Epidemiology exam

Jane Doe Statistics Exam July Question Outline the major features of cohort and case-control studies in epidemiology, and indicate how such observational studies differ from intervention studies, such as randomised controlled trials. Characteristic Random Controlled Clinical Case Control Cohort Study Time Prospective Parallel Retrospective Prospective Incidence Side effects/Efficacy NO YES Prevalence NO NO NO Causality NO YES YES Role of Disease YES Begin with disease End with disease Assesses Intervention efficacy Risk factor for 1 disease 1 risk for many diseases Data Analysis Dbl blinded Odds ratio to est risk Relative risk to est risk Time B (retro) < Time A > Time C (prospective) A: the assessment is for a retrospective or prospective study given the odds the child will be on either side of the mean of birth weight due to smoking of the mother during pre-natal periods. Therefore, we would need to assess one risk factor, smoking, compared with non-smokers. The Odd's Ratio would provide the estimated risk of prior patients, however the relative risk is also assessed looking forward to new ones. Therefore, a Cohort works best here because the assessment is looked at in terms of the mothers habits affecting the child in a forward manner. Birth weight, however, can be affected by infection, lack of support, no neonatal care, previous abortions, previous preterm births and other confounding factors. Reduction of effects would be done by a complete and thorough history of the patients prior to entering the study. B: The question involves an investigation into whether people who have worked in the factory of a chemical company producing toxic chemicals are more likely to develop a specific lung disease. This is a retrospective study or case-control since we are analyzing only one disease plus we are looking backward at people that already worked or were involved in a process prior

to Time A looking backward to Time B. Time A would technically represent a Cross Sectional Study for one point in time as a reference. Eliminating other factors would be difficult, as we would neither know the specific interaction of the chemicals at the workplace, nor the one's commonly used in the home or places one commonly visited. Secondly, we would also not know the length of time or amount of exposure necessary to cause a disease. We also would need to know of any other illnesses which the patients would have had which could also cause a major disease given the exposure to the toxic chemicals per se. So we would need to eliminate, again as with A, the confounding factors which would cause interference with the study clarity. C: We are asked to determine whether there is any association between people becoming cases of Legionnaire’s disease in a town which has experienced an outbreak of the disease, and their using a sports centre in that town during the two weeks before the outbreak. This is an assessment of an incidence increase of a disease for whatever reason given. However, the incidence is the point in time to reference the outbreak which was ongoing. Therefore we are looking backward or retrospectively to find whether there is an association to the sports centre, and the outbreak of the disease and what it may be. Elimination of the variables in this case would be easier, which patients were there and no other place. Legionnaire’s disease is caused by a water borne bacteria and its likelihood in being any other place is remote. Q2: (i) the absolute risk of death for continued smokers and stopped smokers – 34 deaths divided by total = 0. 09 (ii) the relative risk of death for continued smokers compared with stopped smokers = 19/15 = 1. 27 (iii) the attributable risk for continued smokers against stopped smokers . 12-. 07 = . 05 Q3: Surgical biopsy result women considered to be at risk FNA result

Cancer No cancer Total Positive 14 8 22 Negative 1 91 92 Total 15 99 114 Calculate the prevalence of breast cancer > 15/114 (10)= . 13 or 13% sensitivity > (TP/TP+FN) 14/(14+1) = . 93 or 93% specificity > (TN/TN+FP) 91/(91+8) = . 919 or 92% positive predictive value > (TP/TP+FP) 14/(14+8) = . 636 or 64% negative predictive value > (TN/TN+FN) 91/(91+1) = . 989 OR 99% FNA result Cancer No cancer Total Positive 113 15 128 Negative 8 181 189 Total 121 196 317 Part 2 palpable breast masses Calculate the prevalence of breast cancer > 121/317 = . 381 or 38% sensitivity > (TP/TP+FN) 113/(113+8) = . 933 or 93% specificity > (TN/TN+FP) 181/(181+15) = . 923 or 92% positive predictive value > (TP/TP+FP) 113/(113+15) = . 882 or 88% negative predictive value > (TN/TN+FN) 181/(181+8) = . 957 OR 96% Discussion: The immediate change is obviously the prevalence and positive predictive value changes. The addition of the palpation as a method of screening is indicative of increasing the odds of finding the masses as opposed to the limitation of just risk factors. Sensitivity and specificity were not affected at all, which was interesting and indicates that both tests are the same in those terms. NPV was offset but the % of decrease from Risk factor to Palpation was negligible. Q4: We find that the data sets show national means are fairly equal when taking into account the population statistics. For example, Town's A and C have a ratio of 1. 04 F: M , however the Town B has a 1. 25 ratio which indicates a larger female population. Therefore, we would assume a possibility of more births in the ratio analysis. The ratio for births is then taken into account thusly: Town A = 0. 02 Town B = 0. 02 Town C = 0. 02 So each town has the same exact birth rate for the per capita population. Similarly, we see that the amount of children in each town as a percentage of the population is identical at

roughly 0. 22 on average between the three towns. However, cancer rates vary wildly between the three. Town A has a cancer death rate of 1: 869 and Town B has a rate of 1: 750. both are fairly comparable and the differences while a per capital rate of greater than 100 persons doesn't vary to the degree that Town C did. Town C had a cancer death rate of 1: 1385 which is roughly 90% greater than Town B and 62% greater than Town A. Further the death rate or amount of deaths per capita has some anomalous variation. Town A = 1: 79 Town B = 1: 69 Town C = 1: 97 Obviously, Town C has a much higher death rate than both A and B, which one might conclude that either the town sits next to a toxic waste dump or something would need investigating. The subsets of cancer ratios are also very disparate. The amount of breast cancer (A)68, (B)19, (C)37 found in the towns also is highly unusual. The ratio of 1: 2161 in Town A compared to 1: 6027 in Town C indicates a 3 times greater chance of finding breast cancer, the BRCA genes, and likely other findings in A than C. Town B indicates a 2 times greater chance of C in the same findings. Studies would be done to find the causes within the NHS given proper funding. Q4: a) Due to the design, a randomized-controlled clinical trial, a more effective method likely could not be done. A double blinded study would be undo-able because the acupuncture treatment would obviously be known to the patients receiving it. Unless a drug were attached to the needles and all the patients were undergoing acupuncture and only a select group were undergoing the drug therapy, a double blind trial would not be effective. The biases in the trial in this experiment however, are recall related, measurement related, and confounding. These are all anticipated in most studies and can be limited by good clinical protocols like adequate preparation for the control group,

Changes made would include rigorous evaluations of the patients prior to enrollment along with more efficient evaluations of the pain, range of motion limitation, and disability involved in normal every day activities. b) The odds ratio calculation is as follows: AD/BC which shows us (83x34)/(61x18) = 2. 57 So what does this tell us? A lot actually. In this experiment, we can see that the treatment with acupuncture would give us a two and one-half times greater likelihood of improvement in symptoms which is highly significant, if it were in fact true. Note to student, if you need, add a few references interspersed in the answers after this since I have no knowledge of what book you use. Good luck.