Data cleaning and new variable creation, formalized

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STAT 330

OUTLINE

Overview

Categorical to Categorical

Quantitative to Quantitative

Steps to data cleaning/new variable creation

Step 1: **Get to know your data.**

a. Identify existing values and/or unusual values
b. Identify if missing values are present
c. Identify how many observations had the unusual values
d. Identify which observations had the unusual values

Step 2: **Create clean new variables with desired result.**

Over-writing existing variable values could be problematic down the line

Step 3: **Verify that coding was done correctly.**

What's wrong with PROC PRINT for verification?

- Viewing your data with PROC PRINT, or otherwise like in the data table viewer, is prone to human error. Especially with large data sets, it would be very time consuming to visually inspect *all* the data to verify correctness.
- Too much PROC PRINT eats SAS's memory! (Think printing thousands of observations, multiple times...) SAS will dramatically slow down, and maybe even crash on you.
- If you get caught where you have used too much PROC PRINT and SAS is slow, try:
    - the special submit F9
    - close SAS and open it again

Limiting PROC PRINT

You can use PROC PRINT to get a quick glance at your data, but limit the observations printed.

```
obs =
```

specifies the *last* observation that SAS processes in a data set.

```
PROC PRINT DATA = mydata (obs=10) ; RUN ;
```

prints the first 10 observations

```
PROC PRINT DATA = mydata (firstobs=5 obs=10) ; RUN ;
```

prints observations 5 through 10

On your own:

For each of the following questions, identify the scenario as: (1) categorical to categorical, (2) quantitative to quantitative, or (3) quantitative to categorical.

____ Lab 4 Q6: Create a new variable called `GPA_clean` that is a copy of the GPA variable. Re-code the unusual values missing.

____ Lab 4 Q8: Create a new variable called `prev_stats` which has a value of `yes` if students have previous experience with statistics (`Q03a = 0`) and a value of `no` if the student does not have previous experience with statistics (`Q03a = 1`).

____ Lab 4 Q11: Create a new variable called `class` that classifies students as "lower" class (first years and second years) and "upper" class (third years, fourth years, etc.).

____ Lab 4 Q13: Use the `GPA_clean` variable to create a new variable called `honors` that classifies students according to their current GPA; students who do not yet achieve honors should be classified as "none".

Overview

Categorical to Categorical

Quantitative to Quantitative

Step 1: Get to know your data.

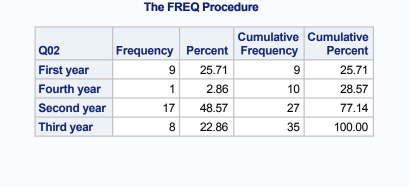
Lab 4 Q11: Create a new variable called `class` that classifies students as “lower” class (first years and second years) and “upper” class (third years, fourth years, etc.).

a. Identify existing values and/or unusual values
b. Identify if missing values are present
c. Identify how many observations had the unusual values
d. Identify which observations had the unusual values

SAS Code

```
PROC FREQ DATA = survey ;
   TABLES Q02 ;
RUN ;
```

SAS Code



The FREQ Procedure

Q02	Frequency	Percent	Cumulative Frequency	Cumulative Percent
First year	9	25.71	9	25.71
Fourth year	1	2.86	10	28.57
Second year	17	48.57	27	77.14
Third year	8	22.86	35	100.00

Step 2: Create clean new variables with desired result.

Lab 4 Q11: Create a new variable called `class` that classifies students as “lower” class (first years and second years) and “upper” class (third years, fourth years, etc.).

SAS Code

```
IF Q02 IN ("First year","Second year") THEN class  = "lower" ;
ELSE class = "upper" ;
```

SAS Code

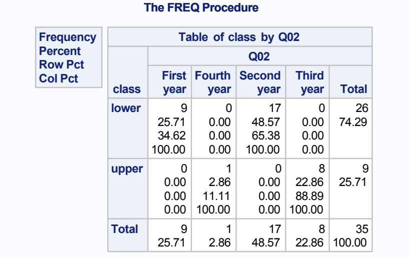
Step 3: Verify that coding was done correctly.

Lab 4 Q11: Create a new variable called `class` that classifies students as “lower” class (first years and second years) and “upper” class (third years, fourth years, etc.).

SAS Code

```
PROC FREQ DATA = survey ;
   TABLES class * Q02 ;
RUN ;
```

SAS Code



The FREQ Procedure

Frequency
Percent
Row Pct
Col Pct

Table of class by Q02					
	Q02				
class	First year	Fourth year	Second year	Third year	Total
lower	9 25.71 34.62 100.00	0 0.00 0.00 0.00	17 48.57 65.38 100.00	0 0.00 0.00 0.00	26 74.29
upper	0 0.00 0.00 0.00	1 2.86 11.11 100.00	0 0.00 0.00 0.00	8 22.86 88.89 100.00	9 25.71
Total	9 25.71	1 2.86	17 48.57	8 22.86	35 100.00

Step 3: Verify that coding was done correctly, better.

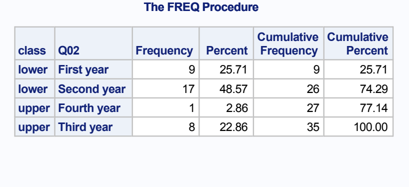
Lab 4 Q11: Create a new variable called `class` that classifies students as “lower” class (first years and second years) and “upper” class (third years, fourth years, etc.).

Step 3: **Verify that coding was done correctly.**

SAS Code

```
PROC FREQ DATA =  survey ;
   TABLES class * Q02
   / LIST MISSING ;
RUN ;
```

SAS Code



The FREQ Procedure

class	Q02	Frequency	Percent	Cumulative Frequency	Cumulative Percent
lower	First year	9	25.71	9	25.71
lower	Second year	17	48.57	26	74.29
upper	Fourth year	1	2.86	27	77.14
upper	Third year	8	22.86	35	100.00

Overview

Categorical to Categorical

Quantitative to Quantitative

Step 1: Get to know your data.

Lab 4 Q6: Create a new variable called `GPA_clean` that is a copy of the GPA variable. Re-code the unusual values that you identified in the previous question to missing.

a. Identify existing values and/or unusual values

b. Identify if missing values are present

c. Identify how many observations had the unusual values

d. Identify which observations had the unusual values

SAS Code

```
PROC MEANS DATA = work.survey2 VAR  Q04; RUN;

PROC UNIVARIATE DATA = work.survey2; VAR Q04; RUN;

PROC FREQ DATA = work.survey2; TABLES Q04; RUN;

PROC PRINT DATA = work.survey2; WHERE Q04 > 4; RUN;
```

SAS Code

Step 2: Create clean new variables with desired result.

Lab 4 Q6: Create a new variable called GPA_clean that is a copy of the GPA variable. Re-code the unusual values that you identified in the previous question to missing.

SAS Code

```
GPA_clean = Q04 ;
IF GPA_clean > 4 THEN GPA_clean = . ;
```

SAS Code

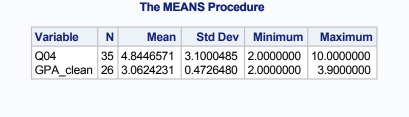
Step 3: Verify that coding was done correctly.

Lab 4 Q6: Create a new variable called GPA_clean that is a copy of the GPA variable. Re-code the unusual values that you identified in the previous question to missing.

SAS Code

```
PROC MEANS DATA = survey3 ;
        VAR Q04 GPA_clean ;
RUN ;
```

SAS Code



The MEANS Procedure

Variable	N	Mean	Std Dev	Minimum	Maximum
Q04	35	4.8446571	3.1000485	2.0000000	10.0000000
GPA_clean	26	3.0624231	0.4726480	2.0000000	3.9000000

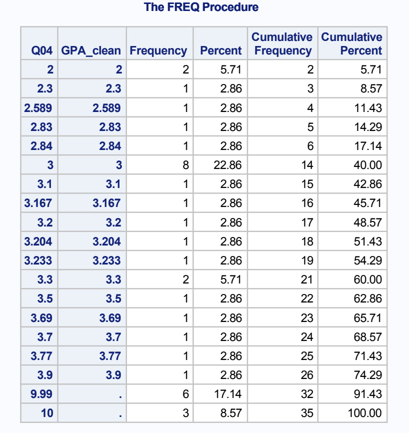
Step 3: Verify that coding was done correctly, better.

Lab 4 Q6: Create a new variable called GPA_clean that is a copy of the GPA variable. Re-code the unusual values that you identified in the previous question to missing.

SAS Code

```
PROC FREQ DATA = survey3 ;
   TABLES Q04 * GPA_clean /
   LIST MISSING ;
RUN ;
```

SAS Code



The FREQ Procedure

Q04	GPA_clean	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2	2	2	5.71	2	5.71
2.3	2.3	1	2.86	3	8.57
2.589	2.589	1	2.86	4	11.43
2.83	2.83	1	2.86	5	14.29
2.84	2.84	1	2.86	6	17.14
3	3	8	22.86	14	40.00
3.1	3.1	1	2.86	15	42.86
3.167	3.167	1	2.86	16	45.71
3.2	3.2	1	2.86	17	48.57
3.204	3.204	1	2.86	18	51.43
3.233	3.233	1	2.86	19	54.29
3.3	3.3	2	5.71	21	60.00
3.5	3.5	1	2.86	22	62.86
3.69	3.69	1	2.86	23	65.71
3.7	3.7	1	2.86	24	68.57
3.77	3.77	1	2.86	25	71.43
3.9	3.9	1	2.86	26	74.29
9.99	.	6	17.14	32	91.43
10	.	3	8.57	35	100.00

Overview

Categorical to Categorical

Quantitative to Quantitative

Step 1: Get to know your data.

Lab 4 Q13: Use the GPA_clean variable to create a new variable called honors that classifies students according to their current GPA; students who do not yet achieve honors should be classified as "none".

a. Identify existing values and/or unusual values
b. Identify if missing values are present
c. Identify how many observations had the unusual values
d. Identify which observations had the unusual values

SAS Code

```
PROC MEANS DATA = work.survey3; VAR GPA_clean; RUN;

PROC UNIVARIATE DATA = work.survey3; VAR GPA_clean; RUN;

PROC FREQ DATA = work.survey3; TABLES GPA_clean; RUN;

PROC PRINT DATA = work.survey3; WHERE GPA_clean = . ; RUN;
```

SAS Code

Step 2: Create clean new variables with desired result, method 1.

Lab 4 Q13: Use the GPA_clean variable to create a new variable called honors that classifies students according to their current GPA; students who do not yet achieve honors should be classified as “none”.

SAS Code

```
LENGTH honors $ 20 ;
IF GPA_clean = . THEN honors = "" ;
ELSE IF GPA_clean >= 3.85 THEN honors = "Summa cum laude" ;
ELSE IF 3.70 <= GPA_clean < 3.85 THEN honors = "Magna cum laude" ;
ELSE IF 3.50 <= GPA_clean < 3.70 THEN honors = "Cum laude" ;
ELSE honors = "none" ;
```

SAS Code

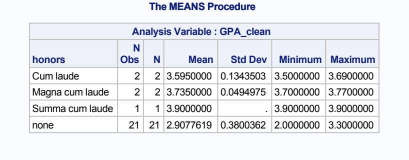
Step 3: Verify that coding was done correctly, method 1.

Lab 4 Q13: Use the `GPA_clean` variable to create a new variable called `honors` that classifies students according to their current GPA; students who do not yet achieve honors should be classified as “none”.

SAS Code

```
PROC MEANS DATA = survey4 ;
   VAR GPA_clean ;
   CLASS honors ;
RUN ;
```

SAS Code



The MEANS Procedure

Analysis Variable : GPA_clean

honors	N Obs	N	Mean	Std Dev	Minimum	Maximum
Cum laude	2	2	3.5950000	0.1343503	3.5000000	3.6900000
Magna cum laude	2	2	3.7350000	0.0494975	3.7000000	3.7700000
Summa cum laude	1	1	3.9000000	.	3.9000000	3.9000000
none	21	21	2.9077619	0.3800362	2.0000000	3.3000000

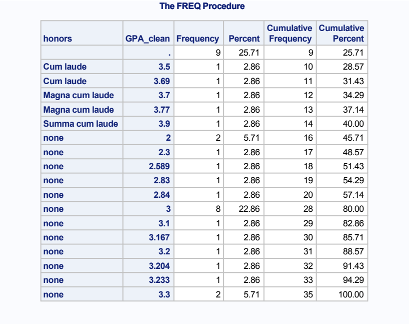
Step 3: Verify that coding was done correctly, method 2.

Lab 4 Q13: Use the GPA_clean variable to create a new variable called honors that classifies students according to their current GPA; students who do not yet achieve honors should be classified as "none".

SAS Code

```
PROC FREQ DATA = survey4 ;
  TABLES honors * GPA_clean /
  LIST MISSING;
RUN ;
```

SAS Code



The FREQ Procedure

honors	GPA_clean	Frequency	Percent	Cumulative Frequency	Cumulative Percent
	.	9	25.71	9	25.71
Cum laude	3.5	1	2.86	10	28.57
Cum laude	3.69	1	2.86	11	31.43
Magna cum laude	3.7	1	2.86	12	34.29
Magna cum laude	3.77	1	2.86	13	37.14
Summa cum laude	3.9	1	2.86	14	40.00
none	2	2	5.71	16	45.71
none	2.3	1	2.86	17	48.57
none	2.589	1	2.86	18	51.43
none	2.83	1	2.86	19	54.29
none	2.84	1	2.86	20	57.14
none	3	8	22.86	28	80.00
none	3.1	1	2.86	29	82.86
none	3.167	1	2.86	30	85.71
none	3.2	1	2.86	31	88.57
none	3.204	1	2.86	32	91.43
none	3.233	1	2.86	33	94.29
none	3.3	2	5.71	35	100.00