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A special "thank you" to Nancy Brucken and Xue Yao for inviting me to present this topic, and to Chris Barrett of SAS Institute Inc. for his valuable contributions to the accompanying paper.

Goals

- Integrate SAS output w/ Excel
- Include SAS-generated graphic images
- Give you something you can use TODAY

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Agenda

- Review sample data
- ODS basics
- Generating XLSX output for Excel
- Open output in Excel
- Enhance functionality and appearance

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Software Requirements

- **Base SAS, any operating system**
- SAS 9.4 ***Maintenance Level 3*** (available July 2015)
- Microsoft Excel 2007 and later
- Another option exists for earlier versions of SAS & Excel

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Limitations

- SAS 9.4M3 "Excel" destination creates only XLSX
- XLSX output requires Microsoft Excel 2007 and later
- Earlier "tagsets.ExcelXP" destination creates only XML
- No graphic image support with XML output
- XML output requires Microsoft Excel 2002 and later

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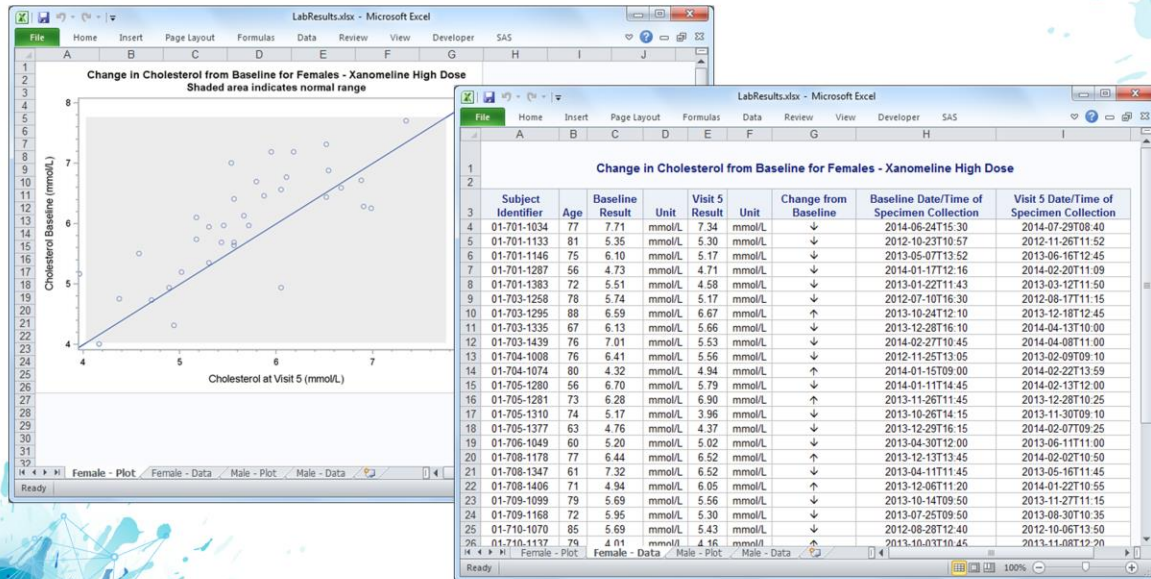
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The Excel destination is only available in the third maintenance release for SAS 9.4 and later. If you have an earlier version of SAS you must use the ExcelXP tagset instead of the Excel ODS destination.

The ExcelXP tagset creates a Microsoft Excel XML Spreadsheet file (XML) for use with Excel 2002 and later, and not an XLSX file like the new Excel destination.

Instructions for using the old tagset are discussed in each example in the accompanying paper.

SAS Output Viewed with Excel



The workbook includes four worksheets that display fictional cholesterol lab results by patient gender for the baseline test and the test results for a given day (visit 5) during a clinical trial.

Notable features of this workbook include the following:

1. Graphic images (scatter plots) are included in the **Female - Plot** and **Male - Plot** worksheets.
2. Worksheet names are customized.
3. Title text is displayed in the document body.
4. Arrow characters are used to indicate the direction of change from the baseline value.
5. Values in the numeric columns are displayed using Excel formats, not SAS formats.

The workbook is created in the native Excel XLSX file format without hand-editing.

The REPORT procedure creates the tabular output. The SGPLOT procedure,

also part of Base SAS, creates the scatter plots. The shaded rectangle in the scatter plots shows the lower and upper reference range limits for cholesterol lab results, and helps to identify values that are outside of this range.

Representative Values in Sample Data

Column Name	Description	Typical Values
usubjid	Character subject identifier	01-701-1034, 01-717-1109
age	Patient age	56, 74, 88
sex	Patient gender	F, M
lbttest	Laboratory test name	PH, CHOLESTEROL, GLUCOSE
baseline_lbstresn	Baseline laboratory result in standard units	3.52, 4.01, 6.00
baseline_lbstresu	Baseline laboratory result units	mmol/L
visit5_lbstresn	Visit 5 laboratory result in standard units	3.39, 5.30, 7.01
visit5_lbstresu	Visit 5 laboratory result units	mmol/L
baseline_lbdtc	Character date/time of baseline specimen collection	2014-01-15T09:00, 2013-01-09T14:57
visit5_lbdtc	Character date/time of visit 5 specimen collection	2014-04-13T10:00, 2012-10-06T13:50

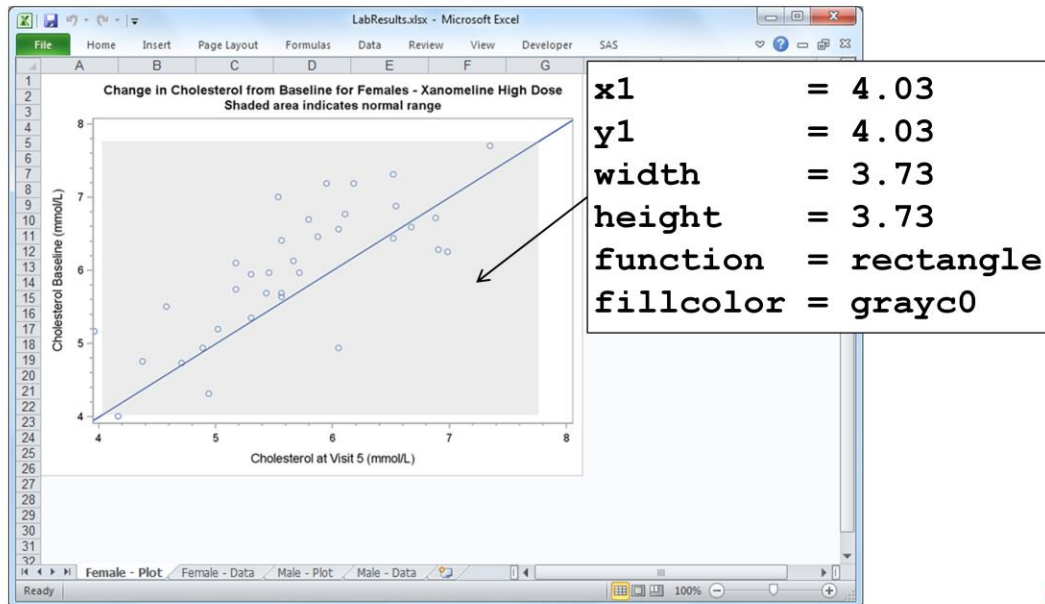
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The results of various lab tests for the baseline and fifth visits are included in the SAS table.

All columns are character except the **age**, **baseline_lbstresn**, and **visit5_lbstresn** columns.

Our code displays only results from the cholesterol tests.

PROC SGPLOT Annotate Dataset



Annotation data sets are used with the SGPLOT procedure to control the size and appearance of the shaded rectangle in the scatter plots.

Here you can see some of the properties of the data set used with the female patient data.

These values control the size of the shaded rectangle representing the lower and upper reference range limits for cholesterol test results.

General Steps

1. Run SAS code to create output
2. Store output where Excel can access it
3. Open output with Excel
4. Modify SAS code to enhance functionality and appearance

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We use ODS to create an XLSX file that is stored in a location that Excel can access. In your production system, SAS and Excel may reside on two different systems. Thus, you may have to make use of network drives, FTP, or some other means to move the SAS output to a location that Excel can access.

Then the ODS output is opened using Excel. If you have ever done this before, you have probably encountered formatting problems. We fix those problems, and then explore techniques to instruct ODS to create output that is more attractive.

ODS Basics

- Part of Base SAS
- Easily generate multiple output types (HTML, RTF, PDF, XML, and so on)
- A "destination" creates the actual output
- A "style" controls the appearance
- Usage:

HTML or RTF or PDF ...

```
ods DestName style=StyleName file=... ;  
    * Your SAS procedure code here;  
ods DestName close;
```



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ODS is the part of Base SAS software that enables you to generate different types of output from your procedure code. An ODS *destination* controls the type of output that is generated (HTML, RTF, PDF, and so on). An ODS *style* controls the appearance of the output (colors, fonts, border lines, and so on).

Both a destination and a style are needed to generate output. If you do not specify a style, a default style is used.

ODS Basics – Output for Excel


■ SAS 9.4M3 only:

```
ods Excel file='LabResults.xlsx' style=... ;  
  * Your SAS procedure code here;  
ods Excel close;
```



■ SAS 9.1.3SP4 and later:

```
ods tagsets.ExcelXP file='LabResults.xml' style=... ;  
  * Your SAS procedure code here;  
ods tagsets.ExcelXP close;
```



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We use the Excel destination to generate the XLSX output and then store the output in a file. The STYLE option controls the appearance of the output, such as the font and color scheme.

If you're using an earlier version of SAS you must use the tagsets.ExcelXP destination to create an XML file that, when opened by Excel, is rendered as a multi-sheet workbook.

Basic SAS Code – 1 of 4

```
* First worksheet;

title1 ... ;
title2 ... ;

proc sgplot data=sample.Baseline_Visit5
            sganno=sample.F_Cholesterol_Anno ... ;
  where (sex eq 'F' and lbtest eq 'CHOLESTEROL');
  scatter x=visit5_lbstresn y=baseline_lbstresn;
  lineparm x=4 y=4 slope=1;
  ... ;
run; quit;
```

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Here is a listing of the **basic** SAS code used to create the Excel workbook.

By default, the Excel destination creates a new worksheet when a SAS procedure creates a new graphic image or new tabular output. Each instance of the SGPLOT procedure creates one image and the REPORT procedure creates one table per instance, resulting in an Excel workbook with four worksheets.

The SGPLOT procedure uses the F_CHOLESTEROL_ANNO table to create the shaded rectangle showing the lower and upper reference range limits for cholesterol test results. A WHERE statement subsets the data based on gender and includes only cholesterol test results.

Basic SAS Code – 2 of 4

```
* Second worksheet;  
  
title2;  
  
proc report data=sample.Baseline_Visit5 ... ;  
  where (sex eq 'F' and lbtest eq 'CHOLESTEROL');  
  column ... ;  
  define ... ;  
  compute change / character length=1;  
    * Placeholder for change from baseline indicator;  
  endcomp;  
run; quit;
```

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The PROC REPORT code creates the tabular results.

The COLUMN statement specifies the order to display the columns and the column roles and appearance characteristics are specified in the DEFINE statements.

The role of the CHANGE column is specified as **computed**, and the computation is performed in the COMPUTE block.

Basic SAS Code – 3 of 4

```
* Third worksheet;  
  
title1 ... ;  
title2 ... ;  
  
proc sgplot data=sample.Baseline_Visit5  
            sganno=sample.M_Cholesterol_Anno ... ;  
  where (sex eq 'M' and lbtest eq 'CHOLESTEROL');  
  scatter x=visit5_lbstresn y=baseline_lbstresn;  
  lineparm x=3 y=3 slope=1;  
  ... ;  
run; quit;
```

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Similar SGPLOT and REPORT procedure code creates the worksheets for the male patients.

Basic SAS Code – 4 of 4

```
* Fourth worksheet;  
  
title2;  
  
proc report data=sample.Baseline_Visit5 ... ;  
  where (sex eq 'M' and lbtest eq 'CHOLESTEROL');  
  column ... ;  
  define ... ;  
  compute change / character length=1;  
    * Placeholder for change from baseline indicator;  
  endcomp;  
run; quit;
```


Using the ODS Excel Destination

```
ods Excel file='LabResults.xlsx' style=HTMLBlue;
```

```
* First worksheet;
```

```
...;
```

```
* Second worksheet;
```

```
...;
```

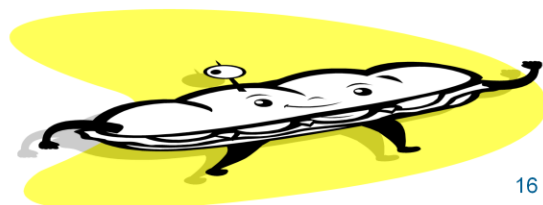
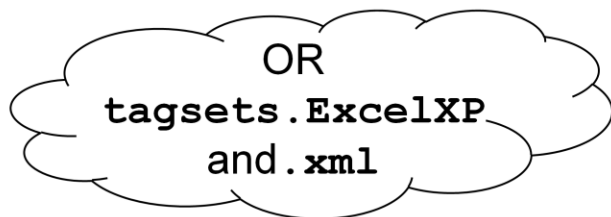
```
* Third worksheet;
```

```
...;
```

```
* Fourth worksheet;
```

```
...;
```

```
ods Excel close;
```



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Add the ODS statements to your existing code to create the XLSX output using the HTMLBlue style supplied by SAS.

Use **tagsets.ExcelXP** and **.xml** if you're using an earlier version of SAS.

Open the Lab Results File with Excel

- Open Excel: **Start > Programs > ...**
- **File > Open**
- Navigate to ...\\LabResults.xlsx (or .xml) and then click Open

~ OR ~

- Navigate to output directory and then double-click the file

.xlsx



.xml



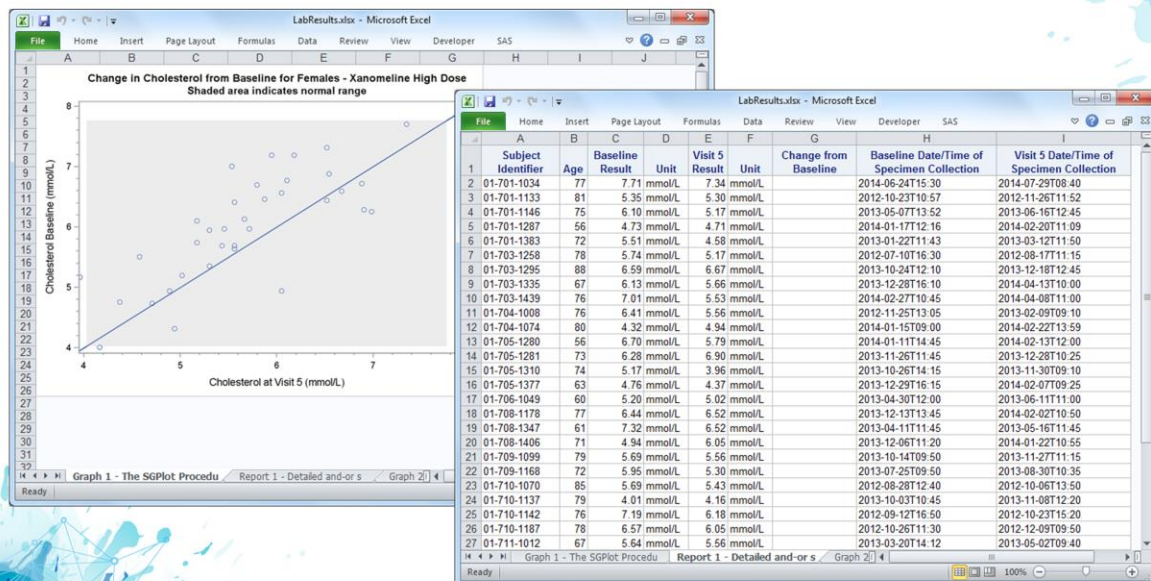
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You can use Excel to open the output file or you can navigate to the file using Windows Explorer, and then double-click it to open it in Excel.

LabResults.xlsx Viewed with Excel



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Here are the results of executing the basic SAS code, and then opening the resulting LabResults.xlsx file with Excel. This output resembles the desired format, but has the following problems:

1. Unattractive, default worksheet names.
2. Missing title text on the tabular output.
3. Incorrect text justification for the data values.
4. Blank "Change from Baseline" column.

We can now change the basic SAS code to correct these problems.

Important: Ungroup Worksheets and Save

- All worksheets grouped in SAS 9.4M3
- Changes to one worksheet affect all worksheets!

LabResults.xlsx [Group] - Microsoft Excel

- Right-click any sheet > **Ungroup Sheets**
- Save the workbook

LabResults.xlsx - Microsoft Excel

- Sheets not grouped in a future release

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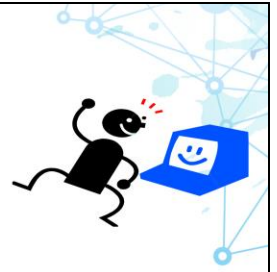
By default, the Excel ODS destination in the third maintenance release for SAS 9.4 creates a workbook with all worksheets grouped, and any changes made to one worksheet are made to **every worksheet**.

To ungroup the worksheets, right-click on any worksheet, click **Ungroup Sheets** in the pop-up menu, and then save the file. The **[Group]** text is not displayed in the Windows title bar after the sheets are ungrouped.

Worksheets will not be grouped by default in a future release of SAS.

Run Setup.sas

1. Start SAS
2. **File > Open Program**
3. Select **Setup.sas** and then click **Open**
4. Review code and then submit



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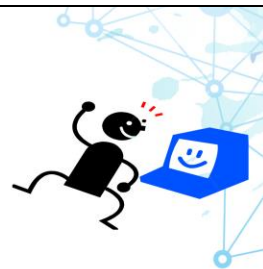
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The SAMPDIR global macro variable specifies the directory containing our sample code and data, as well as the ODS-generated output.

The program assigns a SAS library (SAMPLE) for the input data, using the SAMPDIR macro variable.

Ex. 1 – Create the Initial Workbook

1. Go to SAS
2. **File > Open Program > Exercise1.sas**
3. Review code and then submit
4. Start Excel, and then **File > Open**
5. Navigate to **C:\HOW\DelGobbo**
6. Select **LabResults.xlsx**
7. Close Excel



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TO DO:

Review and submit the code, and then view the resulting XLSX file using Excel.

Understanding and Using the Excel Destination Options

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The material in this section applies to all SAS procedures.

Change the Worksheet Names

■ Have:



■ Want:



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ODS generates a unique name for each worksheet as required by Excel.

However, the names are generally unattractive. There are several options that you can use to alter the names of the worksheets.

Excel Destination Options

- Syntax: `options(option-name='option-value')`
- Example: Hard-coding worksheet name

```
options(sheet_name='worksheet-name');
```

- Option values must be quoted
- Can have multiple ODS statements
- Options remain in effect until changed

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The Excel destination supports many options that control both the appearance and functionality of the Excel workbook. Many of these options are simply tied directly to existing Excel options or features. These options are specified in an ODS statement using the `OPTIONS` keyword, as shown above.

For example, ODS automatically generates unique worksheet names, but we can use the `SHEET_NAME` option to explicitly specify a worksheet name.

IMPORTANT NOTE: Options remain in effect until they are set to another value, or until the ODS destination is closed.

Change the Worksheet Names – 1 of 2

```
ods Excel file='LabResults.xlsx' style=HTMLBlue;  
* First worksheet;  
ods Excel options(sheet_name='Female - Plot');  
...;  
  
* Second worksheet;  
ods Excel options(sheet_name='Female - Report');  
...;
```

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Use the SHEET_NAME option to specify a worksheet name.

Recall that options remain in effect until the destination is closed. We specify the option four times because we want a different name for each worksheet.

Change the Worksheet Names – 2 of 2

* Third worksheet;

```
ods Excel options(sheet_name='Male - Plot');  
...;
```

* Fourth worksheet;

```
ods Excel options(sheet_name='Male - Report');  
...;
```

```
ods Excel close;
```

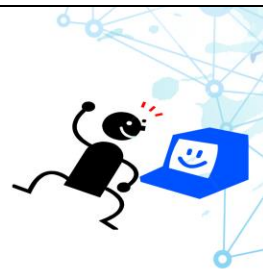
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Ex. 2 – Change the Worksheet Names

1. Go to SAS
2. **File > Open Program > Exercise2.sas**
3. Follow TO DO instructions and then submit
4. Start Excel, and then **File > Open**
5. Navigate to **C:\HOW\DelGobbo**
6. Select **LabResults.xlsx**
7. Close Excel



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TO DO:

Lines 12, 31, 57, and 76: Specify the value of the SHEET_NAME option.

Include Title Text in the Worksheet

```
ods Excel file='LabResults.xlsx' style=HTMLBlue;  
  
* Option that affects all worksheets;  
ods Excel options(embedded_titles='yes');  
  
* First worksheet;  
...;  
* Second worksheet;  
...;  
* Third worksheet;  
...;  
* Fourth worksheet;  
...;  
ods Excel close;
```

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By default, SAS titles appear as Excel print header, which is displayed when the Excel document is printed. You can confirm this by viewing the Excel **Header/Footer** tab in the Page Setup dialog box.

To include title text on-screen, in the worksheet body, use the EMBEDDED_TITLES option.

Because the EMBEDDED_TITLES option is placed at the beginning of the code and is not changed later, it affects all worksheets. The title text is now included in the worksheet body.

Include Title Text in the Worksheet

LabResults.xlsx - Microsoft Excel

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Ex. 3 – Include Title Text in the Worksheet

1. Go to SAS
2. **File > Open Program > Exercise3.sas**
3. Follow TO DO instructions and then submit
4. Start Excel, and then **File > Open**
5. Navigate to **C:\HOW\DelGobbo**
6. Select **LabResults.xlsx**
7. Close Excel



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TO DO:

Line 12: Specify the option to embed titles in the document body.

Understanding and Using ODS Style Overrides

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The material in this section, and this section only, applies only to the PRINT, REPORT, and TABULATE procedures.

ODS Style Overrides

- Supported by PRINT, REPORT, and TABULATE
- Change any ODS style attribute via STYLE=
- Example:

```
define myvar / style(column) = [font_style = italic  
                                background = orange]
```

Location Attributes
- Refer to the ODS documentation for a list of supported attributes
- Refer to PRINT, REPORT, and TABULATE doc for sample usage

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Style overrides are supported by the PRINT, REPORT, and TABULATE procedures, and can be specified in several ways, with the most common shown here.

This example overrides the font style and the cell background color attributes for the data cells (COLUMN location) in the MYVAR column.

Location Values for PROC REPORT

report		
header	header	header
column	column	column
column	column	column
summary	summary	summary
lines		
column	column	column
column	column	column
summary	summary	summary
lines		
lines		

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These are the locations that are pertinent to the REPORT procedure output.

The COLUMN location controls the appearance of data cells.

The HEADER location controls the appearance of the column heading cells.

SAS® 9 Reporting Procedure Styles Tip Sheet

<http://tinyurl.com/3cfqdv9>

ODS Style Overrides - Examples

- On a DEFINE statement:

```
define myvar / style(column) = [attribute = value];
```

- On a PROC statement:

```
proc report ... style(column) = [attribute = value];
```

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By applying the style override in the DEFINE statement, we change attributes for only the data values (COLUMN location) in the MYVAR column:

Specifying the style override on the PROC statement is a convenient way to control the appearance of the data values in all columns.

Style Attributes

<http://tinyurl.com/hddts54>

REPORT Procedure Examples

<http://tinyurl.com/mv8hzuu>

Center Data Values in PROC REPORT

Apply to both procedure instances:

```
proc report data= ... style(column)=[just=center];  
  where ... ;  
  column ... ;  
  define ... ;  
  ... ;  
run; quit;
```

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Some of the data values in the PROC REPORT output are left justified and others are right justified. We override the value of the JUST attribute to center the values.

We apply the style override once in the PROC statement instead of in each DEFINE statement for the columns that need to be centered.

Center Data Values in PROC REPORT

LabResults.xlsx - Microsoft Excel

	A	B	C	D	E	F	G	H	I
1	Change in Cholesterol from Baseline for Females - Xanomeline High Dose								
2									
3	Subject Identifier	Age	Baseline Result	Unit	Visit 5 Result	Unit	Change from Baseline	Baseline Date/Time of Specimen Collection	Visit 5 Date/Time of Specimen Collection
4	01-701-1034	77	7.71	mmol/L	7.34	mmol/L		2014-06-24T15:30	2014-07-29T08:40
5	01-701-1133	81	5.35	mmol/L	5.30	mmol/L		2012-10-23T10:57	2012-11-26T11:52
6	01-701-1146	75	6.10	mmol/L	5.17	mmol/L		2013-05-07T13:52	2013-06-16T12:45
7	01-701-1287	56	4.73	mmol/L	4.71	mmol/L		2014-01-17T12:16	2014-02-20T11:09
8	01-701-1383	72	5.51	mmol/L	4.58	mmol/L		2013-01-22T11:43	2013-03-12T11:50
9	01-703-1258	78	5.74	mmol/L	5.17	mmol/L		2012-07-10T16:30	2012-08-17T11:15
10	01-703-1295	88	6.59	mmol/L	6.67	mmol/L		2013-10-24T12:10	2013-12-18T12:45
11	01-703-1335	67	6.13	mmol/L	5.66	mmol/L		2013-12-28T16:10	2014-04-13T10:00
12	01-703-1439	76	7.01	mmol/L	5.53	mmol/L		2014-02-27T10:45	2014-04-08T11:00
13	01-704-1008	76	6.41	mmol/L	5.56	mmol/L		2012-11-25T13:05	2013-02-09T09:10
14	01-704-1074	80	4.32	mmol/L	4.94	mmol/L		2014-01-15T09:00	2014-02-22T13:59
15	01-705-1280	56	6.70	mmol/L	5.79	mmol/L		2014-01-11T14:45	2014-02-13T12:00
16	01-705-1281	73	6.28	mmol/L	6.90	mmol/L		2013-11-26T11:45	2013-12-28T10:25
17	01-705-1310	74	5.17	mmol/L	3.96	mmol/L		2013-10-26T14:15	2013-11-30T09:10
18	01-705-1377	63	4.76	mmol/L	4.37	mmol/L		2013-12-29T16:15	2014-02-07T09:25
19	01-706-1049	60	5.20	mmol/L	5.02	mmol/L		2013-04-30T12:00	2013-06-11T11:00
20	01-708-1178	77	6.44	mmol/L	6.52	mmol/L		2013-12-13T13:45	2014-02-02T10:50
21	01-708-1347	61	7.32	mmol/L	6.52	mmol/L		2013-04-11T11:45	2013-05-16T11:45
22	01-708-1406	71	4.94	mmol/L	6.05	mmol/L		2013-12-06T11:20	2014-01-22T10:55
23	01-709-1099	79	5.69	mmol/L	5.56	mmol/L		2013-10-14T09:50	2013-11-27T11:15
24	01-709-1168	72	5.95	mmol/L	5.30	mmol/L		2013-07-25T09:50	2013-08-30T10:35
25	01-710-1070	85	5.69	mmol/L	5.43	mmol/L		2012-08-28T12:40	2012-10-06T13:50
26	01-710-1137	79	4.11	mmol/L	4.16	mmol/L		2013-10-03T10:45	2013-11-08T12:20

Ready Female - Plot Female - Report Male - Plot Male - Report 100%

Ex. 4 – Center Data Values in PROC REPORT

1. Go to SAS
2. **File > Open Program > Exercise4.sas**
3. Follow TO DO instructions and then submit
4. Start Excel, and then **File > Open**
5. Navigate to **C:\HOW\DelGobbo**
6. Select **LabResults.xlsx**
7. Close Excel



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TO DO:

Lines 40 and 86: Specify the attribute to center the text of the data cells.

Use Arrows in Change from Baseline

- Arrows indicate Visit 5 result relative to baseline
- ↑ indicates an increase
- ↓ indicates a decrease
- Use characters from Windings font
- Two-step process:
 1. Change font
 2. Specify hex code for characters

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We use an up arrow in the CHANGE column to indicate that a value at visit 5 has risen from the baseline value, and a down arrow for a value that has declined. The arrow characters are available in the Microsoft Windows Wingdings font.

Use Arrows in Change from Baseline

Change the font from Arial to Wingdings using a style override

```
define change / style(column)=[fontfamily=Wingdings]...
```

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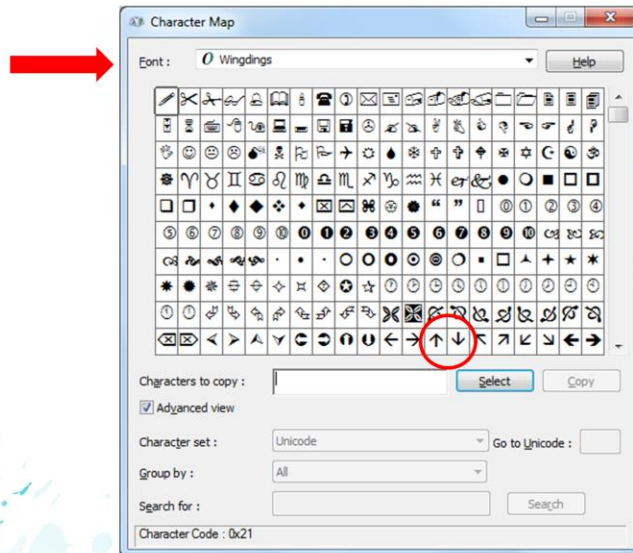
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The HTMLBlue ODS style that we're using applies the Arial font to data cells, but we want to use a different font, so we use a style override to change the font to Wingdings.

By applying the style override in the DEFINE statement instead of in the PROC statement, we change the font for only the data values in the CHANGE column.

Use Arrows in Change from Baseline

Open the Windows Character Map (**charmap.exe**)




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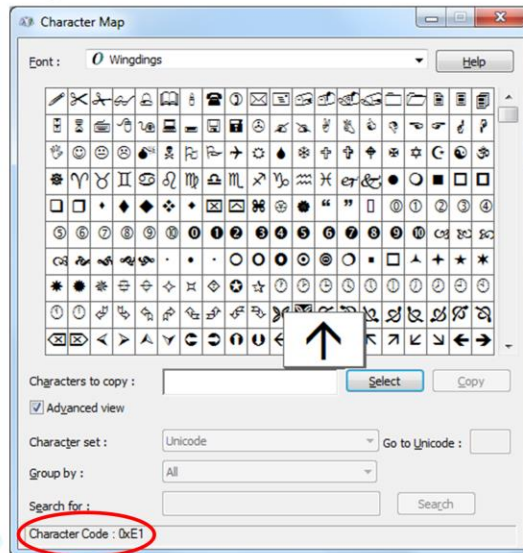
We then use the Windows Character Map to determine the hexadecimal character codes for the up and down arrows:

1. Click the Windows Start button 
2. In the **Search programs and files** textbox, type **charmap.exe** and then press **Enter**.
3. From the **Font** drop-down list, select **Wingdings**.

The arrow characters are shown at the bottom of the Character Map dialog box.

Use Arrows in Change from Baseline

Click character to get hex code



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Click the up arrow to select it. The hexadecimal character code E1 is displayed at the bottom of the dialog box.

The code for the down arrow is E2, and we use these two values in both of the COMPUTE blocks.

Use Arrows in Change from Baseline

Apply changes to both instances of DEFINE and COMPUTE

```
define change / style(column)=[fontfamily=Wingdings]...  
  
compute change / character length=1;  
    if (visit5_lbstresn gt baseline_lbstresn)  
        then change = 'E1'x;  
    else if (visit5_lbstresn lt baseline_lbstresn)  
        then change = 'E2'x;  
endcomp;
```

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Here is the code for one style override and one COMPUTE block.

Use Arrows in Change from Baseline

LabResults.xlsx - Microsoft Excel

	A	B	C	D	E	F	G	H	I
1	Change in Cholesterol from Baseline for Females - Xanomeline High Dose								
2									
3	Subject Identifier	Age	Baseline Result	Unit	Visit 5 Result	Unit	Change from Baseline	Baseline Date/Time of Specimen Collection	Visit 5 Date/Time of Specimen Collection
4	01-701-1034	77	7.71	mmol/L	7.34	mmol/L	↓	2014-06-24T15:30	2014-07-29T08:40
5	01-701-1133	81	5.35	mmol/L	5.30	mmol/L	↓	2012-10-23T10:57	2012-11-26T11:52
6	01-701-1146	75	6.10	mmol/L	5.17	mmol/L	↓	2013-05-07T13:52	2013-06-16T12:45
7	01-701-1287	56	4.73	mmol/L	4.71	mmol/L	↓	2014-01-17T12:16	2014-02-20T11:09
8	01-701-1383	72	5.51	mmol/L	4.58	mmol/L	↓	2013-01-22T11:43	2013-03-12T11:50
9	01-703-1258	78	5.74	mmol/L	5.17	mmol/L	↓	2012-07-10T16:30	2012-08-17T11:15
10	01-703-1295	88	6.59	mmol/L	6.67	mmol/L	↑	2013-10-24T12:10	2013-12-18T12:45
11	01-703-1335	67	6.13	mmol/L	5.66	mmol/L	↓	2013-12-28T16:10	2014-04-13T10:00
12	01-703-1439	76	7.01	mmol/L	5.53	mmol/L	↓	2014-02-27T10:45	2014-04-08T11:00
13	01-704-1008	76	6.41	mmol/L	5.56	mmol/L	↓	2012-11-25T13:05	2013-02-09T09:10
14	01-704-1074	80	4.32	mmol/L	4.94	mmol/L	↑	2014-01-15T09:00	2014-02-22T13:59
15	01-705-1280	56	6.70	mmol/L	5.79	mmol/L	↓	2014-01-11T14:45	2014-02-13T12:00
16	01-705-1281	73	6.28	mmol/L	6.90	mmol/L	↑	2013-11-26T11:45	2013-12-28T10:25
17	01-705-1310	74	5.17	mmol/L	3.96	mmol/L	↓	2013-10-26T14:15	2013-11-30T09:10
18	01-705-1377	63	4.76	mmol/L	4.37	mmol/L	↓	2013-12-29T16:15	2014-02-07T09:25
19	01-706-1049	60	5.20	mmol/L	5.02	mmol/L	↓	2013-04-30T12:00	2013-06-11T11:00
20	01-708-1178	77	6.44	mmol/L	6.52	mmol/L	↑	2013-12-13T13:45	2014-02-02T10:50
21	01-708-1347	61	7.32	mmol/L	6.52	mmol/L	↓	2013-04-11T11:45	2013-05-16T11:45
22	01-708-1406	71	4.94	mmol/L	6.05	mmol/L	↑	2013-12-06T11:20	2014-01-22T10:55
23	01-709-1099	79	5.69	mmol/L	5.56	mmol/L	↓	2013-10-14T09:50	2013-11-27T11:15
24	01-709-1168	72	5.95	mmol/L	5.30	mmol/L	↓	2013-07-25T09:50	2013-08-30T10:35
25	01-710-1070	85	5.69	mmol/L	5.43	mmol/L	↓	2012-08-28T12:40	2012-10-06T13:50
26	01-710-1137	79	4.01	mmol/L	4.16	mmol/L	↑	2013-10-03T10:45	2013-11-08T12:20

Ready 100%

Ex. 5 – Use Arrows in Change from Baseline

1. Go to SAS
2. **File > Open Program > Exercise5.sas**
3. Follow TO DO instructions and then submit
4. Start Excel, and then **File > Open**
5. Navigate to **C:\HOW\DelGobbo**
6. Select **LabResults.xlsx**
7. Close Excel



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TO DO:

Lines 53 and 104: Specify the Wingdings font in the style override.

Lines 60, 62, 111 and 113: Specify the hexadecimal codes for the up (E1) and down (E2) arrows.

Excel Number Formats Automatically Assigned

- Excel destination automatically assigns formats
- # – numeric digit, excluding insignificant zero
- 0 – numeric digit, including insignificant zero
- Example: Excel format 0.00 displays .5 as 0.50

```
define age / ... ; #####0  
define baseline_lbstresn / format=5.2 ... ; #0.00  
define visit5_lbstresn / format=5.2 ... ;
```

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Because no format is associated with the AGE column, PROC REPORT applies the BESTw. SAS format using the default value of the COLWIDTH option (9) for **w**. The **#####0** Excel format is equivalent to the BEST9. SAS format.

The Excel format that is equivalent to the SAS **5.2** format specified in the DEFINE statements for the BASELINE_LBSTRESN and VISIT5_LBSTRESN columns is **#0.00**.

Excel Number Formats Automatically Assigned

#####0

#0.00

Change in Cholesterol from Baseline for Females - Xanomeline High Dose

	Subject Identifier	Age	Baseline Result	Unit	Visit 5 Result	Unit	Change from Baseline	Baseline Date/Time of Specimen Collection	Visit 5 Date/Time of Specimen Collection
4	01-701-1034	77	7.71	mmol/L	7.34	mmol/L	↓	2014-06-24T15:30	2014-07-29T08:40
5	01-701-1133	81	5.35	mmol/L	5.30	mmol/L	↓	2012-10-23T10:57	2012-11-26T11:52
6	01-701-1146	75	6.10	mmol/L	5.17	mmol/L	↓	2013-05-07T13:52	2013-06-16T12:45
7	01-701-1287	56	4.73	mmol/L	4.71	mmol/L	↓	2014-01-17T12:16	2014-02-20T11:09
8	01-701-1383	72	5.51	mmol/L	4.58	mmol/L	↓	2013-01-22T11:43	2013-03-12T11:50
9	01-703-1258	78	5.74	mmol/L	5.17	mmol/L	↓	2012-07-10T16:30	2012-08-17T11:15
10	01-703-1295	88	6.59	mmol/L	6.67	mmol/L	↑	2013-10-24T12:10	2013-12-18T12:45
11	01-703-1335	67	6.13	mmol/L	5.66	mmol/L	↓	2013-12-28T16:10	2014-04-13T10:00
12	01-703-1439	76	7.01	mmol/L	5.53	mmol/L	↓	2014-02-27T10:45	2014-04-08T11:00
13	01-704-1008	76	6.41	mmol/L	5.56	mmol/L	↓	2012-11-25T13:05	2013-02-09T09:10
14	01-704-1074	80	4.32	mmol/L	4.94	mmol/L	↑	2014-01-15T09:00	2014-02-22T13:59
15	01-705-1280	56	6.70	mmol/L	5.79	mmol/L	↓	2014-01-11T14:45	2014-02-13T12:00
16	01-705-1281	73	6.28	mmol/L	6.90	mmol/L	↑	2013-11-26T11:45	2013-12-28T10:25
17	01-705-1310	74	5.17	mmol/L	3.96	mmol/L	↓	2013-10-26T14:15	2013-11-30T09:10
18	01-705-1377	63	4.76	mmol/L	4.37	mmol/L	↓	2013-12-29T16:15	2014-02-07T09:25
19	01-706-1049	60	5.20	mmol/L	5.02	mmol/L	↓	2013-04-30T12:00	2013-06-11T11:00
20	01-708-1178	77	6.44	mmol/L	6.52	mmol/L	↑	2013-12-13T13:45	2014-02-02T10:50
21	01-708-1347	61	7.32	mmol/L	6.52	mmol/L	↓	2013-04-11T11:45	2013-05-16T11:45
22	01-708-1406	71	4.94	mmol/L	6.05	mmol/L	↑	2013-12-06T11:20	2014-01-22T10:55
23	01-709-1099	79	5.69	mmol/L	5.56	mmol/L	↓	2013-10-14T09:50	2013-11-27T11:15
24	01-709-1168	72	5.95	mmol/L	5.30	mmol/L	↓	2013-07-25T09:50	2013-08-30T10:35
25	01-710-1070	85	5.69	mmol/L	5.43	mmol/L	↓	2012-08-28T12:40	2012-10-06T13:50
26	01-710-1137	79	4.01	mmol/L	4.16	mmol/L	↑	2013-10-03T10:45	2013-11-08T12:20

Female - Plot Female - Data Male - Plot Male - Data

Ready 100%

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Using SAS/IntrNet and SAS Stored Processes

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SAS/IntrNet® and SAS Stored Processes

- SAS code is run from non-SAS client
- SAS is on any platform
- Client needs only a Web browser
- SAS output is delivered in real-time
- Web-enable the code we've been using

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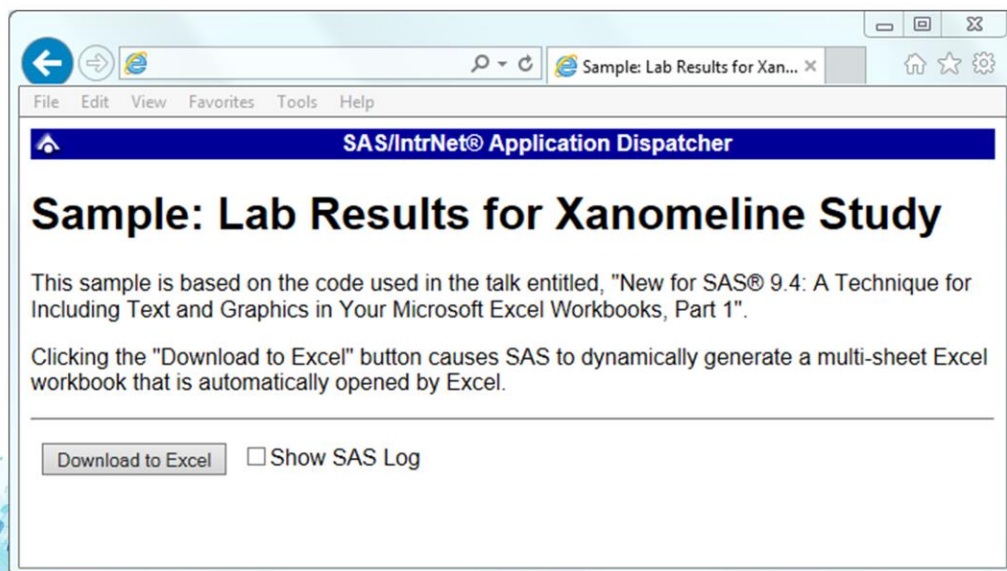
The purpose of the SAS/IntrNet® Application Dispatcher or SAS Stored Processes are to allow you to execute SAS programs from a client machine that does not have SAS installed. The client machine *may* have SAS installed, but that is not required.

A typical client-server model is followed. The SAS server can reside on any hardware platform (Windows, UNIX, z/OS, and so on) and is standing by, waiting to execute a SAS program. The most common client is a Web browser, again, running on any platform.

When the OK button of the Web page is clicked, input parameters, if any, are sent to the SAS server. Your SAS code executes, and the output is delivered in real-time to the Web browser.

The following slides illustrate this process, using a Web-enabled version of the SAS code we have been working with.

Dynamically Generated XML



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Here is a simple Web page that is used to execute SAS code stored on a server using the SAS/IntrNet Application Dispatcher.

The code that is executed is substantially similar to the final version of the code that we used to generate XLSX file, with a few changes to "Web-enable" it.

Refer to the accompanying paper for instructions on how to Web-enable your code.

The SAS program executes on the server when the **Download to Excel** button is clicked.

Dynamically Generated XML



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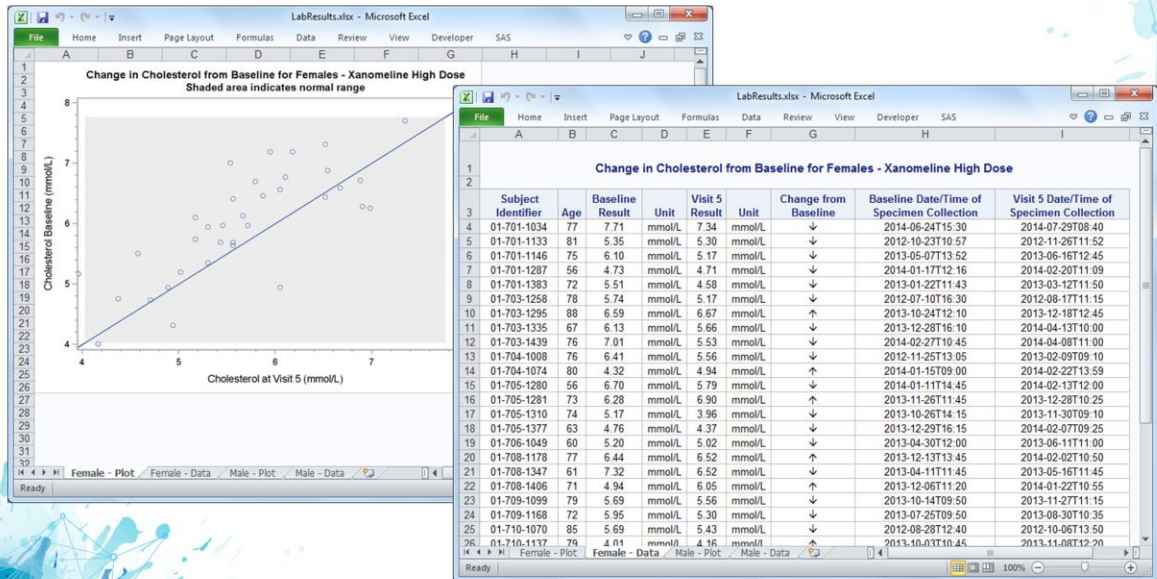
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Once the SAS program executes, the results are sent back to the Web browser.

Instead of the results being displayed in the Web browser, you are presented with a File Download dialog box.

You can click **Open** to immediately open your SAS output using Excel, or click **Save** to save a copy for later use.

Dynamically Generated XML



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Here is the SAS output, created in real-time, and delivered to the client. Refer to the accompanying paper for more information about this topic.

SAS/IntrNet Application Dispatcher

<http://tinyurl.com/n8uqq92>

SAS Stored Processes

<http://tinyurl.com/q99jov6>

Summary and Conclusion

- Use Excel destination to create XLSX file
- Use ExcelXP tagset to create XML file
- Both files can be viewed with Excel
- XLSX supports images; XML does not
- Excel formats automatically applied in XLSX only
- Make use of ODS destination options
- Apply ODS style overrides

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Resources

- Paper & Download Package

support.sas.com/papers/delgobbo-excel2016

- Vince's **ExcelXP** Resources

www.sas.com/reg/gen/corp/867226?page=Resources

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Paper & Download Package

<http://support.sas.com/papers/delgobbo-excel2016>

Vince's **ExcelXP** Resources

<http://www.sas.com/reg/gen/corp/867226?page=Resources>

Contact Information

Please send questions, comments and feedback to:

Vince DelGobbo
sasvcd@SAS.com

If your registered in-house or local SAS users group would like to request this presentation as your annual SAS presentation (as a seminar, talk or workshop) at an upcoming meeting, please submit an online User Group Request Form (support.sas.com/usergroups/namerica/lug-form.html) at least eight weeks in advance.

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About the author:

Vince DelGobbo is a Senior Software Developer in the Metadata and Execution Services group at SAS. This group's responsibilities include the SAS/IntrNet Application Dispatcher and SAS Stored Processes. He is involved in the development of new Web- and server-based technologies, bringing 3rd-party metadata into SAS, and integrating SAS output with Microsoft Office. He was also involved in the early development of the ExcelXP ODS tagset. Vince has been a SAS Software user since 1982, and joined SAS in 1992.