

# Research finds children living at high altitude at higher risk of mental development delays

6 November 2012, by Bob Yirka



Photo of White Mountain peak taken in the Alpine Zone. Credit: Jonathan Lamb/Wikimedia Commons

(Medical Xpress)—George Wehby from the University of Iowa has been conducting a study to discover adverse mental development effects on toddlers and babies due to living at high altitudes. He's found, as he describes in his paper published in the *Journal of Pediatrics* that children living above 8,530 feet were twice as likely to be at risk of experiencing delays in their mental development as those living at or below 2,625 feet.

To find out more about possible adverse mental development in children living at high altitudes, Wehby worked with pediatricians from South American countries Ecuador, Brazil, Argentina, Bolivia and Chile over the years 2005 and 2006. Pediatricians administered tests to over 2000 children living in both high and lower altitude communities. The tests entailed asking the children to perform tasks that measured motor skills and problem solving abilities. Prior research had shown that living at [high altitude](#) can impact physical development, this new research was conducted to find out if the same is true of mental development.

In analyzing the results of the tests given to the children, Wehby found that those children three months to two years old showed a one in three to one in four chance of being at high risk of mental developmental delays, compared to one in five for children not living at high altitude. At high altitudes, the air has less oxygen in it, which some have suggested might mean that less oxygen makes it to the brain of a growing fetus, leading to developmental delays. The data also showed that for every 328 foot increase in altitude, there was a corresponding 2 percent increased risk of [developmental delays](#).

Wehby suggests that the data shows that [health care providers](#) and those involved in making health care [policy decisions](#) need to be made aware of possible adverse effects on children living at high altitudes, and not just in South American countries. Cities in the United States, such as Albuquerque and Denver both have populations living over a mile high and some smaller communities in a few western states exist at over 10,000 feet. He adds that more testing needs to be done to determine why living at high altitudes impacts development and to determine if doing so has other as yet unknown adverse effects.

**More information:** Living on Higher Ground Reduces Child Neurodevelopment—Evidence from South America, [doi:10.1016/j.jpeds.2012.09.011](https://doi.org/10.1016/j.jpeds.2012.09.011) , [www.jpeds.com/article/S0022-34 ... \(12\)01025-6/abstract](http://www.jpeds.com/article/S0022-34... (12)01025-6/abstract)

## Abstract

### Objective

To study the effects of altitude on infant neurodevelopment in the first 2 years of life.

### Study design

Data from a unique study of normal infant neurodevelopment in 5 South American countries

were used. The sample included 2116 infants 3-24 months of age who were evaluated for neurodevelopmental problems by study physicians during their routine well-child visits at 31 pediatric practices. We used regression models with country fixed-effects that compare the neurodevelopment of children born at different altitudes within the same country to avoid confounding. The regressions adjust for several socioeconomic and demographic factors. We also evaluated altitude effects stratifying by sex, age, and household wealth. Infant neurodevelopment was evaluated by physicians by using the Bayley Infant Neurodevelopmental Screener. The primary outcome is an indicator for whether the infant is at high risk for neurodevelopmental problems based on the Bayley Infant Neurodevelopmental Screener norms.

#### Results

Altitude significantly increases the probability of being at high risk for neurodevelopmental problems (100-meter increase in altitude: OR 1.02; 95% CI 1.001-1.037; high altitude greater than 2600 meters vs low altitude less than 800 meters: OR 2.01; 95% CI 1.36-2.973). The effects are larger for females and for second than first year of life. The largest effect is for females 12-24 months of age (high vs low altitude: OR 4.147; 95% CI 1.466-12.013). There are no significant differences in altitude effects by household wealth.

#### Conclusions

Altitude may significantly increase the risk of neurodevelopmental problems during the first 2 years of life, especially for females during their second year of life.

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