Office of Informatics and Analytics
Prescription Drug Overdose
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Adolescent Prescribing Patterns in the Tennessee Controlled Substances Monitoring Database, 2012 to 2016

Introduction

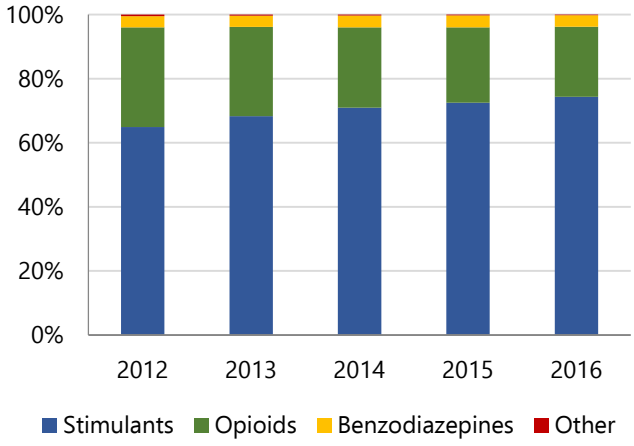
Previous work on patterns of drug use in adolescents suggests that prevalence of narcotics abuse is relatively low. National survey data from multiple sources support that narcotics misuse is on the decline, with prevalence peaking around 4% to 5% in 2011 [1,2]. Further work suggests that among adolescents who do misuse opioids, the risk of initiating use peaks around age 15 to 16 [3], there are no differences between boys and girls [4], and the majority of opioid abusers also report abusing other substances [5]. Of more concern is the finding that adolescents who misuse opioids are substantially more likely to use heroin as young adults [6]. While these previous findings are related primarily to misuse, the majority of adolescent opioid misusers report a previous legitimate prescription that initiated their use [4].

In Tennessee, the Controlled Substances Monitoring Database (CSMD) provides a snapshot of prescribing patterns for adolescents in our state. For this analysis, we define 'adolescents' as individuals between the ages of 12 and 17 years. Because a single adolescent user may have multiple records in the CSMD, we use entity resolution strategies prior to the analysis to identify distinct individuals. These strategies allow us to track not only the total number of prescriptions in the state attributable to adolescents but also the number of prescriptions each person has filled.

Prescription-Level Results

In this section, we focus on total numbers of prescriptions, without considering whether there are individuals filling multiple prescriptions. **Figure 1** illustrates the percentage distribution of the types of prescriptions given to adolescents. In each year, the majority of prescriptions were for stimulants. Opioid prescriptions have decreased from 31.1% of all prescriptions in 2012 to 21.9% in 2016. Benzodiazepines and other controlled substances accounted for a small proportion of adolescent prescriptions.

Figure 1. Total Number of Adolescent Prescriptions, by Drug Class in Tennessee



On the next page, **Figure 2** presents the most commonly filled types of opioid prescription drugs. Short-acting opioid analgesics constituted the majority of all opioid prescriptions for adolescents, with short-acting hydrocodone being the most common. We show that the total number of opioid prescriptions for adolescents decreased from 117,041 in 2012 to 84,765 in 2016. Less than 0.2% of all

Figure 2. Total Number of Adolescent Opioid Prescriptions

	2012		2013		2014		2015		2016	
	N	%	N	%	N	%	N	%	N	%
Codeine	19039	16.3	15989	14.7	13411	13.8	12821	13.9	11636	13.7
Hydrocodone SA	*70321*	*60.1*	*65987*	*60.5*	*58315*	*60.0*	*53411*	*57.9*	*48927*	*57.7*
Oxycodone SA	17374	14.8	17477	16.0	16230	16.7	16778	18.2	16090	19.0
Tramadol SA	6445	5.5	5786	5.3	5806	6.0	5706	6.2	5036	5.9
All Other Opioids	3862	3.3	3793	3.5	3454	3.6	3545	3.8	3114	3.7
Total	117041		109032		97216		92226		84765	

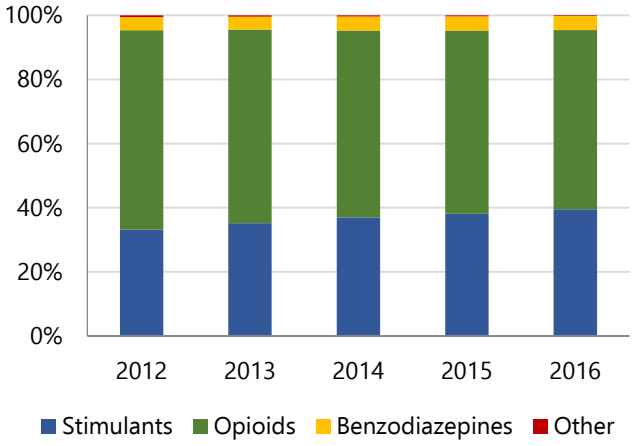
adolescent opioid prescriptions are filled for buprenorphine FDA indicated for medication-assisted treatment (MAT).

The average number of adolescent opioid prescriptions per prescriber decreased from 10.93 in 2012 to 9.34 in 2016, and the maximum number of adolescent opioid prescriptions per prescriber has decreased from 2,158 in 2012 to 1,148 in 2016. At least 20% of all adolescent opioid prescriptions were written by dentists, which may be due to the prescribing of opioids for wisdom tooth removal, a common procedure for adolescents in this age range.

Patient-Level Results

Because some adolescents fill multiple, potentially recurring prescriptions each year, the prescription numbers presented above do not reflect the number and distribution of adolescents who fill controlled substance prescriptions. In this section, we turn our attention to the individuals who had prescriptions filled and identify several noteworthy differences from the prescription-level analysis. **Figure 3** shows the percentage distribution of individuals filling certain classes of prescriptions. These results look different from those at the prescription-level, especially concerning opioids: in 2012, 62.2% of adolescents in the CSMD filled opioid prescriptions, and in 2016 55.9% of adolescents in the CSMD filled opioid prescriptions. The vast majority of these individuals only filled a *single* opioid prescription. In 2012, 72.9% of adolescents who filled an opioid prescription only filled a single prescription, and in 2016, this percentage increased to 79.0%. When considering injuries due to sports and the previously-mentioned common wisdom tooth removal, it is reasonable that there were more individuals filling opioid prescriptions than other types of specialized medications.

Figure 3. Number of Adolescents Filling Controlled Substance Prescriptions, by Drug Class in Tennessee



The total number of adolescents who filled prescriptions for any controlled substance decreased from 124,482 in 2012 to 110,966 in 2016, as did the number of adolescents who filled opioid prescriptions. The number of adolescents who filled opioid prescriptions decreased from 77,455 in 2012 to 62,028 in 2016. Short-acting opioids were more commonly prescribed in all years, and the majority of all adolescents who filled opioid prescriptions received short acting hydrocodone (56.5% in 2012 to 57.3% in 2016).

Figure 4. Adolescents Filling Prescriptions in Multiple Years

	2013		2014		2015		2016	
	N	%	N	%	N	%	N	%
Benzodiazepine	178	0.92	303	1.05	878	1.71	7007	3.28
Opioid	598	3.10	940	3.25	2006	3.90	10036	4.69
Stimulant	18490	95.93	27681	95.56	48429	94.25	196397	91.85
Other	8	0.04	43	0.15	68	0.13	393	0.18
Total	19274		28967		51381		213833	

The number of adolescents who filled prescriptions in multiple years was relatively small. There were 27,701 individuals classified as adolescents in 2016 who filled at least one prescription in every year from 2013 to 2016, and of those, only 980 filled an opioid prescription in all four of those years. **Figure 4** shows the percentages of individuals who were between 12 and 17 in 2016 who had prescriptions filled in multiple years, and the overwhelming majority of this group who filled multiple prescriptions received stimulants rather than opioids.

Conclusion

Adolescent prescribing patterns are of great interest to researchers studying opioid abuse, as studies have shown that misuse of opioids prior to age 18 increases risk of addiction as a young adult. Because misuse is often preceded by a valid prescription, we are interested in tracking adolescent prescribing trends in Tennessee. Current analysis shows that opioid prescriptions for adolescents declined during 2012 to 2016, both in total number and in number of individuals. Among opioid prescriptions, we also see that short-acting opioids are more common, as is the tendency for adolescents to only fill a single prescription during this time period. These results demonstrate that the CSMD can be used as a resource to monitor prescribing patterns among adolescents for public health surveillance.

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