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Longitudinal trends in liquid laundry detergent packet exposures: 2014–2022

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ABSTRACT

Background: Liquid laundry detergent packet exposures modestly declined in the mid-2010s among children less than 6 years of age due to public awareness and voluntary product safety standards. We aimed to assess longitudinal trends in the number and rate of liquid laundry detergent packet exposures in the United States by age.

Methods: Data from the National Poison Data System were analyzed to characterize liquid laundry detergent packet exposures between January 2014 and December 2022.

Results: From 2014–2022, there were 114,826 single and polysubstance exposures to liquid laundry detergent packets. Children less than 6 years of age (86.8 percent) were most commonly exposed. When evaluating multi-year trends, we found that the annual exposure rate per 1 million children less than 6 years old increased by 16.8 percent from 392.6 in 2018 to 458.7 in 2020. Subsequently, the annual exposure rate in children less than 6 years of age declined by 6.8 percent from 2020 to 2022 (427.4 exposures per 1 million). The annual rate of adolescent exposures increased by 85.4 percent from 2014 (4.1 exposures per 1 million) to 2017 (7.6 exposures per 1 million), with a subsequent increase of 155.3 percent from 2017 to 2018 (19.4 exposures per 1 million). Among adults, the annual exposure rate increased by 147.1 percent from 2014 (1.7 exposures per 1 million) to 2022 (4.2 exposures per 1 million). The number of more serious medical outcomes and hospital admissions among children less than 6 years of age declined by 44.3 percent and 68.6 percent, respectively, between 2014 and 2018.

Conclusions: Despite declines in the number, rate, and severity of liquid laundry detergent packet exposures among children less than 6 years old, the exposure burden remains high. Additionally, exposures have increased among older children, adolescents, and adults. Renewed safety efforts are warranted to protect prior public health gains and further reduce exposures.

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Child; detergent packet; poisoning; product packaging

Introduction

Laundry detergent packets were introduced into the United States (US) consumer markets in 2012. Advertised as a convenient alternative to traditional detergents, these concentrated detergent packets have become popular among consumers over the past decade, and the market in the US was valued at approximately \$3.1 billion in 2022 [1]. Laundry detergent packets are a recognized poisoning hazard for young children [2,3]. Exposures to laundry detergent packets have been associated with multiple effects, ranging from ocular [4,5] and mucosal burns [6] to respiratory distress [7] and central nervous system depression [8]. Serious outcomes, including death, have also been described [9]. Exposures to liquid laundry detergent packets are often more severe than exposures to traditional laundry detergents [10].

Liquid laundry detergent packet exposures among young children increased throughout the 2010s [10,11], receiving widespread media attention [12,13]. Efforts by clinicians and public health officials prompted major manufacturers to

implement product safety improvements, including the inclusion of bittering agents and the introduction of opaque containers, double-latch lids, and more prominent product warning labels [14,15]. These were deployed in conjunction with high-profile public health awareness campaigns [14]. In 2015, ASTM International (formerly known as the American Society for Testing and Materials) released the F3159-15 voluntary safety standard for liquid laundry packets, which were adopted by manufacturers [16]. These interventions, in part, led to a modest reduction in liquid laundry detergent packet exposures among young children as of 2017 [9].

Data from America's Poison Centers continue to describe a high burden of laundry detergent packet exposures among children <6 years old since 2018 [17]. Exposure trends among older children and adolescents may have been affected by social media challenges, such as the "Tide Pod Challenge" [18]. Additionally, there have been increasing reports of liquid laundry detergent packet exposures among older individuals, especially those with cognitive

impairment [19]. Examining continuing, long-term trends in exposures in the context of these events can inform prevention efforts. In this study, our objective was to assess longitudinal trends in the number and rate of exposures to liquid laundry detergent packets in the US by age. Because most studies describing laundry detergent packets were conducted with data from the mid- to late-2010s, this study updates our understanding of current exposure trends [9,20,21].

Methods

Data source

Data were obtained from the National Poison Data System (NPDS), which is maintained by America's Poison Centers [22]. The NPDS consolidates poisoning exposure calls to regional poison centers within the US and its territories. Trained poison specialists collect information as part of the routine management of these calls, including product type, route of exposure, and demographic information. The NPDS employs quality control measures to ensure the accuracy and completeness of its data [23,24]. United States Census Bureau 1 July intercensal and postcensal estimates were used to calculate annual exposure rates [25,26].

Case selection criteria

We requested reports of single and polysubstance exposures to liquid laundry detergent packets between 1 January 2014 and 31 December 2022 from America's Poison Centers. Exposures were included in the study if identified by the following: (1) product codes for brand-name liquid laundry detergent packets, (2) generic category "Liquid Unit Dose Laundry Detergents," or (3) generic substance codes for "Laundry Detergents: Liquids (Unit Dose)" and "Laundry Detergents: Granules with Liquids (Unit Dose)" for exposures with a missing product code. This study was restricted to liquid laundry detergent packet exposures, because the ASTM F3159-15 voluntary safety standard covers only this product type and not laundry packets with only non-liquid components (i.e., granules). Exposures were excluded from analysis if: (1) the medical outcome was confirmed as a non-exposure or an exposure was unlikely to be responsible for the observed outcome, (2) age was unknown, or (3) product and generic codes were mismatched. The number of exposures where the age was unknown was small ($n = 486$), accounting for $<0.5\%$ of our data.

Study variables

Age was grouped into four categories: (1) < 6 years old, (2) 6–12 years old, (3) 13–19 years old (i.e., "adolescents"), and (4) > 19 years old (i.e., "adults"). In keeping with the NPDS, the following categories of medical outcome were defined as: (1) no effect, (2) minor effect ("minimally bothersome, rapidly resolving effects that usually involve the skin or mucous membranes"), (3) moderate effect ("more pronounced or more systemic in nature, treatment usually required but

effects are non-life-threatening"), (4) major effect ("symptoms are life-threatening or resulted in significant disability"), (5) not followed, nontoxic exposure, (6) not followed, minimal clinical effects possible, (7) unable to follow, judged as a potentially toxic exposure, or (8) death (including indirect reports) [27]; "not followed, nontoxic exposure" and "not followed, minimal clinical effects possible" were grouped into the category "not followed (at most, minimal clinical effects possible)" in our study. In this study, "more serious outcomes" refers to the moderate and major effects and death categories combined.

Additional study variables included demographic characteristics, year of exposure, route of exposure, reason for exposure, management site, related clinical effects, and highest level of healthcare received.

Statistical analysis and ethical considerations

National Poison Data System data were analyzed using SPSS 29.0 (IBM SPSS Statistics, IBM Corporation, Armonk, NY). Descriptive statistics for general characteristics were calculated from both single and polysubstance exposures. For analysis of management site, the highest level of care received, and medical outcomes, only single substance exposures were included due to possible interaction effects between multiple substances unless explicitly specified otherwise. Simple, linear regression models and piecewise regression models were used to characterize trends, and the estimated slope (m) and associated P value were calculated. Linear regressions were used in our study to characterize if the change in slope was statistically significant from zero to illustrate increases and decreases in exposures over time. For clarity of data presentation in the results section, estimated slopes are provided only for trends meeting our set level of statistical significance ($\alpha = 0.05$). Additional analyses included the calculation of odds ratios (ORs) with corresponding 95% confidence intervals (CI). This study was exempted for review by the Institutional Review Board at the authors' institution.

Results

General characteristics

Over the study period, US poison centers received 114,826 exposure calls related to liquid laundry detergent packets (Table 1). Children < 6 years of age were the most common age group exposed (86.8%), followed by adults > 19 years old (6.4%). Exposures commonly involved only a single substance (96.5%) or occurred at a residence (98.5%). Ingestions (66.5%), followed by ocular exposures (14.0%), were the most common routes. A higher proportion of children 6–12 years old experienced an ocular exposure (42.8%) compared with children < 6 years old (11.5%) or adolescents (22.9%). Among adolescents and adults, 44.0% (1,025 of 2,331) and 14.0% (1,036 of 7,387) of exposures, respectively, were classified as intentional.

Table 1. Characteristics of liquid laundry detergent packet exposures by age group, National Poison Data System 2014–2022.

Characteristic	<6 years n (%) ^a	6–12 years n (%) ^a	13–19 years n (%) ^a	>19 years n (%) ^a	Total n (%) ^a
Type of exposure					
Single substance	97,046 (97.4)	5,262 (96.5)	1,999 (85.8)	6,553 (88.7)	110,860 (96.5)
Polysubstance	2,607 (2.6)	193 (3.5)	332 (14.2)	834 (11.3)	3,966 (3.5)
Sex					
Male	52,932 (53.2)	2,825 (52.0)	1,183 (50.9)	2,691 (36.5)	59,631 (52.1)
Female	46,491 (46.8)	2,612 (48.0)	1,142 (49.1)	4,679 (63.5)	54,924 (47.9)
Unknown	230	18	6	17	271
Exposure site					
Residence	98,558 (99.0)	5,248 (96.4)	2,012 (87.5)	7,030 (95.5)	112,848 (98.5)
Other	936 (1.0)	197 (3.6)	287 (12.5)	329 (4.5)	1,749 (1.5)
Unknown	159	10	32	28	229
Route of exposure					
Single route					
Ingestion	69,374 (69.7)	2,029 (37.2)	1,510 (64.8)	3,384 (45.9)	76,297 (66.5)
Ocular	11,482 (11.5)	2,334 (42.8)	526 (22.6)	1,695 (22.9)	16,037 (14.0)
Dermal	1,545 (1.6)	218 (4.0)	133 (5.7)	1,561 (21.1)	3,457 (3.0)
Nasal inhalation	58 (0.1)	12 (0.2)	8 (0.3)	209 (2.8)	287 (0.2)
Other	24 (0.0)	4 (0.1)	4 (0.2)	32 (0.4)	64 (0.1)
Multiple routes					
Multiple routes involving ingestion	14,362 (14.4)	533 (9.8)	106 (4.5)	366 (5.0)	15,367 (13.4)
Ocular and dermal	2,668 (2.7)	314 (5.8)	39 (1.7)	97 (1.3)	3,118 (2.7)
Other multiple routes	90 (0.1)	10 (0.2)	4 (0.2)	33 (0.4)	137 (0.1)
Unknown	50	1	1	10	62
Total exposures (row %) ^b	99,653 (86.8)	5,455 (4.8)	2,331 (2.0)	7,387 (6.4)	114,826 (100.0)

^aColumn percentages may not sum to 100.0% due to rounding error.

^bRow percentages may not sum to 100.0% due to rounding error.

Table 2. Management site, highest level of health care received, and medical outcomes associated with single substance exposures to liquid laundry detergent packets by age group, National Poison Data System 2014–2022.

Characteristic	<6 years n (%) ^a	6–12 years n (%) ^a	13–19 years n (%) ^a	>19 years n (%) ^a	Total n (%) ^a
Management site					
Managed on site (non-healthcare facility)	58,178 (60.3)	3,081 (59.0)	1,129 (57.1)	4,627 (71.3)	67,015 (60.8)
Patient already in (enroute to) healthcare facility when poison center called	26,827 (27.8)	1,369 (26.2)	490 (24.8)	1,091 (16.8)	29,777 (27.0)
Patient was referred by poison center to a healthcare facility	10,903 (11.3)	724 (13.9)	279 (14.1)	701 (10.8)	12,607 (11.4)
Other	597 (0.6)	49 (0.9)	80 (4.0)	74 (1.1)	800 (0.7)
Unknown	541	39	21	60	661
Highest level of health care received					
Received healthcare facility care	32,952 (34.0)	1,732 (32.9)	585 (29.3)	1,277 (19.5)	36,546 (33.0)
Treated or evaluated and released	30,527 (31.5)	1,677 (31.9)	431 (21.6)	1,035 (15.8)	33,670 (30.4)
Admitted	2,425 (2.5)	55 (1.0)	154 (7.7)	242 (3.7)	2,876 (2.6)
Admitted to critical care unit	838 (0.9)	17 (0.3)	10 (0.5)	55 (0.8)	920 (0.8)
Admitted to noncritical care unit	1,587 (1.6)	29 (0.6)	33 (1.7)	98 (1.5)	1,747 (1.6)
Admitted to psychiatric care facility	0 (0.0)	9 (0.2)	111 (5.6)	89 (1.4)	209 (0.2)
Patient lost to follow-up or left against medical advice	3,545 (3.7)	281 (5.3)	140 (7.0)	374 (5.7)	4,340 (3.9)
Not seen in a healthcare facility	60,370 (62.2)	3,230 (61.4)	1,260 (63.0)	4,868 (74.3)	69,728 (62.9)
No healthcare facility treatment received	59,318 (61.1)	3,169 (60.2)	1,230 (61.5)	4,761 (72.7)	68,478 (61.8)
Patient refused referral or did not arrive at healthcare facility	1,052 (1.1)	61 (1.2)	30 (1.5)	107 (1.6)	1,250 (1.1)
Medical Outcome					
Serious medical outcome (i.e., more serious outcome)	5,160 (5.3)	461 (8.8)	125 (6.3)	481 (7.3)	6,227 (5.6)
Death	0 (0.0)	0 (0.0)	0 (0.0)	9 (0.1)	9 (0.0)
Major effect	182 (0.2)	7 (0.1)	6 (0.3)	15 (0.2)	210 (0.2)
Moderate effect	4,978 (5.1)	454 (8.6)	119 (6.0)	457 (7.0)	6,008 (5.4)
Minor effect	42,095 (43.4)	2,320 (44.1)	712 (35.6)	1,761 (26.9)	46,888 (42.3)
No effect	18,601 (19.2)	553 (10.5)	276 (13.8)	730 (11.1)	20,160 (18.2)
Not followed (at most, minimal clinical effects possible)	26,624 (27.4)	1,627 (30.9)	752 (37.6)	3,204 (48.9)	32,207 (29.1)
Unable to follow, judged as potentially toxic	4,564 (4.7)	301 (5.7)	134 (6.7)	377 (5.8)	5,376 (4.8)
Total single substance exposures (row %) ^b	97,046 (87.5)	5,262 (4.7)	1,999 (1.8)	6,553 (5.9)	110,860 (100.0)

^aColumn percentages may not sum to 100.0% due to rounding error.

^bRow percentages may not sum to 100.0% due to rounding error.

Management site, the highest level of healthcare received, and medical outcome

Most single substance exposures were managed on-site and not in a healthcare facility (60.8%; Table 2). Approximately three in 10 (30.4%) exposures were treated and released from a healthcare facility. Among adolescents, 7.7% of

exposures were admitted to the hospital compared with 2.5% among children <6 years of age and 3.7% among adults; adolescents had higher odds of being admitted to the hospital (OR: 3.27; 95% CI: 2.76–3.87) compared to other ages. Children <6 years of age had higher odds (OR: 1.45; 95% CI: 1.16–1.82) of being admitted to a critical care unit compared to other age groups.

The most common medical outcomes from single substance exposures were a minor effect (42.3%) or no effect (18.2%). More serious outcomes occurred in 5.6% of exposures. The proportion of more serious outcomes was highest among children 6–12 years old (8.8%) followed by adults (7.3%); children 6–12 years of age (OR: 1.66; 95% CI: 1.51–1.84) and adults (OR: 1.36; 95% CI: 1.23–1.50) had higher odds of experiencing a more serious outcome compared to other age groups. Among all children <6 years of age in our study who experienced a more serious outcome, 5,160 were single substance exposures, while 175 were polysubstance. All nine fatalities reported by the NPDS during the study period involved adults. Seven of the nine fatalities occurred in adults >70 years old, and eight of the nine fatalities were unintentional in nature.

Trends in exposure number and rate

The annual exposure rate per 1 million children <6 years old decreased by 28.7% from 550.5 in 2016 to 392.6 in 2018 (Figure 1). More recently, the annual rate of exposures among children <6 years of age increased by 16.8% ($m=33.0$, $P=0.004$) between 2018 (392.6 exposures per 1 million) and 2020 (458.7 exposures per 1 million). Subsequently, the annual rate of exposures among children <6 years of age declined insignificantly by 6.8% ($P=0.273$) from 2020 to 2022 (427.4 exposures per 1 million).

Among children 6–12 years old, the annual rate of exposures increased 74.0% ($m=2.95$; $P=0.006$) from 2014 (15.0 exposures per 1 million) to 2018 (26.1 exposures per 1

million) before declining by 19.6% ($m=-2.56$; $P=0.009$) from 2018 to 2020 (21.0 exposures per 1 million). The exposure rate for those 6–12 years of age remained steady between 2020–2022.

Among adolescents, the annual rate of exposures to liquid laundry detergent packets increased by 85.4% ($m=1.2$, $P=0.032$) from 2014 (4.1 exposures per 1 million) to 2017 (7.6 exposures per 1 million); between 2017 and 2018 (19.4 exposures per 1 million), the annual rate of exposures among adolescents increased by 155.3%. After declining to an annual exposure rate of 7.4 per 1 million in 2020, the rate of adolescent exposures increased by 29.7% by 2022 (9.6 exposures per 1 million). Among adults, the annual rate of exposures increased by 147.1% ($m=0.3$; $P=0.005$) from 2014 (1.7 exposures per 1 million) to 2022 (4.2 exposures per 1 million).

Trends in exposure route

The number of annual ingestions in children <6 years of age increased by 12.6% ($m=384.0$; $P=0.024$) from 2018 (6,089 exposures) to 2020 (6,857 exposures; Figure 2) before decreasing insignificantly by 9.0% ($P=0.231$) from 2020 to 2022 (6,243 exposures). The annual number of ocular exposures in children <6 years old increased insignificantly by 19.9% ($P=0.204$), from 1,227 exposures in 2018 to 1,471 exposures in 2020, before experiencing a plateau.

Among children 6–12 years of age, the annual number of ocular exposures increased by 89.4% ($m=46.6$; $P=0.019$) from 2014 (179 exposures) to 2018 (339 exposures) before declining insignificantly by 18.0% ($P=0.330$) from 2018 to

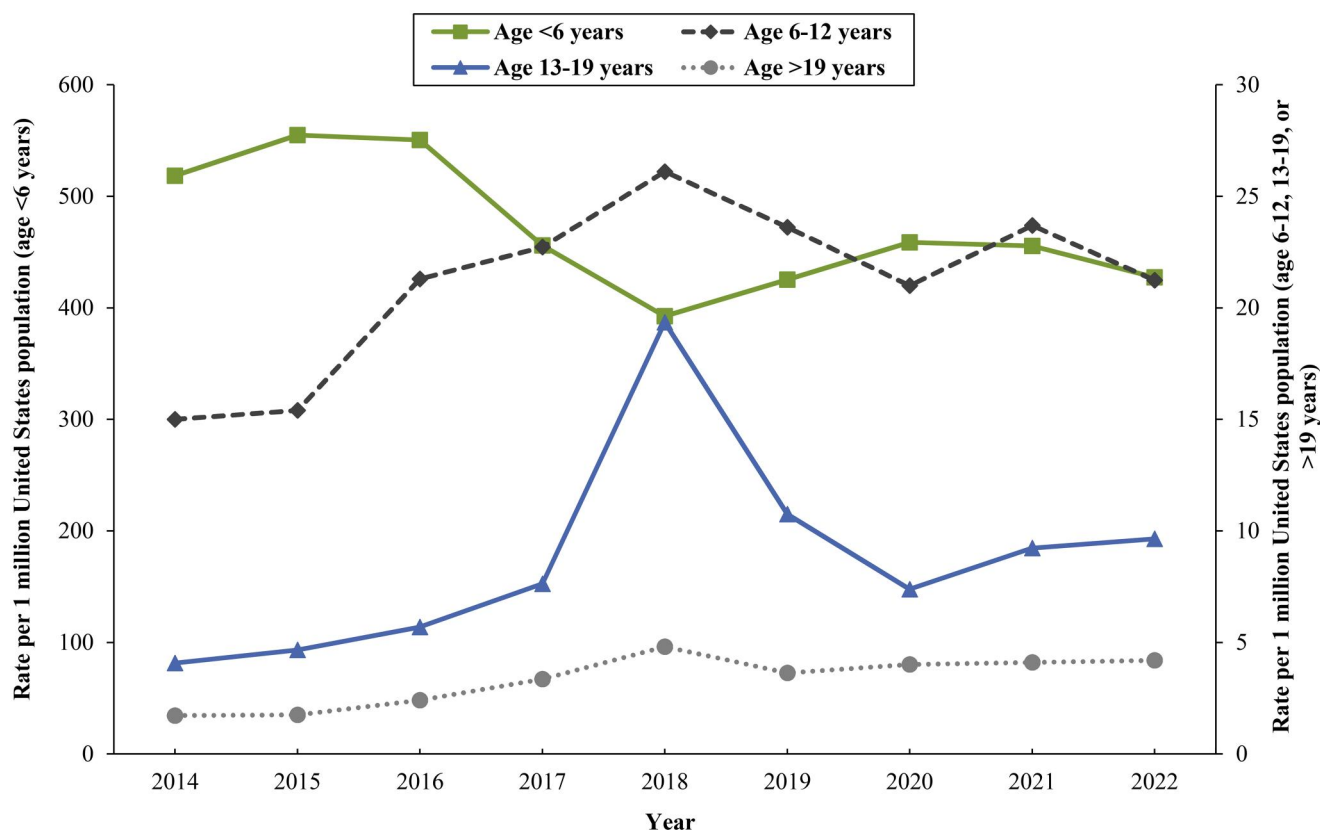


Figure 1. Rate of liquid laundry detergent packet exposure by age group and year, National Poison Data System 2014–2022.

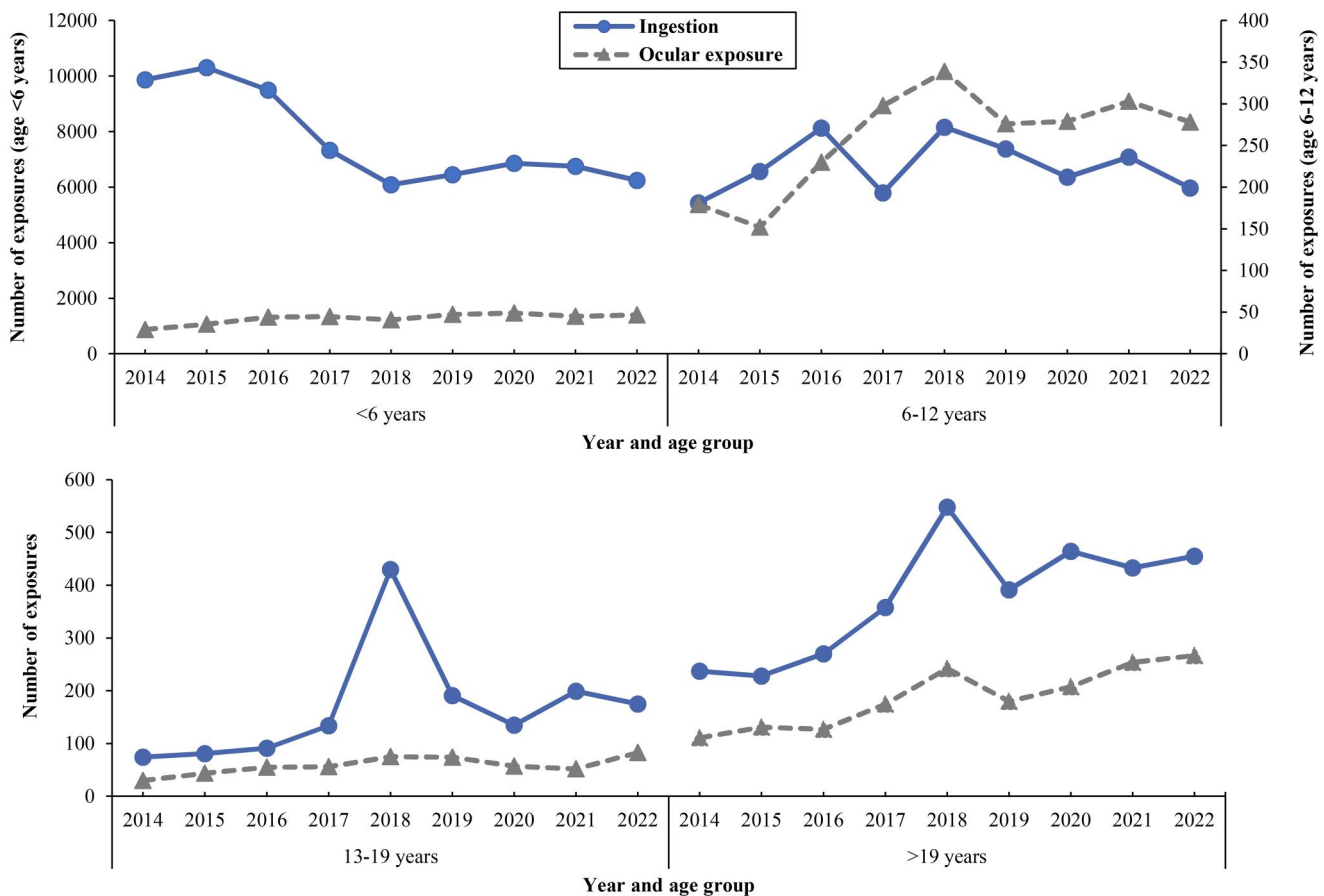


Figure 2. Number of exposures to liquid laundry detergent packets through a single route (ingestion or ocular exposure) by age group and year, National Poison Data System 2014–2022.

2022 (278 exposures). Abrupt increases in annual exposures between 2017 and 2018 among adolescents and adults were primarily associated with ingestions (Figure 2). Among adults, the annual number of ingestions and ocular exposures increased by 92.0% ($m = 31.8$; $P = 0.013$) and 140.5% ($m = 19.3$; $P = 0.001$), respectively, over the study period.

Trends in more serious outcomes and hospital admission

Among single substance exposures, the annual number of more serious outcomes and hospital admissions among children <6 years old declined by 44.3% ($m = -102.1$; $P = 0.002$) and 68.6% ($m = -102.6$; $P = 0.003$), respectively, between 2014 and 2018, and then leveled off (Figure 3). Children 6–12 years old experienced a sudden increase in the annual number of serious outcomes between 2015 and 2016; the annual number of more serious outcomes for this age group subsequently decreased by 43.5% ($m = -6.2$; $P < 0.001$) from 2017 to 2022. The adolescent and adult age groups demonstrated an abrupt increase in more serious outcomes and hospital admissions between 2017 and 2018; this trend partially reversed for adolescents in subsequent years (Figure 3). The annual number of hospital admissions among adults increased by 73.7% ($m = 1.87$; $P = 0.018$) over the study period.

Trends in healthcare facility use and related clinical effects

Trends in healthcare facility use and experiencing at least one related clinical effect from single substance exposures are summarized in Figure 4. The decline in the annual number of children <6 years of age who utilized a healthcare facility or experienced at least one related clinical effect occurred primarily between 2015 and 2018 before plateauing in subsequent years. Among adults, annual numbers for experiencing at least one related clinical effect increased by 91.9% ($m = 32.2$; $P = 0.008$) over the study period.

Discussion

This study describes long-term trends in liquid laundry detergent packet exposures by key age groups since the introduction of the product into the US market. As previously described [9,20,21,28], liquid laundry detergent packet exposures among children <6 years old had modestly declined between 2015–2017. However, exposure numbers and rates in this age group increased between 2018–2020, with subsequent declines only partially mitigating this increase. Previously declining proxies for severity of exposure—more serious outcomes, healthcare facility use, and hospital admissions—have plateaued for children <6 years old since 2018.

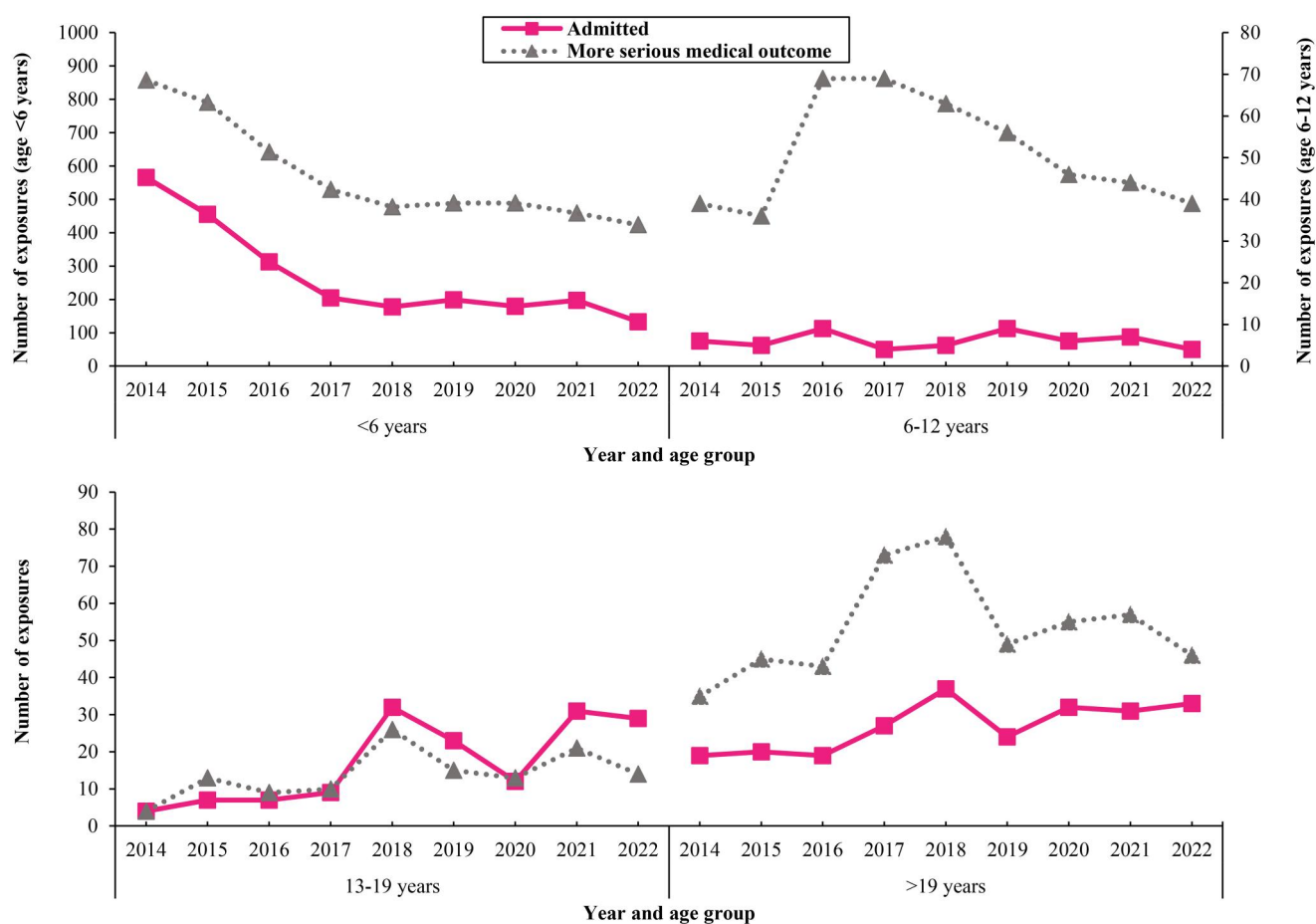


Figure 3. Number of single substance liquid laundry detergent packet exposures resulting in admission or more serious medical outcome by age group and year, National Poison Data System 2014–2022.

Moreover, exposures among older children, adolescents, and adults increased throughout the study period.

The introduction of laundry detergent packets into the US consumer market in 2012 was followed by widely publicized poisonings and subsequent attempts by manufacturers to improve product safety. In 2015, these efforts culminated in the publication of the ASTM International voluntary safety standard F3159-15 for liquid laundry detergent packets, which included specifications for child-resistant containers, opaque packaging, aversive agents to the packet film, minimum burst strength, and warning labeling [16]. Combined with industry and public health educational campaigns, these changes contributed to the decline in exposure number and exposure severity among children <6 years old in the immediate years following the implementation of the safety standard.

Our findings underscore how public health gains for young children have plateaued in recent years. Compared with the historic Poison Prevention Packaging Act of 1970 [29], which substantially decreased poisonings associated with medications and toxic household products by 40–50% [30,31], the ASTM F3159-15 safety standard has not performed similarly with respect to preventing laundry detergent packet poisonings. The weaker epidemiologic effects observed with respect to the ASTM standard reflect its permissive requirements. For example, manufacturers are allowed to meet the requirements

for children-resistant containers in six different ways, which may not conform to the proven-effective Poison Prevention Packaging Act standard. Recent updates to the standard in March 2022 did not substantially change its scope [16]. Multiple opportunities exist to strengthen the ASTM standard. These include requiring Poison Prevention Packaging Act-compliant packaging or adopting additional “layers of protection,” such as individual packaging of each laundry packet. Prior legislative attempts by the US Congress to propose a stronger, mandatory safety standard have not progressed beyond committee referral [32].

Exposures among older individuals, particularly adolescents and adults, increased throughout the study period. These exposures have been described among those uniquely at-risk, such as elderly individuals or those with developmental delay or degenerative brain diseases [9,19]. However, intentional ingestions of laundry detergent packets have also been documented; in 2018, the sudden increase in exposures, more serious outcomes, and hospital admissions among adolescents and adults may have been associated with the “Tide Pod Challenge,” a viral internet phenomenon that became popular in December 2017 [18]. Social media challenges involving toxic substances continue to emerge [33], and the experience with laundry detergent packets highlights the potential public health consequences associated with these trends. Content moderation and counter-

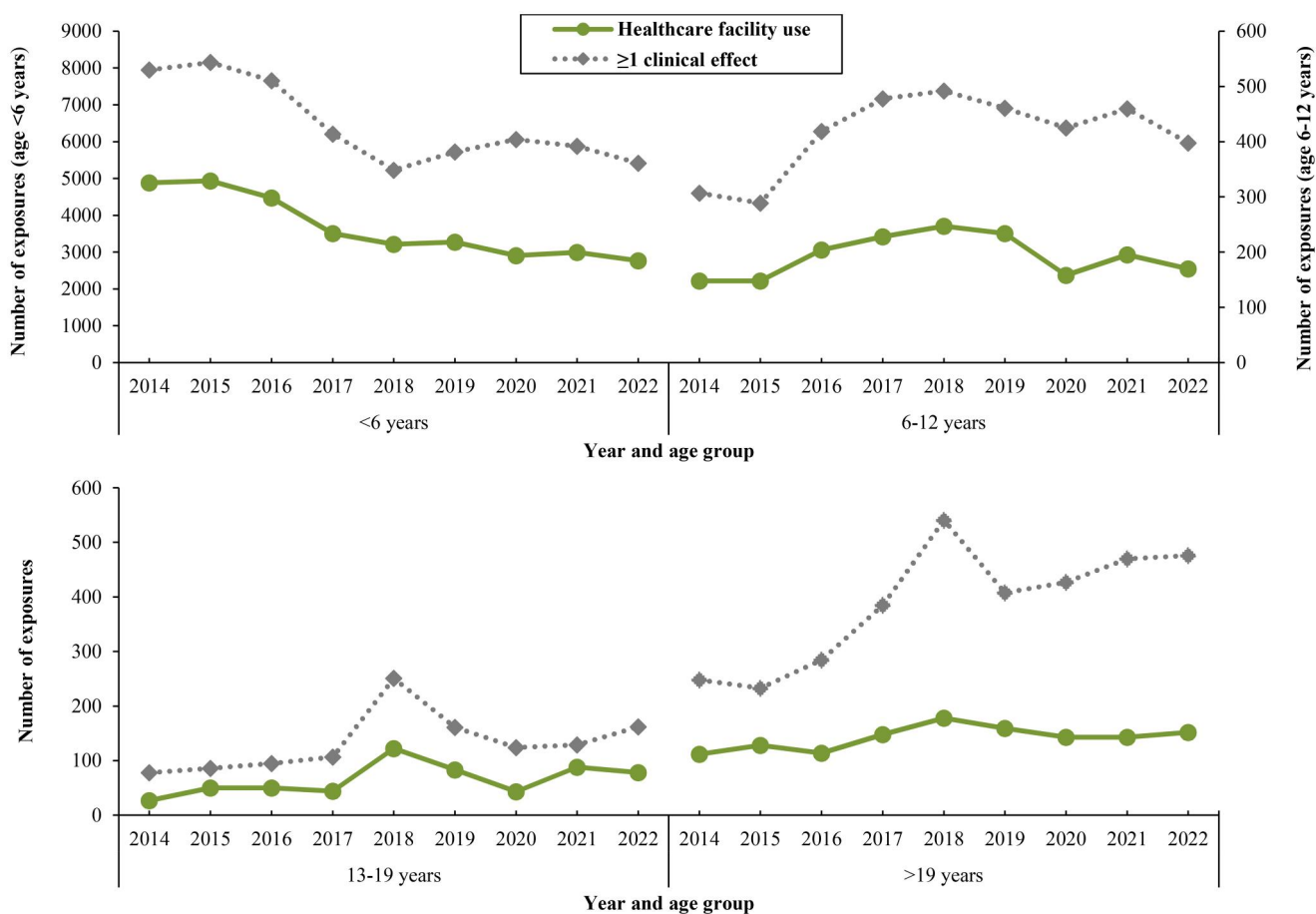


Figure 4. Number of single substance liquid laundry detergent packet exposures resulting in healthcare facility use or ≥ 1 clinical effect by age group and year, National Poison Data System 2014–2022.

social and mainstream media efforts to combat the “Tide Pod Challenge” may have yielded mixed results [34], thus serving as an important lesson in carefully adapting the public health response to the social media era.

Packaging modifications are unlikely to completely prevent intentional or self-harm attempts among older individuals. Rather, reducing product toxicity can prevent more serious outcomes related to exposure. For reasons not completely understood, liquid laundry detergent packets are more toxic than traditional detergents [10]. Product reformulation has been successful in reducing toxicity among other consumer products, such as fabric cleaners [35] and should be considered for liquid laundry detergent packets.

Most media attention related to laundry detergent packets occurred in the mid-2010s. As such, general awareness of the dangers associated with exposures to laundry detergent packets may be waning, which may explain the more recent shifts in exposure trends in our study. Healthcare providers should continue to counsel patients and families regarding safe storage practices for laundry detergent packets. We continue to advise families with children to avoid detergent packets and to use traditional laundry detergents instead. This injury prevention guidance not only applies to young children but also to those with other health conditions, such as cognitive impairment.

Our study has several limitations. National Poison Data System data likely underestimate the number of exposures

associated with liquid laundry detergent packets because not all exposures are reported to poison centers. Exposure calls are voluntary and rely on self-reports from the caller, and cannot be completely verified by poison centers or America’s Poison Centers. Data miscoding by poison centers specialists may also occur. Exposures do not necessarily represent a poisoning or intoxication. In our study, we used linear regression to characterize if the calculated slopes of trends were statistically significant from zero and not for statistical prediction; we did not employ advanced statistical modeling over the entire dataset to attempt to characterize model fit or the contribution of specific variables to the change in trends. Therefore, our study does not describe definitive associations between variables in our data. Despite these limitations, our data highlight important changes in laundry detergent packet trends relevant for poisoning prevention and public health efforts. The NPDS is a comprehensive, standardized national database with strict data quality control measures well-suited to describe laundry detergent packet exposures in the US population.

Conclusions

Public health efforts have led to declines in the number, rate, and severity of liquid laundry detergent packet exposures among children <6 years old. However, the burden of exposures in this age group remains high. Additionally, increasing numbers and rates of exposures are being seen among older children,

adolescents, and adults. Renewed efforts towards improving awareness and strengthening the current ASTM International safety standard are critical in sustaining prior public health gains and reducing further liquid laundry detergent packet exposures.

Acknowledgement

America's Poison Centers maintains the National Poison Data System, which houses de-identified records of self-reported information from callers to the country's Poison Centers. National Poison Data System data do not reflect the entire universe of US exposures and incidence related to any substance(s). Exposures do not necessarily represent a poisoning or overdose and America's Poison Centers is not able to completely verify the accuracy of every report. National Poison Data System data do not necessarily reflect the opinions of America's Poison Centers.

Disclosure statement

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