

Piecewise SEM

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Some data

```
N <- 100

b_m0 <- 1.25; b_mx <- 1.25;
b_y0 <- -0.5; b_ym <- 1.75; b_yx <- 0.75;
sigma_m <- 1.5; sigma_y <- 2.0

mediation_df <- tibble(
  x = rnorm(N, sd = 2),
  m = b_m0 + b_mx * x + rnorm(N, sd = sigma_m),
  y = b_y0 + b_ym * m + b_yx * x + rnorm(N, sd = sigma_y)
)
```

Set up model

```
library(piecewiseSEM)

# set up model
M <- psem(lm(y ~ x + m, mediation_df),
          lm(m ~ x, mediation_df))
```

Coefficients

```
S <- summary(M)
S$coefficients %>% select(Response,
                           Predictor,
                           Estimate,
                           Std.Error,
                           P.Value)
```

##	Response	Predictor	Estimate	Std.Error	P.Value
## 1	y	x	0.6387	0.1823	7e-04
## 2	y	m	1.8426	0.1196	0e+00
## 3	m	x	1.2803	0.0836	0e+00

AIC etc

```
S$IC
```

```
##      AIC      AICc      BIC K      n  
## 1   14 15.217 32.236 7 100
```

Using glm

```
ilogit <- function(x) 1/(1 + exp(-x))  
rbern <- function(p) 1*(runif(length(p)) < p)  
  
N <- 100  
  
b_m0 <- 1.25; b_mx <- 1.25;  
b_y0 <- -0.5; b_ym <- 1.75; b_yx <- 0.75;  
sigma_m <- 1.5; sigma_y <- 2.0  
  
mediation_df <- tibble(  
  x = rnorm(N, sd = 2),  
  m = b_m0 + b_mx * x + rnorm(N, sd = sigma_m),  
  y = rbern(ilogit(b_y0 + b_ym * m + b_yx * x ))  
)
```

Using glm

```
# set up model
M <- psem(glm(y ~ x + m, mediation_df,
             family = binomial(link='logit')),
          lm(m ~ x, mediation_df))

S <- summary(M)
S$coefficients %>% select(Response,
                          Predictor,
                          Estimate,
                          Std.Error,
                          P.Value)
```

##	Response	Predictor	Estimate	Std.Error	P.Value
## 1	y	x	0.6934	0.3965	0.0804
## 2	y	m	1.5658	0.4089	0.0001
## 3	m	x	1.2934	0.0777	0.0000

Using lmer

```
J <- 5
N <- J * 100

b_m0 <- 1.25;
z <- sample(seq(J), size = N, replace = T)
b_mx <- rnorm(J, mean=2.25, sd = 0.1);
b_y0 <- -0.5; b_ym <- 1.75;
sigma_m <- 1.5; sigma_y <- 2.0

mediation_df <- tibble(
  z = z,
  x = rnorm(N, sd = 2),
  m = b_m0 + b_mx[z] * x + rnorm(N, sd = sigma_m),
  y = b_y0 + b_ym * m + rnorm(N, sd = sigma_y)
)
```


Using lmer

```
library(lme4)
# set up model
M <- psem(lmer(m ~ x + (x|z), data=mediation_df),
          lm(y ~ m, mediation_df))

S <- summary(M, .progressBar = F)
S$coefficients %>% select(Response,
                           Predictor,
                           Estimate,
                           Std.Error,
                           P.Value)
```

##	Response	Predictor	Estimate	Std.Error	P.Value
## 1	m	1	1.1982	0.0784	0
## 2	m	2	2.3110	0.0604	0
## 3	y	m	1.7697	0.0184	0

Using brms

```
N <- 100

b_m0 <- 1.25; b_mx <- 1.25;
b_y0 <- -0.5; b_ym <- 1.75; b_yx <- 0.75;
sigma_m <- 1.5; sigma_y <- 2.0

mediation_df <- tibble(
  x = rnorm(N, sd = 2),
  m = b_m0 + b_mx * x + rnorm(N, sd = sigma_m),
  y = rbern(ilogit(b_y0 + b_ym * m + b_yx * x))
)

library(brms)

y_model <- bf(y ~ x + m, family = bernoulli)
m_model <- bf(m ~ x)

M <- brm(y_model + m_model + set_rescor(FALSE),
  data = mediation_df)
```