Using Proc SQL to Calculate Age-Gender Adjusted Pharmacy Utilization Data

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ABSTRACT

The Pharmacy Department at Kaiser Permanente provides quarterly detailed, individualized reporting to approximately 640 physicians. In order for peer comparison within departments and between facilities, an age-gender adjustment of utilization was needed. SAS's PROC SQL provided a straightforward, efficient way to achieve the programming required to directly adjust the pharmacy data. This presentation shows how age-gender adjusted data are used in pharmacy and how this measure is calculated using PROC SQL. The actual program code is presented as well as the final output.

INTRODUCTION

In order to encourage best practices and uncover variation in practice, the Pharmacy Department at Kaiser Permanente provides approximately 640 physicians with detailed pharmacy utilization data. The utilization data partially consists of Total Cost, Total Number of Prescriptions, and Average Cost per Prescription. Due to the fact that some physicians prescribe to a more elderly panel within their department and elderly persons tend to receive more prescriptions and potentially more costly prescriptions, the Average Cost per Prescription needed to be adjusted for age. In addition, since gender is a factor in types of prescriptions written and physician selection, the Average Cost per Prescription also needed to be adjusted for gender. These adjustments allow fair comparison of average cost between providers within the same department.

All prescriptions for costly, however, non-discretionary products (e.g., AIDS drugs, Hemophilia drugs, etc) are excluded from our reports. This maintains the credibility of the report by not "penalizing" those physicians prescribing for a sicker population requiring expensive chronic medications.

AGE ADJUSTING IN PHARMACY UTILIZATION DATA REPORTING

In order to remove the effect of age and gender a standard epidemiological direct adjustment was used for each department. The department distribution of ages and gender of all persons who had received a prescription was used as the standard (e.g., Internal Medicine included only those prescriptions for persons 20 years and older while OB/Gyn included only those prescriptions for females ages 15-64). The distribution of ages was broken down into groups of 5-year increments for each gender (M, F, and U).

OVERVIEW OF PROC SQL

In order to perform the adjustment calculations, PROC SQL was considered on account of the ability to program in fewer steps and no sorting of the data is necessary. CPU time and work space was saved by not having to sort the large dataset.

Standard Query Language (SQL) is a standardized, common programming language used with relational databases. SQL was created independently of SAS, but can be run within SAS in a SAS program or interactive session. SQL allows you to update as well as retrieve data from database tables. SQL tables and views created through SAS can be considered interchangeable with SAS data sets.

SQL can be learned quickly as it is very logical and straightforward. After using SQL for a short amount of time, programmers can appreciate how efficient the programming can be, how easy SQL queries are to follow, and how easy SQL queries are to understand.

PROGRAM

A copy of part of the actual program is provided below (calculations are for the Internal Medicine department) along with an explanation of what each step accomplishes:

- The total number of prescriptions is summed by age group and gender for each department.

```
CREATE TABLE DEPTIM0 AS
   SELECT DEPT_CD, AGROUP, GENDER,
      COUNT(DEPT_CD) AS TOTXAGE
      FROM IM
      WHERE AGROUP GE 'A15-19'
      GROUP BY DEPT_CD, AGROUP, GENDER;
```

- The total number of prescriptions is then summed for each department.

```
CREATE TABLE DEPTIM1 AS
    SELECT DEPT_CD,
       COUNT(DEPT_CD) AS DEPTTOT
       FROM IM
       WHERE AGROUP GE 'A15-19'
      GROUP BY DEPT_CD;
```

- The total number of prescriptions by age group and gender is then divided by the department total to get the percent of prescriptions by age group for each department (creating a "weight").

```
CREATE TABLE DEPTIM2 AS
   SELECT DEPTIM0.DEPT_CD,
 DEPTIM0.AGROUP, GENDER,
     (DEPTIM0.TOTXAGE/DEPTIM1.DEPTTOT)
      AS DEPTADJ
      FROM DEPTIM0, DEPTIM1
      WHERE DEPTIM0.DEPT_CD =
            DEPTIM1.DEPT_CD;
```

- The average cost per prescription by age group and gender is calculated for each provider.

```
CREATE TABLE ADJIM1 AS
  SELECT DEPT_CD, PROV_CD, AGROUP,
         GENDER, AVG(COST) AS AVGXAGE
  FROM IM
  WHERE AGROUP GE 'A15-19'
  GROUP BY DEPT_CD, PROV_CD, AGROUP,
           GENDER;
```

- The next step is done by provider, age group and gender. The average cost per prescription by provider, age group and gender is multiplied by the departmental percentage for that age group and gender. This produces the weighted cost by age group and gender for each provider.

```
CREATE TABLE ADJIM2 AS
   SELECT B.DEPT_CD, A.PROV_CD,
          A.AGROUP, A.GENDER,
          AVG (A.AVGXAGE) AS
          AVGXAGE,B.DEPTADJ,
          (AVGXAGE*DEPTADJ) AS AGEADJ
   FROM ADJIM1 A, DEPTIM2 B
   WHERE A.AGROUP=B.AGROUP
         AND A.GENDER=B.GENDER
   GROUP BY B.DEPT_CD, A.PROV_CD,
         A.AGROUP, A.GENDER, A.AVGXAGE;
```

- The weighted costs are then summed by provider to come up with an overall age-gender-adjusted average cost per prescription. Therefore, the age-gender-adjusted average cost per prescription is simply a weighted cost that takes into account the overall age and gender distribution of the department.

```
CREATE TABLE IMFINAL AS
   SELECT PROV_CD, SUM(AGEADJ) AS
          ADJCOST
   FROM ADJIM2
   GROUP BY PROV_CD;
```

- The next steps outline the programming statements after the adjustment is done. Summary measures are calculated for all providers based on the raw data.

```
PROC SQL;
 CREATE TABLE PROVSUM AS
   SELECT A.DEPT_DES, A.LOC_NAME,
       A.SNAME, A.PROV_CD,
       COUNT(A.SVC_COST) AS TOTRX,
       SUM(A.SVC_COST) AS TOTCOST,
       AVG(A.SVC_COST) AS AVGCOST
   FROM RAWDAT A
   GROUP BY A.DEPT_DES, A.LOC_NAME,
            A.SNAME,A.PROV_CD;
```

- The summary measures are then merged with the age-gender-adjusted costs calculated earlier.

```
PROC SQL;
  CREATE TABLE PRICARE AS
SELECT A.DEPT_DES, A.LOC_NAME,
          A.SNAME, A.PROV_CD, A.TOTRX,
          A.TOTCOST, A.AVGCOST, B.ADJCOST
FROM PROVSUM A,
     FINAL B
WHERE A.PROV_CD = B.PROV_CD;
```

At this point the data is exported to Excel for printing provider specific reports as well as departmental summaries. See Tables 1 and 2 for example data showing results of how the Age-Gender Average Cost per Prescription is utilized.

CONCLUSION

This example illustrates a way to age-gender adjust pharmacy utilization data using PROC SQL. PROC SQL provides a straightforward way to program using less programming steps than data steps. This allows us to provide an expeditious way to disseminate vital information to providers that allows them uncover variation in practice and discover best prescribing practices.

REFERENCES

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Mausner, Judith S., and Kramer, Shira (1985), "Epidemiology: An Introductory Text," Philadelphia, PA: W.B. Saunders Company

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Table 1

KAISER PERMANENTE - COLORADO
QUARTERLY PHARMACY UTILIZATION REPORT
FOURTH QUARTER 1998
INTERNAL MEDICINE

Provider	TotalRx	Total Cost	AvgRxCost	AgeGenAdj AvgRxCost
Prov A	3,832	$ 43,038	$ 11.23	$ 11.23
Prov B	4,573	$ 58,474	$ 12.79	$ 12.66
Prov C	4,424	$ 54,614	$ 12.34	$ 12.19
Prov D	4,573	$ 51,561	$ 11.28	$ 11.26
Prov E	1,266	$ 15,882	$ 12.54	$ 11.75
Prov F	4,788	$ 63,727	$ 13.31	$ 13.36
Prov G	3,397	$ 45,331	$ 13.34	$ 13.45
Prov H	4,562	$ 48,911	$ 10.72	$ 10.95
FACILITY 1	*31,415*	*$ 381,537*	*$ 12.15*	*$ 12.12*
Prov I	4,482	$ 71,216	$ 15.89	$ 15.75
Prov J	2,972	$ 37,475	$ 12.61	$ 13.02
Prov K	860	$ 5,329	$ 6.20	$ 6.96
Prov L	814	$ 7,889	$ 9.69	$ 11.17
FACILITY 2	*9,128*	*$ 121,910*	*$ 13.36*	*$ 13.62*
Prov M	2,942	$ 54,692	$ 18.59	$ 19.00
Prov N	880	$ 15,778	$ 17.93	$ 17.31
FACILITY 3	*3,822*	*$ 70,470*	*$ 18.44*	*$ 18.61*
Prov O	2,344	$ 38,870	$ 16.58	$ 17.07
Prov P	984	$ 16,527	$ 16.80	$ 17.78
Prov Q	756	$ 6,341	$ 8.39	$ 7.92
Prov R	2,308	$ 39,312	$ 17.03	$ 17.19
Prov S	4,813	$ 81,036	$ 16.84	$ 17.32
Prov T	4,440	$ 92,173	$ 20.76	$ 21.41
Prov U	764	$ 10,144	$ 13.28	$ 12.41
Prov V	2,549	$ 45,506	$ 17.85	$ 18.26
FACILITY 4	*18,958*	*$ 329,909*	*$ 17.40*	*$ 17.61*
Prov W	2,524	$ 26,991	$ 10.69	$ 10.68
Prov X	2,115	$ 26,587	$ 12.57	$ 12.51
Prov Y	4,543	$ 54,994	$ 12.11	$ 12.74
Prov Z	3,226	$ 37,425	$ 11.60	$ 11.68
Prov AA	3,792	$ 44,592	$ 11.76	$ 11.77
Prov BB	4,408	$ 58,932	$ 13.37	$ 13.25
Prov CC	4,618	$ 54,279	$ 11.75	$ 11.61
FACILITY 5	*35,264*	*$ 437,550*	*$ 12.41*	*$ 12.49*

Table 2

KAISER PERMANENTE - COLORADO
QUARTERLY PHARMACY UTILIZATION REPORT
FOURTH QUARTER 1998
INTERNAL MEDICINE DEPARTMENTAL SUMMARY

Facility	Total Rx	Total Rx Cost	Avg Rx Cost	Age/Gen Adj Avg Rx Cost
FACILITY 1	31,415	$ 381,537	$ 12.15	$ 12.12
FACILITY 2	9,128	$ 121,910	$ 13.36	$ 13.62
FACILITY 3	3,822	$ 70,470	$ 18.44	$ 18.61
FACILITY 4	18,958	$ 329,909	$ 17.40	$ 17.81
FACILITY 5	35,264	$ 437,550	$ 12.41	$ 12.49
FACILITY 6	9,330	$ 102,688	$ 11.01	$ 11.04
FACILITY 7	12,724	$ 126,025	$ 9.90	$ 10.01
FACILITY 8	14,865	$ 195,769	$ 13.17	$ 13.18
FACILITY 9	55,263	$ 618,374	$ 11.19	$ 11.18
FACILITY 10	7,770	$ 110,967	$ 14.28	$ 14.01
FACILITY 11	46,287	$ 490,292	$ 10.59	$ 10.59
FACILITY 12	10,180	$ 122,647	$ 12.05	$ 11.96
FACILITY 13	41,611	$ 551,777	$ 13.26	$ 13.32
FACILITY 14	27,915	$ 362,158	$ 12.97	$ 12.97
INTERNAL MEDICINE	[illegible]	$ 4,022,072	$ [illegible]	$ [illegible]