

# Rates of Tobacco Use Disorder, Pharmacologic Treatment, and Associated Mental Health Disorders in a Medicaid Claim Review Among Youth in Indiana, USA

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## ABSTRACT

**PURPOSE:** This study delineates a number of Medicaid youth with tobacco use disorder (TUD), prescribing habits for treatment, and associated externalizing disorders.

**METHODS:** Youth Medicaid claims from 2007-2017 processed in a large Midwestern city were analyzed for a diagnosis of TUD, related pharmacotherapy, and externalizing mental health and substance use disorders.

**RESULTS:** Claims connected 6541 patients with 42 890 visits. Mean age was 16.4 with 40% female. 1232 of the 6541 charts contained a TUD diagnosis equating to 1848 visits. A comorbid diagnosis of ADHD, cannabis use, and conduct disorder were more common in males (3.9% vs 1.3% in females; 3.4% vs .8%; and 2.8% vs .8%;  $P < .05$ ). 808 scripts were provided to 152 of the 1232 youths, with 4.7% of those scripts a nicotine replacement product.

**CONCLUSIONS:** Pharmacotherapy is underutilized in this Medicaid claims data set. Certain externalizing factors were associated with males with TUD more than females.

**KEYWORDS:** tobacco use disorder, tobacco use cessation, medicaid, adolescent behavior

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**IMPLICATIONS AND CONTRIBUTION:** Tobacco product use is a problem in the adolescent age group. Pharmacologic therapy is indicated for some adolescents with heavy use. This study delineates prescribing habits towards Medicaid recipients with tobacco use disorder in a large, Midwestern city and describes associated externalizing disorders.

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MeSH terms: Tobacco Use Disorder, Tobacco Use Cessation, Medicaid, Adolescent Behavior Close to a quarter of high school students use 1 or more tobacco products.<sup>1</sup> Among adolescents with Tobacco Use Disorder (TUD), rates of tobacco cessation are low even with treatment, ranging from <5%-7.3% at 12 month follow-up.<sup>2,3</sup> Even small amounts of tobacco use early in life are predictive of continued use.<sup>3-5</sup> Studies show that quitting prior to age 30 reduces the chances of long-term morbidity.<sup>6</sup> Moreover, evidence indicates nearly half of youth who use e-cigarettes are seriously interested in quitting.<sup>7</sup> Development of TUD in adolescents can make quitting later in life more difficult, leading to comorbid conditions. TUD is associated with

many mental health conditions, including depression, anxiety, and ADHD and can worsen mental health outcomes.<sup>1</sup> Adequate treatment, including medications for TUD such as nicotine replacement products (NRT) and bupropion, saves both healthy people-years and money.<sup>8</sup> For the purposes of this study, we focused on Medicaid members as they have higher rates of TUD than their privately insured counterparts.<sup>8</sup> Medicaid is a state-funded insurance plan for children of parents within a predetermined tax bracket. The purpose of this brief report is to assess clinician prescribing habits of medications for TUD and delineate TUD-associated comorbid mental health diagnoses among Medicaid enrolled youth, since this is a highly vulnerable group.



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## Methods

### Population and Setting

Medicaid claims for youth aged 10-18 from 2007-2017 processed in a large, Midwestern city were analyzed.

### Data Collection

Relevant mental health and substance use disorders were categorized (ie tobacco/nicotine use, mood, ADHD, cannabis use, conduct, and psychosis disorders) and extracted from the claims using ICD9/10 codes. Demographic data were also included (age, race, gender, and claim year).

### Analysis

Claims coded for tobacco or nicotine use disorder were analyzed to identify cases where medications for TUD were used, as indicated by national drug code (NDC) numbers assigned to NRT and bupropion. Bupropion was counted as treatment for TUD if an ICD10 code for tobacco use was also used in the same encounter and if the XR form was prescribed, as this is the form that is FDA approved for use in adults with TUD. Frequencies were computed for age, race, gender, and claim year, and bivariate analyses (Chi-square and t-tests) were performed in regard to TUD, mental health conditions, and gender. Analysis was performed via SAS version 9.4 to determine these associations. P values were considered significant at less than 0.05. The study was approved by the Indiana University Review Board (IRB number 1605042518).

## Results

Medicaid claims for 6541 patients representing 42 890 visits were gathered. Of the total sample, 59% were white and 40% were African American. Overall mean age was 16.4 years with 40% female. We found 1232 (18.8%) had a diagnosis of TUD, which corresponded to 1848 visits. Among those with TUD, mean age was 17.2 years with 78% white, 21% African American and 60% female. A total of 808 scripts for TUD medications were provided to 152 (12%) of the 1232 youths; 5% of scripts were for a nicotine replacement product, and 95% were for bupropion (see Table 1 for further details). There was no significant difference between scripts provided to male and female patients. Of those prescribed medication, the mean number of total scripts over the course of their treatment was 3. A comorbid diagnosis of ADHD was more common in males (3.9% vs 1.3% in females,  $P < 0.05$ ). Cannabis use and conduct disorder also had higher rate in males compared to females (3.4% vs 0.8% and 2.8% vs 0.8%,  $P < 0.05$ ). There was no significant difference in mood disorders or psychosis between males and females with TUD (see Table 2). The rate of tobacco or nicotine use disorder diagnosis rose yearly to a peak in 2012 and then fell dramatically towards 2016. Data for 2017 was only reported for half of the year and was not included in the yearly rate diagnosis calculation.

## Discussion

The use of pharmacotherapy in adolescents with TUD has been a subject of interest for years, but results have been mixed regarding efficacy.<sup>4,9,10</sup> A review of early studies assessing bupropion and NRT showed some short-term promise with little long-term cessation, with side effects noted to be similar to adult

**Table 1.** Patient demographics and treatment.

|                                      | OVERALL POPULATION<br>(N = 6541) | TOBACCO USE<br>DISORDER (N = 1232,<br>18.8% ) | TOBACCO USE<br>DISORDER<br>(N = 1232) | PROVIDED<br>SCRIPT (N = 152,<br>12.3% ) |
|--------------------------------------|----------------------------------|-----------------------------------------------|---------------------------------------|-----------------------------------------|
| Age at first appointment (mean, std) | 16.4 (1.6)                       | 17.2 (1.6)                                    |                                       | 16.2 (1.8)                              |
| Gender (n, %)                        |                                  |                                               |                                       |                                         |
| Female                               | 2596 (39.7%)                     | 743/2596 (28.6%)                              | 743 (60.3% <sup>b</sup> )             | 85/743 (11.4%)                          |
| Male                                 | 3945 (60.3%)                     | 489/3945 (12.4%)                              | 489 (39.7% <sup>b</sup> )             | 67/489 (13.7%)                          |
| Race (n, %)                          |                                  |                                               |                                       |                                         |
| Asian                                | 30 (.5%)                         | 5/30 (17.0%)                                  | 5 (.4% <sup>b</sup> )                 | 1 (20.0%)                               |
| African American                     | 2589 (39.6%)                     | 254/2589 (9.8%)                               | 254 (20.6% <sup>b</sup> )             | 26 (10.2%)                              |
| Other                                | 74 (1.1%)                        | 11/74 (14.9%)                                 | 11 (.9% <sup>b</sup> )                | 2 (18.2%)                               |
| White                                | 3847 (58.8%)                     | 962/3874 (25.0%)                              | 962 (78.1% <sup>b</sup> )             | 123 (12.8%)                             |
| Ethnicity (n, %)                     |                                  |                                               |                                       |                                         |
| Hispanic                             | 349 (5.3%)                       | 19/349 (5.4%)                                 | 19 (1.5% <sup>b</sup> )               | 1 (5.2%)                                |
| Non-hispanic                         | 6191 (94.7%)                     | 1213/6191 (19.6%)                             | 1213 (98.5% <sup>b</sup> )            | 151 (12.4%)                             |

<sup>a</sup>% of total number of patients.

<sup>b</sup>% of patients diagnosed with nicotine use disorder.

**Table 2.** Summary of comorbid diagnoses by gender.<sup>a</sup>

| DIAGNOSIS          | TOBACCO USE<br>DISORDER<br>(N = 1232) | FEMALE<br>(N = 743) | MALE<br>(N = 489) | P-VALUE <sup>b</sup> |
|--------------------|---------------------------------------|---------------------|-------------------|----------------------|
| Mood disorder      | 124 (10.1%)                           | 69 (5.6%)           | 55 (4.5%)         | .26                  |
| ADHD               | 64 (5.2%)                             | 16 (1.3%)           | 48 (3.9%)         | <.0001               |
| Cannabis use       | 52 (4.2%)                             | 10 (.8%)            | 42 (3.4%)         | <.0001               |
| Conduct disorder   | 44 (3.6%)                             | 10 (.8%)            | 34 (2.8%)         | <.0001               |
| Psychosis disorder | 31 (2.5%)                             | 12 (1.0%)           | 19 (1.5%)         | .01                  |

<sup>a</sup>Percentages expressed are percentage of total TUD.<sup>b</sup>Male compared to Female, significant if  $P < .05$ .

patients.<sup>11,12</sup> In adult studies, the use of NRT has been shown to reduce Medicaid spending (as much as 3 dollars saved for every 1 dollar spent).<sup>13,8</sup> The FDA has not approved NRT in youth, though the American Academy of Pediatrics recommends consideration in adolescents with daily nicotine use and moderate to severe TUD.<sup>1,3</sup>

Our study found low rates of pharmacotherapy prescription among adolescents across all genders and races (12%), though this is higher than in previous studies.<sup>8,9,14</sup> Among 1 adult population with TUD enrolled in Medicaid, 10% were prescribed medication,<sup>8</sup> and another regional adolescent Medicaid survey found that 1.3% of adolescents and young adults received medication.<sup>14</sup> Bupropion was prescribed more often than NRT in our sample, though the average total number of scripts for each patient treated with pharmacotherapy was 3, leading to questions about compliance for either therapy. The low rate of NRT prescribing is concerning. As highlighted in the introduction, the population insured by Medicaid is particularly vulnerable to the effects of tobacco use disorder,<sup>8</sup> so it is important that clinicians are sensitive to the issue with close monitoring.

Bupropion can be useful in adolescents with comorbid mental health disorders if there are no contraindications.<sup>1</sup> It is known that TUD is associated with various psychiatric disorders.<sup>15</sup> Boys more than girls in our sample had higher diagnoses of ADHD, cannabis use, and conduct disorder. Previous studies indicate that externalizing problems increase risk of nicotine product use.<sup>16,17</sup> Cannabis use has a known prevalence higher in boys than girls, though this gap has been narrowing in other studies.<sup>18</sup> These findings highlight the importance of routine mental health screenings and referral to mental health services when these youth are identified, and that bupropion may be particularly helpful for adolescents with comorbid disorders.

There are several limitations to this study. It is unknown if counselling was given regarding over-the-counter nicotine replacement products, as this would be difficult to trace in this data set. However, encouragement of over-the-counter NRT is unlikely, as Indiana Medicaid will pay for nicotine replacement products when prescribed. During the period of this study, the rate of combustible nicotine products fell as the use of vapor products

increased in this age group, and this may have affected the prescribing habits of physicians seen in this data set.<sup>19</sup> Unfortunately no data are available regarding the use of vaping vs other tobacco products in this data set. We did find that there were more slightly more males than females within the dataset. This finding was unexpected; however, we do not believe this affected the overall analysis or outcome of the study. A final limitation to the study is that we were unable to determine severity of TUD in the claims, thus some of the adolescents may have not met criteria for moderate or severe use to warrant treatment with medication. According to SAMHSA, over 14% of adolescent tobacco users use at least a pack daily, so it is credible that a higher percentage than that number would meet criteria from our sample.<sup>20</sup>

In conclusion, nicotine replacement products were underutilized in this sample of Medicaid enrolled youth in a large-Midwestern county. Use of bupropion XR was marginally better, although most patients left without any script. Clinicians should be aware of the risk factors associated with nicotine product use and appropriate treatment for these youth to prevent continued tobacco-related harms into adulthood.

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## Author Contributions

All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work. Corey McBrayer drafted the paper and guided analysis. Fangqian Ouyang contributed her expertise in statistical analysis and reviewed the methods and results sections of the manuscript. Zachary Adams edited the paper and aided in clinical implications in the discussion. Leslie Hulvershorn edited the paper and aided in interpretation of results. Matthew C. Aalsma conceived the study, received funding to complete the study, and aided in drafting and edited the paper.

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