

QUIZ

1) A confounder is (Circle all that apply)

- (a) a factor associated with the outcome, but not associated with the exposure
- (b) a factor associated with the outcome and associated with the exposure and on the causal pathway between exposure and outcome
- (c) a factor not associated with the outcome, but associated with the exposure
- (d) a factor associated with the outcome and associated with the exposure, but not on the causal pathway.

The NMMAPS was a systematic investigation of the dependence of daily hospitalization and mortality counts on ambient particulate matter (PM) and other air pollutants. The NMMAPS database includes mortality, weather and air pollution data for the largest 90 cities in the USA for 1987 through 2000. Morbidity data was also available for 14 cities that had daily PM10 measurements. Daily data on mortality, weather, and air pollution were obtained from publicly available data sources.

2) What type of study is the NMMAPS? (Circle all that apply)

- (a) cohort study
- (b) case-control
- (c) multi-site time-series
- (d) cross-sectional

3) In NMMAPS a confounding factor is (Circle all that apply)

- (a) smoking
- (b) weather patterns
- (c) a factor that varies on short time scale and is associated with daily mortality
- (d) influenza epidemics

In NMMAPS the statistical model used was semi-parametric Poisson regression of the form $\log E[Y_t^c] = \beta^c PM_{10c} + \text{confounders}$, where Y_t^c is the total mortality count on day t at location c . The estimated β^c was 0.0027.

4) Which is the best interpretation for the slope estimate? (Circle only one response)

- (a) Estimated percentage increase mortality associated with $10\mu\text{g}/\text{m}^3$ increase in PM10 adjusted by confounders
- (b) Estimated mean increase mortality associated with $10\mu\text{g}/\text{m}^3$ increase in PM10 adjusted by confounders
- (c) Estimated log mean increase mortality associated with $10\mu\text{g}/\text{m}^3$ increase in PM10 adjusted by confounders
- (d) Estimated relative risk of mortality associated with $10\mu\text{g}/\text{m}^3$ increase in PM10 adjusted by confounders

5) The main advantages of time-series studies are (Circle all that apply)

- (a) inexpensive

- (b) results sensitive to lag choices
- (c) allow for direct evaluation of effect modification
- (d) control for subject-specific covariates
- (e) applicable to large publicly available data bases

6) In time-series studies the analysis must account for (Circle all that apply)

- (a) non-independence of daily mortality counts
- (b) seasonality
- (c) other pollutants
- (d) area-level covariates

7) In time-series studies, the semi-parametric Poisson regression approach is used because (Circle all that apply)

- (a) the responses are counts
- (b) to account for overdispersion from a classic Poisson process (variance > mean number of daily deaths)
- (c) account for variation in mortality over several periods
- (d) to combine estimates across cities

8) What are the benefits of using multiple locations in a time-series study? (Circle all that apply)

- (a) generalizability
- (b) results not sensitive to lag choices
- (c) statistical power is gained
- (d) use is made of extensive data bases available

9) Which of the following is not a synonym for “multilevel model” (choose all correct answers):

- (a) random effects model
- (b) mixed model
- (c) hierarchical model
- (d) random coefficient model
- (e) stochastic correspondence model

10) The key components of a multilevel model are (choose all correct answers):

- (a) predictor variables that represent many levels of influence from cell to society
- (b) interactions among variables representing different levels
- (c) inferences that account for correlation among observations within clusters
- (d) random effects
- (e) empirical variance estimates

11) In a two-stage hierarchical model, the major sources of variation in an estimate of a regression parameter (e.g. log relative risk) are (check all that apply):

- (a) statistical error that arises from imprecision in the finite set of measurements

- (b) Bayesian error
- (c) natural variation in the true parameter values
- (d) stochastic correspondence deviations
- (e) all of above

12) In estimating the average parameter value (here, log relative risk) across cities, we should weight the city-specific estimates (choose best answer):

- (a) inversely proportional to the standard error
- (b) proportional to the standard error
- (c) inversely proportional to the statistical variance
- (d) proportional to the statistical variance
- (e) inversely proportional to the sum of the statistical and natural variance

13) In the NMMAPS study, why are city-specific estimates heavily shrunk toward the national average?

- (a) The city-specific estimates have large standard errors
- (b) The number of air pollution related deaths is very small in most of cities
- (c) The pollution levels are very low
- (d) Pollution levels vary little with time
- (e) Number of deaths vary little with time

14) Relative to the MLE, the empirical Bayes estimate for a city's parameter (e.g. log relative risk) is: (check all correct answers)

- (a) is shrunk toward the overall estimate
- (b) is more biased
- (c) is more precise
- (d) is less biased
- (e) is less precise

15) In the NMMAPS, the hierarchical approach was appropriate because (check all correct answers)

- (a) provides estimates of the city-specific pollution effects
- (b) provides estimates of the overall pollution effect
- (c) provides estimates of the within and between cities variation of city-specific pollution effects
- (d) it was more challenging and looked good
- (e) provides estimates of the chronic pollution effects

16) What is the evidence the investigators got from NMMAPS? (check all correct answers)

- (a) elevated levels of PM_{10} cause an increase in mortality
- (b) there is a consistent association between short-term variations in PM_{10} and short-term variations in mortality
- (c) the association between PM_{10} and mortality is mainly explained by influenza epidemics
- (d) pooling the information across cities is a good thing to do

17) What are the NMMAPS analyses saying about the heterogeneity among cities?
(check all correct answers)

- (a) there is substantial heterogeneity across cities, but the dose-response curves across cities have similar patterns
- (b) the Chi-square tests of homogeneity are always accepted
- (c) pooling is inappropriate due to large heterogeneity

18) What is the National Medicare Cohort Study? (check all correct answers)

- (a) An European time-series study
- (b) A cohort study with 3 years follow-up data on people older than 65
- (c) A cohort study with time-series data on pollution and weather available
- (d) A case-crossover study
- (e) A joint cohort and time-series study

19) What is the goal of jointly estimating health effects associated with acute and chronic pollution exposure? (check all correct answers)

- (a) make use of a large available data base
- (b) acute and chronic effects will be estimated separately
- (c) comparison of acute and chronic effects will be possible
- (d) develop new statistical procedures
- (e) Write a Ph.D. dissertation

