



Policy Research Perspectives

Competition in Commercial PBM Markets and Vertical Integration of Health Insurers with PBMs: 2023 Update

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Introduction

Pharmacy benefit managers (PBMs) are a very important participant in health insurance markets and the supply chain for prescription drugs. They manage drug insurance benefits for the vast majority of Americans. PBMs are receiving increasing scrutiny from policymakers and regulators. This year alone the U.S. House and Senate have held four hearings on PBMs.¹ There is also considerable proposed legislation seeking to regulate them at both the federal and state levels. Eighteen bills referencing PBMs have been introduced in the 118th Congress, and several states and the District of Columbia have proposed or enacted legislation (National Journal 2023).

PBMs are a middleman between drug manufacturers and insurers (or employers). PBM services are an input to the production of health insurance services and thus a determinant of health plan premiums. PBM functions include negotiating rebates with drug manufacturers, assembling retail pharmacy networks, managing drug formularies, adjudicating pharmacy claims and designing drug benefits.

PBMs were created in the 1960s to help health insurers contain drug spending. For example, they conduct utilization management such as prior authorization and step therapy. PBMs can stimulate price competition among drug manufacturers by shifting demand among competing substitute drugs. In turn, manufacturers offer rebates to PBMs for their drugs to be placed favorably in a drug formulary. PBMs are then supposed to pass on those rebates to insurers and employers. Importantly, PBM markets need to be competitive for rebates to be fully passed on (Garthwaite and Scott Morton 2021). However, it is not clear whether PBMs are (fully) passing on those rebates. Indeed, consolidation in the PBM market, combined with opaque pricing due to confidentiality of rebates, may cause higher pharmaceutical prices (Garthwaite and Scott Morton 2017). In fact, an emerging view is that the use of rebates can also lessen competition. The Federal Trade

¹ See the References section for the list of hearings.

Commission (FTC) is questioning the legality of certain rebates. Last year it announced that it would ramp up enforcement against the use of illegal bribes and rebate schemes that foreclose competition from cheaper drugs (Federal Trade Commission 2022). In sum, although PBMs can negotiate lower prices from drug manufacturers, they can also lessen competition and raise the prices of drugs.

Perhaps in response to the incomplete pass-through of rebates, health insurers have been vertically integrating with PBMs. As a result, the largest insurers in the U.S. and even some smaller ones already have their own PBM or share the same owner with one. The fact that the largest health insurers and PBMs at the national level are vertically integrated can make it appear that vertical integration is more widespread than it actually is. However, that may not be the case given that health insurance markets are generally local. In fact, insurers with a national presence are in the minority. Most insurers are typically licensed in a single state (Guardado and Kane 2022). Thus, a look at the local level may portray a different picture of the extent of vertical integration than at the national level.

The objective of this paper is to shed light on PBM market competition and the services PBMs supply to health insurers. It addresses two questions. First, are PBM markets competitive? Second, what is the extent of vertical integration between PBMs and insurers?

Two other data sources (Drug Channels 2023; Health Industries Research Companies (HIRC) 2022) also study PBM markets and report market shares of the largest PBMs. However, they report them based on only one type of PBM function (adjudicated drug claims), compute them only at the national level, and provide little information about the insurers that use them, particularly whether insurers self supply PBM services.

Using novel data, this paper presents a descriptive analysis of PBM markets and the supply of PBM services to commercial health insurers. This is an update to the original paper published in 2022 which used data for 2020. The current paper adds data for 2021. In contrast to other work, this research provides information on five different PBM functions. A major advantage of the data is that the PBMs that insurers use to manage their lives and conversely what insurers' lives are managed by PBMs are reported for each function. Using this information, PBM market shares at the national, state and MSA levels are computed. The paper also presents data on PBM market concentration—Herfindahl-Hirschman Indices (HHIs)—at those local levels. Due to the nature of the data, the market examined is a very specific one. It is based on commercial drug coverage that is provided by a health insurer in a health plan that includes both a medical benefit and a drug benefit.

It is useful to consider the market shares of the health insurers providing those drug benefits, since they are the same covered lives managed by the PBMs.² This helps explain the size of PBMs' market shares. If a health insurer is big in the drug insurance market, then the PBM that manages its lives would be big as well. To this end, the paper also presents the 10 largest health insurers' national-level market shares of drug coverage lives.

² Covered lives is a standard term used in health and drug insurance, which means the persons covered under a policy. It is synonymous with beneficiaries or enrollees. These terms are used interchangeably throughout the paper.

Insurers face a “make or buy” decision—they can supply a PBM function in house (make) or go to the market and use a PBM (buy). Sometimes the insurer shares ownership with the PBM it uses, while other times they are not affiliated. For each of the five PBM functions, either the name of the PBM that supplies that function or whether the insurer performs it “In house” is reported in the data. An insurer may use an external PBM for some functions and perform other functions in house. Thus, the data can reveal whether an insurer is vertically integrated with a PBM and can be used to quantify the extent of vertical integration between health insurers and PBMs. It can also be determined whether the PBM is exclusive to an insurer or whether the PBM manages other non-affiliated insurers' lives as well.

Whether or not health insurers and PBMs are vertically integrated or whether they are exclusive has important antitrust implications. In vertical mergers, there is a risk of *input* or *customer* foreclosure (Salop 2017).³ If an insurer is already vertically integrated with a PBM, there would be less antitrust concern that proposed vertical mergers between other insurers and PBMs would foreclose the vertically integrated insurer or PBM or raise their costs. However, non-vertically integrated insurers and PBMs could still be foreclosed. An important question is whether non-vertically integrated insurers face higher PBM prices, which could then translate to higher premiums. Regarding exclusivity, if a PBM is exclusive to a specific insurer, its presence in the market does not necessarily mean that it is a viable option for that insurer's rivals.

Data

This paper uses 2020 and 2021 data on commercial drug insurance coverage lives and the PBMs that health insurers use to manage those lives from the Decision Resources Group (DRG). This is the same data source used to produce *Competition in Health Insurance: A Comprehensive Study of U.S. Markets* (Guardado and Kane 2022). To collect data on PBM lives, DRG does not survey PBMs. Instead, in addition to asking health insurers for the number of *medical* lives they cover, DRG asks them for their drug benefit covered lives, as well as for the PBMs that manage them. Thus, the PBM lives reported in the DRG data are those same drug coverage lives reported by insurers, but assigned to the PBM. DRG aggregates the insurer-level lives to the PBM level so that a given PBM's lives are the sum of all lives of the insurers that use it.⁴

These drug insurance lives are part of a commercial health plan that includes both a medical benefit and a drug benefit. Sometimes a health plan does not include a drug benefit, which may instead be *carved out*. Employers may choose not to get drug coverage from the insurer, and instead buy the drug benefit separately from a PBM. This is analogous to standalone plans in Medicare Part D, where Medicare beneficiaries can buy drug coverage separately from their medical plan. The DRG commercial data do not include carved-out lives. In fully insured health plans, DRG estimates that about 10 percent of drug coverage lives are carved out and thus not included in the data. In the self-insured market, about 65 percent of lives are carved out and not included. Of the health insurance

³ For example, in the Aetna-CVS merger, the input foreclosure concern was that Aetna's insurer rivals would not be able to access the Caremark PBM or would face higher costs after the merger. Aetna's insurer competitors might be foreclosed. The *customer* foreclosure concern was that Caremark's PBM rivals might be foreclosed from having Aetna as a customer.

⁴ Although Medicare Part D and Medicaid drug coverage lives are also reported in the DRG data, this paper excludes them and focuses on the commercial market.

lives in the DRG data, 47 percent are fully insured, and 53 percent are self-insured. This suggests the data are missing about 39 percent of commercial drug coverage lives in the combined fully insured and self-insured markets.⁵

One major advantage of the data is that the PBM used by insurers to perform each of five different functions is reported. Those functions are *rebate negotiation*, *retail network management*, *claims adjudication*, *formulary management* and *benefit design*. Alternatively, if the insurer performs the function itself, “In house” is reported instead. Rebate negotiation represents the negotiation of rebates with drug manufacturers. Retail network management is the assembling of retail pharmacy networks. Claims adjudication is the administering and processing of pharmacy claims information. Formulary management represents the controlling of the drug formulary, which is a list of drugs deemed most medically appropriate and cost effective by the entity with control of it. Finally, benefit design is a means to incentivize the use of certain drugs over others, such as through tiering, copays and coinsurance.

Methodology

Market shares and market definition

Geographic market definition

This paper uses the drug coverage lives to compute PBM market shares and HHIs. To calculate firms’ market shares, the market in which competition takes place needs to be defined. Markets are characterized by two aspects: a geographic market and a product market. As in *Competition in Health Insurance*, this study defines geographic markets at the state and MSA levels. In fact, the same methodology used in *Competition in Health Insurance* with respect to the raw data is used here as well. This study also excludes lives from areas where insurers are not licensed. Most notable among these are Blue Cross Blue Shield (BCBS) insurers, which typically do not compete with one another.^{6,7} Thus, this paper analyzes the drug coverage lives of the same insurers as in *Competition in Health Insurance*, the latter of which looks at *medical* lives.

There are plausible reasons why PBM markets may also have a local dimension. Since health insurance markets are local, and when the drug benefit is tied to the medical benefit as is the case here, the market for drug coverage may also be local. As mentioned, there are very few health insurers with a national presence (Guardado and Kane 2022). Most insurers still operate locally and are typically licensed in a single state or region, such as most BCBS insurers. Relative bargaining power may be determined locally. There may be geographic variation in PBMs bargaining power vis-

⁵ 39 percent is a weighted average of the carved-out shares in the self-insured and fully insured markets.

⁶ There is an ongoing lawsuit against BCBS for such an agreement among BCBS insurers. The lawsuit was settled in August 2022. The settlement resolves claims that the insurers violated antitrust laws by entering into an agreement not to compete with each other and to limit competition among themselves in the sale of health insurance. Federal Court granted final approval to the Settlement on August 9, 2022. However, some Settlement Class Members have appealed the Court’s decision to approve the Settlement. Thus, the Settlement cannot become final until all appeals are resolved.

⁷ See *Competition in Health Insurance* (Guardado and Kane 2022) for the detailed methodology employed, including the exclusions of lives from the raw data.

à-vis insurers. Moreover, analogous to health insurers' assembly of hospital and physician networks, PBMs assemble networks of pharmacies. If pharmacies need to be close to where workers live and work to buy their drugs, then, save for mail order, it is plausible that retail pharmacy markets may also have a local dimension. For these reasons, this paper calculates PBM market shares at the local level in addition to the national level. Regardless of the competitive implications, it is nonetheless interesting to shed light on the local presence of PBMs as there could be variation across states and MSAs in their market shares compared to their national sizes.

Product market definition

Turning to product market definition, at the outset all five PBM functions were candidates to assess competition. However, an initial analysis revealed that significant portions of the market were being supplied by insurers in house for two of the functions. Rather than using a PBM as a middleman, there was a significant extent of insurer self supply. At the national level, formulary management for an aggregate 36 percent of drug coverage lives was conducted in house by insurers. The share for benefit design was similar at 37 percent.⁸ In contrast, the in-house shares were only 1 percent to 3 percent for the other three PBM functions.⁹ This suggests formulary management and benefit design should be treated differently in the analysis. For this reason, this paper assesses competition based on the other three functions: *rebate negotiation, retail network management, and claims adjudication*.

Last year's version of this paper excluded the small fractions of in-house lives in calculations of shares and HHIs for those three functions.¹⁰ In contrast, the analysis in this year's update no longer excludes them. Thus, last year's study results for 2020 for rebate negotiation, retail network management and claims adjudication differ slightly from those reported here.

Vertical integration

Another major advantage of the DRG data is that they can be used to quantify the extent of vertical integration between health insurers and PBMs. The PBM that an insurer uses to manage its lives and conversely what insurers' lives are managed by the PBM are both reported. Thus, it can also be determined whether the PBM is exclusive to an insurer or whether the PBM manages other non-affiliated insurers' lives as well. The reported PBM may be owned by the insurer (or the insurer's owner), or it may be independent.

⁸ One potential factor that may contribute to such large shares is that the data exclude carved-out lives. Whereas some insurers have the capability to conduct those functions in house, some employers may not. Thus, when lives are carved out, employers may be more likely to have a PBM perform them. This possibility suggests insurer in-house shares might be lower in an analysis that also included carved-out lives.

⁹ 3 percent for rebate negotiation, 1 percent for retail network management and 2 percent for claims adjudication.

¹⁰ In last year's version of this paper, in-house lives were excluded when calculating market shares and HHIs for rebate negotiation, retail network management, and claims adjudication under the assumption that those lives did not belong in the relevant market. Because there were so few of them, their exclusion had only a minor impact on national market shares. However, a switch by a large insurer (BCBS AL) from using a PBM (Prime Therapeutics) for claims adjudication to performing that function in house highlighted an issue with that approach. Excluding in-house lives in 2021 would have removed 85% of Alabama's claims adjudication market, and ignored the possibility that Prime Therapeutics or other PBMs could still compete for those lives and thus be a potential substitute. Thus, in-house lives are no longer excluded from the analysis.

This paper considers an insurer as vertically integrated if it meets at least one of two criteria for a given PBM function. One is that the PBM reported for the function is “In house,” which is by definition vertically integrated—the firm self supplies an input rather than buying it from the market. The other criterion is that the reported PBM is owned by the insurer or shares its same owner.

Initially, the presence of five PBM functions seemed to present a challenge in determining whether an insurer is vertically integrated. In general, however, there is consistency in whether the insurer is vertically integrated across the five functions. This simplified the classification. For example, the PBM reported across all five functions for UnitedHealth Group is always the PBM it owns—OptumRx, and the PBM reported for Anthem is “In house” for two of its functions and its own IngenioRx for the other three. There are other less common cases where the insurer is vertically integrated for some functions but uses an unaffiliated PBM for others. In this paper, if the insurer uses an affiliated PBM for at least four of the five functions, then it is considered vertically integrated. Although an insurer can be vertically integrated for some functions but not for others, the consistency across functions suggests that a single measure of vertical integration is valid.¹¹

Results

National level market shares

PBM market shares for rebate negotiation, retail network management and claims adjudication

Exhibit 1 reports national-level market shares of the 10 PBMs that were the largest in the U.S. in 2021 along with their 2020 shares. They are presented for rebate negotiation, retail network management and claims adjudication. In general, the results show little difference in the shares and PBM rankings across functions, and with one exception (CVS Health), also over time. Thus, the following discussion focuses on rebate negotiation in 2021.

Express Scripts is the largest PBM in the commercial market with a 21 percent share. The second largest PBM is OptumRx, which has a 17 percent share. CVS Health is the third biggest with a 16 percent share. These PBMs are followed by Prime Therapeutics (14 percent), Kaiser Pharmacy (11 percent) and IngenioRx (10 percent).¹² The four-firm concentration ratio (CR4) is 68 percent. This indicates that the four largest PBMs collectively have a 68 percent share of the national PBM commercial market. This is up from 64 percent in 2020.^{13,14}

¹¹ There were a few instances in which a parent company’s (Centene) insurer subsidiaries were not always vertically integrated across all geographic areas. In particular, although Centene is vertically integrated in the vast majority of geographic areas where it operates, a few of its subsidiaries in a few areas are not.

¹² There are a few differences in the national-level PBM market shares presented in Exhibit 1 compared to those from Drug Channels and HIRC, the latter two of which are themselves similar. The Appendix explores potential explanations for the differences.

¹³ The CR4 of 64 percent in 2020 was calculated from the shares of Express Scripts (21), OptumRx (17), Prime Therapeutics (15) and Kaiser Pharmacy (12).

¹⁴ As indicated above, there was a slight change in methodology from the 2022 version of this paper. This 2023 update no longer excludes in house lives, which resulted in small changes to the 2020 results. Another difference is that in the 2022 version of the paper, it was unknown to the author that the PBM FutureScripts was owned by OptumRx so they were considered different PBMs. In this year’s version, FutureScripts is combined with OptumRx.

The increase in the CR4 is due to CVS Health's acquisition of an insurer, Aetna. Interestingly, this was largely considered a vertical merger. However, Aetna already owned a PBM named Aetna Pharmacy Management (Aetna Pharm Mgmt) so the merger also had a significant horizontal component. Both CVS Caremark and Aetna Pharm Mgmt are now under CVS ownership and we combine them in the data under CVS Health. In 2020, Aetna used Aetna Pharm Mgmt for rebate negotiation, but it switched to CVS Caremark in 2021. As a result of the merger, CVS Health's share increased from 9 percent to 16 percent, made it the third largest PBM, and raised the CR4 to 68 percent.¹⁵

The remaining four PBMs have smaller market shares, ranging from 1 percent to 3 percent. Interestingly, two *insurers* appear in the table. With a 1 percent share, Blue Cross Blue Shield of Massachusetts (BCBS MA) is the ninth largest supplier of rebate negotiation services, given that it self-supplies this service for the 36 percent of Massachusetts's drug lives it insures. Blue Cross Blue Shield of Alabama (BCBS AL) was the 10th biggest supplier of claims adjudication. It obtained that high rank for the first time in 2021 as a result of switching from Prime Therapeutics—a PBM it partly owns—to adjudicating claims in house. Consequently, Prime Therapeutics's claims adjudication share fell from 15 percent to 13 percent. The other PBMs' shares changed by no more than a 1 percentage point between 2020 and 2021 for all three functions.

Drug insurer market shares

It is useful to consider the market shares of the health *insurers* providing those drug benefits, since those are the same lives that the PBMs are managing. This helps explain the size of PBMs' market shares. If a health insurer is big in the commercial drug insurance market, then the PBM that manages those its lives would be big as well. Exhibit 2 reports national-level market shares of the 10 largest commercial drug insurers in 2020 and 2021. The beneficiaries underlying Exhibit 2 are the same ones underlying the PBM shares in Exhibit 1.¹⁶ The lives in Exhibit 1 are distributed among PBMs, while those in Exhibit 2 are distributed among insurers. With one exception, these 10 insurers are the same largest commercial *health* insurers in the U.S. (Guardado and Kane 2022).^{17,18}

Drug insurers' shares and rankings in 2020 and 2021 are very similar so the following discussion focuses on 2021. Exhibit 2 shows that with a 13 percent market share, UnitedHealth is the largest commercial drug insurer in the U.S. This helps explain why the PBM it owns and uses—OptumRx—is the second largest PBM. OptumRx's 17 percent share (for rebate negotiation) is larger than UnitedHealth's because OptumRx is not exclusive; it manages many other insurers' drug benefits as

For these two reasons, the 2020 results reported here may differ slightly from those reported in the 2022 version. For example, last year we reported a 2020 CR4 of 66 percent.

¹⁵ Incidentally, Aetna still used Aetna Pharm Mgmt in 2021 for retail network management and claims adjudication. Exhibit 1 combines them under CVS Health.

¹⁶ The total number of national lives is slightly lower for rebate negotiation, retail network management and claims adjudication because there was one observation (one insurer) with no PBM reported for those three functions.

¹⁷ Centene, listed as the 7th largest drug insurer in 2021 in Exhibit 2, was the 11th largest health insurer by *medical* lives. Highmark was the 10th largest health insurer, but the 11th biggest drug insurer.

¹⁸ However, the ranking and market shares differ slightly given that insurers' numbers of *drug* and *medical* covered lives can differ. Part of the difference is due to the carve out of drug benefits described above, and another is due to some employers not providing a drug benefit.

well. Closely behind UnitedHealth is Kaiser with an 11 percent share in the drug insurance market. The Kaiser Pharmacy PBM is used exclusively by Kaiser and thus also has an 11 percent share. Because Kaiser is a big drug insurer, its PBM is also big.

Cigna has a 10 percent share in the drug insurance market and uses its own PBM—Express Scripts. Cigna's size is largely what makes Express Scripts the biggest PBM. However, Express Scripts is also used by many other insurers—hence its much larger PBM share of 21 percent. Anthem is the fourth largest drug insurer with a 10 percent share. After being used exclusively by Anthem in 2020, Anthem's PBM IngenioRx was also used by Blue Cross of Idaho (BC of ID) in 2021. Because BC of ID is relatively small at the national level, IngenioRx nonetheless also has a (rounded) 10 percent share like Anthem. The fifth largest insurer is CVS-owned Aetna with a 7 percent share. Aetna uses Aetna Pharm Mgmt exclusively, which gives the latter a 7 percent share as well in retail network management and claims adjudication although it does not appear explicitly in Exhibit 1 because it is combined with CVS Caremark under CVS Health.

The next largest insurer is Health Care Service Corporation (HCSC), which owns BCBS companies in five states. HCSC and several other BCBS insurers, including BCBS FL, jointly own and exclusively use Prime Therapeutics and collectively give it its large share of 14 percent in the PBM market. Finally, Centene's national size helps put the PBM it owns—Envolve Pharmacy Solutions (also exclusive)—among the 10 largest PBMs.

In sum, of the 10 PBMs supplying rebate negotiation services in Exhibit 1, which have a collective market share of 95 percent, five are exclusive to a single insurer, and another is exclusive to a set of insurers. Those PBMs (and the insurers) are Kaiser Pharmacy (Kaiser), Envolve (Centene), Humana Pharmacy Solutions (Humana), BCBS MA, Select Health (Select Health) and Prime Therapeutics (several Blues). These six PBMs have a collective national share of 32 percent of the rebate negotiation market—down from 47 percent in 2020. This reduction is due to two factors. First, IngenioRx was exclusive in 2020, and although it still largely is, it started providing PBM services to BC of ID in 2021. Second, Aetna Pharm Mgmt, which is exclusively used by Aetna, no longer provides rebate negotiation services as it did in 2020.

Such extent of exclusivity has competitive implications. Although it may appear that insurers have a considerable number of PBMs to choose from, this may be overstated since six of the 10 largest PBMs are exclusive. Moreover, the other four non-exclusive PBMs (Express Scripts, OptumRx, CVS Caremark and IngenioRx) share ownership with insurers.

The results in Exhibits 1 and 2 suggest a significant degree of vertical integration between health insurers and PBMs due to their common ownership. The eight largest insurers, which have a collective national market share of 61 percent, are affiliated with the seven biggest PBMs.

PBM market shares for formulary management and benefit design

Exhibit 3 reports national-level formulary management and benefit design market shares of the 10 PBMs that were the largest in the U.S. in 2021 along with their corresponding 2020 shares. A few interesting findings emerge from comparing Exhibit 1 to Exhibit 3. First, Express Scripts' market share decreases from 21 percent to 11 percent and falls in rank from first to fourth. Some insurers

that use Express Scripts for the functions in Exhibit 1 conduct formulary management and benefit design in house. Notable among these are BCBS of Michigan (BCBS MI) and other BCBS insurers. Consequently, OptumRx becomes the biggest PBM. The other notable finding is that *four insurers* now appear in Exhibit 3. This is not surprising because in contrast to the three PBM functions in Exhibit 1, formulary management and benefit design are much more often conducted by insurers in house. At the national level, formulary management for an aggregate 36 percent of drug coverage lives was conducted by insurers in house. The share for benefit design was 37 percent.¹⁹ The insurers in Exhibit 3 that are supplying PBM services in house are Anthem, Blue Shield of California (BS of CA), BCBS MI and Highmark.²⁰ In fact, Anthem has 10 percent shares in formulary management and benefit design and has replaced IngenioRx as the sixth and fifth largest “PBM.” IngenioRx is no longer one of the largest PBMs because while Anthem uses IngenioRx for rebate negotiation, retail network management and claims adjudication (Exhibit 1), it conducts formulary management and benefit design in house (Exhibit 3). Finally, Highmark has made the list in 2021. Highmark rose from 13th largest in 2020 to 10th in 2021 as a result of its acquisition of HealthNow New York—an owner of two Blue insurers.

Local level market shares and market concentration

Turning to an assessment of PBM market shares and concentration at the state and MSA levels, Exhibit 4 presents mean and median HHIs and the percentages of markets that are highly concentrated. They are reported for rebate negotiation, retail network management and claims adjudication. More detailed results underlying these summary statistics are reported in the Appendix. Exhibit A1 reports the HHIs and the two largest PBMs’ market shares in each state for the rebate negotiation market. Exhibits A2 and A3 presents this information for retail network management and claims adjudication, respectively.

The results show that on average, local PBM markets are highly concentrated and became even more so in 2021. Average market concentration increased by approximately 50 points across product and geographic markets. In 2021, the average HHIs across states and MSAs in the rebate negotiation market were 3678 and 4087—up from 3623 and 4034 in 2020. Eighty percent of state-level markets and 84 percent of MSA-level markets were highly concentrated. In the retail network management market, the state and MSA-level average HHIs were 3696 and 4064. Finally, claims adjudication markets experienced increases in average HHIs from 3646 and 4037 to 3703 and 4086 across states and MSAs. Across all product and geographic markets, at least 80 percent of markets were highly concentrated in 2021 and all of those fractions increased from 2020. There were particularly large increases in those shares in state-level retail network management and claims adjudication markets. For example, 86 percent of state-level retail network management markets were highly concentrated in 2021—up from 78 percent in 2020, and 84 percent of claims adjudication markets were highly concentrated in 2021—up from 76 percent in 2020. Interestingly, although *average* market concentration increased in 2021, state level *median* HHIs decreased.

¹⁹ These 36 percent and 37 percent shares are the sums of *all* insurers that are supplying formulary management and benefit design in house, including the insurers in Exhibit 3.

²⁰ Centene is not mentioned in this discussion because, although it is an insurer, its share in the table and thus its ranking of 7th is actually due to a combination of its PBM Envolv’s lives as well as its in house lives. Were they to be reported separately, Envolv would be ranked 9th with a 2 percent share, and Centene (the insurer) would be ranked 17th with a 1 percent share.

These changes are largely attributable to the Aetna-CVS merger, and particularly the horizontal consolidation of the Aetna Pharm Mgmt and CVS Caremark PBMs. Prior to the merger, there was overlap between the two in some state- and MSA-level PBM markets. For example, three states and the District of Columbia became highly concentrated in 2021. Of those four areas, the merger put three of them in the highly concentrated category (District of Columbia, Maryland, New York).

Extent of vertical integration of health insurers and PBMs

The national-level results of the largest PBMs and insurers presented above suggest a large extent of vertical integration between health insurers and PBMs. This is in fact the conventional wisdom because it is what prior studies suggest. As Guardado and Kane (2022) find, however, the largest health insurers nationally are not necessarily the biggest health insurers at the local level. In fact, most health insurers don't have a national presence and instead operate locally. Such insurers may not necessarily have their own PBMs and may not be vertically integrated.

Exhibit 5 presents 2020 and 2021 shares of drug lives that are covered by an insurer that is vertically integrated—i.e., has its own PBM or performs the PBM function(s) in house. There was virtually no change over time in the extent of vertical integration. Nationally, 70 percent of drug lives were covered by a vertically integrated insurer in 2021—just one percentage point higher than in 2020. Although the largest U.S. insurers and PBMs are vertically integrated, 30 percent of the national market is not. Turning to the local level, there are areas where there is even less vertical integration. On average, 63 percent of state-level drug lives and 65 percent of MSA-level drug lives are vertically integrated. However, there is wide variation across states and MSAs, with some states having almost no vertical integration, while others are almost entirely vertically integrated. The state with the smallest vertical integration share (South Dakota) has only 6 percent of its lives vertically integrated, whereas the highest share of 97 percent is in Utah (data not shown).

Several insurers that don't have a national presence but are large locally are not vertically integrated. Notable examples are several BCBS insurers. For example, BS of CA and BCBS MI are not vertically integrated and still use external PBMs. The same is true for many other BCBS as well as non-BCBS insurers. Interestingly, BS of CA recently announced that it is planning to drop CVS Caremark as its PBM and switch to non-traditional suppliers of PBM services (Amazon Pharmacy and Mark Cuban's Cost Plus Drug Company) in an effort to save on drug costs (Constantino 2023).

Conclusion

This paper presents a descriptive analysis of PBM markets and the supply of PBM services to commercial health insurers. Due to the nature of the data used, the market examined is based on commercial drug coverage that is tied to a health insurance plan—carved-out lives are not included. Using these novel data from 2020 and 2021 and in contrast to other studies, the paper provides information on five different PBM functions. For each function, insurers face a make or buy decision when they demand PBM services. They can either conduct a function in house (make) or go to the market and use a PBM (buy). The analysis finds that for three of the functions (rebate negotiation, retail network management and claims adjudication), insurers largely use a PBM. In contrast, for benefit design and formulary management, there is no “middleman” for a significant part of the

market, as almost 40 percent of the national market is conducted by insurers in house. This may have implications for recent FTC scrutiny of PBMs since insurers are also supplying PBM services.

With the exception of CVS Health due to its acquisition of Aetna, there was little change between 2020 and 2021 nationally in the size and ranking of the largest PBMs' market shares. In 2021, Express Scripts was the largest commercial PBM at the national level. Express Scripts had a 21 percent market share in the rebate negotiation market. The second largest PBM was OptumRx with a 17 percent share. CVS Health had a market share of 16 percent—up from 9 percent in 2020. Prime Therapeutics's share was 14 percent, followed by Kaiser Pharmacy (11 percent) and IngenioRx (10 percent). Other PBMs were smaller nationally. Interestingly, a health insurer—BCBS MA—is the 9th largest “PBM” in the rebate negotiation market, given that it self supplies this PBM service and has a significant presence in Massachusetts.

National-level market shares of the 10 largest commercial drug insurers are also reported. It is useful to consider these shares since those are the same lives that the PBMs are managing. If a health insurer is big in the commercial drug insurance market, then the PBM it uses to manage its lives would be big as well.

Like PBMs, there was little change over time in drug insurers' shares. With a 13 percent market share in 2021, UnitedHealth is the largest commercial drug insurer in the U.S. This helps explain why its PBM—OptumRx—is the second largest PBM. OptumRx's 17 percent share is larger than UnitedHealth's because OptumRx is not exclusive to UnitedHealth. Kaiser has an 11 percent share in both the drug insurance and PBM markets because Kaiser's PBM is used exclusively by Kaiser. Because Kaiser is big in the drug insurance market, its PBM is also big.

Cigna has a 10 percent share in the drug insurance market and uses its own PBM—Express Scripts. Express Scripts is not exclusive to Cigna so it has a much larger PBM share (21 percent) than Cigna's insurer share. Closely behind Cigna, Anthem is the fourth largest drug insurer with a 10 percent share.

In addition and in contrast to other work, this is the first research to present PBM market shares and HHIs at the state and MSA levels. On average, local PBM markets are highly concentrated and became even more so in 2021. The state-level and MSA-level rebate negotiation market average HHIs were 3678 and 4087 in 2021—up from 3623 and 4034 in 2020. The corresponding statistics were approximately similar for retail network management and claims adjudication, and those markets were also very highly concentrated on average. Across all product and geographic markets, at least 80 percent of markets were highly concentrated in 2021, and all of those fractions also increased from 2020. The increase in average PBM market concentration is attributable to CVS Health's acquisition of Aetna, both of which already owned PBMs. Prior to the merger, there was overlap in some state- and MSA-level PBM markets so the merger was also horizontal.

The results on market concentration levels are not entirely surprising given that the average market for drug insurance is highly concentrated. PBMs end up with large shares because the insurers of the drug lives they manage are also big. For instance, BCBS AL has a state-level share of 85 percent in the drug coverage market so the PBM that manages its lives—Prime Therapeutics—also has a share of 85 percent in the rebate negotiation and retail network management markets.

The level of local market concentration in PBM markets and its competitive implications should be interpreted with some caution. On the one hand, the presence of certain PBMs in the market may not necessarily indicate they are viable options. Specifically, if PBMs are used exclusively by their affiliated insurer, they may not be viable options for other non-affiliated insurers to contract with. Of the 10 largest PBMs, six are exclusive to certain insurers. On the other hand, before insurers and PBMs contract, there may be more PBM choices for insurers to choose from than the large PBM market shares computed here would suggest. Despite the number of PBMs available to choose from, once an insurer with a large share chooses a PBM to manage *all* its lives, that PBM will end up with a large share as well.

Finally, this paper quantifies the extent of vertical integration between health insurers and PBMs. At the national level, 70 percent of commercial drug coverage lives are insured by a health insurer that is vertically integrated. On average, 63 percent and 65 percent of state- and MSA-level drug insurance lives are vertically integrated. However, there is wide variation across states and MSAs, with some states having almost no vertical integration, while others are almost entirely vertically integrated.

PBMs have attracted considerable attention from regulators and policymakers. The FTC is currently examining the PBM industry, and last year a House Education and Labor Committee requested that the Government Accountability Office perform a study on the role of PBMs in the pharmaceutical supply chain. The findings in this paper may be helpful in shedding light on some of those inquiries. They also have antitrust implications, such as whether proposed mergers among PBMs and between insurers and PBMs should raise or should have raised antitrust concerns. For example, even though the largest health insurers nationally are vertically integrated with PBMs, there is still a significant portion of the market that remains not vertically integrated. Thus, the risk of foreclosure or raising rivals' costs and thus consumer harm remain. A retrospective analysis of both the vertical and horizontal effects of the Aetna-CVS merger could yield interesting results.

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Exhibit 1. Largest pharmacy benefit managers in U.S. commercial markets in 2021: Rebate negotiation, retail network management and claims adjudication

PBM	Rebate Negotiation Share (%)		PBM	Retail Network Management Share (%)		PBM	Claims Adjudication Share (%)	
	2020	2021		2020	2021		2020	2021
Express Scripts	21	21	Express Scripts	22	22	Express Scripts	22	22
OptumRx	17	17	OptumRx	18	18	OptumRx	17	17
CVS Health	9	16	CVS Health	9	16	CVS Health	7	14
Prime Therapeutics	15	14	Prime Therapeutics	15	14	Prime Therapeutics	15	13
Kaiser Pharmacy	12	11	Kaiser Pharmacy	12	11	Kaiser Pharmacy	12	11
IngenioRx	10	10	IngenioRx	10	10	IngenioRx	10	10
Envolve Pharm Sol	2	3	Envolve Pharm Sol	2	3	SS and C Health	4	3
Humana Pharm Sol	1	1	MedImpact	2	1	MedImpact	2	1
BCBS MA	1	1	Humana Pharm Sol	1	1	Envolve Pharm Sol	1	1
Select Health	1	1	Select Health	1	1	BCBS AL	0	1

Notes:

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2. PBM market shares are based on commercial drug lives. PBMs are ranked by their 2021 shares.
3. In cases of insurer self supply, we change the PBM's name from "In house" to the name of the insurer performing the function—i.e., the insurer *is* the PBM.
4. A small proportion of the shares reported for Envolve Pharmacy Solutions pertain to another one of Centene's PBMs named MeridianRx.

Exhibit 2. Largest drug insurers in the U.S. commercial market, 2020-2021

Insurer	Market Share (%)	
	2020	2021
UnitedHealth Group	13	UnitedHealth Group
Kaiser	12	Kaiser
Anthem	10	Cigna
Cigna	10	Anthem
Aetna	7	CVS Health (Aetna)
HCSC (BCBS)	5	HCSC (BCBS)
BCBS FL	3	Centene
Centene	3	BCBS FL
BCBS MI	2	BS of CA
BS of CA	2	BCBS MI

Notes:

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2. Insurer market shares are based on commercial drug coverage lives.

**Exhibit 3. Largest pharmacy benefit managers in U.S. commercial markets in 2021:
Formulary management and benefit design**

PBM	Formulary Management Share (%)		PBM	Benefit Design Share (%)	
	2020	2021		2020	2021
OptumRx	16	15	OptumRx	15	15
Prime Therapeutics	12	12	Prime Therapeutics	12	12
Kaiser Pharmacy	12	11	Kaiser Pharmacy	12	11
Express Scripts	11	11	Express Scripts	11	11
CVS Health	3	10	Anthem	10	10
Anthem	10	10	CVS Health	2	9
Centene	2	3	Centene	2	3
BS of CA	2	2	BS of CA	2	2
BCBS MI	2	2	BCBS MI	2	2
Highmark	1	1	Highmark	1	1

Notes:

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2. PBM market shares are based on commercial drug coverage lives. PBMs are ranked by their 2021 shares.
3. In cases of insurer self supply, we change the PBM's name from "In house" to the name of the insurer performing the function—i.e., the insurer is the PBM.
4. Centene (an insurer)'s shares include lives managed both by Centene's PBM—Envolve Pharmacy Solutions—as well as those managed by Centene in house. Across years and across formulary management and benefit design, between 28 percent and 33 percent of Centene's drug lives were managed in house. The other 67 percent to 72 percent were managed by Envolve. Additionally, a few lives were managed by another of Centene's PBMs named MeridianRx.

Exhibit 4. Market concentration in state and MSA level PBM commercial markets

PBM Function and Geographic Market	Mean HHI		Median HHI		% Highly Concentrated	
	2020	2021	2020	2021	2020	2021
<i>Rebate Negotiation</i>						
State	3623	3678	3198	3114	76	80
MSA	4034	4087	3656	3693	82	84
<i>Retail Network Management</i>						
State	3641	3696	3198	3167	78	86
MSA	4010	4064	3669	3697	84	86
<i>Claims Adjudication</i>						
State	3646	3703	3198	3167	76	84
MSA	4037	4086	3653	3686	83	85
Number of MSAs	384	383	384	383	384	383

Notes:

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2. The HHIs and the percentage of markets that are highly concentrated are based on commercial drug coverage lives.

Exhibit 5. The extent of vertical integration between insurers and PBMs in commercial markets, 2020-2021

Geographic Market	Vertical Integration Share					
	2020			2021		
National	69%			70%		
	Mean		Minimum		Maximum	
	2020	2021	2020	2021	2020	2021
State	63%	63%	6%	6%	97%	97%
MSA	65%	65%	5%	5%	99%	99%

Notes:

1. The numbers reported represent percentages of commercial drug insurance coverage lives covered by an insurer that is vertically integrated with a PBM.
2. The national level share is for the U.S. as a whole. The state and metropolitan statistical areas (MSA) shares are summary statistics across all 51 states (including the District of Columbia) and 384 and 383 MSAs in 2020 and 2021, respectively.

Appendix

There are a few differences in the national-level PBM market shares presented in Exhibit 1 compared to those from Drug Channels and HIRC, the latter two of which are themselves similar. The most notable is that Drug Channels reports that the largest PBM in the U.S. is CVS Caremark with a 33 percent national market share in 2021. In contrast, this study computes a market share for CVS Caremark of 16 percent in rebate negotiation and retail network management and 14 percent in claims adjudication.

There are plausible reasons that would give rise to such differences. One is that this paper focuses on the *commercial* market, whereas Drug Channels and HIRC look at all markets combined, including Medicare (Part D) and Medicaid. If CVS/Caremark is overrepresented in Medicare and/or Medicaid, they would be bigger in the market including all payer-types. Indeed, there is some evidence for this. In a separate analysis (not shown), a calculation of market shares on the entire raw DRG data without any exclusions (i.e., including Medicare and Medicaid) reveals that CVS becomes the biggest PBM in the U.S. and its market share increases to approximately 21 percent to 23 percent depending on PBM function. In fact, excluding commercial and limiting to only Medicare and Medicaid raises CVS's share to a range of 25 percent (rebate negotiation) to 30 percent (claims adjudication). Second, the DRG data exclude drug benefits that are based on direct relationships between self-insured employers and PBMs. If CVS is overrepresented in that carved-out segment, its share would be smaller in the DRG data than in the Drug Channels and HIRC data. Third, the shares presented by Drug Channels and HIRC are based on the *number of prescription claims* managed, whereas the DRG data are based on the number of drug coverage enrollees. If there are more claims per covered life among the elderly (Medicare) and/or Medicaid population than in the commercial market, that would also make CVS/Caremark smaller in the DRG data.

Other notable differences in market shares are for Prime Therapeutics, Kaiser, IngenioRx and Humana. This paper finds that Prime Therapeutics, Kaiser and IngenioRx are bigger and that Humana is smaller than in the Drug Channels data. In fact, Kaiser and IngenioRx don't even appear in Drug Channels. The differences between data sets noted above likely explain part of the differences in these other insurers' shares as well. For example, the shares for Prime Therapeutics and Kaiser fall and Humana's rises if they are calculated based on the entire DRG data including Medicare and Medicaid.

Exhibit A1. Market concentration (HHI) and largest PBMs' market shares, January 1, 2021
Rebate negotiation product markets

<u>State</u>	<u>HHI</u>	<u>PBM 1</u>	<u>Share (%)</u>	<u>PBM 2</u>	<u>Share (%)</u>
Alabama	7284	Prime Therapeutics	85	Express Scripts	8
Alaska	6061	Express Scripts	76	CVS Health	18
Arizona	3364	OptumRx	50	Express Scripts	21
Arkansas	3958	CVS Health	54	OptumRx	31
California	2967	Kaiser Pharmacy	47	CVS Health	20
Colorado	1987	Kaiser Pharmacy	25	Express Scripts	24
Connecticut	2660	Express Scripts	34	IngenioRx	31
Delaware	6471	Express Scripts	79	CVS Health	14
District of Columbia	3216	CVS Health	48	OptumRx	20
Florida	2395	Prime Therapeutics	39	OptumRx	17
Georgia	1752	IngenioRx	30	Express Scripts	18
Hawaii	4820	CVS Health	65	Kaiser Pharmacy	24
Idaho	2755	IngenioRx	47	Prime Therapeutics	15
Illinois	4023	Prime Therapeutics	59	OptumRx	20
Indiana	3056	IngenioRx	48	Express Scripts	20
Iowa	4863	CVS Health	66	OptumRx	21
Kansas	3293	Prime Therapeutics	48	OptumRx	28
Kentucky	4071	IngenioRx	60	Humana Pharm Sol	14
Louisiana	5420	Express Scripts	72	OptumRx	15
Maine	2914	IngenioRx	44	Point32Health	21
Maryland	2951	CVS Health	43	Kaiser Pharmacy	21
Massachusetts	2722	BCBS MA	36	CVS Health	33
Michigan	7910	Express Scripts	89	CVS Health	5
Minnesota	2490	Prime Therapeutics	36	HealthPartners	27
Mississippi	2937	Prime Therapeutics	47	Centene (Envolve)	18
Missouri	2582	OptumRx	39	IngenioRx	25
Montana	3167	Prime Therapeutics	49	CVS Health	18
Nebraska	2931	Prime Therapeutics	45	OptumRx	20
Nevada	2980	OptumRx	49	IngenioRx	19
New Hampshire	2453	IngenioRx	38	Point32Health	22
New Jersey	2689	Prime Therapeutics	35	OptumRx	28
New Mexico	2427	Prime Therapeutics	36	Presbyterian	23
New York	2556	Express Scripts	34	OptumRx	26
North Carolina	3915	Prime Therapeutics	58	OptumRx	18
North Dakota	4205	Prime Therapeutics	50	OptumRx	41
Ohio	2649	Express Scripts	34	IngenioRx	32
Oklahoma	4073	Prime Therapeutics	60	CVS Health	15
Oregon	1806	Kaiser Pharmacy	30	Prime Therapeutics	18
Pennsylvania	3352	Express Scripts	48	OptumRx	28
Rhode Island	3485	Prime Therapeutics	51	CVS Health	22
South Carolina	6963	OptumRx	83	Express Scripts	11
South Dakota	5847	CVS Health	73	OptumRx	22
Tennessee	5642	Express Scripts	73	OptumRx	16
Texas	2157	Prime Therapeutics	32	OptumRx	21
Utah	4070	Select Health	61	Prime Therapeutics	10

Exhibit A1 (cont'd). Market concentration (HHI) and largest PBMs' market shares, January 1, 2021
Rebate negotiation product markets

Vermont	5703	Express Scripts	71	CVS Health	26
Virginia	2331	IngenioRx	34	Express Scripts	20
Washington	2521	Express Scripts	33	Kaiser Pharmacy	32
West Virginia	5912	Express Scripts	75	OptumRx	13
Wisconsin	1685	MedImpact	23	OptumRx	22
Wyoming	3114	Prime Therapeutics	47	Express Scripts	24

Notes:

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2. State-level Herfindahl-Hirschman Indices (HHIs) and the market shares of the two largest PBMs in the rebate negotiation product market are reported. The market shares and HHIs are based on commercial drug coverage lives.

Exhibit A2. Market concentration (HHI) and largest PBMs' market shares, January 1, 2021
Retail pharmacy network management product markets

State	HHI	PBM 1	Share (%)	PBM 2	Share (%)
Alabama	7284	Prime Therapeutics	85	Express Scripts	8
Alaska	6061	Express Scripts	76	CVS Health	18
Arizona	3364	OptumRx	50	Express Scripts	21
Arkansas	3958	CVS Health	54	OptumRx	31
California	2967	Kaiser Pharmacy	47	CVS Health	20
Colorado	1987	Kaiser Pharmacy	25	Express Scripts	24
Connecticut	2742	Express Scripts	34	IngenioRx	31
Delaware	6471	Express Scripts	79	CVS Health	14
District of Columbia	3216	CVS Health	48	OptumRx	20
Florida	2395	Prime Therapeutics	39	OptumRx	17
Georgia	1752	IngenioRx	30	Express Scripts	18
Hawaii	4820	CVS Health	65	Kaiser Pharmacy	24
Idaho	2755	IngenioRx	47	Prime Therapeutics	15
Illinois	4023	Prime Therapeutics	59	OptumRx	20
Indiana	3048	IngenioRx	48	Express Scripts	20
Iowa	4866	CVS Health	66	OptumRx	21
Kansas	3293	Prime Therapeutics	48	OptumRx	28
Kentucky	4071	IngenioRx	60	Humana Pharm Sol	14
Louisiana	5420	Express Scripts	72	OptumRx	15
Maine	3117	IngenioRx	44	OptumRx	26
Maryland	2951	CVS Health	43	Kaiser Pharmacy	21
Massachusetts	3583	Express Scripts	45	CVS Health	33
Michigan	6622	Express Scripts	81	Henry Ford (HAP)	8
Minnesota	2501	Prime Therapeutics	36	MedImpact	27
Mississippi	2937	Prime Therapeutics	47	Centene (Envolve)	18
Missouri	2582	OptumRx	39	IngenioRx	25
Montana	3167	Prime Therapeutics	49	CVS Health	18
Nebraska	2931	Prime Therapeutics	45	OptumRx	20
Nevada	2980	OptumRx	49	IngenioRx	19
New Hampshire	2760	IngenioRx	38	OptumRx	29
New Jersey	2689	Prime Therapeutics	35	OptumRx	28
New Mexico	2921	Prime Therapeutics	36	OptumRx	34
New York	2559	Express Scripts	34	OptumRx	26
North Carolina	3915	Prime Therapeutics	58	OptumRx	18
North Dakota	4205	Prime Therapeutics	50	OptumRx	41
Ohio	2645	Express Scripts	34	IngenioRx	32
Oklahoma	4073	Prime Therapeutics	60	CVS Health	15
Oregon	1839	Kaiser Pharmacy	30	Prime Therapeutics	18
Pennsylvania	3352	Express Scripts	48	OptumRx	28
Rhode Island	3579	Prime Therapeutics	51	OptumRx	23
South Carolina	6963	OptumRx	83	Express Scripts	11
South Dakota	5847	CVS Health	73	OptumRx	22
Tennessee	5642	Express Scripts	73	OptumRx	16
Texas	2157	Prime Therapeutics	32	OptumRx	21
Utah	4070	Select Health	61	Prime Therapeutics	10

Exhibit A2 (cont'd). Market concentration (HHI) and largest PBMs' market shares, January 1, 2021
Retail pharmacy network management product markets

Vermont	5708	Express Scripts	71	CVS Health	26
Virginia	2331	IngenioRx	34	Express Scripts	20
Washington	2521	Express Scripts	33	Kaiser Pharmacy	32
West Virginia	5912	Express Scripts	75	OptumRx	13
Wisconsin	1831	MedImpact	26	OptumRx	22
Wyoming	3114	Prime Therapeutics	47	Express Scripts	24

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2. State-level Herfindahl-Hirschman Indices (HHIs) and the market shares of the two largest PBMs in the retail pharmacy network management product market are reported. The market shares and HHIs are based on commercial drug coverage lives.

Exhibit A3. Market concentration (HHI) and largest PBMs' market shares, January 1, 2021
Claims adjudication product markets

State	HHI	PBM 1	Share (%)	PBM 2	Share (%)
Alabama	7284	BCBS AL	85	Express Scripts	8
Alaska	6061	Express Scripts	76	CVS Health	18
Arizona	3364	OptumRx	50	Express Scripts	21
Arkansas	3958	CVS Health	54	OptumRx	31
California	2823	Kaiser Pharmacy	47	IngenioRx	16
Colorado	1987	Kaiser Pharmacy	25	Express Scripts	24
Connecticut	2742	Express Scripts	34	IngenioRx	31
Delaware	6471	Express Scripts	79	CVS Health	14
District of Columbia	3216	CVS Health	48	OptumRx	20
Florida	2395	Prime Therapeutics	39	OptumRx	17
Georgia	1752	IngenioRx	30	Express Scripts	18
Hawaii	4820	CVS Health	65	Kaiser Pharmacy	24
Idaho	2755	IngenioRx	47	Prime Therapeutics	15
Illinois	4023	Prime Therapeutics	59	OptumRx	20
Indiana	3056	IngenioRx	48	Express Scripts	20
Iowa	4866	CVS Health	66	OptumRx	21
Kansas	3293	Prime Therapeutics	48	OptumRx	28
Kentucky	4071	IngenioRx	60	Humana Pharm Sol	14
Louisiana	5420	Express Scripts	72	OptumRx	15
Maine	3117	IngenioRx	44	OptumRx	26
Maryland	2951	CVS Health	43	Kaiser Pharmacy	21
Massachusetts	3583	Express Scripts	45	CVS Health	33
Michigan	7910	Express Scripts	89	CVS Health	5
Minnesota	2501	Prime Therapeutics	36	MedImpact	27
Mississippi	2937	Prime Therapeutics	47	RxAdvance	18
Missouri	2582	OptumRx	39	IngenioRx	25
Montana	3167	Prime Therapeutics	49	CVS Health	18
Nebraska	2931	Prime Therapeutics	45	OptumRx	20
Nevada	2980	OptumRx	49	IngenioRx	19
New Hampshire	2760	IngenioRx	38	OptumRx	29
New Jersey	2689	Prime Therapeutics	35	OptumRx	28
New Mexico	2427	Prime Therapeutics	36	Presbyterian	23
New York	2559	Express Scripts	34	OptumRx	26
North Carolina	3906	Prime Therapeutics	58	OptumRx	18
North Dakota	4205	Prime Therapeutics	50	OptumRx	41
Ohio	2649	Express Scripts	34	IngenioRx	32
Oklahoma	3966	Prime Therapeutics	60	OptumRx	15
Oregon	1839	Kaiser Pharmacy	30	Prime Therapeutics	18
Pennsylvania	3352	Express Scripts	48	OptumRx	28
Rhode Island	3579	Prime Therapeutics	51	OptumRx	23
South Carolina	6963	OptumRx	83	Express Scripts	11
South Dakota	5847	CVS Health	73	OptumRx	22
Tennessee	5642	Express Scripts	73	OptumRx	16
Texas	2157	Prime Therapeutics	32	OptumRx	21
Utah	4070	Select Health	61	Prime Therapeutics	10

Exhibit A3 (cont'd). Market concentration (HHI) and largest PBMs' market shares, January 1, 2021
Claims adjudication product markets

Vermont	5708	Express Scripts	71	CVS Health	26
Virginia	2142	IngenioRx	34	Express Scripts	20
Washington	2521	Express Scripts	33	Kaiser Pharmacy	32
West Virginia	5904	Express Scripts	75	OptumRx	13
Wisconsin	1832	MedImpact	26	OptumRx	22
Wyoming	3114	Prime Therapeutics	47	Express Scripts	24

Notes:

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2. State-level Herfindahl-Hirschman Indices (HHIs) and the market shares of the two largest PBMs in the claims adjudication product market are reported. The market shares and HHIs are based on commercial drug coverage lives.