The common cold is a contagious viral infection of the upper respiratory passages. Some researchers suspect that vitamin C may be protective against the development of the common cold. Those who support this theory believe that persons having low exposure to vitamin C experience an increased risk for the development of colds. In order to test this hypothesis, a group of researchers from the School of Public Health (SPH) identified 200 persons having high vitamin C intake. A comparable group of 100 persons having low vitamin C intake were similarly identified. During the three month follow-up period, members of both exposure groups are asked to report symptoms of the common cold which include a runny or stuffy nose, sore throat, hoarseness, cough that produces little or no sputum, low grade fever, fatigue, watery eyes and loss of appetite.

During the study follow-up period, 11 members of the high vitamin C group reported common cold symptoms. 10 members of the low vitamin C acid group gave similar complaints.

**Table 1 1**

|  |  |  |  |
| --- | --- | --- | --- |
| **3** | **6** | **7** | **Total** |
| **4** | **a** | **b** | **8** |
| **5** | **c** | **d** | **9** |
| **Total** |  |  |  |

1. Fill in the 2x2 table above contrasting vitamin C exposure with incidence of common colds. What information from the study would you assign to **box 3** in the table?
   1. High
   2. Common cold
   3. Vitamin C intake
   4. 279
   5. 11
2. What information from the study would you assign to **box 1** in the table?
   1. Yes
   2. 300
   3. Low
   4. Common cold
   5. 21
3. What information from the study would you assign to **box 5** in the table?
   1. Low
   2. 10
   3. 100
   4. No
   5. Yes
4. What information from the study would you assign to **box d** in the table?
   1. 189
   2. 90
   3. 21
   4. 11
   5. 200
5. What information from the study would you assign to **box a** in the table?
   1. 279
   2. 10
   3. No
   4. 300
   5. 11
6. What information from the study would you assign to **box 6** in the table?
   1. High
   2. No
   3. 100
   4. Yes
   5. Total
7. What information from the study would you assign to **box 8** in the table?
   1. 100
   2. 189
   3. 200
   4. 10
   5. 21
8. Please select the appropriate null hypothesis option below:
   1. Persons with common cold do not consume vitamin C
   2. Incidence of common cold is not associated with intake of vitamin C
   3. Persons having low vitamin C intake have less common cold than those having high intake of vitamin C
   4. There is no difference in risk of common cold between high and low consumers of vitamin C.
   5. b and d above
   6. None of the above
9. Please select the appropriate alternative hypothesis option below:
   1. Persons having high vitamin C intake have fewer common colds than those having low intake of vitamin C
   2. Prevalence of Common cold is associated with intake of vitamin C
   3. There is a difference in risk of common cold between high and low consumers of vitamin C
   4. Persons having high vitamin C intake have fewer colds than those having low intake of vitamin C
   5. a and c above
   6. All of the above
10. On what basis (i.e. criteria) were the subjects in this study selected?
    1. Intake/selection was based on common cold occurrence
    2. Intake/selection was based on vitamin C intake
    3. Intake/selection was based on a convenience sample of friends and colleagues at SPH
    4. Intake/selection was based on common cold symptoms (runny or stuffy nose, sore throat, hoarseness, cough and low grade fever).
    5. None of the above
11. What was the endpoint (outcome) in this study?
    1. Vitamin C intake
    2. Common cold diagnosed by a physician
    3. Common cold symptoms
    4. Viral load
    5. None of the above
12. Are the cases observed during the follow-up period incident or prevalent cases?

* 1. Incident cases
  2. Prevalent cases
  3. Both Incident and prevalent cases

1. Is the distinction between prevalent and incident cases important? Why?
   1. No, the distinction is not important, and we often use both incident and prevalent cases together in research projects.
   2. No, the distinction is not important, but we usually keep incident and prevalent cases separate for statistical analysis purposes
   3. Yes, the distinction between incident (new) and prevalent (existing, meaning new and old) cases is important because of the time difference involved. Occurrence and treatment options may have changed over time.
   4. Yes, the distinction between incident (new) and prevalent (existing, meaning new and old) cases is important because prevalent cases may include people who have had the disease over a long time. They may be “survivors”. Survivors” may not be representative the general population.
   5. c and d above
   6. a and b above
2. Please match the following statements with the appropriate calculations below.
   1. Incidence of common colds among those exposed to high vitamin C

Intake?

* 1. Incidence of common colds among those exposed to low vitamin C

Intake.

1. Relative risk (RR) of having common colds among those with high

vitamin C intake compared to those with low vitamin C intake.

**Match options:**

1. (11/189)/(10/90) = 0.524
2. (11/200)/(10/100) = 11/20 = 0.55
3. 11/189 = 0.058
4. 10/90 = 0.11
5. 11/200 = 0.055
6. 10/100 = 0.1
7. Interpret the value of the relative risk (RR) given that the 95% confidence interval (CI) is 0.45-0.91.
   1. Statistically significant increased risk
   2. Statistically significant protective effect
   3. Not statistically significant increased risk
   4. Not statistically significant protective effect

1. What is the Risk Difference (RD) explained by the lower intake of vitamin C compared to the higher intake of vitamin C? Do the calculation and then explain the result.
   1. RD = (10/90) – (11/189) = 5.3 common colds per 100 avoided by high vitamin C intake
   2. RD = (11/100) – (10/200) = 6.0 common colds per 100 avoided by high vitamin C intake
   3. RD = (10/100) – (11/200) = 4.5 common colds per 100 avoided by high vitamin C intake
   4. RD = (11/200) – (10/100) = -4.5 = common colds increased 4.5 per 100 by high vitamin C intake
2. **The figure below shows a study design you could use to assess the relationship of vitamin C intake and the common cold. Which study design does the figure portray?**

Defined Population

Taken Vitamin C? Common cold

Taken Vitamin C? No Common Cold

1. Retrospective cohort study
2. Cross-sectional study
3. Longitudinal study
4. Case-control study
5. Field trial
6. **Add Vitamin C to drinking water in community A, and compare with community B, which does not have supplemented water. Which study design is this?**
7. Ecologic study
8. Clinical trial
9. Cohort study
10. Cross-sectional study
11. Community trial
12. **The figure below shows a study design you could use to assess the relationship of vitamin C intake and the common cold. Which study design does the figure portray?**

Given High Vitamin C Common colds?

Given Low Vitamin C Common colds?

Study Population

free of

Common Cold

1. Prospective cohort study
2. Clinical trial
3. Migration study
4. Community trial
5. Field trial
6. **The figure below shows a study design you could use to assess the relationship of vitamin C intake and the common cold. Please select the one best answer for box 1 in the figure.**

Defined Population

Taken Vitamin C? Common cold

Taken Vitamin C? No Common Cold

**1.**

1. Cases
2. Random sample
3. Source population
4. Controls (Non-Cases)
5. Cohort
6. **The figure below shows a study design you could use to assess the relationship of vitamin C intake and the common cold. Which study design does the figure portray?**

Do not develop Disease

Develop Disease

Years

Defined

Baseline

Population

1. Retrospective cohort study
2. Case-control study
3. Nested case-control study
4. Migration study
5. Community trial
6. Experimental study
7. **The figure below shows a study design you could use to assess the relationship of vitamin C intake and the common cold. Please select the one best answer for box 2 in the figure.**

Given High Vitamin C Common colds?

**2.**

Given Low Vitamin C Common colds?

Study Population

free of

Common Cold

1. Prognostic selection
2. Inception cohort
3. Exposure cohort
4. Randomization
5. Baseline cohort
6. **A “point-in-time” picture of health/disease status including common colds, health-related behaviors, and other exposure factors including vitamin C. Which study design is this?**
7. Case series
8. Cross-sectional study
9. Ecologic study
10. Prevalence survey
11. Migration study
12. a and d
13. b and d
14. **Do countries with high sales of vitamin C have less common colds? Which study design is implicated in this research question?**
15. Ecologic study
16. Migration study
17. Concurrent cohort study
18. Retrospective cohort study
19. Randomized study
20. **The figure below shows a study design you could use to assess the relationship of vitamin C intake and the common cold. Please select the one best answer for box 3 in the figure.**

Do not develop Disease

Develop Disease

Years

**3.**

Defined

Baseline

Population

1. Follow-up cohort
2. Cases
3. Controls (Non-Cases)
4. Convenience sample
5. Random sample
6. **Japanese men living in Japan, Hawaii, and in the bay area of San Francisco had low, medium and high risk, respectively, of common colds. The risk of common colds was found to be strongly associated with the intake of vitamin C in these populations. Which study design is this?**
   1. **Community trial**
   2. **Cross-sectional study**
   3. **Longitudinal cohort study**
   4. **Migration study**
   5. **Case series**
7. **The figure below shows a study design you could use to assess the relationship of vitamin C intake and the common cold. Please select the one best answer for box 4 in the figure.**

Defined Population

Taken Vitamin C? Common cold

Taken Vitamin C? No Common Cold

**4.**

* 1. **Cases**
  2. **Cohort**
  3. **Controls (Non-Cases)**
  4. **Non-exposed group**
  5. **Exposed group**

1. **Age adjusted risk of common colds was not found to be associated with national per capita intake of vitamin C. Which study design is this?**
2. Longitudinal study
3. Migration study
4. Concurrent cohort study
5. Retrospective cohort study
6. Ecologic study
7. **In a large prospective study assessing vitamin C intake in food in relation to risk of common colds, 950 men with incident common cold and 1054 matched control participants were studied. Relative risk (RR) of common cold in relation to intake of vitamin C were estimated by conditional logistic regression. RR among the highest vs lowest quintile of vitamin C intake was 0.71 (95% confidence interval (CI) 0.54-0.94, p trend=0.03). Which study design is this?**
8. Nested case-control study
9. Case-control study
10. Experimental study
11. Community trial
12. Case-cohort study
13. Longitudinal study
14. None of the above
15. **The figure below shows a study design you could use to assess the relationship of vitamin C intake and the common cold. Please select the one best answer for box 5 in the figure.**

Do not develop Disease

Develop Disease

Years

**5.**

Defined

Baseline

Population

* 1. **Non-exposed cohort**
  2. **Random sample**
  3. **Cases**
  4. **Exposed cohort**
  5. **Controls (Non-Cases)**
  6. **Follow-up cohort**