Supplemental Materials

Coding and interpretation of regression methods with both left and right censoring.

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1. Hazard Ratios and Acceleration Factors

	Possible interpretation	
Distribution	**Hazard Ratio**	**Acceleration Factor**
Weibull	●	●
Log-normal		●
Log-logistic		●

Depending on the distribution specified, the regression methods can be interpreted as a hazard ratio or as an acceleration factor.

Acceleration Factor (AF) = exp(β)
Hazard Ratio (HR) = exp(-β/σ)

where β is the parameter estimate and σ the scale estimate.

2. Interpretation from SAS output

An example from SAS output is below.

Analysis of Maximum Likelihood Parameter Estimates

Parameter		**DF**	**Estimate**	**Standard Error**	**95% Confidence Limits**		**Chi-Square**	**Pr > ChiSq**
Intercept		1	5.4854	0.1497	5.1920	5.7788	1342.97	<.0001
Occupation	**Other**	1	-0.1347	0.1251	-0.3798	0.1104	1.16	0.2814
Occupation	**Housewife**	0	0.0000	.	.	.	.	.
Farmland	**No**	1	0.2615	0.1345	-0.0020	0.5251	3.78	0.0518
Farmland	**Yes**	0	0.0000	.	.	.	.	.
Antenatal	**0-1**	1	0.9839	0.1679	0.6549	1.3130	34.34	<.0001
Antenatal	**2-3**	1	0.3597	0.1427	0.0800	0.6394	6.35	0.0117
Antenatal	**4**	0	0.0000	.	.	.	.	.
Distance	**<30 min**	1	0.2034	0.1475	-0.0857	0.4924	1.90	0.1679
Distance	**≥60 min**	1	-0.2304	0.1523	-0.5290	0.0682	2.29	0.1304
Distance	**30-59 min**	0	0.0000	.	.	.	.	.
Scale		1	1.0571	0.0662	0.9351	1.1951		
Weibull Shape		1	0.9460	0.0592	0.8368	1.0694		

For the parameter associated with 0-1 antenatal care visits (compared to 4 antenatal care visits), the following interpretations are possible with a Weibull distribution:

Acceleration Factor (AF) = exp(β) = exp(0.9839) = 2.67

> Compared to children whose mothers had 4 or more antenatal care visits, children whose mothers had only 0-1 antenatal care visits had an expected time to vaccination that was 2.67 times as long.

Hazard Ratio (HR) = exp(-β/σ) = exp(-0.9839/1.0571) = 0.39

> For numbers <1, this is often interpreted by subtracting from 1 (e.g., 1 – 0.39 = 61%).
>
> Compared to children whose mothers had 4 or more antenatal care visits, children whose mothers had only 0-1 antenatal care visits were 61% less likely to be vaccinated at any age.

3. SAS code to implement left and right censoring

The code below corresponds to an analysis of pentavalent dose 3 (see main text Table 2).

```
data dates;
set  dates;

/**specify the following variables**/
intdt= /**this is the date of data collection**/
gbirthd= /**this is the date of birth**/
gpenta3d= /**this is the date of pentavalent dose 3 vaccination**/
penta3= /**this variable =1 if the child received pentavalent dose 3
(regardless of date or not)**/

if gpenta3d=. then do;
 penta3days=.;
 end;
else do;
 penta3days=gpenta3d-gbirthd;
 end;

if gpenta3d ne . then do;
      penta3lcens=0;
      penta3rcens=0;
      end;
else if penta3=1 then do;
      penta3rcens=0;
      penta3lcens=1;
      end;
else if  penta3 ne 1 then do;
      penta3rcens=1;
      penta3lcens=0;
      end;


if penta3lcens=0 and penta3rcens=0 then do;
 penta3hi=penta3days;
```

```
 penta3lo=penta3days;
 end;
else if penta3lcens=1 then do;
 penta3hi=agedays;
 penta3lo=.;
 end;
else if penta3rcens=1 then do;
 penta3hi=.;
 penta3lo=agedays;
 end;
run;


proc lifereg data=dates;
class  /**insert categorical predictor variables here, as appropriate**/;
model (penta3lo, penta3hi) = /**insert categorical and continuous predictor
variables here, as appropriate**/
      / dist=Weibull ;  /* or dist=LNormal (lognormal) or dist=LLogistic
(log-logistic) or dist=Gamma */
run; quit;
```