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Advancing Public Health Interventions: A Novel Surveillance System for Hazardous Consumer Products

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Abstract

Lead poisoning remains a significant public health concern with preventable exposure from different sources, including certain traditional consumer products. To address the concern of product-related lead exposures, the New York City Department of Health and Mental Hygiene has developed the Non-Paint Sample Database (NPSD). NPSD systematically tracks information about hazardous consumer products collected during New York City case investigations and store surveys. NPSD has enabled identification of new products-related lead sources and populations at risk of lead exposure and has guided risk communication, regulatory activities, and policy initiatives. Since 2007, approximately 8000 consumer products have been tracked

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[§]See 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.

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by NPSD. NPSD demonstrates the potential for consumer product surveillance to enable source identification, monitor lead exposure trends, and facilitate effective educational and enforcement activities, which advances lead exposure prevention strategies.

Keywords

consumer product surveillance; environmental health surveillance; lead exposure; lead poisoning; public health surveillance

Lead poisoning has detrimental effects across multiple organ systems, including the neurological, renal, and cardiovascular systems.¹ Approximately, half of the 2 million lives lost globally to known chemicals exposure in 2019 were attributed to lead exposure.² Although average blood lead levels (BLLs) in children and adults have generally declined across the United States and locally in New York City (NYC), lead exposure continues to persist.^{3,4} Historically, lead-based paint and occupational lead hazards have been primary sources of lead exposures among NYC's lead-poisoned children and non-pregnant adults, respectively.⁵ However, exposure from lead-containing consumer products continues to raise concerns in NYC.⁶ Lead-containing consumer products are the second most common potential source of lead exposure for NYC children; additionally, in approximately, 80% of NYC pregnant cases, imported products are a potential lead source. These products are often obtained abroad and brought into the city.^{7,8} Other jurisdictions across the United States are contending with this problem as well.

One key aspect of reducing exposures from lead-containing consumer products is to first identify these products to guide broader preventive measures. The NYC Department of Health and Mental Hygiene (DOHMH) has developed a consumer product data repository called the Non-Paint Sample Database (NPSD) that systematically catalogues consumer products collected and tested for lead during case investigations and store surveys.⁶ DOHMH's monitoring of consumer product lead data has helped to identify new lead sources associated with BLLs of public health concern among New Yorkers. These data have also guided risk communication strategies and regulatory activities to eliminate the availability of lead-containing consumer products in NYC.^{6,7,9,10}

The inherent challenges associated with lead exposures from consumer products underscore the need for innovative intervention strategies. This brief practice report seeks to provide an overview of the NPSD repository and describes the associated effects of consumer product lead surveillance in NYC. NPSD demonstrates the potential for an effective mitigative strategy to address lead-containing consumer products.

Identifying Lead-Containing Consumer Products

DOHMH receives blood lead test results for all NYC residents and routinely investigates child and adult lead poisoning cases (Figure 1).⁶ During these investigations, a risk assessment questionnaire is administered and samples of consumer products suspected to contain lead might be collected. DOHMH also routinely visits local stores to purchase implicated or similar products based on information from case investigations, federal alerts,

other jurisdictions, and peer-reviewed journals. Samples collected during case investigations and store surveys are analyzed for lead by an accredited laboratory. Laboratory results, along with a description of each sample as reported by the family or retrieved from product packaging, are electronically documented in NPSD.

Overview of the Non-Paint Sample Database

NPSD is a user-friendly Structured Query Language (SQL) Server database that allows DOHMH investigators to input relevant product-related information in designated fields. This includes manual data entry of product name, purchase source, and country of manufacture (Figure 1). For a comprehensive list of variables tracked in NPSD (see Supplemental Digital Content Figure 2, available at <http://links.lww.com/JPHMP/B462>). After analysis, laboratory results are uploaded electronically into NPSD (Figure 1). The system then generates automated standardized risk communication messages based on the product type, analyte concentration, and proxy or regulatory limits. These guide DOHMH staff to relay pertinent findings to affected persons in a consistent manner.

Activities Guided by NYC Consumer Products Surveillance

Since its inception in 2007, NPSD has successfully tracked approximately 8000 consumer products collected during lead poisoning case investigations and store surveys conducted by DOHMH. Through sample collection and testing, NPSD has enabled identification of numerous lead-containing consumer products, including certain traditional health remedies, spices, ceramic and metal cook ware, and cosmetics and cultural powders.^{6,11–15} By systematically cataloguing and tracking lead-containing consumer products data, NPSD complements traditional blood lead surveillance systems. For example, the consumer product information from NPSD, combined with blood lead surveillance data, has identified certain immigrant communities, including NYC's South Asian and Mexican communities to be at an increased risk for lead exposures linked to specific products.^{7,8,11,13–15} Lead exposures associated with traditional consumer products are particularly of concern within certain minority and foreign-born communities, who commonly use these types of products.

NPSD's consumer products surveillance data have guided focused risk communication and intervention strategies, including a media campaign that sought to raise awareness about the lead hazards associated with certain products.¹² Additionally, DOHMH has issued alerts for health care providers to inform them of the lead exposure risks associated with hazardous products identified through investigations and tracked by NPSD. DOHMH has also developed a training program for businesses, educating them about products found to contain lead, adverse health effects associated with their use, and the legal consequences of selling or distributing such products in NYC, including penalties, forfeitures, and the issuance of fines. Surveillance of consumer products using NPSD also supports enforcement activities in NYC, which may include ordering NYC businesses to stop sale and properly dispose of contaminated consumer products.⁶ During 2010 to 2022, approximately 30 000 units of hazardous products were embargoed from NYC stores.⁷ Relatedly, consumer product surveillance data shared with local and state health departments, federal agencies, and foreign health authorities have facilitated the issuance of health advisories, import alerts,

product recalls and triggered investigations and audit activities in the products' country of origin.^{4,6,7}

Beyond guiding risk communication and enforcement activities within NYC, these data have also engaged international stakeholders and shaped global interventions. For example, NYC findings identifying lead-containing spices originating from the country of Georgia prompted education initiatives and regulatory interventions in the country.¹⁶ Through data sharing and collaboration, DOHMH reports catalyzed implementation of stringent policies in Georgia to address the sale of lead-adulterated spices. These mitigation efforts targeting point source contamination have likely contributed to the 96% decline in the rate of NYC children with Georgian ancestry with BLLs at or above the city's level that triggers follow-up care from 2017 to 2022.¹⁷

Envision the Future

NPSD's consumer products surveillance data have been the catalyst for public health initiatives in NYC and abroad. This is achieved by identifying new lead sources, enhancing monitoring of product-related lead exposure trends, and facilitating effective enforcement and educational activities.^{6,16}

While the system has proven to be successful, it does require certain logistical and financial considerations in its operation. Staff members with expertise in environmental health, toxicology, or industrial hygiene can be valuable. Staff need to dedicate sufficient time for field investigations, including conducting background research to guide sampling strategies, surveying businesses to determine availability of lead-containing products, and collecting and preparing sample products for laboratory lead testing. Associated costs include purchasing products, shipping them to accredited laboratories, and analyzing them for lead content, with expenses varying based on product type and analytical method. Skilled SQL developers are essential to ensure the NPSD system remains scalable and efficient without compromising performance as data volume and user demand grow. To address operational challenges and enhance efficiency, expanding partnerships with academic institutions and other government agencies for dedicated funding and support could help offset costs.

NPSD can serve as a model for other jurisdictions to adopt. However, given potential resource constraints, replicability of such a system in other jurisdictions, though recommended, might be challenging. At minimum, even in the absence of such a robust surveillance system, jurisdictions conducting lead poisoning case investigations should consider maintaining a simple repository of consumer products lead data by using available spreadsheet or database management applications.

When harnessed, data on lead-containing consumer products can bolster efforts to comprehensively address lead exposures in the United States and beyond. Identification of specific lead-containing consumer products can enable authorities to focus resources on hazardous products and persons at high risk for lead exposures from these sources. These data can also strengthen efforts toward improved product management along the supply chain—from growers to exporters—by guiding initiatives aimed at removing lead sources

at the countries of origin. Ultimately, a solution to addressing the global issue of lead exposures from these types of consumer products should involve implementing a robust infrastructure centered on educational and regulatory policies supported by public-private partnerships.¹⁸

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Implications for Policy & Practice

- **Data-Driven Interventions:** Use of systematically tracked consumer product data can strengthen lead exposure prevention efforts by guiding focused educational initiatives, enforcement and regulatory actions, and policies.
- **Interagency Collaboration:** Collaborations among health and other governmental agencies and nongovernmental organizations, can facilitate the sharing of product-related data and strategies, improving identification and mitigation of these lead exposure sources.
- **Policy Development:** Findings regarding lead-containing consumer products can guide development of regulatory policies that address supply chain activities (from manufacture to export), with a focus on protecting vulnerable populations.
- **National and Global Outreach:** The success of NPSD-enabled consumer products surveillance system in NYC suggests that similar databases can be effective at national and international levels, offering a model for global public health strategies against lead exposure.
- **Resource Allocation:** Systems like NPSD can optimize resource allocation by identifying high-risk products and populations at risk for lead exposure, allowing for targeted interventions. Instead of implementing broad and expensive prevention campaigns, NPSD enables precise risk communication regarding the lead source, thereby enhancing efficiency of public health interventions.

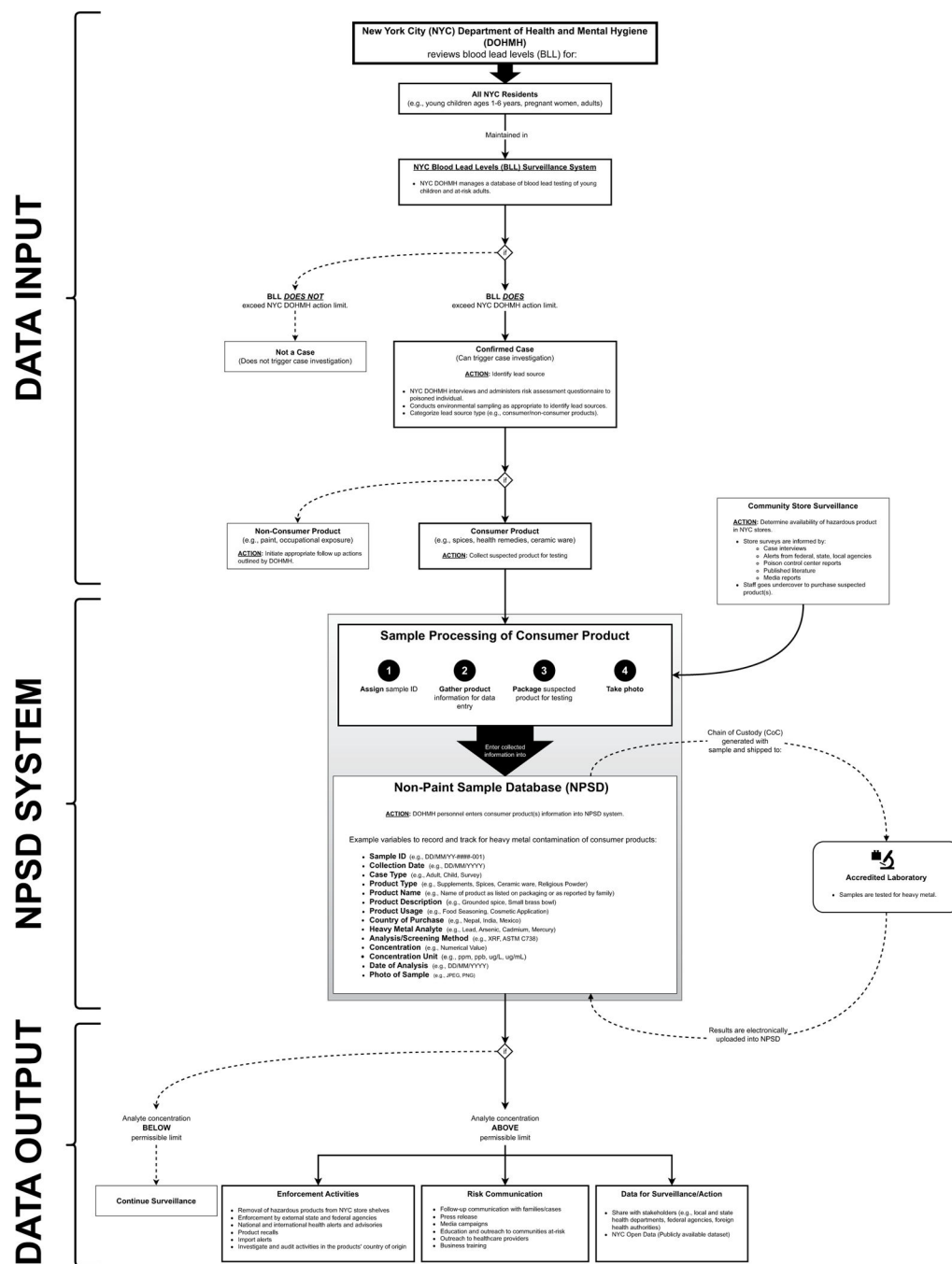


FIGURE 1.
Overview of the New York City (NYC) Non-Paint Sample Database (NPSD) System