

# V is for Venn Diagrams

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## Abstract

Would you like to produce Venn Diagrams easily? This poster shows how you can produce stunning 2, 3 and 4 Way Venn diagrams by utilizing the Graph Template Language in particular the drawoval and drawtext statements. Venn Diagrams are extremely useful when looking at results of transcriptomic experiments because of the huge volume of data.

From my experience Venn Diagrams have typically been created in the pharmaceutical industry by using a combination of Microsoft Excel and Powerpoint. Excel is used to first count the numbers associated in each group of the Venn Diagram and PowerPoint is used to generate the Two or Three Way Venn Diagrams. The Four Way Venn Diagram is still pretty much unheard of and when someone is brave enough to attempt to tackle it manually i.e. without using this Macro, working out the numbers that should go in each of the 16 groups and actually inputting the right number into the right group is usually done nervously and sluggishly!

## Introduction

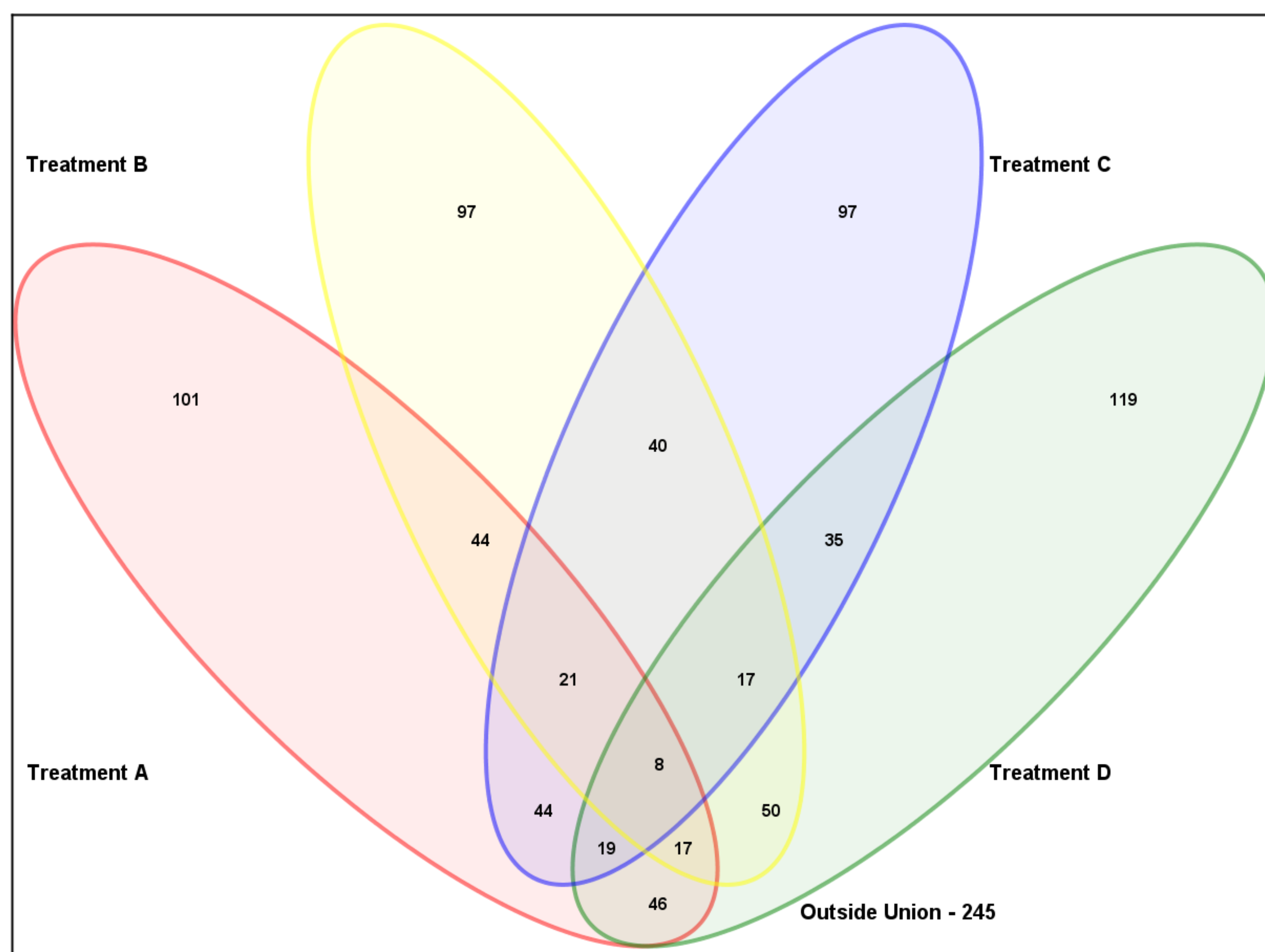
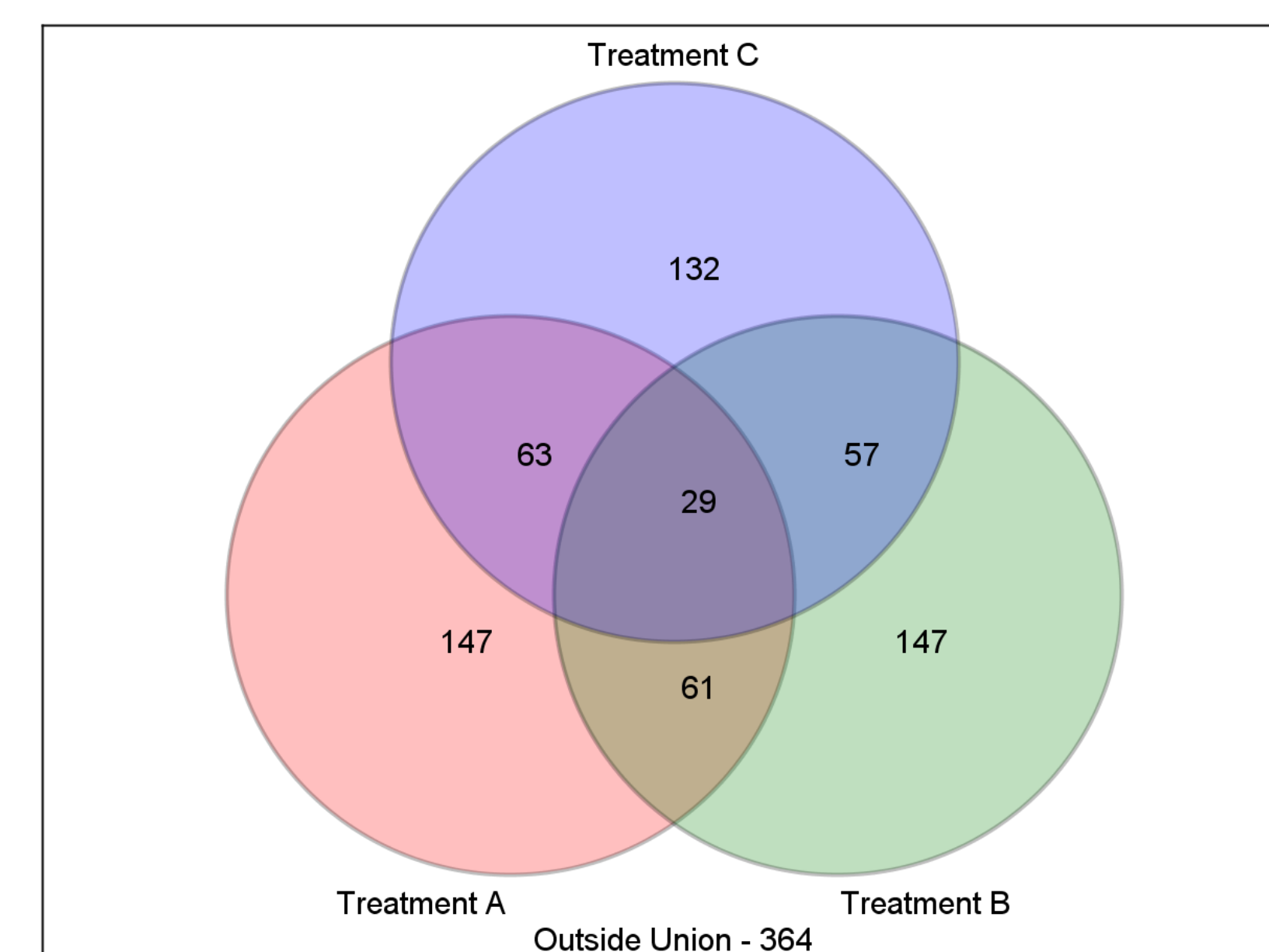
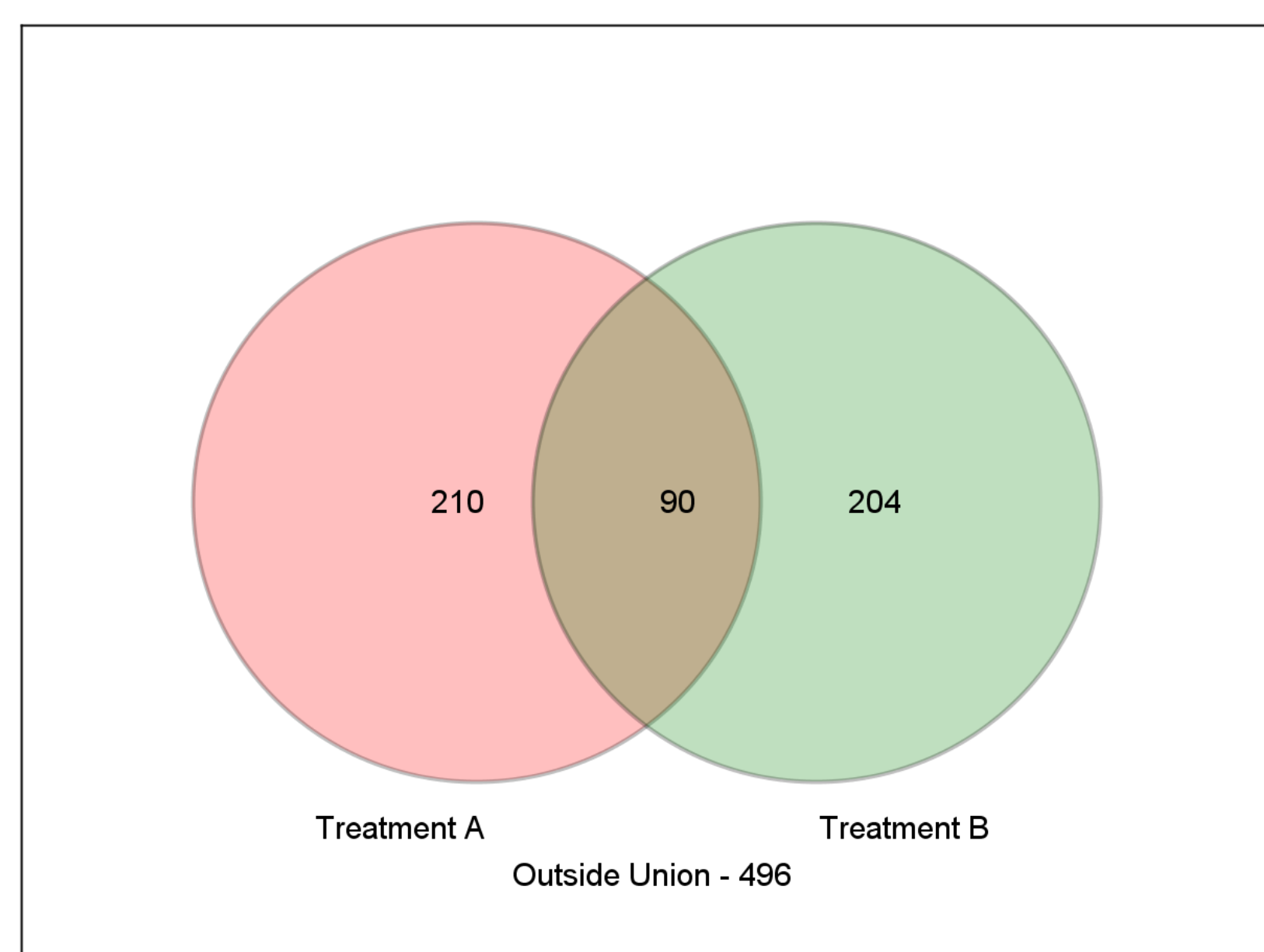
Venn diagrams were introduced in 1883 by John Venn (1834-1923) the Hull born philosopher and mathematician. They are a great way to visualise elements that are unique to only one group and elements that intersect with other groups, and they are symmetrical. The number of groups in an order  $n$  Venn diagram =  $2^n$  (including the group outside the diagram).

Venn Diagrams are built into JMP Genomics and they may be built into the graphical procedures in SAS 9.4, but until then, here is a macro that can be used.

## Macro Call

```
%macro venn(  
data =  
, venn_diagram = 2  
/* Select whether you want a 2 Way,  
3 Way or 4 Way Venn Diagram  
EG for 2 way enter 2. Valid values  
are 2,3 and 4 */  
, cutoff = < 0.3  
/* Set the P Value cut-off or any  
other appropriate cut off */  
, GroupA = Treatment A  
/* Define group name 1, mandatory */  
, GroupB = Treatment B  
/* Define group name 2, mandatory */  
, GroupC = Treatment C  
/* Define group name 3, mandatory  
for 3 and 4 way diagrams */  
, GroupD = Treatment D  
/* Define group name 4, mandatory  
for 4 way diagrams */  
, out_location = C:\SGF 2013\  
/* Define the path for all output  
files e.g. C:\Venn Diagrams */  
, outputfilename = Venn diagram  
/* Define the filename for the  
graphic file */  
);
```

## Venn Diagrams in SAS 9.3



## GTL Example Template for 2 Way Venn Diagram

```
/* Plot */  
layout overlay / yaxistopts = (display = NONE) xaxisopts = (display = NONE);  
scatterplot x=x y=y / markerattrs=(size = 0);  
  
/* Venn Diagram (Circles) */  
drawoval x=36 y=50 width=45 height=60 /display=all fillattrs=(color=red)  
transparency=0.75 WIDTHUNIT= Percent HEIGHTUNIT= Percent;  
  
drawoval x=63 y=50 width=45 height=60 /display=all fillattrs=(color=green)  
transparency=0.75 WIDTHUNIT= Percent HEIGHTUNIT= Percent;  
  
/* Numbers */  
drawtext "&A" / x=33 y=50 anchor=center;  
drawtext "&AB" / x=50 y=50 anchor=center;  
drawtext "&B" / x=66 y=50 anchor=center;  
drawtext "Outside Union - &TO" / x=50 y=10 anchor=center width = 30;  
  
/* Labels */  
drawtext "&GroupA" / x=30 y=15 anchor=center width = 30;  
drawtext "&GroupB" / x=70 y=15 anchor=center width = 30;  
endlayout;
```

## Conclusions

Venn Diagrams are very useful for visualising the relationships between groups. This poster has demonstrated how the technique can be implemented using SAS 9.3, with aesthetically pleasing results.

This poster is an updated version of a previous Venn Diagram paper I presented in 2008, and the improvements are in the quality of the Venn Diagram image and the consistency of how the image is generated. This is because the previous macro was developed for SAS 9.1.3 and a template was not used as in this one to allow for a consistent output of the generation of the Venn Diagrams.

Further upgrades can be made to allow the macro to accept qualitative data, to drill down, and to generate proportional Venn Diagrams. Also to reduce the font size if the numbers in the groups are very large.

## References

- Harris, Kriss. How To Generate 2, 3 and 4 Way Venn Diagrams with Drill Down Functionality within 4 minutes! SAS Global Forum 2008. - <http://www2.sas.com/proceedings/forum2008/073-2008.pdf>
- SAS 9.3 GTL Reference - <http://support.sas.com/documentation/cdl/en/grstatgraph/65377/HTML/default/viewer.htm#titlepage.htm>
- Venn Diagrams - [http://en.wikipedia.org/wiki/Venn\\_diagram](http://en.wikipedia.org/wiki/Venn_diagram)

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## Contact Information

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Full program available in the proceedings or by request.

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