We can also get confidence intervals for the parameter estimates. These can be obtained either by profiling the likelihood function or by using the standard errors and assuming a normal distribution. Note that profiled CIs are not symmetric (although they are usually close to symmetric). If the 95% CI does not cross 0, the parameter estimate is statistically significant.

```
(ci <- confint(m))
# default method gives profiled CIs
 Waiting for profiling to be done...
          2.5 % 97.5 %
 pared   0.5282 1.5722
 public -0.6522 0.5191
 gpa     0.1076 1.1309
confint.default(m) # CIs assuming normality
          2.5 % 97.5 %
 pared   0.5268  1.569
 public -0.6426  0.525
 gpa     0.1051  1.127
```

Confidence Intervals

- The CIs for both pared and gpa do not include 0; public does.
- The estimates in the output are given in units of ordered logits, or ordered log odds.
- So for pared, we would say that for a one unit increase in pared (i.e., going from 0 to 1), we expect a 1.05 increase in the expect value of apply on the log odds scale, given all of the other variables in the model are held constant.

Confidence Intervals

- For gpa, we would say that for a one unit increase in gpa, we would expect a 0.62 increase in the expected value of apply in the log odds scale, given that all of the other variables in the model are held constant.

- The coefficients from the model can be somewhat difficult to interpret because they are scaled in terms of logs.
- Another way to interpret logistic regression models is to convert the coefficients into odds ratios.
- To get the Odds Ratios and confidence intervals, we just exponentiate the estimates and confidence intervals.

Odds Ratios

```
exp(coef(m))
  pared public    gpa
 2.8511 0.9429 1.8514
 # Odds Ratios and CIs
exp(cbind(OR = coef(m), ci))
             OR  2.5 % 97.5 %
 pared  2.8511 1.6958  4.817
 public 0.9429 0.5209  1.681
 gpa    1.8514 1.1136  3.098
```

- These coefficients are called **proportional odds ratios** and we would interpret these pretty much as we would odds ratios from a binary logistic regression.
- For pared, we would say that for a one unit increase in parental education, i.e., going from 0 (Low) to 1 (High), the odds of "very likely" applying versus "somewhat likely" or "unlikely" applying combined are 2.85 greater, given that all of the other variables in the model are held constant.

- Similarly, the odds "very likely" or "somewhat likely" applying versus "unlikely" applying is 2.85 times greater, given that all of the other variables in the model are held constant.
- For gpa (and other continuous variables), the interpretation is that when a student's gpa moves 1 unit, the odds of moving from "unlikely" applying to "somewhat likely" or "very likley" applying (or from the lower and middle categories to the high category) are multiplied by 1.85.