ABSTRACT

A common problem for SAS programmers when working with categorical data is how to utilize SAS format capabilities that associate labels with the values of a variable. It is often hard to decide whether to permanently associate the format with the variable. Sometimes you want to work with the formatted values and sometimes you want to work with the underlying numeric values. Also, this decision could have implications for quality control. Other issues to consider are: 1) Should the original value be included in the format? 2) When is it appropriate to reorder categories using formats? 3) How can format libraries be transferred to other operating systems? and 4) What issues arise when using formats with SAS/GRAPH? This paper will discuss these common considerations, with examples, and provide recommendations.

INTRODUCTION

The SAS formats and user defined formats allow programmers to change the look of SAS data. This is somewhat scary, but potentially extraordinarily helpful! So as not to wreak havoc on our databases, it is best to make sure that we know what we are doing when we use SAS formats.

SAS version 6.12 was used throughout this paper.

THE PERMANENT FORMAT DILEMMA

Working with formatted values in certain SAS procedures can provide useful clarification. For example, formats enable us to match a numeric value to a text description when presenting frequencies.

(A) NOT AS HELPFUL:

<table>
<thead>
<tr>
<th>SATISFY</th>
<th>Frequency</th>
<th>Percent</th>
<th>Cumulative Frequency</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>30.0</td>
<td>3</td>
<td>30.0</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>20.0</td>
<td>5</td>
<td>50.0</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>30.0</td>
<td>8</td>
<td>80.0</td>
</tr>
<tr>
<td>9</td>
<td>2</td>
<td>20.0</td>
<td>10</td>
<td>100.0</td>
</tr>
</tbody>
</table>

(B) MORE HELPFUL:

<table>
<thead>
<tr>
<th>SATISFY</th>
<th>Frequency</th>
<th>Percent</th>
<th>Cumulative Frequency</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very</td>
<td>3</td>
<td>30.0</td>
<td>3</td>
<td>30.0</td>
</tr>
<tr>
<td>Somewhat</td>
<td>2</td>
<td>20.0</td>
<td>5</td>
<td>50.0</td>
</tr>
<tr>
<td>Not at all</td>
<td>3</td>
<td>30.0</td>
<td>8</td>
<td>80.0</td>
</tr>
<tr>
<td>No response</td>
<td>2</td>
<td>20.0</td>
<td>10</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Analytic procedures often use the numeric (internal) value; therefore it is important to know that value to be sure the analysis is correct. For example, "neutral" values (such as not applicable or unknown) often appear as the highest value rather than in the middle.

When formats are permanently associated with a variable, it can be difficult to perform quality control. For example, if some values are reordered and the format is not removed then the format values will be incorrect. It is also more difficult to confirm that code is referring to the proper numeric values.

This can be tedious when there is an abundance of variables. An alternative way of creating formats is to include the original value next to the text description, thereby keeping the internal and formatted ordering the same.

(C) MOST HELPFUL:

<table>
<thead>
<tr>
<th>SATISFY</th>
<th>Frequency</th>
<th>Percent</th>
<th>Cumulative Frequency</th>
<th>Cumulative Percent</th>
</tr>
</thead>
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<td>Very</td>
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<td>20.0</td>
<td>10</td>
<td>100.0</td>
</tr>
</tbody>
</table>

It is often helpful to examine the same variable in different ways. For example, neutral values such as no response or unknown may occasionally be reordered or set to missing. If you are routinely creating different flavors of the same variable, it is probably best to create completely different variables rather than using formats to differentiate the flavors.

REORDERING CATEGORICAL VARIABLES

When transferring datasets it is particularly important to include the format catalog if the formats have been permanently assigned appropriate date-time formats.
assigned. To transfer to a different operating system, use
Proc Cport to convert the format catalog into transport form. The
following code can be used:

```
filename xportf "path\xportf.dat";
libname library "path";
proc cport catalog = library.formats
file=xportf;
run;
```

The receiving party can then use Proc Cimport to transfer the
catalog back into a SAS catalog on their system.

Without the format catalog, permanently formatted data will not
be accessible unless the formats are stripped off. The formats
can be removed using the following format statement within a
data step:

```
data temp02;
  set temp01;
  format _all_; 
run;
```

Whether the transferred dataset is permanently formatted or not,
it is a good idea to send along a format catalog for documentation
purposes. In fact, perhaps the best way to send formats is to
provide SAS code for Proc Format to create all the necessary
formats together with a simple data step to associate the format
with the variable. If the SAS dataset does not have permanent
formats assigned, this approach allows the recipient to assign the
formats permanently or not as desired.

**FORMATS AND SAS/GRAPH**

SAS/GRAPH allows a large amount of labeling flexibility.
Programmers can override the variable values and labels within
the axis statement. As a result, it is best to work with the
underlying value of the variable instead of the formatted value.
Keeping track of the underlying value, the formatted value, and
how they both relate to the user specified axis statements is too
overwhelming.

**CONCLUDING RECOMMENDATIONS**

At the onset of any analysis, write a program to create one
permanent format library that will be updated throughout the
duration of the analysis. The program can be entitled
Formats.sas and it will create the format library Formats.sc2. For
each additional format added to the catalog, update the
Formats.sas program by including the new format. Existing
formats should not be written over. At the end of the analysis,
the log and output from Formats.sas can be used as study
documentation.

It is recommended that formats contain a practical ordering,
which may depend on the task at hand. This makes reading SAS
output easier. When appropriate, the format should contain the
original value that links to the original source document. For
example, the variable Health has values ranging from 1 – 5. An
appropriate format would be:

```
1 → “1: Excellent”
2 → “2: Very Good”
3 → “3: Good”
4 → “4: Fair”
5 → “5: Poor”
```

Similarly, for regression analyses, formats should be created so
that the reference cell represents the desired group. For
instance, the variable Asthma is coded to either 1 (having
asthma) or 0 (not having asthma). So that “No Asthma” is the
reference group (Order = Formatted may or may not be required
in the first line of the PROC depending on the default), a
suggested format would be:

0 → “N: No Asthma”
1 → “A: Asthma”

It is strongly advised that original variables not be assigned a
permanent format. However, in some circumstances, this
recommendation can necessarily be violated (e.g., an annotated
paper form does not accompany data file). In the event that this
situation occurs, formats should be created so that they:

- Are one-to-one (i.e., categories are not combined.)
- Contain the original value within the format itself
- Are not reordered

In addition, any assignment of permanent formats to original
variables should be done in one program.

**CONTACT INFORMATION**

The author welcomes questions and comments. She can be
contacted at:

Michelle Pritchard
The Lewin Group
490 2nd Street, Suite 201
San Francisco, CA 94118
Work Phone: 415-495-8966
Fax: 415-495-8969
Email: michelle.pritchard@lewin.com

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**Coders’ Corner**