

Create Forest Plot for ORR in Solid Tumor Studies

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Abstract

In the solid tumor studies, we often need to create forest plot for objective response rate (ORR). The ORR is defined as the proportion of subjects who achieved a best overall response of complete response (CR) or partial response (PR) as defined by Response Evaluation Criteria in Solid Tumors (RECIST) version 1.1.

In the forest plot we need to show the proportion and the Clopper-Pearson confidence interval in both numbers and in figure for different subgroups. In this short paper I will show how to do that. The programs are provided in Github.

Introduction

we will use the best overall response data below to create the figure.

	 usubjid	 sex	 race	 region	 paramcd	 avalc
1	0001	Male	White	Japan	BOR	PR
2	0002	Female	White	Japan	BOR	PD
3	0003	Male	White	USA	BOR	SD
4	0004	Female	White	Japan	BOR	SD
5	0005	Male	White	Japan	BOR	SD
6	0006	Female	Asian	USA	BOR	PR
7	0007	Male	Asian	Japan	BOR	CR
8	0008	Female	Asian	Japan	BOR	SD
9	0009	Male	Asian	USA	BOR	PD
10	0010	Female	White	USA	BOR	NE

We will use some macros to calculate the ORR with clopper-Pearson confidence interval. For the figure we will show how to do it with both PROC SGPLOT and PROC TEMPLATE.

Details

After we calculate the ORR and confidence intervals for subgroups, we can use PROC SGPLOT to do the figure. The two scatter statements will show the ORR, the lower limit and the upper limit in the figure. The two yaxistable statements will show the subgroup labels and numbers for ORR and confidence interval.

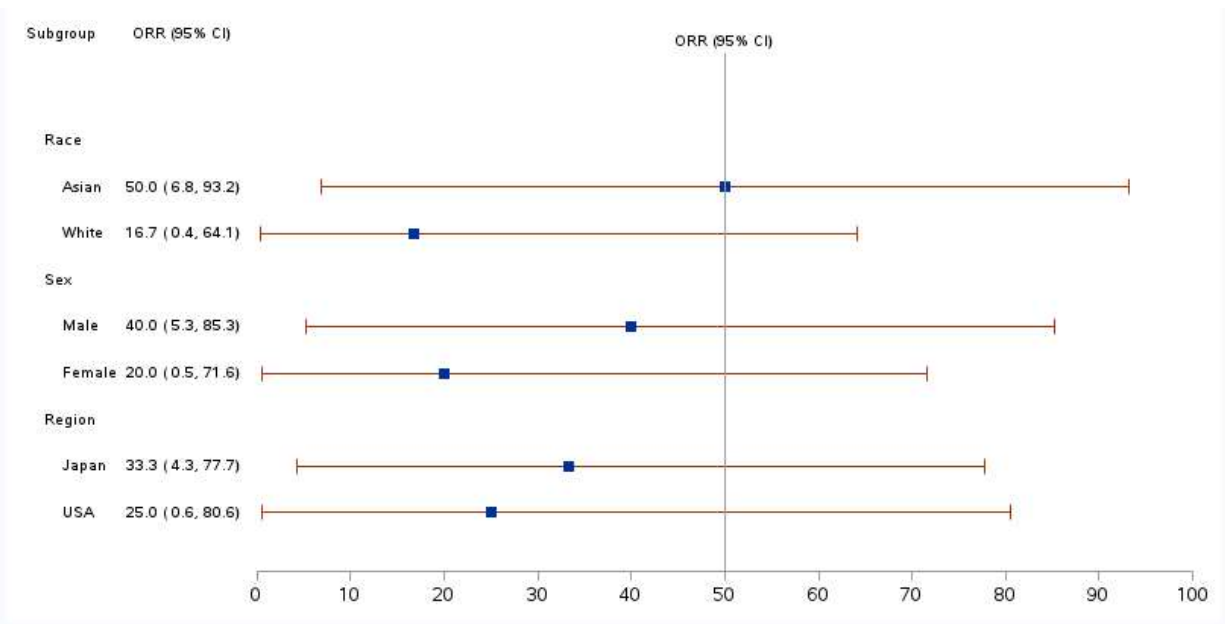
```
Proc sgplot data=final nowall noborder nocycleattrs noautolegend;  
    styleattrs axisextent=data;  
    scatter y=obsid x=orr / markerattrs=(symbol=squarefilled)  
xerrorlower=lower xerrorupper=upper;
```

```

scatter y=obsid x=orr / markerattrs=(size=0) x2axis;
refline 50 / axis=x;
yaxistable catlabel / location=inside position=left labelattrs=(size=7)
labelhalign=left valuehalign=left indentweight=indentweight;
yaxistable orr_ci / location=inside position=left labelattrs=(size=7)
valueattrs=(size=7) nomissingchar;
yaxis reverse display=none colorbands=odd
colorbandsattrs=(transparency=1) offsetmin=0.08 values=(0 to 10 by 1);
xaxis display=(nolabel) values=(0 to 100 by 10);
x2axis label='ORR (95% CI)' display=(noline noticks novalues)
labelattrs=(size=7);
label orr_ci='ORR (95% CI)' catlabel='Subgroup';
run;

```

This is the output.



We can also use the PROC TEMPLATE to do the figure.

We use the axistable statement to show the ORR with confidence intervals, use the scatterplot statement to do the figure. The labels for the subgroups are handled through a format.

```

proc template;
  define statgraph forest;
    begingraph;
      entrytitle textattrs=(size=10.9pt weight=bold) halign =
center "Forest plot of ORR with 95% CI";
      entrytitle " ";
      layout overlay/yaxisopts=(linearopts=(tickvaluelist=(1 2 3
4 5 6 7 8 9)) label=' ' tickvaluehalign=left)
xaxisopts=(linearopts=(tickvaluepriority=true
tickvaluesequence=(start=0 end=100 increment=10)) offsetmin= 0.2
offsetmax=0.1 label=' ');

```

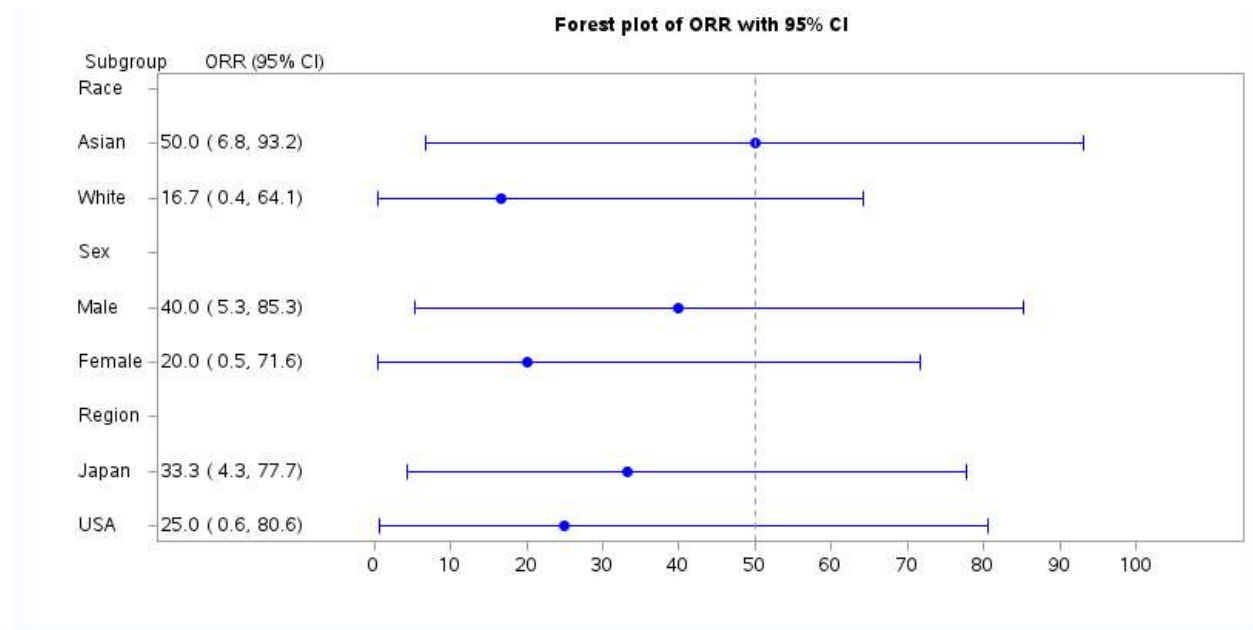
```

                                axistable y=start value=orr_ci /
valueattrs=(size=10 ) display=(values);
                                scatterplot x=orr y=start /
                                ERRORBARCAPSHAPE= serif
                                xerrorlower=lower xerrorupper=upper
errorbarattrs=(color=blue)
                                markerattrs=(symbol=circlefilled size=8
color=blue );
                                referenceline x=50 / lineattrs= ( pattern=2);
                                drawtext textattrs=( size=9pt) "Subgroup"
/anchor=bottomleft width=18
                                widthunit=percent
                                xspace=wallpercent yspace=wallpercent x=-7 y=99
justify=center;
                                drawtext textattrs=( size=9pt) "ORR (95% CI)"
/anchor=bottomleft width=18
                                widthunit=percent
                                xspace=wallpercent yspace=wallpercent x=4 y=99
justify=center;
                                endlayout;
                                endgraph;
                                end;
run;

proc sgrender data=final template=forest;
    format start catf.;
run;

```

This is the output.



Conclusion

Both PROC SGPLOT and PROC TEMPLATE can create high quality forest plot. In PROC SGPLOT we can use indentweight to add indentation to the numbers. In PROC TEMPLATE we can use TICKVALUEHALIGN to left align or right align the subgroup labels.

The full programs are available in my Github account:

<https://github.com/hengweiliu2020/forest-plot-for-ORR/tree/main>

Contact

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