



Your statistical health consultancy



CHM
staying healthy

CRO
getting healthy

TEMP WORK
team health

Forest Plots in Survival Subgroup Analyses



Motivation

ADTTE dummy data

Macro for forest plots

Summary

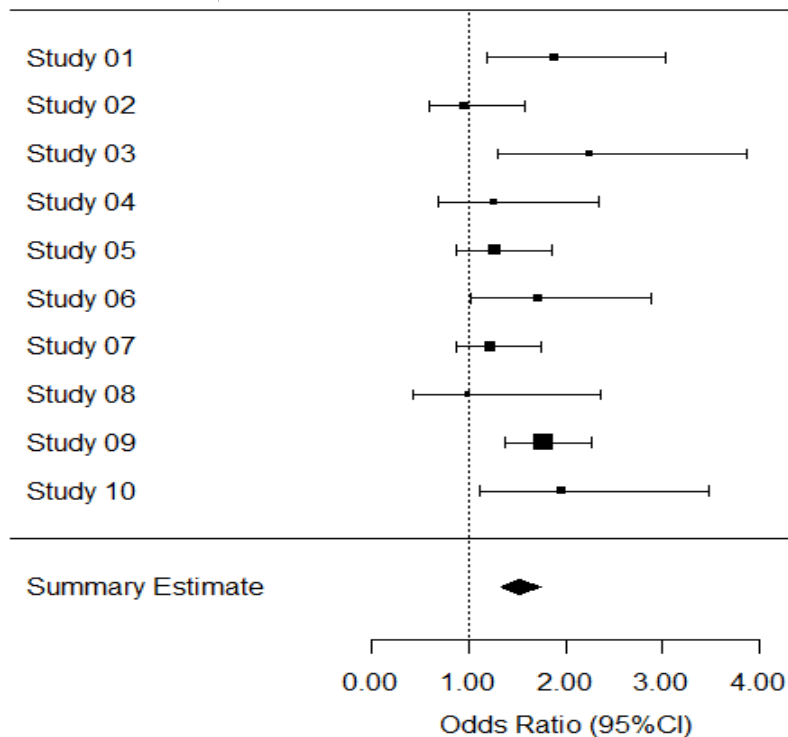
- Survival subgroup analysis, e.g. study from oncology

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- Effect of study drug vs. placebo:
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- Effect of study drug vs. placebo:
Hazard ratio (HR) and confidence interval (CI)
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→ Forest plot

Simple example:



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- Stratification (→ different model)
- In our case: about 40 different forest plots
→ Macro needed!
- Macro: ADTTE data as input → Forest plot as output

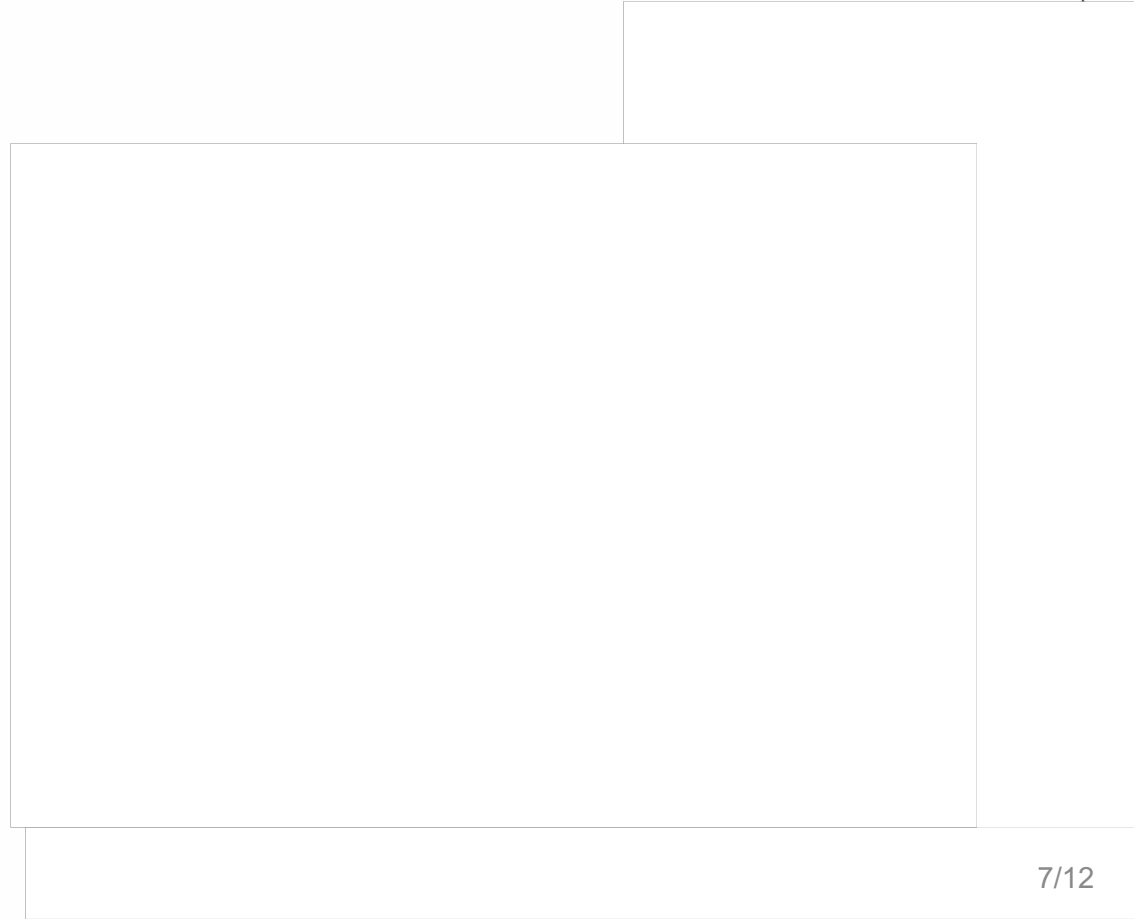
Obs	Subject identifier	Gender	Age group	BMI at baseline	Treatment	Parameter code	Censor variable	Analysis value	Analysis value unit
1	1234500001	Female	>= 85	< 25	Study drug	PFS	0	301	Days
2	1234500001	Female	>= 85	< 25	Study drug	DEATH	1	315	Days
3	1234500042	Male	65-74	25-30	Placebo	PFS	1	1	Days
4	1234500042	Male	65-74	25-30	Placebo	DEATH	1	1	Days
5	1234500114	Male	< 65	> 30	Study drug	PFS	0	51	Days
6	1234500114	Male	< 65	> 30	Study drug	DEATH	0	94	Days
7	1234500210	Female	75-84	.	Placebo	PFS	0	23	Days
8	1234500210	Female	75-84	.	Placebo	DEATH	1	23	Days

`%macro_forest_plot()`

Requirements & layout:

- CI level & endpoint apparent in the title

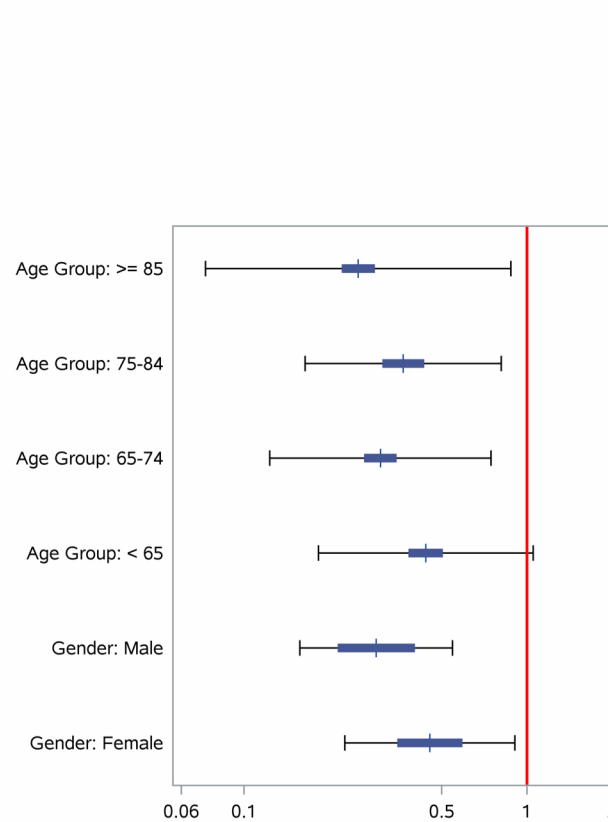
Forest Plot of Hazard Ratios and 95% Confidence Intervals by Subgroup Progression-Free Survival (Intent-to-Treat Analysis Set)



Requirements & layout:

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- HRs & CIs for each subgroup category + Subgroup size

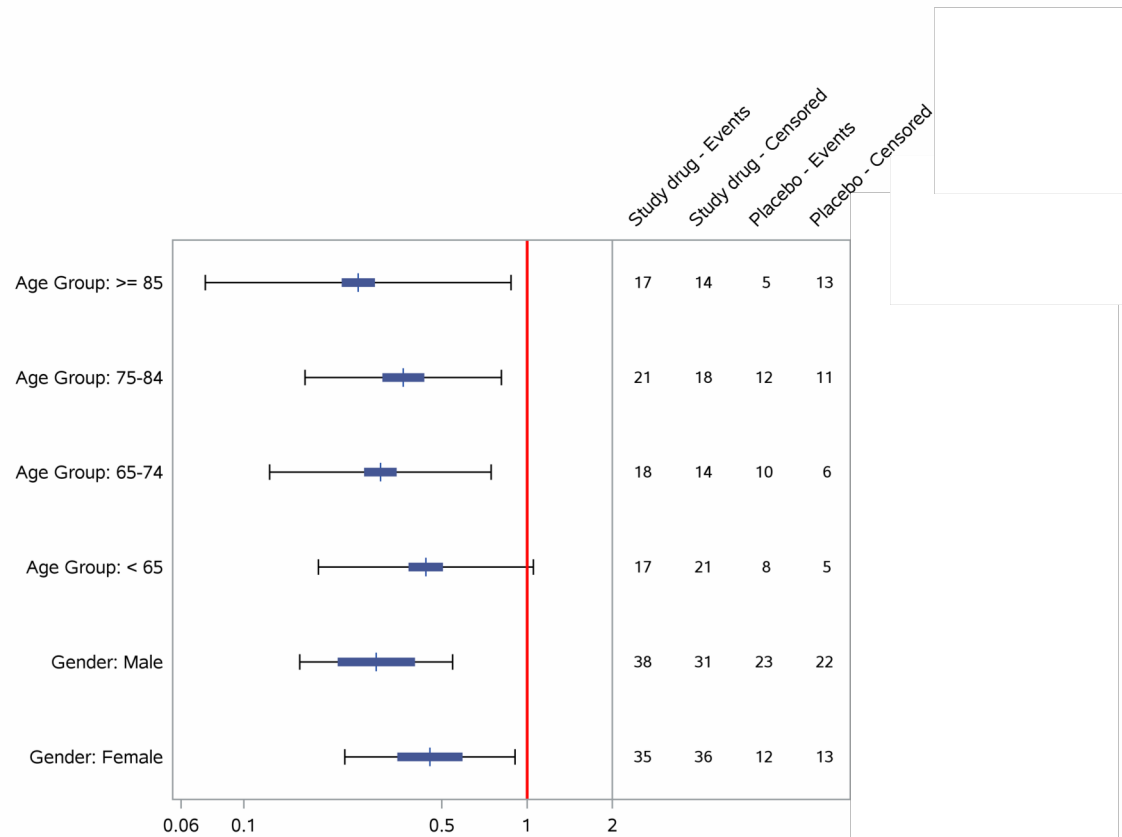
Forest Plot of Hazard Ratios and 95% Confidence Intervals by Subgroup
Progression-Free Survival (Intent-to-Treat Analysis Set)



Requirements & layout:

- CI level & endpoint apparent in the title
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- Survival data: Events & censored patients

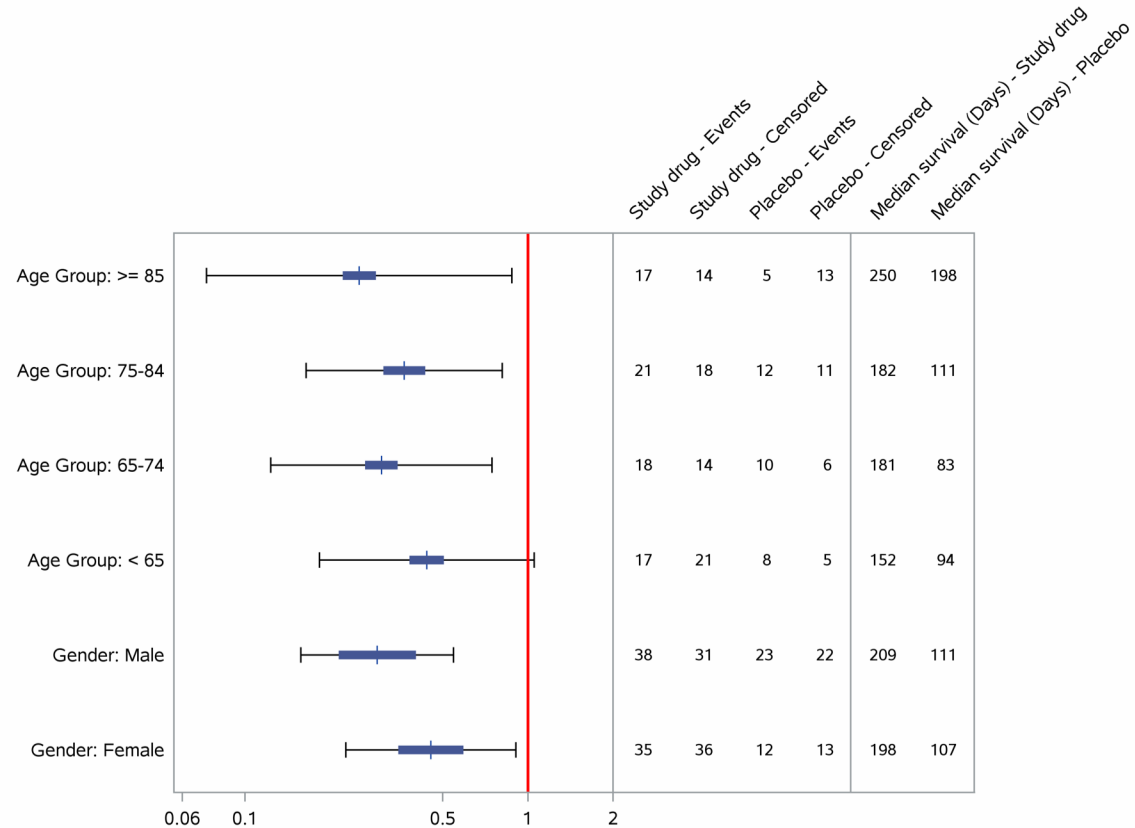
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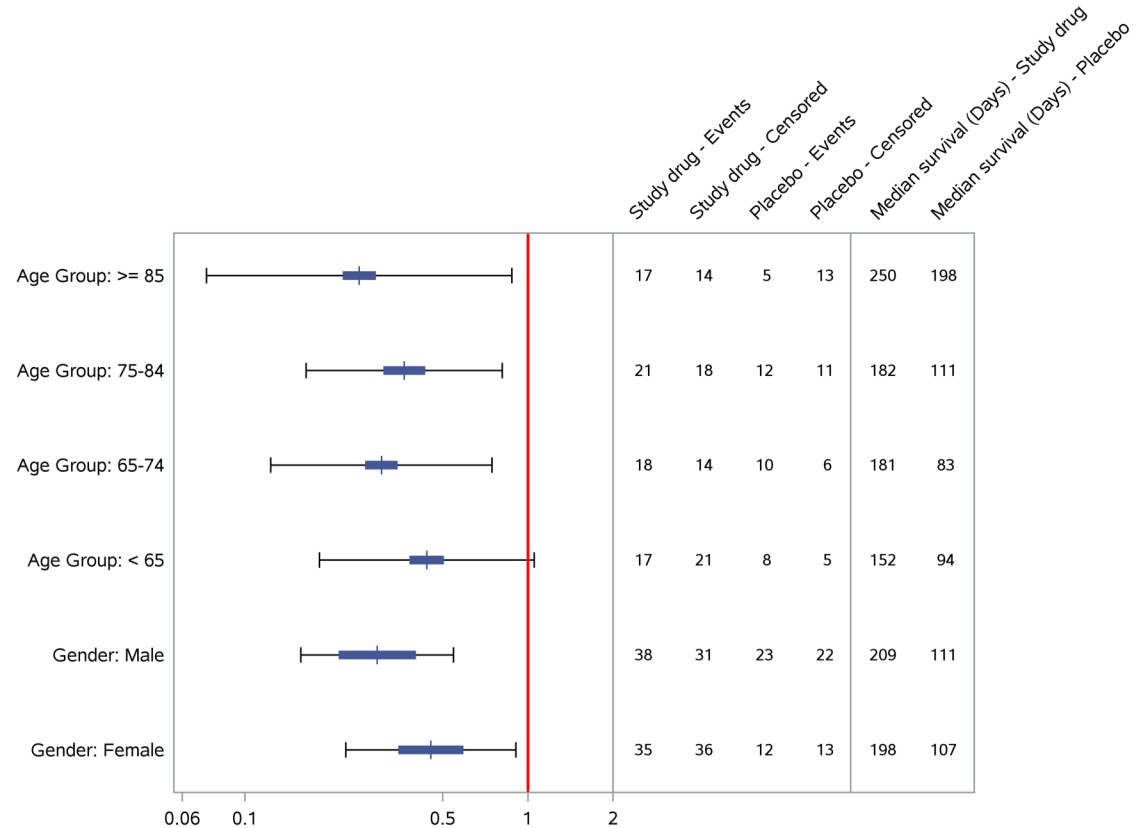
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- Survival data: Events & censored patients
- Median survival times
- Footnotes

Forest Plot of Hazard Ratios and 95% Confidence Intervals by Subgroup
Progression-Free Survival (Intent-to-Treat Analysis Set)



Up to five additional footnotes (footnote1-footnote5) possible.

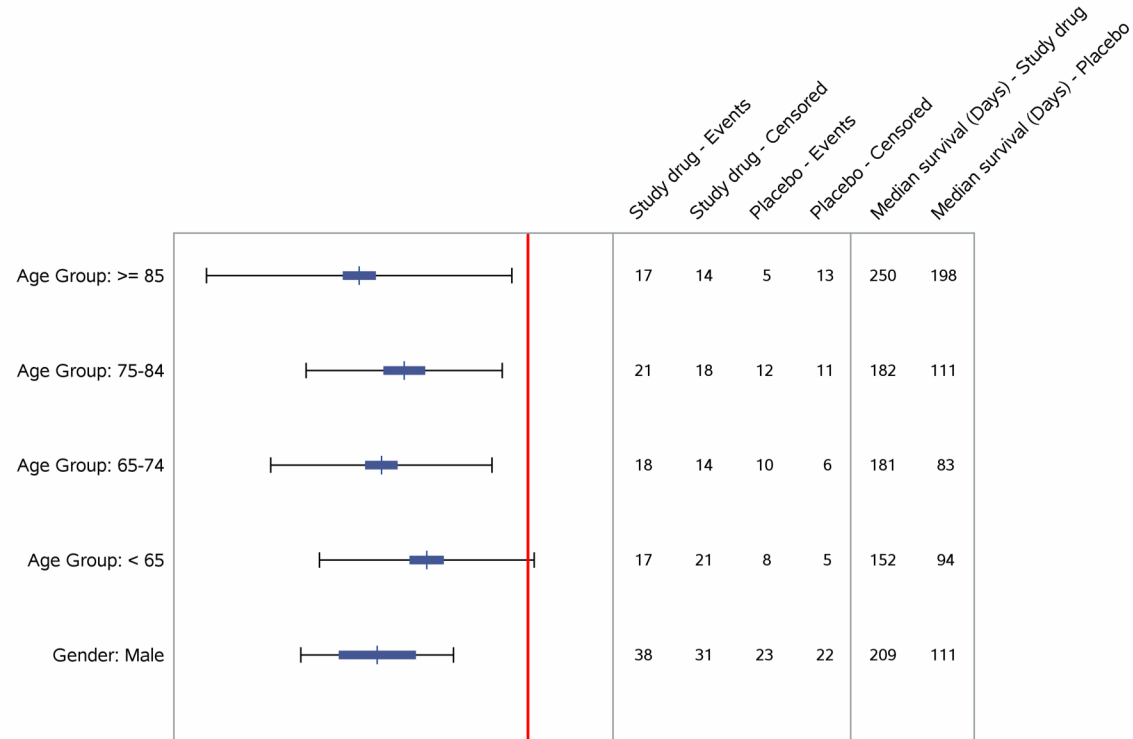
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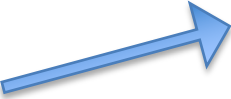
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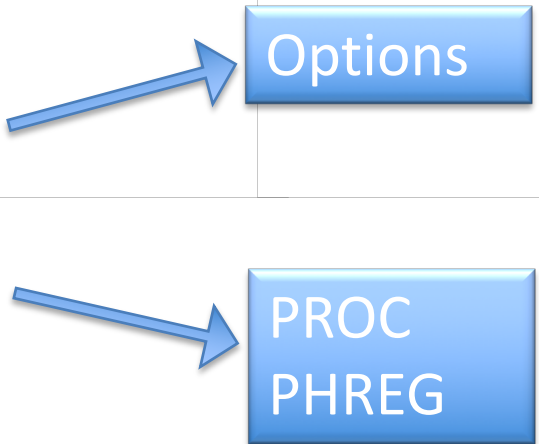
- CI level & endpoint apparent in the title
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Options

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- CI level & endpoint apparent in the title
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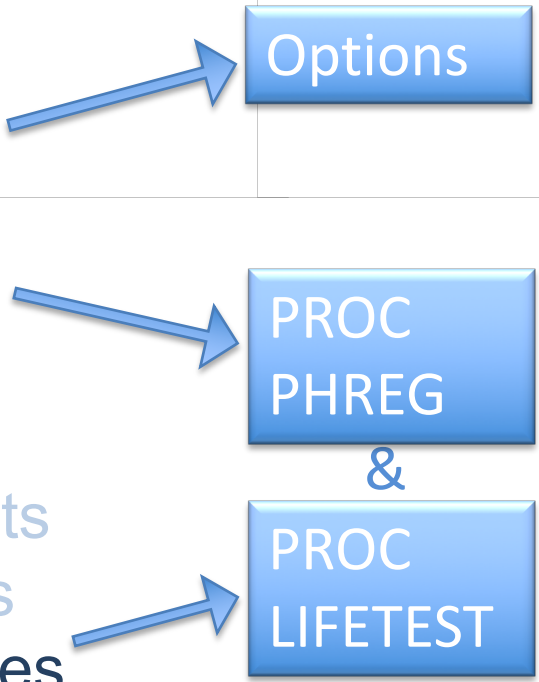


Options

PROC
PHREG

Requirements:

- CI level & endpoint apparent in the title
- HRs & CIs for each subgroup category + Subgroup size
- Survival data: Events & censored patients
- **Median survival times**
- Footnotes



Options

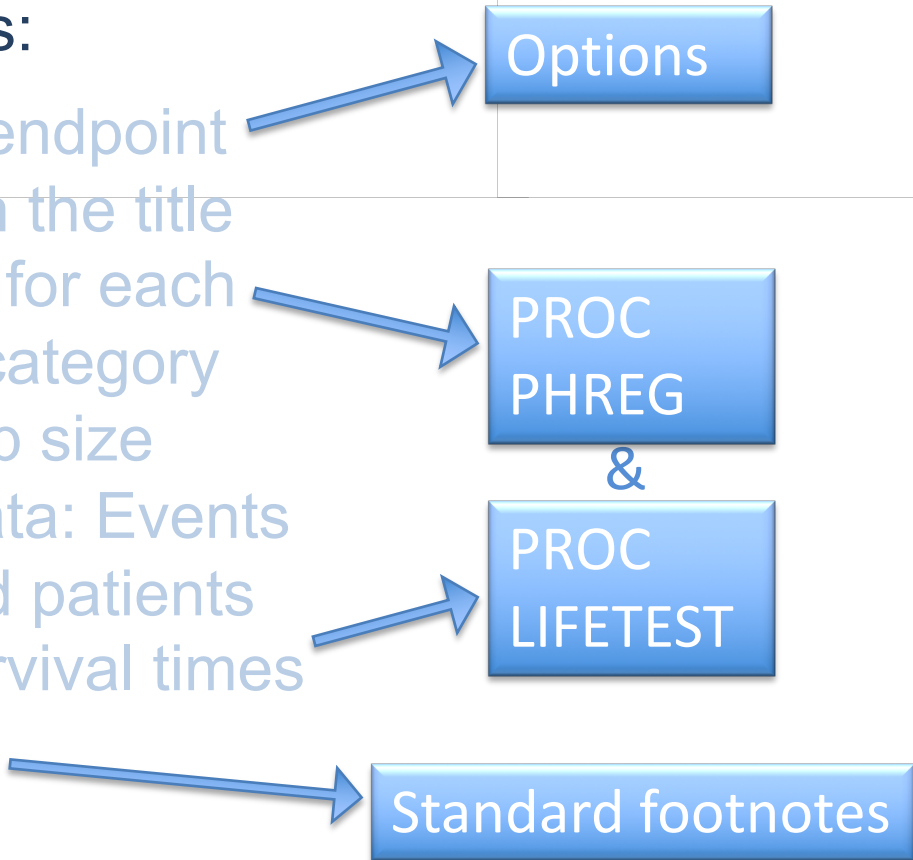
PROC
PHREG

&

PROC
LIFETEST

Requirements:

- CI level & endpoint apparent in the title
- HRs & CIs for each subgroup category + Subgroup size
- Survival data: Events & censored patients
- Median survival times
- **Footnotes**



Options

PROC
PHREG

&

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Standard footnotes

Requirements:

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- HRs & CIs for each subgroup category + Subgroup size
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Options

PROC
PHREG

&

PROC
LIFETEST

Standard footnotes

Main input:

ADTT
E data

Options

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PROC
PHREG

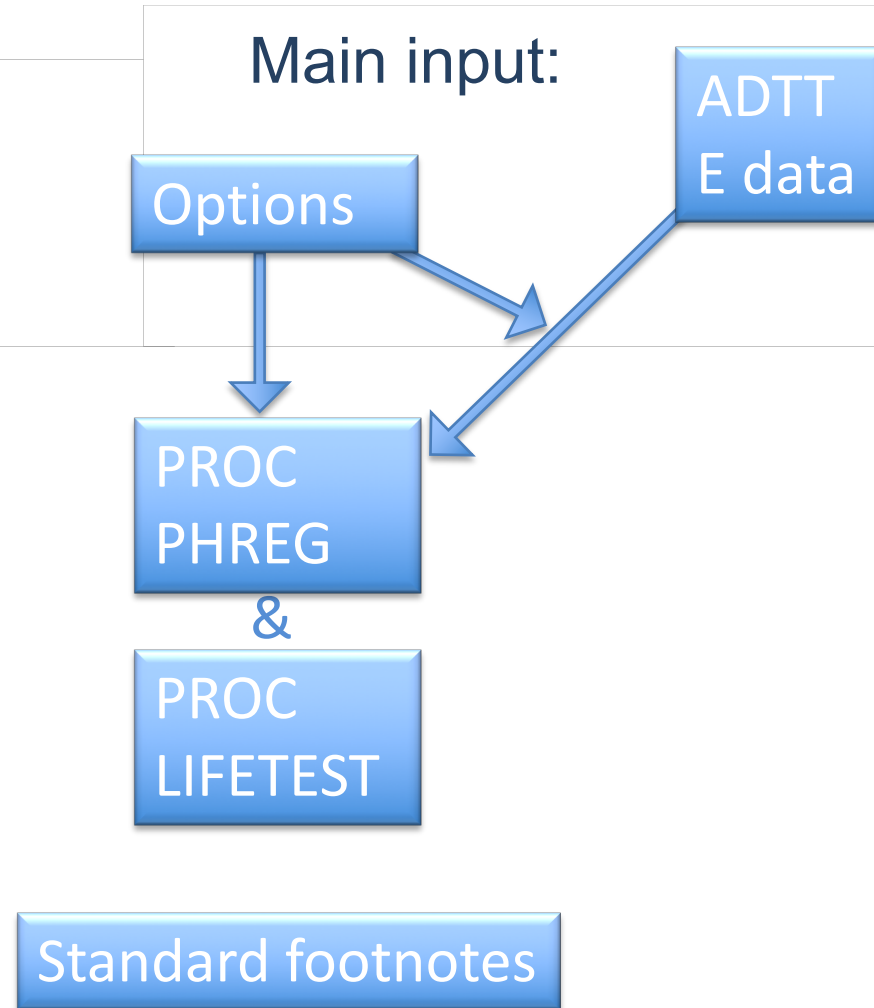
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PROC
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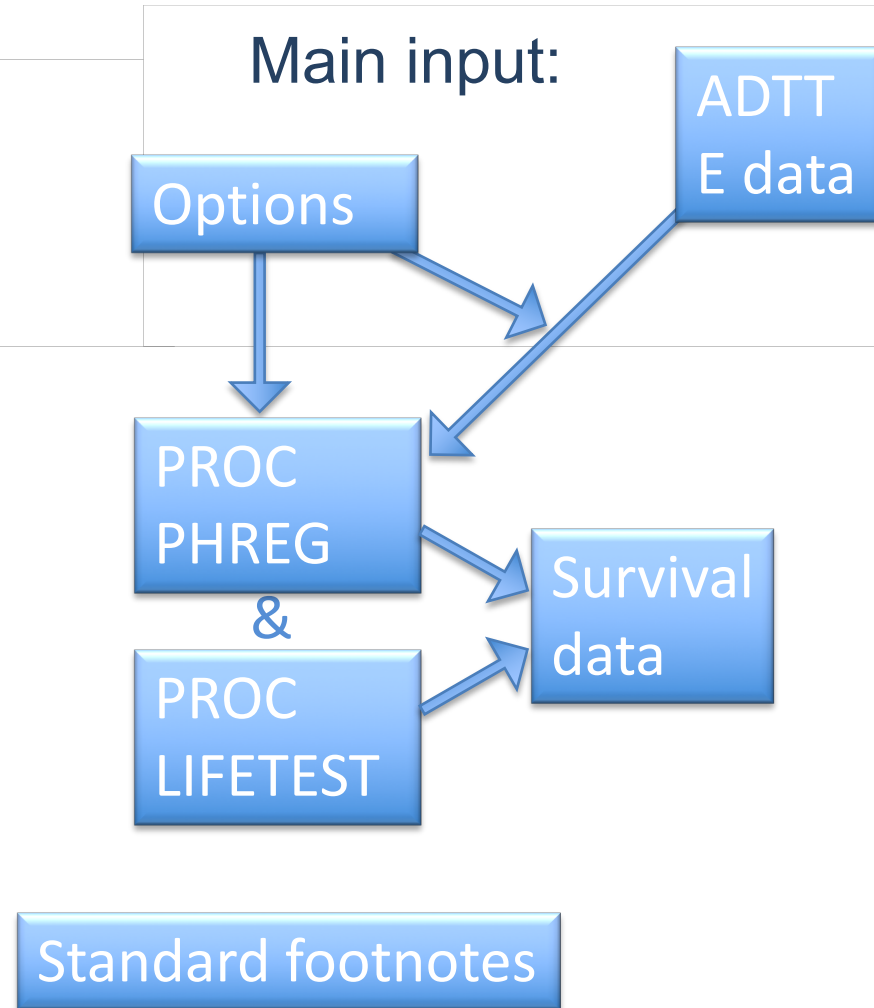
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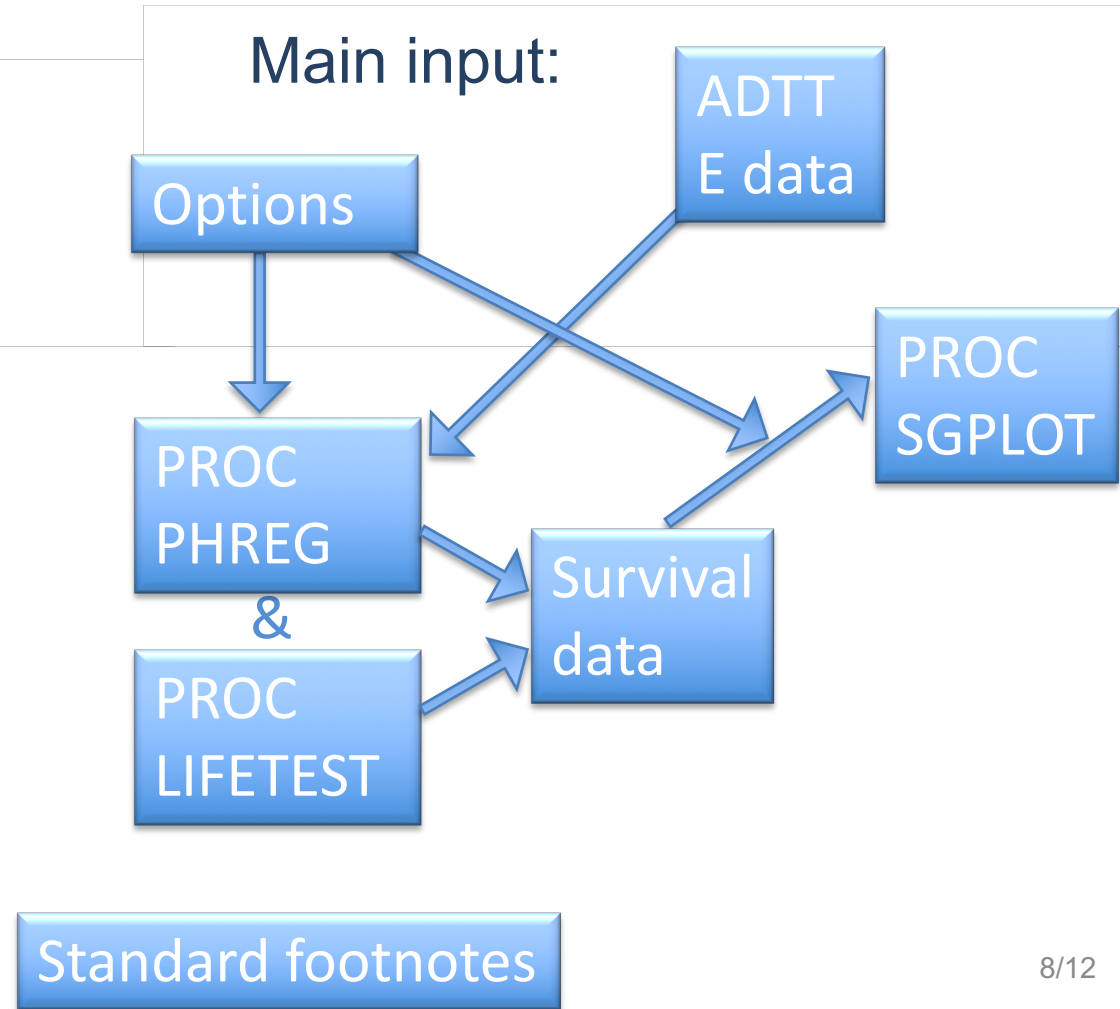
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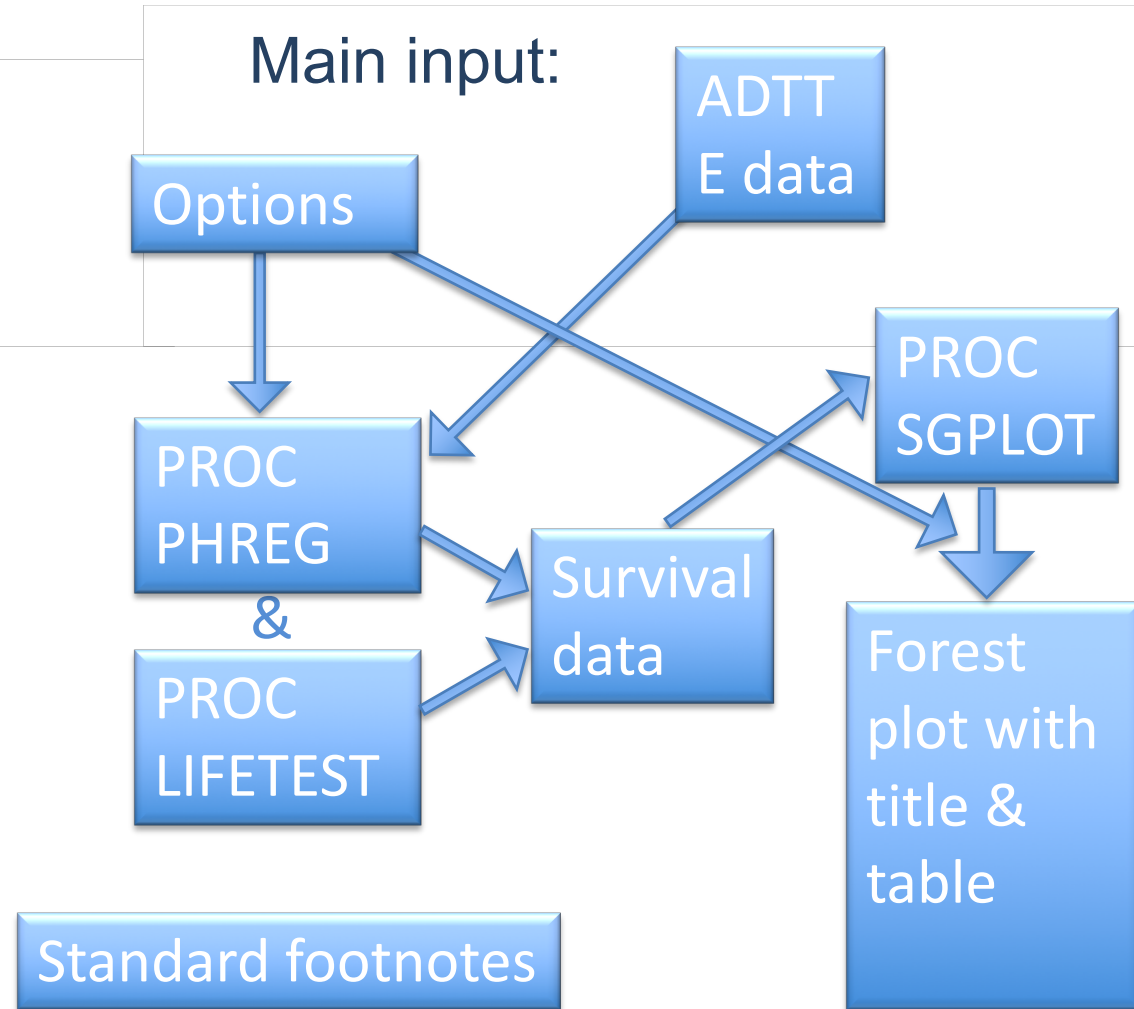
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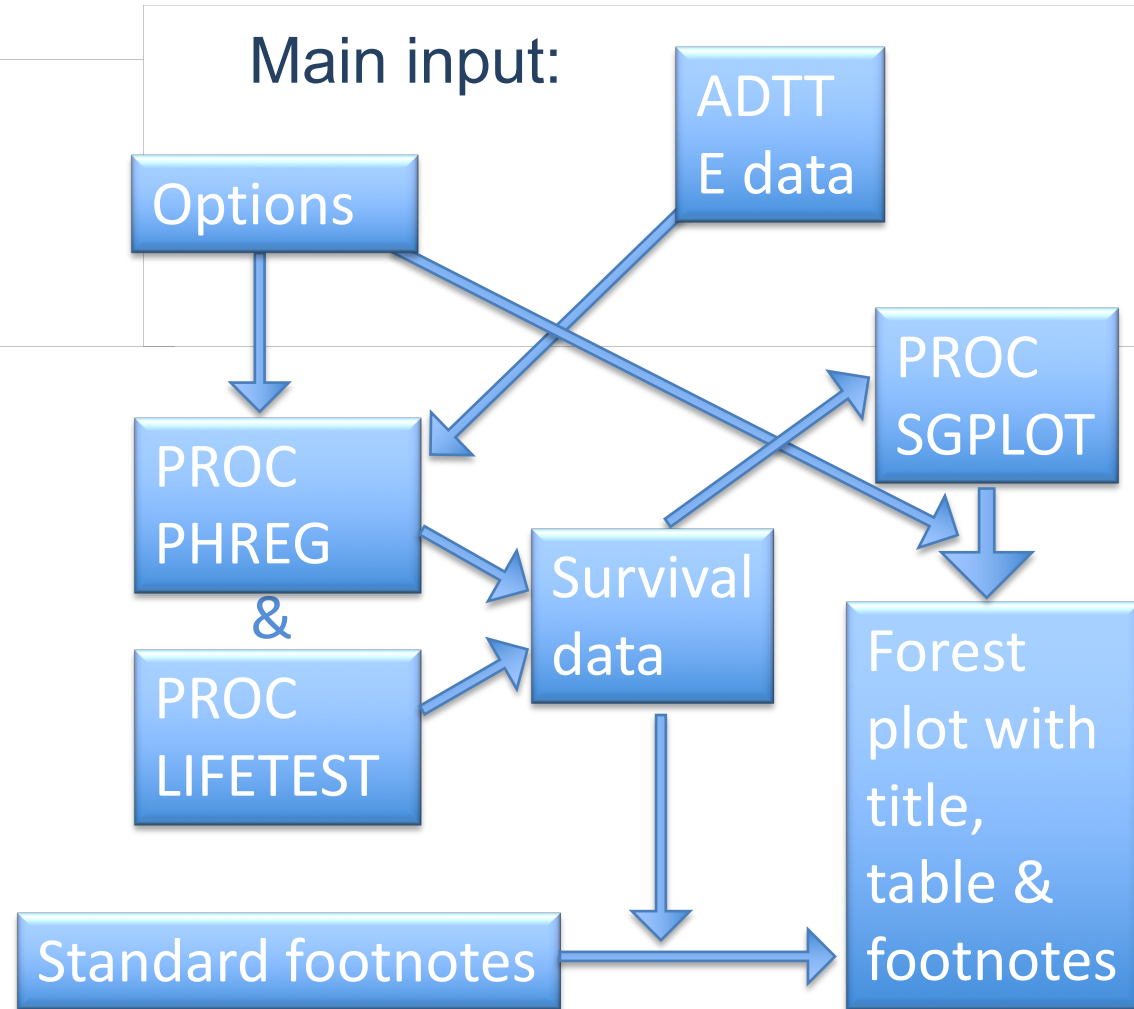
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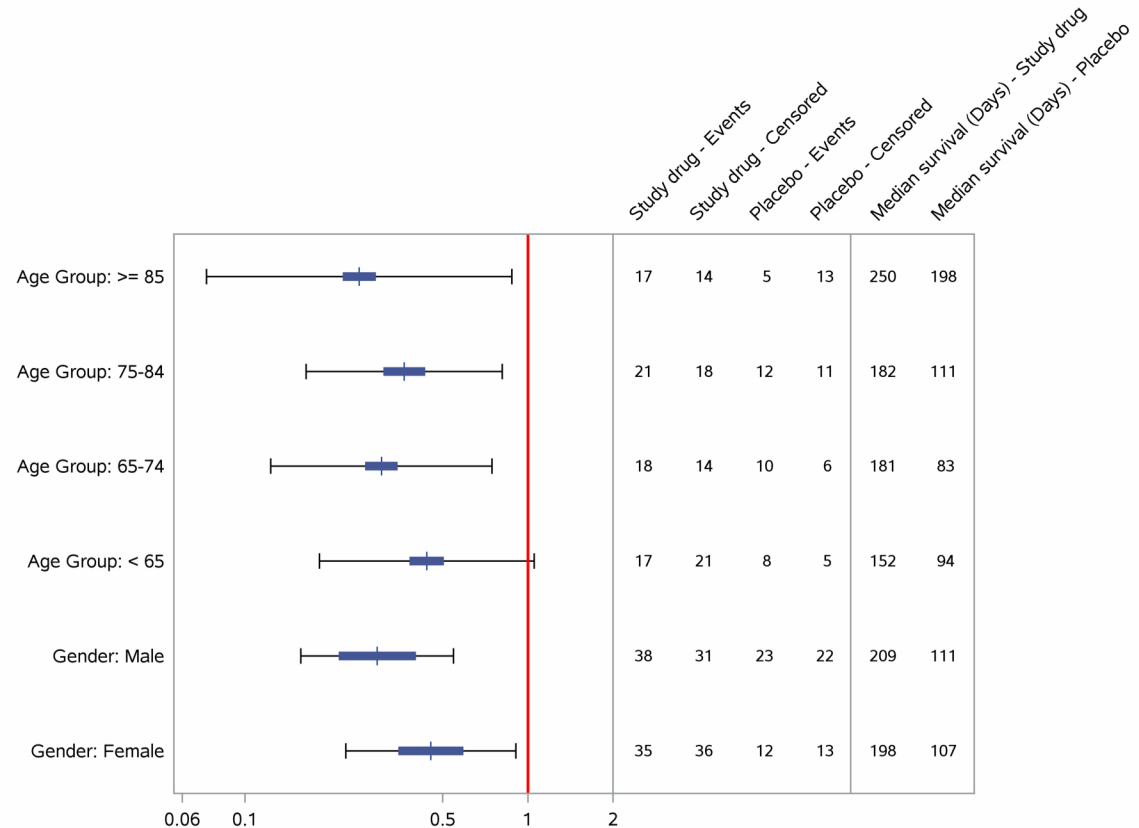
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Macro call – example 1:

```
%macro_forest_plot(
  endpoint = pfs
, ci_level = 95
, sgrp_vlst = sex agegr01n
, sgrp_lbls = Gender~Age Group
, footnote1 = Up to five additional
               footnotes (footnote1-
               footnote5) possible.
);
```

Forest Plot of Hazard Ratios and 95% Confidence Intervals by Subgroup
Progression-Free Survival (Intent-to-Treat Analysis Set)



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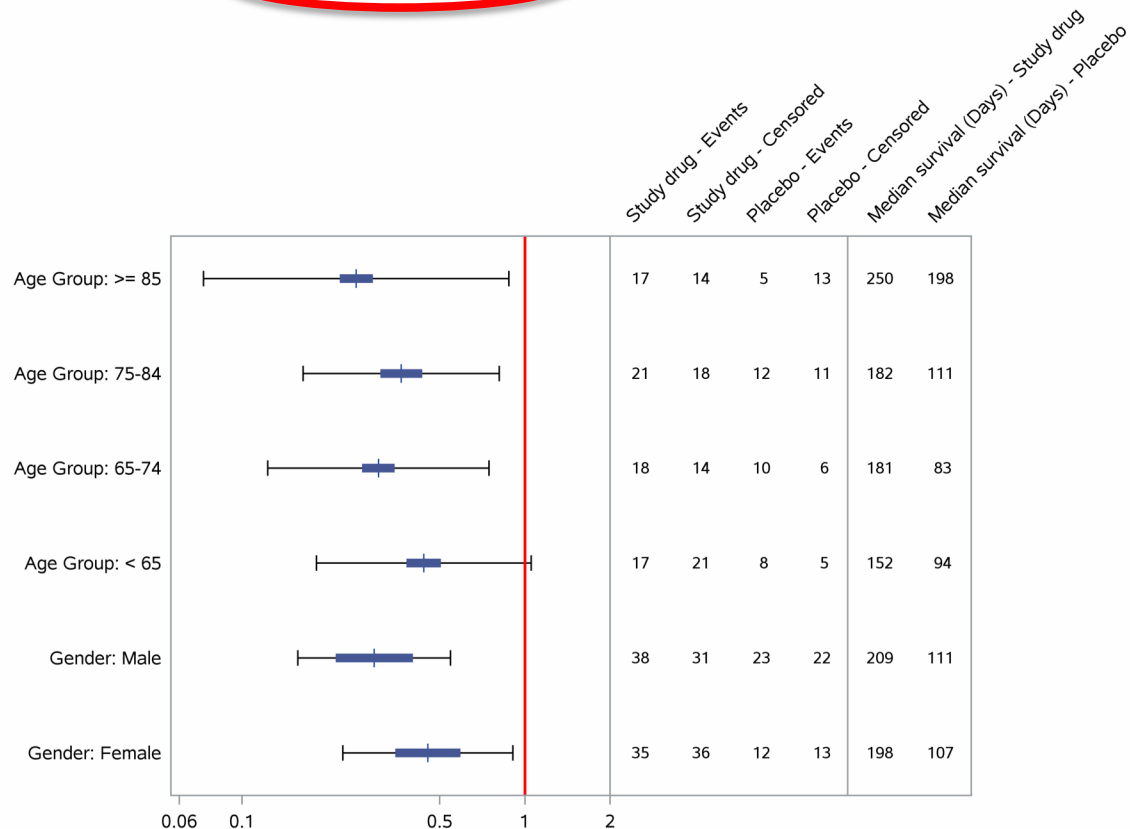
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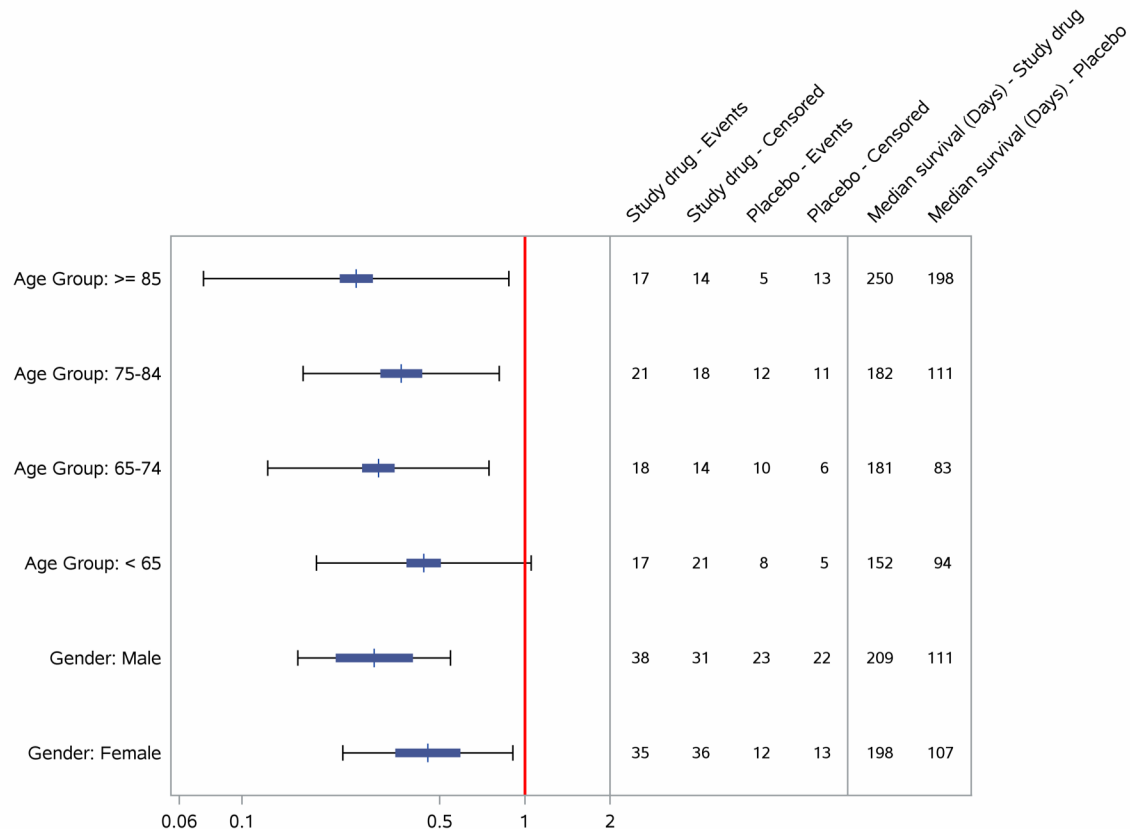
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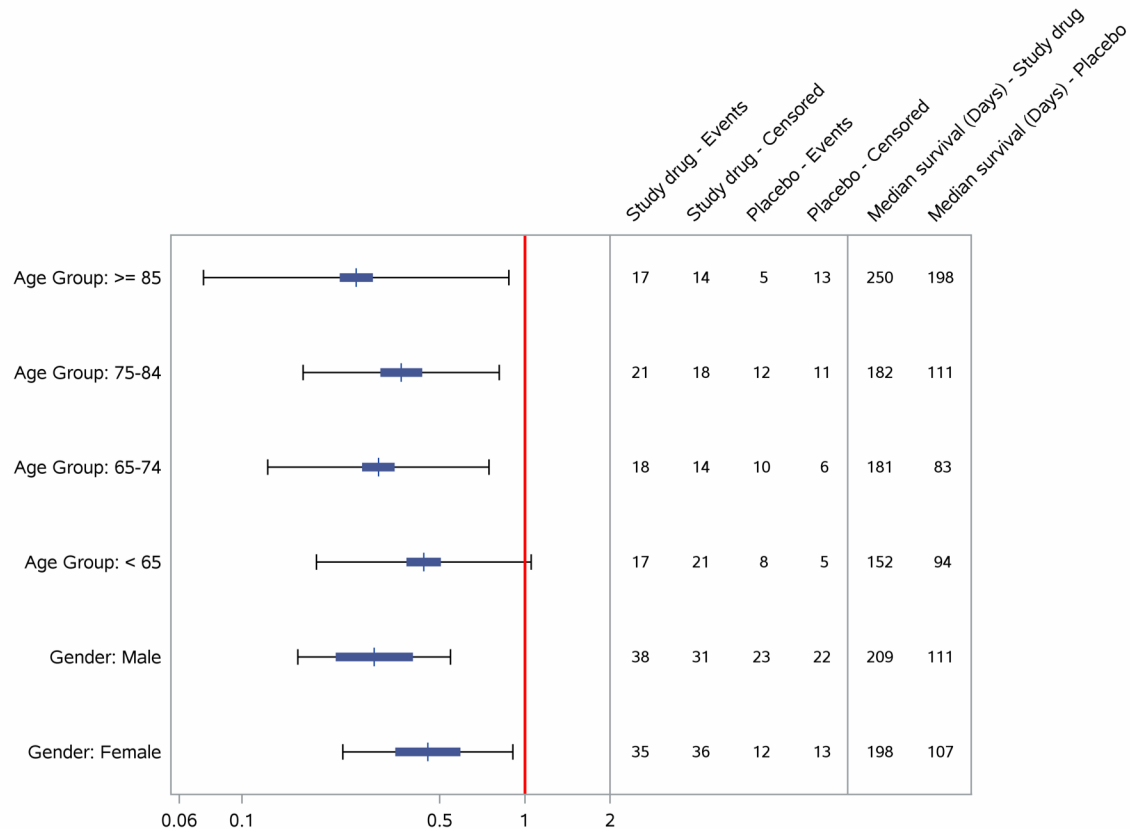
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Changing to:

```
%macro_forest_plot(
  endpoint = death
, ci_level = 80
, sgrp_vlst = sex agegr01n bmigr1
, sgrp_lbls = Gender~Age Group~BMI
);
```

Forest Plot of Hazard Ratios and 95% Confidence Intervals by Subgroup
Progression-Free Survival (Intent-to-Treat Analysis Set)



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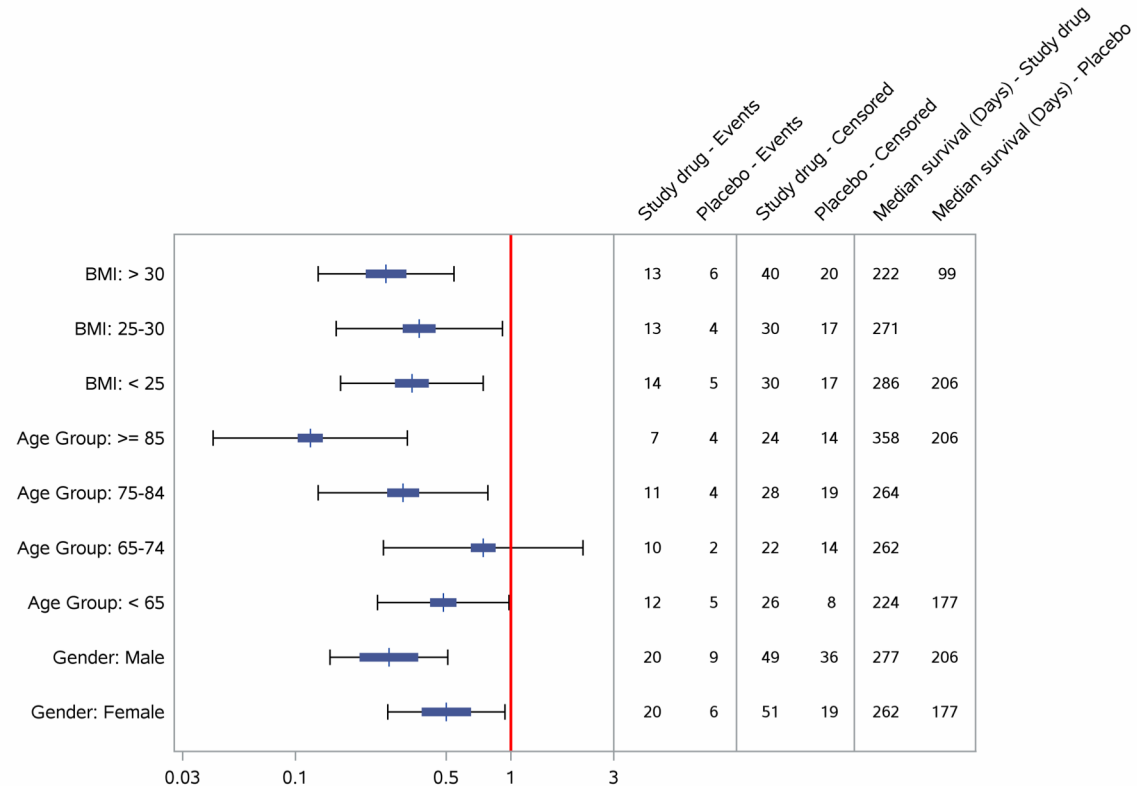
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Macro call – example 2:

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);
```

Forest Plot of Hazard Ratios and 80% Confidence Intervals by Subgroup
Overall Survival (Intent-to-Treat Analysis Set)



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Estimation of the HR and its confidence interval are based on an unstratified Cox regression model.

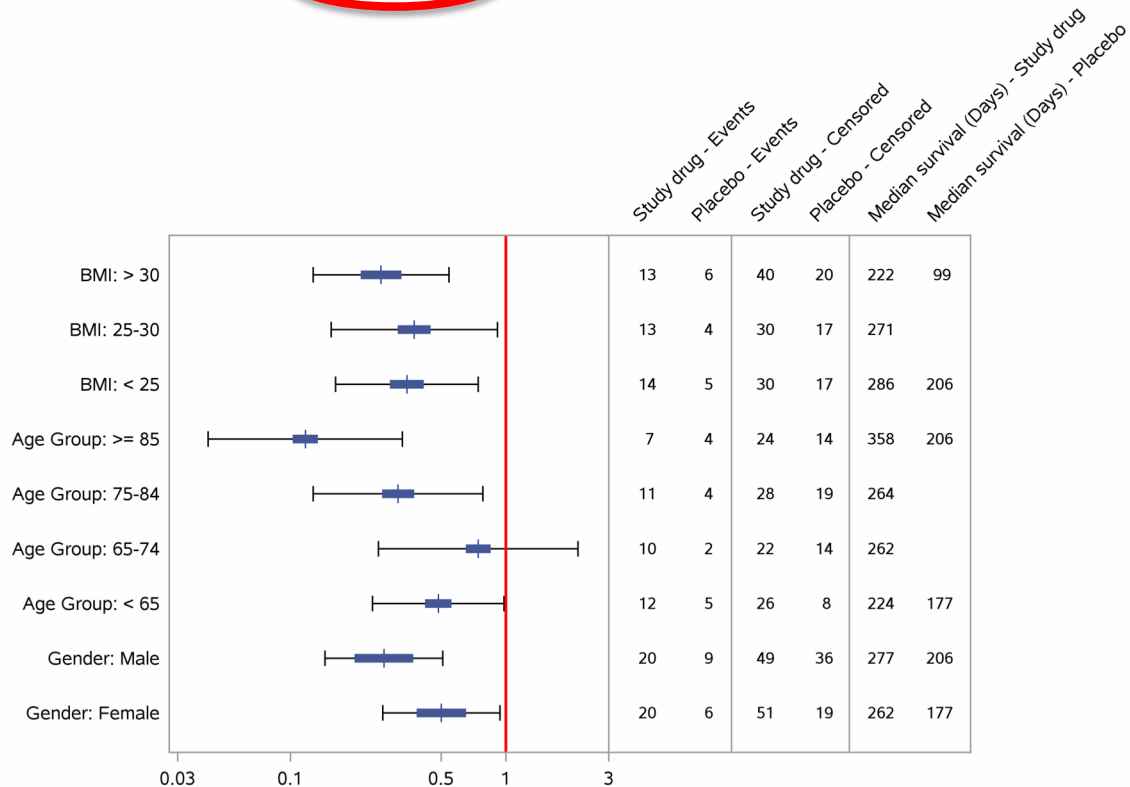
A missing value of median survival or the survival rate means that the value cannot be estimated due to censored data.

There is a subject (1234500210) with missing value of subgroup variable BMIGR1. Subjects with missing treatment information or missing subgroup variable(s) are omitted in the analysis.

Macro call – example 2:

```
%macro forest_plot(
  endpoint = death
  ci_level = 80
  , sgrp_rlst = sex agegr01n bmigr1
  , sgrp_lbls = Gender~Age Group~BMI
);
```

Forest Plot of Hazard Ratios and 80% Confidence Intervals by Subgroup Overall Survival (Intent-to-Treat Analysis Set)



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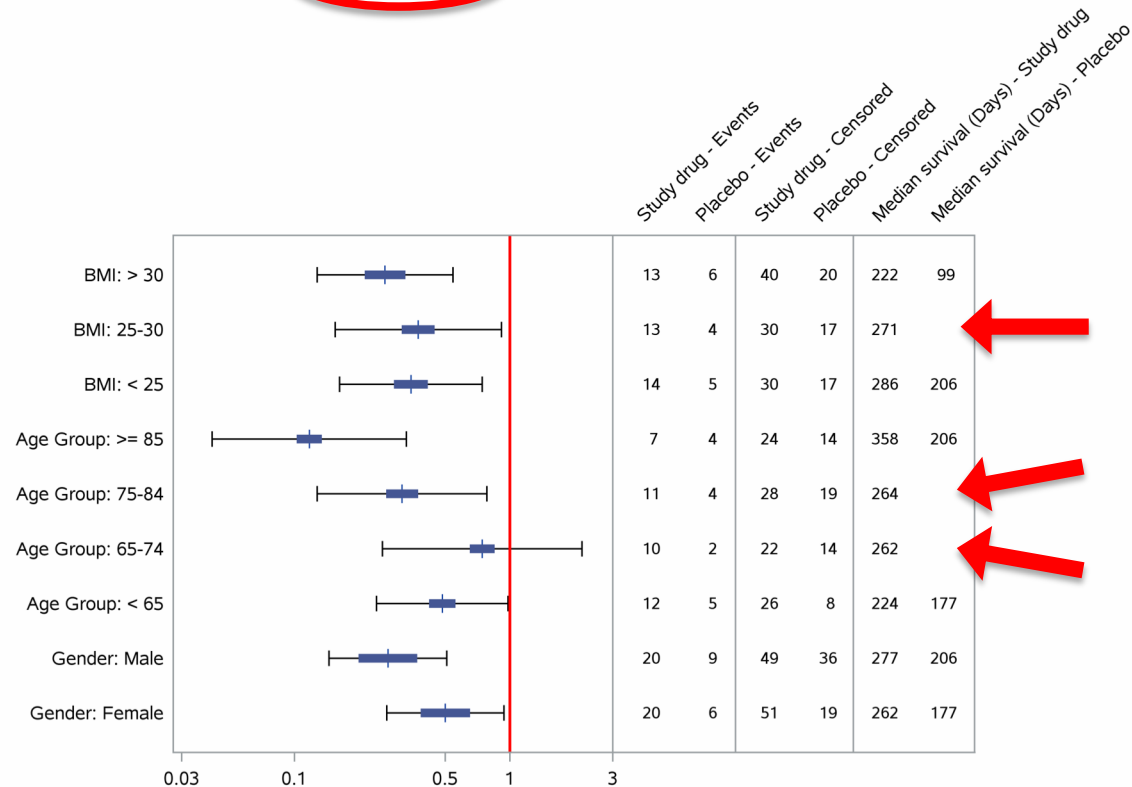
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);
```

Forest Plot of Hazard Ratios and 80% Confidence Intervals by Subgroup

Overall Survival (Intent-to-Treat Analysis Set)



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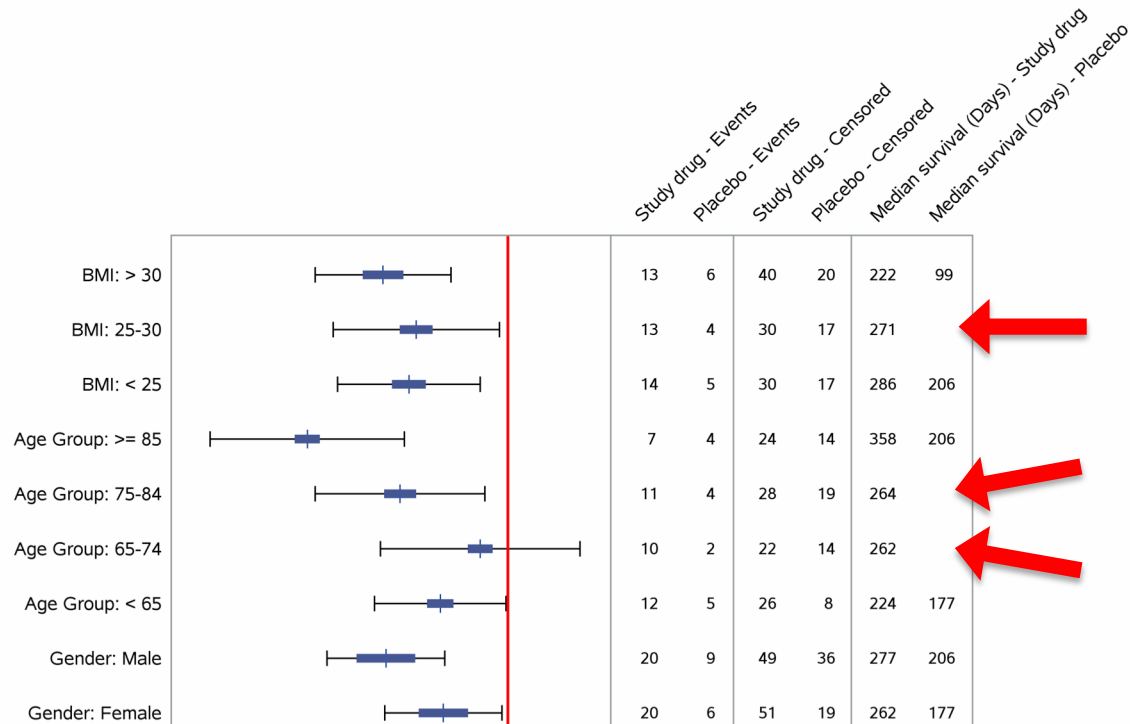
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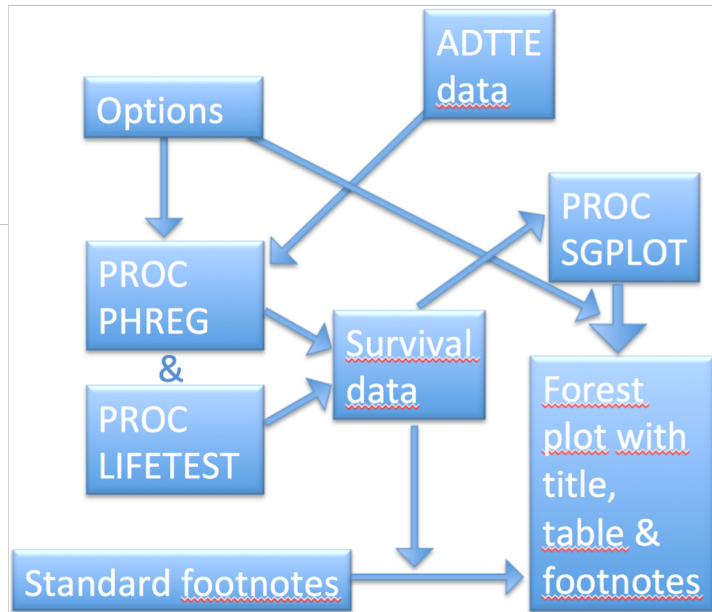
Forest Plot of Hazard Ratios and 80% Confidence Intervals by Subgroup Overall Survival (Intent-to-Treat Analysis Set)



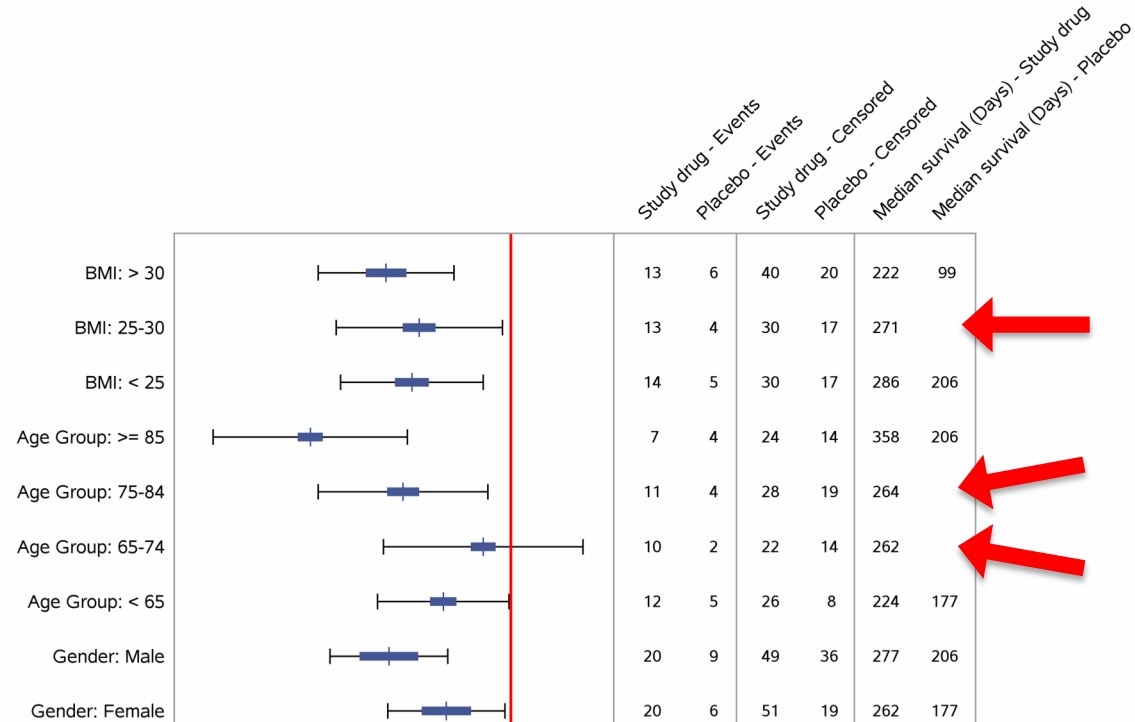
A missing value of median survival or the survival rate means that the value cannot be estimated due to censored data.

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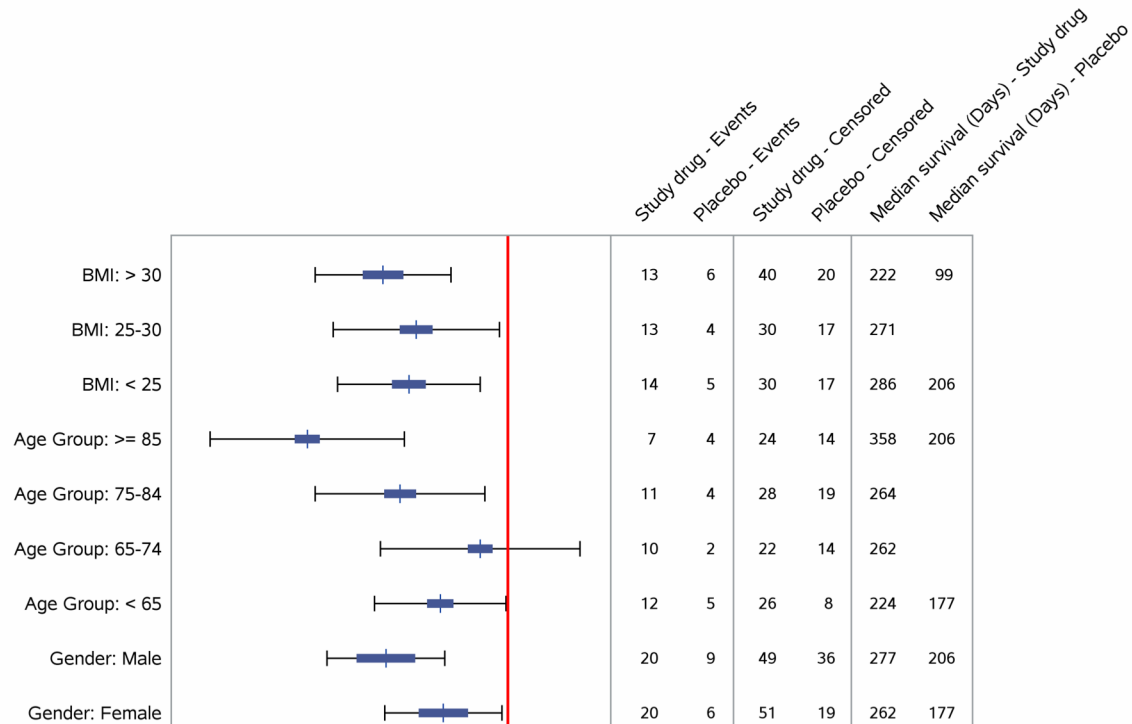
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Macro call – example 2:

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%macro_forest_plot(
    endpoint = death
    , ci_level = 80
    , sgrp_vlst = sex agegr01 bmigr1
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);
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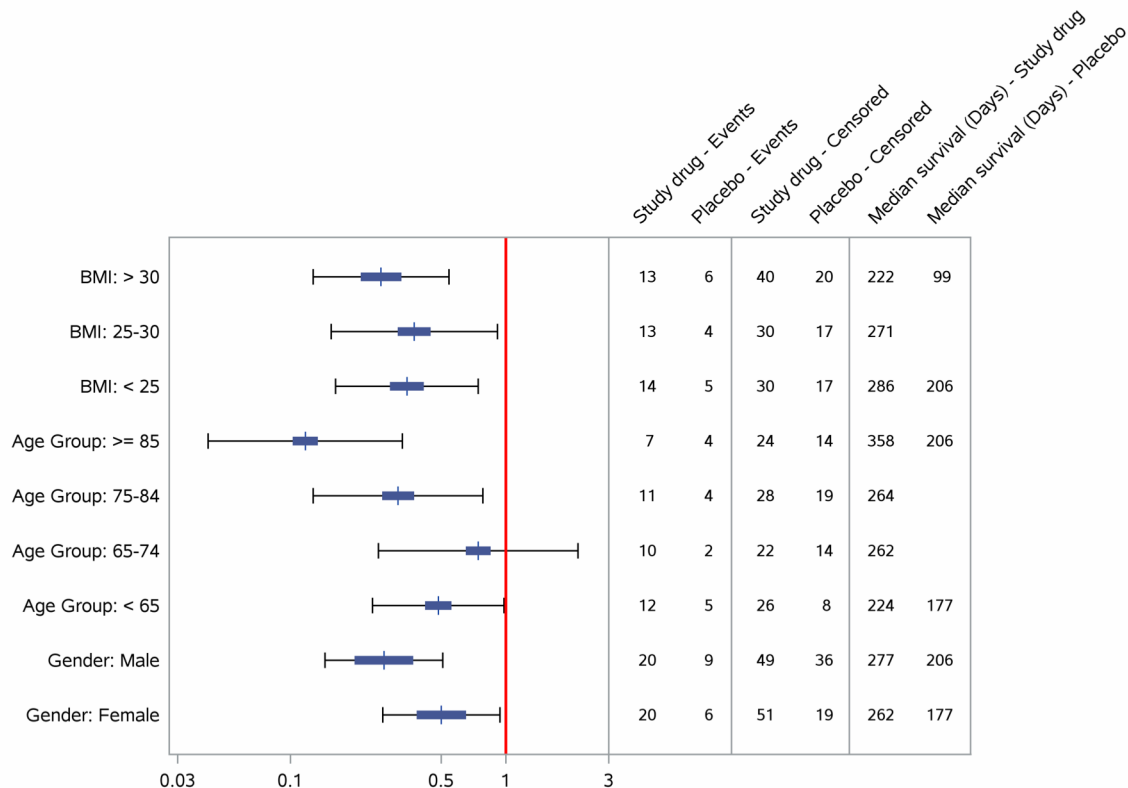
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    endpoint = death
    , ci_level = 80
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    , sgrp_lbls = Gender~Age Group~BMI
);
```

Further possibilities – additional macro vars:

```
subj_lst_ny = N
strat_facts = sex agegr01n
strat_lbls  = Gender and Age
time_unit   = weeks
overall_ny  = Y
```

Forest Plot of Hazard Ratios and 80% Confidence Intervals by Subgroup
Overall Survival (Intent-to-Treat Analysis Set)



A Hazard ratio (HR) smaller than one indicates superiority of Study Drug over Placebo.
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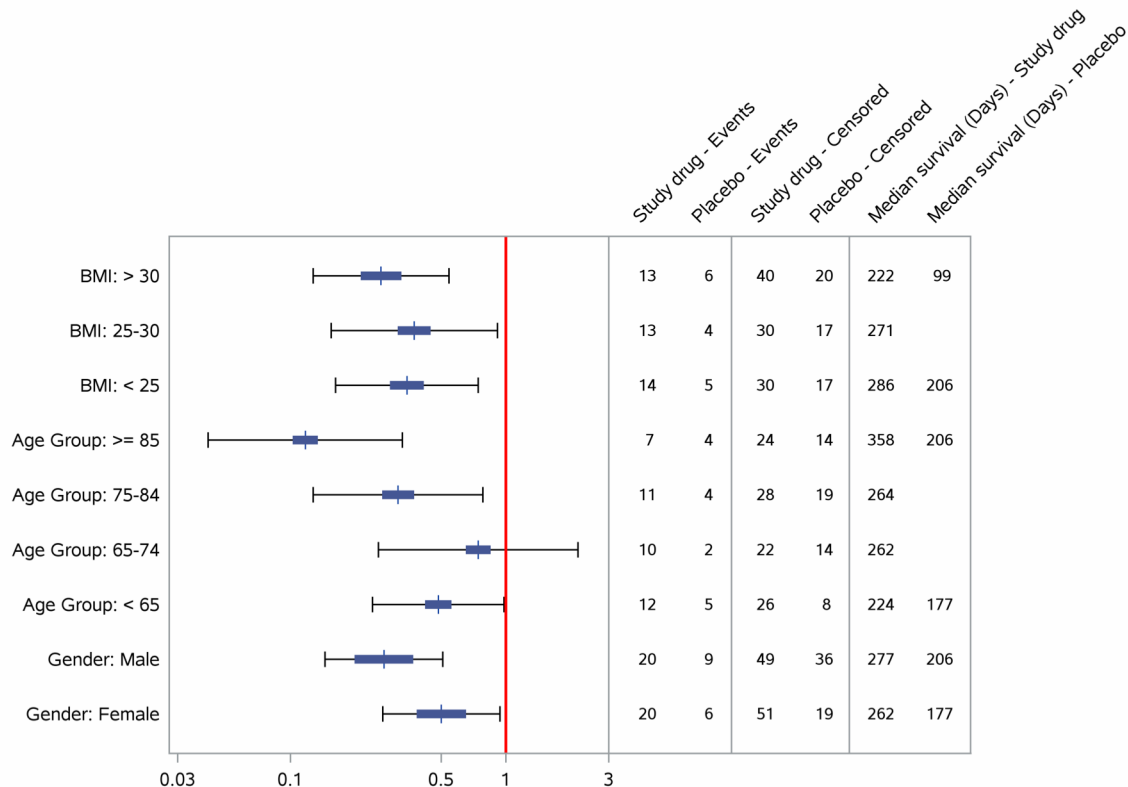
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  endpoint = death
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);
```

Further possibilities – additional macro vars:

```
subj_lst_ny = N
strat_facst = sex agegr01n
strat_lbls = Gender and Age
time_unit = weeks
overall_ny = Y
```

Forest Plot of Hazard Ratios and 80% Confidence Intervals by Subgroup
Overall Survival (Intent-to-Treat Analysis Set)



A Hazard ratio (HR) smaller than one indicates superiority of Study Drug over Placebo. Estimation of the HR and its confidence interval are based on an unstratified Cox regression model. A missing value of median survival or the survival rate means that the value cannot be estimated due to censored data. There is a subject (123456710) with missing value of subgroup variable BMIGR1. Subjects with missing treatment information or missing subgroup variable(s) are omitted in the analysis.

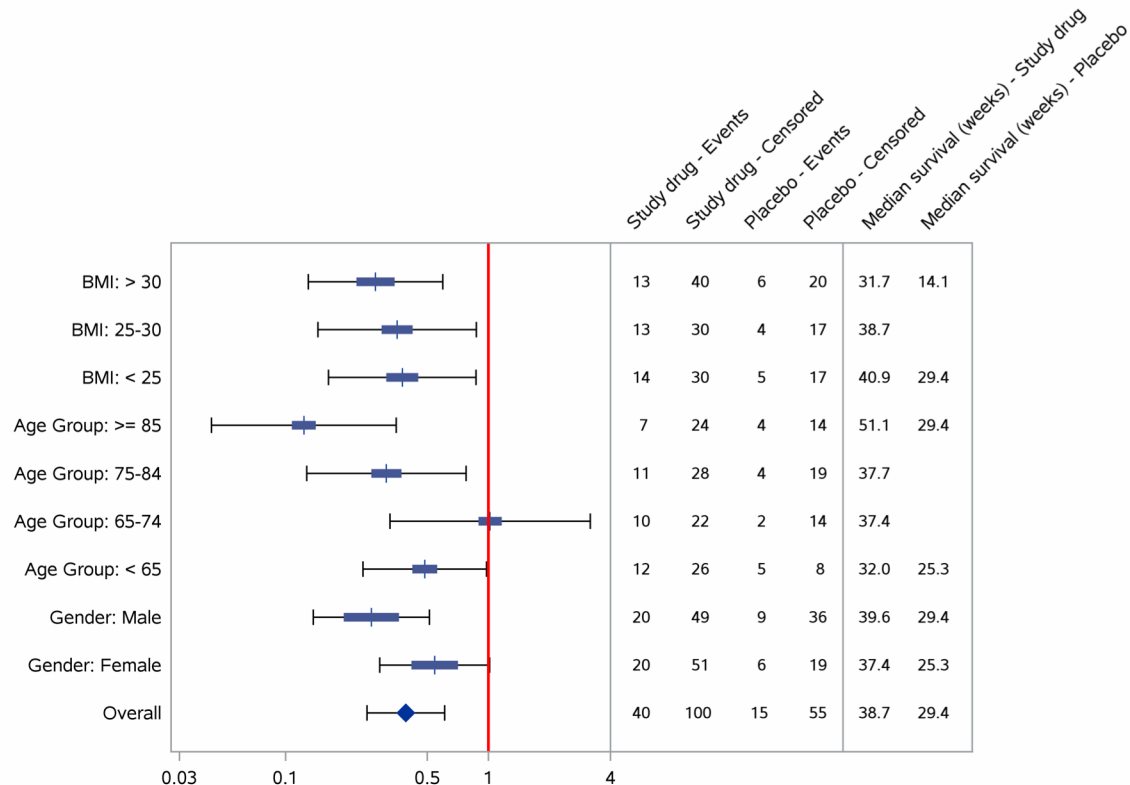
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%macro_forest_plot(
  endpoint = death
, ci_level = 80
, sgrp_vlst = sex agegr01n bmigr1
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Further possibilities – additional macro vars:

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subi_lst_ny = N
strat_facts = sex agegr01n
strat_lbls = Gender and Age
time_unit = weeks
overall_ny = Y
```

Forest Plot of Hazard Ratios and 80% Confidence Intervals by Subgroup
Overall Survival (Intent-to-Treat Analysis Set)



A Hazard ratio (HR) smaller than one indicates superiority of Study Drug over Placebo.

Estimation of the HR and its confidence interval are based on a stratified Cox proportional hazard model stratified by stratification factors Gender and Age.

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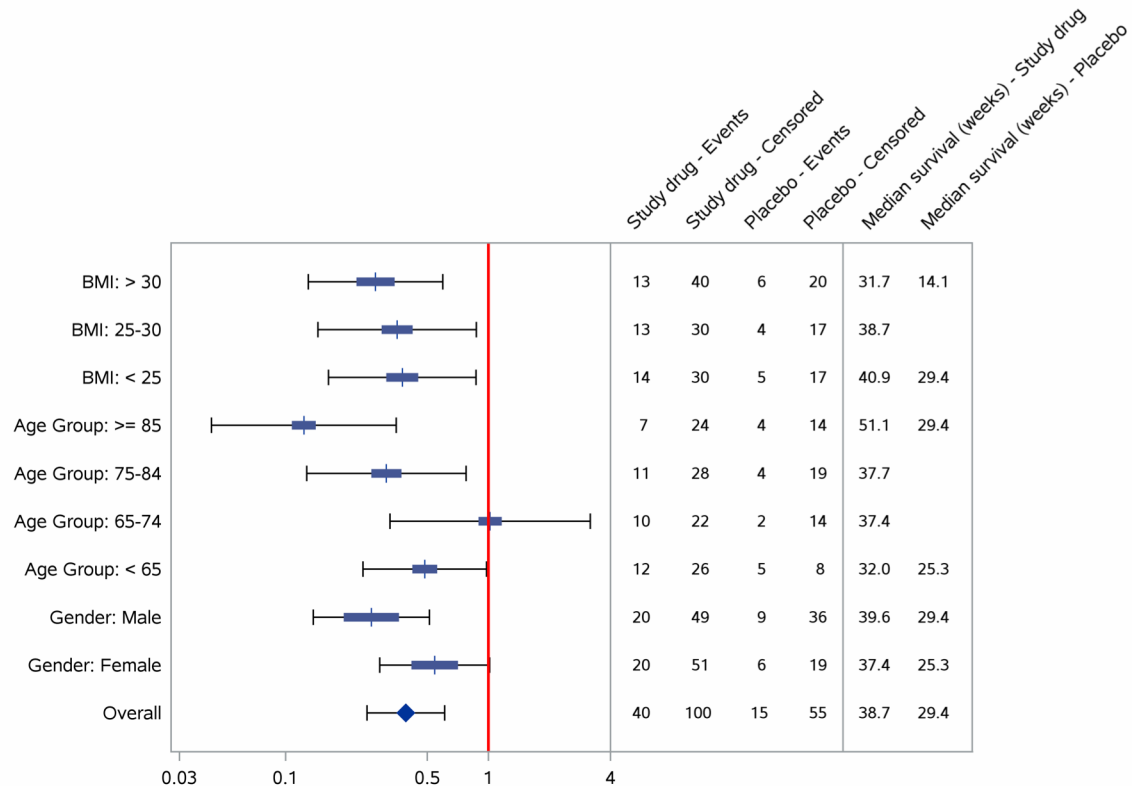
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    endpoint = death
    , ci_level = 80
    , sgrp_vlst = sex agegr01n bmigr1
    , sgrp_lbls = Gender~Age Group~BMI
);
```

Further possibilities – additional macro vars:

```
subj_lst_ny = N
strat facts = sex agegr01n
```

```
overall_ny = Y
```

Forest Plot of Hazard Ratios and 80% Confidence Intervals by Subgroup
Overall Survival (Intent-to-Treat Analysis Set)



Estimation of the HR and its confidence interval are based on a stratified Cox proportional hazard model stratified by stratification factors Gender and Age.

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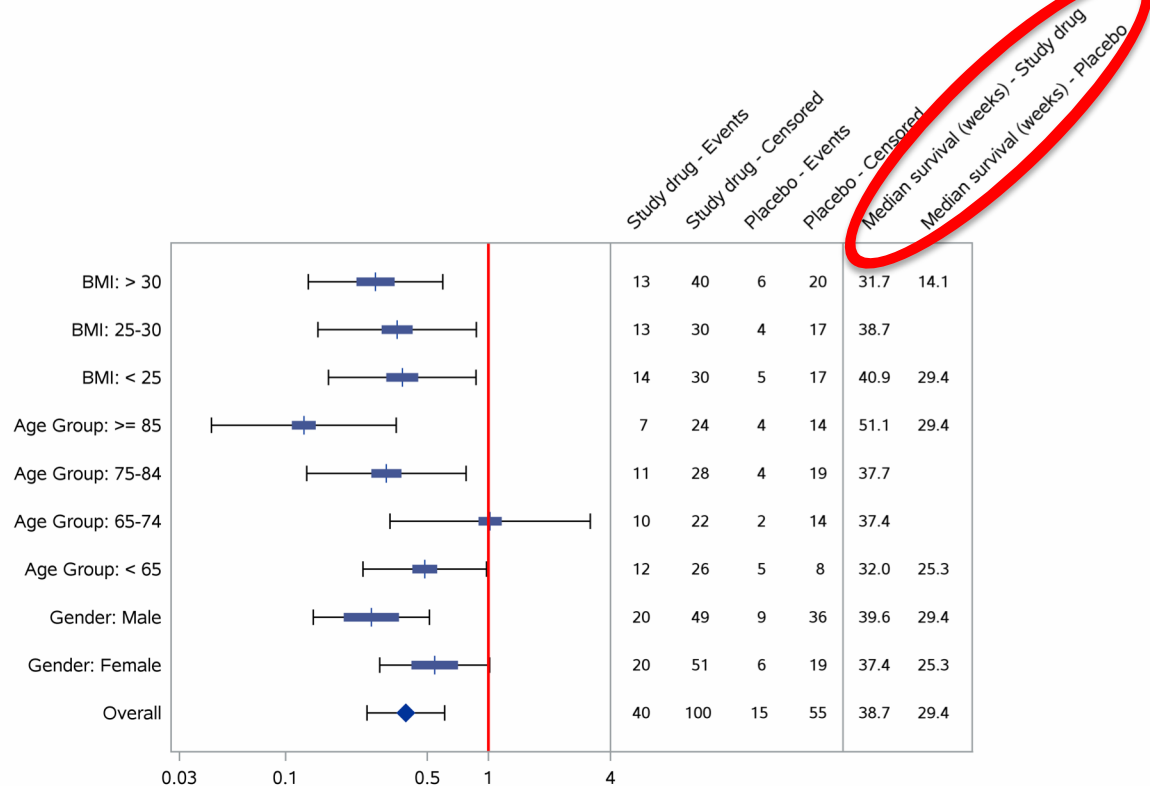
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);
```

Further possibilities – additional macro vars:

```
subj_lst_ny = N
strat_facts = sex agegr01n
strat_lbls = Gender and Age
time_unit = weeks
overall_ny = 1
```

Forest Plot of Hazard Ratios and 80% Confidence Intervals by Subgroup
Overall Survival (Intent-to-Treat Analysis Set)



A Hazard ratio (HR) smaller than one indicates superiority of Study Drug over Placebo.

Estimation of the HR and its confidence interval are based on a stratified Cox proportional hazard model stratified by stratification factors Gender and Age.

A missing value of median survival or the survival rate means that the value cannot be estimated due to censored data.

There is a subject with missing treatment or subgroup information which is omitted in the analysis.

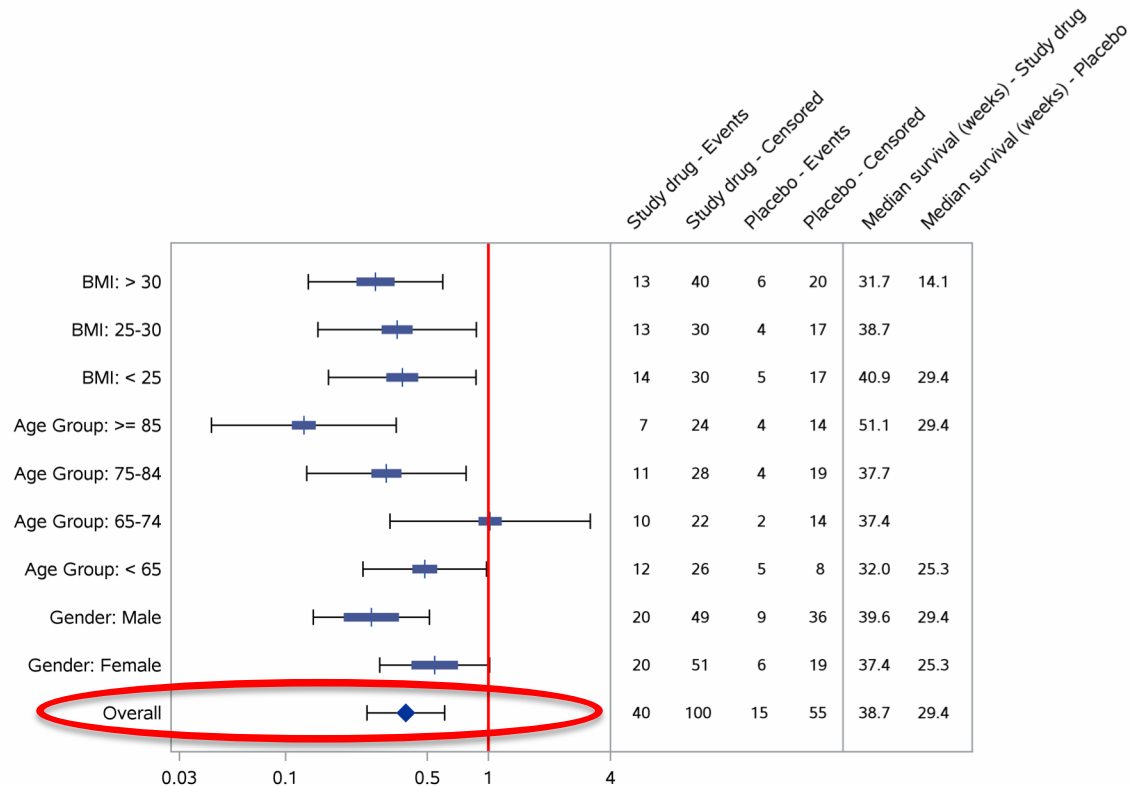
Macro call – example 2:

```
%macro_forest_plot(
    endpoint = death
    , ci_level = 80
    , sgrp_vlst = sex agegr01n bmigr1
    , sgrp_lbls = Gender~Age Group~BMI
);
```

Further possibilities – additional macro vars:

```
subj_lst_ny = N
strat_facts = sex agegr01n
strat_lbls = Gender and Age
time_unit = weeks
overall_ny = Y
```

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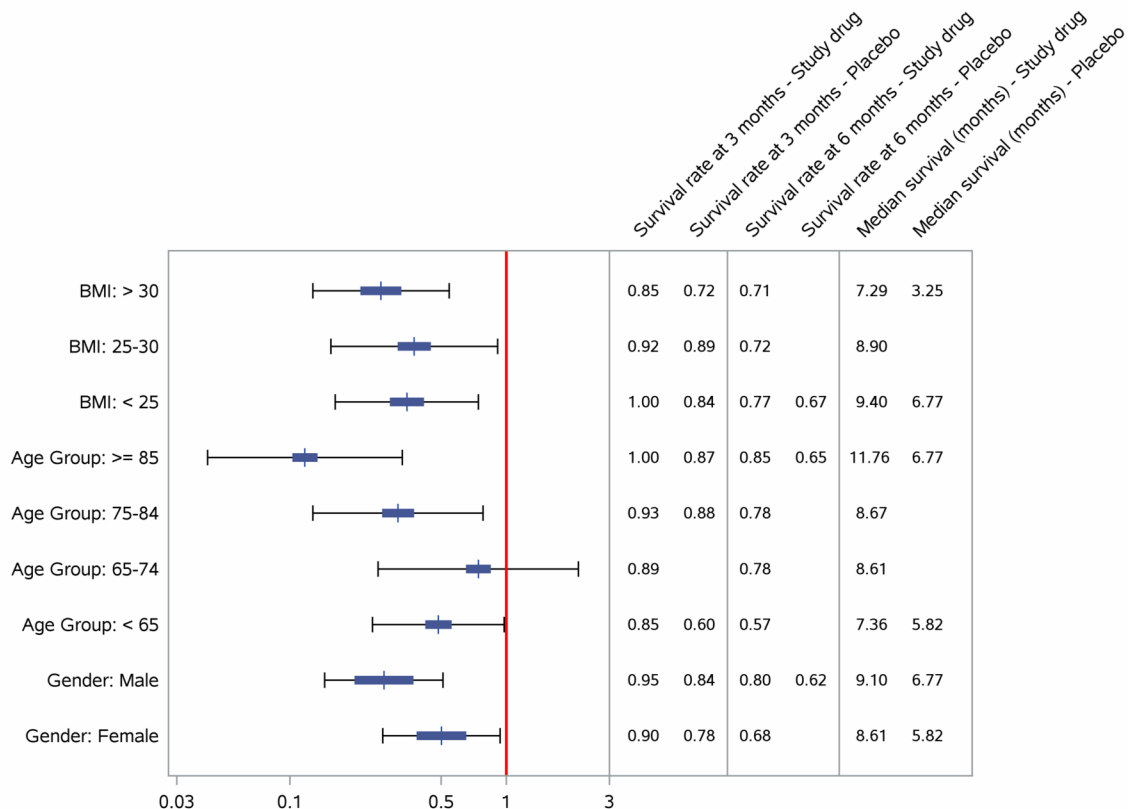
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Macro call – example 3:

```
%macro_forest_plot(
    endpoint = death
    , ci_level = 80
    , sgrp_vlst = sex agegr01n bmigr1
    , sgrp_lbls = Gender~Age Group~BMI
    , time_unit = months

    , evnts_cnsr_ny = N
    , surv_rates_ny = Y
    , time_points = 3 6
);
```

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Estimation of the HR and its confidence interval are based on an unstratified Cox regression model.

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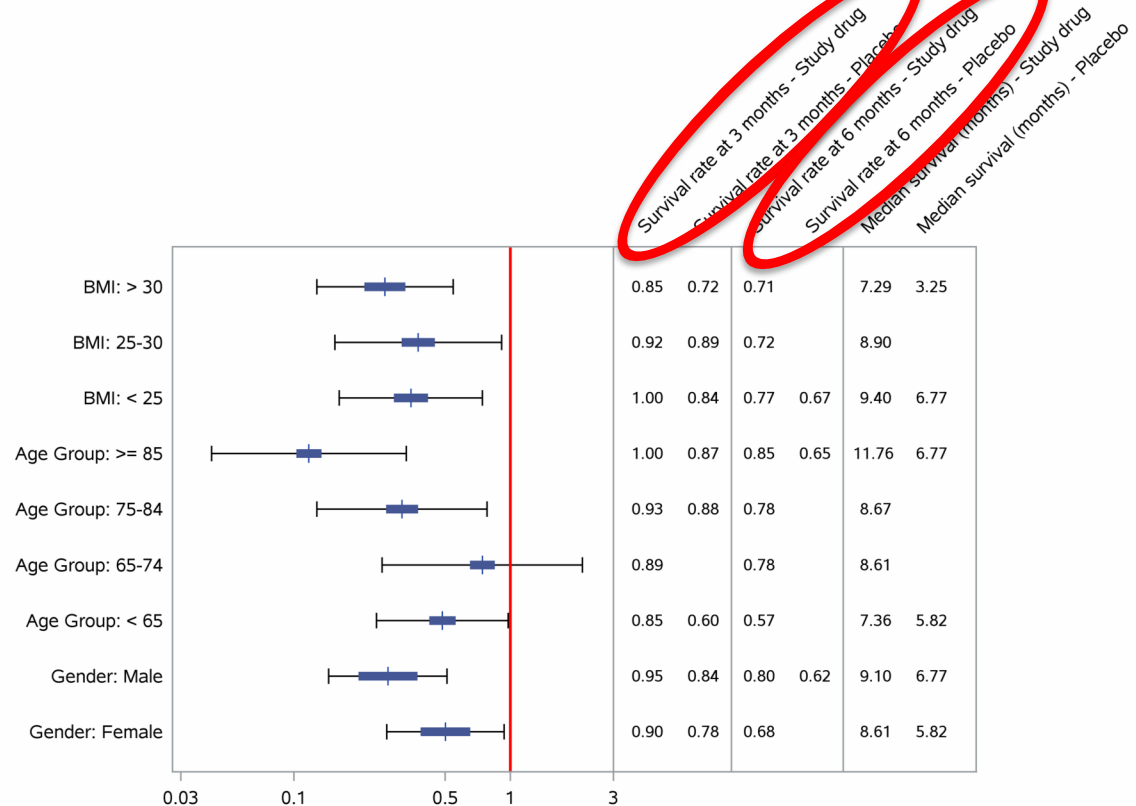
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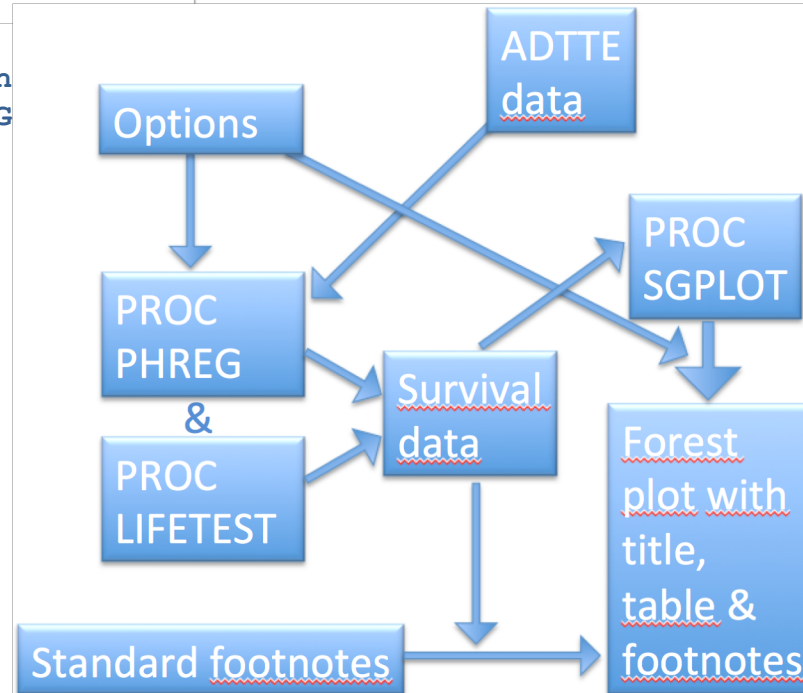
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```
%macro_forest_plot(
  endpoint = death
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, sgrp_lbls = Gender~Age G
, time_unit = months

, evnts_on_ony = N
, surv_rates_ny = Y
, time_points = 3 6
);
```

Forest Plot of Hazard Ratios and 80% Confidence Intervals by Subgroup Overall Survival (Intent-to-Treat Analysis Set)



Survival rate at 3 months - Study drug
Survival rate at 3 months - Placebo
Survival rate at 6 months - Study drug
Survival rate at 6 months - Placebo
Median survival (months) - Study drug
Median survival (months) - Placebo

0.85	0.72	0.71		7.29	3.25
0.92	0.89	0.72		8.90	
1.00	0.84	0.77	0.67	9.40	6.77
1.00	0.87	0.85	0.65	11.76	6.77
0.93	0.88	0.78		8.67	
0.89		0.78		8.61	
0.85	0.60	0.57		7.36	5.82
0.95	0.84	0.80	0.62	9.10	6.77
0.90	0.78	0.68		8.61	5.82

over Placebo.
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 - Stratification
 - Table with additional survival data

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- If you have to create an extensive amount of similar plots or tables, write a macro! It simplifies your work.



Thank you for your attention!

Questions?