



Quest Diagnostics Health Trends™

Prescription Drug Monitoring Report 2016

Prescription Drug Misuse in America
Diagnostic Insights in the Continuing Drug Epidemic Battle



About this report

This fifth Prescription Drug Monitoring Report from Quest Diagnostics® Health Trends™, the medical informatics unit of Quest Diagnostics, examines patterns and trends observed from prescription drug testing data performed by Quest laboratories in 2015. The prescription drug monitoring services of Quest test for commonly prescribed drugs, including opioids and other pain medications, central nervous system depressant medications, and certain illicit drugs, such as marijuana (which is illegal in most states), cocaine, and heroin. Drug test results provide objective information that can assist healthcare providers with assessing the patient's use of prescribed medications, other controlled prescription medications, and illicit drugs.

In this report, Quest medical and scientific experts analyzed a national sample of 3,143,739 de-identified patient test results performed over a recent five-year period, 2011–2015. The study included patient test results by payer type, gender, and a wide age spectrum from 49 states and the District of Columbia. The analysis was of results of patient testing performed by Quest and as ordered by healthcare providers monitoring patient prescription drug use in a range of practice settings. Drug rehabilitation clinics and addiction specialists were excluded from the analysis, given the higher rates of testing and potentially higher rates of inconsistency in populations served in these clinical segments.

New to this year's report is an analysis of 155,646 heroin test results for positivity rates and heroin-benzodiazepine polypharmacy results. We also examine prescription drug misuse in the 39,231 test results of patients who have also been tested for Hepatitis C virus at Quest.

For the purposes of this analysis, a consistent result indicates the patient is taking the prescribed drug as appropriate. An inconsistent result occurs when lab testing provides evidence the patient is taking other drugs either with or without the prescribed drug or is not taking any drugs including the prescribed drug. Inconsistent test results signal potential drug misuse, ranging from dangerous drug combinations to under treatment of pain or other medical conditions.

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Table of Contents

5	Summary
8	Prescription Drug Misuse in the U.S. is Pervasive
12	Drug Groups Associated with Inconsistent Test Results, by Age Ranges
14	Potentially Deadly Combination of Heroin and Benzodiazepine Drug Misuse
16	Association between Hepatitis C Virus and Prescription Drug Misuse
18	Research Methodology
21	Contributors
21	References

“This crisis is taking lives;
it’s destroying families
and shattering communities
all across the country.
That’s the thing about
substance abuse;
it doesn’t discriminate.
It touches everybody.”

President Barack Obama,
announcing a new initiative
to arrest heroin use and
prescription painkiller abuse

October 2015

Summary

2015 marked a turning point in the battle against prescription drug misuse. In October of that year, the Obama Administration announced it was mobilizing an effort with federal, state, local, and private sectors to address the prescription drug abuse and heroin epidemic in the United States. It was also in 2015 that the Centers for Disease Control and Prevention (CDC) issued new draft guidelines intended to address opioid drug abuse.

These two actions reflect a major shift in how policy makers and the medical community view the appropriate medical use of prescription medications, particularly pain-relieving opioids. No longer is the medical goal to alleviate suffering for the many millions of people living with chronic pain considered sufficient basis to prescribe prescription narcotics and other drug therapies without serious consideration of these drugs' potential for unintended harms.

These harms have been significant. The CDC reports, “the prevalence of opioid dependence may be as high as 26% among patients in primary care receiving opioids for chronic non-cancer-related pain.”¹ More people died of drug overdoses in 2014 than in any prior year, and 61% of these deaths involved opioid pain reliever medications, including oxycodone and hydrocodone, along with heroin (whose illicit use has surged in recent years).²

To combat the prescription medication opioid-related death rates, the CDC guidelines, which were finalized in March 2016, provide recommendations for prescribing opioid pain medications for patients 18 years of age and older, with a focus on primary care settings and treatment of chronic pain outside of end-of-life care. Among the key recommendations are that nonpharmacologic therapy and non-opioid pharmacologic therapy are preferred for chronic pain, and clinicians should consider opioid therapy only if expected benefits for both pain and function are anticipated to outweigh risks to the patient. The CDC also recommends that healthcare providers perform drug tests on their patients prior to starting (baseline) and periodically during opioid drug therapy as “urine drug tests can provide information about drug use that is not reported by the patient.”

Key Findings

54%

of patient specimens
indicate prescription
drug misuse

About One in Two Patient Specimens Showed Evidence of Prescription Drug Misuse

A majority of de-identified patient test results from 2011 through 2015 were inconsistent with prescribed medications, suggesting that many patients continued misusing prescription drugs, putting their health at risk. The rate of misuse was about 54% in 2015, a modest increase compared to 53% in 2014 and a significant improvement compared to 63% in 2011. Despite these gains, most patient specimens continue to show signs of misuse according to Quest's testing. Of the inconsistent patient specimens, about 45% showed evidence of using other drugs, suggesting the potential for dangerous drug combinations in a sizeable number of patients.

70%

2011

44%

2015

Rates of Drug Misuse in Children Show Significant Improvement

In 2011, test results from children 10-17 years of age had rates of drug inconsistency of approximately 70%. This rate decreased significantly, dropping to 44% in 2015. The rate of inconsistency for test results of children younger than ten years also decreased, reaching 31% in 2015 compared to 34% in 2014, a relative decrease of 9%. We theorize that these improvements may reflect greater oversight by parents or guardians.

CDC Guidelines Recognize Value of Prescription Drug Screening

In 2016, the CDC issued guidelines that recommend that healthcare providers perform drug tests on their patients prior to starting (baseline) and periodically during opioid drug therapy. Drug test results provide objective information that can assist healthcare providers with assessing the patient's use of prescribed medications, other controlled prescription medications and illicit drugs.

28.6%

of positive heroin tests were also positive for benzodiazepines

In Nearly 30% of Patient Specimens Testing Positive for Heroin, Benzodiazepine Was Also Detected

In adults eighteen years and older, heroin use was detected across all age ranges. Especially concerning was the high frequency of polypharmacy drug misuse. 28.6% of positive heroin test results were also positive for benzodiazepines and in 92.3% of these results, benzodiazepines were not prescribed. Self-administration of heroin and benzodiazepines is a deadly combination of drugs that can result in respiratory depression and death.

HCV

HCV positive patients were more likely to use non-prescribed opiates, fentanyl, or heroin

Patients with Hepatitis C More Frequently Combine Drugs Inappropriately

Intravenous use of opioids and other prescription drugs have been associated with outbreaks of infectious diseases, including HIV and Hepatitis C.³ Quest provides a complete menu of laboratory test services, including screening for Hepatitis C and HIV. New to this year's report is an analysis of inconsistency rates for prescription drugs with positivity rates for HCV.

We also examine prescription drug misuse in the 39,231 specimens of patients who have also been tested for Hepatitis C virus at Quest from 2011 to 2015. Test results of HCV positive patients were positive for additional, non-prescribed drug(s) more frequently than those of HCV negative patients (66.1% vs. 50.9%). Compared to those of HCV positive patients (14.1%), test results of HCV negative patients had a higher rate of no drugs found (27.3%). The HCV positive patients also showed evidence of using non-prescribed opiates, fentanyl, and heroin at a far higher rate than those who tested negative for HCV.

Causes for Inconsistency

Different Drugs Found

Prescribed drug(s) was not detected, but at least one other drug, non-prescribed or illicit, was detected.

Additional Drugs Found

All prescribed drugs were detected, but at least one other drug, non-prescribed or illicit, was also detected.

No Drugs Found

At least one prescribed drug was not detected; non-prescribed or illicit drug(s) were also not detected.

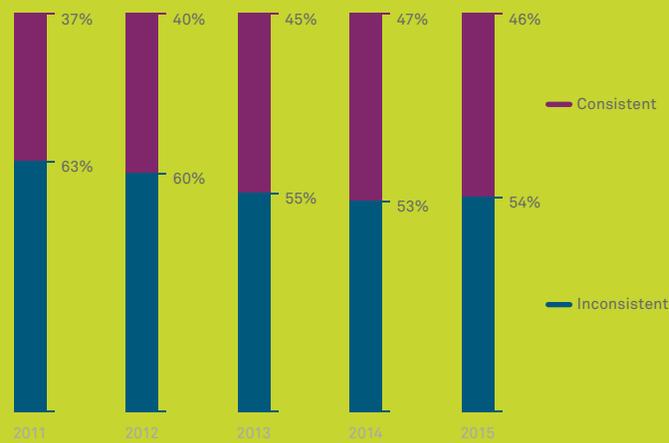
Finding #1

Prescription Drug Misuse in the U.S. is Pervasive

“More than 40 Americans die each day from prescription opioid overdoses. We must act now.”

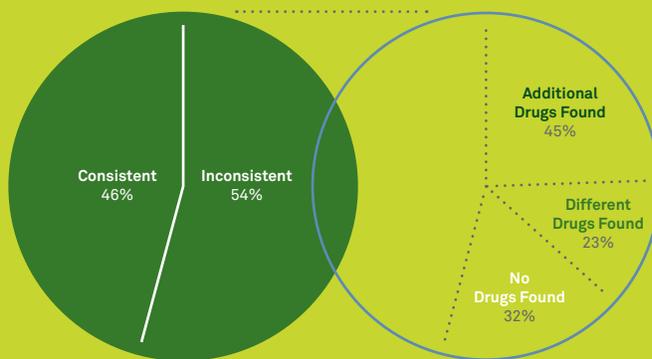
Tom Frieden, MD, MPH
Director, CDC

Fig. 1 Distribution of Patient Test Results, 2011 – 2015



Source Quest Diagnostics, Jan 2011 – Dec 2015

Fig. 2 Distribution of Prescription Drug Monitoring Results, March 2015 – December 2015



Source Quest Diagnostics, Mar 2015 – Dec 2015

A key finding from our earlier reports was the high inconsistency rates observed overall and in every sector of the population. In 2015, we again found the majority of patients' tests (54%) indicated prescription drug misuse, potentially putting their health at risk. By every means of slicing the data — by age, gender, geography, and payer type — patients were at a high risk for misuse.

With the results of 2015, we see a sustained decline in the overall inconsistency rate compared to 2011, although the rate remains high. The overall inconsistency rate decreased from 63% in 2011 to 54% in 2015, a 9% absolute decrease or a 14.3% relative decrease (Fig. 1).

The overall decline since 2011 in prescription drug misuse suggests better provision of information of prescribed drugs (better matching between what we are told and what we detect), less misuse of additional drugs other than those prescribed, better compliance with prescriptions, or a combination of these factors. This likely represents improved education and use of available tools by healthcare providers and patients as awareness of this epidemic increases. Additionally, more states have required continuing medical education in prescription control and have developed programs to combat drug misuse.

The distribution of the three inconsistency categories representing possible misuse or abuse is shown in Figure 2. We also found that the results for inconsistent testing reports have shifted over the five years, particularly in 2015 (Fig. 3).

In particular, among inconsistent patient test results, the percentage that indicated different drugs were found decreased from 28% in 2011 to 23% in 2015, a relative decrease of 18%. We observed an uptick in different drugs found than those that are prescribed in 2015 after a downward trend the previous four years.

Among patient test reports with inconsistent test results, the percentage that indicated the patient tested positive for all prescribed drug(s) and additional drug(s) for which patients were not prescribed, increased from 32% in 2011 to 45% in 2015. For some patients, the inconsistency may have reflected incomplete information provided by the healthcare provider. The increase in inconsistency is worrisome as

Fig. 3 Distribution of Causes of Inconsistency, 2011 – 2015



Source Quest Diagnostics, Jan 2011 – Dec 2015

our data suggest high rates of potentially dangerous drug combinations.

Finally, after four consecutive years of increase, we observed the percentage of inconsistent test results due to no drugs found decreased from 40% in 2011 to 32% in 2015, a 20% relative decrease. Why would a prescribed drug not be detected?

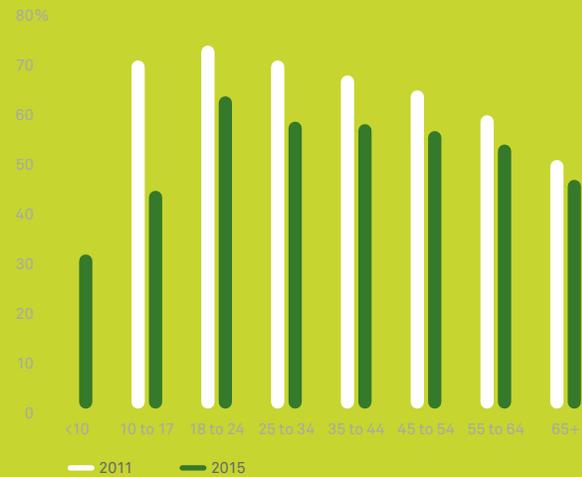
- Patients may not take their prescribed drugs. Patients may cease taking a prescribed drug due to concerns of undesirable side effects or because their pain has subsided.
- A small number of patients may be rapid metabolizers of the prescribed drug and the drug or metabolite is undetectable at the time of testing.
- Others may not take their drugs perhaps due to financial constraints or through diversion or sale of their medication.

Finding #2

High Inconsistency Rates by Age and Gender

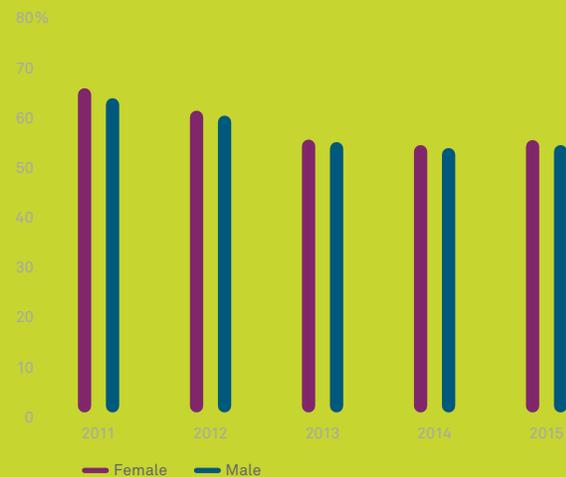
Inconsistency rates for 2015 were greater than 50% for age ranges 18 – 64 years and 46% for patients 65 years and older

Figure 4A Inconsistency Rate by Age Ranges (in Years), 2011 versus 2015



Source Quest Diagnostics, Jan 2011 – Dec 2011; Mar 2015 – Dec 2015

Figure 4B Inconsistency Rates by Gender, 2011 – 2015



Source Quest Diagnostics, Jan 2011 – Dec 2015

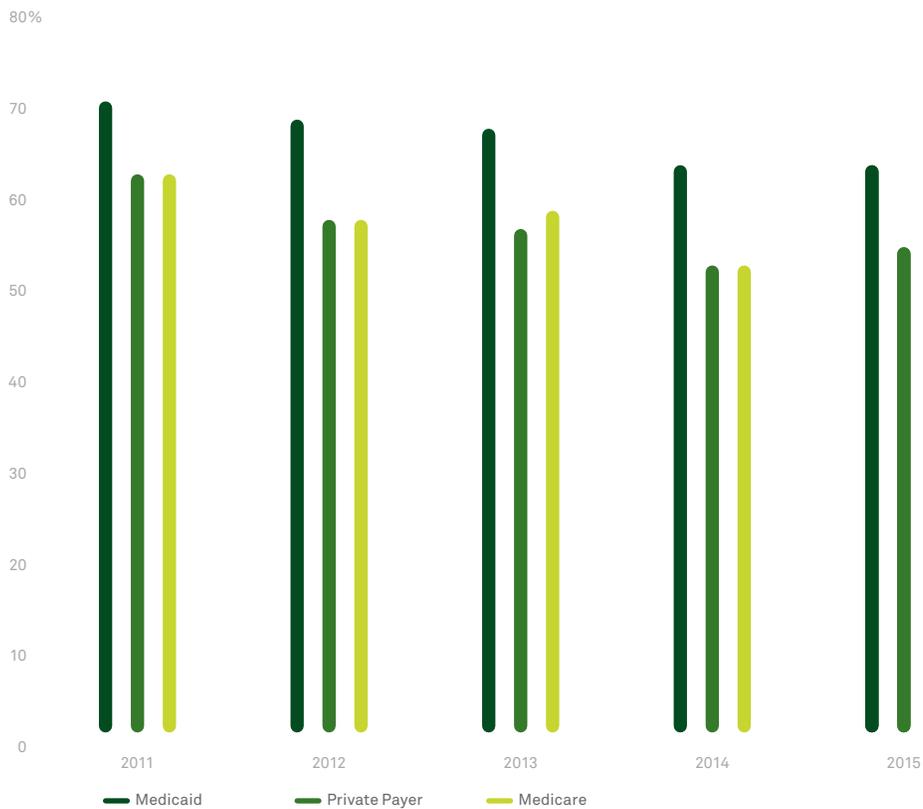
Inconsistency rates for 2015 were greater than 50% for age ranges 18-64 years and 46% for tests of patients 65 years and older. Inconsistency rates improved for all age range groups between 2011 and 2015 (Fig. 4A). The largest improvement was seen in the 10 – 17 years age group, which decreased from 70% to 44%. For tests of children younger than ten years the inconsistency rate decreased from 34% in 2014 to 31% in 2015, a relative decrease of 9%. This lower rate for these young children may be reflective of responsible actions by parents or guardians.

The inconsistency rates decreased for both genders between 2011 and 2015 (Fig. 4B). Female test results had slightly higher (1.0%) inconsistency rates than those of males in 2015.

High Inconsistency Rates Regardless of Payer Type

As we observed in previous reports, test results from patients insured by Medicaid had the highest inconsistency rates of the three major payer groups (Fig. 5). This higher rate may reflect increased testing frequency, patient medical conditions, or the patients themselves. The differences in inconsistent test result rates among patients insured by private payers and Medicare were small. Decreases in the inconsistency rates were observed in each of the three major payer groups from 2011 to 2015, although a slight uptick in the private payer and Medicare groups were observed in 2015.

Figure 5 Inconsistency Rate by Major Payer Type, 2011 – 2015



Source Quest Diagnostics, Jan 2011 – Dec 2015

Finding #2

The Western Regions Have Higher Inconsistency Rates Than Eastern Regions of the United States

There is a broad range in the inconsistency rates across the U.S., as well as a wide variation in the inconsistency rate changes between 2011 and 2015 (Fig. 6). In 2011, all U.S. Health and Human Services (HHS) Regions had inconsistency rates between 54.2% and 66.3%. Between 2011 and 2015, nine of the ten HHS Regions showed a decline in inconsistency rate. In 2015, Region 7 had the lowest inconsistency rate (47.6%) and Region 8, the only Region to exhibit an increase from 2011, had the highest inconsistency rate (65.7%)

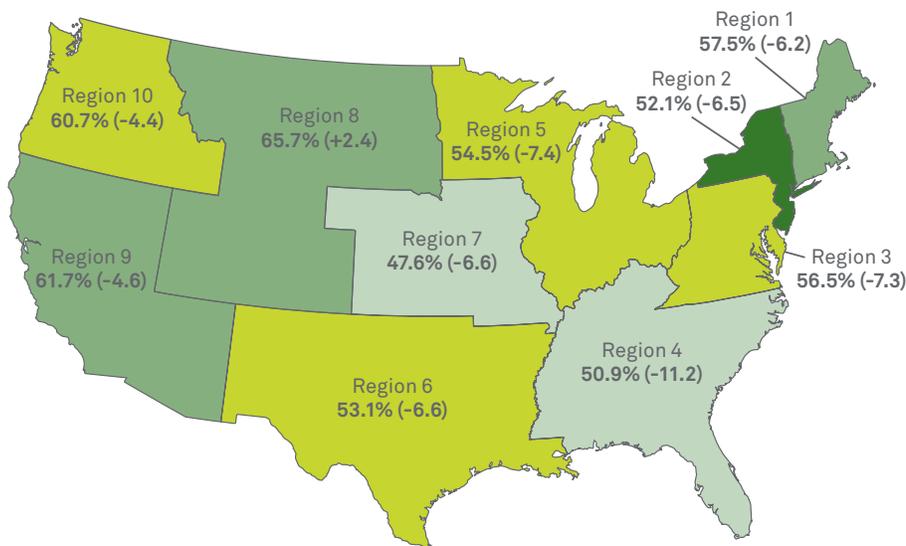
This analysis shows that there are sharp distinctions in the patterns of the inconsistency rates and the changes over time. The differences may relate to variances in efforts to address medication misuse, changes in prescription patterns, changes in test ordering patterns across the HHS Regions, or an artifact of the inclusion criteria (testing performed by Quest).

Drug Groups Associated with Inconsistent Test Results, by Age Ranges

This report examined the drug groups associated with the highest number of inconsistencies from 2011 to 2015. We also looked at these results for various age groups (Table 1).

Among the youngest patients, under ten years of age, amphetamines were associated with the most inconsistent results, followed by methylphenidate and benzodiazepines. Stimulant drugs like amphetamines and methylphenidate are frequently prescribed to treat children with attention-deficit hyperactivity disorder (ADHD). Benzodiazepines are prescribed as anxiolytic and sedative drugs. Opiates are prescribed as pain relievers. Among the next age group, ages 10–17, amphetamines, marijuana, and benzodiazepines were associated with the largest number of inconsistent results. The CDC reports that since 1999 the rate of youth drug abuse has decreased across all measured categories; however, there has been an increase in marijuana use from 2009 to 2013.⁹

Figure 6 Average Inconsistency Rates in 2015 and change from 2011 in HHS Regions in the U.S.



Definition of U.S. Health and Human Services (HHS) Regions

- 1 CT, ME, MA, NH, RI, VT
- 2 NJ, NY
- 3 DE, DC, MD, PA, VA, WV
- 4 AL, FL, GA, KY, MS, NC, SC, TN
- 5 IL, IN, MI, MN, OH, WI
- 6 AR, LA, NM, OK, TX
- 7 IA, KS, MO, NE
- 8 CO, MT, ND, SD, UT, WY
- 9 AZ, CA, HI, NV
- 10 AK, ID, OR, WA

In 2014, an estimated 27 million Americans aged 12 or older (10.2% of the population) had used an illicit drug or abused a psychotherapeutic medication (such as a pain reliever, stimulant, or tranquilizer) in the past month.¹⁰ In our study, in ages 25 years and above, benzodiazepines had the highest number of inconsistent test results. In patients aged 18 years and older, opiates were the second most inconsistent drug class. These results

highlight a troubling pattern of opioid misuse nationally, with more than 2 million people estimated to have a substance use disorder related to prescription opioid pain relievers.¹¹ The misuse of opioids is especially troubling due to risk of harm or potentially fatal overdose that is associated with concurrent use of benzodiazepine drugs and other central nervous system depressants.

Table 1 Most Common Drug Groups Associated with Inconsistent Test Results, by Age Ranges, 2015

Top Inconsistent Drug Classes				
Age Group (Years)	Top Drug Class	Second Drug Class	Third Drug Class	Fourth Drug Class
<10	Amphetamines	Methylphenidate	Benzodiazepines	Opiates
10 to 17	Amphetamines	Marijuana Metabolite	Benzodiazepines	Methylphenidate
18 to 24	Marijuana Metabolite	Opiates	Benzodiazepines	Amphetamines
25 to 34	Benzodiazepines	Opiates	Marijuana Metabolite	Oxycodone
35 to 44	Benzodiazepines	Opiates	Marijuana Metabolite	Oxycodone
45 to 54	Benzodiazepines	Opiates	Marijuana Metabolite	Oxycodone
55 to 64	Benzodiazepines	Opiates	Oxycodone	Marijuana Metabolite
>64	Benzodiazepines	Opiates	Oxycodone	Marijuana Metabolite

Source Quest Diagnostics, Mar 2015 – Dec 2015

Finding #3

Potentially Deadly Combination of Heroin and Benzodiazepine Drug Misuse

Among test results from adults 18 to 65+ years of age that were positive for heroin, 28.6% (690) were also positive for benzodiazepines. Even more alarming was that among these combined heroin and benzodiazepine positive results, 92.3% (637) of the benzodiazepines were non-prescribed ...

“This polypharmacy study data illustrates patients’ risky and dangerous drug abuse behaviors ...”

F Leland McClure, MSci, PhD, F-ABFT
Medical Science Liaison director, Office of Medical Affairs

This report examined heroin positivity rates among various age groups and gender. Because the sedative effects of combined use of benzodiazepines and heroin are especially dangerous, we also looked at concurrent use of heroin and benzodiazepines and whether the benzodiazepines were prescribed or not.

In our study, 1.56% (2,427) of the total number of heroin tests (155,646) were positive. Despite males being tested less frequently than females (65,687 vs. 88,305), more test results from males were positive for heroin (1,293) than those from females (1,110) and at a more than 50% higher rate (1.97% vs. 1.26%). A striking observation was that heroin use was detected across all age ranges from 18 to 65+ (Table 2).

Among test results from adults 18 to 65+ years of age that were positive for heroin, 28.6% (690) were also positive for benzodiazepines. Even more alarming was that among these combined heroin and benzodiazepine positive results, 92.3% (637) of the benzodiazepines were non-prescribed. Non-prescribed use may reflect diversion from legitimate medical use. This polypharmacy study data illustrates patients' risky and dangerous drug abuse behaviors that may be harmful or lead to death. The CDC Opioid-Prescribing guidelines state that "clinicians should avoid prescribing opioid pain medication and benzodiazepines concurrently whenever possible."⁵ Physicians and other health professionals need to consider these patterns of diversion and drug abuse when prescribing and monitoring both prescription and illicit drugs.

Table 2 Positive Heroin Tests and Non-prescribed Benzodiazepines by Age Group, 2015

Age Group (Years)	Positive Heroin Test	Heroin Test	% of Those Tested	Positive Heroin Test with Benzodiazepines not prescribed	
				N	% of Positive Heroin Test
18 to 24	207	6,390	3.24%	47	22.71%
25 to 34	966	26,866	3.60%	268	27.74%
35 to 44	608	29,938	2.03%	161	26.48%
45 to 54	411	37,182	1.11%	93	22.63%
55 to 64	193	33,417	0.58%	51	26.42%
>64	31	18,745	0.17%	17	54.84%

Source Quest Diagnostics, Mar 2015 – Dec 2015

Finding #4

Association Between Hepatitis C Virus and Prescription Drug Misuse

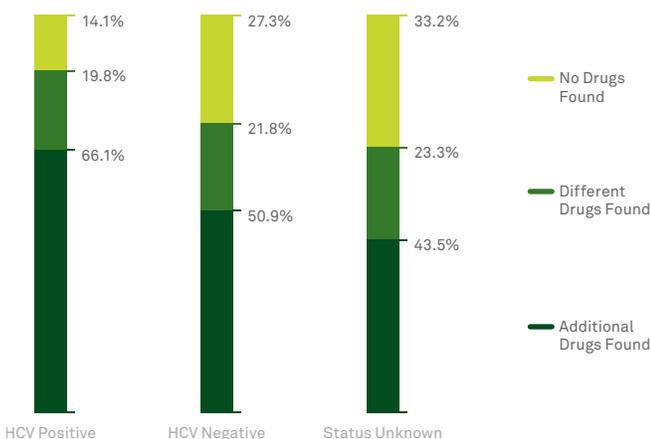
“Illicit injection drug use and Hepatitis C virus infection go hand-in-hand. Every patient who illicitly uses injection drugs is at risk for Hepatitis C virus and other infections.”

Harvey W. Kaufman, MD, MBA, FCAP
Senior Medical Director, Office of Medical Affairs

Hepatitis C virus (HCV) infection is the most common blood-borne infection in the U.S. with approximately 3 million people currently infected. Injection drug use is the primary risk factor for infection. Various reports have shown the rising epidemic of both injection opioid drug misuse and HCV infection.^{12,13} The CDC and HHS have provided guidance on dealing with infections associated with people who use illicit drugs.¹⁴

In this report, we looked at 39,231 test results from patients who had prescription drug monitoring testing (Mar – Dec 2015) and HCV testing (2011 – 2015). We found similar drug test inconsistency rates for the 12,631 from those who tested positive (58.7%) and the 26,600 from those who tested negative (56.7%). Both of these groups exhibited higher drug test inconsistency rates than the 248,593 results from patients who were not tested for HCV at Quest (54%). We refer to the last group as “status unknown” because we are unable to determine if people in this group had been previously tested or tested elsewhere for HCV.

Figure 7 Distribution of Causes of Inconsistency by HCV Status, 2015



Source Quest Diagnostics, Mar 2015 – Dec 2015

The type of drug test inconsistency varied greatly among those patients who were HCV positive, HCV negative, and the status unknown groups (Fig. 7). Test results from HCV positive patients were positive for additional, non-prescribed drug(s) more frequently than those from HCV negative patients (66.1% vs. 50.9%). Compared to

those of HCV positive patients (14.1%), test results of HCV negative patients had a higher rate of no drugs found (27.3%). This data suggests that the behaviors associated with injection drug use, as reflected in HCV positivity, play out with varying patterns of drug misuse. However, the HCV negative group was more likely than the status unknown group to have additional drugs found (50.9% vs. 43.5%) and less likely to have no drugs found (27.3% vs. 33.2%). The differences between the HCV negative group and the status unknown group may indicate a selection bias in those being tested for HCV. Healthcare providers may be more likely to screen for HCV in endemic areas and to test those patients most likely to have used injection drugs. Likewise, educated patients who are aware of their risk for HCV infection may be more likely to request testing from their physicians.

Although benzodiazepines accounted for the most inconsistencies in both the HCV positive and HCV negative test result groups, the groups showed similar rates of misuse (26.6% vs. 25.3%, respectively). As expected, the most dramatic differences existed in opioids, exemplified when broken down by the type of inconsistency. Test results from the HCV positive group were positive for non-prescribed opiates (including codeine, hydrocodone, hydromorphone, and morphine) significantly more often than those from the HCV negative group (17.8% vs. 11.0%, respectively). Results from the HCV positive group were also significantly more likely than those from the HCV negative group to be positive for non-prescribed fentanyl (10.0% vs. 5.5%) and heroin (8.0% vs. 4.1%). Testing positive for non-prescribed oxycodone was similar between the two groups (3.3% vs. 3.6%). Results from the HCV positive group were also significantly less likely than those from the HCV negative group to have prescribed opiates (8.0% vs. 12.4%, respectively) and oxycodone (4.6% vs. 6.7%) that were not found.

Physicians and other healthcare professionals need to consider these patterns when prescribing and monitoring prescription and illicit drug use. Physicians also must remain vigilant in evaluating patients for HCV and other infections that are associated with injection drug misuse.

Appendix

Research Methodology

Study Objectives

The objectives of our study were to assess and identify the scope of prescription drug misuse in America, and identify patterns of misuse over time in a large nationwide population.

We assessed:

Inconsistency rate by age, drug group, gender, by health plan payer group (Medicaid, Private Payer, and Medicare), and by geography (HHS Regions).

The patterns of misuse, including:

- The use of different drug groups (illicit or controlled) other than those prescribed (i.e., different drug groups found)
- The use of additional, non-prescribed (illicit or controlled) medications (i.e., additional drug groups found)
- The failure to use or detect prescribed drugs (i.e., no drugs found)
- The positivity rates of heroin drug testing by age and gender
- The positivity rates of heroin and benzodiazepine polypharmacy use
- The scope and pattern of prescription drug misuse as it relates to Hepatitis C virus status.

Testing Methodology

The objectives of this study were to assess the scope and demographic drivers of prescription drug misuse in America. As with our earlier reports, from 2012 to 2015, we looked at the association of age, gender, payer type, and geography on inconsistent rates. All patients were tested using our proprietary prescription drug monitoring service and medMATCH® reporting methodology for tests of commonly prescribed and abused drugs, including pain medications, central nervous system medications, and amphetamines, as well as certain illicit drugs such as marijuana, and cocaine. Effective February 2015, the number of drug analytes changed from 26 to 44 by including individually-orderable drug classes in addition to profile drug classes. For 2015 studies, we report the results based on March through December 2015 data. Our medMATCH® service reports if prescribed drug(s), drug metabolite(s), and other drugs are in a specimen, as indicated by the ordering healthcare provider. Urine specimen analysis includes presumptive immunoassay screens as well as definitive mass spectrometry quantitative analyses and confirmations of presumptive positive results. Mass spectrometry is the most sensitive and specific drug testing method. The mass spectrometry definitive methods of analysis included liquid chromatography-tandem mass spectrometry (LC-MS/MS) performed in our clinical laboratories.

Hepatitis C virus results were determined by analyzing patient serum using a commercial two-stage immunometric methodology. This immunoassay method is a highly sensitive measure that detects anti-HCV IgG antibody that is reactive to three recombinant Hepatitis C virus encoded antigens (c22-3, c200, and NS5). Results are reported as Non-reactive (Negative) or Reactive (Positive) (Ortho Clinical Diagnostics, Raritan, NJ).

Quest Diagnostics Health Trends studies are performed in compliance with applicable privacy regulations, the company's strict privacy policies, and are deemed exempt by the Western Institutional Review Board.

CDC Guideline for Prescribing Opioids for Chronic Pain, United States

The 2016 CDC guideline provides recommendations for primary care healthcare providers to manage patients 18 years and older with chronic pain. The guidelines exclude chronic pain associated with cancer, palliative care, and end of life care.

Chronic pain is defined as lasting longer than three months or past the time of normal tissue healing. Guidelines recommendations include:

- Use non-opioid therapies when possible
- Start low and go slow when opioid pharmacotherapy is indicated
- Follow up and regularly monitor patients for harms that outweigh benefits

Guideline-related publications which may be useful follow. For complete information, please refer to the CDC MMWR Guideline.

JAMA publication of CDC Guideline

<http://jama.jamanetwork.com/article.aspx?articleid=2503508>

CDC MMWR Guideline

<http://www.cdc.gov/mmwr/volumes/65/rr/rr6501e1.htm>

CDC Fact sheet*

http://www.cdc.gov/drugoverdose/pdf/guidelines_factsheet-providers-a.pdf

CDC Checklist*

http://www.cdc.gov/drugoverdose/pdf/pdo_checklist-a.pdf

*Printed versions of these documents are included at the end of this report.

Strengths and Limitations

Our study's strengths include its size, geographic scope, multiple years of test results, and its use of validated testing by the highly reliable mass spectrometry method. Its limitations include the geographic disparities (nearly 78% of testing came from 12 states) and the inability to validate or contextualize test results with medical records. Like any laboratory test, a clinical determination of drug misuse requires consideration of several factors, including test results, patient history, and symptoms, made in the context of a complete medical assessment.

Laboratory testing does not identify addiction or impairment due to drug use. Patient variations, including hydration state, time since last drug use, and genetic differences in drug metabolism, as well as methodology limitations, can contribute to a failure to detect drugs in a small minority of specimens.

Moreover, it is possible that in some cases, patients in our study were referred to testing because their healthcare providers suspected a high probability of misuse, while the index of suspicion was lower for others who were not tested. In addition, some physicians may have neglected to indicate all prescribed drugs a patient was taking when submitting the test request. These dynamics may have changed over time.

Our analysis assessed patterns of prescription drug misuse for the population served by physicians ordering testing from Quest. Quest provides testing services to approximately half of all physicians and hospitals in the United States. Quest does not serve all healthcare providers and these insights may not accurately be reflective of the entire population. Again, dynamics in our client base may have changed over time and inclusion criteria (testing performed by Quest) may have affected our observations.

Quest Diagnostics Health Trends Reports

As the leading diagnostic information services provider, Quest is well positioned to identify trends in prescription drug monitoring and misuse. Our comprehensive prescription drug testing services build on our long-standing leadership in workplace drug testing for employers. For information about the use of drugs by American workers, refer to Quest Diagnostics Drug Testing Index™ reports at QuestDiagnostics.com/DTI.

Quest maintains the largest private clinical laboratory database in the United States. Consisting of nearly 20 billion data points from de-identified patient testing since 2000, the database provides laboratory information on the vast majority of conditions and

diseases affecting Americans. Quest Diagnostics Health Trends reports are designed to identify and track disease and wellness benchmarks to inform patients, healthcare professionals, and policymakers about the current status of the nation's health. Quest Diagnostics Health Trends reports include Allergies Across America™, the largest study ever conducted on allergy and asthma testing in the United States (2011), as well as peer-reviewed and publicly available reports on hypothyroidism in pregnancy, gestational diabetes, cardiovascular disease (247 million LDL cholesterol results over 11 years), chronic kidney disease, H1N1 influenza and rotavirus. For more information, visit: QuestDiagnostics.com/HealthTrends.

Contributors

This report was developed by a team of Quest Diagnostics medical, technical, and informatics experts including Leland McClure, PhD, Justin Niles, and Harvey W. Kaufman, MD

We also wish to acknowledge the contributions of Nancy Lavon and support from Kathleen Valentine and Jeffrey A. Gudin, MD

For more information on our prescription drug monitoring services, visit:

QuestDiagnostics.com/PDM

For other Quest Diagnostics Health Trends reports, visit:

QuestDiagnostics.com/HealthTrends

Quest Diagnostics (NYSE:DGX) is the leading provider of diagnostic information services that patients and healthcare professionals need to make better healthcare decisions.

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