Measures of Excess Risk

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1. Concept of Excess Risk

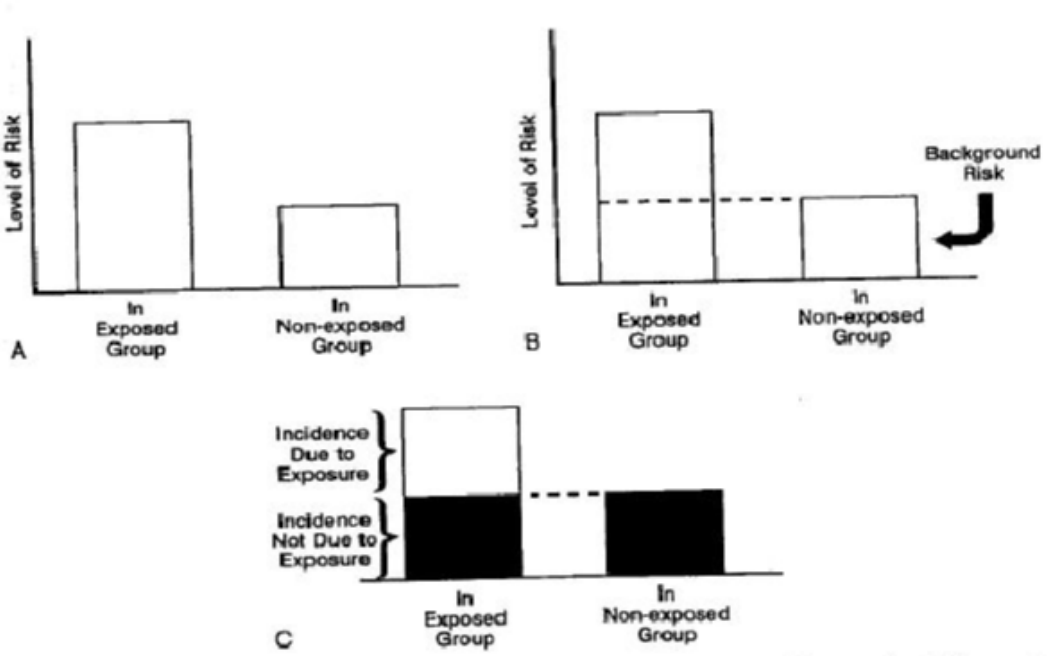

FIGURE 11–1. **A,** Total risks in exposed and nonexposed groups. **B,** Background risk. **C,** Incidence attributable to exposure and incidence not attributable to exposure.

Incidence in the *exposed* group	=	Incidence *not* due to the exposure (background incidence)	+	Incidence due to the exposure
Incidence in the *nonexposed* group	=	Incidence *not* due to the exposure (background incidence)		

2. Concept of Odds

가. In Cohort study

	Develop Disease	Do Not Develop Disease
Exposed	a	b
Not Exposed	c	d

$$\text{Odds Ratio} = \frac{\text{odds that an exposed person develops disease}}{\text{odds that an non-exposed person develops disease}} = \frac{a/b}{c/d} = \frac{ad}{bc}$$

나. In case-control study

	Case (With Disease)	Control (Without Disease)
History of Exposure	a	b
No History of Exposure	c	d

$$\text{Odds Ratio} = \frac{\text{odds that an a case was exposed}}{\text{odds that an a control was exposed}} = \frac{a/c}{b/d} = \frac{ad}{bc}$$

다. Is a odds ratio a good estimate of relative risk? : example

(1) Example: The odds ratio is a good estimate

	Develop Disease	Do Not Develop Disease
Exposed	200	9800
Not Exposed	100	9900

$$\text{Relative Risk} = \frac{200/10{,}000}{100/10{,}000} = 2$$

$$\text{Odds Ratio} = \frac{200 \times 9900}{100 \times 9800} = 2.02$$

(2) Example: The odds ratio is not a good estimate

	Develop Disease	Do Not Develop Disease
Exposed	50	50
Not Exposed	25	75

$$\text{Relative Risk} = \frac{50/100}{25/100} = 2$$

$$\text{Odds Ratio} = \frac{50 \times 75}{25 \times 50} = 3$$

3. Attributable Risk in the Total Population

가. Concepts

(1) Incidence Rate Difference

Incidence Rate Difference
= (incidence in total population) - (incidence in nonexposed group)

이 식을 계산하기 위해서는 아래의 3가지 필요함.(예: 흡연/비흡연, 폐암의 발생위험)
(1) The incidence among smokers(28 per 1,000)
(2) The incidence among nonsmoker(17.4 per 1,000)
(3) The proportion of the total population that smokes(44% in total population)

위의 3가지를 이용하면 전체 인구집단에서의 incidence rate를 계산가능.
(Incidence in smokers)X(% Smokers in population)
+ (incidence in nonsmokers)X(% Nonsmokers in population)
= 28.0/1,000X0.44 + 17.4/1,000X0.56 = 22.1 per 1,000

(2) Proportion of the incidence in the total population (Attributable Risk in the total population)

$$\frac{\text{(Incidence in total population) - (Incidence in nonexposed group)}}{\text{Incidence in total population}}$$

= (22.1 - 17.4) / 22.1 = 21.3%

☞ 21.3% of the incidence of coronary heart disease in this total population can be attributed to smoking, and if an effective prevention program eliminated smoking, the best we could hope to achieve would be a reduction of 21.3% in the incidence of CHD in the total population

☞ Attributable Risk in the total population
: a critical concept in virtually any area of public health and in clinical practice, in particular in relation to questions regarding the potential of preventive measures

(3) Another way to calculate Attributable Risk in the total population

$$\frac{p(r-1)}{p(r-1)+1} = \frac{\text{(Incidence in total population) - (Incidence in nonexposed group)}}{\text{Incidence in total population}}$$

p : proportion of the population with the characteristic or exposure

r : relative risk

Source: Levinto A. Definitions of attributable risk. *Am J Epidemiol* 1973;98;231