The Correlation of Autism Birth Rates and Surface Ozone and in the United States.

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Background

Autism Spectrum Disorder (ASD), is a set of developmental disorders that includes Autism, Asperger's Syndrome and Pervasive Developmental Disorder-not otherwise specified (PDD-NOS). ASD symptoms range from mild to severe and include problems in social behavior, communication, language development, and unusually restricted interests or repetitive behaviors.

Autism rates climbed nearly 30% between 2008 and 2010 and have more than doubled since the turn of the century, according to a new study from the U.S. Centers for Disease Control and Prevention. The condition is now believed to affect one of every 68 8-year-olds – up from one in 88 just two years earlier.

Economic Costs

- It is estimated to cost at least $17,000 more per year to care for a child with ASD compared to a child without ASD. Costs include health care, education, ASD-related therapy, family-coordinated services, and caregiver time. For a child with more severe ASD, costs per year increase to over $21,000. Taken together, it is estimated that total societal costs of caring for children with ASD were over $9 billion in 2011.
- Children and adolescents with ASD had average medical expenditures that exceeded those without ASD by $4,110–$6,200 per year. On average, medical expenditures for children and adolescents with ASD were 4.1–6.2 times greater than for those without ASD.
- In 2005, the average annual medical costs for Medicaid-enrolled children with ASD were $10,709 per child, which was about six times higher than costs for children without ASD ($1,812).
- In addition to medical costs, intensive behavioral interventions for children with ASD cost $40,000 to $60,000 per child per year.

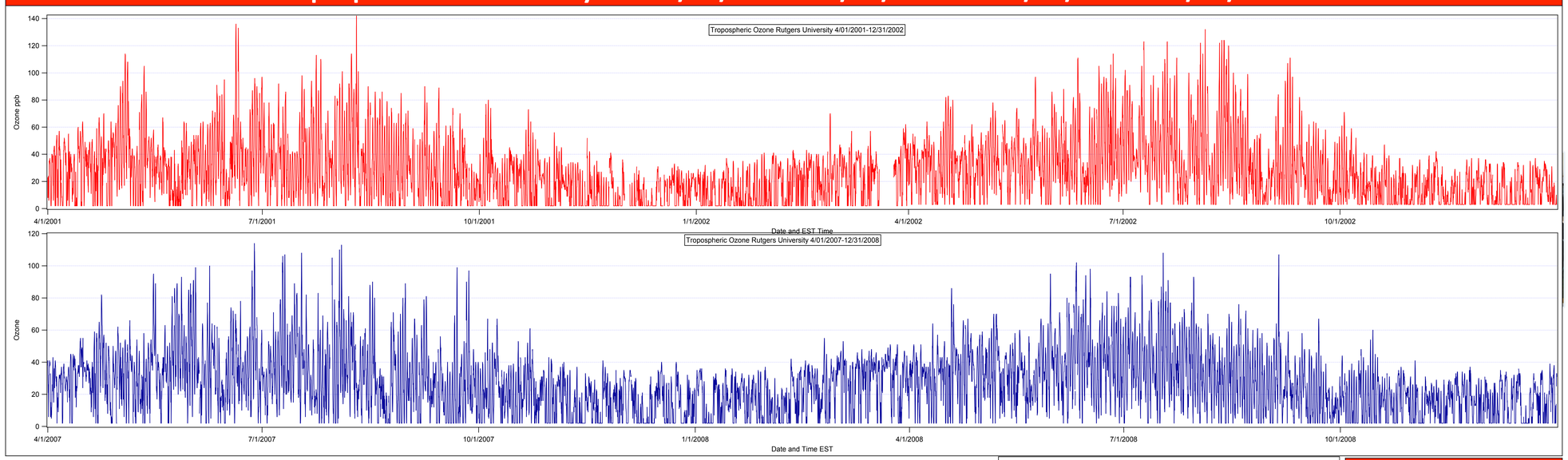
In June 2014, a new study from the Harvard School for Public Health concluded that women in the United States exposed to high levels of air pollution while pregnant were up to twice as likely to have a child with autism as women who lived in areas with low pollution. It is the first large national study to examine links between autism and air pollution across the U.S., looking at associations between autism and levels of pollutants at the time and place of birth. They used air pollution data from the U.S. Environmental Protection Agency (EPA) to estimate women's exposure to pollutants while pregnant, specifically diesel particulates, mercury in the air, lead, manganese, methylene chloride, and combined metal exposure. Also using data from the EPA's AQS database, this study begins to look for a similar correlation between autism prevalence and tropospheric ozone concentration.

Surveillance Year	Birth Year	Reporting Sites	Prevalence per 1,000 Children	This is about 1 in X Children
2000	1992	6	6.7	1 in 150
2002	1994	14	6.6	1 in 150
2004	1996	8	8.0	1 in 125
2006	1998	11	9.0	1 in 110
2008	2000	14	11.3	1 in 88
2010	2002	11	14.7	1 in 68

Autism Prevalence Data

The CDC reviewed medical and school records from 2010 at 11 different sites across the country. Since 2000, the CDC has based its autism estimates on surveillance reports from its Autism and Developmental Disabilities Monitoring Network (ADDM). Every two years, researchers count how many 8-year-olds have autism at 11 monitoring sites. The CDC has used the same method to determine autism prevalence every two years since 2000, showing a 120% increase in autism rates between 2000 and 2010. There is a huge range in autism prevalence across those sites, from one child in 175 found with autism in Alabama, to one child in 46 in New Jersey.

Tropospheric Ozone Hourly Data 4/01/2001 - 12/31/2002 and 4/01/2007 - 12/31/2008

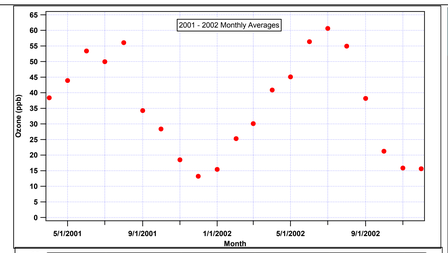


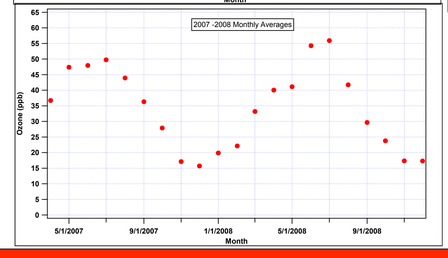
ADDM Network Data

State	Site/Institution	Surveillance Area	2008 Total Population	2008 ASD Total	2002 Prevalence (95% CI)	2008 Prevalence (95% CI)	% Change
Alabama	University of Alabama at Birmingham	32 counties in north central Alabama	36,566	174	3.2	4.8	45.6
Arizona	University of Alabama	One county in metro Phoenix	32,601	507	7.9	15.6	97.1
Arkansas	University of Arkansas for Medical Sciences	Pulaski County in metro Little Rock	4,940	52	10.6	10.5	-0.3
Colorado	Colorado Dept. of Public Health and Environment	6 counties in metropolitan Denver	29,336	188	6.2	11.8	88.8
Florida	University of Miami	Miami-Dade County in south Florida	28,974	211	Did Not Report	7.2	----
Georgia	Center for Disease Control	5 counties including metro Atlanta	50,427	601	7.5	11.9	58.3
Maryland	Johns Hopkins University	6 counties in suburban Baltimore	27,022	336	7	12.1	74.1
Missouri	Washington University St. Louis	5 counties including metro St. Louis	25,668	357	7.2	13.9	92.7
New Jersey	University of Medicine and Dentistry of NJ	Union County in metro Newark	7,082	145	11.1	20.3	83.4
North Carolina	University of North Carolina-Chapel Hill	11 counties in central North Carolina	36,913	525	6.6	12.7	93.6
Pennsylvania	University of Pennsylvania	One metro county in Philadelphia	18,440	245	5.2	13.3	156.1
South Carolina	Medical University of South Carolina	23 counties including Pee Dee regions	23,769	264	6.1	11.1	83
Utah	University of Utah	Part of one county in northern Utah	2,123	45	8.3	21.2	157
Wisconsin	University of Wisconsin-Madison	10 counties in southeastern Wisconsin	34,451	267	5.1	7.8	51.7

Nine Month Ozone Averages

Start	End	Ozone (ppb)	Start	End	Ozone (ppb)
April 2001	Dec. 2001	37.33	April 2007	Dec. 2007	35.85
May 2001	Jan. 2002	34.785	May 2007	Jan. 2008	33.98
June 2001	Feb. 2002	32.71	June 2007	Feb. 2008	31.18
July 2001	March 2002	30.12	July 2007	March 2008	29.54
August 2001	April 2002	29.11	August 2007	April 2008	28.46
Sept. 2001	May 2002	27.89	Sept. 2007	May 2008	28.14
Oct. 2001	June 2002	30.35	Oct. 2007	June 2008	30.14
Nov. 2001	July 2002	33.93	Nov. 2007	July 2008	33.26
Dec. 2001	August 2002	37.989	Dec. 2007	August 2008	35.99
Jan. 2002	Sept. 2002	40.761	Jan. 2008	Sept. 2008	37.54
Feb. 2002	Oct. 2002	41.40	Feb. 2008	Oct. 2008	37.98
March 2002	Nov. 2002	40.36	March 2008	Nov. 2008	37.44
April 2002	Dec. 2002	38.75	April 2008	Dec. 2008	35.68





Results

Based on data from one of the fourteen monitoring sites, it seems there is no correlation between ozone concentration and autism prevalence. However, the data shows that extended exposures at lower levels of ozone may be correlated with increased autism prevalence.

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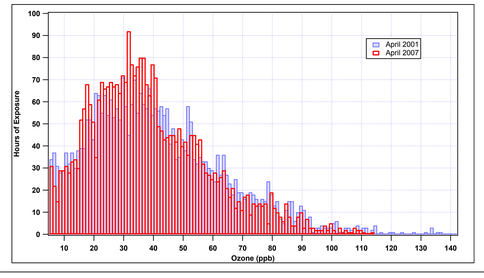
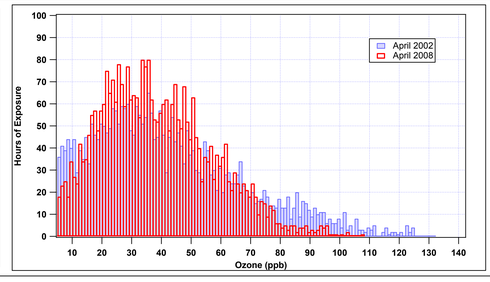
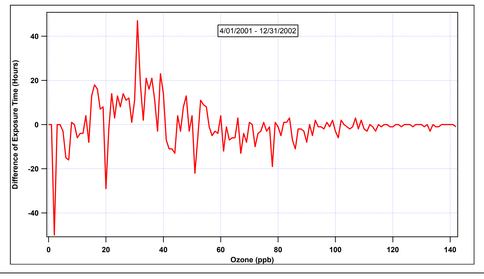
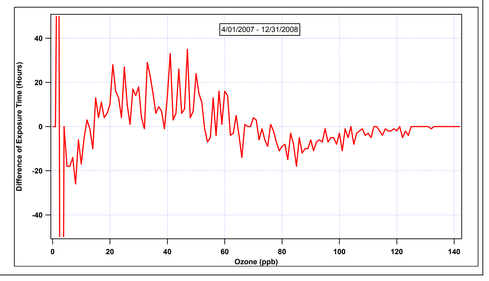
Extended Exposure Time Differences 2002 - 2008

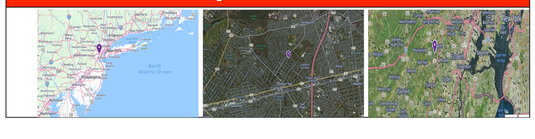




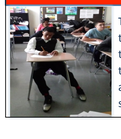




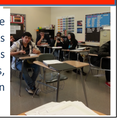
Study Focus Area



Student Engagement



The Stamford High School partnership of administrators, faculty, and staff believes that all students can learn. We believe that we must provide a rigorous, relevant curriculum for all students that promotes critical and creative thinking and works to engage all students regardless of their varied abilities and backgrounds. To do so, we give students multiple opportunities to succeed in the high school experience as well as set high expectations for all students and hold them, and ourselves, accountable. We are extremely grateful to NASA and the NASA Langley Research Center for sharing their resources in support of our students.



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