



Pharmaceutical pricing benchmarks: governmental versus private sector

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Purpose: To explore the best pricing benchmark for workers' compensation drugs reimbursement at retail pharmacies. **Materials & methods:** We used California workers' compensation system (CAWCS) total cost of pharmacy dispensed medications (2017–2019) as a proxy to estimate drug prices using alternative pricing mechanism fee schedules. **Results:** CAWCS paid 65.6% of the average wholesale price (AWP), 104.1% of Medi-Cal, 122.1% of the wholesale acquisition cost (WAC), 140.1% of the national average drug acquisition cost (NADAC), and 253.5% of the federal upper limit. In addition, we found the AWP-based formulas: CAWCS = AWP - 34.4%, Medi-Cal = AWP - 36.9%, WAC = AWP - 46.3%, NADAC = AWP - 53.2%, and federal upper limit = AWP - 74.1%. We found that AWP: 50% for generics and AWP - 18.2% for brands are the lowest paying formulas. The estimated median cost savings were \$8.7 million (by adapting 97% of the WAC) and \$9.5 million (by adapting the NADAC) across all states. **Conclusion:** NADAC was the best pricing benchmark for reimbursement of pharmacy dispensed drugs.

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In the USA, the costs of prescription drugs have been rising more rapidly than the consumer price index for all items over the time [1]. The net spending on prescription drugs increased by 20% between 2013 and 2015 [2]. The rising cost of healthcare represents one of the nation's most important long-term fiscal challenges. Different pricing benchmarks are available for reimbursements to pharmacies in the US. Each price benchmark used either by the government or private sectors has its own limitations. Drug reimbursement policies are changing and the key question for private and public payers is 'which benchmark they should use?'

The average wholesale price (AWP), wholesale acquisition cost (WAC) and direct price (DP) are all considered list prices, whereas Medicaid, the federal upper limit (FUL) prices and the national average drug acquisition cost (NADAC) are determined and closely overseen by Centers for Medicare and Medicaid Services (CMS). By reviewing all states' fee schedules for worker compensation systems (WCS), majority of states' WCS use the AWP as their primary drug pricing benchmark.

The AWP is reported by the manufacturer and it does not represent the actual price paid by pharmacies after discount and rebates [3]. As concerns rose about the inflation of the AWP, it became the subject of scrutiny and litigation [4]. Major publishers of pharmacy data discontinued its publication of the AWP in September 2011, but it was later published again, often as the average manufacturer prices (AMPs) [5].

The WAC is the only price type defined in regulations, 42 US Code § 1395w-3A [6]. It is the list price paid by a wholesaler or a direct purchaser for drugs purchased from drug manufacturers. The WAC is the price before any discounts, rebates, purchasing allowances or other forms of economic consideration [7].

The DP is the list price used for invoices between drug manufacturers and pharmacies or providers. It is the price before any discounts, rebates, purchasing allowances or other forms of economic consideration. The DP is usually the same as the WAC or slightly higher than WAC by 3 to 5%. The DP has a consistent relationship with the actual acquisition cost (AAC) for brand name but not for generic drugs (multiple sources) [8].

According to the Affordable Care Act (ACA) of 2010, Medicaid has required manufacturers to give a minimum rebate equal to 23.1% of the AMP for brand drugs and 13% for generics or the best price (i.e., including the

largest discount that manufacturers give to any private purchaser) [9]. CMS calculates the FUL as 175% of the weighted average of the most recently reported monthly AMP for multiple source drug products that are available in retail community pharmacies [10]. Then, the result (of AMPs multiplied by 175%) is compared with the NADAC published on the Medicaid.gov website [11].

- According to ACA, the FUL is calculated by the following equation only if the results of the equation $\geq$ the most updated NADAC:

$$\text{FUL} = \text{AMP} \times 175\%$$

- According to ACA, if the calculated FUL is less than the most updated NADAC, the FUL will be equal to the most updated NADAC.

The FUL files are published on a monthly basis [12]. The NADAC provides the actual average drug market prices paid in the US. CMS conducts periodic surveys of randomly selected, retail community pharmacy prices nationwide to calculate the NADAC. The survey collects pharmacy acquisition costs for Medicaid covered outpatient drugs purchased by retail community pharmacies [5]. The NADAC represents a national pricing methodology and is published on a monthly basis [5].

The actual correlation between different pricing benchmarks is unknown with most studies only comparing two or three benchmarks. Our objectives were to compare all available pricing benchmarks using a Workers' Compensation (WC) pharmacy dispensed (PD) dataset to determine the correlation (i.e., mathematical equations or formulas) between different pricing benchmarks used for drug reimbursement to pharmacies and to find out the best pricing benchmark for WC drugs reimbursement at the retail level. This study focused on prescription drugs dispensed at retail pharmacies.

Materials & methods

Data sources

Several datasets were used: claims level data from the Workers' Compensation Information System (WCIS) was used to estimate California workers' compensation system (CAWCS) total PD drug costs [13]; weekly Medi-Cal datasets were obtained from WCIS; and the AWP, WAC, DP, FUL and the NADAC datasets were obtained from Medi-Span [14].

All pharmaceutical transactions between 2017 and 2019 were obtained from WCIS. Only a WC PD drugs data subset (at the transaction level) was used in this study as we aimed to find out the best pricing benchmark for WC drugs reimbursement at the retail level. The focus groups formed by the National Council for Prescription Drug Programs identified the 'Best Benchmark Criteria' in discussion of the alternative benchmark price replacing the AWP. They set twelve criteria for the ideal price benchmark. Price benchmark should be: accessible, timely, administratively simple and efficient, comprehensive, durable, stable, easily understood, transparent and unambiguous, auditable, trustworthy, not anticompetitive and acknowledge the complexity of drug distribution system [4]. We used these criteria in our study to identify the best pricing benchmark for WC drugs reimbursement at the retail level. In addition, the best price considered the factor of the lowest price available to any wholesaler, retailer, provider or paying entity excluding certain governmental payers such as the Indian Health Service, Department of Veterans' Affairs, Department of Defense, Public Health Service (including 340B), Federal Supply Schedule and Medicare Part D plans [15].

We used CAWCS total cost of PD medications as a proxy to estimate drug prices using alternative pricing mechanism fee schedules. CAWCS total cost was used as the reference price as it is the largest WCS in the US [16]. In 2013, CAWCS accounted for 11.9% of all states covered workers and 20.6% of all states' total paid benefit [17]. Therefore, CAWCS represents a significant proportion of all US WC claims [17]. For the purpose of repricing CAWCS drugs relative to other fee schedules, we used the 11-digit national drug code (NDC), unit of quantity dispensed, and the date of service. The NDC number identifies the manufacturer, drug dispensed, strength of the drug and the wholesale package size. Claims with missing quantity dispensed data field, pending payment status, duplications and negative or zero total paid amounts were excluded from the analysis. All claims data were de-identified and no informed consent was required from patients because the study did not involve human subjects.

The WC pharmacy state fee schedules were obtained from each state WC websites. We assumed that all states WC dispense the same group of drugs. All pharmacy state fee schedules were used to identify which formula provides the lowest payment, the best price formula and to recalculate what each state would have paid for the same group of drugs.

All pricing benchmarks included in our analysis are from drug prices publicly available reports. These reports either report cost of ingredient or the average amount paid to the drug manufacturer. The AWP, WAC and DP are list prices that exclude discounts and rebates. The NADAC reports a hybrid of net and list prices, but it omits the off-invoice rebates. The FUL is calculated from the AMP, which includes all discounts and rebates and is reported at NDCs level but it is confidential [18].

Data analysis

This is a descriptive cross-sectional study estimating the costs using different pricing benchmarks compared with the actual amount paid by CAWCS at the transaction level. Each claim line in CAWCS was matched to the corresponding unit price of an alternative price benchmark using the NDC and the dates of service(s). The unit price from different price benchmarks was multiplied by the unit quantity dispensed by CAWCS. The results were compared across different price benchmarks. The comparisons of the paid amounts across all pricing systems were for the same group of drugs across all pricing benchmarks. We excluded the DP from the analysis due to its low number of covered claims.

We calculated the CAWCS based-formulas using each pricing system and maintain budget neutrality. To determine the correlation (i.e., mathematical equations) between different pricing benchmarks, we calculated the AWP-based formulas. Each pricing benchmark was evaluated according to the 'Best Benchmark Criteria' [4]. According to our evaluation of the best pricing benchmark for WC drugs reimbursement at retail pharmacy, we recalculate what each state would have paid for the same group of drugs using the best pricing benchmark. We did not include the dispensing fees in the repricing calculations (because the dispensing fees are fixed amounts that should be paid, to the pharmacies, for each prescription regardless the pricing benchmark used for reimbursement). Only 36 states were included in our final analysis because they used the AWP or WAC-based formula, whereas other states could not be repriced using the drug pricing benchmarks that included in our analysis. All statistical analyses were conducted using Stata MP Version 14 and Microsoft Excel 2013 [19,20].

Results

Between 2017 and 2019, a total of 1,011,628 claims were submitted to CAWCS for pharmaceutical products dispensed by retail pharmacies. We included 48.3% (488,485 out of 1,011,628 claims) of the PD claims that have unit prices in CAWCS and were reimbursed. These claims were included in our repricing analysis. The cost of these claims (i.e., the total paid amount) was over \$46.5 million.

Repricing PD paid claims using all pricing benchmarks

Excluding the DP from the analysis (due to its low number of covered claims), we compared the same CAWCS-based drug bundle that had prices across all pricing benchmarks. The percentage of CAWCS claims that have drug price in all pricing benchmarks together was 48.3%. For those 48.3% of CAWCS paid claims, CAWCS paid 65.6% of AWP, 104.1% of Medi-Cal, 122.1% of WAC, 140.1% of NADAC and 253.5% of FUL. Table 1 shows the calculated the CAWCS based-formulas using each pricing system while maintaining budget neutrality.

The AWP estimated cost compared with all pricing benchmarks

Across different pricing benchmarks, we found that the AWP estimated cost as 152.4% of CAWCS, 158.6% of Medi-Cal, 186.1% of WAC, 213.7% of NADAC and 386.1% of FUL. The given AWP-based formula is shown in Table 2.

Evaluation of different pricing benchmarks

According to the 'Best Benchmark Criteria' [4], we found that the AWP, WAC and DP are accessible, timely, durable and not anticompetitive. The FUL is transparent, accessible, unable to be manipulated, durable, trustworthy, not anticompetitive and acknowledge the complexity of drug distribution system. The NADAC is transparent, accessible, unable to be manipulated, durable, trustworthy and not anticompetitive (Table 3).

Table 1. Drug prices availability for California workers' compensation system claims compared with all pricing benchmarks.

Pricing benchmarks	% CAWCS claims with drug prices under all pricing benchmarks	Amount paid by CAWCS for claims with drug prices under each pricing benchmark	Total EC by different pricing benchmark for CAWCS claims with drug prices available	The difference between amount paid by CAWCS and EC by different pricing benchmark	% Change (amount paid by CAWCS/EC by different pricing benchmark)	% CAWCS claims without drug prices under different pricing benchmark	The correlation between the amount paid by CAWCS over estimated costs by different pricing benchmark for matched NDCs [†]
MC	48.29%	\$46,577,502	\$44,759,217	\$1,818,285	104.06%	51.71%	CAWCS = MC + 4.06%
AWP	48.29%	\$46,577,502	\$71,001,465	-\$24,423,963	65.60%	51.71%	CAWCS = AWP - 34.4%
WAC	48.29%	\$46,577,502	\$38,162,779	\$8,414,723	122.05%	51.71%	CAWCS = WAC + 22.05%
FUL	48.29%	\$46,577,502	\$18,372,265	\$28,205,237	253.52%	51.71%	CAWCS = FUL + 153.5%
NADAC	48.29%	\$46,577,502	\$33,228,684	\$13,348,818	140.17%	51.71%	CAWCS = NADAC + 40.17%

This table compared the same CAWCS-based drug bundle that had prices across all pricing benchmarks including.

The drug availability under all pricing benchmarks and estimate the cost of these drugs compared with CAWCS claims.

The percentages of claims and amount paid for drugs that are not benchmarked under all pricing mechanism.

[†] Represent the calculated CAWCS based-formulas using each pricing system to maintain budget neutrality.

AWP: Average wholesale price; CAWCS: California workers compensation system; DP: Direct price; EC: Estimated cost; FUL: Federal upper limit;

Table 2. Drug prices availability for average wholesale price national drug codes compared with all pricing benchmarks.

Pricing benchmarks	% AWP claims with drug prices under all pricing benchmarks	EC by AWP for claims with drug prices under each pricing benchmark	Total EC by different pricing benchmark for AWP NDC's with drug prices available	The difference between EC by AWP and different pricing benchmark	% Change (EC by AWP/EC by different pricing benchmark)	The correlation between the EC by AWP over EC by different pricing benchmark for matched NDCs [†]
CAWCS	48.29%	\$71,001,465	\$46,577,502	\$6,783,921	152.44%	CAWCS = AWP - 34.4%
MC	48.29%	\$71,001,465	\$44,759,217	\$7,163,358	158.63%	MC = AWP - 36.96%
WAC	48.29%	\$71,001,465	\$8,997,094	\$38,162,779	186.05%	WAC = AWP - 46.25%
FUL	48.29%	\$71,001,465	\$3,720,743	\$18,372,265	386.46%	FUL = AWP - 74.12%
NADAC	48.29%	\$71,001,465	\$7,633,514	\$33,228,684	213.68%	NADAC = AWP - 53.2%

This table compared the same AWP-based NDCs bundle that had prices across all pricing benchmarks including.

[†] Represent the calculated AWP-based formulas using each pricing system.

AWP: Average wholesale price; CAWCS: California workers'

WC pharmacy state fee schedules

Across all states WCS, we found that 69% (36 out of 52 states) of all states used the AWP-based formula plus or minus different percentages for their pharmacy fee schedules. Of this 69%, California was the only state that used the AWP-based formula only as an alternative to Medi-Cal (California medicaid program), their primary pricing benchmark. North Dakota was the only state that used the WAC-based formula for its pharmacy fee schedules.

We found that 22% (8 out of 36 states) of the states used different AWP-based formula for brand and generic drugs, and 16% (6 out of 36 states) of the states used the same AWP-based formula for brand and generic drugs with different dispensing fees. North Dakota used different discount rate of its WAC-based formula for brand and generic drugs as well as different dispensing fees. We found that Alabama, Hawaii, Louisiana, Pennsylvania and Texas represent 13.8% (5 out of 36) of the states used the AWP minus different percentages formula. In addition, 47.2% (17 out of 36) used the AWP plus different percentages formula and 38.8% (14 out of 36) using 100% of the AWP.

The AWP-based formula was ranging from 'AWP-50%' to 'AWP+40%'. The highest AWP-based formula (AWP+40%) was used by Hawaii (for both generics and brands) and Louisiana (for only generics). We found that the formula 'AWP-50%' for generics was used by Washington, and the formula 'AWP-18.2%' for brands was used by Delaware, were the lowest paying formulas.

The dispensing fees ranged from \$2 (paid by Oregon) to \$11.58 (paid by Alabama) for generics. The dispensing fees were not reported for Hawaii, North Carolina, Pennsylvania and Rhode Island. We did not include the dispensing fees in the repricing calculations.

Table 3. Comparing different price benchmarks.

Comparison	AWP	FUL	NADAC	WAC	DP	Medicaid
Source	Manufacturers or publishers	CMS	CMS	Manufacturers or publishers	Manufacturers or publishers	CMS for each state
Discounts/rebates	Excluded	Included	Hybrid	Excluded	Excluded	Depend on the reimbursement formula for state
List or net price	List	Hybrid	Hybrid	List	List	Depend on the reimbursement formula for state
Best Benchmark Criteria						
Transparent and unambiguous	–	Yes	Yes	–	–	Yes
Accessible	Yes	Yes	Yes	Yes	Yes	Yes
Comprehensive	–	–	–	–	–	–
Timely	Yes	–	–	Yes	Yes	–
Unable to be manipulated	–	Yes	Yes	–	–	Yes
Administratively simple and efficient	–	–	–	–	–	Yes
Durable	Yes	Yes	Yes	Yes	–	Yes
Stable	–	–	–	–	–	–
Easily understood	–	–	–	–	–	–
Trustworthy	–	Yes	Yes	–	–	Yes
Not anticompetitive	Yes	Yes	Yes	Yes	Yes	Yes
Acknowledge the complexity of drug distribution system	–	Yes	–	–	–	–

AWP: Average wholesale price; DP: Direct price; FUL: Federal upper limit; NADAC: National average drug acquisition cost; WAC: Wholesale acquisition cost.

We found that the states WC would have paid for the same group of drugs ranged from \$9.2 million (paid by Washington) to \$25.7 million (paid by Hawaii and Louisiana). After calculating the cost-savings that the states would have saved adapting either benchmarks of 97% of WAC or 100% NADAC, we found all states would have saved more by adapting to 100% of the NADAC. The total saving ranged from \$1.5 million (adapted by Washington) to \$18.1 million (adapted by Hawaii and Louisiana; [Table 4](#)).

Discussion

This study aimed to explore the correlation (i.e., mathematical equations or formulas) between different pricing benchmarks used for WC drug reimbursements to pharmacies and to find out the best pricing benchmark for drug reimbursement at retail pharmacies. Overall 48.3% of drugs had prices in all drugs price benchmarks included in our analysis.

In order to find out the correlation between different pricing benchmarks, we used the same group of drugs to calculate the AWP-based formulas as follow: CAWCS = AWP - 34.4%, Medi-Cal = AWP - 36.9%, WAC = AWP - 46.3%, NADAC = AWP - 53.2% and FUL = AWP - 74.1% ([Table 2](#)). Our analysis showed that the relationships among various price benchmarks were lower than that reported by the Academy of Managed Care Pharmacy. We found that the FUL price accounts for 26% of the AWP and the WAC accounts for 54% of the AWP in 2017. The Academy of Managed Care Pharmacy reported that the FUL prices account for an average of 42% of the AWP and the WAC price account for 55% of the AWP [21]. The difference between this study results and the results reported by the Academy of Managed Care Pharmacy could be due to including a different mix of drugs. A previous study assessed the correlation between the AWP and the NADAC found that among the top 25 single source brands and the top 25 multiple source brands, the average NADAC was about 82% of the AWP (AWP - 18%) [22]. This result was much higher than what we found, NADAC = AWP - 53.2% based on CAWCS data. The difference between this study results and the previous study results could be due to including different percentages of brand and generic drugs in the analysis. A study found that the average WACs and NADACs for brand drugs are less than the amount that Medicaid pays [22]. This finding is consistent with our results. We found that Medi-Cal estimated the cost as 117.3% of the WAC and 134.7% of the NADAC. Also, the previous study found that across all therapeutic classes,

Table 4. The estimated cost of drugs using different states fee schedules.

States	Fee schedule	The estimated cost of drugs under different states fee schema	Cost-saving	
			Recommendation 1: Reimbursement at 97% of WAC (\$8,727,181)	Recommendation 2: Reimbursement at 100% of NADAC (\$7,633,514)
Alabama (AL)	BR: (AWP + 5%) + \$8.92 DF GR: (AWP + 5%) + \$11.58 DF	\$19,348,014	\$10,620,832	\$11,714,500
Arizona (AZ)	BR: (AWP - 5%) + \$7 DF GR: (AWP - 15%) + \$7 DF	BR: \$17,505,346 GR: \$15,662,678	BR: \$8,778,164 GR: \$6,935,496 Ave = \$7,856,830	BR: \$9,871,832 GR: \$8,029,164 Ave = \$8,950,498
Alaska (AK)	BR: AWP + \$10 DF GR: AWP + \$5 DF	\$18,426,680	\$9,699,498	\$10,793,166
Arkansas (AR)	Lesser of: Provider's usual charge or AWP + \$5.13 DF	\$18,426,680	\$9,699,498	\$10,793,166
California (CA)	100% of Medi-Cal reimbursement + Medi-Cal professional DF (AWP - 17%) + \$7.25 DF	\$11,263,322	\$2,536,140	\$3,629,808
Colorado (CO)	AWP + \$4.00 DF	\$18,426,680	\$9,699,498	\$10,793,166
Connecticut (CT)	BR: AWP + \$8 DF GR: AWP + \$5 DF	\$18,426,680	\$9,699,498	\$10,793,166
Delaware (DE)	BR: (AWP - 18.2%) + \$3.72 DF GR: (AWP - 25.6%) + \$4.65 DF	BR: \$15,073,024 GR: \$13,709,449	BR: \$6,345,842 GR: \$4,982,267 Ave = \$5,664,055	BR: \$7,439,510 GR: \$6,075,935 Ave = \$6,757,723
Florida (FL)	AWP + \$ 4.18 DF	\$18,426,680	\$9,699,498	\$10,793,166
Georgia (GA)	BR: AWP + \$ 4.26 DF GR: AWP + \$ 6.38 DF	\$18,426,680	\$9,699,498	\$10,793,166
Hawaii (HI)	AWP + 40%	\$25,797,352	\$17,070,170	\$18,163,838
Idaho (ID)	BR: AWP + \$ 5 DF GR: AWP + \$ 8 DF	\$18,426,680	\$9,699,498	\$10,793,166
Kansas (KS)	BR: (AWP - 10%) + \$5 DF GR: (AWP - 15%) + \$3 DF	BR: \$16,584,012 GR: \$15,662,678	BR: \$7,856,830 GR: \$6,935,496 Ave = \$7,396,163	BR: \$8,950,498 GR: \$8,029,164 Ave = \$8,489,831
Kentucky (KY)	AWP + \$5 DF	\$18,426,680	\$9,699,498	\$10,793,166
Louisiana (LA)	BR: (AWP + 10%)+ \$10.51 DF GR: (AWP + 40%)+ \$10.51 DF	BR: \$20,269,348 GR: \$25,797,352	BR: \$11,542,167 GR: \$17,070,171 Ave = \$14,306,169	BR: \$12,635,834 GR: \$18,163,838 Ave = \$15,399,836
Massachusetts (MA)	(AWP - 16%) + \$3 DF	\$15,478,411	\$6,751,230	\$7,844,897
Michigan (MI)	BR: (AWP - 10%) + \$5.50 DF GR: (AWP - 10%) + \$3.50 DF	\$16,584,012	\$7,856,830	\$8,950,498
Minnesota (MN)	(AWP - 12%) + \$3.50 DF	\$16,215,478	\$7,488,297	\$8,581,964
Mississippi (MS)	AWP + \$5 DF	\$18,426,680	\$9,699,498	\$10,793,166
Montana (MT)	BR: (AWP - 25%) + \$3 DF GR: (AWP - 10%) + \$3 DF	BR: \$16,584,012 GR: \$13,820,010	BR: \$7,856,830 GR: \$5,092,828 Ave = \$6,474,829	BR: \$8,950,498 GR: \$6,186,496 Ave = \$7,568,497
Nevada (NV)	AWP + \$10.54 DF	\$18,426,680	\$9,699,498	\$10,793,166
North Dakota (ND)	BR: (WAC + 8%) + \$4 DF GR: The lesser of 1. (MAC + 5%) 2. (WAC + 7%) + \$5 DF	BR: \$9,716,861 GR: \$9,626,890	BR: \$989,679 GR: \$899,708 Ave = \$944,694	BR: \$2,083,347 GR: \$1,993,376 Ave = \$2,038,362
New York (NY)	BR: (AWP - 12%) + \$4 DF GR: (AWP - 20%) + \$4 DF	BR: \$16,215,478 GR: \$14,741,344	BR: \$7,488,296 GR: \$6,014,162 Ave = \$6,751,229	BR: \$8,581,964 GR: \$7,107,830 Ave = \$7,844,897
North Carolina (NC)	AWP - 5%	\$17,505,346	\$8,778,164	\$9,871,832
New Mexico (NM)	(AWP - 10%) + \$5 DF	\$16,584,012	\$7,856,830	\$8,950,498
Ohio (OH)	(AWP - 9%) + \$3.5 DF	\$16,768,278	\$8,727,181	\$9,134,764
Oklahoma (OK)	(AWP - 10%) + \$5 DF	\$16,584,012	\$7,856,830	\$8,950,498
Oregon (OR)	(AWP - 16.5%) + \$2 DF	\$15,386,277	\$6,659,096	\$7,752,763

Ave: Aver; BR: Brand rate; DF: Dispensing fees; GR: Generic rate.

Table 4. The estimated cost of drugs using different states fee schedules. (cont.).

States	Fee schedule	The estimated cost of drugs under different states fee schema	Cost-saving	
			Recommendation 1: Reimbursement at 97% of WAC (\$8,727,181)	Recommendation 2: Reimbursement at 100% of NADAC (\$7,633,514)
Pennsylvania (PA)	AWP + 10%	\$20,269,348	\$11,542,166	\$12,635,834
Rhode Island (RI)	AWP - 10%	\$16,584,012	\$7,856,830	\$8,950,498
South Carolina (SC)	AWP + \$5 DF	\$18,426,680	\$9,699,498	\$10,793,166
Tennessee (TN)	AWP + \$5.10 DF	\$18,426,680	\$9,699,498	\$10,793,166
Texas (TX)	BR: (AWP + 9%) + \$4 DF GR: (AWP + 25%) + \$4 DF	BR: \$20,085,081 GR: \$23,033,350	BR: \$11,357,899	BR: \$12,451,567
			GR: \$14,306,168	GR: \$15,399,836
			Ave = \$12,832,034	Ave = \$13,925,702
Vermont (VT)	AWP + \$3.15 DF	\$18,426,680	\$9,699,498	\$10,793,166
Washington (WA)	BR: (AWP - 10%) + \$4.5 DF GR: (AWP - 50%) + \$4.5 DF	BR: \$16,584,012 GR: \$9,213,340	BR: \$7,856,830	BR: \$8,950,498
			GR: \$486,158	GR: \$1,579,826
			Ave = \$4,171,494	Ave = \$5,265,162
Wisconsin (WI)	AWP + \$3 DF	\$18,426,680	\$9,699,498	\$10,793,166
Wyoming (WY)	(AWP - 10%) + \$5 DF	\$16,584,012	\$7,856,830	\$8,950,498

Ave: Aver; BR: Brand rate; DF: Dispensing fees; GR: Generic rate.

the NADAC was close to WAC $\pm$ 1–2% [22]. This result was slightly lower than what we found in our study. We found that the NADAC estimated cost is 114.9% of the WAC.

Evaluation of different pricing benchmarks

The AWP has been widely used as a pricing benchmark for nearly 40 years, but it has been criticized prior to this investigative report for its unreliability, subjectivity to manipulation and it is not representative of the actual purchase price for pharmaceuticals [4]. There were 36 states that used the AWP as a pricing benchmark for reimbursement of the WC PD drugs. California used the AWP only as alternative pricing benchmark for their primary Medi-Cal benchmark to reimburse WC PD drugs.

We found that AWP-50% for generics (used by Washington) and AWP- 18.2% for brands (used by Delaware) were the lowest paying formulas. Based on our analysis, we found that CAWCS would have to pay AWP-34.4% to be budget neutral, this is likely due to the mixture of brand and generic drugs in our sample. According to the Congressional Budget Office report in 2005, the best price for brand name drugs was 63% of the AWP (i.e., AWP - 37%) [21]. Based on our findings and referring to the Congressional Budget Office report, we suggested that the AWP-based formula should be different for single source brand and generic or multiple source brand drugs. If states WC desired to use AWP-based formula for reimbursement of PD drugs, we suggested using AWP - 50% for generics and AWP - 37% for brands, as they were the lowest AWP-based formulas paid by states WC.

The WAC is the basis for AWP, but it is more transparent than AWP. Like the AWP, the WAC is not a transaction price and it is subjected to inflation by manufacturers [4]. North Dakota was the only state that used WAC-based formula for reimbursement of WC PD drugs. North Dakota used WAC + 8% for brands and WAC + 7% for generics. Based on our analysis, we found that CAWCS would have to pay 122% of WAC to be budget neutral, this is likely due to the comparisons across a different mix of drugs. Pharmaceutical companies typically sell drugs to wholesalers at a list price, WAC or WAC - (1 or 2%) [9]. A previous study found that CAWCS would have paid WAC - 2.9% for drugs reimbursements at retail level. If the states WC desired to use WAC-based formula for reimbursement of PD drugs, we suggested using WAC - 3% as this was the discount rate received by wholesalers and based on previous studies.

The NADAC is focused on outpatient prescription and over-the-counter drug prices from retail community and independent pharmacies [5]. The NADAC does not include specialty pharmacies in their pricing survey, so prices for specialty drugs are not available [5]. The NADAC is transparent, accessible, unable to be manipulated, durable, trustworthy and not an anticompetitive pricing benchmark.

According to the ACA, the states' reimbursement to pharmacies for outpatient drugs dispensed to Medicaid beneficiaries must be at an aggregate upper limit based on the AAC plus a dispensing fee. Each state has a different

method to determine the reimbursement amounts, consistent with applicable statutory and regulatory requirements. The AAC is defined as the actual prices paid by pharmacies to acquire drugs either marketed or sold by manufacturers. The states can implement an AAC model of reimbursement based on different pricing methodologies: state survey of retail pharmacy providers' pricing, the national survey (NADAC), published compendia prices WAC or AMP-based pricing [12]. Theoretically, the NADAC is the most accurate pricing benchmark for retail pharmacy as it averages the true acquisition cost, but it has some limitation. As participation in the CMS survey is voluntary and there is no incentive for pharmacies to comply, it is difficult to know how accurate or representative the data that CMS uses to calculate NADAC. Additionally, discounts and rebates are not calculated into the price and they are not parameters to collect from invoices. We do recommend that 100% NADAC should be used as a pricing benchmark for reimbursement of PD drugs.

The FUL is established by Medicaid for the maximum allowable drug cost for generic products that has more than three generic equivalents [21]. There was no WC state using FUL as a pricing benchmark for reimbursement for WC PD drugs. The FUL is not comprehensive, timely or efficient pricing benchmark. The FUL could be used as ceiling pricing benchmark for reimbursement of PD drugs that have FUL prices.

The DP does not generally have a reliable relationship to the AAC [8]. Many pharmaceutical companies have only a wholesale policy and do not sell directly to pharmacies or providers, leaving high percentage of drugs without DP [8]. Therefore, we suggested that DP should not be used as a pricing benchmark for PD drugs.

We compared pharmacy state fee schedules AWP or WAC based formulas to 100% NADAC and 97% WAC drugs reimbursement formulas to assess the cost-savings potential for each state by adapting one of these alternative. The NADAC and WAC were selected because they are best pricing benchmarks based on our analysis of the 12 criteria 'Best Benchmark Criteria'. The implications of these choices would be more cost-saving than all current pharmacy state fee schedules with estimated median cost savings of \$8.7 million (by adapting 97% of the WAC) and \$9.5 million (by adapting 100% of the NADAC) across all states. All states would save more by adapting to NADAC.

Policy implications: Any formula using a fixed percentage increase or decrease from the list price benchmark, such as AWP - 18% or WAC - 3%, could result in markups (or markdowns) that vary in actual dollar amounts based on the price of the drug.

Limitations

This study focused on prescription drugs dispensed at retail pharmacies. Therefore, the results of the study could not be generalizable to other medication dispensing points such as physician's offices, hospital outpatient pharmacies and hospital inpatient pharmacies. This cross-sectional study used CAWCS total cost of PD medications as a proxy to estimate drug prices using alternative pricing mechanisms. California prescribing and reimbursement practices may be different compared with other states and therefore this may have an impact on our results. Drug classes and drug types (generics/brands) may have different correlations with different pricing benchmarks. We suggested that future studies should include larger samples nationwide with more details on drug classes and drug types (generics/brand) to better determine the correlation with different pricing benchmarks and to find out the best pricing benchmark for drugs reimbursement at retail pharmacies.

Conclusion

The US system for selling prescription medicines is complex and none of the pricing benchmarks included in our analysis acknowledge the complexity of the drug distribution system. The true correlation between different pricing benchmarks and the best pricing benchmark for drugs reimbursement at retail pharmacies is unknown and varies with the mix of drugs used by a system. Our analysis allowed us to find out this correlation on a regional scale. We found that NADAC was the best pricing benchmark for reimbursement of PD drugs, as governmental pricing benchmarks are subjected to price control by federal agencies. We found that the AWP - 50% for generics and the AWP - 37% for brands or WAC - 3% are the best formulas that could be adapted by states that use the AWP or the WAC as a pricing benchmark for reimbursement of the PD drugs.

Financial & competing interests disclosure

The authors have no relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript. This includes employment, consultancies, honoraria, stock ownership or options, expert testimony, grants or patents received or pending, or royalties.

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Summary points

- The true correlation between different pricing benchmarks and the best pricing benchmark for drugs reimbursement at retail pharmacies is unknown.
- The national average drug acquisition cost (NADAC) was the best pricing benchmark for reimbursement of pharmacy dispensed drugs, as governmental pricing benchmarks are subjected to price control by the federal agencies.
- The estimated median cost savings were \$8.7 million (by adapting 97% of the wholesale acquisition cost [WAC]) and \$9.5 million (by adapting 100% of the NADAC) across all states. All states would save more by adapting NADAC.

References

Papers of special note have been highlighted as: • of interest; •• of considerable interest

1. Bin Sawad A, Seoane-Vazquez E, Rodriguez-Monguio R, Turkistani F. Price analysis of multiple sclerosis disease-modifying therapies marketed in the United States. *Curr. Med. Res. Opin.* 32(11), 1783–1788 (2016).
- **Explains the increase over time of the average wholesale price at market entry.**
2. IMS institute for healthcare informatics. Medicine use and spending in the US: a review of 2015 and outlook to 2020 (April 2016) (2020). <https://morningconsult.com/wp-content/uploads/2016/04/IMS-Institute-US-Drug-Spending-2015.pdf>
3. Gencarelli DM. Average wholesale price for prescription drugs: is there a more appropriate pricing mechanism? *NHPF Issue Brief* 775, 1–19 (2002).
4. Curtiss FR. What is the price benchmark to replace average wholesale price (AWP)? *J. Manag. Care Pharm.* 16(7), 492–501 (2010).
5. Levy J, Rosenberg M, Vanness D. A transparent and consistent approach to assess US outpatient drug costs for use in cost–effectiveness analyses. *Value Health* 21(6), 677–684 (2018).
- **Provides information related to estimating the net drug prices for various insurers.**
6. LII / Legal Information Institute. U.S. Code § 1395w–3a - Use of average sales price payment methodology (2020). www.law.cornell.edu/uscode/text/42/1395w-3a
7. Pharmaceutical Commerce. Standard MMEG. Analyzing drug-pricing mechanisms: pricing systems in US drug supply chain have many limitations; an analytics-based method might avoid some of them (October 2012) (2020). <http://pharmaceuticalcommerce.com/legal-regulatory/analyzing-drug-pricing-mechanisms/>
8. Schondelmeyer SW, Wrobel MV. Medicaid and medicare drug pricing: strategy to determine market prices. Abt Associates; 2004. (2020). www.abtassociates.com/reports/CMS_Drug_Pricing_Final_Report_Aug_2004.pdf
9. Danzon PM. Pricing and reimbursement of biopharmaceuticals and medical devices in the USA. *Encyclopedia Health Econ.* 3, 127–135 (2014).
- **Provides information related to drug distribution system, pricing and reimbursement in the US market.**
10. Medicaid.gov. Federal upper limits (2020). www.medicare.gov/medicaid/prescription-drugs/federal-upper-limits/index.html
11. Medicaid.gov. Survey of retail prices (2020). www.medicare.gov/medicaid/prescription-drugs/survey-of-retail-prices/index.html
12. McRae J, Vogenberg FR, Beaty SW, Mearns E, Varga S, Pizzi L. A review of US drug costs relevant to medicare, medicaid, and commercial insurers post-affordable care act enactment, 2010–2016. *Pharmacoeconomics* 35(2), 215–223 (2017).
- **Provides information related to drug acquisition costs, reimbursement and rebates for medicare, medicaid and commercial insurers.**
13. Division of Workers' Compensation - Injured worker information. Workers' compensation information system (WCIS). [Online] State of California Department of Industrial Relations (September 2017) (2020). www.dir.ca.gov/dwc/wcis.htm
14. Clinical drug information | Lexicomp, medi-span, and facts & comparisons. [Online database] Wolters Kluwer (2020). www.wolterskluwercli.com/
15. Medicaid and CHIP Payment and Access Commission (MACPAC). Medicaid payment for outpatient prescription drugs: MACPAC [Online] (2020). www.macpac.gov/publication/medicaid-payment-for-outpatient-prescription-drugs
16. Trusted Safety National. California WC system: a regulator's perspective [Online]. Conference chronicles (December 2015) (2020). www.safetynational.com/conferencechronicles/california-wc-system-a-regulators-perspective/
17. National Academy of Social Insurance-NASI Report. Workers' compensation: benefits, coverage, and costs. (October 2016) (2020). www.nasi.org/sites/default/files/research/NASI_Workers_Comp_Report_2016.pdf
18. Lieberman SM, Ginsburg P. Would price transparency for generic drugs lower costs for payers and patients? [Online] Brookings. Brookings (June 2017) (2019). www.brookings.edu/research/would-price-transparency-for-generic-drugs-lower-costs-for-payers-and-patients/

19. Excel 2013 Quick Start Guide. [Online] excel (2019).
<https://support.office.com/en-us/article/Excel-2013-Quick-Start-Guide-4337FE93-0690-47CB-89A1-8424D5FDD886>
20. Microsoft. Datasets for Stata user's guide, Release 14. [Online] Stata Press (2019). www.stata-press.com/data/r14/u.html
21. Guide to Pharmaceutical Payment Methods: Academy of Managed Care Pharmacy. AMCP Guide to pharmaceutical payment methods - 2013 (Version 3.0) [Online] (2020). www.amcp.org/pharmaceutical-payment-guide/
22. Young M. Paying for prescribed drugs in medicaid: current policy and upcoming changes. [Online] The Henry J.Kaiser Family Foundation (May 2014) (2020).
www.kff.org/medicaid/issue-brief/paying-for-prescribed-drugs-in-medicare-current-policy-and-upcoming-changes/