.5 Areas for Future Research

In addition to the questions already posed, the findings of this research invoke several more areas to explore. First: aside from certain hospital characteristics, what is creating the gap between those CAHs that are enrolled in 340B and CAHs that are actually making purchases through the PVP? Although enrollment in 340B does not technically cost the eligible entities, one issue is that participation does require an investment. Does this investment result in CAH enrollment, but not 340B program use? The increase in 340B compliance efforts and audit-readiness could impact an entity's decision to enroll, but it also could stall participation if the costs associated with these efforts are greater than the hospital anticipated. Because the 340B Program is not "free," what are HRSA's expectation for the financial and staff investment in integrity?

Another area for future research asks what are the factors that an entity should consider prospectively when determining whether to participate? If a 340B-eligible entity has the tools to evaluate the cost-benefit of investing the program versus savings, the decision about whether to use the program could be more efficient and straightforward. This tool could start with considerations like those studied in this project (number of

outpatient visits, pharmacy staff, and level of EHR implementation), but go a step further in contemplating benefit of 340B after costs of participation are considered.

Bibliography

340B orphan drug rule back on hold. (June 2013) *The Drug Discount Monitor*. Safety Net Hospitals for Pharmaceutical Access.

340B orphan drug rule: stakeholders are parsing ACA statute – should some indications be cheaper than others? (June 6, 2011). *The Pink Sheet*. Retrieved March 13, 2013, from http://www.elsevierbi.com/Publications/The-Pink-Sheet/73/23/340B-Orphan-Drug-Rule-Stakeholders-Are-Parsing-ACA-Statute-Should-Some-Indications-Be-Cheaper?result=28&total=154&searchquery=%253fq%253d340B%2526start%253d21

AIDS Healthcare Foundation.(2013 May 7). *Federal Court Throws Out CA Pharmacy Cuts.* [Press Release]. Retrieved from: http://www.aidshealth.org/archives/16270

American Hospital Association. 2010 American Hospital Association's Annual Survey of Hospitals. Data distributed through licensing by: Health Forum, LLC, Chicago, IL.

Antonogeorgos, G., Demosthenes, B., Panagiotakos, Kostas N. Priftis, and Anastasia Tzonou. (2009) "Logistic Regression and Linear Discriminant Analyses in Evaluating Factors Associated with Asthma Prevalence among 10- to 12-Years-Old Children: Divergence and Similarity of the Two Statistical Methods," *International Journal of Pediatrics, 2009*, Article ID 952042, doi:10.1155/2009/952042

Apexus Announces HRSA'S 340B Prime Vendor Contract Renewal. (September 10, 2012). Apexus Press Release. Retrieved May 30, 2013 from: https://docs.340bpvp.com/documents/public/news/archive/hrsa_contract_renewal.pdf

Astra USA, Inc v. County of Santa Clara, 563 U.S. ___ (2011).

Avalere Health. (February 2013). *The 340B Discount Program: A Review and Analysis of the 340B Program.* [White Paper]. Retrieved May 20, 2013, from http://www.bio.org/sites/default/files/340B%20White%20Paper%20FINAL.pdf

Bill fixes 340B discounts for orphan drugs in children's hospitals; will more entities follow? (December 9, 2010). *The Pink Sheet*. Retrieved March 13, 2013, from http://www.elsevierbi.com/Publications/Health-News-Daily/2010/12/9/Bill-Fixes-340B-Discounts-For-Orphan-Drugs-In-Childrens-Hospitals-Will-More-Entities-Follow?result=42&total=154&searchquery=%253fq%253d340B%2526start%253d41

Bureau of Labor Statistics. (2013). "Labor force statistics from the current population survey." Retrieved March 3, 2013, from http://data.bls.gov/timeseries/LNS14000000

Burstin, H., & Wakefield, M. (2004). The Importance of safety and quality in rural america. *The Journal of Rural Health. 20*(4), 301-303.

Casey, M. M., Klingner, J., & Moscovice, I. (2002). Pharmacy services in rural areas: is the problem geographic access or financial access? *The Journal of Rural Health, 18*(3), 467-477.

Casey, M. M., & Moscovice, I. (2004). Quality improvement strategies and best practices in critical access hospitals. *The Journal of Rural Health, 20*(4), 327-334.

Casey, M.M., Moscovice, I., Davidson, G. (2006). Pharmacist staffing, technology use and implementation of medication safety practices in rural hospitals. *The Journal of Rural Health, 22*(4), 321-330.

Casey, M. M., Prasad, S., Klingner, J., & Moscovice, I. (2012). Are the CMS hospital outpatient quality measures relevant for rural hospitals? *The Journal of Rural Health, 28*(3), 248-259. doi:10.1111/j.1748-0361.2012.00406.x; 10.1111/j.1748-0361.2012.00406.x

Centers for Medicare and Medicaid Services. (2013*). Electronic Health Record Incentive Program.* [Press Release]. Retrieved March 26, 2013, from https://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/index.html?redirect=/EHRIncentivePrograms/

Centers for Medicare and Medicaid Services (CMS). (January 2013). "Critical Access Hospital Rural Health Fact Sheet Series." Retrieved March 15, 2013, from http://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNProducts/downloads/critaccesshospfctsht.pdf

Children's hospitals supporters step up pressure on government to allow 340B enrollment. (June 2007). *The Federal Drug Discount & Compliance Monitor, (4)* 6.

Clark, C. (2010, January 27). "Critical Access Hospitals Could Benefit from Drug Discounts." *HealthLeaders Media*. Retrieved March 3, 2013, from http://www.healthleadersmedia.com/page-1/COM-245575/Critical-Access-Hospitals-Could-Benefit-from-Drug-Discounts

Cobb, R. and Elder, C. (1983). *Participation in American Politics: The Dynamics of Agenda-Building.* Johns Hopkins University Press.

Cook, A and Dong, N. (1999). *An Analysis of Purchases, Savings and Participation in the PHS Drug Pricing Program.* (No. 8597-006). Washington, DC: Mathematica Policy Research, Inc.

The Deficit Reduction Act of 2005, Pub. L. No. 109-171, § 6004, 61 Stat. 120 (2006).

DesRoches, C. M., Worzala, C., Joshi, M. S., Kralovec, P. D., & Jha, A. K. (2012). Small, nonteaching, and rural hospitals continue to be slow in adopting electronic health record systems [web first] *Health Affairs,* doi:10.1377/hlthaff.2012.0153

Drug audits of 340B providers will be both random and targeted, HRSA says. (March 7, 2010). *The Pink Sheet*. Retrieved March 13, 2013, from http://www.elsevierbi.com/Publications/The-Pink-Sheet-Daily/2012/3/7/Drug-Audits-Of-340B-Providers-Will-Be-Both-Random-And-Targeted-HRSA-Says?result=15&total=154&searchquery=%253fq%253d340B%2526start%253d11

Eggers, G., Mark, S. and Robert Weber. (2011). 340B drug pricing program: interpreting regulations and exploring opportunities. *Hospital Pharmacy, 46*(5), 362.

Enrollment in 340B program to provide affordable medications begins for newly eligible safety-net health care providers. August 2, 2010. U.S. Department of Health and Human Services, Health Resources and Services Administration press release. Available at: http://www.hrsa.gov/about/news/pressreleases/2010/100802340b.html

Eyestone, R. (1978). *From social issues to public policy*. New York, NY: Wiley.

Fein, A. "The coming battle over 340B contract pharmacies." *Drug Topics.* February 14, 2013. Web. Available at: http://www.drugchannels.net/2013/02/the-coming-battle-over-340b-contract.html. Accessed June 18, 2013.

Gamm, L., Hutchinson, L., Dabney, B., & Alicia Dorsey. (2003). *Rural healthy people 2010: A companion document to healthy people 2010. Volume 3 - rural health research gateway.* (No. 2013). College Station, Texas: The Texas A&M University System Health Science Center, School of Rural Public Health.

GAO and legislators pushing HHS for stronger 340B oversight. (October 3, 2011). *The Pink Sheet*. Retrieved March 13, 2013, from http://www.elsevierbi.com/Publications/The-Pink-Sheet/73/40/GAO-And-Legislators-Pushing-HHS-For-Stronger-340B-Oversight?result=21&total=154&searchquery=%253fq%253d340B%2526start%253d21

Garson, G.D. (2012). *Testing Statistical Assumptions."* Statistical Associates Publishing: North Carolina State University. Available online: http://www.statisticalassociates.com/assumptions.pdf

The Health Care and Education Reconciliation Act of 2010, Pub.L. No 111-152. § 2301, Stat. 1082 (2010).

Henriksen, M., & Walzer, N. (April 2012). *Illinois critical access hospitals: Enhancing quality of care in rural Illinois*. [White Paper]. Center for Governmental Studies: Northern Illinois University. Retrieved May 20, 2013, from http://www.cgsniu.org/portfolio/pdf/icahn-04.10.2012-interactive.pdf

H.R. 2015--105th Congress: Balanced Budget Act of 1997. (1997). In www.GovTrack.us. Retrieved June 14, 2013, from http://www.govtrack.us/congress/bills/105/hr20

HRSA defines "orphan drug" for 340B; purchasing prohibition applies only to use in rare diseases. (May 19, 2011). *The Pink Sheet*. Retrieved Marcy 13, 2013, from http://www.elsevierbi.com/Publications/The-Pink-Sheet-Daily/2011/5/19/HRSA-Defines-Orphan-Drug-For-340B-Purchasing-Prohibition-Applies-Only-To-Use-In-Rare-Diseases?result=30&total=154&searchquery=%253fq%253d340B%2526start%253d21

The Kaiser Commission on Medicaid and the Uninsured. (April 2008). *Medicaid, SCHIP and the economic downturn: policy challenges and policy responses*. Washington, DC: Kaiser Family Foundation.

Kingdon, J. W. (1995). *Agendas, alternatives, and public policies* (2nd ed.). New York, NY: HarperCollins College Publishers.

Letter to the Honorable Kathleen Sebelius, Secretary, Department of Health and Human Services. (May 19, 2010). Safety Net Hospitals for Pharmaceutical Access, National Rural Health Association, Rural Referral Center/Sole Community Hospital Coalition.

The Lewin Group & The Guttmacher Institute. (2009). *Analysis of the effectiveness of title X family planning providers' use of the 340B drug pricing program.* Washington, DC: Department of Health and Human Services.

McCaughan, M. Orphan drugs, 340B, and the challenges of implementing health reform. (July 1, 2011). *The RPM Report*.

McCullough, J., Casey, M., Moscovice, I., & Burlew, M. (2011). Meaningful use of health information technology by rural hospitals. *The Journal of Rural Health, 27*(3), 329-337. doi:10.1111/j.1748-0361.2010.00359.x

Medicare Prescription Drug Improvement and Modernization Act of 2003, Pub. L. No.108-173, 117 Stat. 2066.

Medicare Payment Advisory Committee. (June 2005). *Report to congress: issues in a modernized medicare program.* Retrieved May 21, 2013 from Medicare Payment Advisory Commission Web site: http://www.medpac.gov/documents/june05_entire_report.pdf

Medicare Payment Advisory Committee. (June 2012). *Report to the congress: medicare and the health care delivery system.* Retrieved May 21, 2013 from Medicare Payment Advisory Commission Web site: http://www.medpac.gov/documents/Jun12_EntireReport.pdf

Menard.S. (2000). Coefficients of determination for multiple logistic regression analysis. *The American Statistician, 54* 17-24.

Moscovice, I. S., & Casey, M. M. (2011). Quality of care in critical access hospitals. *JAMA : The Journal of the American Medical Association, 306*(15), 1653; author reply 1654-5. doi:10.1001/jama.2011.1487

National Association of Public Hospitals and Health Systems. (August 2010). Safety net health systems: An essential resource during the economic recession. Retrieved May 21, 2013 from: http://www.naph.org/Main-Menu-Category/Publications/Safety-Net-Financing/Recession-Brief-Aug-2010.aspx

National Rural Health Association. What's different about rural health care? Retrieved May 21, 2013, from http://www.ruralhealthweb.org/go/left/about-rural-health/

"Notice regarding section 602 of the Veterans Health Care Act of 1992; Contract Pharmacy Services." *Federal Register* 60:210 (23 August 1996) p. 43549. ONLINE. Available: http://www.gpo.gov/fdsys/search/pagedetails.action?browsePath=1996/08/08-23\/6/Health+and+Human+Services+Department&granuleId=96-21485&packageId=FR-1996-08-23&fromBrowse=true

"Notice regarding section 602 of the Veterans Health Care Act of 1992: Patient and Entity Eligibility." *Federal Register* 61:207 (24 October 1996) p. 55156. ONLINE. Available: http://www.hrsa.gov/opa/programrequirements/federalregisternotices/patientandentityeligibility102496.pdf

"Notice Regarding HRSA Grant Requirement--Participation in the 340B Drug Pricing Program." *Federal Register* 65:27 (9 February 2000) p. 6383. ONLINE. Available: http://www.gpo.gov/fdsys/pkg/FR-2000-02-09/html/00-2862.htm

"Notice regarding 340B Drug Pricing Program-Contract Pharmacy Services." *Federal Register* 72:8 (12 January 2007) p. 1540. ONLINE. Available: http://www.gpo.gov/fdsys/search/pagedetails.action?browsePath=2007/01/01-12\/6/Health+and+Human+Services+Department&granuleId=E7-334&packageId=FR-2007-01-12&fromBrowse=true

"Notice regarding Section 602 of the Veterans Health Care Act of 1992 Definition of 'Patient'" *Federal Register* 72:8 (12 January 2007) p. 1543. ONLINE. Available: http://www.gpo.gov/fdsys/search/pagedetails.action?browsePath=2007/01/01-12\/6/Health+and+Human+Services+Department&granuleId=E7-335&packageId=FR-2007-01-12&fromBrowse=true

"Notice regarding 340B Drug Pricing Program-Children's Hospitals." *Federal Register* 74:168 (1 September 2009). p. 45206. ONLINE. Available: http://www.gpo.gov/fdsys/search/pagedetails.action?browsePath=2009/09/09-01\/3/Health+Resources+and+Services+Administration&granuleId=E9-21109&packageId=FR-2009-09-01&fromBrowse=true

"Notice regarding 340B Drug Pricing Program-Contract Pharmacy Services." *Federal Register* 75:43 (5 March 2010). p. 10272. ONLINE. Available: http://www.gpo.gov/fdsys/search/pagedetails.action?browsePath=2010/03/03-05\/6/Health+Resources+and+Services+Administration&granuleId=2010-4755&packageId=FR-2010-03-05&fromBrowse=true

"Notice of Proposed Rulemaking, Exclusion of Orphan Drugs for Certain Covered Entities Under 340B Program." *Federal Register* 76:98 (20 May 2011). p. 29183. ONLINE. Available: http://www.hrsa.gov/opa/programrequirements/federalregisternotices/orphandrugexclusion052011.pdf

Office of Pharmacy Affairs' 340B Covered Entity Extract. Accessed May 2013. Available at: http://opanet.hrsa.gov/opa/

Office of Pharmacy Affairs website, Eligible Entities link, Accessed May 2013, available at: http://www.hrsa.gov/opa/eligibilityandregistration/index.html

Office of Senator Chuck Grassley, "Grassley, Enzi, Hatch, Pitts Seek Details of Discount Drug Program," News release, March 5, 2012, http://www.grassley.senate.gov/news/Article.cfm?customel_dataPageID_1502=39441.

The Omnibus Budget Reconciliation Act of 1990. Pub. L. No. 101-508, § 4401, 104 Stat. 1388, 1388–143-161 (codified at 42 U.S.C. § 1396r-8 (2000)).

The Orphan Drug Act. Pub. L. No. 97-414 96 Stat. 2049. (1983).

The Patient Protection and Affordable Care Act, Pub.L. No 111-148. § 7101, 124 Stat. 119 (2010).

Pedley, K. (Speaker). (December 30, 2010). 340B drug pricing program new covered entities. [Webinar]. Rockville, MD: Health Resources and Services Administration.

Peng, C., Lee, K., & Ingersoll, G. (2002). An introduction to logistic regression analysis and reporting. *The Journal of Educational Research, 96*(1), 3.

The Patient Protection and Affordable Care Act, Pub.L. No 111-148. § 7101, 124 Stat. 119 (2010).

Radford, A., Slifkin, R., Schur, C., Cheung, K. & Baernholdt, M. (June 2008). Are you missing out on drug savings? *Healthcare Finance Management*, *62*(6): 82–85

Rosko, M. D., & Mutter, R. L. (2010). Inefficiency differences between critical access hospitals and prospectively paid rural hospitals. *Journal of Health Politics, Policy and Law, 35*(1), 95-126. doi:10.1215/03616878-2009-042

Schleif, R., Edelen, B., & Bowers, M. L. (September 2011). 340B benefits some, not others. *Oncology Business Review*. Available at: http://obroncology.com/documents/OBR_0911_v3_340B.pdf

Schmidz, R., Limpa-Amara, S., Milliner-Waddell, J., & Potter, F. (2004). *The PHS 340B drug pricing program: results of a survey of eligible entities.* (No. PR04-70). Cambridge, MA: Mathematica Policy Research, Inc.

Schmitz, R, Quinn, A. & Williams, S. (2003). *The PHS 340B drug pricing program: pricing, participation, and stakeholder attitudes*. Cambridge, MA: Mathematica Policy Research.

Schur, C., Cheung, K., Radford, A., Slifkin, R. and Baernholdt, M. (2007). *340B drug pricing program: results of a survey of participating hospitals.* (Working Paper #90). Chapel Hill, NC: Report to the Office of Rural Health Policy.

Schur, C., Cheung, K., Radford, A., Slifkin, R. and Baernholdt, M. (May 2007). *340B drug pricing program: results of a survey of eligible but non-participating hospitals.* (Working Paper #88). Chapel Hill, NC: Report to the Office of Rural Health Policy.

Stensland, J., Moscovice, I., & Christianson, J. (2002). Future financial viability of rural hospitals. *Health Care Financing Review, 23*(4), 175-188.

To avoid duplicate drug discounts for Medicaid and 340B, OIG wants more accurate information. (June 16 2011). *The Pink Sheet*. Retrieved March 13, 2013 from: http://www.elsevierbi.com/Publications/The-Pink-Sheet-Daily/2011/6/16/To-Avoid-Duplicate-Drug-Discounts-For-Medicaid-And-340B-OIG-Wants-More-Accurate-Information?result=27&total=154&searchquery=%253fq%253d340B%2526start%253d21

U.S. Department of Agriculture. Economic Research Center's Rural Urban Continuum Codes, 2003. Available online: http://www.ers.usda.gov/data-products/rural-urban-continuum-codes.aspx#.UcEhA_nviSo

U.S. Department of Health and Human Services. (1998). *Audit of state AIDS drug assistance programs' use of drug price discounts.* (OIG publication No. A-01-97-01501). Washington, DC: Author.

U.S. Department of Health and Human Services. (1998). *Audit of the utilization of the public health service 340B drug pricing program.* (OIG publication No. A-01-98-01500). Washington, DC: Author.

U.S. Department of Health and Human Services. (1999). *Audit of comprehensive hemophilia treatment centers' utilization of the PHS 340B drug pricing program.* (OIG publication No. A-01-98-01505). Washington, DC: Author.

U.S. Department of Health and Human Services. (2004). *Deficiencies in the 340B drug pricing program's database.* (OIG publication No. OEI-05-02-00071). Washington, DC: Author

U.S. Department of Health and Human Services. (2005). *Deficiencies in the oversight of the 340B drug pricing program.* (OIG publication No. OEI-05-02-00072). Washington, DC: Author.

U.S. Department of Health and Human Services. (2006). *Review of 340B prices.* (OIG publication No. OEI-05-02-00073). Washington, DC: Author.

U.S. Department of Health and Human Services. (2011). *State medicaid policies and oversight activities related to 340B-purchased drugs.* (OIG publication No. OEI-05-09-00321). Washington, DC: Author.

U.S. Department of Health and Human Services. (2011). *Drug pricing: manufacturer discounts in the 340B program offer benefits, but federal oversight needs improvement.* (GAO publication No. GAO-11-836). Washington, DC: Author.

U.S. Department of Health and Human Services. (October 21, 2011). Letter to Honorable Charles E. Grassley from the HRSA Administrator, Dr. Mary Wakefield. Available at: http://www.grassley.senate.gov/about/upload/Final-signed-Grassley-340B-package-10-21-11.pdf

U.S. Department of Health and Human Services. (February 10, 2012). Letter to 340B Program Participants from the HRSA Administrator, Dr. Mary Wakefield. Available at: http://www.hrsa.gov/opa/programrequirements/policyreleases/programintegrity021012.pdf

U.S. Food and Drug Administration. "Instructions for Searchable Designation Database". Accessed May 2013. Available at: http://www.fda.gov/ForIndustry/DevelopingProductsforRareDiseasesConditions/HowtoapplyforOrphanProductDesignation/ucm333718.htm

U.S. House. 112th Congress, 1st Session. H.R.2674, *340B Program Improvement Act* (Introduced in House July 27, 2011). ONLINE. Available at http://thomas.loc.gov/cgi-bin/query/z?c112:H.R.2674.IH:

U.S. House. Committee on Energy and Commerce. Subcommittee on Oversight and Investigations. *Oversight and administration of the 340B drug discount program: Improving efficiency and transparency.* (15 December 2005). Washington: Government Printing Office, 2005. Retrieved from http://purl.access.gpo.gov/GPO/LPS75443

U.S. House of Representatives Report. Veterans' Affairs Committee. The Medicaid Drug Rebate Amendments of 1992 (to accompany H.R. 2890). (H.R. Rep. 102-384). Washington: Government Printing Office, 1992.

U.S. House of Representatives Report. Making Omnibus Consolidated and Emergency Supplemental Appropriations for Fiscal Year 1999 (to accompany H.R. Rep. 4328). H.R. 105-825. Washington: Government Printing Office, 1998.

U.S. Senate Committee on the Judiciary. (March 27, 2013). Letter to HRSA Administrator Dr. Mary Wakefield on Oversight of the 340B Program. Available at: http://www.grassley.senate.gov/about/upload/2013-03-27-CEG-to-HRSA-340B-Oversight-3.pdf

The Veterans Health Care Act of 1992. Pub. L. No. 102-585, §§ 601–03, 106 Stat. 4943

von Oehsen, W., Doggett, G., & Davis, J. (2012). The 340B drug discount program: A new era of enforcement and oversight. *Journal of Health & Life Sciences Law, 5*(3), 72.

Wallack, M. and Herzog, S. (June 2011) "Demonstrating the Value of the 340B Program to Safety-Net Hospitals and the Vulnerable Patients They Serve," Prepared for the Safety Net Hospitals for Pharmaceutical Access.

Wallack, M. and Sorensen, T. (March 2012) "Excluding Orphan Drugs from the 340B Drug Discount Program: The Impact on 18 Critical Access Hospitals." *Innovations in Pharmacy.* Vol 3, No. 1.

Werling, K., Abraham, S., & Strelec, J. (2007). The 340B drug pricing program: An opportunity for savings, if covered entities such as disproportionate share hospitals

and federally qualified health centers know how to interpret the regulations. *Journal of Health Care Finance, 34*(2), 57-70.

Wilensky, S. (2010). *340B Prime Vendor Program: Health Center Decision Making and Barriers to Participation.* (Doctoral dissertation). Available from ProQuest Dissertations & Theses database. (UMI No. 3397606).

Will the 340B orphan drug final rule come out in may? (January 12, 2012). *The Drug Discount Monitor.* Safety Net Hospitals for Pharmaceutical Access.

Wright, R. (1995). "Logistic regression," in Reading and Understanding Multivariate Statistics, L. G. Grimm and P. R. Yarnold, Eds., pp. 217–244, American Psychological Association, Washington, DC, USA.