Impact of Eliminating Medicaid Adult Dental Coverage in California on Emergency Department Use for Dental Problems

Introduction:

Oral health is an integral part of overall well-being. Apart from having a significant direct effect on the quality of life, oral diseases have also been associated with systemic diseases including cardiovascular, diabetes and pregnancy outcomes, although the mechanism of the association is not fully understood.

Medicaid program is jointly funded by state and federal government and administered by the state to provide health insurance to the poor and needy population subgroup. Dental coverage is mandatorily provided for children under the Early and Periodic Screening Diagnosis and Testing component of Medicaid, but dental coverage for adults is optional. So individual states can decide if, and to what extent, to provide dental coverage for adults enrolled under Medicaid (Center for Medicaid and Medicare Services). As a result, there is great variation in what dental services are covered by different states.

Medicaid enrollees are low-income, vulnerable population subgroup with very limited resources and in the absence of Medicaid dental coverage, they are unable to receive regular dental services in the traditional venues like a dental office. Instead they are left with emergency departments as their only resort to turn to, in case of any dental problems. Many studies have found that among those who visit an emergency department (ED) for dental problem, uninsured and Medicaid insured adults form a vast majority (Billings, Parikh, and Mijanowich 2000; Guay 2004, 1599-605; quiz 1623). Hospital EDs and the emergency personnel are not equipped and trained to diagnose and treat dental diseases effectively. As a result, majority of patients who
visit ED with a dental problem are prescribed medicines and do not receive any definitive dental treatment.

Due to budget constraints, many states have eliminated or limited the dental benefits offered to Medicaid adults over the past 10 years (Mullins et al. 2004, 672-687; Shapiro 2008). Some studies have examined how this policy change affected ED use for dental problems by the affected population. One such study was done in Maryland to examine the impact of elimination of Medicaid adult dental coverage in 1993. Using a before-after comparison, the authors found a 21.8% increase in ED dental visits (Cohen, Manski, and Hooper 1996, 605-609). Another study examining the same policy change in Maryland found a 12% higher rate of ED visitation in the post-policy change period, after adjusting of age, sex and the enrollment period (Cohen et al. 2002, 715-24; quiz 768). Although the authors adjusted for person-years of eligibility and many other factors, the study design was still a before-after comparison, which has inherent deficiencies. Massachusetts reduced its Medicaid adult dental coverage in 2002 and 2003, and this reduced the number of Medicaid enrollees who got dental services by more than 100,000 compared to the previous years, and strained the community health centers with limited capacities (Pryor and Monopoli 2005). Oregon eliminated adult dental coverage for Oregon Health Plan Standard (OHP Standard), which comprised of adults and couples with incomes less than 100% federal poverty level, whereas dental coverage was retained for Oregon Health Plan Plus (OHP Plus) enrollees, which included enrollees based on temporary assistance to needy families or presence of disabling condition (Wallace et al. 2011, 2144-2150). The impact of eliminating dental coverage was examined by comparing these two subgroups concurrently from consumer as well as Medicaid program’s perspective. The authors reported that compared to enrollees who retained dental benefits, the ones that lost benefits had 101% increase in ED use
for dental problems and had 3 times the odds of reporting an unmet dental need (Wallace et al. 2011, 2144-2150).

California Medicaid program (MediCal) provided comprehensive adult dental coverage until July 1, 2009, when dental coverage for adults was eliminated (Denti-Cal Bulletin 2009). Although many studies have examined the impact of the Medicaid adult dental coverage policy on emergency department use, the study design had limitations which make the findings unreliable. The current study proposes a robust quasi-experimental approach, interrupted time series analysis to examine the impact of Medicaid adult dental policy change in California. The use of EDs for dental problems is the outcome of interest.

We hypothesized that the proportion of Medicaid adult enrollees who visit an ED for dental problem will increase significantly after dental coverage for Medicaid adult enrollees was eliminated by the state of California.

**Methods:**

Data source: State Emergency Department Databases (SEDD) captures the visits to a hospital affiliated emergency department (ED) that do not result in a hospitalization. SEDD is a part of the Healthcare Cost and Utilization Project (HCUP), which was developed through a federal-state-industry partnership sponsored by Agency for Healthcare Research and Quality (AHRQ). California SEDD was purchased from AHRQ for 6 years, 2006 to 2011, and a data use agreement was signed. SEDD contains all ED visits made in the state and is not restricted by payer type.
Target Population: Medicaid adult enrollees in the state of California over the study period of six years comprised the target population for this study.

Conceptual Model/ Study Design: Quasi-experimental study designs are nonrandomized studies of interventions, which are employed when randomization is not feasible due to logistic or ethical reasons. Policy decisions are usually made in response to budgetary restraints and can rarely be randomized. Hence, quasi-experimental study designs can be very useful to examine causal implications due to policy changes.

Interrupted time series is one of the strongest quasi-experimental study design, which consists of a string of equally spaced observations interrupted by an intervention. This design is robust despite the lack of randomization as multiple pre and post intervention observations allow the detection of and accounting for the time trends that are unrelated to the intervention. Additional features, such as nondependent outcome variables allow for researchers to minimize many threats to internal validity like history and maturation. The current study utilized an interrupted time series study design with nondependent outcome variables.

Main variables: The main outcome variable was the number of Medicaid adult enrollees who visited an ED with primary diagnosis of dental disease, per 100,000 enrollees per month. The main explanatory factor was the Medicaid adult dental coverage policy change. The nondependent outcome variables were number of Medicaid adult enrollees who visited an ED with primary diagnosis of asthma per 100,000 enrollees per month. Dental visits were identified as the ED visits with primary diagnosis ICD-9-CM codes of either of the following: 521.00-521.99, 522.00-522.99, 523.00-523.99, 525.00-525.99, 528.00-528.99; and asthma visits were identified as ED visits with the primary diagnosis of ICD-9-CM codes among: 493.00-493.99.
Statistical analysis: Segmented linear regression was the analytic technique used to assess the interrupted time series study. The model is denoted as follows:

\[ Y = \beta_0 + \beta_1 \text{time} + \beta_2 \text{intervention} + \beta_3 \text{time after intervention} + \beta_4 \text{seasonality} + \epsilon \]

Where,

\( \beta_0 \): Baseline intercept

\( \beta_1 \): Baseline slope

\( \beta_2 \): Change in intercept after intervention

\( \beta_3 \): Change in slope after intervention

\( \beta_4 \): Presence of seasonal trends

\( \epsilon \): Error term

The change in intercept (\( \beta_2 \)) and change in slope (\( \beta_3 \)) after the policy change occurred would indicate an immediate or a gradual change, respectively, in the proportion of Medicaid adult enrollees visiting an ED for dental problems. Hence, our hypotheses stated in the terms of the model are:

\[ H_A: \beta_2 > 0 \text{ and/ or } \beta_3 > 0 \]

The presence of autocorrelation was examined using the Durbin-Watson test. The regression also accounted for any seasonal trends in the data. Significance was determined at \( p<0.05 \) and SAS v9.3 was used to conduct all statistical analysis.
Results:

Over the study period of six years, 113,309 Medicaid adult enrollees visited the ED for a dental problem while 108,884 Medicaid adult enrollees visited for asthma. The average no. of Medicaid adult enrollees who visited an ED each month for dental problem was 42 enrollees/100,000 enrollees in the pre-policy change period and 55.43 enrollees/100,000 enrollees in the post-policy change period. The rates for asthma visits were 45.54 enrollees/100,000 enrollees in pre-policy change period and 46.8 enrollees/100,000 enrollees in post-policy change period (Figure 1).

Testing for autocorrelation revealed a Durbin-Watson statistic of 2.2, which can be considered as an evidence for very weak autocorrelation. Analytic method accounting for autocorrelation revealed estimates to be same as the method that does not account for autocorrelation.

Segmented linear regression model for dental ED visits had an excellent fit with R-squared of 86.7%. There was a significant baseline trend with the number of Medicaid adult enrollees/100,000 enrollees who visit an ED for dental problem increasing throughout the study period (beta=0.26, p-value < 0.0001). The change in intercept after the policy change occurred was significant with 4.75 more enrollees visiting an ED for dental problems (p-value=0.0011). However, there was no significant change in slope after the policy change occurred. Seasonal trends were also not significant. This confirms the hypothesis that more Medicaid adult enrollees/100,000 enrollees visit an ED for dental problem in the post-policy change period (Figure 2a).

Segmented linear regression model for asthma ED visits as control variable had a poorer fit with R-squared of 25.7%. There were neither any significant baseline trends nor any significant
change in intercept or slope post-policy change. However, seasonal trends were significant (p-value < 0.0001) (Figure 2b).

**Discussion**

The current study is the only study, to the best of our knowledge, which examines the impact of Medicaid adult dental policy coverage using an interrupted time series study design. This study with a robust study design provides evidence that eliminating adult dental coverage under Medicaid leads to an immediate and significant increase in the use of hospital ED for dental problems.

The current study comprised of all emergency department visits in the state of California, rather than a sample of few hospitals, as reported in several past studies (Cohen, Manski, and Hooper 1996, 605-609). This eliminates the selection bias that could affect the conclusions. Our study results agree with other studies that have examined this policy, but provide a stronger evidence for causal relationship by using quasi-experimental study design. Interrupted time series study design is the approach of choice to examine a policy, and is considered as level II evidence by Cochrane reviews due to its robustness (Wagner et al. 2002, 299-309; Sanson-Fisher et al. 2007, 155-161). Due to the study design incorporating a ‘time trend’, it accounts for all the unmeasured confounders that may occur or change over the study period. For example, economic recession, fluoridation policy change etc. are not specifically introduced in the model, but their effect on ED visits is accounted for by the time term in the model.

When number of Medicaid adult enrollees visiting an ED for dental problems and asthma per 100,000 enrollees are compared in Figure 1, it is evident that the trend is increasing for dental
visits, whereas it is more or less stable for asthma. Another evident fact is the seasonal trends in asthma ED visits, as we would expect based on past literature (Reeves et al. 2006, S106-17).

The statistical segmented linear regression model for dental ED visits has an excellent fit, with R-squared of 86.7% which implies that the current model explains almost 87% of variability in the outcome variable. We find a significant increasing trend in ED visits for dental problems throughout the study period, which is in agreement to many state and national studies that have reported an increase in ED dental visits, especially among Medicaid enrollees and uninsured (Okunseri et al. 2011, 540-550; Wallace et al. 2011, 2144-2150; Pew Children's Dental Campaign 2012; Shortridge and Moore 2009, 238-245).

Our findings confirmed our hypothesis that elimination of Medicaid adult dental coverage will increase the use of EDs for dental problem by Medicaid adult enrollees. The current study also provides evidence as to when and how much of an increase in ED visits can be attributed to the policy change- we conclude that the policy change leads to an immediate increase in ED visits and does not affect the trends significantly over the study period. The findings also indicate that this increase in ED visits is stable and does not wear off, at least over the two and a half years after the policy change. No previous studies have been able to provide such information about the impact of policy.

Although the current study used a comprehensive source of data and a reliable study approach, it does have a few limitations. Firstly, emergency visits that led to a hospital admission were not included in the dataset, which implies that we may be underestimating the impact of the policy change. Secondly, we could only follow up for two and a half years after the policy change as data was not available beyond 2011. This limits us in estimating the longevity of the impact of
policy analysis. Finally, economic data was not available through the State Emergency Department Databases, which limits us from performing any economic analysis, which would be most useful and relevant to policymakers.

The current study is very time relevant and significant as many states are about to expand their Medicaid programs under the Affordable Care Act. This will extend Medicaid coverage to as many as 9 million uninsured adults (Kaiser Family Foundation 2014), who likely have pent-up unmet dental need (Nasseh, Vujicic, and O'Dell 2013). Moreover, the federal government will provide almost entire funding for the first few years to expand coverage to these populations. This extends an unprecedented unique opportunity to the states, to expand dental coverage to these newly Medicaid eligible populations, and thereby improve their oral health and reduce the unnecessary and inefficient use of emergency departments for dental problems.

Future studies should examine the impact of policy change from an economic standpoint, such as a cost-effectiveness analysis. Such analysis would be of immense use to policymakers and stakeholders in deciding whether to expand dental coverage for adults, especially under the ACA as this population is set to expand nationally.