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Real-World At-Risk Opioid Overdose Patient Trends, Economic Burden, and Naloxone Use in the United States (2016-2019)

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Background

Opioid Misuse and Overdose in the United States

- 9.5 million people in the United States reported opioid misuse and 2.3 million met the criteria for an opioid use disorder in 2020.[1]
- More than half a million Americans have died from an opioid overdose since 2000. There were nearly 70,000 opioid overdose fatalities in 2020, including 56,516 deaths involving synthetic opioids (primarily illicitly manufactured fentanyl), 16,416 deaths involving prescription opioids, and 13,165 deaths involving heroin.[2]
- Opioid use disorder and opioid overdose deaths are estimated to cost the U.S. more than $1 trillion annually.[3]
- Opioid overdoses put a strain on healthcare resources and account for more than $11 billion in annual hospital costs nationwide.[4]

Naloxone

- Naloxone is a life-saving medication that can block the effects of opioids and reverse an opioid overdose.[5] Research findings and several scientific consensus guidance documents support co-prescribing naloxone to any individual at risk for an opioid overdose.[6]
- Risk factors for opioid overdose identified in the current prescribing guidelines from the Centers for Disease Control and Prevention include high-dose opioid prescriptions, opioids taken with benzodiazepines, history of substance use disorder, previous opioid overdose, prescription opioid misuse, and the use of illicit opioids (or drugs potentially contaminated with illicit opioids).[7]
- Findings from previous claims data studies show that only 0.5-1.5% of at-risk opioid overdose patients were prescribed naloxone.[8-9]

Objectives

- To characterize demographic and clinical features of at-risk opioid overdose patients (AROODP) stratified by insurance type (commercial, Medicare, Medicaid).
- To examine naloxone prescription rates among AROODP by payor (commercial, Medicare, Medicaid).
- To analyze overall economic burden of AROODP by payor (commercial, Medicare, Medicaid).
- To assess disease-specific costs of AROODP by payor (commercial, Medicare, Medicaid).

Methods

Study Design and Data Source

- Retrospective cohort study

Data Source

- Optum's Clinformatics® Data Mart (CDM) that is derived from administrative health claims for members of large Commercial, Medicare Advantage, and Managed Medicaid health plans.[10]

Patient Cohort

- ≥18 years old with a minimum continuous enrollment of 30 days at index event (first claim date) between January 1, 2016 and December 31, 2019.
- Patients prescribed opioids who:
  a. Receive high opioid dosages of 50 morphine milligram equivalents (MME) per day or greater.
  b. Have a history of respiratory conditions.
  c. Have been prescribed benzodiazepines or sedating antihistamines or sedatives/ hypnotics (regardless of opioid dose).
- Patients with an elevated risk for opioid overdose include individuals who:
  a. Use heroin, illicit synthetic opioids or misusing prescription opioids.
  b. Use other illicit drugs such as stimulants, including methamphetamine and cocaine, which could potentially be contaminated with illicit synthetic opioids like fentanyl.
  c. Receive treatment for opioid use disorder, including medication-assisted treatment with methadone, buprenorphine, or naltrexone.

Analysis

- International Classification of Disease (ICD)-9-Clinical Modification (CM) and ICD-10-CM codes and National Drug Codes (prescription opioid and naloxone dispensing) were used to search claims in the database.
- AROODP were analyzed by patient demographics, type of insurance coverage, comorbidities, and naloxone dispensing.
- Healthcare costs (per member per month costs, PMPMC) were analyzed annually by insurance type (commercial, Medicare, and Medicaid).
- Disease-specific medical costs included any claims related to a diagnosis of opioid abuse, opioid dependence, or opioid adverse effect during the year.
- Disease-specific pharmacy costs included any claims for naloxone during the year
- Charlson Comorbidity Index (CCI) and Agency for Healthcare Research and Quality (AHRQ1-2) were employed to characterize comorbidities of AROODP patients by insurance type (commercial, Medicare, and Medicaid).

Results

Figure 1. Annual Trends in Age Distribution of At-Risk Opioid Overdose Patients (AROODP), by Payor (2016-2019).

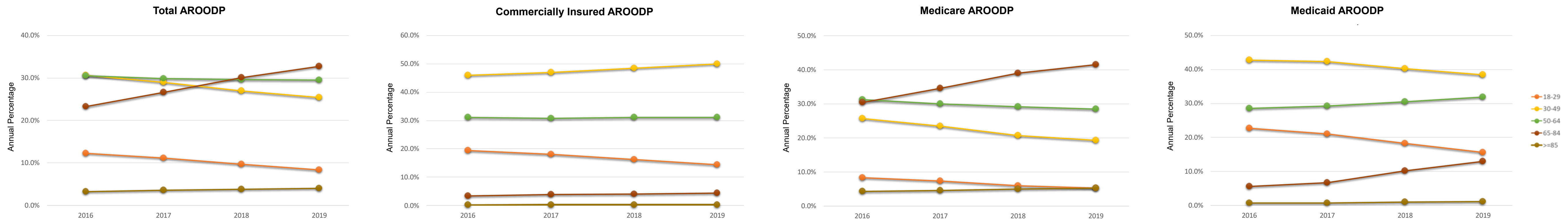


Figure 2. Annual Trends in Gender Distribution of At-Risk Opioid Overdose Patients, by Payor (2016-2019).

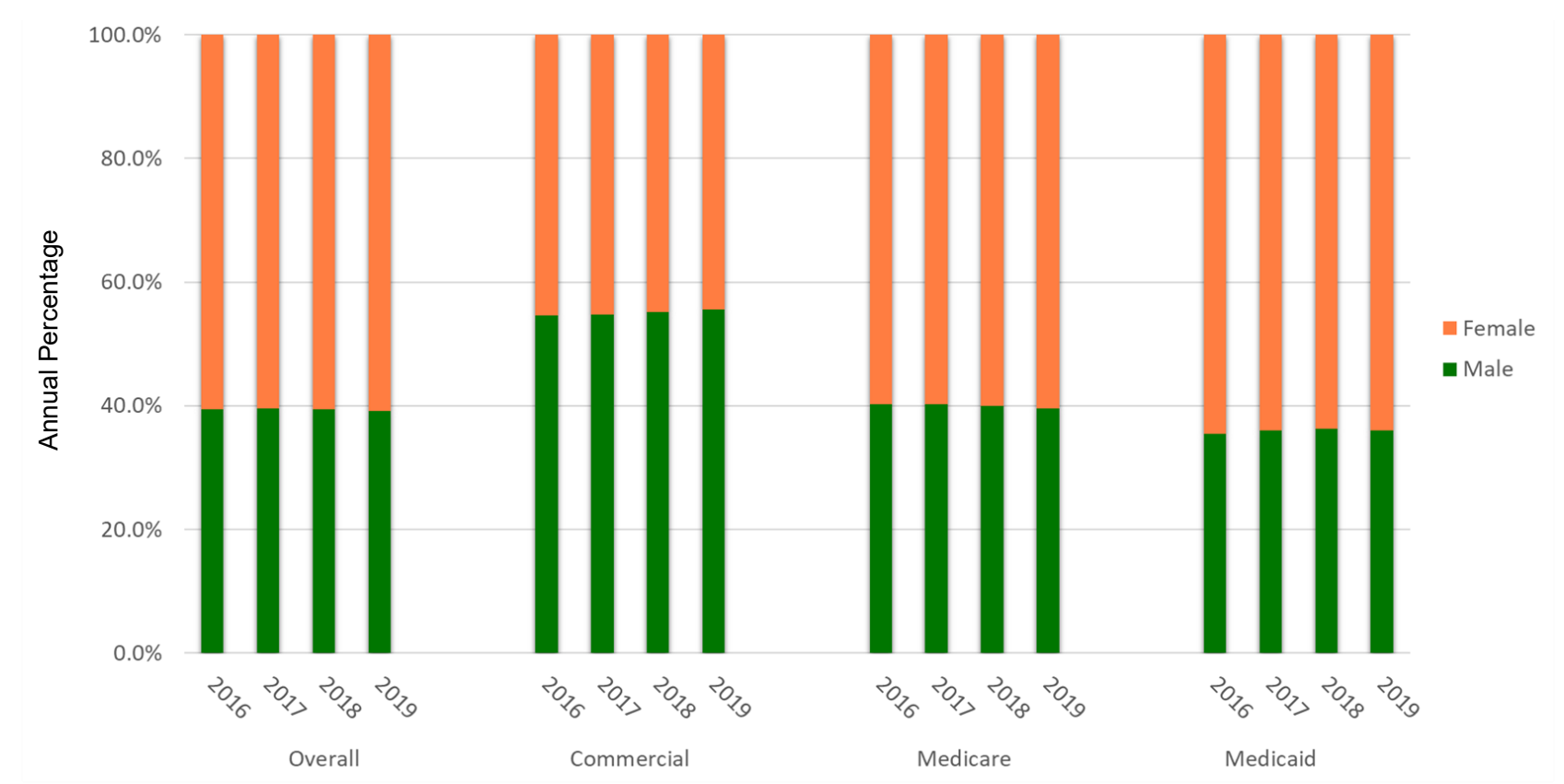


Figure 3. Annual Trends in Race/Ethnicity Distribution of At-Risk Opioid Overdose Patients, by Payor (2016-2019).

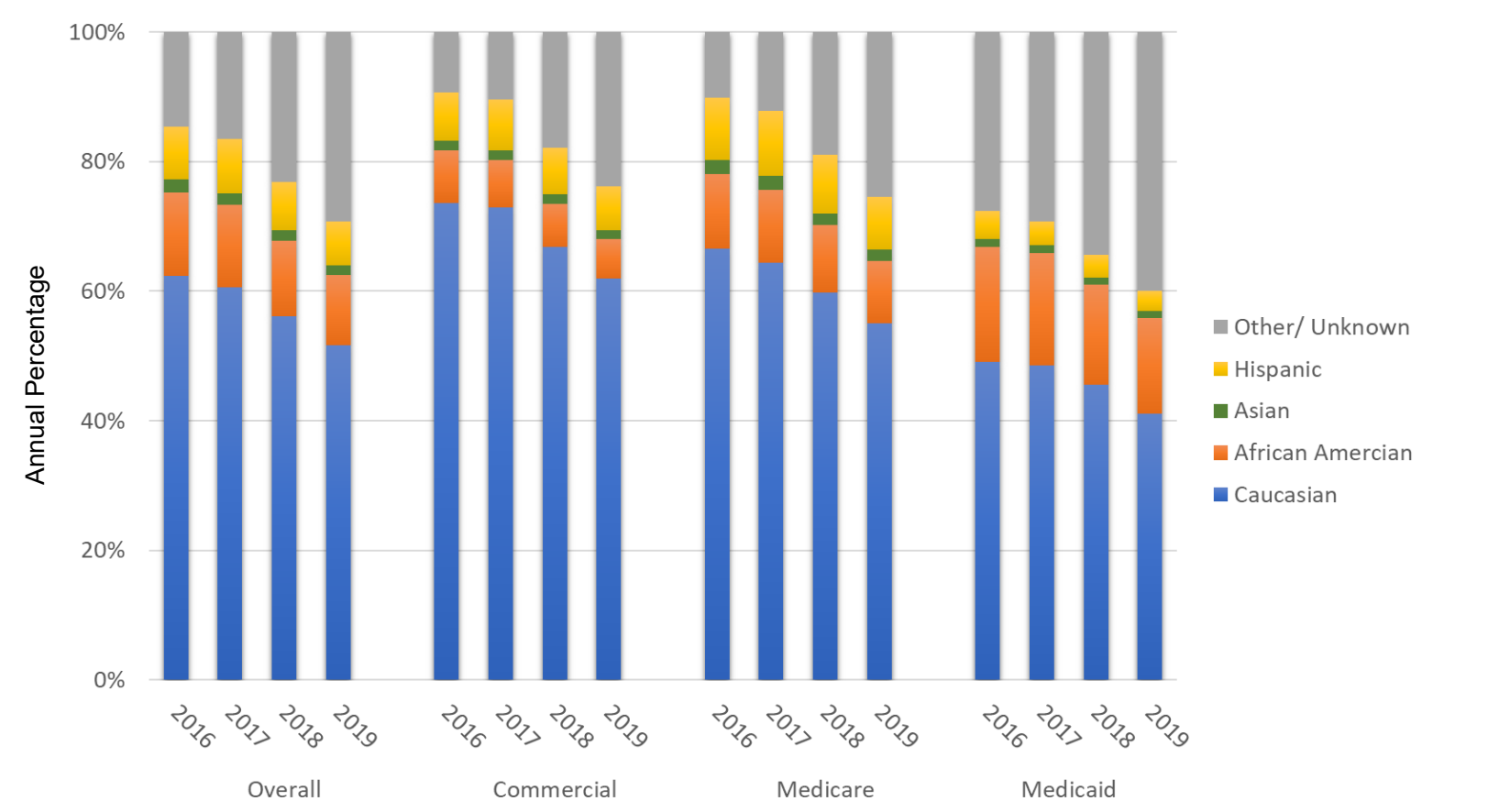
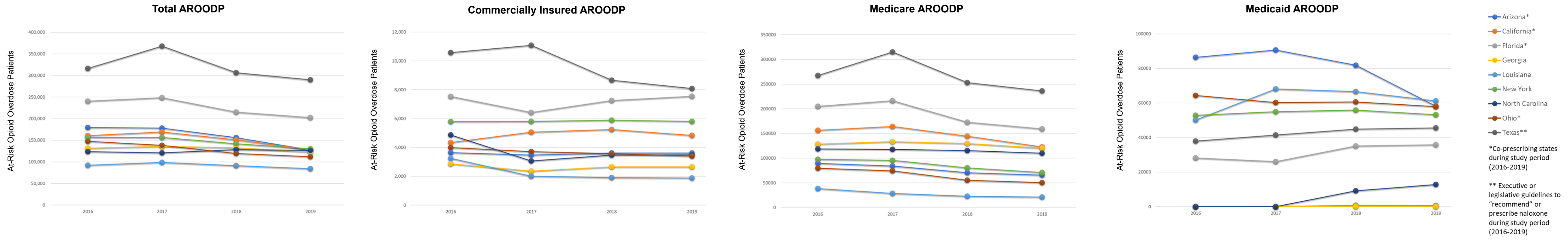


Figure 4. Annual Trends in State-Level Distribution of At-Risk Opioid Overdose Patients, by Payor (2016-2019).



*Co-prescribing states during study period (2016-2019)

** Executive or legislative guidelines to "recommend" or prescribe naloxone during study period (2016-2019)

Figure 5. Annual Trends in Average CCI Score of At-Risk Opioid Overdose Patients, by Payor (2016-2019).

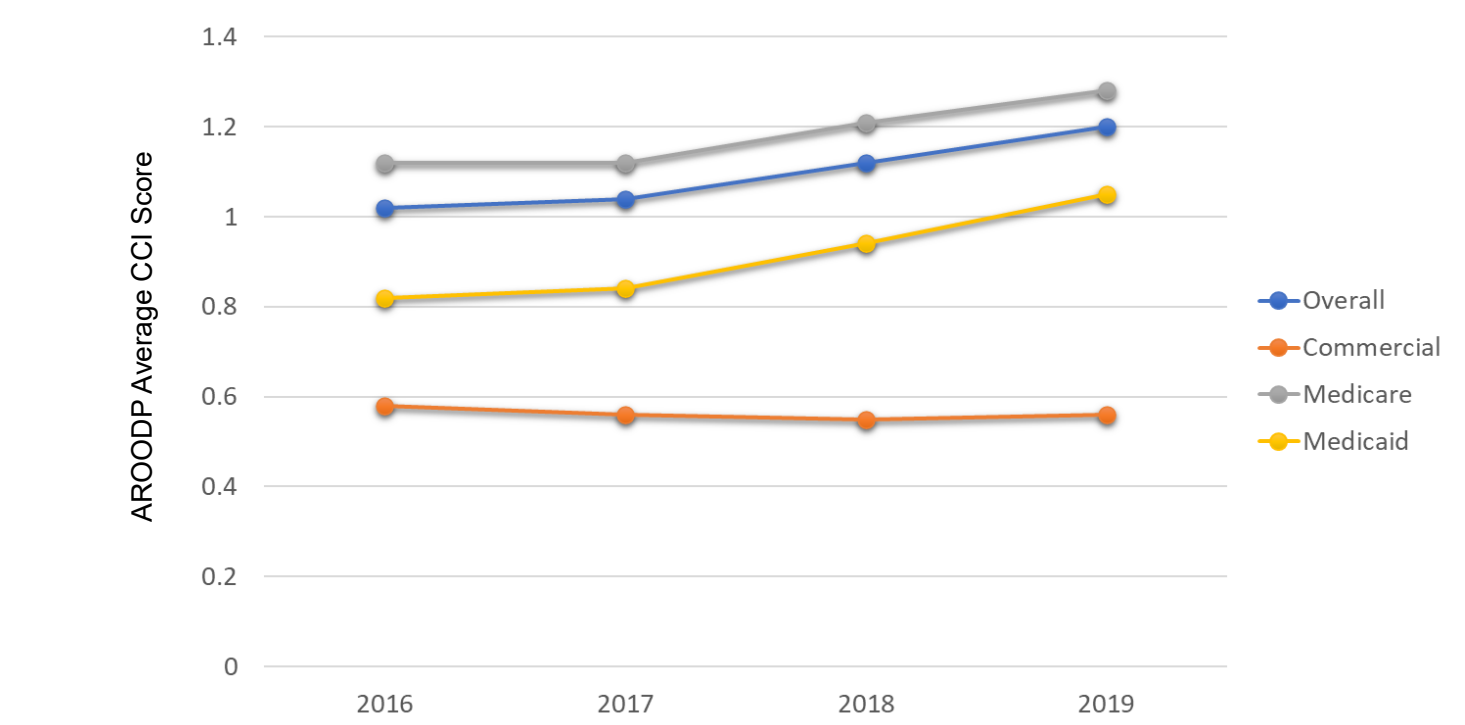


Figure 6. Annual Trends in At-Risk Opioid Overdose Patients with ≥1 CCI Comorbidity, by Payor (2016-2019).

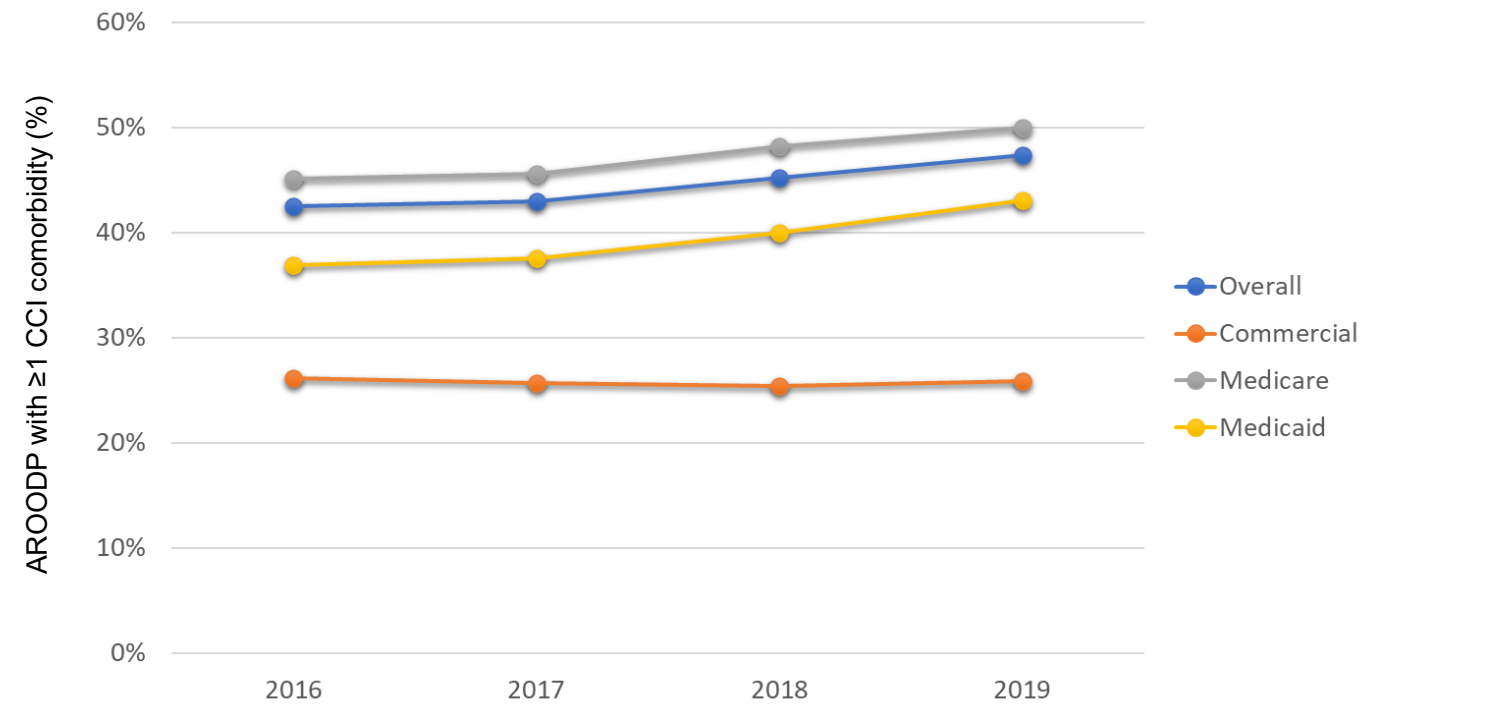
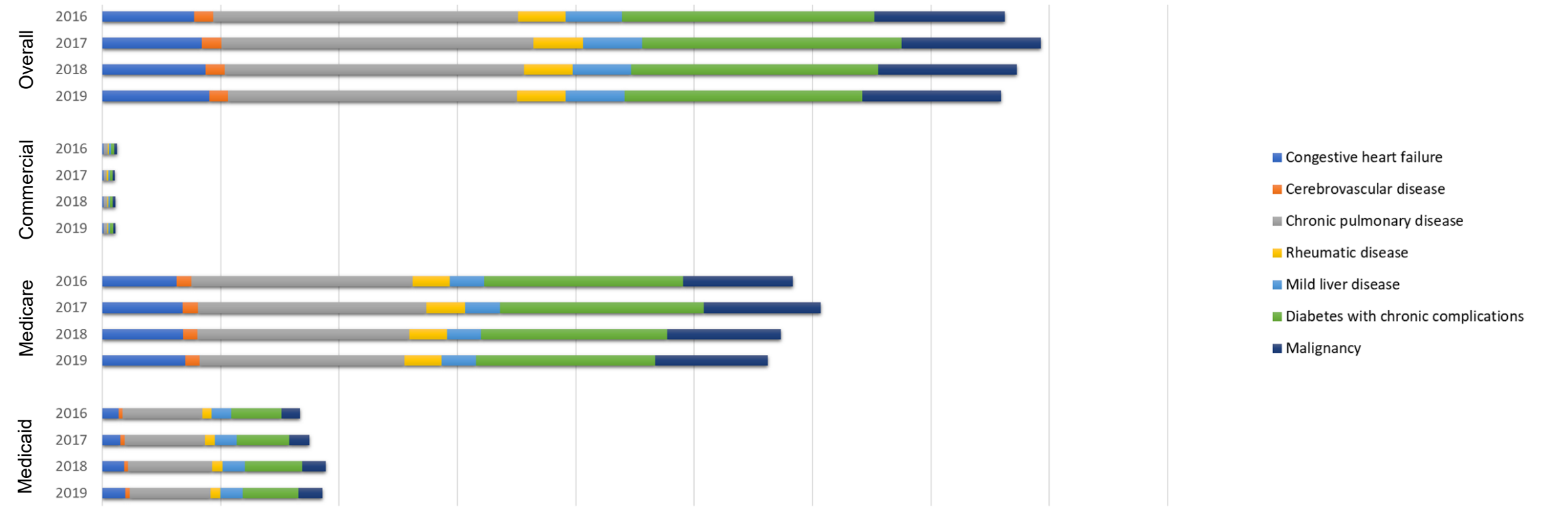
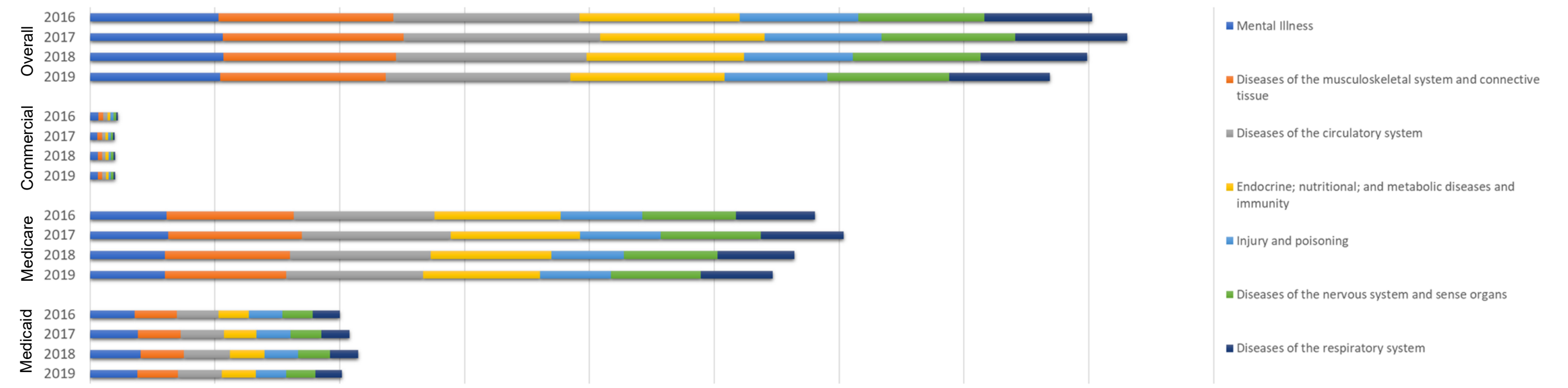


Figure 7. Annual Trends in CCI Comorbidities among AROODP, by Payor (2016-2019).



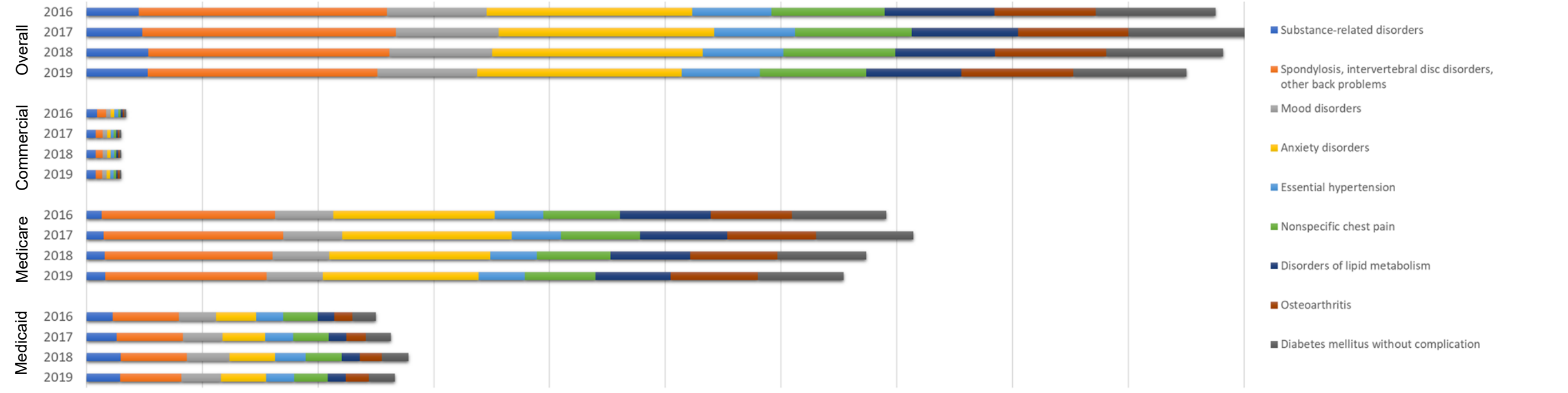
	Overall				Commercial				Medicare				Medicaid			
	2016	2017	2018	2019	2016	2017	2018	2019	2016	2017	2018	2019	2016	2017	2018	2019
Congestive heart failure	154,721	167,950	174,476	180,746	1,672	1,405	1,520	1,610	125,259	135,706	136,482	140,209	27,790	30,839	36,474	38,927
Cerebrovascular disease	32,796	33,676	31,856	31,809	506	426	390	390	25,507	26,112	24,342	23,854	6,783	7,138	7,124	7,565
Chronic pulmonary disease	514,773	526,848	505,816	488,445	6,978	5,933	6,057	6,033	373,931	385,366	358,047	346,409	133,864	135,549	141,712	136,003
Rheumatic disease	80,379	83,993	82,616	81,527	2,197	2,000	1,854	1,971	62,369	65,665	63,347	62,515	15,813	16,328	17,415	17,041
Mild liver disease	94,872	99,275	98,470	99,701	3,330	2,829	2,951	3,084	58,160	59,503	57,000	58,630	33,382	36,943	38,519	37,987
Diabetes with chronic complications	426,791	438,297	417,127	401,866	5,745	5,010	5,020	5,153	336,137	344,288	315,580	302,519	84,909	88,999	96,527	94,194
Malignancy	220,954	235,339	234,808	234,214	4,075	3,948	3,909	3,905	185,195	196,955	191,365	189,984	31,684	34,436	39,534	40,325

Figure 8. Annual Trends in AHRQ1 Comorbidities among AROODP, by Payor (2016-2019).



	Overall				Commercial				Medicare				Medicaid			
	2016	2017	2018	2019	2016	2017	2018	2019	2016	2017	2018	2019	2016	2017	2018	2019
Mental Illness	1,029,166	1,063,891	1,065,665	1,039,517	64,801	58,021	60,206	61,184	610,123	625,433	601,097	601,178	354,242	380,437	404,362	377,155
Diseases of the musculoskeletal system and connective tissue	1,401,220	1,448,684	1,384,264	1,330,026	41,657	36,181	34,743	33,473	1,020,591	1,069,484	1,001,428	970,295	338,972	343,019	348,093	326,258
Diseases of the circulatory system	1,491,734	1,571,931	1,524,476	1,477,532	31,657	28,783	29,158	29,865	1,127,016	1,193,590	1,126,563	1,095,290	333,061	349,558	368,755	352,377
Endocrine; nutritional; and metabolic diseases and immunity	1,283,280	1,318,346	1,265,523	1,235,580	25,154	22,798	23,223	23,982	1,011,750	1,035,695	964,793	938,268	246,376	259,853	277,507	273,330
Injury and poisoning	946,098	936,395	867,669	824,438	22,964	19,532	18,937	18,554	654,631	645,572	583,327	565,000	268,503	271,291	265,405	240,884
Diseases of the nervous system and sense organs	1,011,693	1,070,450	1,022,968	975,780	20,850	18,750	18,898	18,752	749,336	802,252	747,342	721,870	241,507	249,448	256,728	235,158
Diseases of the respiratory system	864,366	899,002	856,931	803,753	15,433	13,935	14,044	13,697	632,880	663,294	615,980	577,008	216,053	221,773	226,907	213,048

Figure 9. Annual Trends in AHRQ2 Comorbidities among AROODP, by Payor (2016-2019).



	Overall				Commercial				Medicare				Medicaid			
	2016	2017	2018	2019	2016	2017	2018	2019	2016	2017	2018	2019	2016	2017	2018	2019
Substance-related disorders	224,725	241,633	266,730	264,572	46,523	38,898	39,571	38,587	66,012	73,390	78,806	81,015	112,190	129,345	148,353	144,970
Spondylosis, intervertebral disc disorders, other back problems	1,072,834	1,094,262	1,041,620	990,903	37,218	31,761	30,393	28,999	748,981	776,246	725,353	697,024	286,635	286,255	285,874	264,880
Mood disorders	431,180	445,474	444,747	432,351	19,638	17,694	18,108	18,772	250,333	255,775	243,849	242,696	161,209	172,005	182,790	170,883
Anxiety disorders	887,814	930,977	909,345	883,929	17,050	15,307	15,797	16,382	697,506	731,967	695,129	672,145	173,258	183,703	198,419	195,402
Essential hypertension	340,688	347,416	348,048	337,686	15,494	14,291	15,125	15,448	209,285	210,931	202,625	200,807	115,909	122,194	130,298	121,431
Nonspecific chest pain	491,383	505,271	483,095	458,823	11,073	9,456	9,375	9,281	331,907	342,828	317,579	304,202	148,403	152,987	156,141	145,340
Disorders of lipid metabolism	473,999	458,545	429,727	411,528	8,630	7,453	7,453	7,642	393,169	376,304	344,170	326,175	72,200	74,788	78,104	77,711
Osteoarthritis	437,501	476,913	480,652	481,871	8,119	7,259	7,408	7,372	350,901	384,429	376,991	375,620	78,481	85,225	96,253	98,879
Diabetes mellitus without complication	515,649	533,950	504,845	490,065	7,762	6,962	7,142	7,373	406,103	419,154	382,508	370,013	101,784	107,834	115,195	112,679

Figure 10. Annual Trends in Total Healthcare Expenditure (Average Per Member Per Month Costs) among AROODP, by Payor (2016-2019).

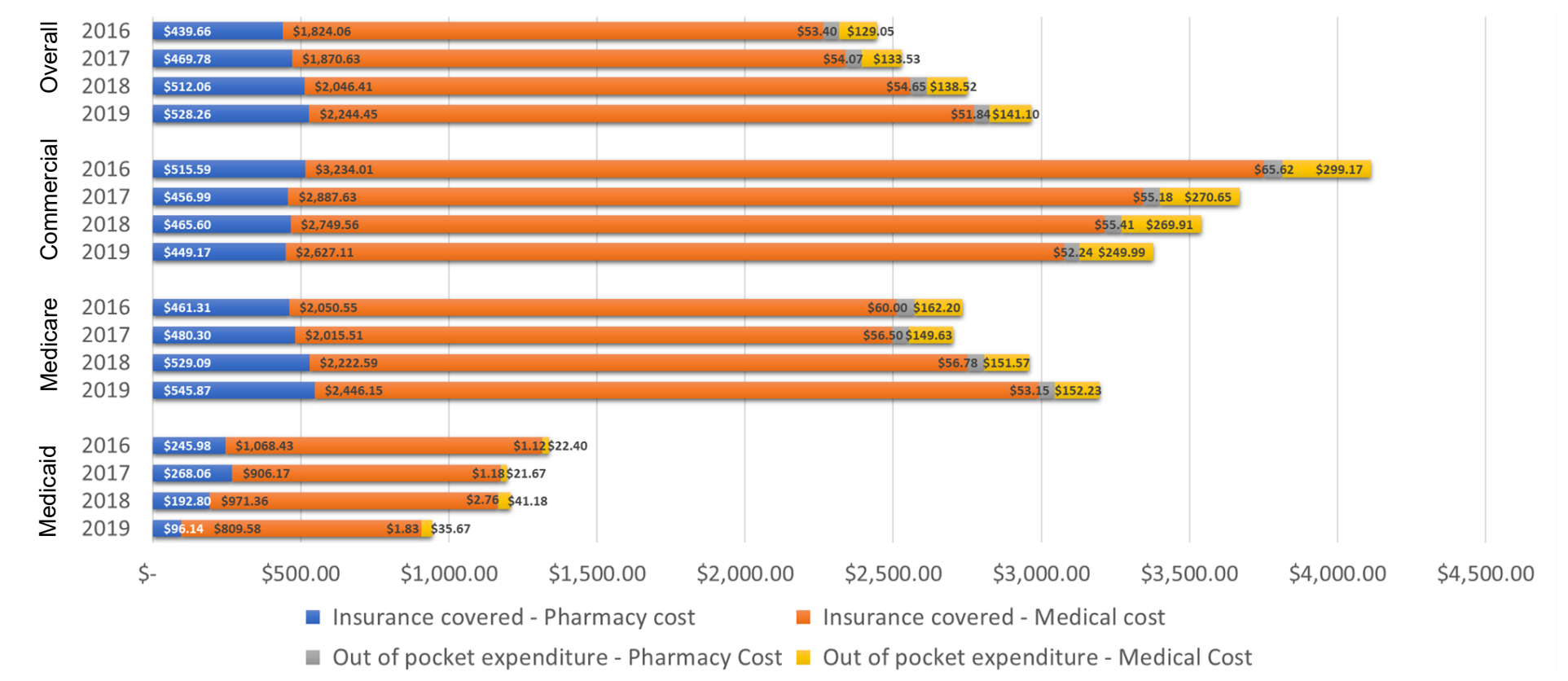


Figure 11. Annual Trends in Disease-Specific Healthcare Expenditure (Average Per Member Per Month Costs) among AROODP, by Payor (2016-2019).

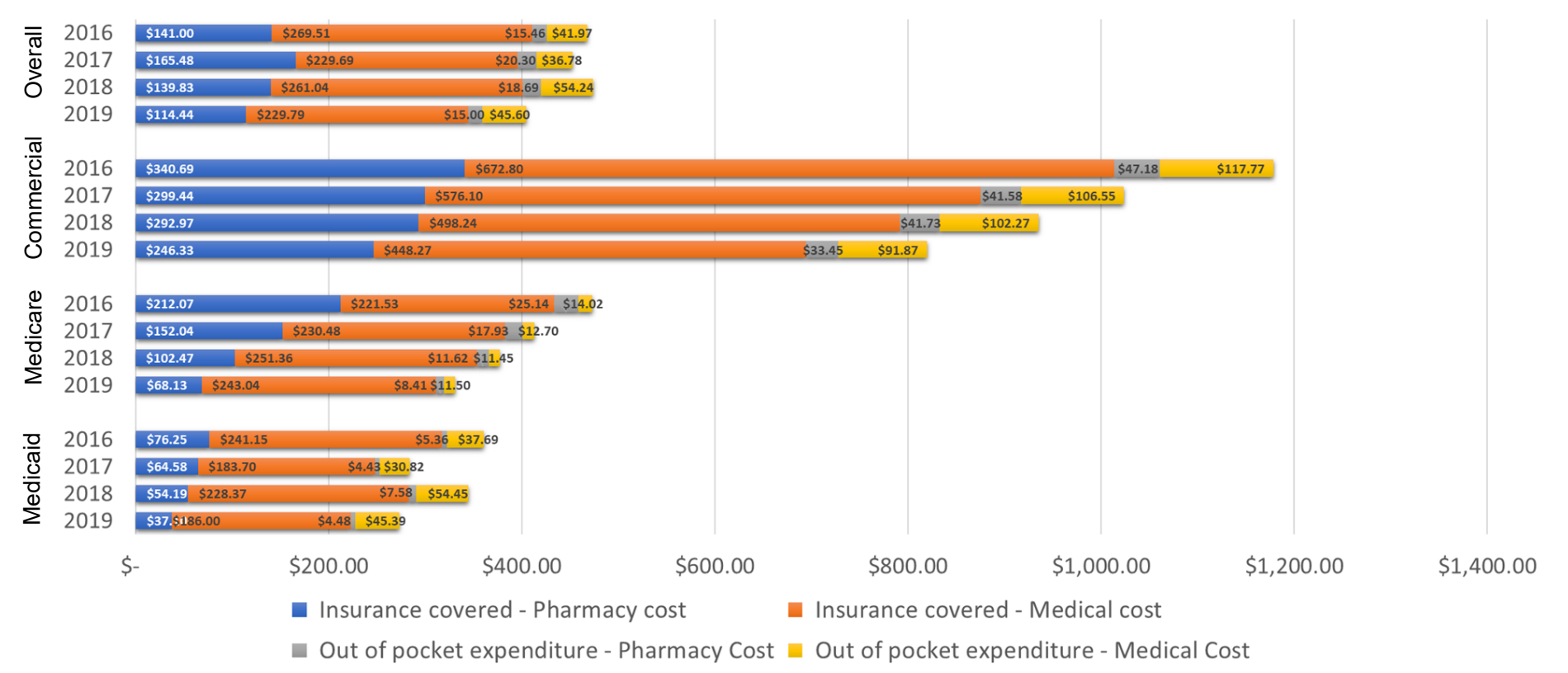


Figure 12. Annual Trends in Naloxone Prescribing Among AROODP, by Payor (2016-2019).

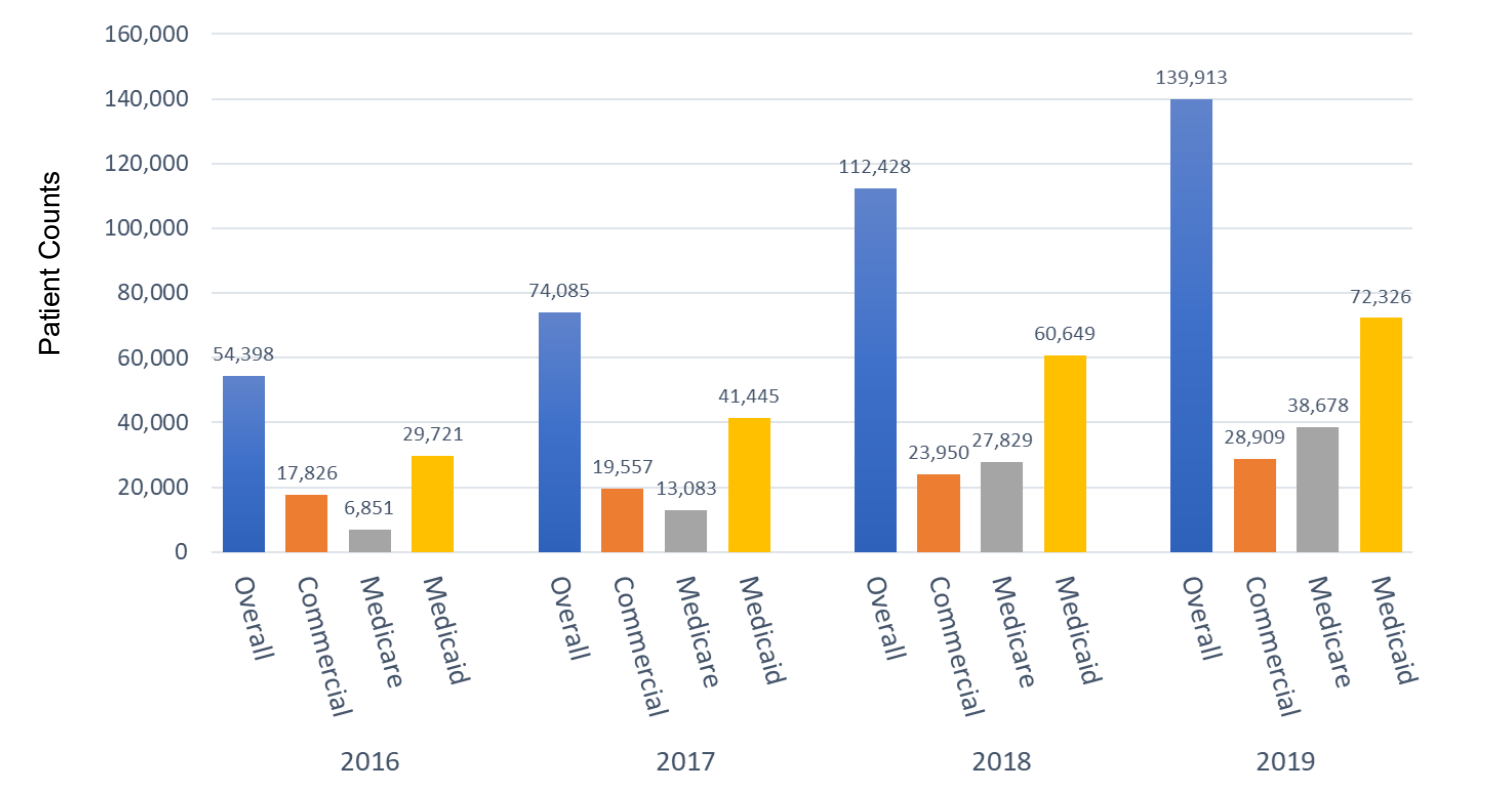
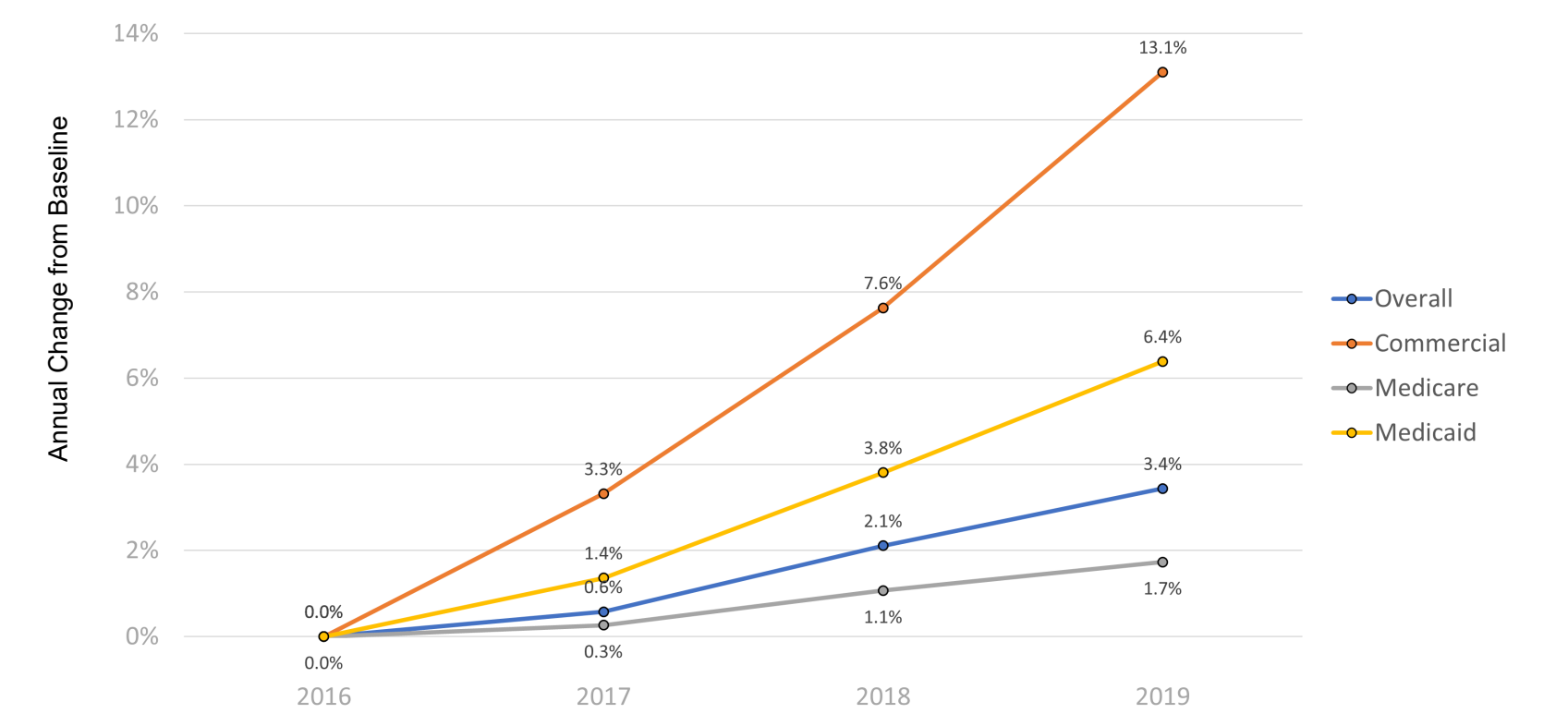


Figure 13. Percentage Change from Baseline in Naloxone Prescribing Among AROODP, by Payor (2016-2019).



Key Findings

Characteristics of AROODP

- 3.14 million AROODP were identified in 2016, 3.21 million in 2017, 2.93 million in 2018, and 2.71 million in 2019.
- In 2019, the majority of AROODP were covered by Medicare (70.24%), followed by those with Medicaid (26.48%) and commercial insurance (3.28%).
- Approximately two-thirds of AROODP (66.31%) identified in 2019 were ≥50 years of age. Three-quarters of AROODP with Medicare were aged ≥50 years (75.41%), followed by nearly one-half of individuals with Medicaid (45.98%) and around one-third of commercial insurance beneficiaries (35.66%).
- From 2016 to 2019, there was a 9.24 percentage point increase in AROODP rates among individuals ≥50 years. The largest increase was observed among AROODP with Medicaid (11.31%), followed by those with Medicare (9.40%) and commercial insurance (1.06%).
- Overall, 60.83% of AROODP were female in 2019. AROODP with Medicaid (64.03%) and Medicare (60.39%) were both predominantly female, while the majority of AROODP covered by commercial insurance were male (55.53%).
- In 2019, a little more than one-half of all AROODP were Caucasian (51.64%), with commercial insurance beneficiaries having the highest proportion of Caucasians (61.96%), followed by individuals with Medicare (55.11%) and Medicaid (41.16%).
- States with the highest AROODP rates in 2019 were TX (10.70%), FL (7.49%), NY (4.81%), CA (4.75%), and AZ (4.70%).

Rates by State and Payer

- States with the overall highest RIOP-RX rates were NJ (22.16%), OH (13.64%), TN (11.93%), NY (9.66%), and PA (8.52%).
- States with the overall highest number of IOP-RX included OH (20.68%), PA (11.65%), NJ (11.18%), NY (10.17%), and LA (7.16%).

Comorbidities among AROODP

- In 2019, nearly one-half of all AROODP (47.36%) had at least one comorbidity. Half of the older population of AROODP covered by Medicare had at least one comorbidity (50.00%), with lower rates found in Medicaid (43.03%) and commercial insurance (25.86%) patients.
- The average Charlson Comorbidity Index (CCI) score was 1.20. Medicare patients had the highest CCI score (1.28), followed by patients with Medicaid (1.05) and commercial insurance coverage (0.56). The most common CCI comorbidities among AROODP across all three payor groups included chronic pulmonary disease (6.80%-18.97%), diabetes with chronic complications (5.81%-15.91%), and mild liver disease (3.08%-5.30%).
- In 2019, the most common AHRQ1 comorbidities among AROODP across all three payor groups were mental illness (31.61%-68.96%), diseases of the circulatory system (33.36%-57.60%), diseases of the musculoskeletal system and connective tissue (37.73%-51.03%), and endocrine, nutritional and metabolic diseases and immunity disorders (27.03%-49.34%). Patients with commercial insurance had the highest rate of mental illness (68.96%), followed by individuals with Medicare (52.61%) and Medicaid (31.61%). Medicare patients had the highest rate of diseases of the circulatory system (57.60%), followed by Medicaid (49.15%) and commercial insurance beneficiaries (33.66%).
- In 2019, the most prevalent AHRQ2 comorbidities among AROODP across all three payor groups were substance-related disorders (4.26%-43.49%), spondylosis, intervertebral disc disorders, and other back problems (32.68%-36.95%), mood disorders (12.76%-23.84%), essential hypertension (18.46%-35.35%), osteoarthritis (8.31%-19.75%), and diabetes mellitus without complications (8.31%-19.46%). Medicaid patients had the highest proportion of spondylosis and intervertebral disc disorders (36.95%), followed by those with Medicare (36.65%) and commercial insurance (32.68%). The commercial insurance cohort had the highest proportion of substance-related disorders (43.49%), followed by the Medicare (20.22%) and Medicaid (4.26%) groups.

Healthcare Costs among AROODP

- From 2016 to 2019, the overall per member per month healthcare costs (PMPMC) for AROODP increased by 21.24%. In 2019, overall PMPMC for AROODP were $2,965.66. When broken down, total costs were mostly insured medical costs (75.68%) followed by insured pharmacy costs (17.81%), out-of-pocket medical costs (4.76%), and out-of-pocket pharmacy costs (1.75%).
- In 2019, overall insured medical costs were highest for AROODP enrolled in commercial plans ($2,627.11), followed by Medicare ($2,446.15) and Medicaid ($809.58). Insured pharmacy costs were highest for Medicare beneficiaries ($545.87), followed by commercial insurance ($449.17) and Medicaid ($96.14) patients.
- Out-of-pocket medical costs were highest for commercial insurance ($249.99), followed by Medicare ($152.23) and Medicaid ($35.67). Out-of-pocket pharmacy costs were highest for Medicare ($53.15), followed by commercial ($52.24) and Medicaid ($1.83)
- In 2019, disease-specific insured medical costs for AROODP (the costs associated with treatment of opioid abuse, dependence, and adverse effects) were highest for patients with commercial insurance ($448.27), followed by Medicare ($243.04) and Medicaid ($186.00) patients. Insured pharmacy costs were highest for commercial plans ($246.33), followed by Medicare ($68.13) and Medicaid ($37.10). Out-of-pocket medical costs were highest for commercial insurance ($91.87), followed by Medicaid ($45.39) and Medicaid ($11.50). Out-of-pocket pharmacy costs were highest for commercial patients ($33.45), followed by Medicare ($8.41), and Medicare ($4.48).

Naloxone Use among AROODP

- Among all AROODP, only 139,913 individuals (5.17%) received a naloxone prescription in 2019. Rates of naloxone use greatly varied by payor group, with commercial patients receiving naloxone at a much higher rate (32.58%) compared to Medicaid (10.09%) and Medicare (2.03%) patients.
- From 2016 to 2019, there was a 3-fold increase in naloxone prescription rates among AROODP.
- Overall, 98.21% of AROODP were not on MOUD in 2019. Only 70,708 AROODP not on MOUD (2.66%) were prescribed naloxone. Among these patients, commercial insurance beneficiaries had the highest rate of naloxone use (13.74%), followed by those covered by Medicaid (4.66%) and Medicare (1.52%).

Limitations

- Undetected diagnosis coding errors may have potentially led to the misidentification of AROODP patients.
- Since our analysis of dispensed prescriptions and diagnoses was based on filed claims data, any medication dispensing that occurred outside of medical settings was not captured.
- Although this study utilized a large, nationwide database (~180 million covered lives from commercial, Medicare, and Medicaid plans), our claims dataset did not include individuals under 18 years of age.
- Analysis was restricted to a defined study window with a minimum continuous enrollment of 30 days following index event (date of first claim related to AROODP classification). Due to this continuous enrollment constraint, our study did not address overdose-induced deaths at the index event.

Conclusions

- This study provides previously unavailable data for AROODP that are broken down by payor types (commercial, Medicare, and Medicaid).
- Naloxone prescriptions among AROODP increased from 2016 to 2019, however, the rate of naloxone use among this vulnerable population remains suboptimal.
- AROODP demonstrated significant economic burden to the healthcare system and payors of commercial, Medicare, and Medicaid plans. Commercial and Medicare patients had the highest expenses in all 4 PMPMC categories (insured medical costs, insured pharmacy costs, out-of-pocket medical costs, and out-of-pocket pharmacy costs) when considering overall healthcare costs. Commercial patients had the highest disease-specific costs, including the highest costs across all 4 PMPMC categories.
- This study may serve as an important resource for public health policymakers, researchers, and payors. Our findings may better facilitate the evaluation of real-world benefits of naloxone use among AROODP.
- Increased naloxone co-prescribing among AROODP may enable substantial healthcare cost savings, helping to reduce the economic burden of payors with increasingly constrained healthcare budgets.

Future Research

Future studies are needed to assess how increased naloxone co-prescribing impacts:

- The demographic and clinical characteristics of AROODP.
- Overall and disease-specific healthcare costs associated with treating AROODP.
- The prevention of prescription opioid overdose deaths among AROODP.

Additional research should also examine the benefits of naloxone co-prescribing among AROODP using data from states that have implemented co-prescribing policies.

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References

1. Substance Abuse and Mental Health Services Administration. (2021). *Key substance use and mental health indicators in the United States: Results from the 2020 National Survey on Drug Use and Health* (HHS Publication No. PEP21-07-01-003, NSDUH Series H-56). Rockville, MD: Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration.
2. National Institute on Drug Abuse. Trends and Statistics: Overdose Death Rates. https://nida.nih.gov/drug-topics/trends-statistics/overdose-death-rates; accessed January 27, 2022.
3. Florence C, Luo F, Rice K. The economic burden of opioid use disorder and fatal opioid overdose in the United States, 2017. *Drug Alcohol Depend.* 2021 Jan 1;218:108350.
4. Premier Inc. "Opioid Overdoses Costing U.S. Hospitals an Estimated $11 Billion Annually," news release, Jan. 3, 2019. https://www.premierinc.com/newsroom/press-releases/opioid-overdoses-costing-us-hospitals-an-estimated-11-billion-annually; accessed February 8, 2022.
5. National Institute on Drug Abuse. Naloxone Drug Facts. https://nida.nih.gov/publications/drugfacts/naloxone; accessed April 23, 2022.
6. Green TC, Davis C, Xuan Z, Walley AY, Bratberg J. Laws Mandating Coprescription of Naloxone and Their Impact on Naloxone Prescription in Five US States, 2014-2018. *Am J Public Health.* 2020;110(6):881-887.
7. Dowell D, Haegerich TM, Chou R. CDC Guideline for Prescribing Opioids for Chronic Pain — United States, 2016. *MMWR Recomm Rep.* 2016;65(No. RR-1):1–49.
8. Naloxone Prescriptions Among Commercially Insured Individuals at High Risk of Opioid Overdose. Follman S, Arora VM, Lyttle C, Moore PQ, Pho MT. *JAMA Netw Open.* 2019 May 3;2(5):e193209.
9. Rates and Costs of Dispensing Naloxone to Patients at High Risk for Opioid Overdose in the United States, 2014-2018. Barenie RE, Gagne JJ, Kesselheim AS, Pawar A, Tong A, Luo J, Bateman BT. *Drug Saf.* 2020 Jul;43(7):669-675.
10. Optum's de-identified Clinformatics® Data Mart Database (2007-2021).