

Local anesthetic associated deaths reported to the National Poison Data System

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INTRODUCTION

Local anesthetics (LA) are ubiquitous pain control agents in medicine but with the known complication of LA systematic toxicity. In 2010, multiple anesthesia societies introduced practice advisories [1][2] for treating LA systemic toxicity, but the impact of those recommendations is uncertain.

METHODS

This research was deemed non-human research by the University of Illinois at Chicago IRB (Study 2023-1026). We conducted a case-control study using data from the National Poison Data System (NPDS, 1983 – 2022), with the hypothesis that the 2010 recommendations contributed to a reduction in reporting and mortality from LAs. The odds ratio was calculated using the Yates continuity-corrected X² test comparing reporting and deaths from LAs in 2010 – 2022 relative to 2001 – 2010. Confidence intervals were calculated using the Baptista-Pike method (GraphPad Prism). The sample size was determined using data from 1991 – 2000, with 19000 reports required to identify an odds ratio of 2 (alpha = 0.025, power = 80%). Poisson regression was used for confirmation, alongside exploratory analyses of individual cases of mortality based on epoch of publication.

RESULTS

From 1983 - 2022 there was a case fatality rate of 0.036% compared with a rate of 0.049% with other drugs (Table 1). Following the introduction of professional society practice advisories in 2010, reports of LA poisoning decreased but reports of death increased (Figure 1). The decrease in reporting was driven by a decrease in non-lidocaine-related events. Conversely, reports of lidocaine poisoning and mortality from lidocaine increased over the same period (Figure 2). Poisson regression of lidocaine deaths was significant (p=0.007) and demonstrated no effect of year, total deaths or total lidocaine poisonings but did demonstrate a significant effect of the workgroup epoch (B1 = 5.64, 95%CI 1.34 to 33, p=0.03).). Exploratory analysis of the cases between 1985 and 2010, 67% used lidocaine, whereas 82% used lidocaine between 2011 and 2022 (Figure 3A). From 1985 – 2010, 33% of cases were ingestion/inhalational, 10% were nerve blocks, and 3% were intravenous whereas those percentages changed to 19%, 0%, and 27% from 2011 – 2022 (Figure 3B). Regarding the delivery location, the operating room represented 47% of cases from 1985 – 2010 but only 15% from 2011 – 2022, while prehospital (EMS or ED) went from 7% to 31% (Figure 3C). Almost all cases of lidocaine death used doses in excess of package insert recommendations with doses as high as 48,000mg of lidocaine (Table 2).

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LA reports to NPDS declined but deaths rose 2011 -2022

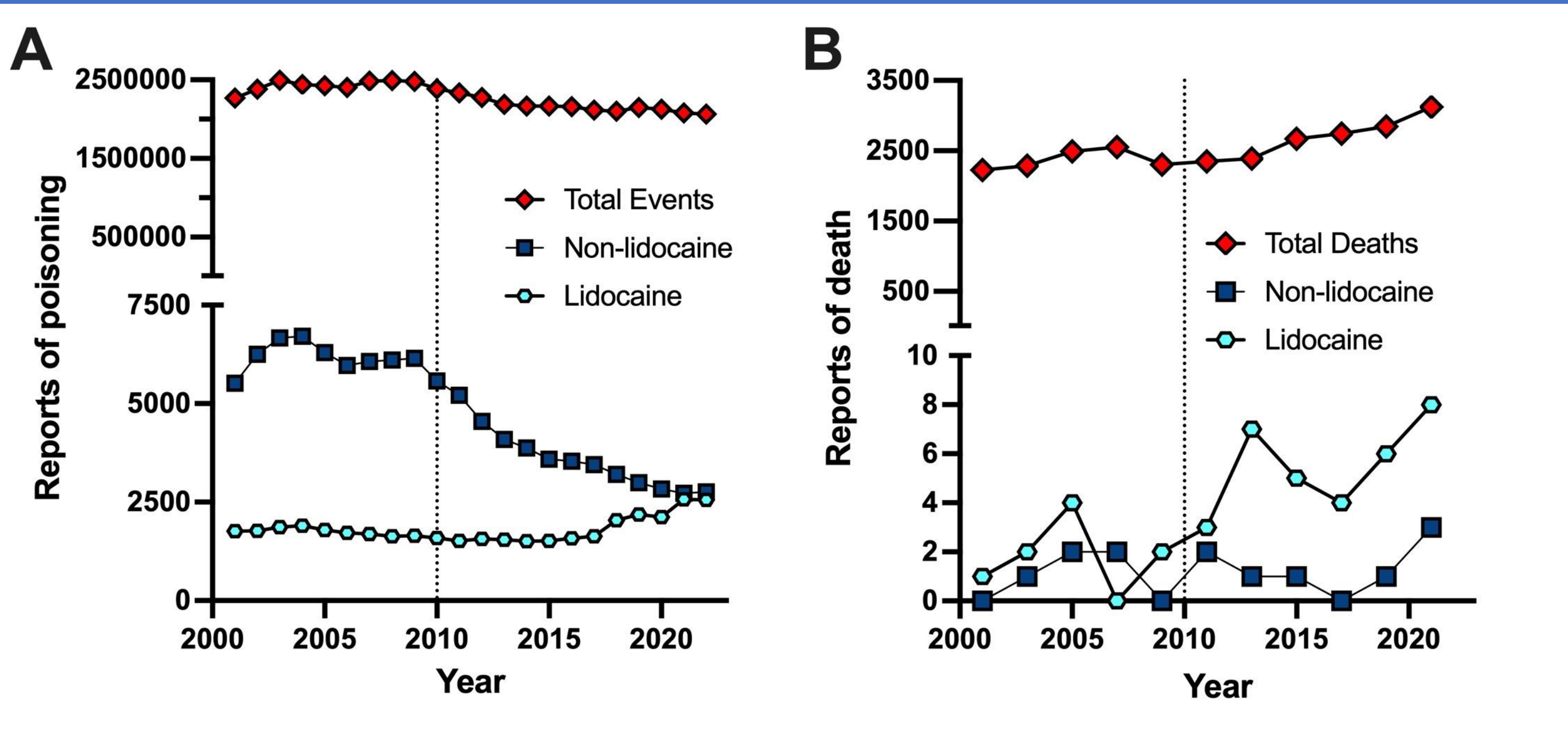


Figure 1: A. Reports of poisoning to the National Poison Data System (NPDS) from 2001 – 2022. B. Reports of death to NPDS from 2001 - 2022

Figure 2: Forest plot of poisoning and mortality from local anesthetics reported to the National Poison Data System from 2011-2022 relative to reporting from 2001-2010.

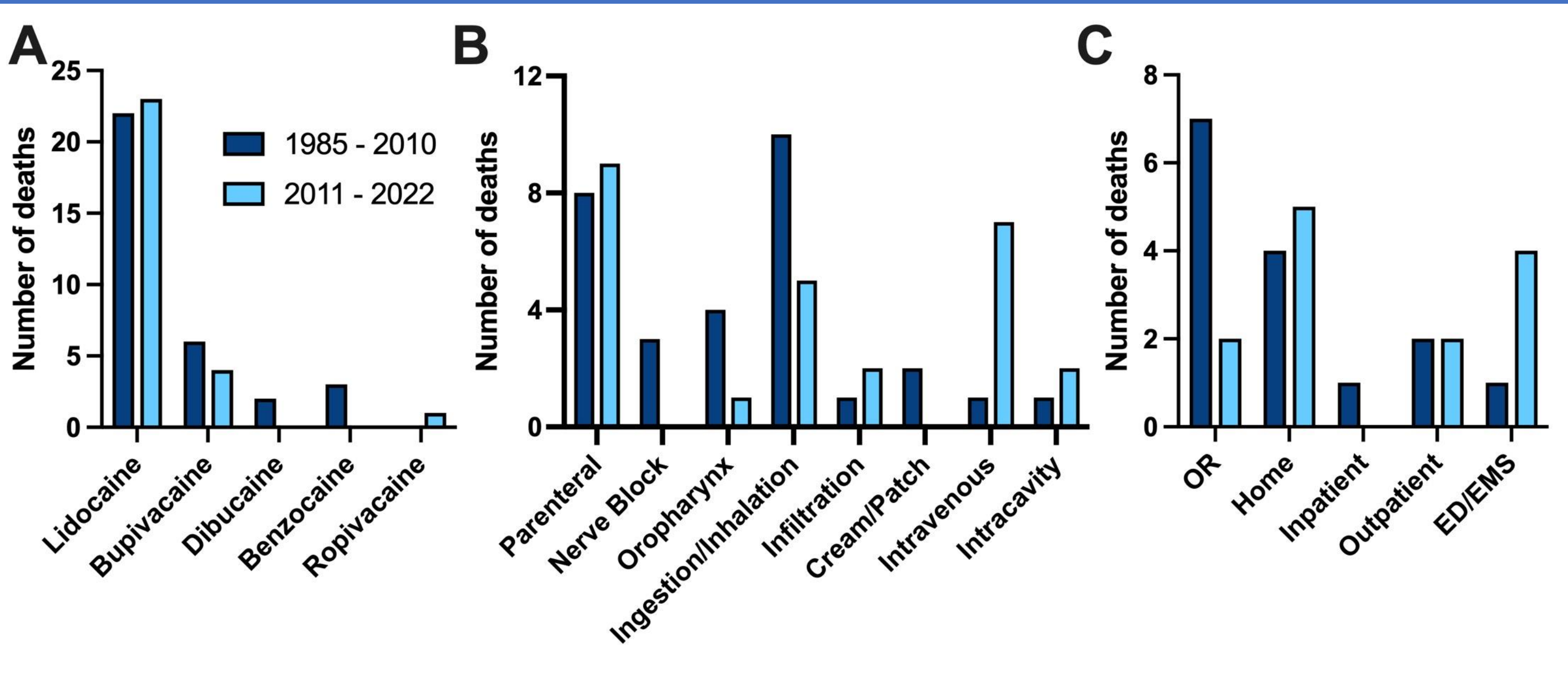
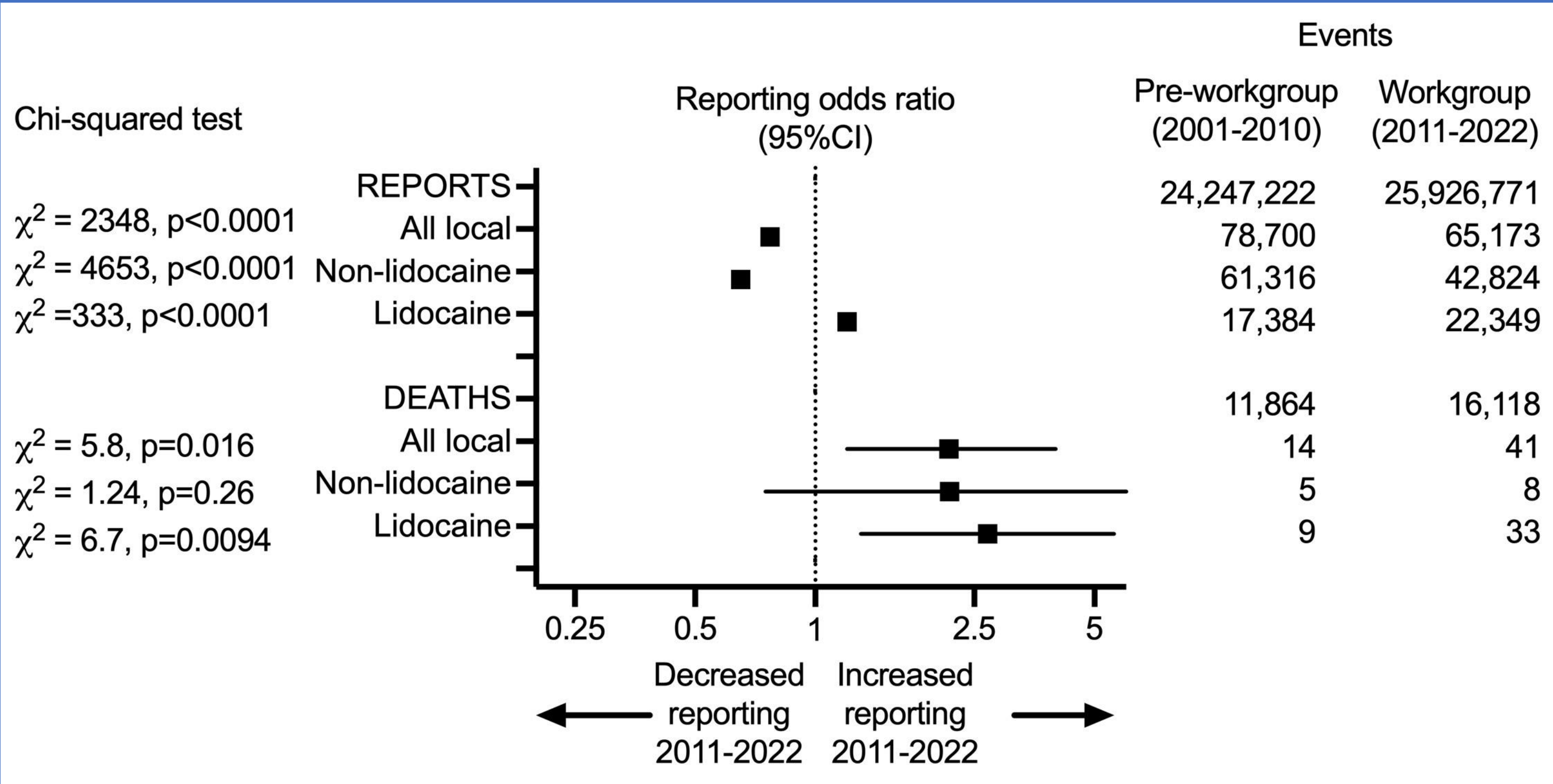


Figure 3: A. Number of deaths by drug and epoch (1985 – 2010, 2011 – 2022). B. Number of deaths by delivery method and epoch C. Number of deaths by location and epoch.



Table 1: Reports of poisoning and death from local anesthetics to National Poison Data System from 1983-2022

Year	Lidocaine		Non-lidocaine		All local anesthetic		All reports	
	Death	Poisoning	Death	Poisoning	Death	Poisoning	Death	Poisoning
1983-1990							3,266	8,824,720
1991-2000					19	59,980	7,665	20,361,656
2001-2010	9	17,384	6	61,316	14	78,700	11,864	24,247,222
2011-2022	33	22,349	7	42,824	41	65,173	16,118	25,926,771
Totals	42	39,733	13	104,140	74	203,853	38,913	79,360,369
Case Mortality	0.106 %		0.012 %		0.036 %		0.049 %	

Table 2: Available cases of lidocaine toxicity with doses since 2010

Year	Age / Gender	Delivery / Location	Drug / Dose
2013	77 / F	Intravenous / ED	Lidocaine / 100mg#
2015	28 / M	Oropharynx topicalization / Home	Lidocaine / 2000mg (if 2%)#
2016	55 / F	Intraosseous/ intravenous / -	Lidocaine / 800mg#
2017	11 / M	Cecal flush / Home	Lidocaine / 4425mg#
2019	68 / M	Intravenous / ED	Lidocaine / 2000mg#
2021	61 / M	Intravenous / EMS	Lidocaine / 1000mg#
2021	70 / M	Intravenous / Outpatient	Lidocaine / 600mg#
2022	41 / M	Intravenous / Outpatient	Lidocaine / 2000mg#

CONCLUSIONS

Consistent with our hypothesis, we observed a decrease in LA poisoning reports since 2010 which aligns with the implementation of professional recommendations. However, we observed an unexpected increase in reports of death, specifically due to lidocaine. While nerve blocks have disappeared as a source of reporting of death to the NPDS since 2010, intravenous lidocaine has risen as a source of death. The escalation of lidocaine-related deaths—primarily in emergency settings and linked to large intravenous doses—underscores significant risks. These findings emphasize the need for improved guidance on lidocaine usage and strategies to prevent lidocaine-related mortality.

REFERENCES

- Neal JM, Bernards CM, Butterworth JF, *et al.* ASRA practice advisory on local anesthetic systemic toxicity. *Reg Anesth Pain Med.* 2010;35:152–61.
- Cave G, Harrop-Griffiths W, Harbey M, *et al.* AAGBI Safety Guideline: Management of Severe Local Anaesthetic Toxicity. The Associaton of Anaesthetists of Great Britain and Ireland. 2010.