

Dear Dr. Shallal,

A number of issues came up at the Arsenic workgroup meeting on which I thought we might be of assistance to the workgroup. Therefore, the attached:

1. The question was raised as to whether children were at special risk from arsenic exposure. Engel and Lamm (2008) is a recent review found no association but determined the literature was inadequate to assess and that the right studies needed still to be done. Liaw et al. (2008) found no association with the common childhood cancers (brain cancer and leukemia) but did find an association with liver cancer for those with pediatric exposure to very high arsenic levels (> 870 ug/L) but not with in-utero exposure.
2. The workgroup was interested in whether cancer risks were greater in SW Taiwan region than in all Taiwan. I do not have that comparison, but Tsai et al. (1999) provide an indirect answer and conclude that there is little difference. The Tsai et al. (1999) has three study populations – an arseniasis area, a local reference group, and the national data. Their arseniasis area comprises four of the six townships in the Wu et al. (1989) study. Their figure 1 shows the map, similar to that from Dr. Kim. Their local reference population comprises two of the three areas in the Wu et al. SW Taiwan region. It contains Chiayi county and Tainan county, but not Kaohsiung city and county. The map seems to indicate that it includes Tainan city, but that is unlikely as its population is only 10 x that of the study area. They report data for 23 years, similar to Wu's 14 years in Taiwan or Lamm's 30 years in the US. Tables 2 and 3 show that the SMRs for the arseniasis area are elevated for almost every disease, both cancer and non-cancer. However, the SMRs are similar whether the local reference group is used or the national reference group. Female bladder cancer particularly stands out.
3. Professor Allan H. Smith published an ecological study of US mortality related to mean arsenic level in the drinking water (Engel and Smith, 1994). Table 4 has data on Lung cancer, which should be included in EPA's literature review. The numbers in this article are not small. Additional data in here may be relevant to their non-cancer assessments.
4. The attached county map might be useful. The study area incorporates about the top half of Tainan county and some of Chiayi county next to it. The SW region includes Tainan and Chiayi counties and Tainan and Kaohsiung cities.
5. The question arose whether SW Taiwan differs from the study villages, as the Poisson analysis assumes that the villages are similar, except for arsenic exposure. The main source of variation in the dataset analysis comes from the reference group. The reference group and the villages differ little in age distribution but markedly in size. The low exposure study villages (n=15) have an average population of 13,800 with a range of 5,081-24,704 and a median of 12,534. The village populations have a normal distribution with an average population of 13,800 and a standard deviation of 5,698. In contrast, the SW Taiwan reference population has a population of 27,759,087.

Does it make sense that we might have to handle this large data source separately? Are there reasons other than its big size? We have to ask "Why is this village different from all other villages?" We have some answers. The study villages have Blackfoot Disease, the rest of the

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region does not. The study area waters have a suspicious “fluorescent substance” or humic substance that is not known to be present in the rest of the region. We do know that the study area was greatly dependent upon the deep artesian wells because the shallow wells were too saline, but we don’t know that about the rest of the region.

We examined this with a dummy variable and found that the positive association was with the dummy variable, not with the arsenic exposure. There must be a variety of other methods that will either accept or reject the conclusions of our analyses.

I hope these comments and references are of help to you,

Cordially,

Steve

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Engel-Lamm 2008. Arsenic Exposure and Childhood Cancer - Syst. Review of Lit [J Env Health 71 3 12-16].pdf



Liaw 2008. Increased Childhood Liver Cancer Mortality and Arsenic in Drinking Water in Northern Chile [Ca Epi Biom Prev].pdf



Tsai 1999. Mortality for certain diseases in areas with high levels of arsenic in drinking water.pdf County map of Taiwan.pdf