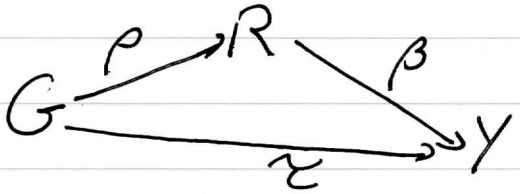
Encouragement Design Estimation (Holland 1988, p471)

Setting
Salt, BP
random assignment
to G=1 workshops, nagging
G=0 none
observe R salt intake
Y BP

Individual Picture (Holland ALICE)



Individual Potential outcomes

$R_G(u) = R_c(u) + \rho G$

$Y_{Gr}(u) = Y_{c0}(u) + \gamma G + \beta r$

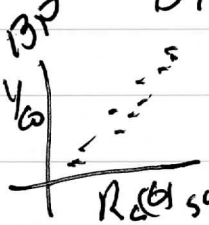
Regression Equations (over persons)

$R = \alpha_R + \gamma_1 G + \varepsilon_R \; ; \; Y = \alpha_y + \gamma_2 R + \gamma_3 G + \varepsilon_y$

Results for regression coefficients (Holland 1988)

$\gamma_1 = \rho \qquad \gamma_2 = \beta + \delta \qquad \gamma_3 = \tau - \rho\delta$

bias $\delta > 0$ association



other healthy habits, attitudes — salt intake when not encouraged

BP outcome when not encouraged and no reduction in salt

IF $\tau \equiv 0$ then algebra says use regression coefficients to solve

$\beta = \gamma_2 + \gamma_3/\gamma_1 = \beta + \delta - \delta = \beta$

Instrumental Variables IV (week 6) requires
$\tau = 0$ (basic IV assumption) G is instrument for R

$$\hat{\beta} = \frac{\hat{\beta}_{YG}}{\hat{\beta}_{RG}} = \frac{\bar{Y}_t - \bar{Y}_c}{\bar{R}_t - \bar{R}_c}$$

Wald estimator

Link between IV (Wald) and Holland estimator ($\tau w = 0$)

Barron-Kenney est $\hat{\gamma}_1 \hat{\gamma}_3$ path analysis indirect effect.

for $\tau = 0$

$$\beta = \gamma_2 + \gamma_3/\gamma_1 = \beta_{YR \cdot G} + \beta_{YG \cdot R}/\beta_{RG}$$

weak

Regression recursion

$$\beta_{YG \cdot R} = \beta_{YG} - \beta_{RG}\beta_{YR \cdot G}$$

Substitute

$$\gamma_2 + \gamma_3/\gamma_1 = \beta_{YR \cdot G} + \frac{\beta_{YG} - \beta_{RG}\beta_{YR \cdot G}}{\beta_{RG}}$$

$$= \beta_{YG}/\beta_{RG}$$

estimate by $\dfrac{\bar{Y}_1 - \bar{Y}_0}{\bar{R}_1 - \bar{R}_0}$ Wald estimator