COMPLETION NOTICE
SA ¶4 (q) Conduct statistical analysis of children data from epidemiological studies (P29)

Summary of the Study

To evaluate whether children were at increased risk or a heightened sensitivity of illness following exposure to recreational water, EPA conducted statistical analyses of the data from each of the epidemiology studies at freshwater, marine, runoff and tropical beaches. Children were examined separately from other age groups. Results for children were compared to adults and other age groups. Age groups for comparison were as follows: age 10 and under, age 11-55 and over 55. Younger age groups were not analyzed separately due to small sample sizes.

Summary of Findings

Great Lakes Studies:

Enterococcus QPCR cell equivalents (CEs) were positively associated with swimming-associated gastrointestinal (GI) illness. The association between GI illness and QPCR CE was stronger among children aged 10 years and below (1.69; 1.24 –2.30). Children at 10 years or younger were at greater risk for GI illness following exposure. A higher proportion of children immersed their head and swallowed water compared to adults. Children also stayed in the water longer than adults.

Further information is available in *"High Sensitivity of Children to Swimming-Associated Gastrointestinal Illness Results Using a Rapid Assay of Recreational Water Quality"* Timothy J. Wade, Rebecca L. Calderon, Kristen P. Brenner, Elizabeth Sams, Michael Beach, Richard Haugland, Larry Wymer, and Alfred P. Dufour (Epidemiology 2008;19: 375–383)

Marine Studies (P1, 2):

Among all subjects, the risks of both GI illness and diarrhea were significantly associated with exposure to Enterococcus and Bacteroidales. A $\log_{10}$ increase in the daily average of Enterococcus and Bacteroidales CCE was associated with an approximate doubling or greater in the risk of GI illness. Although children 10 and under had slightly higher overall rates of gastrointestinal illness, there was no evidence of an increased susceptibility to illness with exposure to fecal indicator bacteria. Statistical models which allowed a separate slope for children showed no improvement over models with a single slope for all subjects. As with the freshwater sites, a higher proportion of children at the marine sites immersed their body or head in the water compared to adults.

Further information is available in Environmental Health: *"Rapidly measured indicators of recreational water quality and swimming-associated illness at marine beaches: A prospective cohort study"* Timothy J Wade , Elizabeth Sams , Kristen P Brenner , Rich Haugland , Eunice Chern , Michael Beach , Larry Wymer , Clifford C Rankin , David Love , Quanlin Li , Rachel Noble and Alfred P Dufour - Environmental Health 2010, 9:66doi:10.1186/1476-069X-9-66 Published: 31 October 2010

See Table S2: Adjusted Odds Ratios for illness risk among swimmers for a 1 $\log_{10}$ increase in indicator density. Children age 10 and under.

http://www.ehjournal.net/imedia/3968942414721357/supp2.pdf

Epidemiological study in marine waters impacted by urban runoff in a temperate region (CD 5(a)):

Although children had higher overall rates of gastrointestinal and respiratory illness at the Surfside Beach study site, there was no consistent pattern of a heightened sensitivity following exposure. A higher proportion of children immersed their body and head in water compared to other respondents. Results for children ten years of age and under are reported separately for the Surfside Beach site in the report titled: "Report on 2009 National Epidemiologic and Environmental Assessment of Recreational Water Epidemiology Studies". The results among children are summarized in the following tables:

Table 4.5, 4.6: Water exposures among children

Tables 4.8-4.12: Incidence of illness among children

Table 4.39, 4.42, 4.56, 4.57, Figure 5.16: Incidence of illness among children with regard to measures of water quality.

Epidemiological study in a tropical region (CD 5(b)):

Although children had higher overall rates of gastrointestinal and respiratory illness at the Boquerón Beach study site, there was no consistent pattern of a heightened sensitivity among children following exposure. A higher proportion of children immersed their body and head in water compared to other respondents. Results for children ten years of age and under are reported separately for the Boquerón Beach site in the report titled "Report on 2009 National Epidemiologic and Environmental Assessment of Recreational Water Epidemiology Studies". Results among children are summarized in the following tables:

Table 4.73, 4.74: Water exposures among children

Tables 4.76-4.80: Incidence of illness among children

Tables 4.103, 4.104, 4.129, 4.130: Incidence of illness among children with regard to measures of water quality.

This study has been completed as of December 15, 2010.