

## Progress Toward the Elimination of Hepatitis B and Hepatitis C in the Country of Georgia, April 2015–April 2024

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### Abstract

Hepatitis B and hepatitis C are leading causes of cirrhosis and liver cancer and caused 1.3 million deaths worldwide in 2022. Hepatitis B is preventable with vaccination, and hepatitis C is curable with direct-acting antivirals. In 2015, in collaboration with CDC and other partners, Georgia, a country at the intersection of Europe and Asia, launched a hepatitis C elimination program to reduce the prevalence of chronic hepatitis C; at that time, the prevalence was 5.4%, more than five times the global average of 1.0%. In 2016, the World Health Assembly endorsed a goal for the elimination of viral hepatitis as a public health problem by 2030. In 2024, 89% of the Georgian adult population have received screening for hepatitis C, 83% of persons with current chronic HCV infection have received a diagnosis, and 86% of those with diagnosed hepatitis C have started treatment. During 2015–2023, vaccination coverage with the hepatitis B birth dose and with 3 doses of hepatitis B vaccine among infants exceeded 90% for most years. In 2021, the prevalence of hepatitis B surface antigen was 0.03% among children and adolescents aged 5–17 years and 2.7% among adults. Georgia has demonstrated substantial progress toward hepatitis B and hepatitis C elimination. Using lessons from the hepatitis C elimination program, scale-up of screening and treatment for hepatitis B among adults would prevent further viral hepatitis-associated morbidity and mortality in Georgia and would accelerate progress toward hepatitis B and hepatitis C elimination by 2030.

### Introduction

Worldwide, in 2022, an estimated 304 million persons had chronic hepatitis B virus (HBV) or hepatitis C virus (HCV) infection, two leading causes of cirrhosis and liver cancer,

and an estimated 2.2 million new HBV and HCV infections and 1.3 million associated deaths occurred (1). In 2016, the World Health Assembly endorsed the goal of eliminating viral hepatitis as a public health problem by 2030, defined as a 90% reduction in incidence of newly reported chronic infections (95% for hepatitis B and 80% for hepatitis C), and a 65% decrease in mortality compared with 2015 estimates (2). Elimination of HBV and HCV infections are documented at the country level by achievement of impact (disease incidence and mortality) targets and programmatic (infant vaccination coverage, prevention, diagnosis, and treatment) targets (3). Achievement of impact targets is demonstrated by 1) hepatitis B surface antigen (HBsAg)\* seroprevalence of  $\leq 0.1\%$  among children aged  $\leq 5$  years, 2) an annual incidence of new chronic HCV infections of five or fewer per 100,000 persons in the general population and two or fewer per 100 among persons who inject drugs (PWID), and 3) an annual

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hepatitis B and hepatitis C combined mortality of six or fewer per 100,000 persons. Achievement of programmatic targets is demonstrated by 1) timely<sup>†</sup> hepatitis B vaccine (HepB) birth dose (HepB-BD) and 3 infant doses of HepB (HepB3) coverage of ≥90%, 2) receipt of a diagnosis by ≥90% of persons with chronic hepatitis B and hepatitis C, 3) treatment of ≥80% of persons with diagnosed hepatitis B and hepatitis C, 4) 100% safe injections,<sup>§</sup> 5) 100% blood safety,<sup>¶</sup> and 6) distribution of 300 needles and syringes per PWID per year<sup>\*\*</sup> (3).

Georgia, a country in the Caucasus region, had a prevalence of chronic HCV infection of 5.4% in 2015, compared with a global average of 1.0% (4). In April 2015, in collaboration with CDC and other partners, Georgia launched the world's first hepatitis C elimination program. Modeled estimates using prevalence from nationwide serologic surveys conducted in 2015 and 2021 indicate that 130,000 Georgians were estimated to have current chronic HCV infection in 2015,

and 77,000 were estimated to have chronic HBV infection in 2021 (5,6). In April 2024, Georgia's government endorsed a hepatitis B elimination program. This report describes the progress made during April 2015–April 2024 toward achieving hepatitis B and hepatitis C elimination in Georgia.

## Methods

### Data Sources: Impact Indicators

Data on chronic hepatitis B and chronic hepatitis C seroprevalence were compiled from published nationwide serologic surveys (6,7). Incidence of new chronic HCV infections was based on modeled estimates derived from the 2021 nationwide serologic survey findings (5–7).

### Data Sources: Programmatic Indicators

Official country-reported<sup>††</sup> timely HepB-BD and HepB3 vaccination coverage data were compiled. Data from the national hepatitis C screening and treatment registries were used to estimate the number of persons who received testing and treatment for hepatitis C. Population data were obtained from the national statistics office.<sup>§§</sup> Vital statistics registry data were used to estimate combined hepatitis B and hepatitis C mortality. Because no national hepatitis B screening

\* HBsAg seropositivity is an indicator of chronic HBV infection. HBsAg seroprevalence can be measured among children aged 1 year, 5 years, or 1–5 years, according to existing country surveillance and data collection practices. Serosurveys might be conducted in children aged >5 years in regions and countries with a long history of high hepatitis B vaccination coverage and those that already conduct school-based serosurveys. <https://www.who.int/publications/i/item/9789240039360>

† Administration of a dose of hepatitis B vaccine within 24 hours of birth.

§ An alternate measure is ≥90% of syringes procured have an autodisable function.

¶ Donated blood units screened for bloodborne infections using quality-assured procedures.

\*\* An alternate measure in countries with opioid epidemics is opioid agonist treatment coverage among PWID ≥40%.

†† [https://immunizationdata.who.int/global/wiise-detail-page/hepatitis-b-vaccination-coverage?CODE%20=%20GEO&ANTIGEN%20=%20HEPB\\_BD+HEPB3&YEAR%20=](https://immunizationdata.who.int/global/wiise-detail-page/hepatitis-b-vaccination-coverage?CODE%20=%20GEO&ANTIGEN%20=%20HEPB_BD+HEPB3&YEAR%20=)

§§ <https://www.geostat.ge/en/modules/categories/41/population>

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and treatment registry exists, the number of persons screened for hepatitis B was estimated using data from the national hepatitis C screening and treatment registries, because all patients with current chronic HCV infection should be screened for hepatitis B, and from persons screened at harm reduction sites.<sup>¶¶</sup> Data on injection safety, blood safety, and indicators of services provided to PWID (e.g., the number of syringes and needles distributed per PWID and coverage with opioid agonist treatment) were obtained from relevant programs in Georgia.

### Analysis

The percentages of persons in Georgia who received a screening test for hepatitis C were calculated using the numbers from the national hepatitis C screening registry as numerators and national population statistics as denominators. A unique national identification number, common across hepatitis C screening and treatment registries, was used to track the progression of persons with hepatitis C in the care cascade. SAS software (version 9.4; SAS Institute) was used to analyze the hepatitis C care cascade. The number of syringes and needles distributed per PWID each year was calculated by dividing the total number of syringes and needles distributed to harm reduction sites by the total number of PWID registered at harm reduction sites. Coverage with opioid agonist treatment was calculated by dividing the number of PWID who received opioid agonist treatment by the estimated number of PWID in Georgia. This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.<sup>\*\*\*</sup>

## Results

### Impact Indicators for Hepatitis B and Hepatitis C Elimination

The 2021 nationwide serologic survey found HBsAg seroprevalence of 0.03% (95% CI = 0%–0.19%) among children and adolescents aged 5–17 years and 2.7% (95% CI = 2.3%–3.4%) among adults. The same serologic survey reported a chronic hepatitis C prevalence of 1.8% (95% CI = 1.3%–2.4%) among adults, indicating a 67% decrease in prevalence compared with 5.4% in 2015. Modeled estimates based on the 2021 serologic survey results showed a decrease in the estimated annual incidence of new chronic HCV infections from 132 to 52 per 100,000 persons among the general non-PWID population and from 2.51 to 1.14 per 100 PWID during 2015–2022. Using national death registry data, researchers concluded that

combined mortality from hepatitis B and hepatitis C increased from 6.3 per 100,000 persons in 2015 to 7.8 per 100,000 persons in 2023 (Table).

### Programmatic Indicators for Hepatitis B and Hepatitis C Elimination

**Diagnosis and treatment of current chronic HCV infection.** By April 2024, among the 2.8 million adults in Georgia, 2.5 million (89.3%) had been screened for HCV antibody (anti-HCV) (Figure 1). An additional 18,586 persons received a reactive anti-HCV test result using an anonymized code at harm reduction sites or prisons. Among adults screened for anti-HCV during January 2023–April 2024, 80% had been screened previously and consistently received nonreactive test results. Among the 2.5 million adults screened, 164,951 (6.7%) received a reactive anti-HCV test result. Among this group, 138,746 (84.1%) persons received testing for HCV presence (HCV RNA or HCV core antigen), of whom 107,604 (77.6%) had detectable HCV RNA or HCV core antigen, indicating current chronic infection. By April 2024, among 130,000 persons estimated to have current chronic HCV infection in Georgia, 107,604 (82.8%) had received a diagnosis of current chronic HCV infection. Among 101,138 (94.0%) of those 107,604 who were eligible<sup>†††</sup> for treatment, 87,047 (86.1%) initiated treatment, 82,516 (94.8%) of whom completed treatment. Among 61,071 persons who received testing for sustained virologic response (absence of detected HCV RNA  $\geq$  12 weeks after completing treatment), 60,449 (99.0%) were cured of HCV infection (Figure 2). Overall, among 157,674 persons who received a reactive anti-HCV test result and were eligible for further testing, 18,928 (12.0%) did not receive an HCV RNA or HCV core antigen test. Among 101,138 persons who received a positive test result for current chronic HCV infection and were eligible for treatment, 14,091 (13.9%) did not initiate treatment.

**Diagnosis and treatment of chronic HBV infection.** Among 87,047 adults in Georgia treated for hepatitis C, 83,712 (96.2%) also received testing for HBsAg, among whom 1,978 (2.4%) received a positive test result. An additional 34,908 persons received HBsAg testing at harm reduction sites; 688 (2.0%) of these persons received a positive test result. Based on the estimated 77,000 persons in Georgia with chronic HBV infection, at least 2,666 (3.5%) had received a diagnosis by April 2024 (Table). While antiviral treatment (i.e., tenofovir disoproxil fumarate and entecavir) for hepatitis B is available in specialized clinics in Georgia, patients need to pay out of pocket for further assessment of treatment eligibility and to cover treatment costs. No hepatitis B screening and

<sup>¶¶</sup> An approach to policies, programs, or practices that is intended to reduce the negative health and social impacts of substance use.

<sup>\*\*\*</sup> 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d); 5 U.S.C. Sect. 552a; 44 U.S.C. Sect. 3501 et seq.

<sup>†††</sup> Not listed as deceased in any vital records.

**TABLE. Impact and programmatic indicators\* for achievement of hepatitis B and hepatitis C elimination — Georgia, 2024**

Indicator	Measure and target	Most recent data from Georgia
<b>Impact indicators</b>		
Hepatitis B incidence (HBsAg seroprevalence)	≤0.1% (persons aged ≤5 yrs) <sup>†</sup>	0.03% (95% CI = 0–0.19) (persons aged 5–17 yrs) <sup>§</sup>
<b>Hepatitis C incidence</b>		
Annual incidence of new chronic HCV infections per 100,000 general population	≤5	52 <sup>¶</sup>
Annual incidence of new chronic HCV infections per 100 PWID	≤2	1.14 <sup>¶</sup>
Annual crude HBV and HCV mortality (deaths per 100,000 population)	≤6	7.85
<b>Programmatic indicators</b>		
<b>Testing</b>		
Persons with chronic HCV infection who received a diagnosis, %	≥90	82.77
Persons with chronic HBV infection who received a diagnosis, %	≥90	3.46
<b>Treatment</b>		
Persons with diagnosed HCV infection who have initiated treatment, %	≥80	86.06
Persons with diagnosed HBV infection and eligible for treatment who are treated, %	≥80	NA
<b>Prevention</b>		
Timely** HepB-BD coverage, %	≥90	93 <sup>††</sup>
Coverage with HepB3, %	≥90	92 <sup>††</sup>
Safe injections in health care settings, % <sup>§§</sup>	100	100 <sup>¶¶</sup>
Blood units screened for hepatitis B and hepatitis C, %	100	100
No. of syringes and needles distributed per PWID per year or OAT coverage among PWID***	≥300 per PWID per year or OAT coverage ≥40%	131 per PWID per year OAT coverage = 31.93%

**Abbreviations:** HBsAg = hepatitis B surface antigen; HBV = hepatitis B virus; HCV = hepatitis C virus; HepB3 = 3 infant doses of hepatitis B vaccine; HepB-BD = hepatitis B vaccine, birth dose; NA = not available; OAT = opioid agonist treatment; PWID = persons who inject drugs.

\* <https://iris.who.int/bitstream/handle/10665/373186/9789240078635-eng.pdf?sequence=1>

<sup>†</sup> HBsAg seroprevalence can be measured among children aged 1 year, 5 years, or 1–5 years, according to existing country surveillance and data collection practices. For regions and countries with a long history of high hepatitis B vaccination coverage and those that already conduct school-based serosurveys, serosurveys might be conducted in children aged >5 years. <https://www.who.int/publications/i/item/9789240039360>

<sup>§</sup> <https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2023.28.30.2200837>

<sup>¶</sup> <https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2023.28.30.2200952>

\*\* Administration of a dose of hepatitis B vaccine within 24 hours of birth.

<sup>††</sup> [https://immunizationdata.who.int/global/wiise-detail-page/hepatitis-b-vaccination-coverage?CODE=GEO&ANTIGEN=HEPB3+HEPB\\_BD&YEAR=](https://immunizationdata.who.int/global/wiise-detail-page/hepatitis-b-vaccination-coverage?CODE=GEO&ANTIGEN=HEPB3+HEPB_BD&YEAR=)

<sup>§§</sup> An alternate measure is ≥90% of syringes procured with an auto-disable function.

<sup>¶¶</sup> CDC and ICAP Columbia University (<https://icap.columbia.edu>), Situational Analysis of Core Components of Infection Prevention and Control Programs at the Facility Level in Georgia, unpublished data, 2018.

\*\*\* An alternate measure in countries with opioid epidemics is OAT coverage among PWID ≥40%.

treatment registries exist to assess treatment coverage among eligible persons.

**Prevention of hepatitis B and hepatitis C.** Timely HepB-BD coverage remained consistently above 90% during 2015–2023. HepB3 coverage was above 90% for most years during 2015–2023, except during 2020–2022 when it dropped to 85%–88%. A 2018 independent assessment of infection prevention and control in 41 randomly selected hospitals across different regions in Georgia indicates that all facilities had continuous supply of single use and safety-engineered injection devices (CDC and ICAP Columbia University, Situational Analysis of Core Components of Infection Prevention and Control Programs at the Facility Level in Georgia, unpublished data, 2018). Since 2020, all blood units in Georgia have been screened for hepatitis B and hepatitis C by serology, and centralized nucleic acid testing is performed at the national reference laboratory. In addition, in 2022, Georgia adopted a law to strengthen the blood safety system to align with the European Union blood safety directives. In 2023, a total of 5,010,266 needles and syringes were distributed to 38,177 persons registered at harm reduction sites (131 needles and syringes per PWID) compared with a total of 3,611,785 needles and syringes distributed to 25,423 PWID in 2015 (142 needles and syringes per PWID) (Table). Among the estimated 49,700 PWID in Georgia, <sup>§§§</sup> 15,869 (31.9%) received opioid agonist treatment through the national state program in 2023, a 167% increase compared with 5,953 (12%) in 2015.

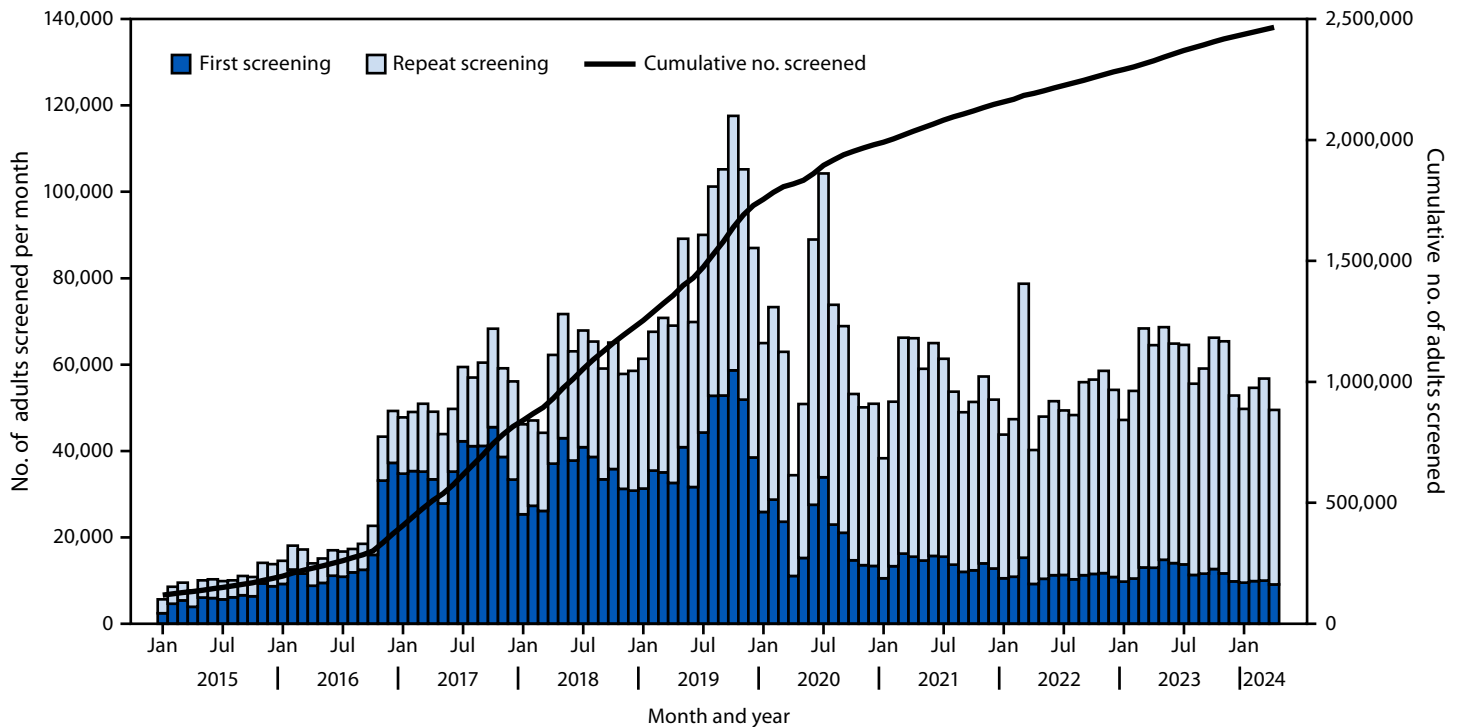
## Discussion

Since launching its hepatitis C elimination program in April 2015, Georgia has made substantial progress in diagnosing and treating persons with HCV infection, improving the safety of the blood supply, and scaling up prevention services, leading to a 61% decrease in the estimated annual incidence of new chronic HCV infections (from 132 to 52 per 100,000 persons) among the general population and a 55% decline among PWID (from 2.51 to 1.14 per 100) (5). In recent years, more than 80% of adults received screening more than once for anti-HCV and received negative test results, suggesting that some persons who have current chronic HCV infection and need treatment might not have been reached yet. Hence, additional screening strategies, such as mobile screening campaigns, are needed to identify the remaining 17% of persons estimated to have current chronic HCV infection who have never received a diagnosis (8). In addition, many persons were lost to follow-up in the care cascade, highlighting the need to collect blood samples needed to test for anti-HCV and HCV RNA or HCV

<sup>§§§</sup> <https://www.inhsu.org/resource/population-size-estimation-of-people-who-inject-drugs-in-georgia/>



FIGURE 1. Monthly number of adults screened for hepatitis C virus antibody, by first and repeat screening status\* — Georgia, January 2015–April 2024



\* First screening was defined by receipt of testing for the first time. Repeat screening was defined by a second or subsequent screening of record.

core antigen during the same visit. This practice will permit automatic HCV RNA or HCV core antigen testing among persons who receive a reactive anti-HCV test result, provision of adequate counseling so that clients can be informed of their test results, and referral of those who have current chronic HCV infection to care and treatment services (9). PWID and incarcerated populations have the highest prevalence of HCV infection in Georgia (4,7) and might be at risk for reinfection if prevention efforts, including increasing the number of needles and syringes distributed per PWID and access to opioid agonist treatment, are not further expanded.

Sustained high hepatitis B infant vaccination coverage for more than a decade has substantially reduced the incidence of HBV infection in children and adolescents. Current data demonstrate that Georgia might have achieved the targets for elimination of mother-to-child transmission of HBV (HBsAg seroprevalence of  $\leq 0.1\%$  among children and  $\geq 90\%$  HepB-BD and HepB3 coverage) (3). However, hepatitis B prevalence in adults remains high (6). To date, care and treatment for hepatitis B is not free, and there is no registry to document the care cascade. However, with the initiation of the hepatitis B elimination program, Georgia intends to provide free screening and treatment to all citizens starting in September 2024,

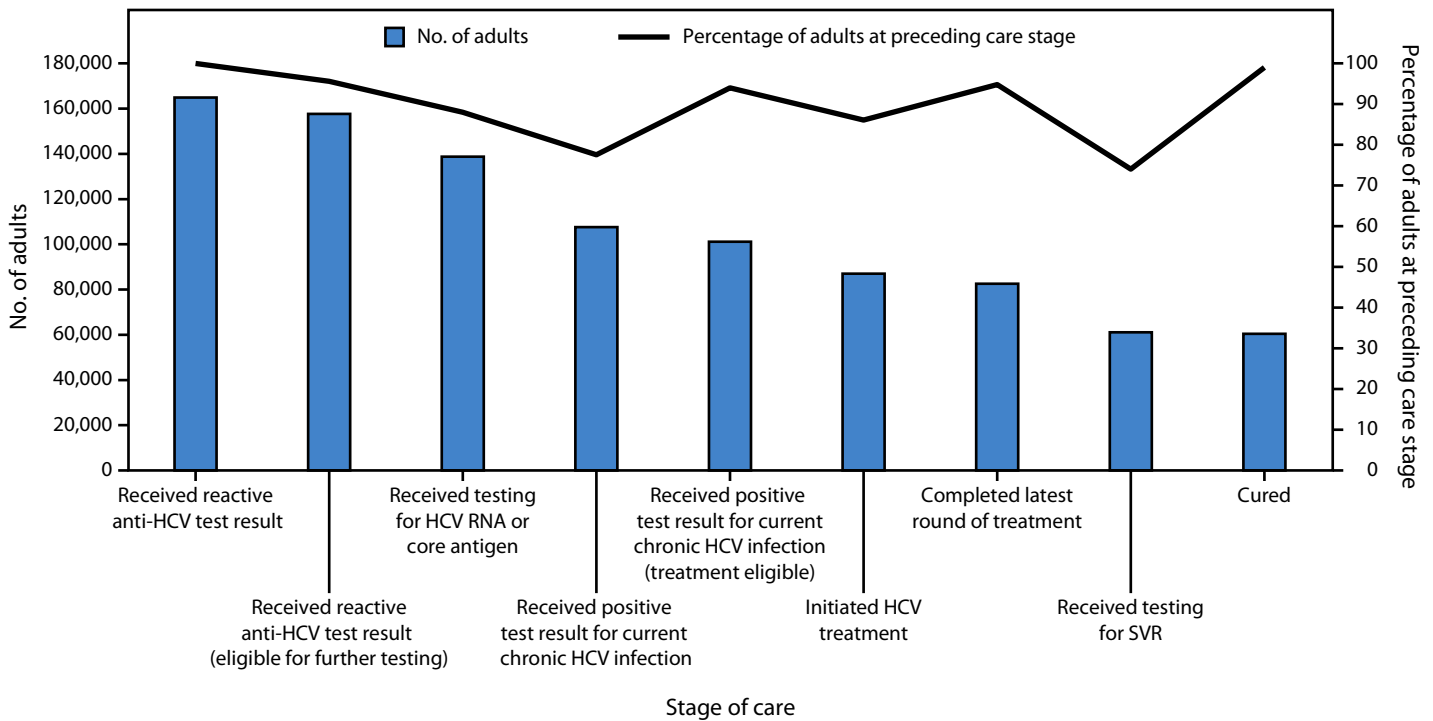
and a national hepatitis B screening and treatment registry is under development.

Reported mortality from viral hepatitis has increased in Georgia; this is the result of improved reporting of causes of deaths in vital statistics registries and increasing hepatitis C screening, which has led to an increase in the number of persons who received a diagnosis of hepatitis C since 2015. However, further improvements in documenting causes of deaths resulting from viral hepatitis are needed to capture the combined mortality from hepatitis B and hepatitis C. This goal be achieved by implementing awareness and screening campaigns for hepatitis B and hepatitis C, and reporting mortality related to hepatitis B and hepatitis C in vital statistics registries.

### Limitations

The findings in this report are subject to at least four limitations. First, the total number of persons screened and linked to care for hepatitis C in the care cascade might be underestimated because data from harm reduction sites and prisons might not be fully incorporated in the national hepatitis C screening and treatment registries. Second, in the absence of a patient registry for hepatitis B, screening and treatment coverage might have been underestimated. Third, given that the majority (60%) of PWID in Georgia prefer buying needles

FIGURE 2. Hepatitis C cascade of care\*<sup>†,§,¶</sup> among adults — Georgia, April 2015–April 2024



**Abbreviations:** anti-HCV = HCV antibody; HCV = hepatitis C virus; SVR = sustained virologic response.

\* Persons who received a reactive anti-HCV test result are among those with national identification numbers. An additional 18,586 persons using an anonymized 15-digit code had received a reactive anti-HCV test result. Thus, their representation in the cascade cannot be confirmed.

† Eligible for further testing or treatment-eligible includes persons who received a reactive anti-HCV test result or who received a positive test result for current chronic HCV infection (before progressing in cascade) for whom no mortality data are available.

§ Approximately 130,000 persons are estimated to have current chronic HCV infection in Georgia.

¶ SVR is defined by the absence of detected HCV in blood ≥12 weeks after completing treatment.

and syringes from private pharmacies,<sup>¶¶</sup> and that the data are lacking on procurement of needles and syringes outside of harm reduction sites, the number of needles and syringes provided per PWID was underestimated. Finally, combined mortality from hepatitis B and hepatitis C might be underestimated because of low screening for hepatitis B, limiting identification of HBV-related deaths.

### Implications for Public Health Practice

Identifying persons who have never been screened for hepatitis C, ensuring that those who receive a diagnosis are linked to care, and scaling up prevention services among PWID are essential to achieving HCV elimination in Georgia. Scaling up hepatitis B screening and treating those who are eligible for treatment would decrease hepatitis B–associated morbidity and mortality and expedite progress toward elimination by 2030. CDC is supporting and sharing lessons learned from Georgia’s efforts to eliminate hepatitis C with other countries in Eastern Europe and Central Asia that share similarly elevated prevalence of hepatitis C.

<sup>¶¶</sup> [https://hri.global/wp-content/uploads/2023/11/LDSS-report\\_Final.pdf](https://hri.global/wp-content/uploads/2023/11/LDSS-report_Final.pdf)

### Summary

#### What is already known about this topic?

Hepatitis B and hepatitis C are leading causes of cirrhosis and liver cancer. In April 2015, the country of Georgia launched a hepatitis C elimination program to address its high prevalence of hepatitis C.

#### What is added by this report?

As of April 2024, 83% of persons with chronic hepatitis C have received a diagnosis, and 86% of those diagnosed have initiated treatment. Sustained hepatitis B vaccination coverage above 90% has substantially reduced prevalence of infection in children; however, prevalence in adults remains high.

#### What are the implications for public health practice?

Identifying persons with chronic hepatitis C who have never received a diagnosis and linking them to care, and scaling up hepatitis B screening and treatment, would accelerate progress toward hepatitis B and hepatitis C elimination by 2030.

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# Lead Poisoning in a Mother and Her Four Children Using a Traditional Eye Cosmetic — New York City, 2012–2023

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## Abstract

Even low levels of lead in children's blood are associated with developmental delays, difficulty learning, and behavioral issues. Adults are also vulnerable to the detrimental health effects of lead exposure. The New York City (NYC) Department of Health and Mental Hygiene receives blood lead test results for NYC residents and conducts investigations of lead poisoning cases. Blood lead testing of a child aged 4 years in 2012 led to the discovery of blood lead levels above the CDC blood lead reference value of 3.5  $\mu\text{g}/\text{dL}$  in the child as well as four other family members over a period of 11 years, including the child's mother and three younger siblings born during 2012–2016. The only potential source of lead exposure identified for all cases was the use of surma, a traditional eye cosmetic, which was found to contain 390,000 ppm lead. The cases in this report highlight the challenges of risk communication when deeply ingrained cultural practices, such as the use of surma, persist despite health warnings. Moreover, they highlight the intergenerational nature of such practices and the need for comprehensive family follow-up once a member is identified as being at risk. These products continue to be available globally, even in places such as the United States where sales are prohibited. Multistakeholder efforts involving local and global engagement could promote reformulation of these products at the countries of origin to eliminate lead as an ingredient.

## Introduction

No safe blood lead levels (BLL) in children have been identified, because even low levels of lead in blood are associated with developmental delays, difficulty learning, and behavioral issues.\* Adults are also vulnerable to the detrimental health effects of lead exposure.† Surma, a traditional eye cosmetic (also known as kohl in certain regions of the world), is typically galena- (lead sulfide) based with extremely high levels of lead, and has been recognized as a source of lead exposure among adults and children (1–4). It is widely used in the Middle East, India, Pakistan, parts of Africa, and increasingly in other parts of the world because of migration (1,2). The population of New York City (NYC) comprises a wide spectrum of global cultures; associated with this diversity is a range of customs and practices, including the use of cultural products, such

as surma. Among some communities, surma serves a variety of cultural purposes. It is used on children as young as newborns in the belief it will protect against misfortune or injury, improve eye health, or to adhere to religious traditions. These practices can continue into adulthood. Surma is typically a fine powder with substantial potential for hand-to-mouth exposure, especially among infants and children. Although banned in the United States, surma is often purchased abroad by South Asian, Middle Eastern, and North- and West-African immigrants and hand-carried into the United States. Despite warnings about potential lead exposures, its use persists within these communities. This report describes BLLs above the CDC blood lead reference value (BLRV) of 3.5  $\mu\text{g}/\text{dL}$  among five NYC residents (a mother and her four children) associated with surma use.

## Methods

The NYC Department of Health and Mental Hygiene (DOHMH) receives blood lead test results for NYC children and adults and conducts follow-up investigations of persons with BLLs above CDC's BLRV<sup>§</sup> (5). During these investigations, DOHMH administers a risk assessment questionnaire and conducts environmental sampling to identify the potential lead sources. DOHMH collects samples of consumer products suspected to contain lead and reportedly mouthed or ingested by the lead-exposed person. Samples are analyzed for lead by an accredited laboratory using the Environmental Protection Agency Method SW6020.¶ Laboratory results, along with a description of each sample as conveyed by the family or retrieved from product packaging, such as the product name, origin, and usage information, are stored electronically in a proprietary structured query language (SQL) server database.

This report describes a family of five whose BLLs above CDC's BLRV were associated with use of surma. The family members included four children born during 2008–2016 and their mother, whose BLL above CDC's BLRV was identified during one of her pregnancies. Information on BLLs, laboratory results, risk assessments and case coordination notes

<sup>§</sup> Before June 2019, Local Law 1 of 2004 required DOHMH to conduct environmental investigations for NYC children with a BLL of  $\geq 15 \mu\text{g}/\text{dL}$ . Since then, DOHMH has been conducting environmental investigations for all children with a BLL of  $\geq 5 \mu\text{g}/\text{dL}$ , and starting in March 2022, DOHMH has been providing these services to all children with a confirmed BLL of  $\geq 3.5 \mu\text{g}/\text{dL}$ .

<sup>¶</sup> <https://www.epa.gov/sites/default/files/documents/6020.pdf>

\* <https://www.cdc.gov/lead-prevention/about/index.html>

† [https://www.atsdr.cdc.gov/csem/leadtoxicity/who\\_at\\_risk.html](https://www.atsdr.cdc.gov/csem/leadtoxicity/who_at_risk.html)



were retrieved using SQL Server Studio Management (version 18.12.1; Microsoft). The DOHMH Institutional Review Board reviewed the report and determined that the activity did not constitute human subjects research.

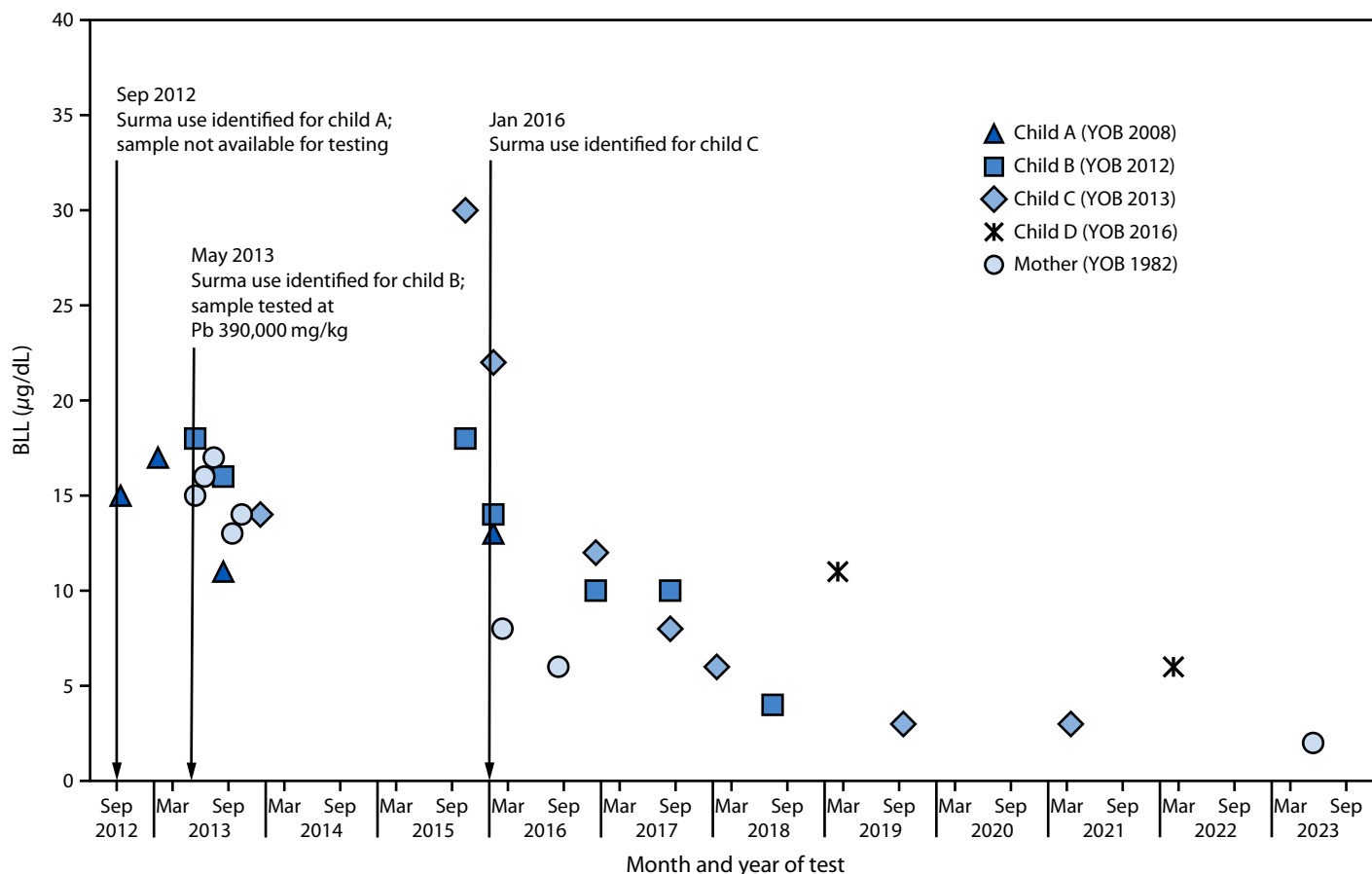
### Results

In September 2012, routine testing detected a BLL of 15  $\mu\text{g}/\text{dL}$  in an asymptomatic child, aged 4 years (child A), who had arrived from Pakistan 16 months earlier (Figure 1). DOHMH inspectors visited the child’s home and conducted environmental sampling. None of the 20 paint X-ray fluorescence measurements or 11 dust wipe measurements collected exceeded the regulatory guidelines for paint (1  $\text{mg}/\text{cm}^2$ ) and dust (40  $\mu\text{g}/\text{ft}^2$  for floors, 250  $\mu\text{g}/\text{ft}^2$  for windowsills, and 400  $\mu\text{g}/\text{ft}^2$  for window troughs) in place at the time. DOHMH conducted a comprehensive risk assessment interview, during which the only potential lead source identified was use of surma on the child; however, a sample was not available for testing.

The family was informed about the dangers of lead in surma and advised to discontinue using it. However, 4 months later, a follow-up BLL for child A was 17  $\mu\text{g}/\text{dL}$ , indicating no change.

Because of the BLL of 15  $\mu\text{g}/\text{dL}$  identified in child A in September 2012, DOHMH nurses recommended testing of child A’s asymptomatic sibling (child B), aged 6 months (born in 2012); however, testing was not conducted until May 2013, when child B was aged 15 months. Child B’s BLL at that time was 18  $\mu\text{g}/\text{dL}$ . At approximately the same time, the children’s mother, who was pregnant and asymptomatic, received routine prenatal blood lead testing, and had a BLL of 15  $\mu\text{g}/\text{dL}$ . Comprehensive risk assessments for child B and the mother identified surma as the only potential source of lead exposure. A surma sample was obtained, tested, and found to contain 390,000 ppm of lead. The surma (brand name Hashmi Surma Special) was manufactured in Pakistan and hand-carried by the family to NYC (Figure 2). The family was educated again about the potential for lead exposure from

FIGURE 1. Blood lead levels of a mother and her four children with a history of surma use — New York City, 2012–2023\*



**Abbreviations:** BLL = blood lead level; DOHMH = Department of Health and Mental Hygiene; Pb = lead; YOB = year of birth.

\* Before June 2019, Local Law 1 of 2004 required DOHMH to conduct environmental investigations for New York City children with a BLL of  $\geq 15 \mu\text{g}/\text{dL}$ . Since then, DOHMH has been conducting environmental investigations for all children with a BLL of  $\geq 5 \mu\text{g}/\text{dL}$ , and starting in March 2022, DOHMH has been providing these services to all children with a confirmed BLL of  $\geq 3.5 \mu\text{g}/\text{dL}$ .

surma use and advised, both by DOHMH and the children's pediatrician, to stop using it. In December 2013, the mother delivered a baby (child C); around the time of delivery, both the mother and newborn had BLLs of 14  $\mu\text{g}/\text{dL}$ , which were below DOHMH's intervention level of 15  $\mu\text{g}/\text{dL}$  at that time. In June 2014, their pediatrician reported the mother and three children were in Pakistan.

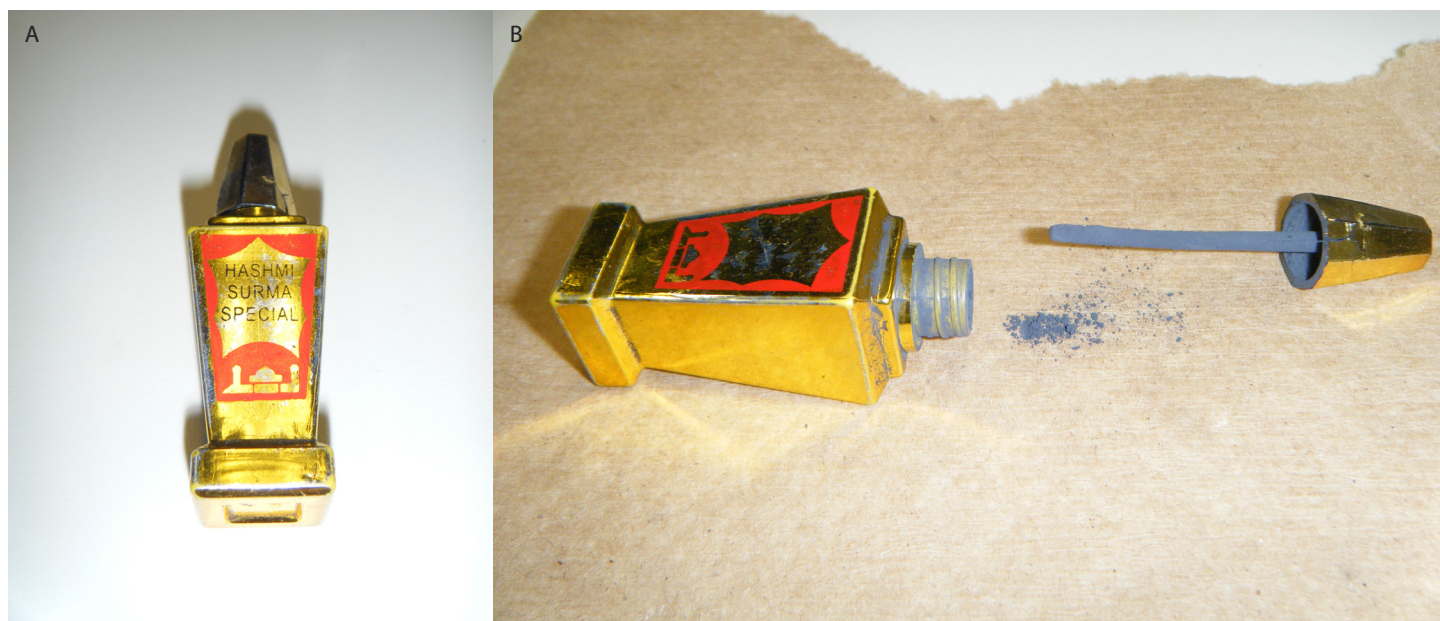
Approximately 1 year later (October 2015), after returning from Pakistan, child B and child C received retesting. No decline in child B's BLL was observed (18  $\mu\text{g}/\text{dL}$ ), and child C's BLL had increased from 14  $\mu\text{g}/\text{dL}$  at birth to 30  $\mu\text{g}/\text{dL}$ . During a comprehensive home investigation at the family's new residence, none of the 132 X-ray fluorescence or 13 dust wipe samples detected lead above the regulatory thresholds. As was the case in 2012, the only potential lead source identified was recent use of surma. A surma sample was not available for testing, but the family was again advised to discontinue use. A few months later, in early 2016, the BLLs for all three children and the mother had declined; child A's BLL was 13  $\mu\text{g}/\text{dL}$  (child A's last documented BLL), child B's BLL had declined from 18 to 14  $\mu\text{g}/\text{dL}$ , child C's from 30 to 22  $\mu\text{g}/\text{dL}$ , and the mother's from 14 to 8  $\mu\text{g}/\text{dL}$ . Two years later, in 2018, BLLs in child B and child C continued to decline (4  $\mu\text{g}/\text{dL}$  and 6  $\mu\text{g}/\text{dL}$ , respectively). In 2019, when child C's BLL was 3  $\mu\text{g}/\text{dL}$ , DOHMH identified a fourth child (child D), aged 2 years (born in 2016), with a BLL of 11  $\mu\text{g}/\text{dL}$ . Considering the history, surma use was suspected; however, the family reported not using it on this child. By February 2022, 3 years

later, child D's BLL had declined to 6  $\mu\text{g}/\text{dL}$ . It had taken approximately 5 years for the BLLs of child B and child C to decline to levels  $<5$   $\mu\text{g}/\text{dL}$ . By May 2023, the mother's BLL had declined to 2  $\mu\text{g}/\text{dL}$ . DOHMH continues to monitor the BLLs in this family.

## Discussion

The case series described in this report, highlighting a family's prolonged exposure to lead through use of surma, illustrates persistent challenges associated with reducing exposure to lead in a multicultural urban setting. Surma and similar lead-sulfide or galena-based traditional eye cosmetics (e.g., kohl and tiro) are used around the world (1,2,5–7). DOHMH has investigated numerous cases of children and adults with BLLs above CDC's BLRV associated with use of surma found to contain lead concentrations as high as 980,000 ppm (6). Although potential for lead exposures associated with surma use has been previously documented, this report is unique in describing intergenerational use of a product and culturally embedded nature of its use, as multiple family members were exposed successively, despite health warnings and prevention efforts. The family continued using surma even after being advised repeatedly to discontinue its use, likely prolonging the time for BLLs to decline below CDC's BLRV. The absence of symptoms among the mother and her children with BLLs above CDC's BLRV, identified through New York State–mandated blood lead testing (8,9), underscores the importance of systematic surveillance and follow-up activities to identify sources of lead

**FIGURE 2.** Image of Hashmi Surma Special container (A) and powdered product (B) used by five family members with blood lead levels exceeding CDC's blood lead reference value — New York City, 2012–2023



Photos/New York City Department of Health and Mental Hygiene

**Summary****What is already known about this topic?**

Surma, a traditional eye cosmetic, has been recognized as a source of lead exposure among adults and children. Banned in the United States, surma is often purchased abroad and hand-carried into the country.

**What is added by this report?**

A blood lead level above CDC's blood lead reference value detected in a child in New York City in 2012 was associated with use of surma. Over a period of 11 years, four other family members, including the child's mother and three younger siblings, were also affected.

**What are the implications for public health practice?**

Cultural practices often persist despite health warnings and can span generations, highlighting challenges in risk communication and the importance of comprehensive family follow-up once a family member at risk of lead exposure is identified.

exposure. However, effectiveness of blood lead surveillance depends on testing mandates, and might miss populations at risk of lead exposure who do not routinely receive testing.

**Limitations**

The findings in this report are subject to at least one limitation. Surma samples were not always available for lead testing when suspected as a potential source of exposure based on family members' self-reports and history. Nonetheless, DOHMH has tested approximately 200 samples of cultural powders, including surma, during 2013–2022 through lead poisoning investigations and store surveys, some of which were found to contain extremely high levels of lead (6). These data, coupled with the lead analysis of the one available surma sample collected from the family during the follow-up investigations of the children and their mother, and the corresponding self-reports of surma use, as well as the exclusion of other potential sources based on comprehensive inspections and risk assessment, provide strong support that the likely source of lead exposure in this series of cases was surma.

**Implications for Public Health Practice**

The cases in this report highlight the challenges of risk communication when deeply ingrained cultural practices, such as the use of surma, persist despite health warnings, which are available and are disseminated in multiple languages by trusted members of the community. Moreover, they highlight the need for comprehensive family follow-up once a member of the family is identified as being at risk. Travel outside of the United States, as in this case of the family visiting Pakistan, should prompt an investigation of the potential use of traditional consumer products. Persons with cultural connections

abroad, and who use products such as surma, might also be more likely to have extended absences from the United States because of travel, making follow-up challenging, and leading to longer intervals between blood lead testing, resulting in ongoing exposures and longer time for BLLs to decline. Although DOHMH has removed thousands of hazardous consumer products from NYC store shelves via local enforcement, these products are often hand-carried from abroad (10). These products continue to be available globally, even in places where sales are prohibited, leading to lead exposures worldwide and potentially contributing toward detrimental health outcomes. Long-term multistakeholder efforts involving local and global engagement are needed to reformulate these products in their countries of origin to eliminate lead as an ingredient.

**Acknowledgment**

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All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. No potential conflicts of interest were disclosed.

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## Notes from the Field

### Detection of Medetomidine Among Patients Evaluated in Emergency Departments for Suspected Opioid Overdoses — Missouri, Colorado, and Pennsylvania, September 2020–December 2023

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Medetomidine, a canine veterinary agent used for its anesthetic and analgesic properties, is an emerging adulterant detected in illicit drugs and drug paraphernalia. Medetomidine is a racemic mixture of two optical isomers, levomedetomidine and dexmedetomidine; the pharmacologic effects are caused by dexmedetomidine, an alpha-2 agonist similar to xylazine (1). Medetomidine is not approved for human use. Xylazine, a well-described opioid adulterant, is associated with multiple adverse effects, including soft tissue wounds\* (2). Whereas xylazine is not approved for human use, dexmedetomidine is used in hospitals as a sedative and analgesic. Dexmedetomidine is considered safe for sedation during certain procedures† (3) and is not associated with wounds when administered intravascularly or intramuscularly in hospitals. Medetomidine has been detected in samples of street-level drugs beginning in 2022 (4). Medetomidine is increasingly found in the drug supply across the United States and Canada and was associated with overdoses in April and May 2024 in Philadelphia, Pittsburgh, and Chicago.‡ The recent overdose outbreaks in Philadelphia, Pittsburgh, and Chicago highlight the need to understand symptoms associated with medetomidine use and overdose. This report describes the detection of medetomidine from illicit agents among patients evaluated in an emergency department (ED) after suspected opioid overdoses, none of whom had received medetomidine as part of clinical care.

### Investigation and Outcomes

Data for this analysis are from the Toxicology Investigators Consortium Fentanyl Study Group, a 2020–2025 study of patients aged >18 years evaluated in 10 EDs in nine states

\* [https://www.cdc.gov/overdose-prevention/about/what-you-should-know-about-xylazine.html#cdc\\_generic\\_section\\_6-additional-resources](https://www.cdc.gov/overdose-prevention/about/what-you-should-know-about-xylazine.html#cdc_generic_section_6-additional-resources)

† Examples include abscess incisions, suture placement, and fracture reduction; or sedation of intubated patients.

‡ <https://www.cfsre.org/nps-discovery/public-alerts/medetomidine-rapidly-proliferating-across-usa-implicated-in-recreational-opioid-drug-supply-causing-overdose-outbreaks>

#### Summary

##### What is already known about this topic?

Medetomidine, a veterinary anesthetic drug, is an emerging adulterant detected in illicit drugs, drug paraphernalia, and overdoses.

##### What is added by this report?

During August 2022–July 2023, medetomidine was detected among five patients along with xylazine, fentanyl, and illicit opioids. No permanent sequelae were reported. All patients received naloxone; however, only two received naloxone kits at discharge, and only one was referred for addiction treatment.

##### What are the implications for public health practice?

Medetomidine is an emerging adulterant detected in illicit drugs; further investigation is important to better understand the clinical effects of medetomidine and other novel adulterants. Programs to improve addiction treatment and naloxone distribution are needed.

after a suspected opioid overdose as part of ongoing activities to determine the role and prevalence of novel substances in these overdoses. Comprehensive toxicologic testing for the presence of approximately 1,200 drugs and metabolites, including an array of novel psychoactive substances and adulterants, was performed on residual blood samples using liquid chromatography quadrupole time-of-flight mass spectrometry. Patients who received a positive medetomidine test result were included. Additional case information was obtained through chart review.§ A waiver of consent was obtained for specimen collection. This activity was approved centrally by Western Institutional Review Board, and locally at each participating institution.

During September 2020–December 2023, a total of 1,331 blood samples\*\* collected from persons evaluated in participating EDs for a suspected opioid overdose were analyzed. Medetomidine was detected among five patients (0.4%) from

§ Chart reviews were performed by medical toxicology physicians or trained research assistants at each institution, using the patient's electronic medical record. Abstracted data included details surrounding the overdose, demographic information, and clinical signs and symptoms including vital signs, medications administered, testing obtained, and the patient's disposition.

\*\* All suspected opioid overdose cases from participating sites that met inclusion criteria were eligible for inclusion in the study. Inclusion criteria were met for any patient aged >18 years with a suspected opioid overdose who had a leftover blood specimen for analysis. Persons who were incarcerated or patients with trauma or burns were excluded. All uploaded information was deidentified; therefore, some patients (e.g., those with approximately one overdose) might have been enrolled more than once. However, blood samples were only drawn once during each hospitalization (at the beginning) and thus should all represent a unique overdose. All five cases described in this report were associated with unique patients.

three states (Missouri, Colorado, and Pennsylvania) during August 2022–July 2023 (Table). Patients A and B were initially hypotensive (systolic/diastolic blood pressures = 64/37 mmHg and 96/60 mmHg, respectively), but neither had bradycardia. Four patients were intentionally using opioids recreationally. All patients received naloxone (median total dose = 2 mg), one of whom received an infusion. All patients' neurologic exams were normal by 4 hours after arrival in an ED. Patient C, a man, aged 30–39 years, had an elevated troponin concentration but was discharged 4 hours after arrival. Patients A and B initially had acidosis (pH = 7.29 and 7.19, respectively). Patient B, a woman, aged 20–29 years, experienced respiratory and hemodynamic complications shortly after arrival and received positive test results for methamphetamine and olanzapine, but negative test results for opioids; she was hospitalized for 18 days. Comprehensive blood testing confirmed the presence of fentanyl among three patients, illicit benzodiazepines among three, stimulants among three, xylazine among three, and nitazene opioids among two. Only two patients were documented to have received naloxone kits at discharge, and only one was referred for addiction treatment.

## Preliminary Conclusions and Actions

These clinical findings are the first to illustrate the effects of medetomidine among a series of patients who used illicit drugs. Codetection with fentanyl is consistent with medetomidine use as an adulterant. Although knowledge about medetomidine's short- and long-term effects is limited, permanent sequelae were not reported in any of the patients in this analysis. Xylazine was detected in samples from three patients, suggesting that medetomidine and xylazine exposure might occur from a concomitant drug exposure. Information regarding wounds was not recorded in the hospital chart in this cohort.

Hospitals are improving their treatment of patients with substance use disorders (5); however, continued support is required, given the low prevalence of naloxone distribution and addiction medicine referrals identified in this sample. Medetomidine is an emerging adulterant, associated in this report with fentanyl and other novel psychoactive substances, that is not detected as part of a standard urine drug screen. Although long-term, permanent sequelae were not reported, further investigation into the clinical and long-term effects of medetomidine is warranted.

**TABLE. Characteristics of patients with detection of medetomidine during emergency department visits after suspected opioid overdoses — Missouri, Colorado, and Pennsylvania, September 2020–December 2023**

Characteristic	Patient				
	A	B	C	D	E
Age group, yrs; sex	40–49; man	20–29; woman	30–39; man	20–29; man	20–29; man
Date of detection	Mar 2, 2023	Jul 12, 2023	Apr 5, 2023	Aug 8, 2022	Aug 9, 2022
History of illicit opioid use in the previous 30 days	Yes	Unknown	Yes	Yes	Yes
History of other substance use	Alcohol and tobacco	Sedatives and stimulants	Unknown	Ethanol	Ethanol, cannabis, and stimulants
Psychiatric history	Anxiety and depression	Unknown	None	Schizophrenia	Bipolar disorder
No. of naloxone doses received	5*	1	1	1	3
Received initial naloxone dose before ED arrival	Yes	Yes	Yes	No	Yes
Total naloxone dosage received	3.95 mg*	2 mg	2 mg	0.4 mg	6 mg
Received prehospital CPR	Yes	No	No	No	No
Precipitated withdrawal <sup>†</sup> after receiving naloxone	No	No	No	Yes	No
Highest level of hospital care	ICU	ICU	ED	ED	ED
Disposition	Self-discharged (left AMA)	Transferred to psychiatric facility	Discharged	Self-discharged (left AMA)	Discharged
Length of stay, hrs	19	427 (18 days)	4	1	5
Opioids found in serum	Fentanyl and mitragynine	None	Fentanyl, heroin, and tramadol	Fentanyl, n-pyrrolidino-etonitazene, and tramadol	Fentanyl
<b>Other drugs detected in serum</b>					
Benzodiazepines	None	None	Bromazolam and clonazepam	Bromazolam, clonazepam, and etizolam	Bromazolam and etizolam
Stimulants	None	Methamphetamine	Cocaine	Methamphetamine	None
Other drugs	THC <sup>§</sup>	Olanzapine	Lidocaine, quinine, and xylazine	Lidocaine, quinine, and xylazine	Quinine and xylazine

**Abbreviations:** AMA = against medical advice; CPR = cardiopulmonary resuscitation; ED = emergency department; ICU = intensive care unit; THC = delta-9 tetrahydrocannabinol.

\* Includes infusion dose given as the final dose.

<sup>†</sup> Onset of withdrawal symptoms immediately after administration of medications used to treat opioid use disorder or overdose rather than from abstinence from opioids.

<sup>§</sup> THC is the psychoactive constituent of cannabis.

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## References

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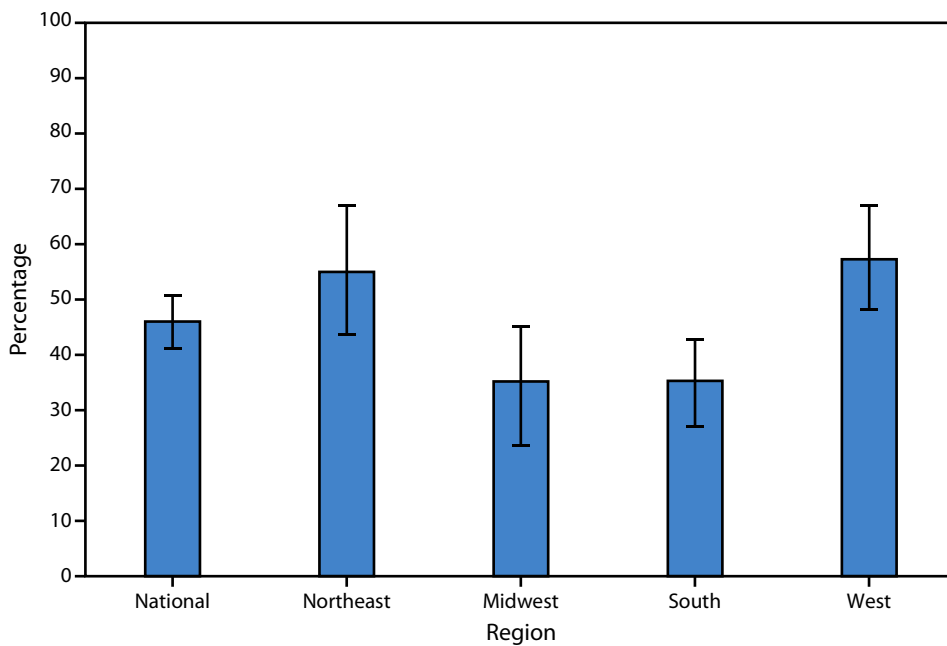
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QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage\* of Adult Day Services Centers<sup>†</sup> That Use Any Telehealth,<sup>§</sup> by U.S. Census Bureau Region — United States, 2022<sup>¶</sup>



\* With 95% CIs indicated by error bars.  
<sup>†</sup> Adult day services centers are state-regulated and further defined at <https://www.cdc.gov/nchs/data/npals/npals-2022-survey-method-doc.pdf>.  
<sup>§</sup> Based on a "yes" response by adult day services center directors to the following question: "In the last 12 months, did this center use any of the following types of telehealth tools to assess, diagnose, monitor, or treat participants? a. Telephone audio; b. Videoconference software with audio (e.g. Zoom, Webex, FaceTime)."  
<sup>¶</sup> Adult day services centers with missing data or with directors who responded "don't know" were excluded.

In 2022, 46% of U.S. adult day services centers used any telehealth tools. Approximately one half of centers in the Northeast and West used any telehealth, compared with approximately one third of centers in the Midwest and South.

**Supplementary Table:** <https://stacks.cdc.gov/view/cdc/157543>

**Source:** National Center for Health Statistics, National Post-Acute and Long-Term Care Study, 2022. <https://www.cdc.gov/nchs/npals>

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## Morbidity and Mortality Weekly Report

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