**Malaria.** A prospective cohort study sought to determine the association between P. vivax and severe malaria (SM).[1] Data from this study are reproduced below and are accompanied by questions.

| | | Severe Malaria? | |
|---|---|---|---|
| | | Yes | No |
| Age | 0 to < 2 years | 173 | 846 |
| | 2 to < 5 years | 207 | 2216 |

1. Can prevalence be calculated using these data? Why or why not?

2. What is the prevalence of Severe Malaria among children aged 0 to < 5 years?

3. What is the relative risk of Severe Malaria for participants under 2 years of age compared with those aged between 2 and 5?

[1] Genton B, D'Acremont V, Rare L, et al. Plasmodium vivax and Mixed Infections Are Associated with Severe Malaria in Children: A Prospective Cohort Study from Papua New Guinea. Rogerson S, ed. *PLoS Med*. 2008;5(6):e127. doi:10.1371/journal.pmed.0050127

| | | Severe Malaria? | |
|---|---|---|---|
| | | Yes | No |
| Age | 0 to < 2 years | 173 | 846 |
| | 2 to < 5 years | 207 | 2216 |

4. Can the odds ratio be calculated using these data? Why or why not?

5. What is the odds ratio for Severe Malaria for participants under 2 years of age compared with those aged between 2 and 5?

6. Compare the relative risk to the odds ratio.

7. Interpret the Relative Risk from #3.

8. Interpret the Odds Ratio from #5.

**Cytokines.** A case-control study was undertaken to illuminate the relationship between venous thrombosis (VT) and different cytokines (IL-1β, IL-6, IL-8, IL-10, IL12p70).[2] From a larger national study, 506 participants with VT were identified. Another sample of 1,464 participants without VT was randomly-selected. Excerpts from the article follow, accompanied by questions.

| | | IL-1β | |
|---|---|---|---|
| | | Detected | Undetected |
| Group | Cases | 289 | 217 |
| | Controls | 850 | 614 |

1. Can prevalence be calculated using these data? Why or why not?

2. What is the odds ratio comparing cases to controls?

3. A 95% confidence interval for odds ratio was calculated to be [0.8, 1.2]. Do you think the Cases and Controls groups differ in the presence of IL-1β?

[2] Christiansen SC, Næss IA, Cannegieter SC, Hammerstrøm J, Rosendaal FR, Reitsma PH. Inflammatory Cytokines as Risk Factors for a First Venous Thrombosis: A Prospective Population-Based Study. Greaves M, ed. *PLoS Med*. 2006;3(8):e334. doi:10.1371/journal.pmed.0030334

**Cytokines, Part 2.** The table below is from the same study as that in *Cytokines*.

| | | IL-6 | |
|---|---|---|---|
| | | Detected | Undetected |
| Group | Cases | 194 | 312 |
| | Controls | 547 | 917 |

1. Can prevalence be calculated using these data? Why or why not?

2. What is the odds ratio comparing cases to controls?

3. A 95% confidence interval for odds ratio was calculated to be [0.9, 1.3]. Do you think the Cases and Controls groups differ in the presence of IL-6?

**Leptospirosis.** A study was conducted to evaluate the performance of a Rapid Diagnostic Test (RDT) for leptospirosis in French tropical territories.[3] PCR was used as a gold standard to classify patients as either having Leptospirosis or being Controls. Germane results are reproduced below, and questions follow.

| | | Leptospirosis | Control |
|---|---|---|---|
| IgM RDT assay | Positive | 168 | 14 |
| | Negative | 19 | 207 |

1. Calculate the following:
    a. Sensitivity

    b. Specificity

    c. False Positive Error Rate

    d. False Negative Error Rate

    e. Positive Predictive Value

    f. Negative Predictive Value

    g. Likelihood Ratio +

    h. Likelihood Ratio -

[3] Goarant C, Bourhy P, D'Ortenzio E, et al. Sensitivity and Specificity of a New Vertical Flow Rapid Diagnostic Test for the Serodiagnosis of Human Leptospirosis. Büscher P, ed. *PLoS Negl Trop Dis*. 2013;7(6):e2289. doi:10.1371/journal.pntd.0002289

**Schistosoma.** A cross-sectional study was conducted to determine the diagnostic properties of urine microscopy for detecting *Schistosoma haematobium* infections in South African young women.[4] Table 3 from this article is reproduced below, followed by questions.

| | Urine microscopy [b] | | |
|---|---|---|---|
| **Pseudo gold standard [a]** | **Negative** | **Positive** | **Total** |
| **Negative** | 203 | 67 | **270** |
| **Positive** | 303 | 161 | **464** |
| **Total** | **506** | **228** | **734** |
| **Sensitivity (95% CI):** 34.7 (30.4 to 37.0)<br>**Specificity (95% CI):** 75.2 (69.6 to 80.2) | | | |

Missing data was not included in this analysis. CI: Confidence Interval

a. Sandy patches identified using clinical photocolposcopic examination or by computerised colourimetric image analysis [17, 26]

b. *Schistosoma haematobium* ova detected in a single urine sample by microscopy [27].

https://doi.org/10.1371/journal.pone.0191459.t003

1. Calculate the following:
    a. Sensitivity

    b. Specificity

    c. False Positive Error Rate

    d. False Negative Error Rate

    e. Positive Predictive Value

    f. Negative Predictive Value

    g. Likelihood Ratio +

    h. Likelihood Ratio -

[4] Galappaththi-Arachchige HN, Holmen S, Koukounari A, et al. Evaluating diagnostic indicators of urogenital Schistosoma haematobium infection in young women: A cross sectional study in rural South Africa. Knight M, ed. *PLOS ONE*. 2018;13(2):e0191459. doi:10.1371/journal.pone.0191459

**Neoplasms.** A recent study examined the Surveillance, Epidemiology, and End Results (SEER) database to examine the occurrence of myeloid neoplasms (MN) among breast cancer survivors who had received radiotherapy (RT) and who did not receive chemotherapy.[5] Excerpts from the journal article and questions follow.

> In the unadjusted analysis, there was an increased risk of subsequent MN among breast cancer patients who received RT compared to those who underwent surgery alone … After 5 years of follow-up 5.0 (95% CI 2.1–12.2) of 1,000 who received RT and 3.7 (95% CI: 1.8–7.9) of 1,000 who did not receive RT had developed subsequent MN (absolute risk increase of __A__ per 1,000 patients); corresponding to a number needed to harm of __B__. After 8 years of follow-up, the absolute risk increase was 1.7 per 1,000 patients corresponding to a number needed to harm of __C__, consistent with an increase in risk over time and longer follow-up.

1. What is the absolute risk increase (A)?

2. What is the number needed to harm (NNH) after 5 years (B)?

3. What is the number needed to harm (NNH) after 8 years (C)?

4. Explain why a *lower* value for #3 represents an *increase* in risk.

[5] Zeidan AM, Long JB, Wang R, et al. Risk of myeloid neoplasms after radiotherapy among older women with localized breast cancer: A population-based study. Hills RK, ed. *PLOS ONE*. 2017;12(9):e0184747. doi:10.1371/journal.pone.0184747