Asymmetric Information: Health Insurance

Possible future states for a buyer:

State	Payoff
Sick (S)	$X_S = \$100k$
Well (W)	$X_W = \$0$

Buyers differ in risk of S, ρ_S:

Type	Chance of S	Chance of W
High (H)	$\rho_S = 0.1$	$\rho_W = 0.9$
Low (L)	$\rho_S = 0.01$	$\rho_W = 0.99$

Expected value of insurance?
$$EV = \rho_S * X_S + \rho_W * X_W$$

By buyer type:

Type	EV		Value
H	$EV_H = 0.1 * \$100k + 0.9 * \$0$		$10k
L	$EV_L = 0.01 * \$100k + 0.99 * \$0$		$1k

Distribution of types?

Type	% of Pop

%

Distribution of types?

Type	% of Pop
H	20%
L	80%
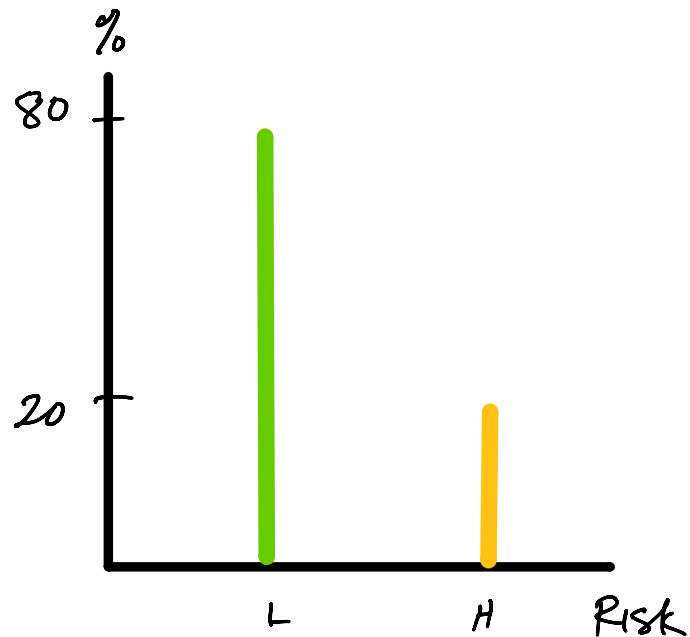
Charge the expected cost?

$$EV_A = \rho_H * EV_H + \rho_L * EV_L$$
$$EV_A = 0.2 * \$10k + 0.8 * \$1k$$
$$EV_A = \$2.8k$$

Who buys?

Type	Benefit	Cost	Net	Buy?
H	$10k	$2.8k	$7.2k	Yes
L	$1k	$2.8k	-$1.8k	No

Pool after adverse selection:

Type	% of Pop
H	100%
L	0%
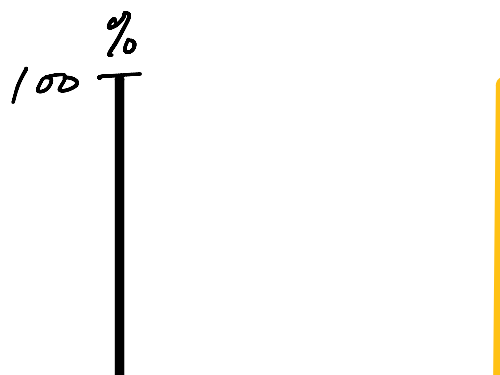
Charge the expected cost?

$$EV_A = \rho_H * EV_H + \rho_L * EV_L$$
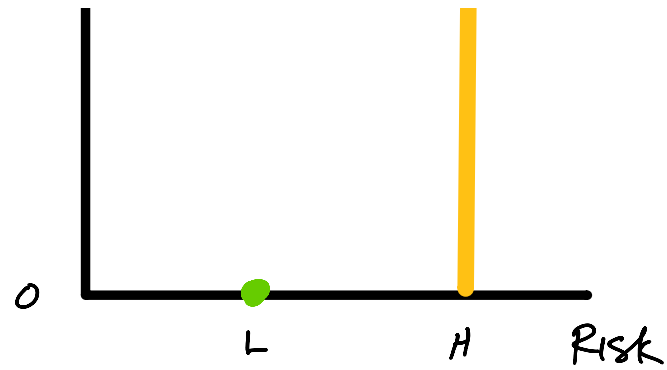$$EV_A = 1.0 * \$10k + 0 * \$1k$$
$$EV_A = \$10k$$

Who buys?

Type	Benefit	Cost	Net	Buy
H	$10k	$10k	$0	Yes
L	$1k	$10k	-$9k	No

How bad is the outcome?

Suppose population = 1000

Sick people and spending:

Type	Population	Sick	Spending
H	0.2*1000 = 200	0.1*200 = 20	$100k*20 = $2M
L	0.8*1000 = 800	0.01*800 = 8	$100k*8 = $800k
Total	1000	28	$2.8M

Uncovered portion, L share of sick individuals:
   8/28 = 0.29 or 29%