Selecting All Observations When Any Observation Is of Interest

Christopher Bost

What does that mean?

- Some data have more than one obs/person
- We want to select all obs for a person
  - If at least one obs for that person meets criteria
- Examples?
What's in it for you?

- Review how to select obs with the DATA step
- Review how to select obs with PROC SQL
- Useful techniques to have in your SAS "toolkit"
Sample data set: COURSES

<table>
<thead>
<tr>
<th>studentid</th>
<th>course</th>
<th>ap</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BIOL101</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>BIOL102</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>CHEM102</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>CALC101</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>STAT101</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>PSYC201</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>HIST102</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>PHYS101</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>CHEM101</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>CALC102</td>
<td>1</td>
</tr>
</tbody>
</table>

Desired data set

<table>
<thead>
<tr>
<th>studentid</th>
<th>course</th>
<th>ap</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>BIOL102</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>CHEM102</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>PSYC201</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>HIST102</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>PHYS101</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>CHEM101</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>CALC102</td>
<td>1</td>
</tr>
</tbody>
</table>
Select observations with DATA step

1. Subset observations of interest
2. Keep one observation per person
3. Match-merge with original data set

1. Subset observations of interest

data ap;
set courses;
where ap=1;
run;

Data set AP

<table>
<thead>
<tr>
<th>studentid</th>
<th>course</th>
<th>ap</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>BIOL102</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>CHEM102</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>PSYC201</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>PHYS101</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>CALC102</td>
<td>1</td>
</tr>
</tbody>
</table>
2. Keep one observation per person

```sas
proc sort data=ap out=ap_sort;
by studentid;
run;

data ap2;
set ap_sort;
by studentid;
if first.studentid;
keep studentid;
run;
```

Data set AP2

<table>
<thead>
<tr>
<th>studentid</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
</tbody>
</table>

3. Match-merge observations

```sas
proc sort data=courses out=courses_sort;
by studentid;
run;

data anyap;
merge courses_sort ap2(in=inap2);
by studentid;
if inap2;
run;
```
Desired data set: ANYAP

<table>
<thead>
<tr>
<th>studentid</th>
<th>course</th>
<th>ap</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>BIOL102</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>CHEM102</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>PSYC201</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>HIST102</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>PHYS101</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>CHEM101</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>CALC102</td>
<td>1</td>
</tr>
</tbody>
</table>

Full DATA step program

```bash
data ap;
set courses;
where ap=1;
run;

proc sort data=ap
  out=ap_sort;
by studentid;
run;

data ap2;
set ap_sort;
by studentid;
if first.studentid;
keep studentid;
run;

proc sort data=courses
  out=courses_sort;
by studentid;
run;

data anyap;
merge courses_sort
  ap2(in=lnap2);
by studentid;
if inap2;
run;
```
Pros and cons

- It works
- Three DATA steps
- Two PROC SORT steps
Select observations with PROC SQL

1. Use a subquery
2. Use GROUP BY and HAVING clauses

Terminology

<table>
<thead>
<tr>
<th>DATA Step</th>
<th>PROC SQL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
<td>Column</td>
</tr>
<tr>
<td>Observation</td>
<td>Row</td>
</tr>
<tr>
<td>SAS data set</td>
<td>Table</td>
</tr>
</tbody>
</table>
SQL clauses: required order

PROC SQL;  
1 SELECT  
2 FROM  
3 WHERE  
4 GROUP BY  
5 HAVING  
6 ORDER BY ;  
QUIT;  

starts procedure  
selects variables  
opens data sets  
restricts observations  
groups observations  
restricts groups  
sorts results  
ends procedure

Use a subquery

proc sql;
create table anyap2 as
select *
from courses
where studentid in (select distinct studentid
from courses
where ap=1)
order by studentid;
quit;
Desired data set: ANYAP2

<table>
<thead>
<tr>
<th>studentid</th>
<th>course</th>
<th>ap</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>BIOL102</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>CHEM102</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>PSYC201</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>PHYS101</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>HIST102</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>CALC102</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>CHEM101</td>
<td>0</td>
</tr>
</tbody>
</table>

Pros and cons

- Single step
- Two passes through data set
  - One for the subquery
  - One for the outer query
SQL clauses: order of execution

1 FROM       opens data sets
2 WHERE      restricts observations
3 GROUP BY   groups observations
4 HAVING     restricts groups
5 SELECT     selects variables
6 ORDER BY   sorts results
Use GROUP BY and HAVING clauses

proc sql;
create table anyap3 as
select *
from courses
group by studentid
having sum(ap=1) > 0
order by studentid;
quit;

Desired data set: ANYAP3

<table>
<thead>
<tr>
<th>studentid</th>
<th>course</th>
<th>ap</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>CHEM102</td>
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<td>1</td>
</tr>
<tr>
<td>5</td>
<td>CHEM101</td>
<td>0</td>
</tr>
</tbody>
</table>
Pros and cons

- Single step
- **Flexibility**
  - Any condition(s) in parentheses after SUM
- **NOTE:** The query requires remerging summary statistics back with the original data.
Conclusion

- Use either the DATA step or PROC SQL
- PROC SQL requires significantly less coding
- PROC SQL is not necessarily more efficient
  - Test on your own data
- Use on any data with groups of observations
Contact information

Comments and questions are valued and encouraged.

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chrisbost@gmail.com

Alternate DATA step method

```sas
proc sort data=courses(where=(ap=1) keep=studentid ap)
   out=lookup(keep=studentid)
   nodupkey;
by studentid;
run;

proc sort data=courses out=courses_sort;
by studentid;
run;

data anyap;
merge courses_sort lookup(in=inlookup);
by studentid;
if inlookup;
run;
```
Alternate PROC SQL method

proc sql;
create table anyap4 as
select courses.*
from courses inner join
    (select distinct studentid as studentid2
     from courses
     where ap=1)
on studentid=studentid2
order by studentid;
quit;