Prescription Drug Misuse in America
Diagnostic Insights into Managing the Drug Epidemic
# Table of Contents

Summary ........................................................................................................... 2  

Prescription Drug Misuse in the U.S. is Widespread ........................................... 4  

Co-testing for Two Heroin Metabolites, including Morphine, for the Identification of Recent Heroin Use ......................................................... 10  

Specimen Validity Testing to Increase Reliability of Drug Testing .................. 11  

Research Methodology .................................................................................... 13  

Contributors .................................................................................................... 15  

References ....................................................................................................... 15
Summary

The abuse of prescription painkillers and narcotics has grown into a bonafide public health crisis, affecting virtually every state, city and small town in the United States.\(^1\) Nearly half of the roughly 40,000 drug overdose deaths in 2010 involved pain medications, such as hydrocodone and oxycodone.\(^2\) Approximately 2.1 million people are dependent upon or abusing opioid pain medications.\(^3\) Even older Americans are at risk, with one in four adults 50 years of age and over using psychoactive medications—mostly opioids and benzodiazepines.\(^4\)

We at Quest Diagnostics have learned through our conversations with healthcare providers that patients often fail to report their non-medical uses of drugs or of non-compliance with prescriptions to their physicians. Prescription drug misuse falls into every age range, among both men and women, and across socioeconomic strata. Because misuse is difficult to predict or detect, many healthcare providers are hesitant to prescribe pain medications even when indicated.

Quest Diagnostics Health Trends is a series of reports produced by Quest Diagnostics based on our database of de-identified laboratory testing data across the U.S. In 2012, we issued our first Quest Diagnostics Health Trends Report on prescription drug misuse, “Prescription Drug Misuse in America: Laboratory Insights into the New Drug Epidemic”\(^5\) and in 2013 we issued “Prescription Drug Misuse in America: A Report on Marijuana and Prescription Drugs.”\(^6\) The current report is based on patients tested using the Quest Diagnostics prescription drug monitoring service. This service tests for commonly prescribed drugs, including pain medications, central nervous system medications, and certain illicit drugs such as marijuana, cocaine, and heroin.

Our 2014 report builds on our prior research and confirms the high rates of inconsistent test results among those prescribed pain medications and it spans all ages and both genders. This report also provides additional insights into the value of co-testing for heroin metabolites, 6-monoacetylmorphine and morphine, and the importance of specimen validity testing. Together, these reports reflect analysis of 1,409,037 patient test results for the years 2011-2013. Urine specimens are screened by immunoassay-based methods and all positive results are confirmed by mass spectrometry, the most sensitive and specific drug testing method. The company’s Quest Diagnostics Health Trends studies are performed in compliance with applicable privacy regulations, the company’s strict privacy policies, and as approved by the Western Institutional Review Board.
Key Findings

Prescription Drug Misuse in the U.S. is Widespread Regardless of Age, Gender, Geographic Region, and Payer Type

A majority (55–63%) of de-identified patient test results between 2011 and 2013 were inconsistent, suggesting that many patients are misusing prescription drugs putting their health at risk. While high, the rate of inconsistency declined from 63% in 2011 to 55% in 2013, suggesting signs of progress in combating prescription drug misuse.

Recent Heroin Use May Not be Detected if Testing were Limited to Morphine

Our results show that 6.6%, or one in every 15 patients, tested positive for heroin metabolite, 6-monoacetylmorphine, but were negative for morphine (another metabolite of heroin). These patients would not have been identified if co-testing for both metabolites had not been conducted.

Specimen Validity Testing is Important for Improving the Reliability of Laboratory Test Results

The present Quest Diagnostics Health Trends Report describes the results from 1,409,037 patient test reports from 2011 to 2013 that included specimen validity testing (SVT) along with drug testing. The number of abnormal (i.e., invalid) SVT patient test reports was 21,907 (1.16%). Although the percentage of abnormal SVT reports was similar among patients with one or more prescribed drugs listed (1.58%) or no drugs listed (1.54%), for patients with no prescribed drugs listed who tested positive for one or more drugs, the abnormal rate was 6.30%—four times higher than other groups.

About This Study

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 and 2013, we looked at the influences of age, gender, and payer type on inconsistency rates. In this report, we also review inconsistency rates by geography. These studies have allowed us to examine temporal trends in prescription medication misuse. We include new analyses demonstrating the value of co-testing for heroin metabolites, 6-monoacetylmorphine and morphine, to detect individuals who test positive for heroin but have no detectable morphine. Additionally, we examined the importance of specimen validity testing when drug testing.

As the world’s leading diagnostic information services provider, Quest Diagnostics 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.

For the current report, Quest Diagnostics medical and scientific experts analyzed a national sample of more than 1.4 million de-identified patient test...
results performed in a recent three-year period, 2011 through 2013. The study included test results of patients of both genders, all adult age groups, and from nearly every state in the U.S. and the District of Columbia. The analysis was of patient test results from Quest Diagnostics testing services ordered by healthcare providers serving patients in a variety of practice settings. For the evaluation of the inconsistency rates, we did not include results of patients tested by drug rehabilitation clinics or addiction specialists, given the higher rates of testing and potentially higher rates of inconsistency in this clinical segment of the population.

Prescription Drug Misuse in the U.S. is Widespread

The most startling findings of our 2011 and 2012 reports were the high inconsistency rates observed overall and in every sector of the population. In 2013 we analyzed 422,005 patient test reports and again found that the majority of patients tested (55%) misused their prescription medications, potentially putting their health at risk. By every means of slicing the data—by age, gender, geography, and payer type—patients were at an alarmingly high risk for misuse.

With the results of the current analysis, we are pleased to see a steady decline in the overall inconsistency rate over time although, it still remains high. The inconsistency rate declined from 2011 to 2013 by every approach used to analyze the data. The overall inconsistency rate decreased from 63% in 2011 to 55% in 2013, an 8% absolute decrease or 13% relative decrease (Figure 1).

The declining trend 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 of and use of available tools by physicians and patients as awareness of this epidemic increases. Additionally, some states have required continuing medical education in prescription drug control or have developed programs to combat drug misuse.
We also found that the cause for inconsistent testing reports has shifted over the three years (Figure 3). We find a downward trend of different drugs found than those that are prescribed and upward trends in having additional drugs and no drugs found. These findings may reflect improved collection of information of drugs prescribed, decreased use of different drugs, or a combination of these factors.

In particular, among patient test reports with inconsistent test results the percentage that indicated different drugs were found than those prescribed decreased from 28% in 2011 to 22% in 2013. On a relative basis this decline represents a more than 20% decrease.
Among patient test reports with inconsistent test results the percentage that indicated the patient tested positive for the drug(s) prescribed and an additional drug(s) for which they were not prescribed increased slightly from 32% in 2011 to 35% in 2013. This is worrisome as it suggests high rates of potentially dangerous drug combinations. For some patients, the inconsistency may have reflected incomplete information provided by the healthcare provider.

Also, the percentage of inconsistent patient test reports that indicated the prescribed drug(s) was undetected increased slightly, from 40% in 2011 to 43% in 2013. Why would a prescribed drug not be detected? Many patients do not take their prescribed drugs. Patients may cease taking a prescription due to a concern of side effects or because their pain had subsided. A small number of patients may be rapid metabolizers of the prescribed drug and the drug or metabolite is undetected at the time of testing. Others may not take their drugs perhaps due to financial constraints or through sale of their medication.

Inconsistency Rates by Age and Gender

Inconsistency rates were greater than 50% for all age groups except patients over 64, which was 44%. Inconsistency rates improved for all age groups between 2011 and 2013. The largest improvement was seen in the 10-17 age group, which decreased from 70% to 57%. The lowest inconsistency rate was 44% and was seen in the 65+ age group (Figure 4).

FIGURE 4.
INCONSISTENCY RATES BY AGE, 2011 VS. 2013

INCONSISTENCY RATES BY GENDER, 2011-2013

Source: Quest Diagnostics, January 2011-December 2013
The inconsistency rates decreased for both genders between 2011 and 2013 (Figure 4). In all three years, women had higher inconsistency rates than that of men. This difference in inconsistency rates between women and men decreased progressively from 2% in 2011, to 1.0% in 2012, and to 0.5% in 2013. It is noteworthy that the rates of annual decline were similar for both men and women.

Inconsistency Rates by Payer Type

As with our prior reports, we observed that test reports of patients insured by Medicaid had the highest inconsistency rate of the three major payer groups (Figure 5). This higher rate among Medicaid insured patients may reflect differences in the quality of care and coordination among healthcare providers, medical conditions being treated, or of the patients themselves. The differences in inconsistency rates among patients insured by private payers and Medicare were small (Figure 5). Although inconsistency rates remained high, decreases were observed in each of the three major payer groups from 2011 to 2013. The decrease was sharpest among patients insured by private payers (10%), moderate for patients insured by Medicare (8%), and modest for patients insured by Medicaid (5%). The causes for these differences in changes in inconsistency rates among the different payer groups may reflect similar factors as discussed above.

FIGURE 5. INCONSISTENCY RATE BY PAYER TYPE, 2011-2013

Source: Quest Diagnostics, January 2011-December 2013
Inconsistency Rates by Geography

We found that there is a broad range in inconsistency rates across the U.S., as well as a wide variation in inconsistency rate changes between 2011 and 2013. In 2011, all Health and Human Services (HHS) regions had inconsistency rates above 54%; HHS regions 9 and 10 had the highest inconsistency rates in 2011, while HHS regions 2 and 7 had the lowest inconsistency rates in both 2011 and 2013 (Figures 6 and 7).

FIGURE 6. AVERAGE INCONSISTENCY RATES IN 2011 IN HHS REGIONS IN THE U.S.

What is a prescription drug monitoring program (PDMP)?

According to the National Alliance for Model State Drug Laws (NAMSDL), a PDMP is a statewide electronic database which collects designated data on substances dispensed in the state. The PDMP is housed by a specified statewide regulatory, administrative or law enforcement agency. The housing agency distributes data from the database to individuals who are authorized under state law to receive the information for purposes of their profession.

www.deadiversion.usdoj.gov/faq/rx_monitor.htm

Definition of Health and Human Services 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

Source: Quest Diagnostics, January 2011-December 2011

FIGURE 7. AVERAGE INCONSISTENCY RATES IN 2013 AND CHANGE FROM 2011 IN HHS REGIONS IN THE U.S.
Changes in Inconsistency Rates in HHS Regions (2011 versus 2013)

Figure 7 shows 2013 inconsistency rates along with the absolute percent changes (2013 rate minus the 2011 rate) for HHS regions. A positive number indicates that the inconsistency rate increased. A negative number indicates that the inconsistency rate decreased. For example, 5% would indicate a decrease from 60% in 2011 to 55% in 2013. HHS region 2 had the largest decrease in inconsistency rate (13.5%), while HHS region 6 had the lowest change in inconsistency rate (-2.6%). The differences in the changes in inconsistency rates across the HHS regions may relate to differences in efforts to address pain medication misuse, changes in prescription patterns, changes in test ordering patterns among the HHS regions in the U.S. or sample size.

Marked Improvements in Five States

Several states showed improvement in inconsistency rates. There are likely different dynamics within each state that drove these observed differences. While most states have implemented a prescription drug monitoring program (PDMP) for practitioners which provides access to prescription databases, other states have supplemented the database with guidance and regulations on use of controlled medications.

Florida, Georgia, Kentucky, New York, and Tennessee all showed marketed improvement in their inconsistency rates, which are highlighted in Figure 8. These five states are highlighted because they are driving change through various approaches, including but not limited to state legislation, practitioner education requirements, public awareness campaigns, and utilization of law enforcement. All of the five states highlighted below have an active PDMP with a state prescription database. In addition, some have taken an integrated approach by combining legislation with adoption of clinical guidelines through their state medical boards to address the problems of prescription drug misuse.

FIGURE 8. FIVE STATES WITH IMPROVEMENTS IN INCONSISTENCY RATES

<table>
<thead>
<tr>
<th>FL</th>
<th>GA</th>
<th>KY</th>
<th>NY</th>
<th>TN</th>
</tr>
</thead>
<tbody>
<tr>
<td>70%</td>
<td>60%</td>
<td>50%</td>
<td>40%</td>
<td>30%</td>
</tr>
<tr>
<td>2011</td>
<td>2012</td>
<td>2013</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Providers have several subjective tools to help monitor patients for prescription drug adherence, including clinical observation and evaluation-requiring patients to sign “treatment consent agreements” that specify rules patients must follow, self-reporting questionnaires, interviewing a patient’s prior and concurrent healthcare providers, and reviewing medical records. Yet, research suggests that some providers do not commonly employ these tools in practice. In addition, some patients may mislead their providers about their drug use. Urine testing provides objective laboratory data to assist with assessing appropriate use of medications.
Co-testing for Two Heroin Metabolites, including Morphine, for the Identification of Recent Heroin Use

Dr. Charles Wright first synthesized heroin in 1874 from morphine, a naturally occurring substance extracted from the seed pod of the Asian opium poppy plant. He was originally searching for non-addictive alternatives to morphine; however, the legacy of his discovery is that heroin has become a highly addictive, dangerous drug worldwide.

In the U.S., the number of heroin users has increased nearly 80% from an estimated 373,000 in 2007 to 669,000 in 2012, according to surveys by the Substance Abuse and Mental Health Services Administration. The National Institute on Drug Abuse (NIDA) reports that approximately 23% of persons that use heroin become dependent on it. Moreover, the NIDA states that “nearly half of young people who inject heroin surveyed in three recent studies reported abusing prescription opioids before starting to use heroin”; and “some individuals reported taking up heroin because it is cheaper and easier to obtain than prescription opioids.”

Quest Diagnostics offers testing for heroin metabolite, 6-monoacetylmorphine, and morphine, another metabolite of heroin. Providers have asked why they should order testing for both metabolites of heroin. Our data shows that among 1,672 urine specimens positive for heroin metabolite and tested for morphine, 93.4% (1,562 patient specimens) also tested positive for morphine. Thus, 6.6% (110 patient specimens) had no morphine detected and would not have been identified of having recent heroin use if co-testing for heroin metabolite and morphine had not been conducted (Figure 9).

This is the first report of a national cohort that shows that nearly one in every 15 people (6.6%) who test positive for heroin metabolite would not be identified as a recent heroin user if testing were limited to morphine. Although it is possible that a portion of these patients had morphine levels just beneath the level of detection, this novel observation strongly supports the testing of heroin metabolite in addition to morphine if the objective is to identify patients who recently used heroin.
Specimen Validity Testing to Increase Reliability of Drug Testing

The basis of interpreting any laboratory test is assurance that the specimen is reflective of the natural state of the person being tested and testing is reliable. Patients who are tested for opioids, and other drugs of potential abuse, are more likely to intentionally alter the specimen, prior to or during collection. Specimens can be diluted by consuming large quantities of liquid prior to testing or adding fluid to the specimen. Adulterants are foreign substances that are added directly to a urine specimen during the collection process to prevent the detection of drug use. Promoted as “cleansing agents,” these substances range from everyday household items to specific chemical additives easily obtained through the internet.

Specimen validity tests determine whether a urine specimen has been diluted, adulterated, or substituted to obtain a negative result. A specimen validity test can compare urine specimen characteristics with acceptable density and composition ranges for human urine, detect many adulterants (e.g., oxidizing compounds), or test for a specific compound (e.g., nitrite, chromium VI) at concentrations indicative of adulteration.

Industry standards for specimen validity testing have been established by the Substance Abuse and Mental Health Services Administration Workplace test program. “Invalid” has a very specific definition. In our clinical testing program, we adopted many features of the federal program and use “abnormal” when we encounter results out of range. Quest Diagnostics provides several tests to establish specimen validity focusing on detecting dilution and addition of adulterants (Table 1).

<table>
<thead>
<tr>
<th>Test</th>
<th>Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Creatinine of &lt;2 mg/dL or Creatinine &gt;2 mg/dL and &lt;20 mg/dL with a specific gravity &lt;1.003</td>
<td>Creatinine and specific gravity are two ways to check for dilution and flushing, which are the most common mechanisms used in an attempt to circumvent drug testing.</td>
</tr>
<tr>
<td>3. pH of &lt;4.5 or &gt;9.0</td>
<td>Tests for the presence of acidic or alkaline adulterants in urine.</td>
</tr>
<tr>
<td>4. Oxidants &gt;200 mcg/mL</td>
<td>Tests for the presence of oxidizing agents such as nitrite, bleach, hydrogen peroxide, and chromate VI equivalents.</td>
</tr>
</tbody>
</table>

As part of our Quest Diagnostics Health Trends analyses, we reviewed 1,409,037 patient test reports from 2011 to 2013 that included specimen validity testing along with drug testing. Overall, 21,907 (1.55%) patient test reports had abnormal specimen validity results (Figure 10). This percentage was relatively constant over the three years. The abnormal rate was similar among patients prescribed one or more drugs (1.58%) and patients not
prescribed drugs and no drugs detected (1.16%). This 1.16% may represent successful attempts to mask inappropriate drug use. Moreover, we observed that among the 47,548 patients with no prescribed drugs listed who tested positive for one or more drugs, the abnormal rate was 6.30%—four times higher than other groups (nearly 3,000 test reports). This 6.30% may represent unsuccessful attempts to mask inappropriate drug use. This suggests that patients with inconsistent test results, based on having no prescribed drugs listed and detection of a non-prescribed drug, are most likely to have a specimen with abnormal specimen validity testing results. Patient awareness of the effectiveness of specimen validity testing may limit attempts to manipulate the specimen.

FIGURE 10. ABNORMAL RATES BASED ON SPECIMEN VALIDITY TESTING, 2011–2013

![Figure 10](source: Quest Diagnostics, January 2011–December 2013)

The observed 1.55% of test reports flagged as abnormal is substantial. Given the importance of drug testing, the role of testing for specimen validity is significant, as this step assures the treating healthcare provider about how to interpret the test results and take appropriate follow-up for patient management.

Finally, we analyzed the causes for abnormal test reports and there was extremely little overlap (Figure 11).

FIGURE 11. DISTRIBUTION OF CAUSES FOR ABNORMAL TEST REPORTS WITH SPECIMEN VALIDITY TESTING, 2011–2013

![Figure 11](source: Quest Diagnostics, January 2011–December 2013)
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 also examined the impact of co-testing for heroin metabolites, 6-monoacetylmorphine and morphine, for the identification of recent heroin users, and pattern of abnormal laboratory test results based on specimen validity testing.

We assessed:

- Inconsistency rate by age, gender, by health plan payer group (Medicaid, Private Payer, and Medicare), and by geography (state and HHS regions).
- The patterns of misuse, including:
  1) The use of different drugs (illegal or controlled) other than those prescribed (i.e., different drugs found)
  2) The use of additional, non-prescribed (illegal or controlled) medications (i.e., additional drugs found), and
  3) The failure to use or detect prescribed drugs (i.e., no drugs found)
- The frequency of morphine negativity among patients who tested positive for heroin metabolite, 6-monoacetylmorphine.
- The scope and pattern of abnormal test reports with specimen validity testing.

Testing Methodology

All patients were tested using our proprietary prescription drug monitoring service and medMATCH® reporting methodology for tests of up to 26 commonly prescribed and abused drugs, including pain medications, central nervous system medications, and amphetamines, as well as certain illicit drugs such as marijuana, cocaine, and heroin. 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. All specimens were screened by immunoassay-based methods and all positive results were confirmed by mass spectrometry, the most sensitive drug testing method. The specific mass spectrometry methods were liquid chromatography-tandem mass spectrometry (LC/MS/MS) and gas chromatography-mass spectrometry (GC-MS), performed in our clinical laboratories. Specimen validity testing included tests for specific gravity, creatinine, pH, and oxidants.

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 80% 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.

The procedures used to de-identify the test results and analyze the data were approved and determined to be exempt by the Western Institutional Review Board.

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 Diagnostics. Quest Diagnostics provides testing services to approximately half of all physicians and hospitals in the United States. Quest Diagnostics 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 affected our observations.

**Quest Diagnostics Health Trends Reports**

Quest Diagnostics maintains the largest private clinical laboratory database in the United States. Consisting of de-identified data on nearly two billion patient encounters 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 Amy J. Blatt, PhD, F. Leland McClure, PhD, and Harvey W. Kaufman, MD.

We also wish to acknowledge the contributions of Nancy Lavon, support of Sukumar Nagendran, MD, and leadership of Laure Park.

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

For other Quest Diagnostics Health Trends reports, visit: QuestDiagnostics.com/HealthTrends

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

References


FIGURE 1. DISTRIBUTION OF PATIENT TEST RESULTS

Source: Quest Diagnostics, January 2011–December 2013
FIGURE 2. DISTRIBUTION OF PRESCRIPTION DRUG MONITORING RESULTS, JANUARY 2013 – DECEMBER 2013

Consistent, 45%

Inconsistent, 55%

Different Drugs Found, 22%

Additional Drugs Found, 35%

No Drugs Found, 43%

Source: Quest Diagnostics, January 2013–December 2013
FIGURE 3. DISTRIBUTION OF CAUSE OF INCONSISTENT PATIENT TEST REPORTS, 2011–2013

Source: Quest Diagnostics, January 2011–December 2013
FIGURE 4.
INCONSISTENCY RATES BY AGE, 2011 VS. 2013

INCONSISTENCY RATES BY GENDER, 2011-2013

Source: Quest Diagnostics, January 2011–December 2013
FIGURE 5. INCONSISTENCY RATE BY PAYER TYPE, 2011-2013

Source: Quest Diagnostics, January 2011-December 2013
FIGURE 6. AVERAGE INCONSISTENCY RATES IN 2011 IN HHS REGIONS IN THE U.S.

Inconsistency Rates
- 45.1% - 52.0%
- 52.1% - 59.0%
- 59.1% - 61.6%

Source: Quest Diagnostics, January 2011–December 2011
FIGURE 7. AVERAGE INCONSISTENCY RATES IN 2013 AND CHANGE FROM 2011 IN HHS REGIONS IN THE U.S.

Source: Quest Diagnostics, January 2013–December 2013
FIGURE 8. FIVE STATES WITH IMPROVEMENTS IN INCONSISTENCY RATES

Source: Quest Diagnostics, January 2011–December 2013
FIGURE 9. DETECTION OF MORPHINE IN PATIENT SPECIMENS POSITIVE FOR HEROIN AND TESTED FOR MORPHINE 2011–2013

Source: Quest Diagnostics, January 2011–December 2013
FIGURE 10. ABNORMAL RATES BASED ON SPECIMEN VALIDITY TESTING, 2011-2013

Source: Quest Diagnostics, January 2011–December 2013
FIGURE 11. DISTRIBUTION OF CAUSES FOR ABNORMAL TEST REPORTS WITH SPECIMEN VALIDITY TESTING, 2011–2013

- 59%: Creatinine >2 mg/dL and <20 mg/dL with a Specific Gravity <1.003
- 22%: pH of <4.5 or >9.0
- 12%: Oxidants >200 mcg/mL
- 7%: Creatinine of <2 mg/dL

Source: Quest Diagnostics, January 2011–December 2013