

# Poisson Regression with R

## Poisson regression

- ▶ At this point, we are ready to perform our Poisson model analysis using the `glm` function.
- ▶ We fit the model and store it in the object `m1` and get a summary of the model.

# Poisson Regression with R

```
m1 <- glm(num_awards ~ prog + math,  
          family="poisson", data=p)  
  
summary(m1)
```

## Poisson Regression with R

Call:

```
glm(formula = num_awards ~ prog + math, family = "po
```

Deviance Residuals:

Min	1Q	Median	3Q	Max
-2.204	-0.844	-0.511	0.256	2.680

# Poisson Regression with R

Coefficients:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-5.2471	0.6585	-7.97	1.6e-15
progAcademic	1.0839	0.3583	3.03	0.0025
progVocational	0.3698	0.4411	0.84	0.4018
math	0.0702	0.0106	6.62	3.6e-11
---				

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.'

## Poisson Regression with R

(Dispersion parameter for poisson family taken to be

```
Null deviance: 287.67  on 199  degrees of freedom  
Residual deviance: 189.45  on 196  degrees of freedom  
AIC: 373.5
```

```
Number of Fisher Scoring iterations: 6
```

## Poisson Regression with R

- ▶ It is recommended using robust standard errors for the parameter estimates to control for mild violation of the distribution assumption that the variance equals the mean.
- ▶ The R package **sandwich** can be used to obtain the robust standard errors and calculated the p-values accordingly.
- ▶ Together with the p-values, we have also calculated the 95% confidence interval using the parameter estimates and their robust standard errors.

# Poisson Regression with R

## **sandwich** R Package

- ▶ Robust Covariance Matrix Estimators
- ▶ Model-robust standard error estimators for cross-sectional, time series, and longitudinal data.

# Poisson Regression with R

## Robust Standard Errors

```
cov.m1 <- vcovHC(m1, type="HC0")
std.err <- sqrt(diag(cov.m1))

r.est <- cbind(Estimate= coef(m1),
  "Robust SE" = std.err,
  "Pr(>|z|)" = 2 * pnorm(abs(coef(m1)/std.err),
    lower.tail=FALSE),
  LL = coef(m1) - 1.96 * std.err,
  UL = coef(m1) + 1.96 * std.err)
```



# Poisson Regression with R

```
r.est
```

	Estimate	Robust SE	Pr(> z )	LL
(Intercept)	-5.24712	0.64600	4.567e-16	-6.5133
progAcademic	1.08386	0.32105	7.355e-04	0.4546
progVocational	0.36981	0.40042	3.557e-01	-0.4150
math	0.07015	0.01044	1.784e-11	0.0497