3.5 Summary

Prevalence and incidence measures are important measures that quantify the extent of disease and the rate of development of disease in study populations. Understanding the difference between prevalence and incidence is critical. Prevalence refers to the extent of a disease at a point in time, whereas incidence refers to the development of disease over a specified time. Because it can be difficult to ascertain disease status in every participant in longitudinal studies—particularly when the follow-up period is long—measures that take into account all available data are needed. IRs that account for varying followup times are useful measures in epidemiological analysis.

The formulas to estimate and compare prevalence and incidence are summarized in **Table 3.7**. In the next chapter, we present descriptive statistics. Specifically, we discuss how to estimate prevalence and incidence in study samples. We then move into statistical inference procedures, where we discuss estimating unknown population parameters based on sample statistics.

TABLE 3.7 Summary of Key Formulas

Measure	Formula
Point prevalence (PP)*	$\dfrac{\text{Number of persons with disease}}{\text{Number of persons examined at baseline}}$
Cumulative incidence (CI)*	$\dfrac{\text{Number of persons who develop disease during a specified period}}{\text{Number of persons at risk (at baseline)}}$
Incidence rate (IR)	$\dfrac{\text{Number of persons who develop disease during a specifiedperiod}}{\text{Sumof the lengths of time during which persons are disease-free}}$
Risk difference (RD)	$PP_{exposed} - PP_{unexposed}$, $CI_{exposed} - CI_{unexposed}$, $IR_{exposed} - IR_{unexposed}$
Population attributable risk (PAR)	$\dfrac{PP_{overall} - PP_{unexposed}}{PP_{overall}}$, $\dfrac{CI_{overall} - CI_{unexposed}}{CI_{overall}}$, $\dfrac{IR_{overall} - IR_{unexposed}}{IR_{overall}}$
Relative risk (RR)	$\dfrac{PP_{exposed}}{PP_{unexposed}}$, $\dfrac{CI_{exposed}}{CI_{unexposed}}$
Odds ratio (OR)	$\dfrac{PP_{exposed}/(1-PP_{exposed})}{PP_{unexposed}/(1-PP_{unexposed})}$, $\dfrac{CI_{exposed}/(1-CI_{exposed})}{CI_{unexposed}/(1-CI_{unexposed})}$

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3.6 Practice Problems

3. A case-control study is conducted to assess the relationship between heavy alcohol use during the first trimester of pregnancy and miscarriage. Fifty women who suffered miscarriage are enrolled, along with 50 who delivered full term. Each participant's use of alcohol during pregnancy is ascertained. Heavy drinking is defined as four or more drinks on one occasion. The data are shown in **Table 3.10**.

TABLE 3.10 **Alcohol Use and Outcome of Pregnancy**

	Miscarriage	Delivered Full Term
Heavy alcohol use	14	4
No heavy alcohol use	36	46

a. Compute the odds of miscarriage in women with heavy alcohol use during pregnancy.
b. Compute the odds of miscarriage in women with no heavy alcohol use during pregnancy.
c. Compute the odds ratio for miscarriage as a function of heavy alcohol use.

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4. A randomized trial is conducted to evaluate the efficacy of a new cholesterol-lowering medication. The primary outcome is incident coronary artery disease. Participants are free of coronary artery disease at the start of the study and randomized to receive either the new medication or a placebo. Participants are followed for a maximum of 10 years for the development of coronary artery disease. The observed data are shown in **Table 3.11**.

TABLE 3.11 **Incident Coronary Artery Disease by Treatment**

	Number of Participants	Number with Coronary Artery Disease
Cholesterol medication	400	28
Placebo	400	42

a. Compute the relative risk of coronary artery disease in patients receiving the new cholesterol medication as compared to those receiving a placebo.

b. Compute the odds ratio of coronary artery disease in patients receiving the new cholesterol medication as compared to those receiving a placebo.

c. Which measure is more appropriate in this design, the relative risk or odds ratio? Justify briefly.

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6. A small cohort study is conducted in 13 patients with an aggressive cellular disorder linked to cancer. The clinical courses of the patients are depicted graphically in **Figure 3.5**.

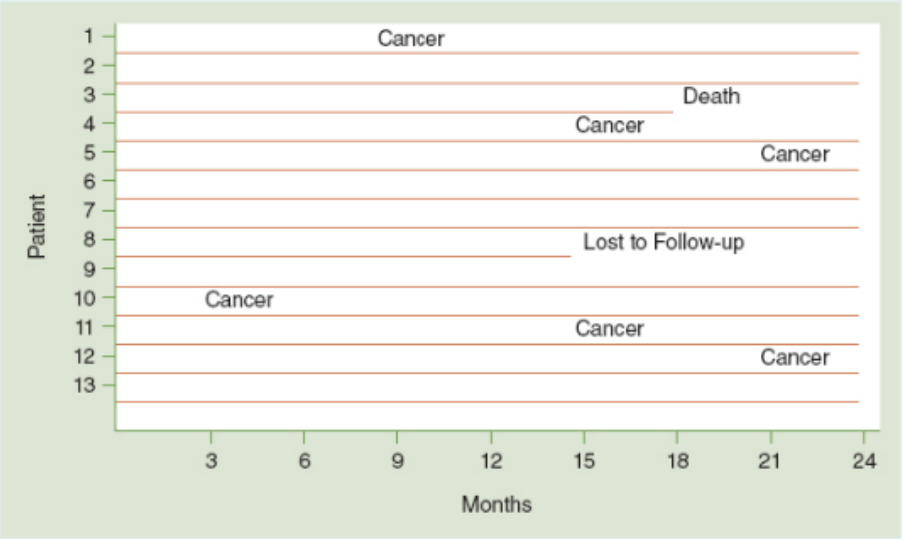

Figure 3.5 Clinical Course for Patients with Aggressive Cellular Disorder
Description

a. Compute the prevalence of cancer at 12 months.
b. Compute the cumulative incidence of cancer at 12 months.
c. Compute the incidence rate (per month) of cancer.
d. Compute the incidence rate (per month) of death.

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10. In a nursing home, a program is launched in 2015 to assess the extent to which its residents are affected by diabetes. Each resident has a blood test, and 48 of the 625 residents have diabetes in 2015. Residents who did not already have diabetes were again tested in 2020, and 57 residents had diabetes.
    a. What is the prevalence of diabetes in 2015?
    b. What is the cumulative incidence of diabetes over 5 years?
    c. What is the prevalence of diabetes in 2020 (assume that none of the residents in 2015 have died or left the nursing home)?