

Mercury-Containing Amalgam Fillings Account for Less Than 6% of Posterior Tooth Fillings in 2022

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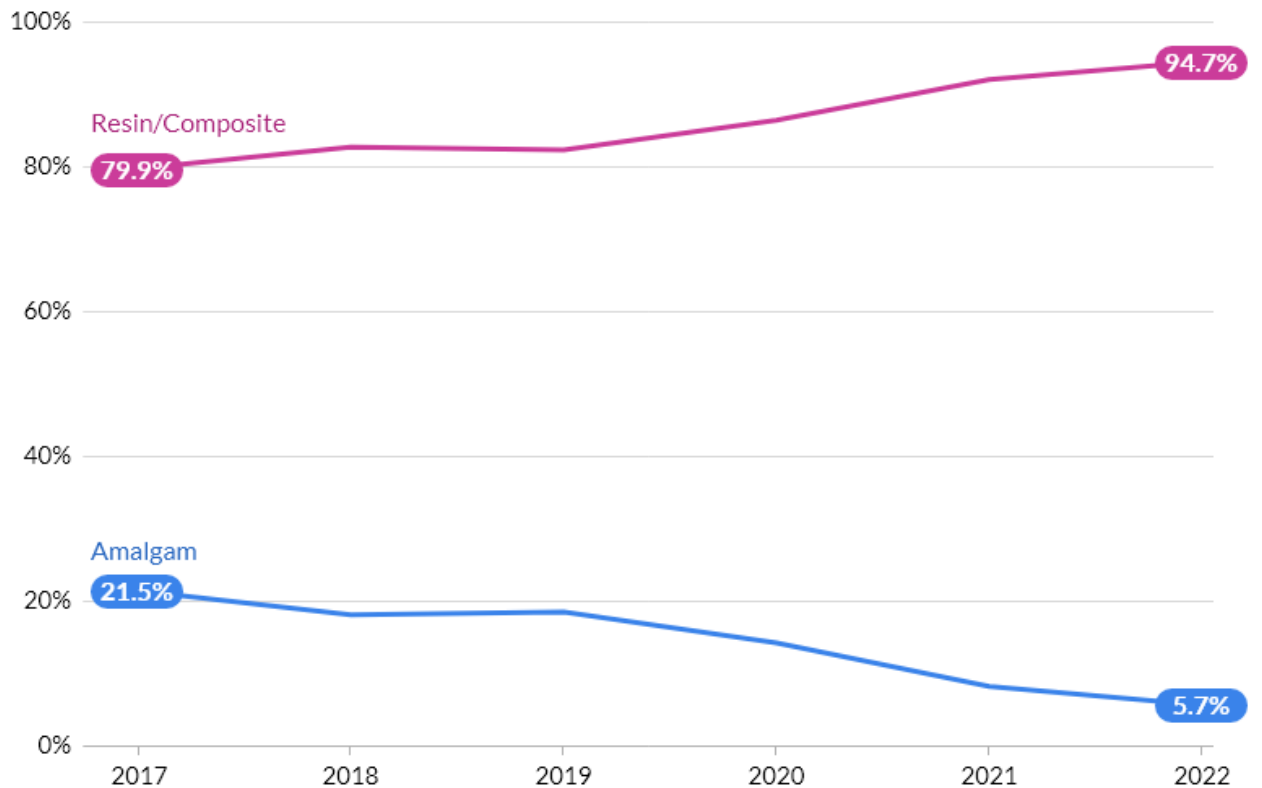
Key Findings:

- Less than 6% of dental fillings in posterior teeth in 2022 used amalgam, compared to more than 21% of fillings in posterior teeth in 2017, a 73% decrease in that five-year period.
- The use of amalgam fillings declined across all social vulnerability index quartiles, but patients with the highest social vulnerability are still most likely to receive amalgam fillings.
- Amalgam fillings have decreased across all payers, among all age groups, and across both rural and urban areas since 2017.

For many years, amalgam has been one of the materials used for dental restorations to fill cavities in posterior teeth. However, there are environmental and health concerns about exposure to mercury, one of the components of dental amalgams.¹ These concerns are outlined by the Minamata Convention, a global treaty to protect against the adverse effects of mercury, which has 128 worldwide signatories.² Sweden, Norway, and Germany have banned the use of amalgam for restorations, but other countries, such as the U.S., are following the phasedown approach as outlined in the Convention.³ The U.S. Food and Drug Administration (FDA) recommends that high-risk populations avoid amalgam when possible but maintains that amalgam is safe for other populations.⁴ High risk populations include patients ages six or younger, patients who are pregnant, breastfeeding, or trying to become pregnant, and patients with certain sensitivities to metal or certain pre-existing conditions. However, since amalgam restorations have better longevity than restorations using other materials, amalgam might preferentially be used in patient populations where future dental care follow-up is less assured.⁵

We sought to understand whether the proportion of dental fillings that used amalgam has changed over time and whether those rates differ across populations. We studied 1,346,918 posterior tooth filling encounters in the U.S. from 2017 to 2022 and assessed the rate of amalgam fillings compared to resin or composite fillings each year. We found that the rate of amalgam fillings has decreased from 21.5% of fillings in 2017 to 5.7% of fillings in 2022, as shown in Figure 1.

Percentage of Encounters with Restoration Type



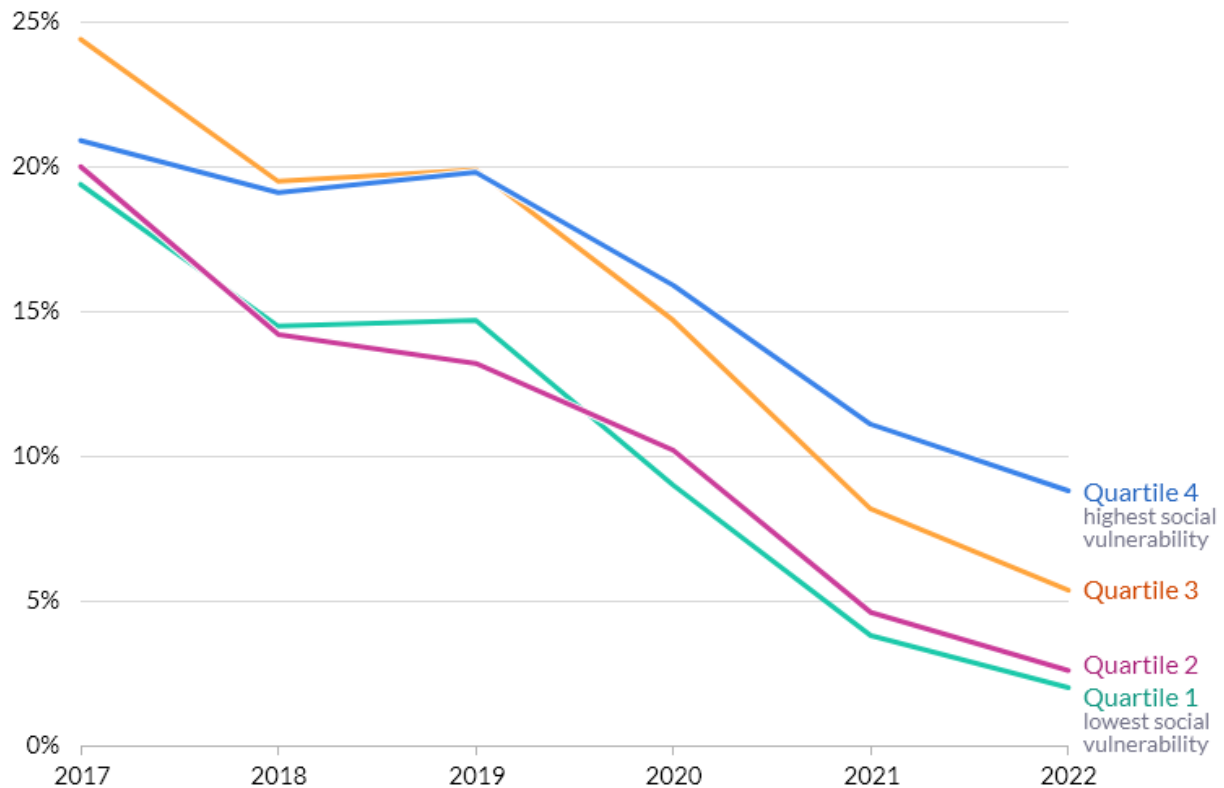
1,346,918 encounters

"Percentage of Encounters with Restoration Type," 2023. EpicResearch.org

Figure 1. Percentage of posterior tooth filling encounters that used amalgam or resin/composite materials by year from 2017 to 2022.

When comparing the rates of amalgam fillings across social vulnerability index quartiles, we found that those most socially vulnerable were most likely to have an amalgam filling, as shown in Figure 2. The rate of amalgam restorations in that group has decreased 58% since 2017, which compares to a 73% decrease in the overall rate of amalgam fillings.

Percentage of Encounters with Amalgam Restoration by Social Vulnerability



1,344,245 encounters

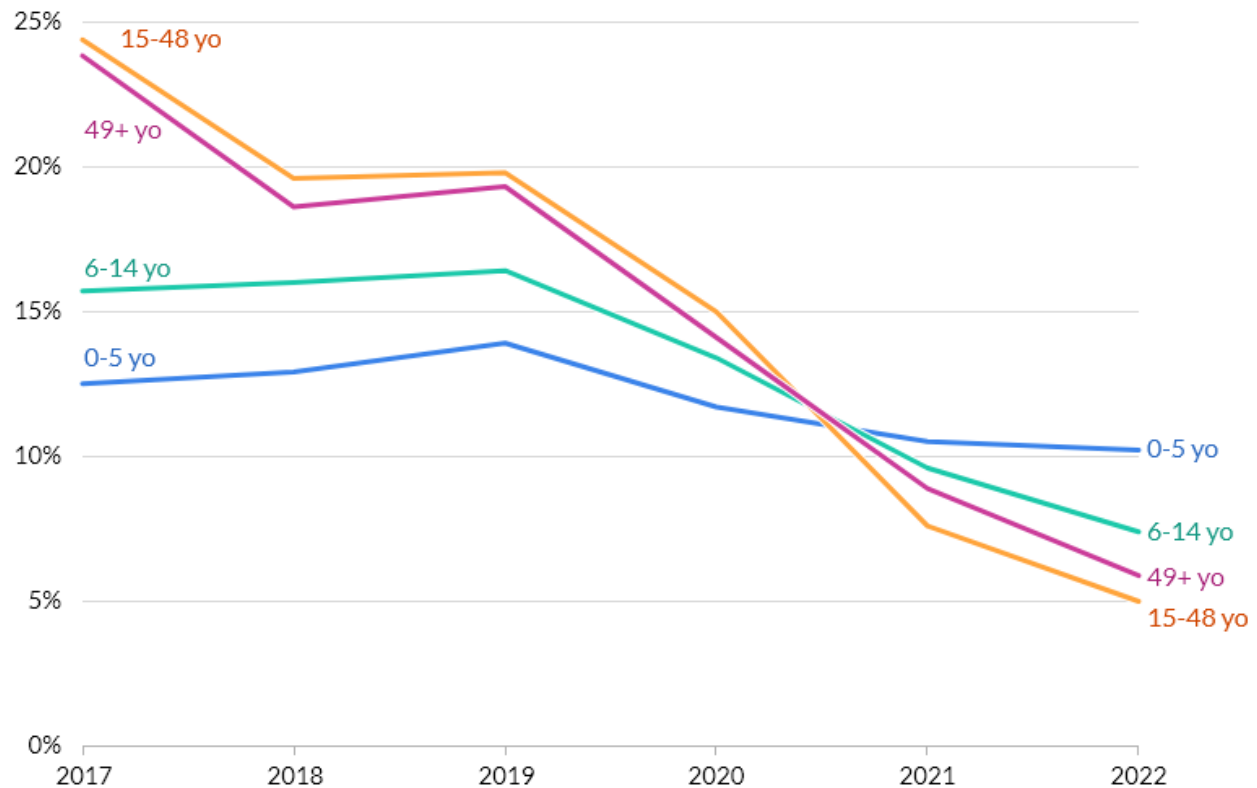
"Percentage of Encounters with Amalgam Restoration by Social Vulnerability," 2023. EpicResearch.org

Figure 2. Percentage of posterior tooth filling encounters that used amalgam materials by year from 2017 to 2022, stratified by social vulnerability index quartile.

Analysis by insurer and rural and urban classification showed similar declines in amalgam use across commercial and government payers as well as rural and urban areas. The proportion of amalgam fillings for patients with Medicaid has decreased 70% since 2017, with less than 7% of fillings using amalgam in 2022.

Additionally, the proportion of fillings that used amalgam decreased across all age groups. Patients under age six, who are considered an at-risk group for mercury exposure per the FDA, had the least decrease in rate over the five-year period and were most likely to receive an amalgam filling compared to other age groups in 2022, as shown in Figure 3. However, children under age six accounted for less than 2% of all posterior tooth filling encounters in 2022, which supports that amalgam fillings are relatively infrequent in this age group.

Percentage of Encounters with Amalgam Restoration by Patient Age



1,346,918 encounters

"Percentage of Encounters with Amalgam Restoration by Patient Age," 2023. EpicResearch.org

Figure 3. Percentage of posterior tooth filling encounters that used amalgam or resin/composite materials by year from 2017 to 2022, stratified by patient age.

Patients aged 15-48 account for the majority of posterior tooth fillings and thus represent the majority of patients with amalgam fillings in the general population. This age group also had the greatest decline over time in the proportion of fillings that used amalgam, as shown in Figure 3. This age group is most likely to include patients who are pregnant, breastfeeding, or attempting to become pregnant, indicating that mercury exposure may be decreasing for this group that the FDA considers high-risk.

This analysis demonstrates that the U.S. appears to have made significant progress in the phasedown in amalgam use. Though there appear to still be some apparent demographic differences, amalgam use in all populations across the U.S. has decreased dramatically.

These data come from Cosmos, a HIPAA-defined Limited Data Set of more than 203 million patients from 208 Epic organizations including 1,187 hospitals and more than 25,400 clinics, serving patients in all 50 states and Lebanon. This study was completed by two teams that worked independently, each composed of a clinician and research scientists. The two teams came to similar conclusions. Epic Research collaborated with the American Dental Association on this analysis. Graphics by Brian Olson.

References

1. Anusavice KJ, Shen C, Rawls RR, eds. Phillips' Science of Dental Materials. St. Louis, MO: Elsevier/Saunders; 2013.
2. Minamata Convention on Mercury. About Us. [About us | Minamata Convention on Mercury \(mercuryconvention.org\)](https://mercuryconvention.org). Accessed August 7, 2023.

3. Minamata Convention on Mercury. Parties and Signatories. [Party Profiles | Minamata Convention on Mercury \(mercuryconvention.org\)](#). Accessed August 7, 2023.
4. U.S. Food and Drug Administration. FDA Issues Recommendations for Certain High-Risk Groups Regarding Mercury-Containing Dental Amalgam. *U.S. Food and Drug Administration*. [FDA Issues Recommendations for Certain High-Risk Groups Regarding Mercury-Containing Dental Amalgam | FDA](#). Accessed August 7, 2023.
5. Worthington HV, Khangura S, Seal K, Mierzwinski-Urban M, Veitz-Keenan A, Sahrman P, Schmidlin PR, Davis D, Ihezor-Ejiofor Z, Rasines Alcaraz MG. Direct composite resin fillings versus amalgam fillings for permanent posterior teeth. *Cochrane Database of Systematic Reviews* 2021, Issue 8. Art. No.: CD005620. DOI: 10.1002/14651858.CD005620.pub3. Accessed August 7, 2023.

Data Definitions

Term	Definition
Study period	1/1/2017 - 12/31/2022
Study population	All dental filling encounters in a department with a specialty of Dentistry or Pediatric Dentistry.
Dental filling encounter	Procedures with HCPCS codes: Amalgam filling - D2140, D2150, D2160, D2161 Resin/composite filling - D2391, D2392, D2393, D2394 *Of note, an encounter may have both amalgam and resin/composite codes which explains why the sum of the percentage of the encounters may be greater than 100%

Appendix

Table 1: Percentage of Encounters with Restoration Type

Year	Amalgam		Resin/Composite	
	% using Amalgam	N	% using Resin/Composite	N
2017	21.5%	27,171	79.9%	101,151
2018	18.2%	26,351	82.9%	120,084
2019	18.6%	30,443	82.5%	134,905
2020	14.3%	17,262	86.6%	104,359
2021	8.3%	24,898	92.2%	276,287
2022	5.7%	27,832	94.7%	465,763

Table 2: Percentage of Encounters with Amalgam Restoration by Social Vulnerability

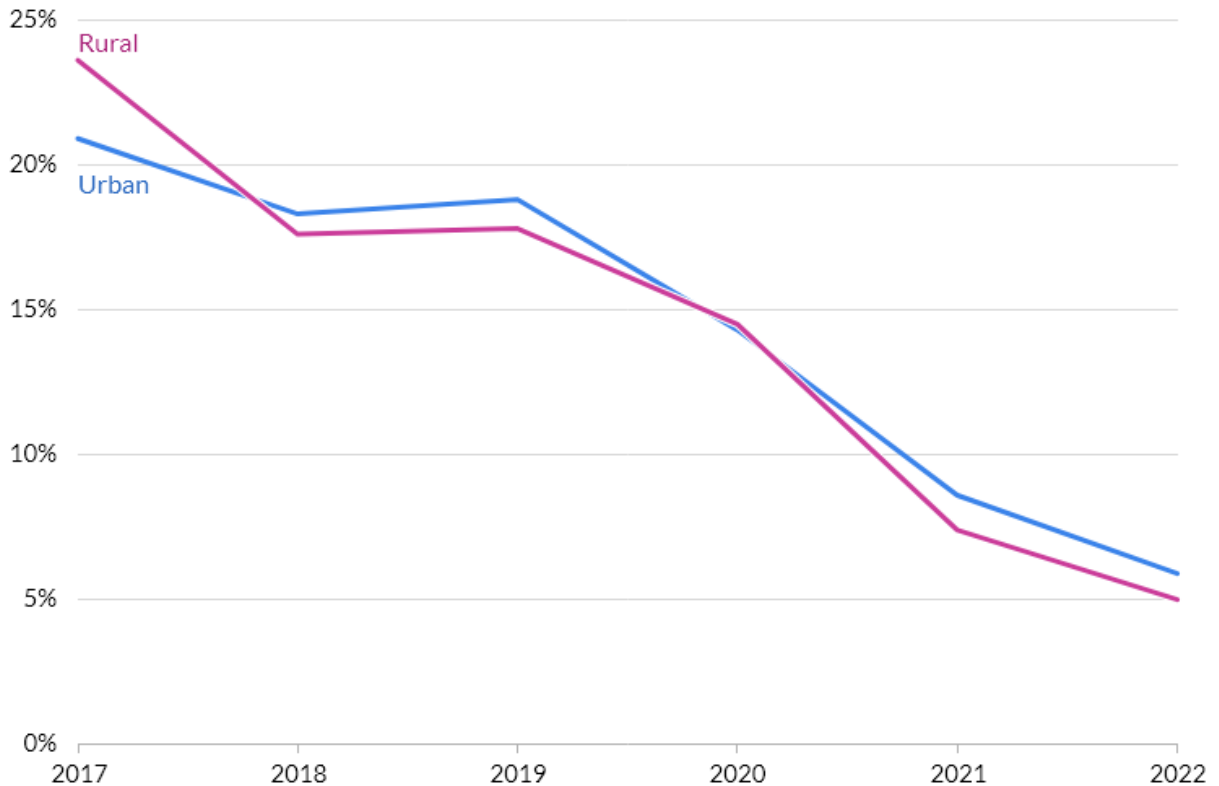
Year	% w/ Amalgam							
	SVI Quartile 1		SVI Quartile 2		SVI Quartile 3		SVI Quartile 4	
	% encs	N	% encs	N	% enc	N	% enc	N
2017	19.4%	1,422	20.0%	3,507	24.4%	6,825	20.9%	15,385
2018	14.5%	1,185	14.2%	2,868	19.5%	5,919	19.1%	16,352
2019	14.7%	1,444	13.2%	3,026	19.9%	6,869	19.8%	19,051

2020	9.0%	796	10.2%	1,767	14.7%	3,970	15.9%	10,709
2021	3.8%	1,289	4.6%	2,613	8.2%	5,932	11.1%	15,033
2022	2.0%	1,378	2.6%	2,742	5.4%	6,607	8.8%	17,082

Table 3: Percentage of Encounters with Amalgam Restoration by Patient Age

% w/ Amalgam								
	0-5 yo		6-14 yo		15-48 yo		49+ yo	
Year	% 0-5 yo encs	N	% 6-14 yo encs	N	% 15-48 yo encs	N	% 49+ yo encs	N
2017	12.5%	756	15.7%	5,061	24.4%	15,117	23.8%	6,237
2018	12.9%	783	16.0%	5,922	19.6%	13,698	18.6%	5,948
2019	13.9%	872	16.4%	6,634	19.8%	15,728	19.3%	7,209
2020	11.7%	447	13.4%	3,524	15.0%	9,300	14.1%	3,991
2021	10.5%	634	9.6%	4,871	7.6%	13,258	8.9%	6,135
2022	10.2%	761	7.4%	5,589	5.0%	14,910	5.9%	6,572

Figure 4: Percentage of Encounters with Amalgam Restoration by Rural or Urban Area



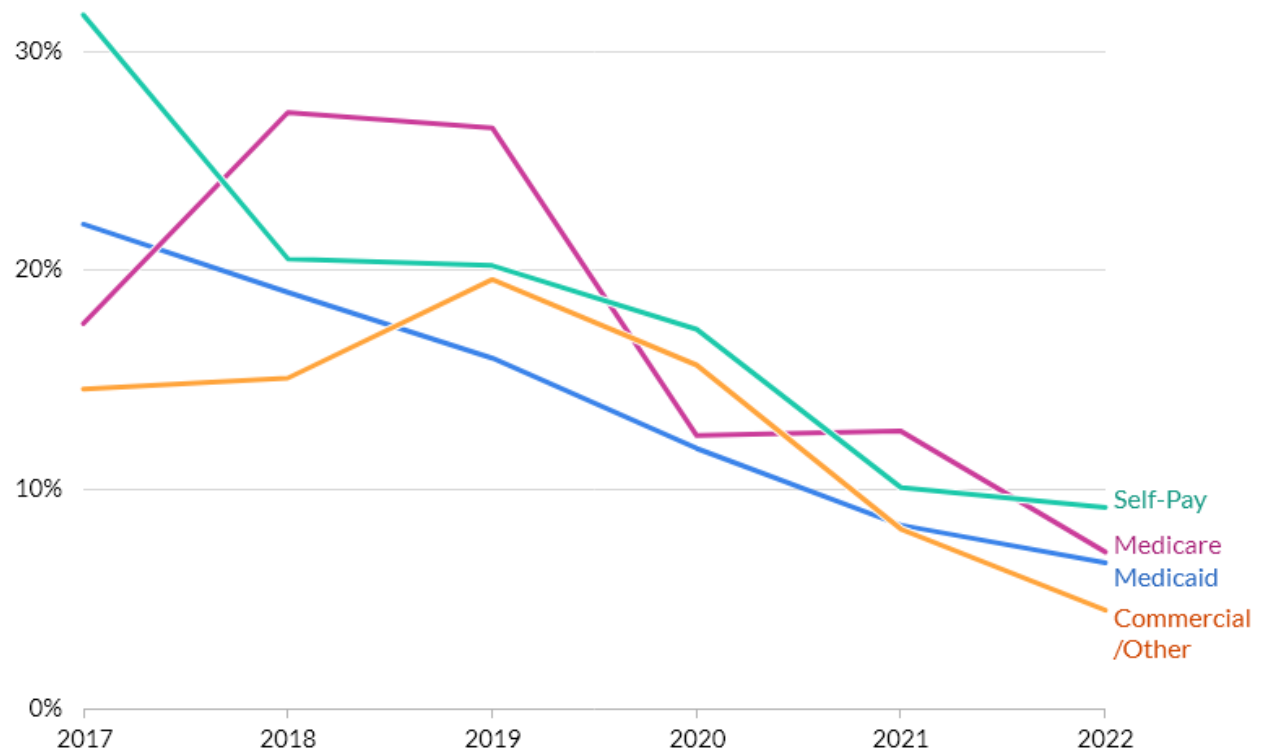
1,344,348 encounters "Percentage of Encounters with Amalgam Restoration by Rural or Urban Area," 2023. EpicResearch.org

Figure 4. Percentage of posterior tooth filling encounters using amalgam by rural or urban classification.

Table 4: Percentage of Encounters with Amalgam Restoration by Rural or Urban Area

% w/ Amalgam				
Year	Urban		Rural	
	% encs	N	% encs	N
2017	20.9%	20,872	23.6%	6,266
2018	18.3%	21,049	17.6%	5,250
2019	18.8%	24,208	17.8%	6,189
2020	14.3%	13,533	14.5%	3,706
2021	8.6%	19,758	7.4%	5,117
2022	5.9%	21,851	5.0%	5,954

Figure 5: Percentage of Encounters with Amalgam Restoration by Insurance Coverage



1,208,401 encounters "Percentage of Encounters with Amalgam Restoration by Insurance Coverage," 2023. EpicResearch.org

Figure 5. Percentage of posterior tooth filling encounters using amalgam by insurance coverage.

Table 5: Percentage of Encounters with Amalgam Restoration by Insurance Coverage

% w/ Amalgam								
Year	Medicaid		Medicare		Miscellaneous/Other		Self-Pay	
	% Medicaid encs	N	% Medicare encs	N	% Misc/Other encs	N	% Self-Pay encs	N
2017	22.1%	14,224	17.6%	107	14.6%	6,150	31.6%	1,961
2018	19.0%	13,393	27.2%	243	15.1%	8,107	20.5%	1,962
2019	16.0%	11,942	26.5%	286	19.6%	12,482	20.2%	2,488
2020	11.9%	5,853	12.5%	79	15.7%	8,634	17.3%	1,519
2021	8.4%	8,129	12.7%	193	8.2%	13,527	10.1%	1,774
2022	6.7%	10,299	7.2%	163	4.5%	12,969	9.2%	2,374

Figure 6: Portion of Posterior Tooth Filling Encounters by Age Group

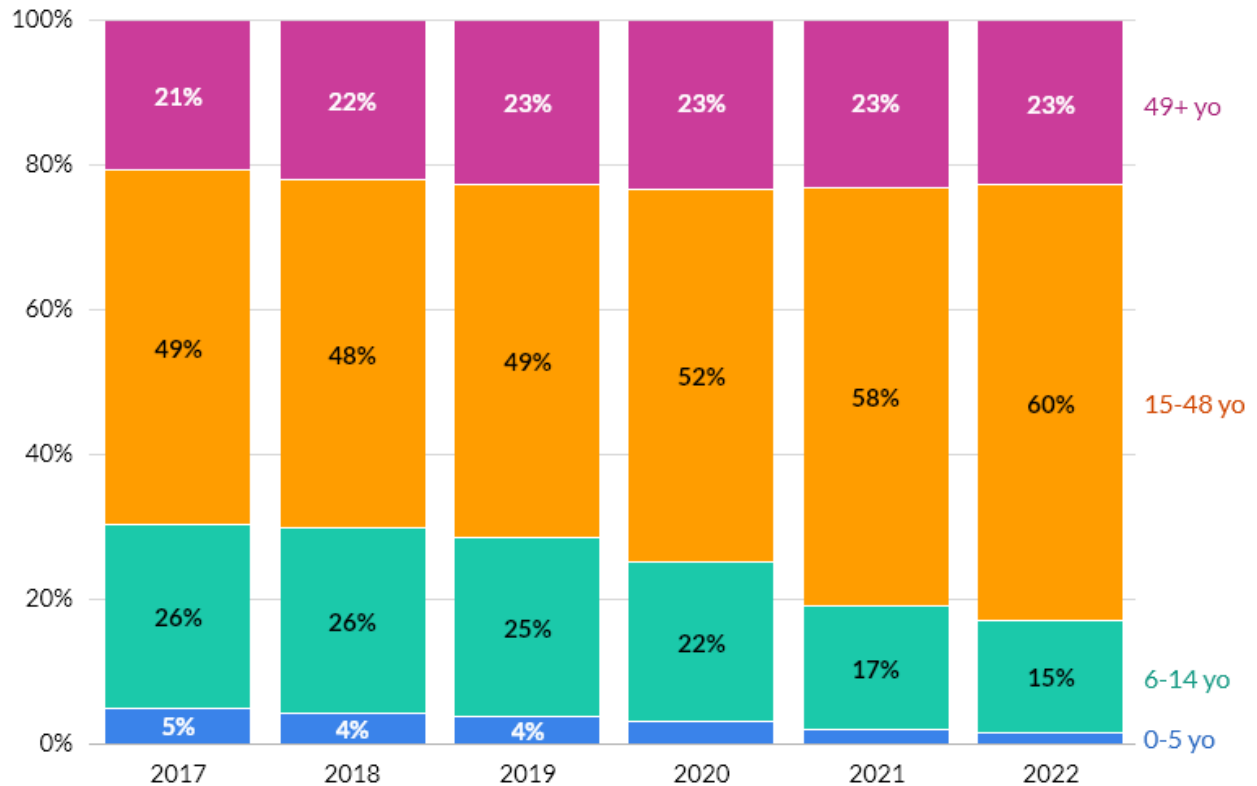


Figure 6. Year over year percentage of posterior tooth filling encounters by patient age.

Table 6: Posterior Tooth Filling Encounters by Age Group

Filling Encounters by Age				
Year	0-5 yo	6-14 yo	15-48 yo	49+ yo
2017	6,043	32,323	62,055	26,162
2018	6,087	37,090	69,733	31,933
2019	6,283	40,388	79,544	37,326
2020	3,826	26,382	62,087	28,243
2021	6,048	50,787	173,710	69,130
2022	7,445	75,892	296,762	111,639