**# For functions below, assume data frame is called df …**

**# count number of events by variable values**

def count\_events(var1,x1, var2=None,x2=None, var3=None,x3=None):

c = 0

if var1 is None:

c = df.shape[0]

elif var2 is None:

c = sum(df[var1]==x1)

elif var3 is None:

for b1,b2 in zip(df[var1]==x1, df[var2]==x2):

if b1 and b2:

c += 1

else:

for b1,b2,b3 in zip(df[var1]==x1, df[var2]==x2, df[var3]==x3):

if b1 and b2 and b3:

c += 1

return c

**# compute p(X=x|Y=y)**

def p(var1,x1, var2=None,x2=None, var3=None,x3=None):

return count\_events(var1,x1, var2,x2, var3,x3) / count\_events(var2,x2, var3,x3)

def show\_p(var1,x1, var2=None,x2=None, var3=None,x3=None):

if var2 is None:

print(f" p({var1}={x1}) = {p(var1,x1)}")

elif var3 is None:

print(f" p({var1}={x1} | {var2}={x2}) = {p(var1,x1,var2,x2)}")

else:

print(f" p({var1}={x1} | {var2}={x2}, {var3}={x3}) = {p(var1,x1,var2,x2, var3,x3)}")

**# For example, show p(R=1 | A2=0)**

show\_p('r', 1, ‘a2’, 0)