

Autism and intellectual disability incidence linked with environmental factors

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Quinn, an autistic boy, and the line of toys he made before falling asleep. Repeatedly stacking or lining up objects is a behavior commonly associated with autism. Credit: Wikipedia.

(Medical Xpress)—An analysis of 100 million U.S. medical records reveals that autism and intellectual disability (ID) rates are correlated at the county level with incidence of genital malformations in newborn males, an indicator of possible congenital exposure to harmful

environmental factors such as pesticides.

Autism rates—after adjustment for gender, ethnic, socioeconomic and geopolitical factors—jump by 283 percent for every one-percent increase in frequency of [malformations](#) in a county. Intellectual disability rates increase 94 percent. Slight increases in autism and ID rates are also seen in wealthier and more urban counties.

The study, published by University of Chicago scientists in the March 13 issue of *PLOS Computational Biology*, confirms the dramatic effect of diagnostic standards. Incidence rates for autism and ID on a per-person basis decrease by roughly 99 percent in states with stronger regulations on diagnosis of these disorders.

"Autism appears to be strongly correlated with rate of [congenital malformations](#) of the genitals in males across the country," said study author Andrey Rzhetsky, professor of genetic medicine and human genetics. "This gives an indicator of environmental load and the effect is surprisingly strong."

Although autism and [intellectual disability](#) have genetic components, environmental causes are thought to play a role. To identify potential environmental links, Rzhetsky and his team analyzed an insurance claims dataset that covered nearly one third of the U.S. population. They used congenital malformations of the reproductive system in males as an indicator of parental exposure to toxins.

Male fetuses are particularly sensitive to toxins such as environmental lead, sex hormone analogs, medications and other synthetic molecules. Parental exposure to these toxins is thought to explain a large portion of congenital reproductive malformations, such as micropenis, hypospadias (urethra on underside of the penis), undescended testicles and others.

The researchers created a statistical baseline frequency of autism and ID across the country. They then looked at the actual rates of these disorders, county by county. Deviations from the baseline are interpreted as resulting from local causes. Factors such as age, ethnicity, socioeconomic groups and geopolitical statuses were analyzed and corrected for.

The team found that every one-percent increase in malformations in a county was associated with a 283-percent increase in autism and a 94-percent increase in ID in that same county. Almost all areas with higher rates of autism also had higher rates of ID, which the researchers believe corroborates the presence of [environmental factors](#). In addition, they found that male children with autism are almost six times more likely to have congenital genital malformations. Female incidence was linked with increased malformation rates, but weakly so. A county-by-county map of autism and ID incidence above or below the predicted baseline for the entire U.S. is included in the study.

Non-reproductive congenital malformations and viral infections in males were also associated with double digit increases in autism and ID rates. Additionally, income appeared to have a weak effect—every additional \$1,000 of income above county average was correlated with around a three percent increase in autism and ID rates. An increased percentage of urban population in a county also showed a weak increase in rates.

The most striking negative effect was state regulation. State-mandated diagnosis of autism by a clinician for consideration in special education was linked with around a whopping 99 percent decrease in the rate of incidence for autism and ID. Certain ethnic backgrounds, such as Pacific Islanders, had significantly lower risk for both diseases.

While the effect of vaccines was not analyzed as part of this study, Rzhetsky notes that the geographic clustering of autism and ID rates is

evidence that if vaccines have a role, it's a very weak one as vaccinations are given uniformly across the US.

Rzhetsky acknowledges that there are potential confounders to the study; for example, ease of access to data could differ between counties, or uneven genetic distribution beyond the factors for which the scientists controlled could have an effect. The team anticipates future studies could leverage data from the Environmental Protection Agency and other sources to identify links between specific environmental causes and increased rates of autism and ID.

"We interpret the results of this study as a strong environmental signal," Rzhetsky said. "For future genetic studies we may have to take into account where data were collected, because it's possible that you can get two identical kids in two different counties and one would have [autism](#) and the other would not."

Provided by University of Chicago

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