Let’s Make Forest Plot by SAS

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Abstract:

The tips to create the forest plots easily with SAS/GRAPH's basic functions are introduced.

Keywords:

SAS GRAPH, GPLOT Procedure, PLOT Statement, BUBBLE Statement, Annotate Facility

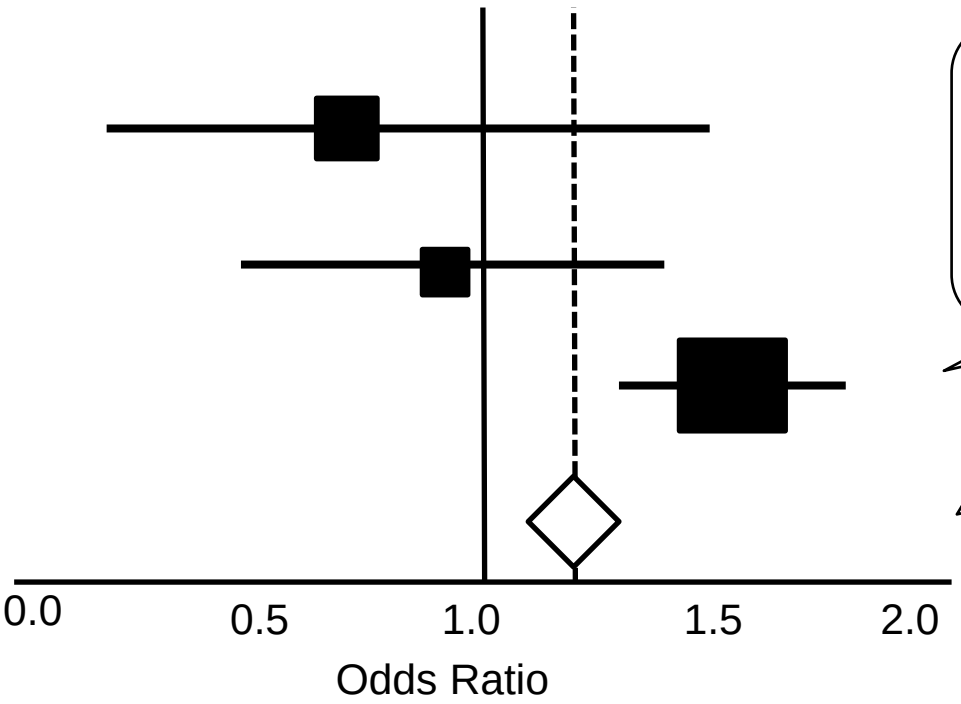
What is “Forest Plot”?

“Forest Plot” is…

- Some groups’ estimates and their intervals as a graph. (Anything is OK)
- Used for Meta-analyses.

Example of Typical Forest Plot

Study	Odds Ratio
Study A	0.6 (0.1, 1.5)
Study B	0.9 (0.4, 1.4)
Study C	1.5 (1.3, 1.8)
Overall	1.2 (1.1, 1.3)

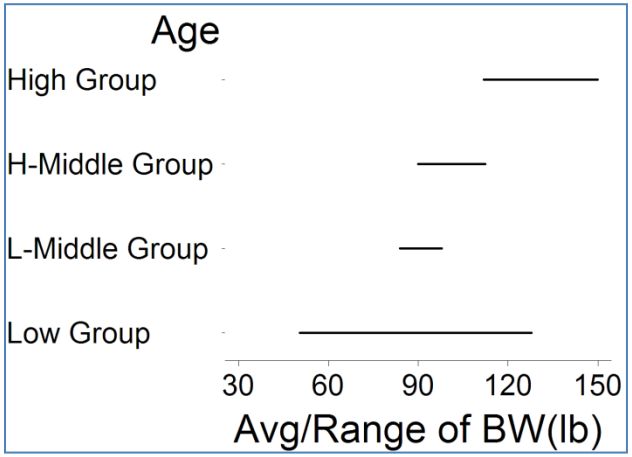


The sizes of estimate’s symbols are often weighted by the sample sizes.

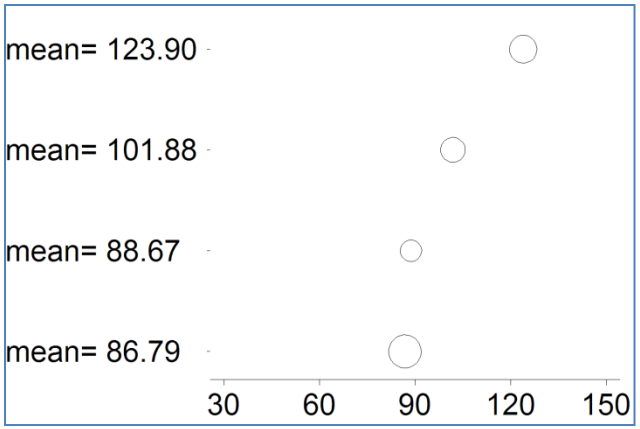
The overall result is sometimes displayed at the same time.

How to make the forest plot by SAS8.2

- SAS doesn't have the graph function for the forest plot.
- The overlay of Line plot and Bubble plot enables you to make the forest plot.

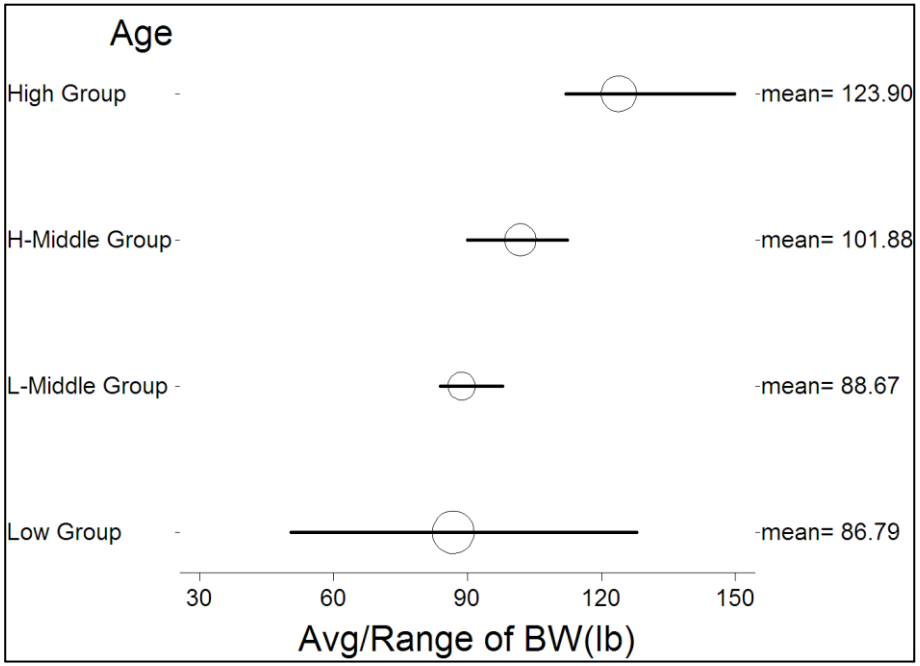


Line plot for the interval



Bubble plot for the estimate

Overlay



Forest plot

The basic data structure for the forest plot

- The structure of the input dataset is relevant to the forest plot.

(1) The variable to vertically plot left must have the values for the group names (numeric is OK, discrete is required).

(4) At the observations for the interval, the variable for the estimate must be blank.

(3) The variable to horizontally plot must have the values for the estimates and their intervals (upper and lower limits).

	rowid	rowid2	n_subj	bplot
1	H-Middle Group		4	90
2	H-Middle Group		4	112.5
3		H-Middle Group	4	101.875
4	High Group		5	112
5	High Group		5	150
6		High Group	5	123.9
7	L-Middle Group		3	84
8	L-Middle Group		3	98
9		L-Middle Group	3	88.666666667
10	Low Group		7	50.5
11	Low Group		7	128
12		Low Group	7	86.785714286

(5) At the observation for the estimate, the variable for the intervals must be blank.

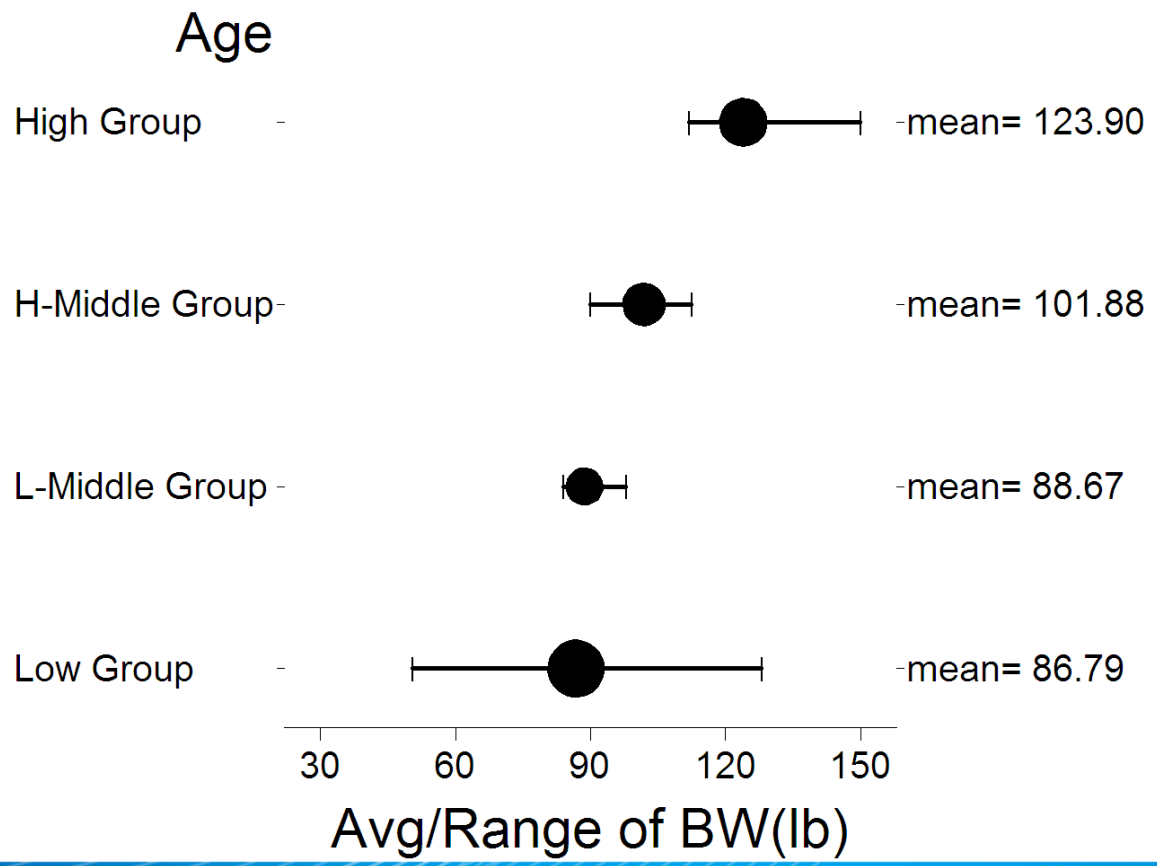
(Optional)
You can use the aliases for the groups by applying the format to one of the variables to vertically plot.

(2) The variable to vertically plot right must have the same values as the same group in the variables to vertically plot left (numeric is OK, discrete is required).

(6) The variable to weight must have the numeric values that mean “N”.

The forest plot by SAS9.2

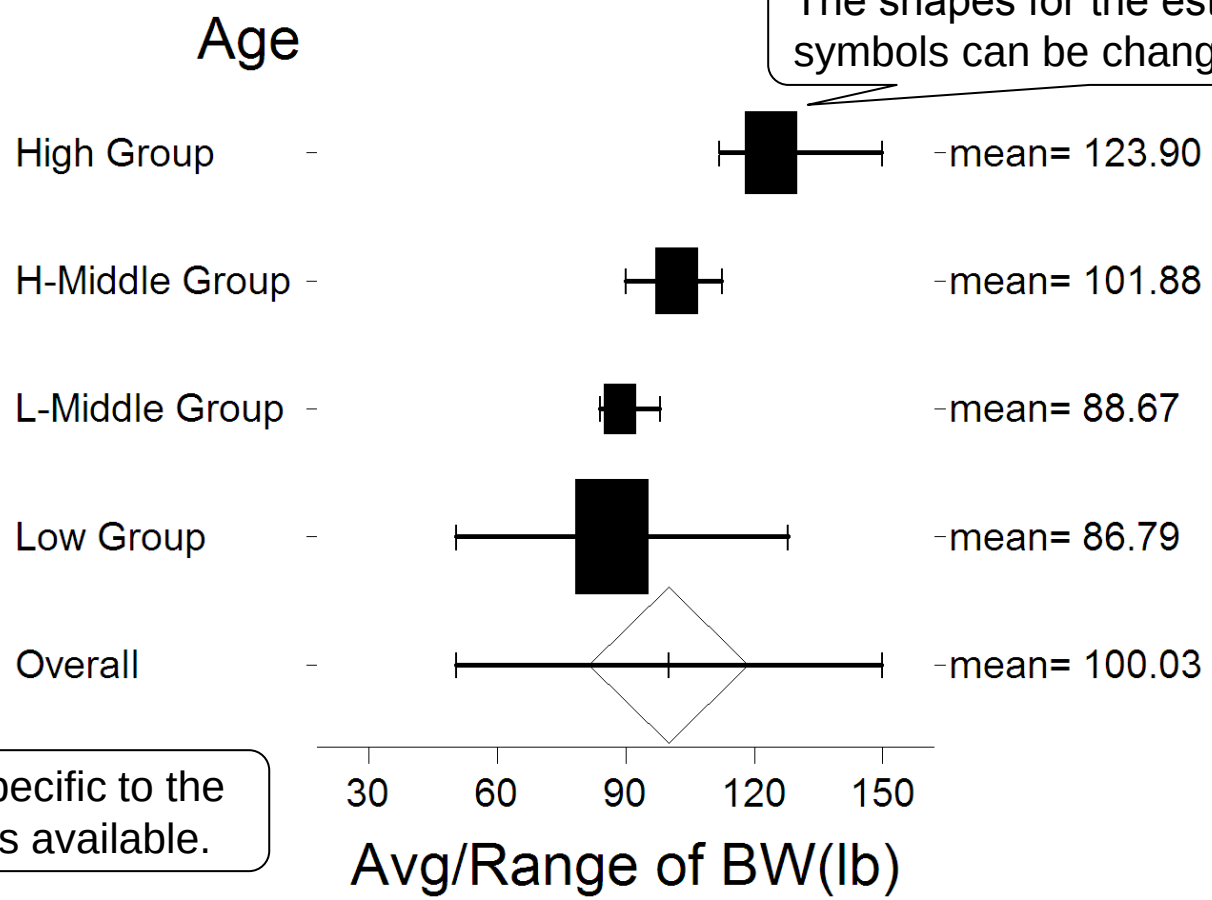
- By SAS9.2 or later version, BFILL= option in GPLOT procedure's BUBBLE statement enables you to fill the bubbles with the colors.
- This looks probably more ideal as the forest plot.



The more exploratory techniques

•Instead of BUBBLE Statement, using Annotate Facility will expand the variety of the forest plots.

The shapes for the estimates' symbols can be changed as needed.



The display specific to the overall result is available.

The expanded basic data structure

•The basic data structure for the forest plot can be expanded and applied into the dataset for Annotate Facility.

The variables in the dataset with the basic data structure are renamed for Annotate Facility.

The added variables for Annotate Facility's settings.

The added observations for the overall results.

	rowid	yc	size	x	function	text	cbox	xsys	ysys
1	Overall		19	50.5				2	2
2	Overall		19	150				2	2
3		Overall	19	100	symbol	diamond		2	2
4	H-Middle Group		4	90				2	2
5	H-Middle Group		4	113				2	2
6		H-Middle Group	4	102	symbol		black	2	2
7	High Group		5	112				2	2
8	High Group		5	150				2	2
9		High Group	5	124	symbol		black	2	2
10	L-Middle Group		3	84				2	2
11	L-Middle Group		3	98				2	2
12		L-Middle Group	3	88.7	symbol		black	2	2
13	Low Group		7	50.5				2	2
14	Low Group		7	128				2	2
15		Low Group	7	86.8	symbol		black	2	2

The aliases are still applicable through the format .

The highlights of sample SAS programs

Sample for SAS8.2

```
proc gplot data=byage2;
plot rowid*bplot=rowid/vaxis=axis2 haxis=axis1 nolegend;
bubble2 rowid2*bplot=n_subj/vaxis=axis3 bsize=9 bcolor=black;
run;
```

Sample for SAS9.2 or later version

```
proc gplot data=byage2;
plot rowid*bplot=rowid/vaxis=axis2 haxis=axis1 nolegend;
bubble2 rowid2*bplot=n_subj/vaxis=axis3 bsize=9 bcolor=black bfill=solid;
run;
```

Sample for ANNOTATE Facility

```
proc gplot data=anno_age annotate=anno_age;
plot rowid*x=rowid/vaxis=axis2 haxis=axis1 nolegend;
plot2 yc*x=yc/vaxis=axis3 nolegend;
run;
```

If you need the full sample programs, please contact shinichi.hotta@pfizer.com.