A Primer for States: Cross Frequencies and Regressions

Linkage between Existing Measures in the CHIPRA Initial Core Set, based on enhanced specifications (Measure 13: Percentage of Eligibles That Received Preventive Dental Services, and Measure 17: Percentage of Eligibles That Received Dental Treatment Services)

This primer describes a methodology for analyzing administrative claims data to examine the relationship between preventive dental services and dental treatment. When this analysis was run by the PMCoE Dental Project using this specific study design, relationships were found, specifically related to the five hypotheses tested. Using multivariate regression models (both logistic and linear), allows for a more complex examination of the relationships and also adjusts for external factors that may influence the results (e.g., variation by age). However, the study design does not control for other influences, such as access to dentists or doctors who accept Medicaid patients, important elements affecting health care utilization. It could be beneficial for state Medicaid programs to conduct these tests over a number of years to analyze the relationships between preventive and dental treatment services in their programs. It would also allow for further exploration of the potential benefits of medical/dental collaboration to ensure that more children who are seen in the medical office for well child care are also seen in the dental office for prevention and dental treatment services. The continued surveillance of these aforementioned relationships will assist Medicaid with identifying utilization and potential health-risk trends that will allow these programs to more appropriately allocate their limited resources to targeted intervention programs that will likely result in improved patient care and decreased healthcare costs.

SUMMARY

This is a specification that describes a set of cross frequencies with statistical options as well as a set of logistic regressions.[1] The purpose of this analysis is to examine the relationship between dental prevention and treatment services.

Based on enhanced specifications for measures 13 and 17, our approach calculates the percentage of individuals ages 1 to 18 that are enrolled in Medicaid or CHIP Medicaid Expansion programs, are eligible for EPSDT services, and that received both preventive dental services and dental treatment services; relationships are analyzed between prevention and treatment, between treatment and prevention, and oral health services from a medical provider to a later dental visit.[2]

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[1] Using proc freq statements in Statistical Analysis Software (SAS)

[2] These specifications do not apply eligibility for EPSDT services. These specifications supplement our feasibility testing using MarketScan Medicaid data. Our testing population was Medicaid enrollees.

CROSS FREQUENCIES

The cross tabs examine the relationship between prevention services as well as the relationship between prevention and treatment for specific age groups. For each age group, a cross frequency comparison (see p.6 'ChiSquare' code for proc freq statement example) for all combinations of prevention variables (see p.3 'Prev Variables' for full list) was created. A Cross-frequency of all prevention variables with treatment variables for each age group was also created.

LOGISTIC REGRESSIONS

A set of logistic regressions were created, examining the relationship between treatment (dependent variables) and prevention (independent variables) while controlling for age and sex. Separate regressions were run for every treatment and prevention combination. The same age categories were applied, and the reference categories was the age=1 group and for the prevention services, the comparison group will be children who received no prevention services (see p.6 'Logistic Code' for example regression code). For the regressions, all children were grouped together.

Demographics			
Variable	**Label**	**Values**	**Value Description**
AGE	Age of Patient	1-18	
DENT_AGEGRP	Dental Age Groups in years	1	1
		2	2
		3	3-4
		4	5
		5	6-8
		6	9
		7	10-11
		8	12-18
SEX	Sex of Patient	1	Male
		2	Female

PREVENTION VARIABLES

Prevention Variable Definitions		
Variable	**Proc. Code**	**Label**
PREV_A	D1120	Prev. Grp. A: Dental Prophy - At least one claim
PREV_A_1		Prev. Grp. A: Dental Prophy - 1 claim
PREV_A_2		Prev. Grp. A: Dental Prophy - 2 claims
PREV_A_3		Prev. Grp. A: Dental Prophy - 3+ claims
PREV_A_CLM		Prev. Grp. A: Dental Prophy - Claim Indicator
PREV_A_CNT		Prev. Grp. A: Dental Prophy - Count of claims
PREV_B	D1203, D1206, D1208, or 99420 (w/DX V07.31)	Prev. Grp. B: Fluoride Tx - At least one claim
PREV_B_1		Prev. Grp. B: Fluoride Tx - 1 claim
PREV_B_2		Prev. Grp. B: Fluoride Tx - 2 claims
PREV_B_3		Prev. Grp. B: Fluoride Tx - 3 claims
PREV_B_4		Prev. Grp. B: Fluoride Tx - 4+ claims
PREV_B_CLM		Prev. Grp. B: Fluoride Tx - Claim Indicator
PREV_B_CNT		Prev. Grp. B: Fluoride Tx - Count of claims
PREV_B_DENT		Prev. Grp. B: Fluoride Tx - (Dent Prov) At least one claim
PREV_B_DENT_1		Prev. Grp. B: Fluoride Tx - (Dent Prov) 1 claim
PREV_B_DENT_2		Prev. Grp. B: Fluoride Tx - (Dent Prov) 2 claims
PREV_B_DENT_3		Prev. Grp. B: Fluoride Tx - (Dent Prov) 3 claims
PREV_B_DENT_4		Prev. Grp. B: Fluoride Tx - (Dent Prov) 4+ claims
PREV_B_DENT_CLM		Prev. Grp. B: Fluoride Tx - (Dent Prov) - Claim Indicator
PREV_B_DENT_CNT		Prev. Grp. B: Fluoride Tx - (Dent Prov) Count of claims
PREV_B_MED		Prev. Grp. B: Fluoride Tx - (Med Prov) At least one claim
PREV_B_MED_1		Prev. Grp. B: Fluoride Tx - (Med Prov) 1 claim
PREV_B_MED_2		Prev. Grp. B: Fluoride Tx - (Med Prov) 2 claims
PREV_B_MED_3		Prev. Grp. B: Fluoride Tx - (Med Prov) 3 claims
PREV_B_MED_4		Prev. Grp. B: Fluoride Tx - (Med Prov) 4+ claims
PREV_B_MED_CLM		Prev. Grp. B: Fluoride Tx - (Med Prov) - Claim Indicator
PREV_B_MED_CNT		Prev. Grp. B: Fluoride Tx - (Med Prov) Count of claims
PREV_C	D1351	Prev. Grp. C: Sealants (any claim)
PREV_D	See above	Prev. Grp. D: Dental Prophy w/Fluoride Tx (Grp A & B) (Same Day)
PREV_D_E	See above	Prev. Grp. D OR E: Dental Prophy w/Sealant (Same Day)
PREV_E	See above	Prev. Grp. E: Dental Prophy w/Sealant (Grp A & C) (Same Day)
WELL_CHILD	99381, 99391, 99382, 99392, 99383, 99393, 99384, 99394, 99385, 99395	Well Child Exam
PROVIDER TYPES: Medical and Dental provider types (STDPROV) are listed below. Note: identification of percentage of eligibles that receive services is not limited by provider type, however there are some parts of the analysis that examine services by provider type (e.g., fluoride services).		
**Medical:**	_**200-Medical Doctor, 206-Mutispecialty Physician Group, 240-Family Practice, 360-Preventive Medicine, 400-Pediatrician, 815-Medical Technician, 822-Nursing Services, 825-Nurse Practitioner, 845-Physician Asst**_	
**Dental:**	_**100-MD & DDS, 105-Dental Specialist, 805-Dental Technician**_	

TREATMENT VARIABLES

Treatment Variables Definition			
Variable	**Proc. Code**	**Label**	**Treatment Variables Definition - Identification is an input into the Chi-Square and Regression**
TX_A_1	D2140, D2330	Tx Grp. A: Surface Amalgam or Resin - 1 surface	Input to dichotomous variables
TX_A_2	D2150, D2331	Tx Grp. A: Surface Amalgam or Resin - 2 surfaces	Input to dichotomous variables
TX_A_3	D2160, D2332	Tx Grp. A: Surface Amalgam or Resin - 3 surfaces	Input to dichotomous variables
TX_A_4	D2161, D2335	Tx Grp. A: Surface Amalgam or Resin - 4 surfaces	Input to dichotomous variables
TX_A_1_4	Se above	Tx. Grp. A: One or more Surface Amalgams	Two dichotomous variables - First variable which equals if they have or more Surface amalgam i.e. TX_A_1=1 or TX_A_2=1 or TX_A_3=1 or TX_A_4=1 0 otherwise
TX_A_2_4	Se above	Tx. Grp. A: Two or more Surface Amalgams	Second variable equals if they have or more surface amalgam i.e. TX_A_2=1 or TX_A_3=1 or TX_A_4=1, 0 otherwise
TX_B_01	D2390	Tx Grp. B: Anterior Resin-based Composite Crown	Input to dichotomous variables
TX_B_02	D2391	Tx Grp. B: Post One Surface Resin-based Composite	Input to dichotomous variables
TX_B_03	D2392	Tx Grp. B: Post Two Surface Resin-based Composite	Input to dichotomous variables
TX_B_04	D2393	Tx Grp B: Post Three Surface Resin-based Composite	Input to dichotomous variables
TX_B_05	D2394	Tx Grp. B: Post >/=4 Surface Resin-based Composite	Input to dichotomous variables
TX_B_02_05	Se above	Tx. Grp. B: One or more Surface Resin Composites	Two dichotomous variables - First variable which equals if One or more surface Resin composite i.e. if TX_B_02=1 or TX_B_03=1 or TX_B_04= or TX_B_05= , otherwise
TX_B_03_05	Se above	Tx. Grp. B: Two or more Surface Resin Composites	Second variable equals if Two or more surface Resin composite i.e. if TX_B_03=1 or TX_B_04=1 or TX_B_05=1 0 otherwise
TX_B_06	D2930	Tx Grp. B: Prefab Stainless Steel Crown Primary	Two Dichotomous variables- First is TX_B_06 as is Second is if any crown, so equals one if TX_B_06= or
TX_B_06_10	Se above	Tx. Grp. B: Any Crown	TX_B_07= or TX_B_08= or TX_B_09= or TX_B_10=1, otherwise
TX_B_07	D2931	Tx Grp. B: Prefab Stainless Steel Crown Permanent	Input to dichotomous variables
TX_B_08	D2932	Tx Grp. B: Prefab Resin Crown	Input to dichotomous variables
TX_B_09	D2933	Tx Grp. B: Prefab Stainless Steel Crown	Input to dichotomous variables

TREATMENT VARIABLES (cont'd)

Treatment Variables Definition			
Variable	**Proc. Code**	**Label**	**Treatment Variables Definition - Identificatio is an input into the Chi-Square and Regression**
TX_B_10	D2934	Tx Grp. B: Prefab Steel Crown Primary	Input to dichotomous variables
TX_B_11	D2940	Tx Grp. B: Protective Restoration	Input to dichotomous variables
TX_B_12	D2950	Tx Grp. B: Core Build up Including Pins	Input to dichotomous variables
TX_C_1	D7111, D7140	Tx Grp. C: Partial Pulpectomy	Input to dichotomous variables
TX_C_2	D7210, D7220, D7230, D7240	Tx Grp. C: Complete Pulpectomy	Input to dichotomous variables
TX_E_1	D3120	Tx Grp. E: Pulp Cap Indirect	Input to dichotomous variables
TX_E_2	D3220	Tx Grp. E: Therapeutic Pulpotomy	Input to dichotomous variables
TX_E_3	D3240	Tx Grp. E: Pulpal therapy Posterior Primary	Input to dichotomous variables
TX_E_4	D3310 , D3320, D3330	Tx Grp. E: End Therapy (Root Canals), Anterior Bicuspid and Posterior Tooth	Input to dichotomous variables

CHI SQUARE CODE

```
PROC FREQ DATA=XXXX; /* Prevention variables crossed by Treatment Variables
*/
    where DENT_AGEGRP=&agegrp_;
    tables (WELL_CHILD
            PREV_A PREV_A_CLM
            PREV_B PREV_B_CLM PREV_B_MED PREV_B_MED_CLM PREV_B_DENT
PREV_B_DENT_CLM
            PREV_C
            PREV_D
            PREV_E
            PREV_D_E)*
           (WELL_CHILD
            PREV_A PREV_A_CLM
            PREV_B PREV_B_CLM PREV_B_MED PREV_B_MED_CLM PREV_B_DENT
 PREV_B_DENT_CLM
            PREV_C
            PREV_D
            PREV_E
            PREV_D_E)/chisq measures;
    title2 "Hypthesis # 4 Tables for Age = &agelabel_";
    run;
```

LOGISTIC CODE

```
Final Version:


%macro logistic_ (prev_,treat_);

PROC LOGISTIC data=odata.MCW_DENTAL_02a descending; /* Treatment Variables -
Regressed on Prevention */
   CLASS DENT_AGEGRP (ref='1' param=ref) SEX &prev_ (ref='0' param=ref);
   MODEL &treat_=&prev_ DENT_AGEGRP SEX;
 title2 "Prevention=&prev_ and Treatment=&treat_";
 run;

%mend logistic_;
```

AMALGAM AND RESIN VARIABLE

Variable	Label	Service Codes	Multiplier	Treatment Variable Definition
TX_GRP_A and TX_GRP_A_NOTOP (*)	Tx Grp. A: Surface Amalgam or Resin - 1 surface	D2140	1	The new variable "counts" the number of surfaces treated (or fillings) received by each child. For each of the services listed, we need the total counts of each service (see service codes for full list) received by each child. The new variable is the count of each service adjusted by the multiplier. New variable=(# D2140 codes)+(# D2330 codes)+2*((# D2150 codes)+(# D2331 codes))+3*((# D2160 codes)+(# D2332 codes))+4*((# D2161 codes)+(# D2335 codes))
		D2330	1	
	Tx Grp. A: Surface Amalgam or Resin - 2 surfaces	D2150	2	
		D2331	2	
	Tx Grp. A: Surface Amalgam or Resin - 3 surfaces	D2160	3	
		D2332	3	For simplicity, we will ignore whether or not services are received on the same date, and to eliminate outliers, we will create a top coded version of this variable. The top coded variable will replace all values greater than 10 with 10.
	Tx Grp. A: Surface Amalgam or Resin - 4 surfaces	D2161	4	
		D2335	4	

(*)   NOTOP value will be the value prior to top coding of values over 10 to 10.

New Code-GENMOD

```
Final Version:


PROC FREQ data=odata.MCW_DENTAL_02a;
  tables TX_GRP_A_NOTOP TX_GRP_A/list missing;
  title2 "New Amalgam Variables - Capped and Not Capped";
  run;


%macro genmod_ (prev_);

PROC GENMOD data=odata.MCW_DENTAL_02a; /* Amalgam and Resin Variable - Regressed on
Prevention */
  CLASS DENT_AGEGRP (ref='1' param=ref) SEX &prev_ (ref='0' param=ref);
  MODEL TX_GRP_A=&prev_ DENT_AGEGRP SEX;
  title2 "Amalgam and Resin Variable Regressed on Prevention=&prev_ ";
  run;

%mend genmod_;
```