

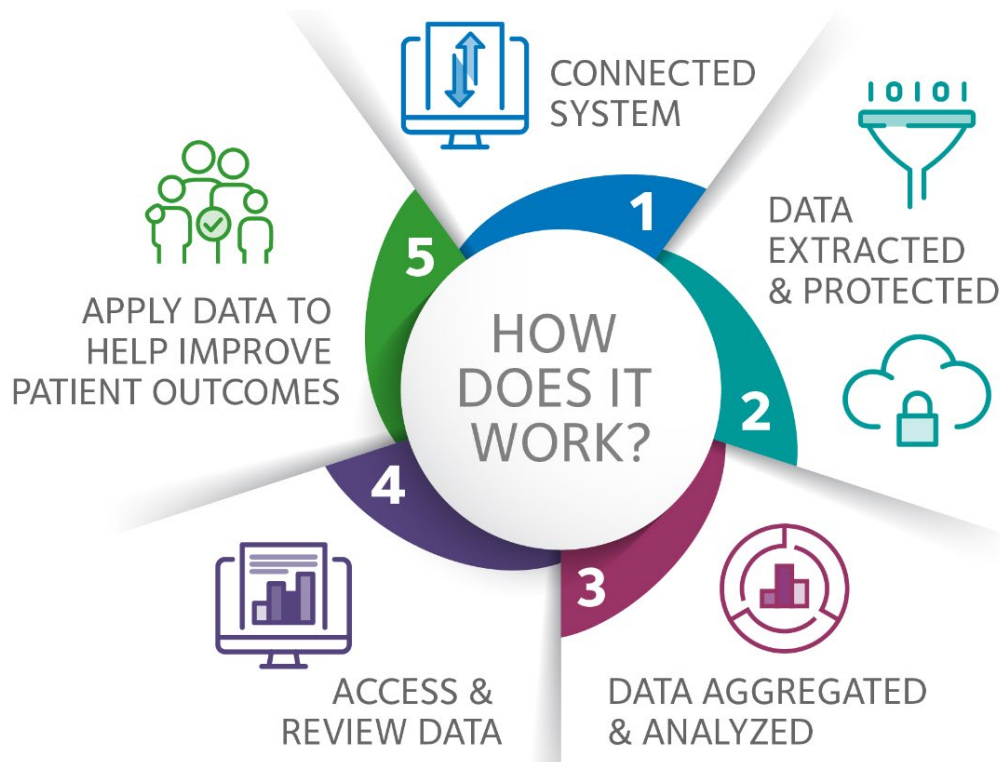
# DERE Research: Connecting individual practices to the big picture

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No conflicts of interest to disclose.

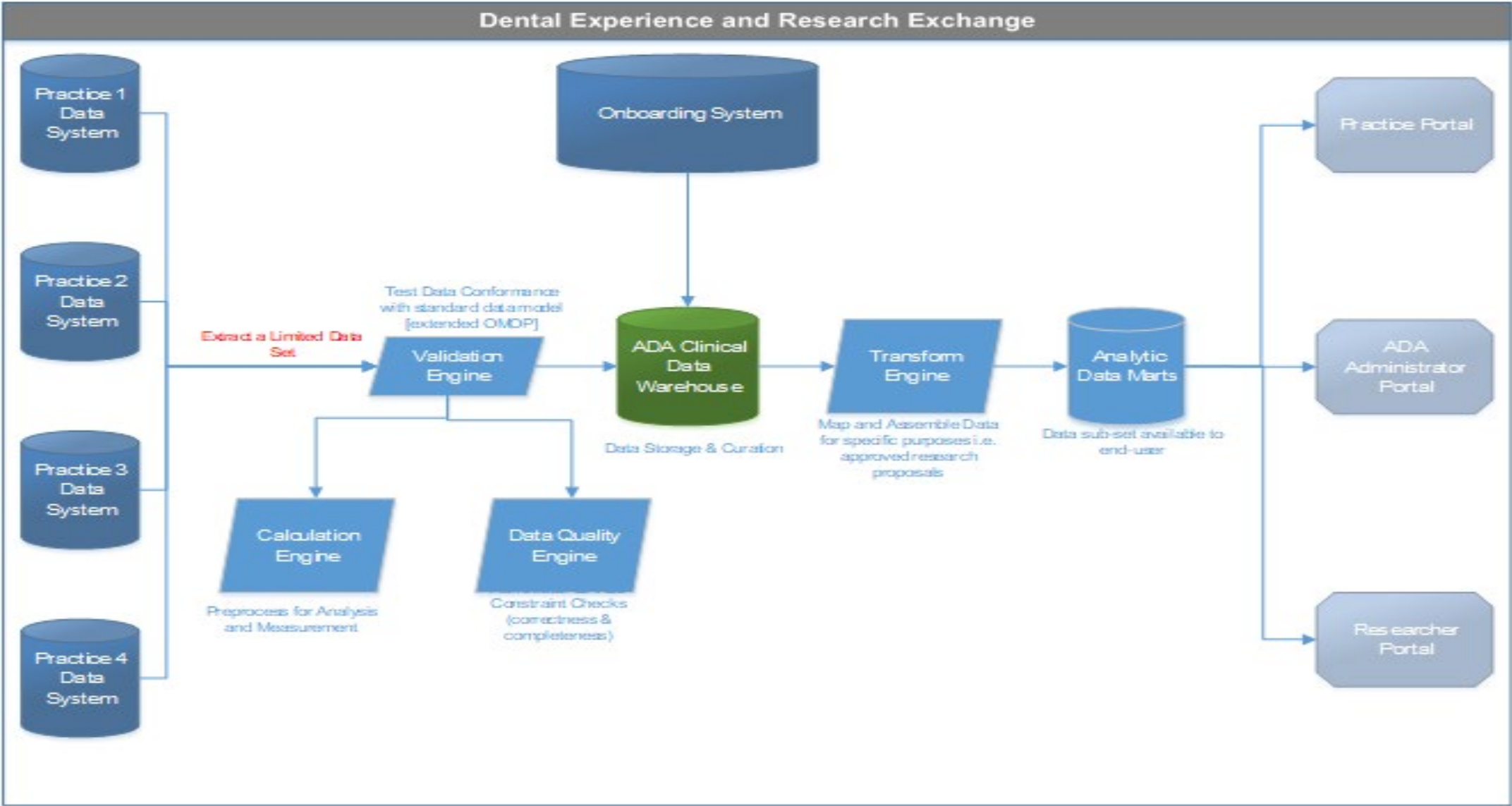


# The ADA Dental Experience and Research Exchange (DERE)<sup>™</sup>



- Cloud-based database
- Data from dental practices updated biweekly
- Currently limited to practices using Open Dental Version 19.3 or higher for the practice management system
- Currently includes ~ 525,000 patients and >1 million dental procedures

# ADA DERE System Architecture



## Observational Medical Outcomes Partnership Common Data Model (OMOP) common data model



Interoperability useful for health systems integrating multiple types of care

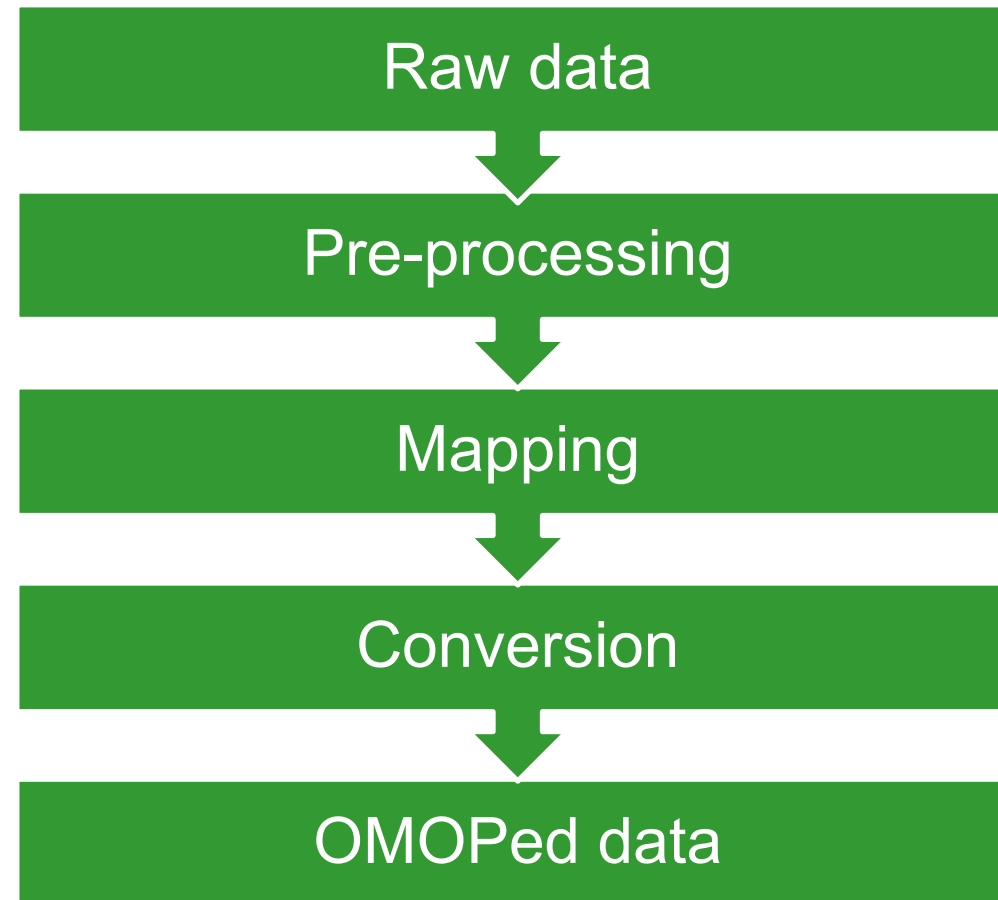


Shared organization and vocabulary necessary in order to combine data from multiple sources



Speeds and encourages consistent, comparable analyses across researchers and sites

# Transforming data for research in DERE



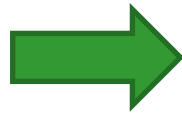
# OMOP conversion example

In electronic health record:

- Patient Information module

Gender

Male
<b>Female</b>
Other
Unknown



In DERE research portal:

- person-data .csv file
- gender\_source\_value = Female
- gender\_source\_concept\_id = 0
- gender\_concept\_id = 8532

# DQA related data in ADA DERE research database:

- Current dental terminology (CDT) codes
- Procedure date
- Procedure tooth
- Procedure tooth surface
- Patient gender, location, primary language, select medical conditions, and birth date
  
- Suitable for DQA measures that use dental claims data
- Currently not useful for DQA measures that require medical or administrative data

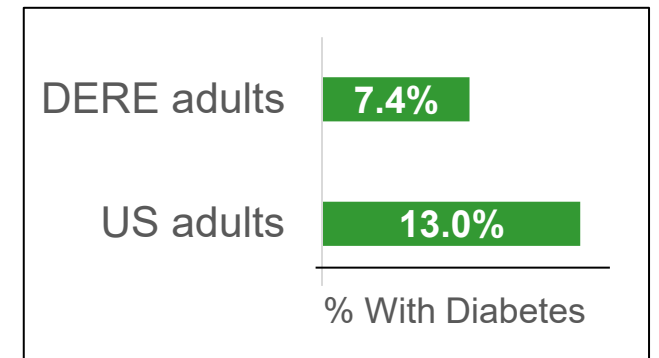


# Oral Care During Pregnancy

- Percentage of enrolled persons aged 15 through 44 years with live-birth deliveries in the reporting year who received
  - a comprehensive or periodic oral evaluation during pregnancy.
  - any dental service during pregnancy.
- ICD-10 or Current Procedural Terminology (CPT) codes
- Age
- CDT codes

# Adults with Diabetes—Oral Examination

- Percentage of adults with diabetes who received a comprehensive or periodic oral evaluation or a comprehensive periodontal evaluation within the reporting year.
- Age
- Diabetes diagnosis, acute care, or medication
- CDT codes
- Drawbacks
  - Diabetes is self-reported and not necessarily diagnosed
  - No onset date, rarely an end date
  - Can't exclude based on payor (for instance dual eligibility for Medicaid and Medicare) or whether palliative or hospice care was received



# What DQA measures are possible?

- Topical fluoride for children, adults at elevated caries risk
- Non-surgical ongoing periodontal care for adults with periodontitis
- Periodontal evaluation in adults with periodontitis
- Preventative services for children
- Receipt of sealants on permanent 1<sup>st</sup> or 2<sup>nd</sup> molars
- Care continuity or source
- Efficiency and cost

# Analysis and stratification

- Age
- Primary language
- Location
  - State
  - Zip
  - Distance between patient home and care site
  - Characteristics of location (ex: community water fluoridation level, deprivation index, density, dental health professional availability)
- Time
  - Since last visit
  - Between procedure of interest and outcome

# Pilot research: restoration materials

- To describe the annual incidence and trends in amalgam restoration.
- To estimate whether means and trends in amalgam restoration placement differ by year or patient characteristics.

# Data access for research

- All Researchers must complete enrollment documents and attest to a training designed to support compliance with HIPAA.
- Downloadable Limited Dataset: Each research application must be reviewed and approved by the ADA DERE Research Review Committee. This application includes:
  - Research Protocol
  - Data Management Plan
  - Research Abstract
  - Institutional Review Board (IRB) Approval or Exemption
  - IRB Waiver of Informed Consent
  - Researcher Agreement/Data Use Agreement

# Methods

- DERE records were included if they had a CDT in Restorative Service category from 1/1/2012 through 11/29/2022
- Restorations coded D2140, D2150, D2160, D2161 considered to contain dental amalgam
- Rural or urban location determined by RUCA 3 classification of home address
- Age calculated as date of restoration – birth date
- Age groups chosen to reflect groups the FDA strongly recommends do not receive amalgam restorations
- Available case analysis
- Frequencies, percentages, ANOVA, Wilcoxon-Mann-Whitney U tests and multilevel polynomial linear regression performed in Stata 17.0
- Change points in slopes calculated in Joinpoint Regression Program 4.9.1.0
- Alpha set at 0.05

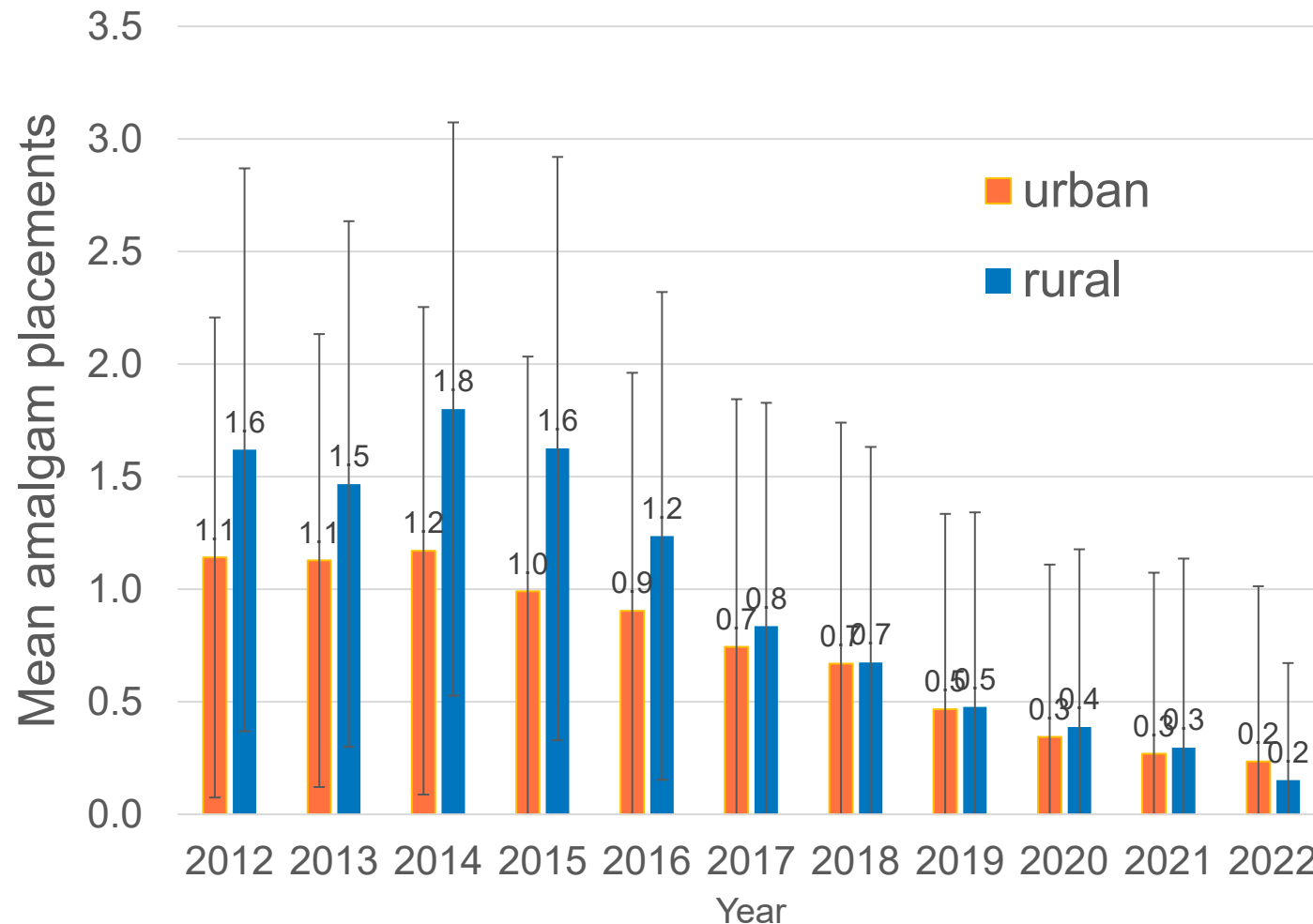
# Sample characteristics

- 189,352 patients
- 1,050,493 restorative procedures

Patient characteristic	N	%
Male	94,724	44.7%
Female	116,610	55.0%
Unknown sex	705	0.3%
Urban home address	171,853	81.1%
Rural home address	39,120	18.5%
Unknown address	1,066	0.5%
Mean age at restoration (SD)	34.16 (22.57)	
Unknown age	11	0.0006%

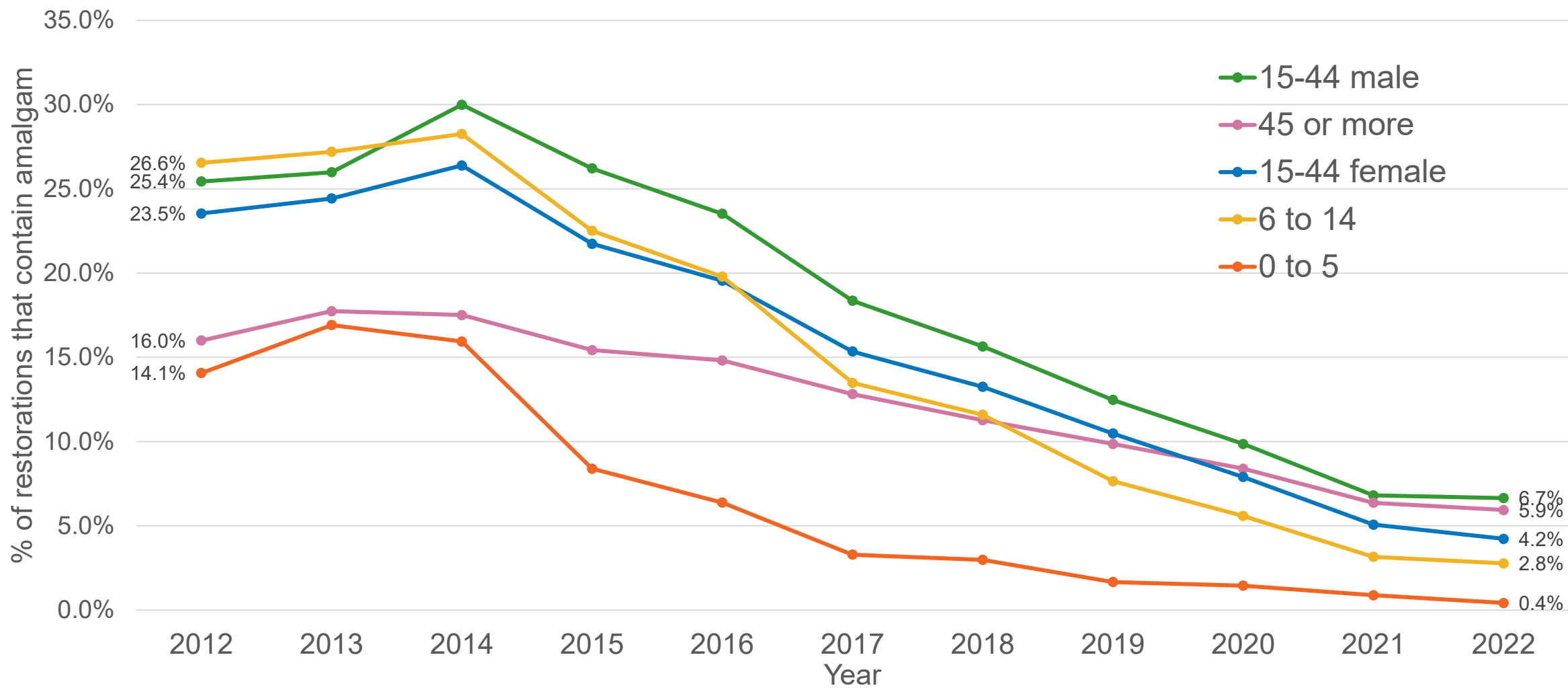


# Mean amalgam by location type

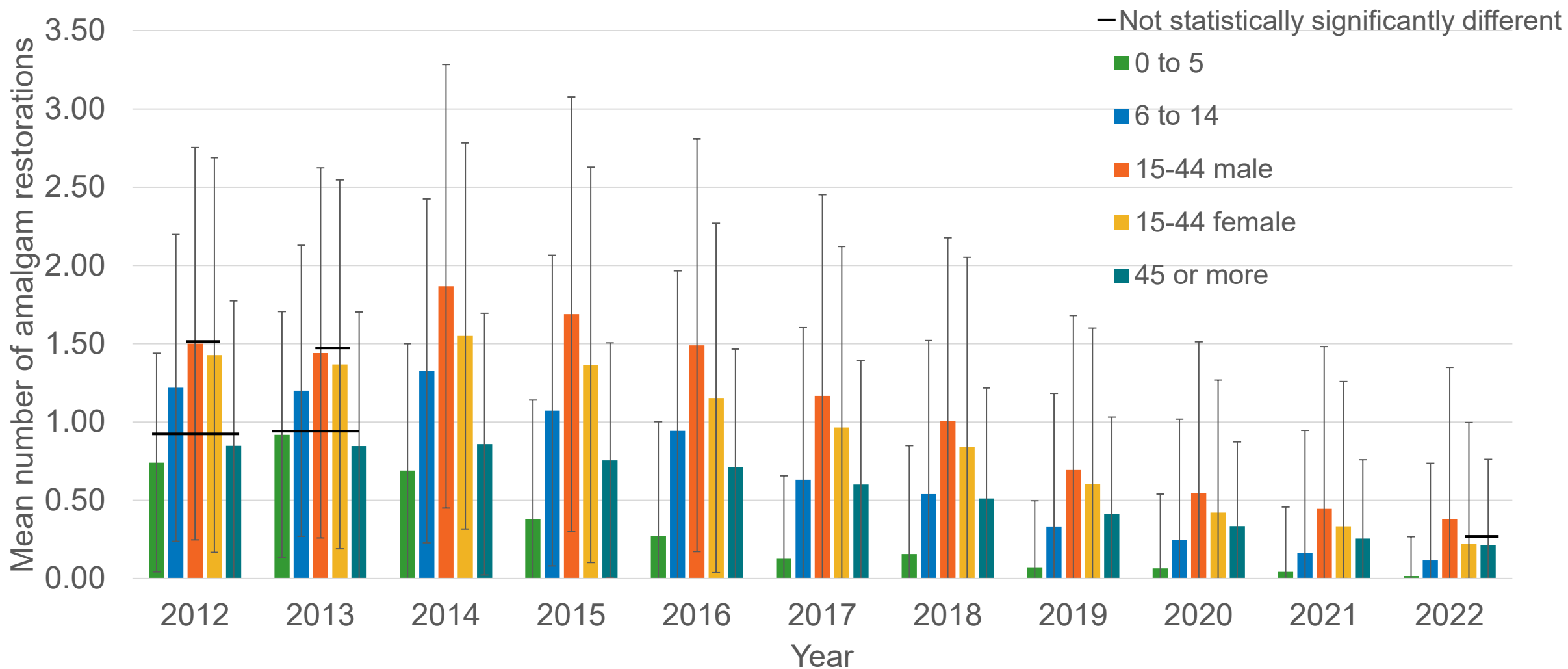


- Rural patients have statistically significantly higher nearly every year
- Magnitude of difference began diminishing after 2015

# Proportion of restorations containing amalgam, by age

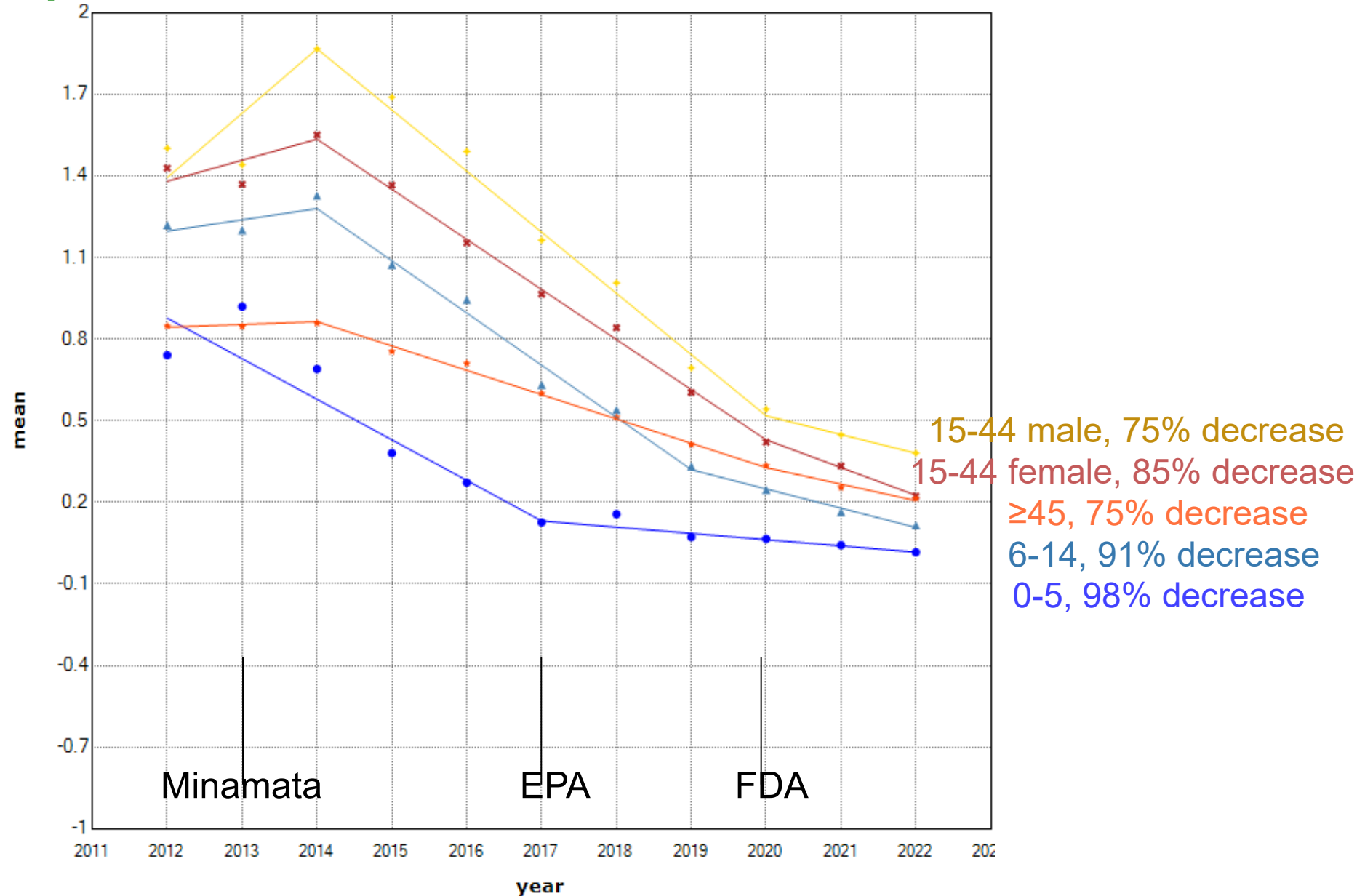


# Mean number of amalgam restorations per year

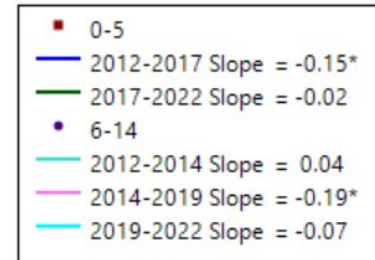
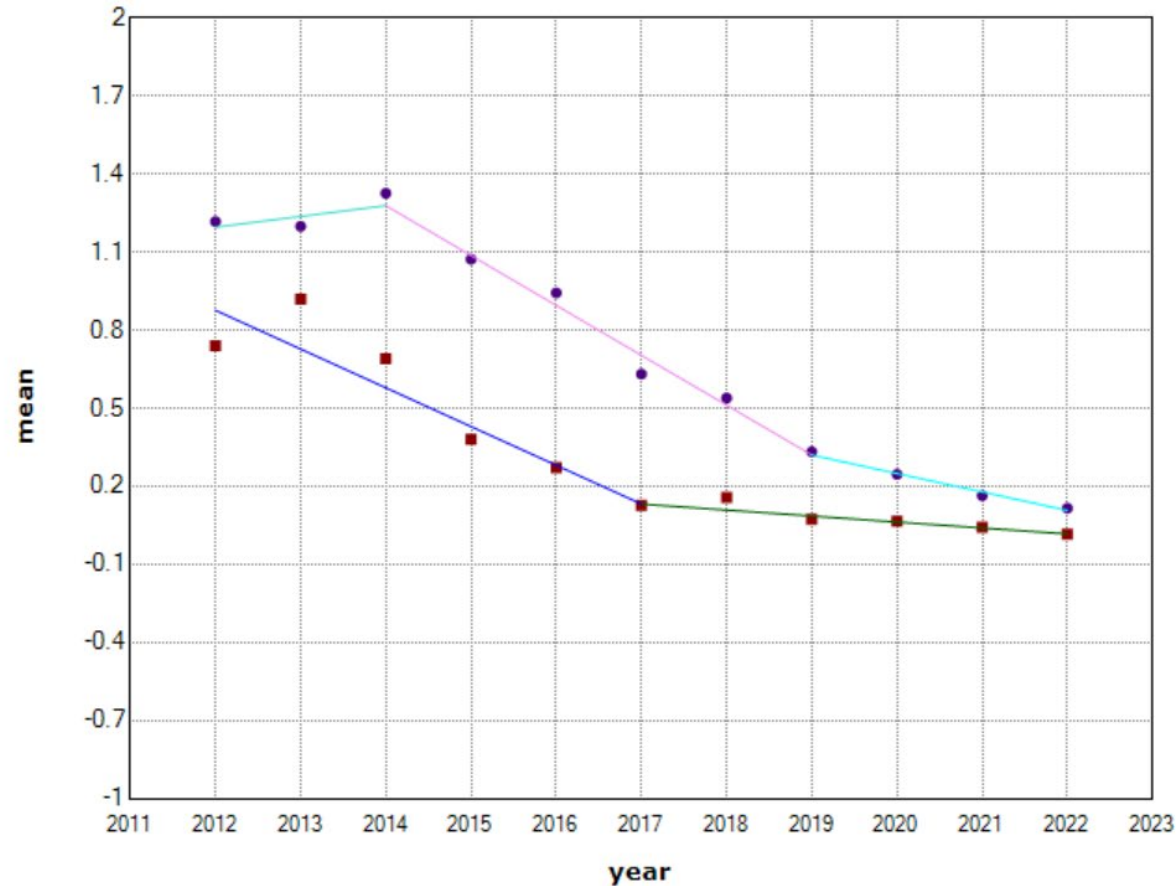


# Comparing temporal trends

- Multiple significant breaks in trends
- Mean amalgam restorations trending downward for all groups after 2014



## Trends in mean amalgam placements in <15 year olds

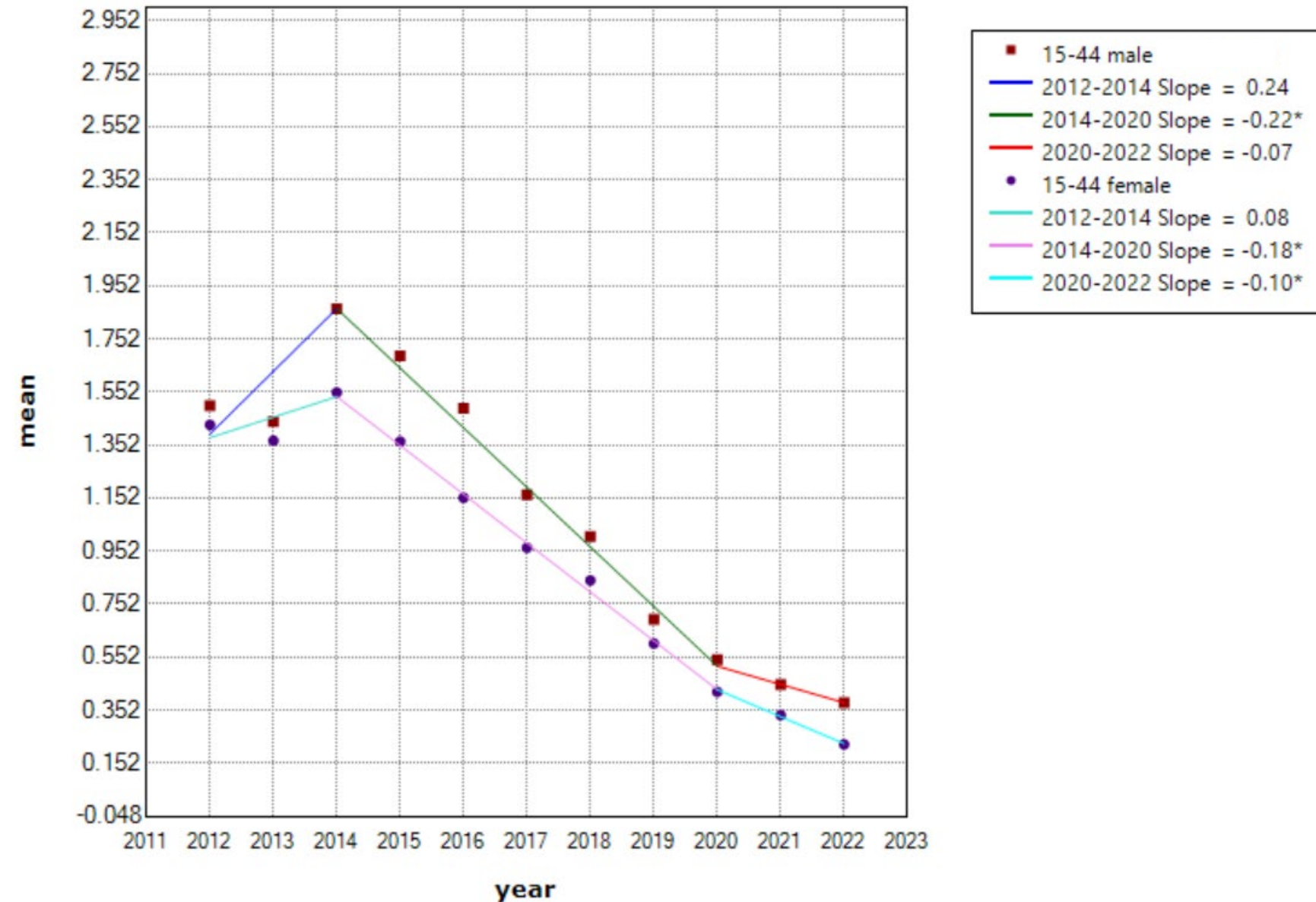


- Regression functions not identical, means not parallel
- 0-5 year olds: start at 0.7 amalgam placements/year, significant decrease at 0.15 amalgams per year until 2017, then slope plateaus at under 0.02 placements/year
- 6-14 year olds: start at 1.2 placements/year, begin decreasing at a significant rate of 0.19 placements a year until 2019, then non-significant decline to end at 0.1 placements/year

\* Indicates that the Slope is significantly different from zero at the alpha = 0.05 level  
Final Selected Model: 0-5 - 1 Joinpoint, 6-14 - 2 Joinpoints. Rejected Parallelism.

# Reproductive age

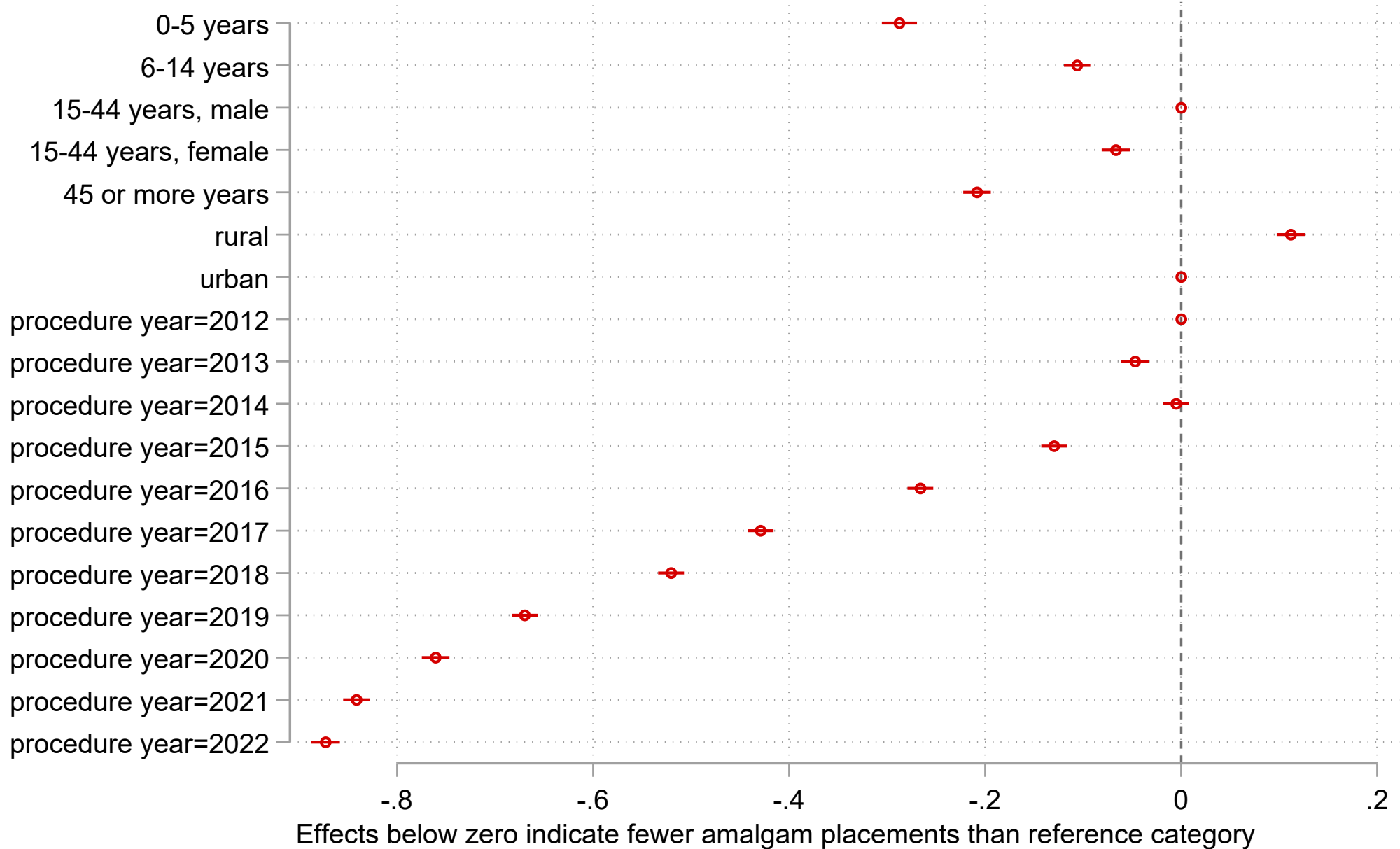
- Regression functions not identical, mean functions not parallel
- Significant change point in 2014 for both sexes



\* Indicates that the Slope is significantly different from zero at the alpha = 0.05 level

Final Selected Model: 15-44 male or unknown - 2 Joinpoints, 15-44 female - 2 Joinpoints. Rejected Parallelism.

# Polynomial mixed effects ML regression: mean amalgam placements



# Pilot study conclusions

- Placements of dental amalgam restorations significantly decreased since 2014 in every patient age or DERE-participating practice location.
- Children under 6 and patients of reproductive age exhibited the greatest significant decline in mean amalgam placements.
- By 2022, only 0.4% of restorations in children under 6 and 4.2% in females of reproductive age were dental amalgam.
- Dental amalgam was still in use in the US in 2022.



# DERE for quality evaluation, improvement

- Within a single practice
- System-wide
- Dentistry as a whole



# The Ultimate Goal

## A Learning Health System



*A continuously learning health system is one in which science, informatics, incentives, and culture are aligned for continuous improvement and innovation, with best practices seamlessly embedded in the delivery process and new knowledge captured as an integral by-product of the delivery experience*

Institute of Medicine; Smith M, Saunders R, Stuckhardt L, et al., editors.  
Washington (DC): National Academies Press (US); 2013.



# Thank you

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