Dimensions of Autism: Unravelling the Relation between Autism Spectrum Disorder (ASD) Incidence and Socioeconomic Background

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Table of Contents

Section 1 - Title Page, Table of Contents, Acknowledgements, Timeline
STEP 14: TITLE PAGE, TABLE OF CONTENTS AND ACKNOWLEDGMENTS

Title Page - This should be attractively planned and have:

- Title of project centred on the page
- Student Name, School, Grade, and completion date in lower right-hand corner
- Illustrations are optional

Table of Contents: - This should be accurate and include:

- 'Table of Contents" at top of page
- Listing for each Section of your report and the accompanying page number.

Acknowledgements - this page appears at the beginning of your report, right after the table of contents, and it is an important part of your science fair project. You should recognize, briefly describe, and thank **all outside** help you received throughout your science fair project. This can be parents, contacts, teachers, equipment suppliers, etc. Generally, this is about one paragraph in length.

Nov. 30, 2025

Dimensions of Autism: Unravelling the Relation between Autism Spectrum Disorder Incidence and Socioeconomic ~~Background~~ Conditions

Nov. 29, 2025

<table>
<tr><th>Timeline (by week)</th><th>Obehi</th><th>Tina</th></tr>
<tr><td rowspan="2">November</td><td colspan="2">● Synthesize ideas, brainstorm
Choose a Focused Topic
● Pick a science topic you're genuinely interested in.
● Make sure it's not too broad — narrow it to a clear question or issue.
● Example: Instead of "climate change," focus on "How is climate change affecting Arctic wildlife?"
Ask a Research Question
● Frame a question that can be answered through information and evidence, not an experiment.
● Example: What are the most effective renewable energy sources for reducing carbon emissions?</td></tr>
<tr><td>● Find five sources
● Question and purpose</td><td>● Find five sources
● Hypothesis</td></tr>
<tr><td>December</td><td colspan="2">● Complete your basic information CYSF site for registration by Dec 5</td></tr>
</table>

<table>
<tr><td></td><td colspan="2">

- Make sure ethics forms and experimental design are completed.
- Collect sources and add to sheet

Conduct Background Research

- Use reliable sources: science journals, government or university websites, books, and interviews with experts.
- Take notes and track your sources for your bibliography.
- Make note of interesting research
- Time to collate the research and make an opinion about it

</td></tr>
<tr><td></td><td>

- Method and data of CYSF form

</td><td>

- Ethics due form
- Question and research of CYSF form

Background research:
~~https://www.canada.ca/en/public-health/services/diseases/autism-spectrum-disorder-asd/causes-autism-spectrum-disorder-asd.html~~

~~https://www.nimh.nih.gov/health/topics/autism-spectrum-disorders-asd#:~:text=Autism%20spectrum%20disorder%20is%20a,first%20two%20years%20of%20life~~.

~~https://www.canada.ca/en/public-health/services/diseases/autism-spectrum-disorder-asd.html~~

~~https://www.autismcanada.org/history-of-autism#:~:text=What%20is%20Autism?,Challenges%20with%20social%20interactions~~

https://vkc.vumc.org/assets/files/resources/neurodiversity.pdf (importance)

</td></tr>
<tr><td>December</td><td colspan="2">

Organize and Analyze Information

- Sort your notes into key ideas or themes.
- Look for patterns, causes and effects, and different viewpoints.
- Create charts, diagrams, or timelines if helpful.

</td></tr>
<tr><td></td><td>

- Next steps to either experiment more or research more relevant questions stemming from old

</td><td>

- Drawing conclusions about research
- This is the time to move beyond

</td></tr>
</table>

	research	your research - what does the research mean? Research: ~~https://www.mdpi.com/2227-9067/13/1/62#:~:text=Social%20determinants%20included%20household%20income,more%20equitable%20identification%20and%20intervention~~. https://www.thelancet.com/journals/lanchi/article/PIIS2352-4642(22)00273-5/abstract https://pmc.ncbi.nlm.nih.gov/articles/PMC4382377/#:~:text=Prior%20research%20has%20demonstrated%20that,in%20therapy%20or%20pharmacological%20treatments. https://link.springer.com/article/10.1007/s10803-025-07085-3#:~:text=Past%20studies%20assessing%20the%20associations,effectively%20address%20these%20unmet%20needs. https://pmc.ncbi.nlm.nih.gov/articles/PMC10460124/ https://link.springer.com/article/10.1007/s10803-025-07205-z https://link.springer.com/article/10.1007/s10803-025-07190-3 https://link.springer.com/article/10.1007/s10803-025-07137-8
December	**Develop Your Thesis or Main Idea** ● Write a statement that sums up what your research shows or argues. ● Example: *Solar energy is the most practical renewable source for residential use because it is efficient, affordable, and widely available.*	
	● Organize research	● Review the judging rubrics: Grade 7-12 - Secondary Rubric
December	**Write and Present Your Findings** ● Structure your report or display:	

<table>
<tr><td></td><td colspan="2">

Introduction (your question and why it matters)
Background information
Key findings and evidence
Conclusion (what you learned and why it’s important)
Include visuals such as graphs, maps, or photos to support your message.

Cite Your Sources

Give credit for all information and images you use.
Use a simple APA bibliography format

</td></tr>
<tr><td></td><td>

Background research and experiment sheets must be submitted with sources.
If non-experimental - new theories based on research should be drawn, additional connections are made

</td><td>

Cite all your sources: books, magazines, people, organizations, websites
Continue collecting data or researching or building
Make sure all forms are completed
Trifolds need to be picked up to be brought home
Layout and design of trifold begins

</td></tr>
<tr><td>January</td><td colspan="2">
Reflect and Share

Reflect on what you learned and what new applications you have.

</td></tr>
<tr><td></td><td>

Ensure research for non-experiment is compiled

</td><td>

Trifolds are started
Logbook is 90% completed

</td></tr>
<tr><td>January</td><td>

Keep on working on fine tuning the experiments and research.

</td><td>

Make sure sources list are in APA format
Possible sources: interviewing experts, podcasts, books, CD sources, magazines, articles.

</td></tr>
<tr><td>January</td><td>

Add details such as pictures and interesting facts to the write up
This should be replicated on trifold
Trifold should be almost finished

</td><td>

Scientific Write Up completed
Include all the detailed research
All the categories should be found in logbook
Make sure scientific write up and as many parts of logbook are in digital format

</td></tr>
<tr><td>January</td><td>

Presentation completed

</td><td>

Make sure you review the judging

</td></tr>
</table>

	Preparing for WCS Science Fair… ● Decide on visual accompaniment - trifold, visuals	rubrics to ensure you have all the pieces completed.
February	● Rehearsal and practice day ● Logbook completed ● Trifold completed ● Scientific report completed ● Presentation rehearsed. ● Sources in APA and completed. ● All projects must be in the CYSF site for registration	
February 6	**School Fair Day!** ● School Science Fair Day in Learning Commons ● We will be judging based on the judging rubrics ● Please have a logbook, trifold, and presentation ready to showcase.	
February 9	Students chosen for the Calgary Youth Science Fair will be notified ● All the students who participated in the school Science Fair will receive a participation certificate.	
February 20	**Last day to adjust** any project materials on CYSF website.	
April 2026	**Calgary Youth Science Fair (CYSF) Competition**	

Section 2 - Ideas and Background Research

Nov. 23-24, 2025

Ideas (Neuroscience):

1. What do our dreams mean? **I finally used my frontal lobe to realize this topic is ahh and doesn't have any real impact/applications**
    a. Have to understand REM, circadian rhythms, and how they're formed
2. **How does the use of drugs affect our brain functioning?**
3. What does giftedness look like?
    a. What do societal pressures do to our brains?
    b. Autism through development
        i. Wait this is cool because we could also talk about like nature vs nurture and talk about the social determinants of health and neurodivergence

Topic Ideas and Article Examples:

Schizophrenia and Visual Impairment (*I saw an instagram reel and read an article about it)*
https://www.healthcentral.com/condition/schizophrenia/blindness-and-schizophrenia

- Implications: schizophrenia is very hard to diagnose so researching this could like make it easier idk – we could also talk about the neural basis for schizophrenia if we wanted to because that would be good for diagnosing
    - Isn't it kind of crazy that blind people aren't usually schizophrenic

Lucid Dreaming
https://pmc.ncbi.nlm.nih.gov/articles/PMC6451677/

- Implications: idk its just fun fr and also this article says they still haven't figured out why it happens or whatever so we could look at a bunch of sources and try to come to our own conclusion
    - So its like kind of new

Bilingualism and Dementia (*I saw a lot of articles about it isn't that really cool)*
https://news.las.iastate.edu/2021/01/28/study-shows-learning-a-second-language-thwarts-onset-of-dementia/

- Implication: dementia is bad so this could be a treatment
- We could talk about music/art and dementia as well or like learning a new skill but also thats like generic i dont know

I know i said deja vu as well but i lowkey realized that that is an irrelevant to anything like the research has no real world application

STEP 5: BACKGROUND RESEARCH

All background research you do should be recorded in detail in the research section of your Log Book (you will likely need many pages to fully explore your subject area and may wish to subdivide this section on your own). **This will be one of the most important steps in your science fair project**. It is necessary to gather as much information as possible in an effort to fully understand your topic. Information sources would be the most important for this area. There is no limit as to how much background information you have. Ensure you use headings to break up the information. **This will not only help you make a logical hypothesis, but will also help you to make correct inferences for your conclusion at the end of the experiment.**

Basic Requirements:

After you have taken notes and filled up your Background Research section in your logbook, you can take all your notes and write up the Background Research section for your report. The completed background research section of your report should be neatly organized and be a minimum of two pages typed (double-spaced, 10-12 size font, one side of paper only) or a minimum of four pages hand-written (script, blue or black pen, double-spaced, one side of paper only). In addition to the written text, the research section should contain relevant illustrations, and a list of references (your science teacher will show you how to properly document these). Illustrations will be in addition to the two or four page requirement. The reference list should appear immediately following the research section of your report. The basic requirements are explained in more detail, below.

What to research:

Lastly, if the project is research based, find all the information for the project and while it is a collection related to the research project, the question "so what?" is key. What **new** findings would this research suggest in your project?

Adding Extras:

The research section also needs to include definitions, interesting related facts, new discoveries being made in the topic area, and relevant pictures or illustrations (labelled of course!). You should always be on the lookout for this type of information while doing your background research. Feel free to add published materials that would be relevant to your project.

Where to Find Information:

Possible suggestions for information sources include family, friends, scientists, libraries, Science Encyclopedias, news articles, scientific papers, websites, computer programs, The Science Centre, business or industry, the University, research institutes, magazines, Twitter, and other Social Media sites etc.

Use of AI

The use of Artificial Intelligence is not prohibited. However, each project must state how it is used. Each project will **require** a digital logbook so that it will be checked with our school AI detectors. This process will be completed prior to the school competition in February. If projects are mainly created with AI the project will be **disqualified** for the school and the city fair.

Suggestions on Taking Notes:

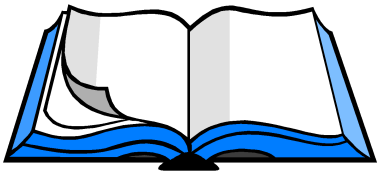
Remember to include the source of information for each entry for use in the Reference List!

Making an Outline:

Now that you have your notes, it is time to summarize the ideas into paragraph form for the background research section of your report. This section will have a minimum of five well-developed paragraphs. Remember that a paragraph has an introductory sentence (what the paragraph will be about), several informative sentences, and a concluding sentence (summary of what has been said and some sort of link to the next paragraph). The research section should contain the following paragraphs (or groups of paragraphs if you have a lot of material to explain).

1. Introductory paragraph - reason for report, general description of what it will be about (relate to Science Fair project).
2. Information on manipulated variable.
3. Information on responding variable.
4. Other relevant information (interesting info, historical info, new discoveries).
5. Concluding paragraph - review of what has been learned from background research, plus a statement about how this will help with understanding of the science fair project.

Here is a sample outline for the research section of your report…



SAMPLE OUTLINE FOR SCIENCE FAIR RESEARCH PAPER

Student Name: _____

Project Title: _____

1) Introductory Paragraph
   - General description of project
   - Reason for doing project
   - Briefly describe what you will cover in the rest of report

2) Information on your manipulated variable/ independent variable.
   - Describe your manipulated variable
   - What do you know about this variable?
   - How will you measure this variable
   - How does what you learned relate to your particular experiment?

3) Information on your responding variable/dependent variable.
   - Describe your responding variable (what change will you be looking for)
   - What do you know about this variable?
   - How will you measure this variable?
   - How does what you learned relate to your particular experiment?

4) Other interesting information

- Did you discover anything of interest that may or may not directly relate to your project?
- Any historical information that would relate to your topic.
- Any new discoveries in this area of Science?

5) Concluding Paragraph
   - Briefly summarize what you learned about your manipulated and responding variables.
   - What do you think the answer to your scientific question is, now that you have completed the research (hypothesis).
   - How will you use the information that you have used to plan your science fair project?

Reminders when writing your final Research section:

Always make a rough draft, first. This should be double-spaced to accommodate easy editing. Re-phrase notes into complete sentences, using your own words and following the outline format. Edit the report! Check for proper grammar, punctuation, spelling, correct sentence form, labels for illustrations, and overall neatness. Having another person read it over or reading it outloud will help reduce errors.

Reference List: (You should always have a minimum of three quality references)

- Some online resources to create a proper **APA** format for your reference list.
- https://owl.purdue.edu/owl/research_and_citation/apa_style/apa_formatting_and_style_guide/general_format.html
- https://www.scribbr.com/apa-citation-generator/
- https://www.easybib.com/guides/citation-guides/apa-format/apa-citation/
- https://www.bibliography.com/apa/apa-format-and-citations/

Be sure to include a list of all the resources you used in the process of doing your background research. This is an alphabetical list of all books, magazines, newspapers, computer programs or websites, and professionals from whom you obtained information. The Reference List should be broken into the following categories:

Books

Last name of author, First name (date of publication). Title of Book. City: Name of publisher.

Magazines or Newspaper Articles

Last name of author, First name (date of publication). Title of Article. Title of magazine. Page numbers (pp.3-10).

Encyclopaedias, Computer Programs, Databases, etc.

Name of Encyclopaedia. Program. etc. (Year and/or edition), Publisher, Topic title. Page numbers if applicable.

Internet Web Sites

Domain address http://..., (date visited), Author of Site if given, Title of site if given.

Professional Contacts

Last name, First name. (date of conversation) Professional Title. Organization. Address/phone number.

Your final Background Research section should look something like this. Keep in mind that this is only an EXAMPLE of paragraph openers. You will want to begin your paragraphs differently, and may need additional paragraphs to explain your topic fully.

Background Research on… *(your topic)*
This report was written in order to*...(introductory paragraph)*
The manipulated variable in this experiment was... *(information on manipulated variable)*
The responding variable for this science project was*...(information on responding variable)*
I discovered many interesting facts about*...(interesting information, discoveries, etc.)*
My research has answered many of the questions that I had about*...(concluding paragraph)*

Dec. 1, 2025

https://www.canada.ca/en/public-health/services/diseases/autism-spectrum-disorder-asd.html (Tina)
(Public Health Agency of Canada, 2025)

- Different communication, connections with others, and sensory processing
- May focus on specific interests
- Physical, intellectual, learning, mental health conditions
    - Complexities, challenges
- Co-occurring conditions (physical/mental health)
    - Epilepsy
    - Hyptonia
    - Sleep disorders
    - Digestive issues
    - Under/over reacting to pain
    - Metabolism problems
    - Anxiety
    - Depression
    - Obsessive-compulsive disorder (OCD)
    - Attention deficit hyperactivity disorder (ADHD)

https://www.canada.ca/en/public-health/services/diseases/autism-spectrum-disorder-asd/causes-autism-spectrum-disorder-asd.html (Tina)
(Public Health Agency of Canada, 2020)

- The exact cause is unknown
- Likely due to genetics and environment/exposure
    - Increasing research
- Increased risk does not mean cause (i.e. gene changes are not exclusive to those with autism)
- It is not contagious, caused by vaccination, or caused by parenting style

https://www.nimh.nih.gov/health/topics/autism-spectrum-disorders-asd#:~:text=Autism%20spectrum%20disorder%20is%20a,first%20two%20years%20of%20life (Tina)
(National Institute of Mental Health, 2024)

- Autism is a neurological and developmental disorder (symptoms generally in the first two years)
- Affects interactions, communication, learning, and behaviour
    - Socially, intellectually, physical and mental health
- Diagnosed at any age
- Research done to provide support

Jan. 1, 2026

https://www.autismcanada.org/history-of-autism#:~:text=What%20is%20Autism?,Challenges%20with%20social%20interactions (Tina)
(Autism Canada, 2018)

- Neurodevelopmental disorder
- Communication and social interaction difficulties
- Repetitive behavioural patterns
- Restricted range of activities/interests
- co-occurring medical conditions
    - Epilepsy
    - Sleep disorders
    - Gastrointestinal (gut) abnormalities
    - Immune dysregulation
    - Mental health (anxiety, depression)

- Spectrum is continuum of severity of developmental impairment
    - Number/kinds of symptoms
    - Severity (mild to severe)
    - Age of onset
    - Levels of functioning
    - Social challenges
- Treatment is specific to the individual
- 1/54 children/youth between 5 and 17 years diagnosed in National (Canadian) ASD Surveillance System 2018 report
- Lifelong condition → needs support for adults (medical care, social support, education, employment, housing)
- 2017 report Aging and Autism: A think tank round table showed
    - Increased prevalence
    - Processes of aging
    - Demographic change of aging societies
- Constant evolution (e.g. Asperger's)

Jan. 27, 2026 *Added in-text citations on **Jan. 29, 2026***
Background Research Write-up (Tina)

Autism spectrum disorder (ASD), or commonly known as autism, is a neurodevelopmental disorder characterized by learning and behavioural patterns (National Institute of Mental Health, 2024). The Canadian National ASD Surveillance System in 2018 reported that 1 in 54 children between the ages of 5 and 17 were diagnosed with autism; patterns show that prevalence has increased over the years (Autism Canada, 2018). It can be diagnosed at any age, though symptoms typically arise during the first two years of development (National Institute of Mental Health, 2024). Common symptoms of ASD include repetitive behaviours, narrow and deep interests, and a multitude of difficulties with communication and social interactions (Autism Canada, 2018).

There is a range of severities to this condition, hence the name autism spectrum disorder, and it can look different from person to person (Autism Canada, 2018). Many individuals with autism have problems with mental health, intellectual or sensory differences, while others may struggle physically (Public Health Agency of Canada, 2025). Furthermore, autism often comes with a multitude of co-occurring conditions: to name a few, epilepsy, anxiety, depression, obsessive compulsive disorder (OCD), attention deficit hyperactivity disorder (ADHD), immune/sleep dysregulation, and gastrointestinal abnormalities (Public Health Agency of Canada, 2025). Because of this wide continuum, treatments and diagnoses are case-specific and varied (Autism Canada, 2018). Although many are diagnosed at a young age, symptoms may not be recognized until adulthood, often meaning feelings of isolation in childhood and the inability to articulate one's thoughts. In addition, ASD is a lifelong condition, requiring continued support for both children and adults, such as specialized medical care, social support, education, employment, and housing (Autism Canada, 2018).

Nevertheless, the diagnostic criteria, demographics, and treatments of autism are constantly evolving; for instance, the subsumption of Asperger's syndrome (Autism Canada, 2018). Still, the exact origins of autism are unknown, making it difficult to treat—likely factors include genetics, exposure, and environmental effects (Public Health Agency of Canada, 2020). Certain studies have revealed that components such as gene mutilation can increase the risk of autism, but do not necessarily cause or guarantee its occurrence (Public Health Agency of Canada, 2020). It has also been confirmed that it is not contagious, nor a result of vaccination or parenting (Public Health Agency of Canada, 2020). Despite this ambiguity, increased research and studies have been conducted to further support communities affected by ASD (National Institute of Mental Health, 2024). This project focuses on the environmental causes of autism spectrum disorder, more specifically, the social determinants of health.

Jan. 28, 2026
https://publichealth.jhu.edu/2025/is-there-an-autism-epidemic (Obehi)
(Johns Hopkins Bloomberg School of Public Health, 2025)
ASD is a very misunderstood disease by many in the scientific community, despite the fact that tens of millions of people worldwide are affected. In the past few decades in the US alone, the rate at which people have been diagnosed with ASD has tripled. Discussing the possible connection between healthcare determinants and Autism gives us further insight into the causes of ASD and, more importantly, helps us to develop improved treatment options for individuals suffering from ASD. Despite this, this research also provides reasoning for the continued use of healthcare's most effective tool: prevention. Although some determinants can't be changed, like race and sex, things like access to readily available healthcare are determinants that can be changed on a societal level, allowing both individuals with ASD and those without to live healthier lives.

January 31, 2026
Social Determinants of Health - Obehi
https://www.who.int/health-topics/social-determinants-of-health#tab=tab_1
(World Health Organization, n.d.)
- Where people live essentially
- Can vary from region to region
    - There are massive disparities in premature deaths in high and low-income countries

https://www.cpha.ca/what-are-social-determinants-health
(Canadian Public Health Association, n.d.)
- The disparity in income for different groups of people is called the social gradient
- List of determinants as outlined by the Canadian Public Health Association
    - Income and Income Distribution
    - Education
    - Unemployment and Job Security
    - Employment and Working Conditions
    - Early Childhood Development
    - Food Insecurity
    - Housing
    - Social Exclusion
    - Social Safety Network
    - Health Services
    - Indigenous Status
    - Gender
    - Race
    - Disability
- Impacts of determinants are not always obvious
- Government policies can have a direct impact on the determinants of health

https://www.cdc.gov/about/priorities/why-is-addressing-sdoh-important.html
(CDC, 2024)
- Social determinants of health (SDOH) are nonmedical factors that influence health
- Public health policies may be effective in combating adverse health outcomes

The World Health Organization (WHO) defines the social determinants of health (SDOH) as the conditions in which individuals grow and live. These determinants can often affect healthcare outcomes,

such as life expectancy and quality of care. This varying impact, if left unaddressed, can lead to lasting adverse health outcomes and perpetuate disparity among different populations. Although the Canadian Public Health Association lists fourteen determinants as factors affecting healthcare quality in Canada, this project focuses on 4: Socioeconomic status and household income, ethnic background, quality and access to services, and gender in adolescents.

Section 3 - Scientific Question and Purpose

Question to answer in your research

STEP 3: ASKING YOUR SCIENTIFIC QUESTION

Once you have decided what you want to investigate, you must put your question into terms that will allow you to investigate it using the scientific method.

Nov. 30, 2025

Is there a direct relationship between Autism Spectrum Disorder (ASD) occurrence in early development and the social determinants of health?

Dec. 1, 2025

~~How is the occurrence of Autism Spectrum Disorder (ASD) directly related to the social determinants of health in early development?~~

Jan. 27, 2026 (Tina)

Individuals with Autism Spectrum Disorder (ASD), diagnosed or undiagnosed, struggle with a range of challenges, from difficulty communicating opinions, connecting with others, or managing mental health conditions. Each case may look different, and the specific roots of ASD are still unknown, often making treatments hard to target. This research study aims to identify the patterns between social determinants of health (SDOHs) and autism, increasing awareness, effectiveness of treatments, and equity within the health community.

How can this information be utilized to aid individuals affected by autism?

Feb. 3, 2026 (Obehi)

ASD is a very misunderstood disease by many in the scientific community, despite the fact that tens of millions of people worldwide are affected. In the past few decades in the US alone, the rate at which people have been diagnosed with ASD has tripled. Discussing the possible connection between healthcare determinants and Autism gives us further insight into the causes of ASD and, more importantly, helps us to develop improved treatment options for individuals suffering from ASD. Despite this, this research also provides reasoning for the continued use of healthcare's most effective tool: prevention. Although some determinants can't be changed, like race and sex, things like access to readily available healthcare are determinants that can be changed on a societal level, allowing both individuals with ASD and those without to live healthier lives.

Section 4 - Hypothesis (Including explanation of your predictions) and Variables (MV, RV, and CVs)

What do you predict the information will tell you in the research?

STEP 6: STATING YOUR HYPOTHESIS

The hypothesis is the "best guess" answer to the scientific question. This is a statement that is possibly true and is based on the knowledge gained through research. However, it needs to be tested in order to prove whether it is true or false. The hypothesis is often written as an "if / then" statement, but that is not a requirement.

If the research on the electromagnet experiment indicated that more coils would make a stronger electromagnet, then the hypothesis might be "The more coils of wire there are around a nail, the stronger the nail's electromagnetic potential."

An important part of a good hypothesis is to mention something about "why" you believe your predicted result might be true. Remember: A good hypothesis is an educated prediction that may be proved correct or incorrect by experimentation.

Dec. 1, 2025

If there is an observed difference in social determinants of health between individuals, then there should be a direct negative correlation to the incidence of autism, because ASD is affected by common background or environmental factors, though they may not directly cause it.

Jan. 31, 2026

If there is variance in social determinants of health between individuals, then we expect to see a direct negative correlation to the incidence of autism, because the social determinants of health are linked with adverse health outcomes.

Section 5 - Experimental Design (Materials and Procedure)

December 8, 2025

Materials:

- Online medical article databases, including PubMed and the National Institutes of Health
- Graphing software (Google Sheets) to organize data efficiently

Jan. 30, 2026

For this research project, the following factors will be studied:

- Socioeconomic status and household income
- Ethnic background
- Quality and access to services
- Gender in adolescents

This will be investigated through:

- Online medical article databases, including PubMed and the National Institutes of Health
- Graphing software (Google Sheets) to organize data effectively

Section 6 - Observations (Data tables to be completed as you conduct your experiment)

Dec. 30, 2025
https://pmc.ncbi.nlm.nih.gov/articles/PMC4067639/#sec6 (Obehi)
(Becerra et al., 2014)

TABLE 1.

Maternal Race/Ethnicity and Nativity in Relation to Children's Diagnosis of AD in LA County

Maternal Race/Ethnicity and Nativity	Mean (SD) Age at Diagnosis, y	Case/Cohort, *n*	Rate, per 10 000 Births	Crude RR (95% CI)	Maternal Age–Adjusted RR (95% CI)	Adjusted RR[a] (95% CI)	Additionally Adjusted RR[b] (95% CI)	RR Additionally Adjusted by Regional Center (95% CI)
White								
US-born	3.4 (0.9)	1477/236 347	62.5	1.00	1.00	1.00	1.00	1.00
Foreign-born	3.3 (0.9)	420/63 464	66.2	1.06 (0.95–1.18)	1.06 (0.95–1.19)	1.02 (0.91–1.14)	1.05 (0.94–1.17)	1.04 (0.93–1.16)
Black								
US-born	3.4 (0.9)	526/123 316	42.6	0.68 (0.62–0.75)	0.84 (0.76–0.93)	1.00 (0.90–1.10)	1.04 (0.94–1.15)	1.14 (1.02–1.26)
Foreign-born	3.2 (0.9)	92/10 093	91.2	1.46 (1.18–1.80)	1.49 (1.20–1.84)	1.59 (1.28–1.96)	1.65 (1.33–2.05)	1.76 (1.41–2.18)
Hispanic								
US-born	3.5 (0.8)	1376/316 565	43.5	0.70 (0.65–0.75)	0.97 (0.90–1.05)	1.08 (1.00–1.17)	1.15 (1.06–1.24)	1.13 (1.04–1.22)
Foreign-born	3.5 (0.9)	2594/711 825	36.4	0.58 (0.55–0.62)	0.69 (0.64–0.73)	0.85 (0.79–0.91)	1.05 (0.97–1.14)	1.06 (0.98–1.15)

Mexico	3.5 (0.9)	1792/548 977	32.6	0.52 (0.49–0.56)	0.61 (0.57–0.66)	0.76 (0.70–0.82)	0.95 (0.86–1.05)	0.95 (0.86–1.05)
Central/South America	3.6 (0.9)	760/157 147	48.4	0.77 (0.71–0.84)	0.89 (0.81–0.97)	1.08 (0.98–1.19)	1.25 (1.13–1.39)	1.26 (1.14–1.40)
Asian/PI								
US-born	3.1 (0.8)	138/21 678	63.7	1.02 (0.85–1.21)	1.08 (0.91–1.29)	1.03 (0.86–1.22)	1.02 (0.85–1.21)	1.04 (0.87–1.24)
Foreign-born	3.5 (0.9)	917/143 066	64.1	1.03 (0.94–1.11)	1.01 (0.93–1.10)	0.98 (0.90–1.06)	1.04 (0.95–1.13)	1.02 (0.93–1.11)
China	3.5 (0.9)	145/29 666	48.9	0.78 (0.66–0.93)	0.74 (0.62–0.87)	0.66 (0.56–0.79)	0.74 (0.62–0.89)	0.69 (0.57–0.83)
Japan	3.2 (0.7)	29/5815	49.9	0.82 (0.57–1.18)	0.76 (0.53–1.09)	0.71 (0.49–1.02)	0.72 (0.50–1.04)	0.70 (0.48–1.03)
Korea	3.4 (0.9)	136/22 206	61.2	0.98 (0.82–1.16)	0.98 (0.82–1.18)	0.92 (0.77–1.10)	0.95 (0.80–1.14)	0.97 (0.81–1.17)
Philippines	3.5 (1.0)	266/35 306	75.3	1.21 (1.06–1.37)	1.21 (1.06–1.37)	1.23 (1.08–1.40)	1.23 (1.08–1.41)	1.25 (1.09–1.43)
Vietnam	3.6 (0.9)	179/19 287	92.8	1.48 (1.27–1.74)	1.49 (1.27–1.74)	1.45 (1.24–1.70)	1.58 (1.35–1.86)	1.43 (1.21–1.68)

- Incidence among US-born white children are higher
    - Autism is highly variable among Asians and pacific islanders
- Black and brown people are more likely to be diagnosed with having severe emotional outbursts and impaired expressive language (phenotype)
    - Also more likely to have comorbidity [intellectual disability]
- Maternal nativity seems to play a factor

Jan. 1, 2026

Brain Facts (2018) (Tina)

(Society for Neuroscience, 2018, 48, 71-72, 117, 121)

- Defects in molecules in synapse formation could contribute to disorders like autism (p.48)
- Considered a childhood condition, but symptoms persist lifelong (p.71)

- Often concurrent with mood/anxiety disorders, seizures, intellectual disability, ADHD, OCD (p.71)
- Normal or above average intelligence (p.71)
- Considered a spectrum; mild to disablign (p.71)
- Diagnosed based on:
    - Impaired social communication/interaction (p.71)
    - Repetitive behaviours or obsessive interests (p.71)
- Many adults think of it as a strength (p.71)
- 1/68 8-year-old Americans meet diagnostic criteria (p.71)
    - Increased prevalence since 1970s (p.71)
        - Could be due to wider diagnostic criteria (p.71)
- 5x more boys diagnosed (p.71)
    - Maybe because of underdiagnosis (p.71) and outwards presentation
- Environmental factors
    - Children later in life; fever, infection, premature birth (p.71)
    - Nothing to do with vaccination (p.72)
- Partially genetic (p.72)
    - Twin studies reveal 50% greater chance if your identical twin has ASD, ⅕ for siblings (p.72)
    - Dozens or more genes, unique condition by person (p.72)
    - Hard to identify genome-wide association (p.72)
    - For rarer mutations, known to cause intellectual disability and social disfunction, but are not prevalent in every case (p.72)
        - FMRI (codes for fragile X mental retardation protein, non-mutant form used for cognitive development) (p.72)
            - 50-60% people with fragile X syndrome have ASD (p.72)
        - PTEN (codes for tumour suppressor enzyme regulating cell division) (p.72)
        - TSC1/TSC2 (tuberous sclerosis complex) → code for proteins controlling cell growth/size
            - 40% with this complex have ASD (p.72)
        - Gene variant NF-1 develops tumours in childhood (neurofibromatosis) (p.72)
            - 10% with ASD (p.72)
        - Influence mTOR signalling pathway for regulating cell metabolism, growth, proliferation (p.72)
            - Contribute to drugs (p.72)
- No biochemical or biomarkers (p.72)
- Based on behavioural analysis (p.72)
    - Now using more eye movement trackers and neuroimaging in infants (p.72)
    - Often notice characteristics at age 2, but usually diagnose at 4.5 (p.72)
- Interventions more affective early on (p.72)
- Likely to result from unusual cellular development in cerebral cortex (memory, attention, perception, language), both white/gray matter (p.72)
- Some ASD children have large brain volumes and faster brain growth, or unusual development and network inefficiencies at back of cerebral cortex; atypical cortex activity into adulthood (integration) (p.72)
- No single medication, some use drugs for anxiety, or oxytocin (hormone improving social bonding) (p.72)
    - Many use behavioural therapies (p.72)
- Impacts on the economy and ethics (p.121)
    - E.g. gene replacement technology CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) (p.117)

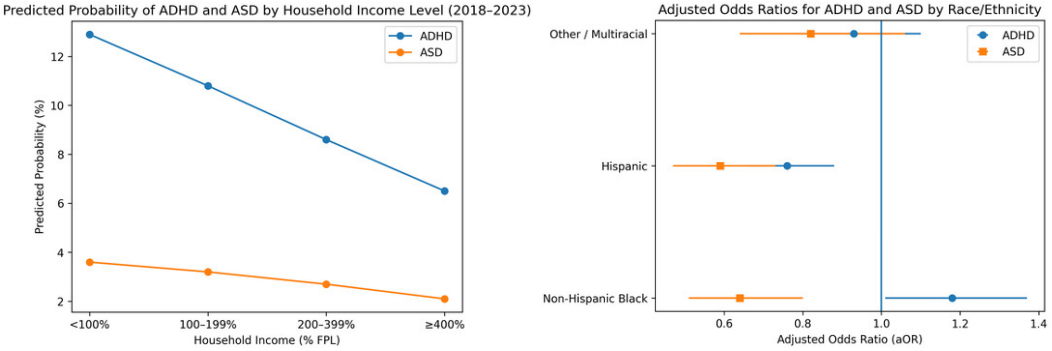
Open Neuroscience Initiative (Tina)
(Lim, 2021, 215, 339)

- Cerebellar abnormalities (e.g. Purkinje cell loss) may be a factor (p.215)
- Disorders of the oxytocin (OT) system could contribute (p.339)
    - Role in development and maintenance of prosocial behaviours (e.g. trust, compassion, empathy, interpersonal relationships) (p.339)

https://www.mdpi.com/2227-9067/13/1/62#:~:text=Social%20determinants%20included%20household%20income,more%20equitable%20identification%20and%20intervention (Tina)
(Izuchi et al., 2025)

- Note: US study
- Social determinants:
    - Household income relative to poverty level
    - Parental education
    - Health insurance type
    - Food insecurity
    - Caregiver reported neighbourhood safety
- Lower security associated with higher odds of ASD (and ADHD)
- Boys have higher odds
- Racial and ethnic inequities within health diagnostic services
    - Non-Hispanic Black and Hispanic children lower odds (or later) of ASD than non-Hispanic White children
    - Access to developmental screening, specialty care, school evaluations, culturally responsive services
- Prevalence of ASD increased to nearly 3% (improved detection, developmental burden)
- Conditions embedded within broader social/structural contexts
    - Social, economic, environmental conditions
    - Family socioeconomic position, health care access, neighbourhood environments, material stability
    - Stress exposure, enrichment opportunities, pathways to identification.support
- Exposure to poverty stressors, financial instability, food insecurity, and constrained access to support is linked to attention regulation, emotional control, adaptive functioning difficulties
    - Nutritional risks, poorer developmental/behavioural outcomes
- ASD evidence more heterogenous, studies showing higher rates in socioeconomically advantaged families, likely from accessibility to diagnostic services
- Unsafe neighbourhoods increase caregiver stress/vigilance and limit outdoor play, peer interaction, and independen exploration
    - Influences behaviour and parental perception
- Data pools from 6 consecutive NSCH cycles (2018-2023) examining associations between social determinants of health and ASD aong 3-17 aged US children
    - Statistical precision, consistent social gradients
    - Caregiver-given outcomes
- Note: view tables for more detailed/accurate stats
- Pool of 205,480 children, representing 73.1 million US children
    - Mean age of 10.6
    - 51.2% male children
    - 50.8% non-Hispanic White, 13.6% non-Hispanic Black, 24.1% Hispanic, 11.5% other or multiracial
    - 61% in two-parent households, 33% single-parent households

    - 19.7% children in households below 100% of federal poverty level; 23.1% in households at/above 400% FPL
    - 10.8% food insecurity
    - 4.1% unsafe neighbourhoods
- 2.9% ASD prevalence; 1.1% comorbid ADHD and ASD
    - ASD prevalence 4.1% among boys; 1.1% among girls
    - Decreased steadily from 3.8% (households below 100% FPL) to 2.0% (at/above 400% FPL)
    - Higher prevalence among those with parents with lower education, with public insurance, living in food-insecure households, and unsafe neighbourhoods
    - Comorbidity highest in disadvantaged social groups

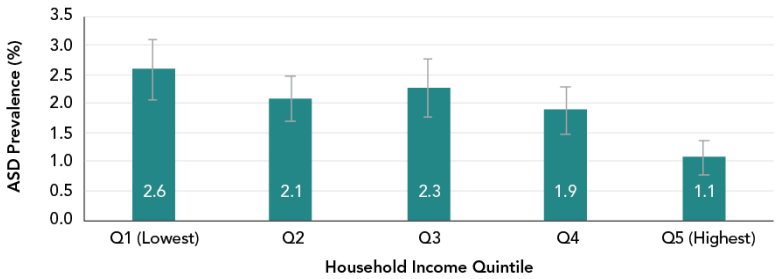


- Need to address barriers of historically marginalized communities and screening and evaluation practices for biased diagnoses
- Limitations:
    - Caring for child may influence stress, employment, income, etc.
        - Bidirectional relationship between social conditions and diagnoses
    - Some aspects based on caregiver reports
    - Pre-pandemic data survey
- Conclusion
    - NOT equally distributed
    - Socioeconomic status and neighbourhood conditions DO have effects
    - Racial and ethnic patterns most consistent → diagnostic services issue rather than underlying neurological risk

Jan. 3, 2026

Canadian data January 1, 2025 (Health Canada, Canadian Institutes of Health)
https://www.canada.ca/en/public-health/services/publications/diseases-condtions/autism-spectrum-disorder-canadian-health-survey-children-youth-2019.html (Obehi)
(Public Health Agency of Canada, 2025)

- ASD is seen most in Q1 (lowest income families) and Q3 (middle income)



-
- 1 in 50 Canadians aged 2-1 7 were diagnosed with autism – higher prevalence in males

- Canadian data states there was no significant difference among the following categories:
    - population groupFootnote‡ (visible minority, not a visible minority and indigenous identity)
    - household education (less than high school, high school graduate and post-secondary graduate)
    - location of residence (urban, rural)
    - Contradicts American Data
- People were more likely to have some other health complications

https://www.cihi.ca/sites/default/files/document/cihi-population-grouping-methodology-v1.4-overview-outputs-manual-en.pdf

Jan 16, 2026

https://www.researchgate.net/publication/233889572_Autism_risk_factors_genes_environment_and_gene-environment_interactions (Obehi)

(Chaste & Leboyer, 2012, #)

- Swedish study
- Autism incidence signifiacantly increases for children born abroad
    - Specifically those with lower human developmental index
- Mothers who took antidepressants were more likely to have kids with ASD
- https://jamanetwork.com/journals/jamapediatrics/fullarticle/2476187

https://link.springer.com/article/10.1186/s13690-021-00577-5?fromPaywallRec=true (Tina)

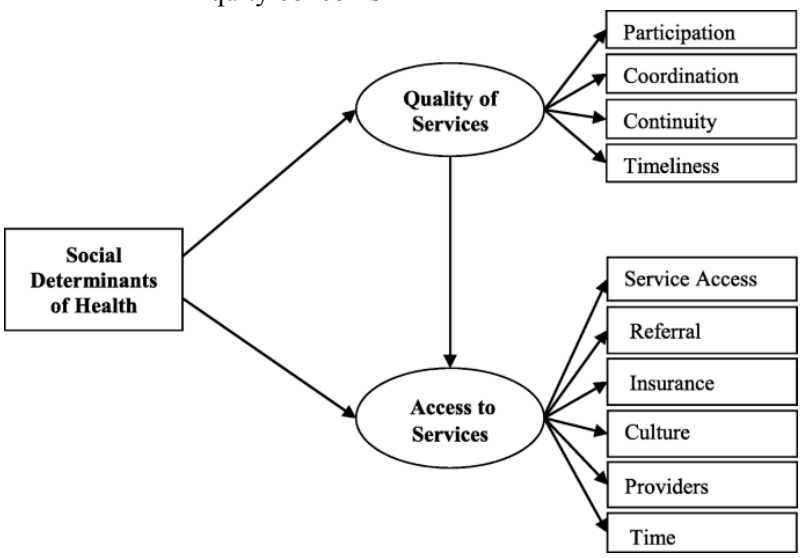
(Jafarabadi et al., 2021)

- Note: Iranian study
- Socioeconomic disparities (health) affect children, especially tose with healthcare needs, developmental impairment (e.g. ASD)
    - Affects access to health services and quality
- Cross-sectional study; Project with Azeri Blue Buddies: Interdisciplinary Longitudinal Autism Researches (ABBILAR) in NW Iran (provinces of Ardabil and East-Azerbaijan), data from July 1 to November 30, 2019
- 202 participants (aged 2-16) with ASD, 10 observed variables, 3 latent variables → questionnaire collected data on demographic, SDH status, services quality and accessibility
    - ~77% male; mean age was 2.5 years
    - Structural Equation Modeling (SEM) assessed the relationship
- All statistically significant ($P<0.001$)

Jan 23, 2026 (cont)

- Socioeconomic disparities are present in quality/access to services (ASD) in NW Iran
- Health/medical centers are designed to conduct SDH screening and provide for low-SDH status, accommodating for diagnosis of ASD; medical universities plan to monitor services for improvement
- ASD causes lifelong neurodevelopmental impairments
    - Afefcts social interactions and communication
    - Could be improved with appropriate services/support (broad array of intervaentions)
- According to World Health Organization (WHO), ASD individuals have higher rates of forgone healthcare needs; inadequate access to services
    - Can be affected by race/ethnicity, education, insurance type
    - No direct evidence saying occurance depends on SDH factors, but studies reveal association between SDH and diagnoses/services (racial/socioeconomic disparities)
- Major public health issue → efforts to improve access, but disparities persist
    - Black and latino, lower-income households, greater functional limits
    - Lack of data on accessibility issue in low/middle-income countries
        - >61% of children live in LMICs
- Inequality in quality of services
    - Families' perceptions of children's care/satisfaction with services → cultural norms

    - E.g. Montes and Halterman study (2011) showed disparities in family-centred care in those with vs. without ASD, and between black/white families (with ASD)
- In Iran, many special services for ASD (speech, occupation therapy, family training programs) are from private organizaitons (welfare) rather than public centers/clinics
    - Health insurance doesn't cover ASD rehabilitation
    - Equity concerns



- Background variables: age, gender, mother tongue, father/mother status, father/mother education level, father/mother occupations, health insurance type, and siblings with ASD
- Mean quality of services: 61.23/100
- Mean access to services: 65.91/100
    - Significantly related to quality
    - Cultural and family domain highest score (84.44/100); services worst score (49.73/100)
- Mean SDH status: 29.50/100
    - Positively significant
- Positive association between SDH and quality/access
- SDH indirectly and directly affected access/quality
    - Lower SDH had lower quality
        - Consistent with a Magana study in 2012 about racial/ethnic disparities between Black/Latino children and White
        - Also a Zeleke et al. (2019) study shows white children with access to a variety of services more satisfied compared to minorities
- Children with ASD experience lower access to services, problems in referrals, lack of insurance coverage, cultural/family issues, access to trusted providers, long waiting
- Main reason for gaps is because rehabilitation therapies are not covered by health insurance or primary health centers (mostly by private organization affiliated to the Welfare Org.)
    - Change can be seen in policymakers

https://link.springer.com/article/10.1007/s10803-025-07181-4 (Tina)
(Khorasani et al., 2025, #)

- Note: Finnish study
- Limited research on ASD trends/risk factors (especially related to intellectual disability or ID)
- Examines incidence of ASD (and co-occurring conditions) in relation to sociodemographic risk factors
- Individuals born in Finland (1998-2015) with ASD diagnosis (both with ID and without)

    - Divided by birth cohorts (ages) and analyzed changes in inidence over time
        - 1998-2002 (transition to adulthood, 20); 2003-2007 (mid-puberty); 2009-2011 (pre-puberty); 2012-2015 (transition to school, 6)
    - Cases matched with controls of age, gender, birthplace
- Incidence of ASD without ID increased from 0.52% to 0.89% by age 10; ASD with ID remained at 0.17%
- Parental immigration status only associated with cases with ID; many factors for both groups
- 59% of cases had 1 co-occurring psychiatric disorder
- Evidence suggesting increase in incidence of diagnosed ASD
    - Could be changes in diagnostic criteria/practices, improved mental health services, greater public/pro awareness/treatment seeking behaviour
- ASD is a neurodevelopmental disorder marked by deficits in social communication, restricted interests, repetitive behaviour.
- Genetic and environmental risk factors; may influence heterogeneity (co-occurance of ID, median of 33%). Cases of ASD with ID experience greater functional impairment (additional support and intervention)
- Substantial economic burden, ASD is a very disabling developmental disorder (convergence of deficits and co-occurrence)
- Global ASD prevalence varied across regions
    - Median of approx. 1 in 100 children (0.01%-4.36%)
    - Higher rates among children between 6 and 12
    - Increase in incidence in the last decade
        - US report from 2000-2016, prevalence of ASD with ID increased from 2.9 to 7.3 per 1000 persons; ASD without ID increased from 3.8 to 18.9 per 1000 persons
            - Boy to girl ratio: 3.9 (with ID) to 4.4 (without ID)
        - Sweden report from 2001-2011 showed increase without ID from 0.14% to 1.10%; prevalence with ID showed form 0.28% to 0.34%
- Many studies between ASD and psychosocial risk factors (e.g. family income, birth region, maternal marital status, maternal socioeconomic status, immigration status, parental age)
- Many co-occurring psychiatric conditions, but few with/without ID
- Information can support public health in planning resources, targeted interventions, and healthcare services
- Part of Finnish Prenatal Study of Autism and Autism Spectrum Disorder
- In Finland, ASD typically diagnosed in inpatient or outpatient clinic of child neurology/psychiatry
    - diagnosed/treated in public healthcare system, registered by CRHC physicians
- Maternal SES divided into upper white-collar workers, lower white-collar workers, blue-collar workers, others, and unkonwn/missing
- Maternal marital status divided into married, relationship, and single
- Maternal age categorized into <20; 20-24; 25-29; 30-34; 35-39; >40
- Paternal age categorized into <20; 20-24; 25-29; 30-34; 35-39; 40-44; 45-49; >50
- Parental immigration status into both parents from Finland, both immigrants, or just one
- Birth region into NESW
- Urbanicity into urban, semi-urban, rural
- Examinied co-occurence only in 1998-2002
    - Schizophrenia, bipolar disorder, depressive disorder, anxiety disorder, obssessive-compulsive disorder, sleep disorders, ADHD, Tourette syndrome
- Median age at first diagnosis of ASD was 8 years for boys and 9 years for girls
- 77.1% of cases were boys
- 83.3% of cases diagnosed without ID
- 38% of cases from 1998-2002 (followed until age 20, while others followed until 15, 10, and 6)

- Majority of ASD cases from families with mothers whose SES was lower white-collar worker (31.9%), aged 25-29 years (31.3%), and married or relationship (84.9%)
- Many cases had non-immigrant parents (86.8%) and fathers 30-34 (31.7%)
- First diagnoses at 9 for cases without ID, and 4 for those with ID (significantly different)
- Yearly incidence among boys increased rapidly between 3 and 9; for girls, steadily increased from 3 to 15. Incidence decreased for both after these ages
- Boy to girl ratio for ASD diagnoses was 4.18:1 at age 6, then 1.52:1 by 15
    - Changes more in boys than girls
    - At age 10; ratio was 4.50:1 (without ID); 3.17:1 (with ID)

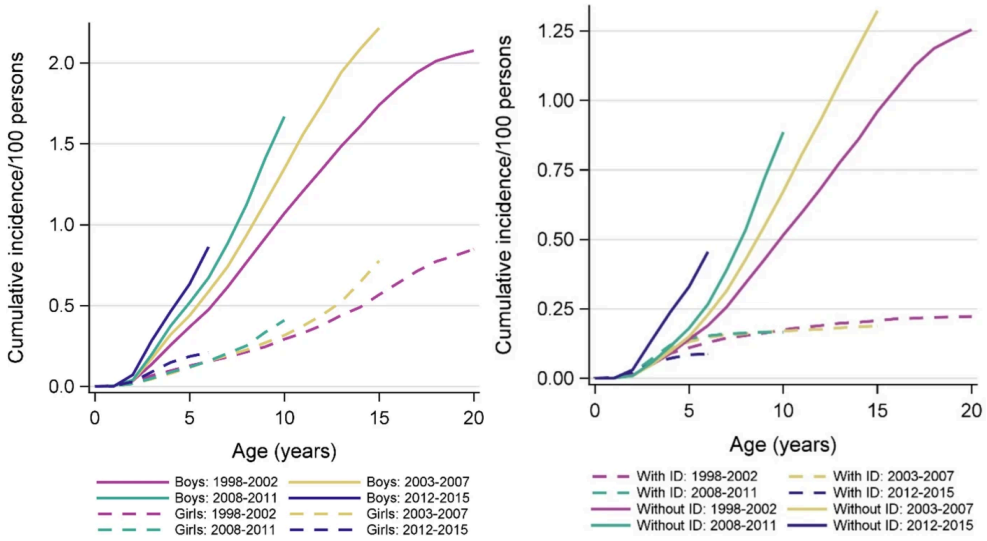


Table 1 Table 2 Table 3

- Interaction by biological sex between region of birth and ASD
    - E.g. girls' odds of ASD increased in Southern Finland; increased for boys in Eastern Finland
- For youngest birth cohort (2012-2015), those with immigrant parents more likely to get diagnosed compared to parents both born in Finland
- Increased odds of ASD without ID include lower maternal SES (blue-collar); single motherhood; younger maternal age (<20); older paternal age (>40)
    - Similar for those with ID, add: Eastern Finland, immigrant parents
- 59% of cases had at least one co-occurring diagnosis
    - Without ID: 64.1%
        - ADHD (33.9%); depressive disorder (25.4%); anxiety disorder (23.9%)
    - With ID: 31.9%
        - ADHD (17.2%); anxiety disorder (10.5%); schizophrenia (5.2%)
- Incidence of ASD increases with age, specifically with girls
    - May be from increased awareness of ASD in girls (more complicated, could mask symptoms through better social-communication and imitation skills), detection only when impairments more severe
    - Girls may have more internalizing symptoms (anxiety, depression), leading to often misdiagnosis of ASD
    - Boys exhibit externalizign behaviorus (aggression, motor problems), so earlier diagnosis
- Boy-to-girl ratio greater for cases without ID compared to with ID
    - ID may moderate female phenotype of ASD
    - Girls with ASD without ID have fewer repetitive behaviours/interests and linguistic problems than boys

    - Girls with ASD and ID have greater social difficulties, repetitive behaviorus, linguistic challenges, and motor problems —> higher referral/diagnosis rates
    - Girls requires greater attention and awareness
- Mothers of lower income could experience higher levels of stress → neuroinflammatory abnormalities, potentially affecting offspring's brain development
- Single motherhood increased odds of ASD (especially with ID)
    - Tend to have lower income, education, and support
- Quality of sperm may increase risk of ASD (affected by paternal age, de novo mutations increase likelihood of neurodevelopmental disorders like autism and ID)
- Higher prevalence among immigrant parents
    - Could be higher percentage of consanguineous marriage → elevated risk of novel mutations in genes linked to ID
    - Immunological factors from early pathogen exposure in mother
    - Stressful life events (poverty, war, immigration) linked to gene mutations
    - Reduced stigma, increased access to healthcare services, help-seeking behaviours
    - Higher rates across regions could be from disparities in healthcare access

Personal note/observation: even across these studies examined, there is a notable difference in research topic/focus and data for different area (e.g. private institutions in Iran vs. public healthcare system in Finland)

Jan. 28, 2026
https://www.cdc.gov/mmwr/volumes/74/ss/ss7402a1.htm (Obehi)
(Shaw et al., 2025, #)
- 2022 study in the US
- Compounded data on 15 sites in the ADDM network (the Autism and Developmental Disease Monitoring Network
- Calculated prevalence by sex and ethnicity
- *White children had a lower prevalence of Autism than multiracial population (in all the sites except the one in Utah
    - Seems to contradict a few of the other studies
    - Asian and pacific islander groupd reported the most
- Lower MHI was associated with higher ASD prevalence than other sites
- Black and Indigenous childern had a higher proportion of co-occurring intellectual disability

Jan. 29, 2026
https://onlinelibrary.wiley.com/doi/10.1002/aur.2419 (Obehi)
(Brooks et al., 2020, #)
- Specifics on the candian data
-

Missing	497 (0.6)	494 (0.6)	–
1—Lowest	11,740 (14.6)	11,553 (14.6)	187 (17.6)
2	14,496 (18.1)	14,286 (18.0)	210 (19.8)
3	16,341 (20.4)	16,118 (20.4)	223 (21.0)
4	18,074 (22.5)	17,854 (22.6)	220 (20.7)

5—Highest	19,089 (23.8)	18,870 (23.8)	219 (20.6)

- In Ontario, individuals with ASD were more likely yo need to see a specialist and undergo surgery
    - Individuals with ASD were also determined to have more comorbitiies

Section 7 - "Managed" Data (Graphs of important data)

IDK if we actually do this part

STEP 8: OBSERVING RESULTS AND COLLECTING DATA

The results (data collected) of a scientific investigation are usually expressed in two ways: written form and picture form. The written form reports the results with words and numbers (measurements). The picture form records observations that may be difficult to describe (such as patterns, shapes, or colours). Photographs may be used if you aren't happy with your artistic talents. While conducting the experiment it is absolutely essential to make careful observations and record all information. You should look for and record both Quantitative *and* Qualitative changes (see below). These notes should be included in your journal entry for the day, and recorded in detail in your log book

Quantitative changes are those that must be measured using a calibrated measuring device such as a thermometer, a weight scale, a ruler, or other scale designed by the experimenter. Note: Always use the metric system when recording quantitative changes.

Qualitative changes are those that are observed directly through use of the senses (sight, touch, smell, sound, taste), and tend not to be measured using calibrated devices. Qualitative observations should be described in very specific terms.

All experiments and tests should be repeatable and by looking back at other trial data records, the experimenter should be able to see if the test procedure is working well. Remember that no change is an important observation and should be included in the data.

Steps for Setting Up Data Tables:

1. Decide on what changes to observe for using just the senses (Qualitative) and what will be measured (Quantitative).
2. Design a recording system that will work for both of these types of observations. This must be decided on and be in place before the experiment or test begins. A rough copy should be in the journal. The best way to record data is in table form. This allows for better organization and analysis of results. There may be a separate table for each experiment (trail), or trials can be combined into one table. You must include:
    - date and trial #
    - manipulated variable value
    - space for quantitative measurements (include unit of measure)
    - space for qualitative observations (this could include written or picture description)

An example of a table that could be used for recording observations is shown below:

		Trial #1 (Date:)			Trial #2 (Date:)			Trial #3 (Date:)	
Number of Coils		**# of paper clips**	**Observations**		**# of paper clips**	**Observations**		**# of paper clips**	**Observations**
10									
20									
30									
40									
50									

SHORT SUMMARY PARAGRAPH:

The last thing you need in the "Observations" section is a short summary paragraph that briefly summarizes the experimental findings. This is often forgotten, so you may need to remind yourself to include it (highlight this!).

STEP 9: MANAGED DATA

The data from an experiment is called "raw" because nothing has been done to make it easier to deal with. This can be done by organizing the data into graphs. A graph can help illustrate any relationships more effectively than tables alone. There are several types of graphs - bar, double bar, histogram, line, circle, pictograph, and scatter-plots, for example. Whichever type of graph used, the goal is to make it easy for anyone looking at it to interpret the results of the experiment quickly. Remember: Graphs are precision communication tools, not just pretty pictures to spice up your report or display.

Graphs relate the manipulated variable, usually shown on the horizontal (X) axis, to the responding variable, usually shown on the vertical (Y) axis.

It is very important to put considerable thought into graphs before actually making them. The data could adapt equally well to more than one type of graph. If that is the case, multiple graphs are an excellent idea (provided you have room!) since visitors to a project may have strong preferences for a particular type of graphic display.

Line graphs show the relationship between your manipulated and responding variables. They are especially good for showing how data changes over time. Your line graph also needs a title and clearly written labels for the information presented to be understandable. The title of the graph should mention both manipulated and the responding variables. Be sure that whatever numbers or values you use, they are clear and evenly spaced along the axis.

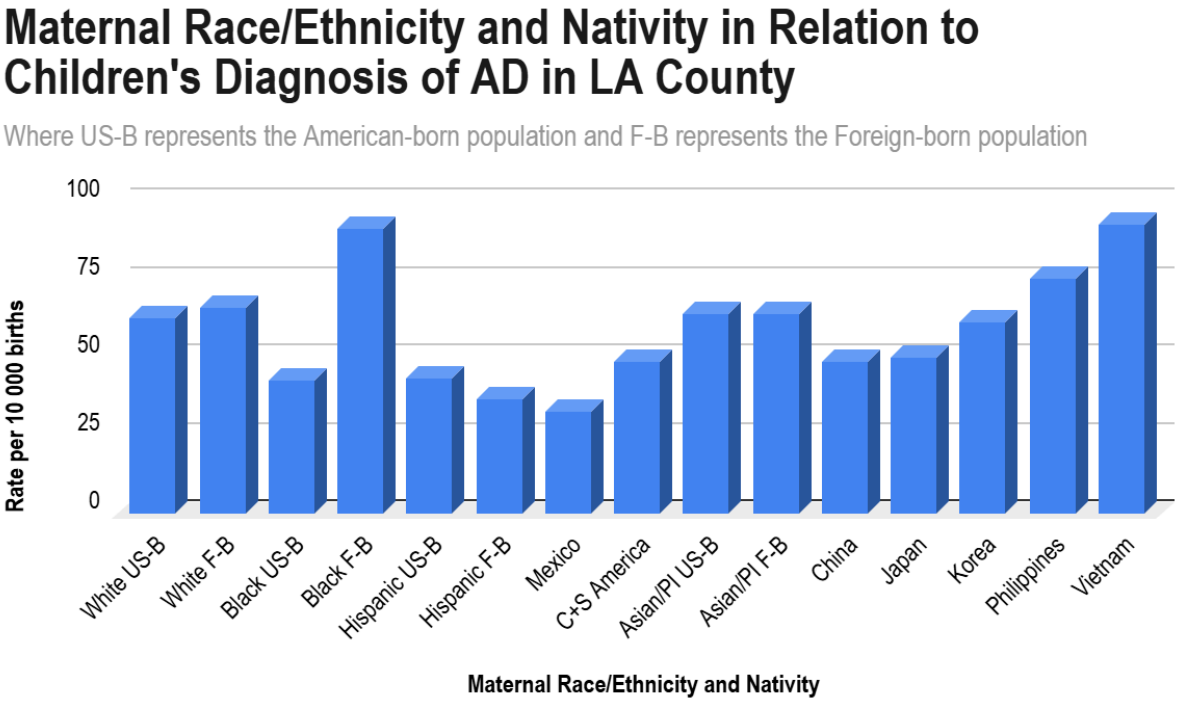
Bar graphs also show the relationship between the manipulated and responding variables. They are especially good for emphasizing differences in data. Your bar graph needs a title mentioning both axes.

Double bar Graphs are an excellent way of comparing two sets of data at once. This may be data from several trials in an experiment.

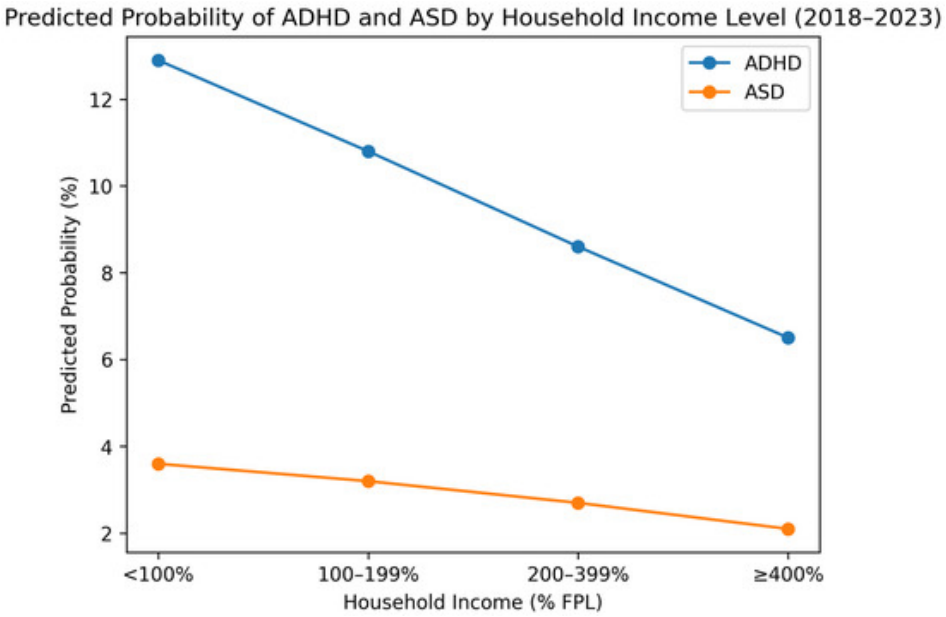
Circle graphs (also called pie charts or pie graphs) show the relationships of the parts to a whole. Your manipulated variable can be represented by the labels of different "slices" of the circle graph, and the responding variable will be represented by how big these slices are. To make a circle graph, you need to convert your responding data into percentages.

Scatter-Plots, Pictographs, and Histograms are other types of graphs you might find useful in displaying and analyzing your observed data.

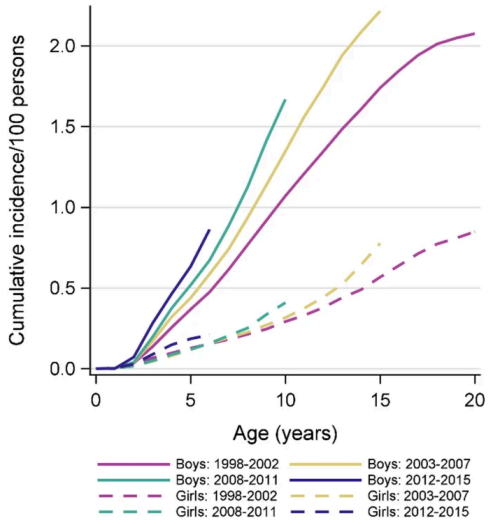
Jan. 29, 2026


Maternal Race/Ethnicity and Nativity in Relation to Children's Diagnosis of AD in LA County
Where US-B represents the American-born population and F-B represents the Foreign-born population
Rate per 10 000 births
100
75
50
25
0
White US-B
White F-B
Black US-B
Black F-B
Hispanic US-B
Hispanic F-B
Mexico
C+S America
Asian/PI US-B
Asian/PI F-B
China
Japan
Korea
Philippines
Vietnam
Maternal Race/Ethnicity and Nativity

Jan. 30, 2026

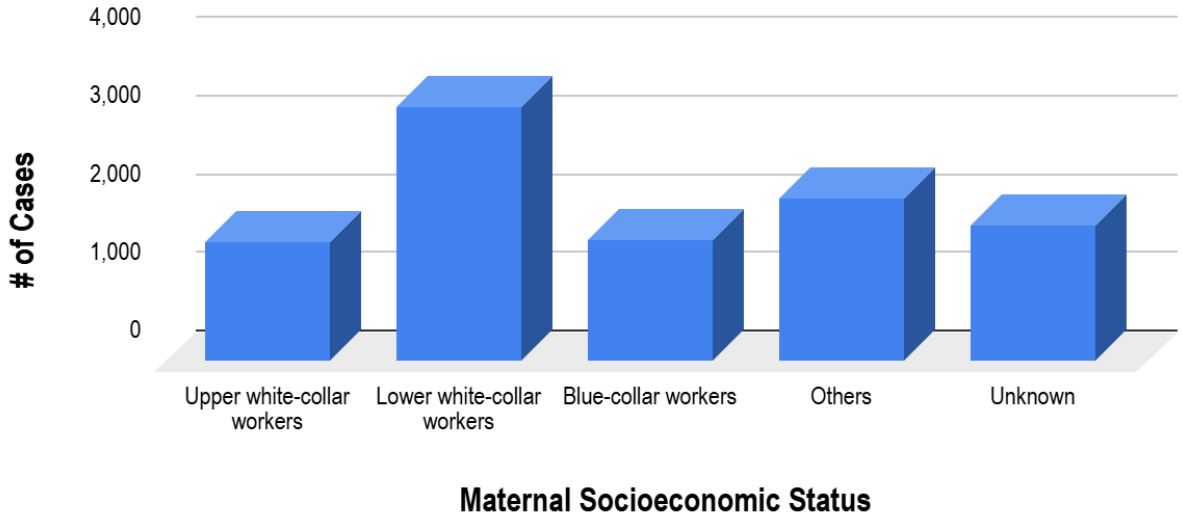

Predicted Probability of ADHD and ASD by Household Income Level (2018–2023)
ADHD
ASD
Predicted Probability (%)
12
10
8
6
4
2
<100%
100–199%
200–399%
≥400%
Household Income (% FPL)

Variables	Mean*	SD
Quality dimension		
Participation in decision making	65.61	36.07
Care coordination	61.26	37.86
Continuity of care	60.82	40.35
Timeliness	62.72	38.24
Total service quality	61.23	30.01
Access dimension		
Services usage	49.73	32.25
Referral	60.18	23.72
Insurance coverage	51.71	40.86
Cultural and family	84.44	27.12
Access to trusted provider	71.69	32.58
Waiting time	77.72	30.96
Total	65.91	21.89
SDH		
SDH Score	29.50	22.32



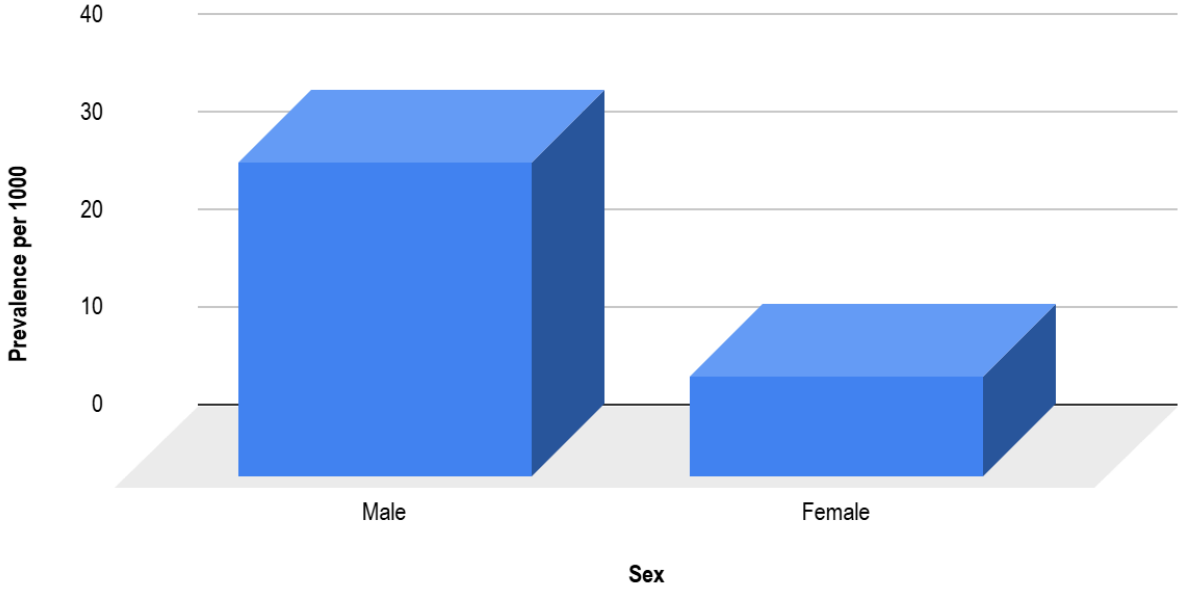
Association between Maternal Socioeconomic Status in Total ASD Cases and Controls

Finnish Prenatal Nationwide Register Study of Autism

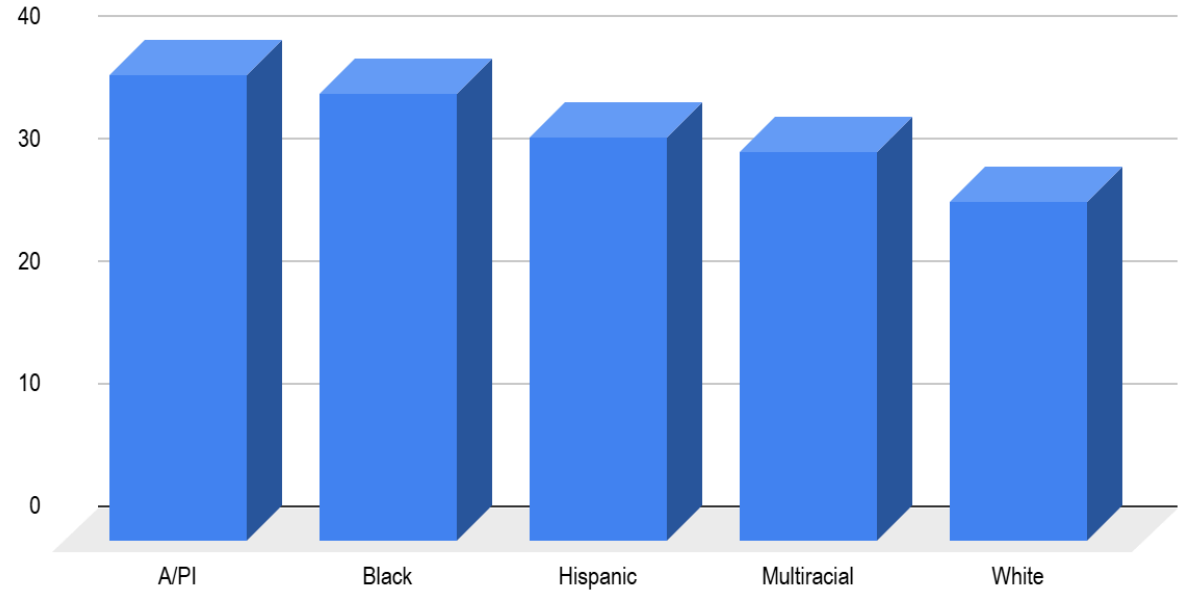


Jan. 31, 2026

Prevalence* of autism spectrum disorder among children aged 4 years, by sex



Prevalence of autism spectrum disorder per 1,000 children aged 8 years, by sex* and race and ethnicity



Section 8 - Results and Conclusions

What did you find from the information?

What were the overall ideas and findings from the research?

STEP 10: CONCLUSIONS

This is where you will state the final outcome of your investigation as supported by the data and observations. The conclusion must answer the initial scientific question, and verify whether your hypothesis was correct or incorrect. In order to draw a conclusion,
you must make a judgement based on observations and facts found during your research. The conclusion is an inference (a connection suggested by experimental observation), not a fact. The more evidence (facts and observations), however, the better your inference will be. Because the conclusion is a judgement, it leaves an opening to change your opinion if new evidence comes along to prove you wrong. That is what science is all about! Your conclusion should roughly follow the guidelines given below (re-worded to suit your needs):

- I wanted to find out... (re-state original scientific question and reason for asking it).
- Based on my research, I guessed.... (re-state hypothesis and summarize the evidence from background research).
- My experiment showed that... (summarize observations from data tables, and analyze trends or patterns that you may have noticed in graphs).
- My hypothesis was therefore... (correct or incorrect).
- I believe this was because... (state your inference, based on facts learned during research and observations made during experiment or test).

Remember: If the experiment did not verify the hypothesis, the experiment did not fail. You have still learned something! It happens to the best of Scientists and is all part of the experimentation process. The project will not be judged on its success or failure, but rather on your understanding of the scientific method and your use of a sound procedure.

Results/Analysis:

Gender

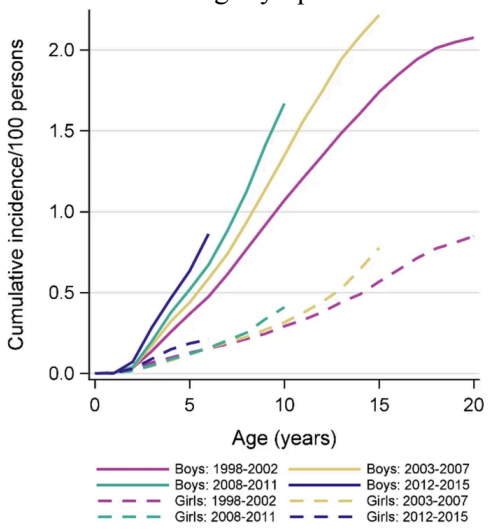
Jan. 29-30, 2026

Data from *Brain Facts, 2018,* were taken and studied (Society for Neuroscience, 2018, 71), revealing that 1 in 68 Americans at 8 years of age meet the criteria for an autism diagnosis. By comparing patterns to those of the 1970s, there is a positive trend of ASD prevalence, meaning there has been an increase in autism incidence over time. Although this suggests an increase in autism spectrum disorder demographics, it could be a result of a broader criteria of diagnoses. In addition, results show that boys are five times more likely to be diagnosed. Again, this doesn't necessarily mean that males have a higher risk factor of ASD, just that the symptoms exhibited may be presented outwardly, and therefore more commonly recognized/diagnosed.

Jan. 30, 2026

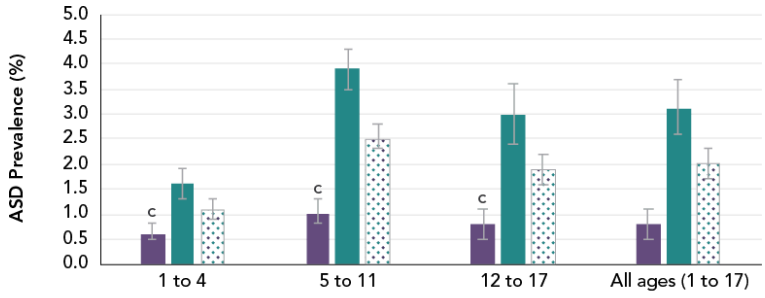
The Finnish Prenatal Nationwide Register Study of Autism investigated time trends in ASD (socio-demographic) risk factors and co-occurring conditions (59% of cases studied had at least 1), particularly intellectual disability, or ID (Khorasani et al., 2025). Individuals with an ASD diagnosis (with and without ID) born in Finland from 1998-2015 were divided into birth cohorts of transition to school (2012-2015), pre-puberty (2009-2011), mid-puberty (2003-2007), and transition to adulthood (1998-2002). Birthplace, parent immigration status, and gender were also taken into consideration. The statistics of autism spectrum disorder without ID were shown to increase from 0.52% to 0.89% by age 10, while cases with ID remained at 0.17%; it is likely that this increase over time is based on wider diagnostic criteria, improved mental health services (at identifying conditions), greater awareness, and

more frequent treatments. Moreover, at age 6, the boy to girl ratio for autism diagnoses was 4.18:1, then 4.50:1 (without ID) at age 10, and finally 1.52:1 by 15; the prevalence of girls change much more rapidly than boys, and we see that girls typically first get diagnosed at 9 years of age (1 year later than most boys; median age). Still, 77.1% of autism cases were boys. It was also observed that ASD rates for biological sex tended to differ by region (e.g. girls' rates increased in the South; boys' rates increased in the East). This evidence supports research that girls tend to be diagnosed with autism later on due to more internalized feelings/symptoms.



Feb. 3, 2026

The Public Health Agency of Canada compiled data relating to Autism Spectrum Disorder (ASD) using data from the 2019 Canadian Health Survey on Children. It compiled data from all 10 provinces and 3 territories. In terms of ASD rates relating to sex, diagnosis rates were significantly higher for males than for females. The male-to-female diagnosis ratio for children aged 1 to 4 was 2.7; however, it seems to rise significantly for children 5 and up, resulting in a ratio of 3.9 (Public Health Agency of Canada). This difference in ratio may be attributed to the difference in sample size for the different age groups. The overall male-to-female ratio for all children aged 1 to 17 was 3.9.



	1 to 4	5 to 11	12 to 17	All ages (1 to 17)
Female	0.6	1.0	0.8	0.8
Male	1.6	3.9	3.0	3.1
Both Sexes	1.1	2.5	1.9	2.0
Sex Ratio (Male: Female)	2.7	3.9	3.8	3.9

Age Group (years)

Using the 95% confidence specified in this source and the 69 000+ children in the population pool, we determined that the chi-squared value was greater than the critical value, meaning that we **reject the null hypothesis** and **accept our alternative hypothesis**.

Ethnicity

Jan. 30, 2026

A study from the journal *Children*, taking place in the United States of America tried to pick out racial inequities within health diagnostic services; this was done by stratifying ethnic backgrounds with rates of autism spectrum disorder, and comorbid ASD and ADHD, or attention deficit hyperactivity disorder from a pool of 205,480 children aged 3-17 (with a mean age of 10.6 years), representing 73.1 million American children (Izuchi et al., 2025). Data shows that Hispanic and non-Hispanic Black children had lower odds (or were diagnosed later on) of ASD than non-Hispanic White children. The patterns discovered through these statistics were very consistent, and it was determined, after thorough analysis, that this was an issue with diagnostic services, rather than biological risks of neurological disorders.

In the Finnish Prenatal Nationwide Register Study of Autism, ASD incidence was studied in comparison to immigration status and birth region in Finland (Khorasani et al., 2025). After analysis of the results, there was higher prevalence among immigrant parents. This could be due to a higher percentage of consanguineous marriage (leading to an increased risk of genetic mutations of intellectual disability), immunological factors (pathogen exposure in mothers), stressful life events (also related to genetic mutation), and reduced stigma in seeking healthcare or diagnostic services.

Feb. 3, 2026

In a 2014 study published in PubMed, researchers investigated Autism Spectrum Disorder (ASD) in relation to race, ethnicity, and nativity. The study was focused on the Los Angeles Area and found that 7540 out of 1,626,324 children born in the time period were diagnosed with ASD (Becerra et al., 2014). Researchers also investigated potential comorbidity with intellectual disability. The study concluded that there seemed to be an association between maternal race or ethnicity and ASD diagnosis and severity. Increased risks of being diagnosed with ASD with intellectual disability were found in the children of foreign-born mothers, especially those who were black, Central/South American, Filipino, and Vietnamese. Children of foreign-born black mothers and Vietnamese mothers were also more likely to express the “violent outbursts” phenotype.

In a 2022 study published to the Autism and Developmental Disease Monitoring (ADDM) network, 16 sites analyzed healthcare data of 16 sites across the United States. Using health insurance information and passports, researchers were able to identify important determinants like race, household income, and sex. The article notes that before 2016, the highest ASD prevalence was observed in white children and women from neighbourhoods with higher socioeconomic status. That data seems to changed, however, as rates of autism diagnoses have increased in non-white populations. This data contradicts that of some of our other studies.

The Public Health Agency of Canada states that they did not find a statistical significance between ASD diagnosis and visible minority status (presumably including things like ethnicity), household education level, and location of residence (Public Health Agency of Canada)

Due to the outdated nature of some of the sources and the lack of certainty with our current sources, we can **neither reject nor fail to reject** our null hypothesis. This leaves us with a rather ambiguous conclusion to this question.

Quality/Access

Jan. 30, 2026

In the North-West provinces of Iran (including Ardabil, East-Azerbaijan, etc.), a cross-sectional study was conducted by Azeri Blue Buddies: Interdisciplinary Longitudinal Autism Researchers (Jafarabadi et al., 2021). This project ran from July 1st to November 30th in 2019, which included 202 participants with ASD aged 2-16 (mean age of 2.5 years), observing 10 variables on demographics, socioeconomic status,

and the quality/accessibility of services. Although there is no direct evidence here connecting ASD occurance to SDOH markers, there is an association between these indicators and diagnostic services (access/quality). In Iran, many health or medical centers conduct SDOH screening, providing for low socioeconomic status and accomodating autism diagnoses; however, health insurance generally does not account for ASD rehabilitation, and most diagnoses are issued from private organization (welfare organizations) rather than public centers or clinics, raising concerns about equity. Furthermore, there is a lack of data on accessibility in low/middle-income countries (LMICs), where over 61% of children reside. An assessment with Structural Equation Modelling (SEM) of the data uncovered the relationship and inequalities in this public health issue. The mean quality of services was 61.23/100 (significantly affected by access), and the mean access to services was 65.91/100. The mean SDOH status was 29.50/100, showing a positive correlation between SDOH and quality/access: individuals with lower determinant levels recorded lower quality. These gaps stem from referral issues, lack of insurance coverage, cultural norms, long waiting times, and more.

Variables	Mean*	SD
Quality dimension		
Participation in decision making	65.61	36.07
Care coordination	61.26	37.86
Continuity of care	60.82	40.35
Timeliness	62.72	38.24
Total service quality	61.23	30.01
Access dimension		
Services usage	49.73	32.25
Referral	60.18	23.72
Insurance coverage	51.71	40.86
Cultural and family	84.44	27.12
Access to trusted provider	71.69	32.58
Waiting time	77.72	30.96
Total	65.91	21.89
SDH		
SDH Score	29.50	22.32

Jan. 31, 2026

The Finnish Prenatal Nationwide Register Study of Autism, ASD incidence was studied and evaluated, taking note of where these screenings occurred (Khorasani et al., 2025). In contrast to Iranian ASD services, diagnoses in Finland are conducted and treated in public healthcare systems, registered by CRHC physicians. These typically are at clinics of child neurology/psychiatry.

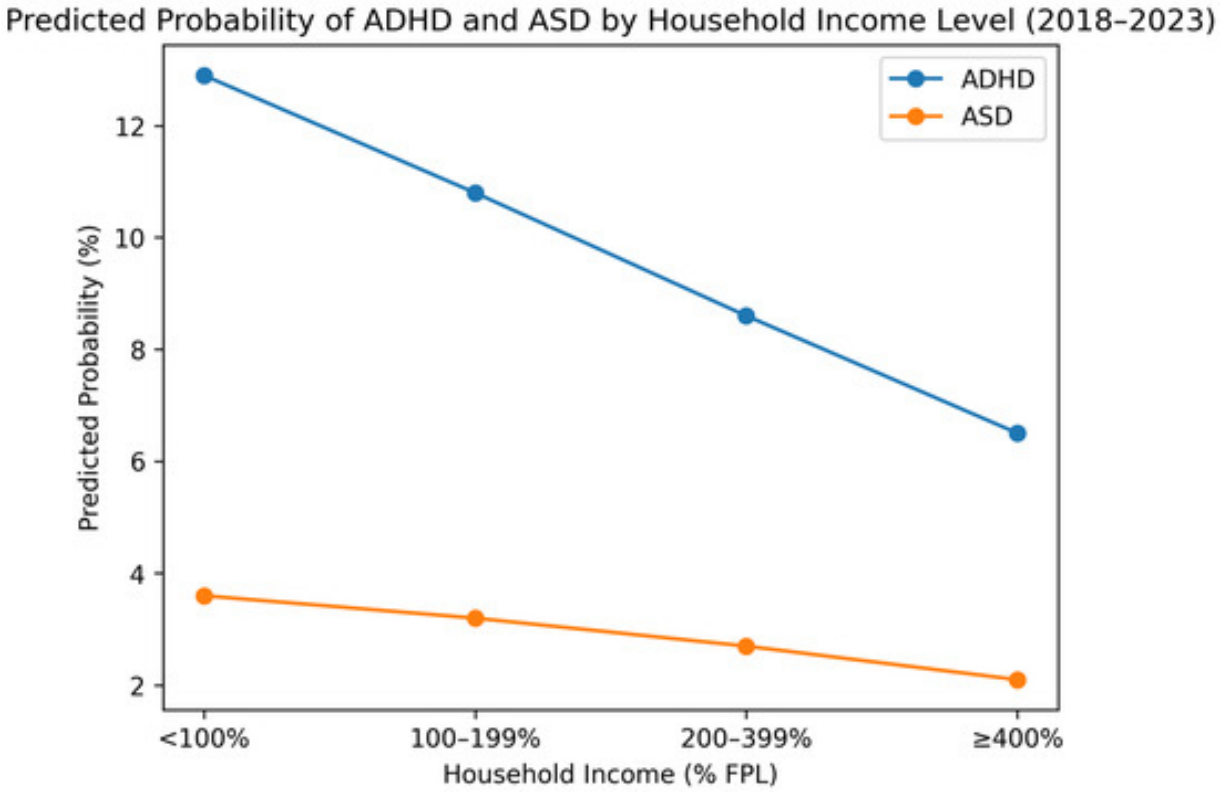
The same study from *Children* in the USA studied socioeconomic conditions within larger structural contexts in terms of access to services for autism support (Izuchi et al., 2025). It was discovered that constrained healthcare access to is associated with attention regulation, emotional control, and adaptive functioning difficulties. Higher rates of ASD in advantaged families is most likely from increased accessibility to these screening services. There appears to be a need to address these barriers in healthcare practices of marginalized communities in autism diagnosis.

Income

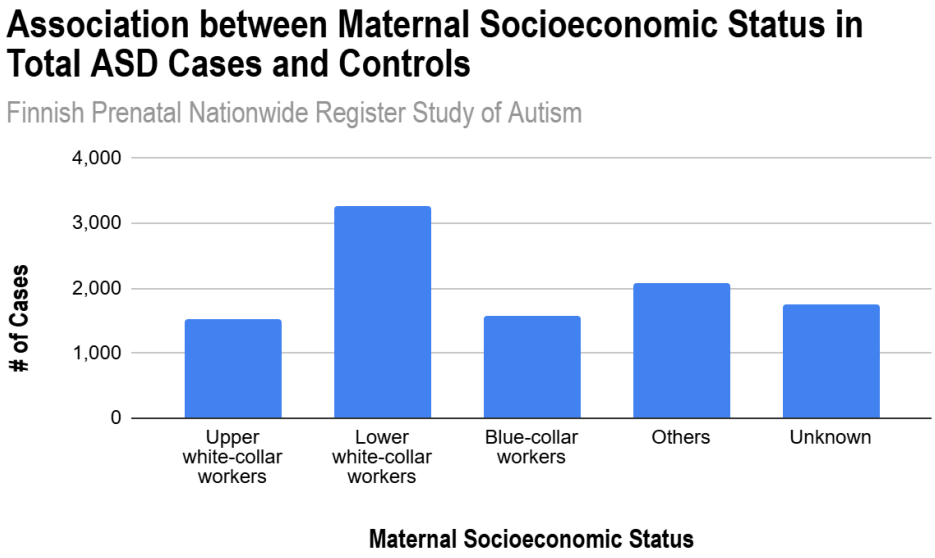
Jan. 30, 2026

The same study from *Children* in the USA identified common SDOH markers and compared them to incidence of autism spectrum disorder, and comorbid ASD and ADHD (Izuchi et al., 2025). These social determinants of health include those relating to financial security, such as household income (relative to poverty level), parental education, health insurance, food insecurity, and neighbourhood safety. Rates of ASD decreased steadily from 3.8% in households below 100% FPL (federal poverty level, relative to

household income), to 2.0% at households above 400% FPL; after analyzing the data, lower levels of socioeconomic status showed a strong correlation with higher odds of ASD (and as a result, co-occurring conditions like ADHD). This suggests that higher stress levels in caregivers likely correlates to autism prevalence; from financial burdens of poverty, to nutritional risks, and dangerous neighbourhood environments, these challenges are all associated with poorer developmental or behavioural outcomes in children. Despite this, statistics often show high rates of diagnosed autism in financially stable families—it is most probable that this is primarily due to better access to diagnostic services. This data supports our hypothesis of higher ASD incidence among lower SDOH levels, as prevalence is not equally distributed.



In the Finnish Prenatal Nationwide Register Study of Autism, household income was categorized by maternal socioeconomic status, and compared to ASD incidence (Khorasani et al., 2025). Groups include upper white-collar workers, lower white-collar workers, blue-collar workers, others, and unknown/missing. The majority of ASD cases from families of lower white-collar workers (31.9%), signifying elevated risk. Furthermore, the majority of ASD cases come from lower socioeconomic status, alluding to the suggestion that lower income levels and support are associated with higher levels of stress (neuroinflammatory abnormalities, potentially changing brain development in offspring). This evidence supports our hypothesis that higher socioeconomic status indicates a lower risk of ASD.



Feb. 3, 2026

The Canadian Public Health Agency compared rates of ASD diagnosis by household income. Data was divided into 5 different quintiles, with quintile 1 being households with a household income in the 20th percentile ($0-44,878) and people in quintile 5, including people in the 80th percentile of income (over $149,924). ASD prevalence was highest in households in the first quintile, with a prevalence rate if 2.6. The rate was lowest for members in the last quintile, with a prevalence rate of 1.1.

Conclusion:

Feb. 1, 2026

After a thorough investigation, it was determined that there is a significant correlation between the social determinants of health (SDOHs) and occurence of autism spectrum disorder (ASD). Through statistical analysis, we deduced that ASD prevalence is highest among individuals in low-income households and those of the male sex; however, rates for factors such as ethnic background or race are rather ambiguous, and it is difficult to deduce whether patterns are coincidental. Even across the various examined studies taking place in different countries, there is a notable difference in research topic, and data is focused in varied areas (e.g. private institutions in Iran vs. the public healthcare system in Finland). To conclude, individuals with autism reported adverse health outcomes, and often the access or quality of services was insufficient in providing appropriate support.

Section 9 - Applications, Improvements, Further Questions, and New Problems

Where can this research be applied?

STEP 11: APPLICATIONS

This is often a single paragraph, which explains why is it good or useful to know the results you have obtained. What practical problem can it help society solve?

STEP 12: ASKING FURTHER QUESTIONS

Based on what you have learned, what new questions do you have? Is there another experiment or test that could be done? If the project was a good one, it will actually raise more questions than it answered.

STEP 13: WAYS THAT PROJECT COULD BE IMPROVED

Once the project is complete, you should not stop thinking like a scientist. Scientists are always asking further questions, thinking of new ideas, and realizing that they could have done something differently or better if they were to repeat their experiments. In this section of the project, you should address the following things:

Experimental error - Think about where some potential sources of error might have occurred in your experiment. Could the measurements have been made more accurately? Were some variables not as well controlled as they should have been? Some of these will not come to light until *after* the experiment is complete. Remember that there is *always* something that can be done to improve the project and you should be able to list several things.

What might have been done differently in the project? Could different subjects or different variables be used? Could things have been done in a different order, or measurements made in other ways? Were some parts of the project more difficult to do, or less clear?

Applications:

Feb. 1, 2026

As stated earlier, there is no single medication for treating autism spectrum disorder, and many individuals tend to turn to behavioural therapies. With the information researched in this project, risk factors and symptoms can be identified and diagnosed earlier on, making interventions more effective. It can also provide as evidence to influence change in areas like access to healthcare services and appropriate ASD support.

Further Questions:

Feb. 1, 2026

Why are some of these disparities present?

What are some common biomarkers correlated with an autism diagnoses (e.g. genetic mutations)?

Some limitations include the credibility of the data investigated in this study. In the future, improvements can be made by accessing a plethora of databases, and comparing statistics accordingly, to optimize the accuracy of our results.

Section 11 – Sources
Citations, acknowledgements
Science Fair Sources and Information Sheet
Jan. 28-30, 2026; Feb. 1, 2026

References

Autism Canada. (2018). *What is Autism?* Autism Canada. Retrieved January 1, 2026, from https://www.autismcanada.org/history-of-autism

Becerra, T. A., von Ehrenstein, O. S., Heck, J. E., Olsen, J., Arah, O. A., Jeste, S. S., Rodriguez, M., & Ritz, B. (2014, July). *Autism Spectrum Disorders and Race, Ethnicity, and Nativity: A Population-Based Study*. PubMed Central. Retrieved December 30, 2025, from https://pmc.ncbi.nlm.nih.gov/articles/PMC4067639/#sec6

Brooks, J. D., Bronskill, S. E., & Fu, L. (2020, October 24). Identifying Children and Youth With Autism Spectrum Disorder in Electronic Medical Records: Examining Health System Utilization and Comorbidities. *Autism Research*, *14*(2), 400-410. https://doi.org/10.1002/aur.2419

Canadian Public Health Association. (n.d.). *What are the social determinants of health?* Canadian Public Health Association. Retrieved January 31, 2026, from https://www.cpha.ca/what-are-social-determinants-health

CDC. (2024, January 17). *Social Determinants of Health (SDOH) | About CDC*. CDC. Retrieved January 31, 2026, from https://www.cdc.gov/about/priorities/why-is-addressing-sdoh-important.html

Chaste, P., & Leboyer, M. (2012, September). Autism risk factors: genes, environment, and gene-environment interactions. 10.31887/DCNS.2012.14.3/pchaste

Izuchi, C., Onwuameze, C. N., & Akuta, G. (2025, December 31). Social Determinants of Neurodevelopmental Disorders: Associations with ADHD and ASD Among U.S. Children. *Children*. https://doi.org/10.3390/children13010062

Jafarabadi, M. A., Gholipour, K., Shahrokhi, H., Malek, A., Ghiasi, A., Pourasghari, H., & Iezadi, S. (2021, April 26). *Disparities in the quality of and access to services in children with autism spectrum disorders: a structural equation modeling*. Springer Nature Link. Retrieved January 23, 2026, from https://link.springer.com/article/10.1186/s13690-021-00577-5?fromPaywallRec=true

Johns Hopkins Bloomberg School of Public Health. (2025, June 6). *Is There an Autism Epidemic? | Johns Hopkins | Bloomberg School of Public Health*. Johns Hopkins Bloomberg School of Public Health. Retrieved January 28, 2026, from https://publichealth.jhu.edu/2025/is-there-an-autism-epidemic

Khorasani, Z. K., Upadhyaya, S., Ståhlberg, T., Arrhenius, B., Heinonen, E., & Sourander, A. (2025, December 15). Time Trends in Treated Incidence, Socio-demographic Risk Factors, and Co-occurring Psychiatric Disorders in Diagnosed Autism Spectrum Disorder With or Without Intellectual Disability: A Finnish Nationwide Register Study. *Journal of Autism and Developmental Disorders*. https://doi.org/10.1007/s10803-025-07181-4

Lim, A. (2021). *Open Neuroscience Initiative* (1st ed.). file:///C:/Users/tinay/Downloads/Open%20Neuroscience%20Initiative%20-%20Full%20Digital%20Textbook.pdf

National Institute of Mental Health. (2024, December). *Autism Spectrum Disorder*. National Institute of Mental Health. Retrieved December 1, 2025, from https://www.nimh.nih.gov/health/topics/autism-spectrum-disorders-asd

Public Health Agency of Canada. (2020, October 21). *Causes of autism spectrum disorder (ASD)*. Canada.ca. Retrieved December 1, 2025, from https://www.canada.ca/en/public-health/services/diseases/autism-spectrum-disorder-asd/causes-autism-spectrum-disorder-asd.html

Public Health Agency of Canada. (2025, August 27). *Autism: Overview*. Canada.ca. Retrieved December 1, 2025, from https://www.canada.ca/en/public-health/services/diseases/autism-spectrum-disorder-asd.html

Public Health Agency of Canada. (2025, October 29). *Autism spectrum disorder: Highlights from the 2019 Canadian health survey on children and youth*. Canada.ca. Retrieved January 3, 2026, from https://www.canada.ca/en/public-health/services/publications/diseases-conditions/autism-spectrum-disorder-canadian-health-survey-children-youth-2019.html

Shaw, K. A., Williams, S., & Patrick, M. E. (2025, April 17). Prevalence and Early Identification of Autism Spectrum Disorder Among Children Aged 4 and 8 Years. *Autism and Developmental Disabilities Monitoring Network, 16 Sites, United States, 2022*. http://dx.doi.org/10.15585/mmwr.ss7402a1

Society for Neuroscience. (2018). *Brain Facts: A Primer on the Brain and Nervous System* (8th ed.). Society for Neuroscience. Retrieved January 1, 2026, from https://drive.google.com/file/d/1PVu3iCe_AUlDZHeMOwIq1adhrsCmsuR5/view

World Health Organization. (n.d.). *Social determinants of health*. World Health Organization (WHO). Retrieved January 31, 2026, from https://www.who.int/health-topics/social-determinants-of-health#tab=tab_1

Acknowledgements

Feb. 1, 2026

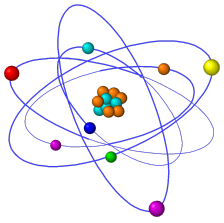
We would like to thank our families and Ms. Lai of Westmount Charter School for their continual support during this project.

https://docs.google.com/presentation/d/1thrF-84vgChQqn21c9QXQFT9YxuPtsXjxwJnBJNkzV4/edit?slide=id.g35f391192_00#slide=id.g35f391192_00

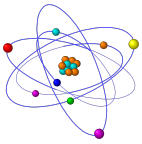
WRITING THE REPORT

If you have kept a well-organized logbook and continually added to it throughout your experiment, you will have all the information you will need to write an excellent scientific report to accompany your display. You may have already written a good copy of your background research from the notes you compiled in the background research section of your logbook (see the section on background research). Now you must do the same with the other sections of your logbook. Take each section and compose a good copy, review it, edit it, make sure each section has a heading, etc. When you are satisfied with your efforts, place all the sections of the report together in order (without dividers or extra blank pages), staple or bind it together, and you're ready to hand it in to your science teacher!

On the next page you will find the correct order of sections in your final report…



Here is the order of sections of your final report:
(each section should begin on it's own page):



Title Page
Table of Contents
Acknowledgements
Scientific Question / Problem
Background Research & References
Hypothesis
Materials
Procedure
Observations / Raw Data
Results / Managed Data
Conclusions
Applications & New Questions
Improvements to Experimental Design
Back Page *(just a blank page which is good for teacher comments)*

PREPARING FOR THE ORAL PRESENTATION:

This is an extremely important step in any Science Fair Project because it is where you get to tell someone else about all that you have accomplished! All of those who come to view your project will want to hear about it and will have lots of questions. Your teacher will go over some of the things that make a good oral presentation and you will have time to practice these things in IS/SDS.

<u>Some quick tips to think about</u>:

- A Polite introduction at the start of the presentation is a must.
- Tell the audience the title of the project, and briefly explain why it was chosen.
- Walk through the project, step by step - in order of the scientific method.
- When sharing a project, feel free to refer to the display board at any time, but do not just read directly off of it.
- Be sure to make eye contact, speak clearly and know your Project. Remember that "practice makes perfect".

GOOGLE SLIDES LAYOUT

After all of this hard work, you will be anxious to share what you have learned with others. This is where the display comes in. The science fair display will consist of a **virtual** backboard and any materials that are necessary to fully explain the experiment to others. Your virtual backboard should be bright, interesting, and clear, so that people will want to spend time looking at it. Therefore, you will want to spend some time planning the best way to display all of your discoveries. The best rule of thumb is to keep it simple! Your slides should include the following:

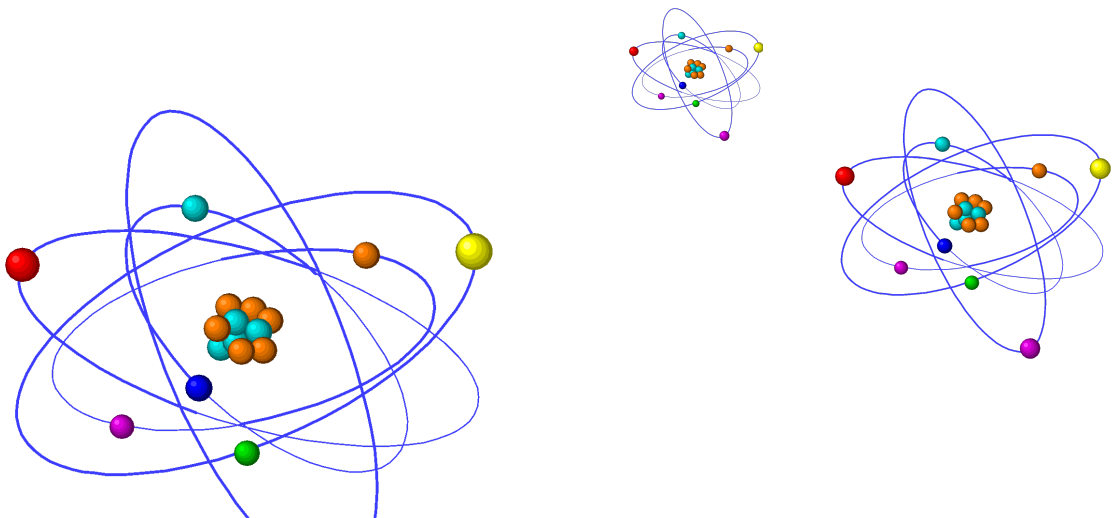
- Title of project in bold letters. The title might be a catchy phrase to get audience attention and make them want to come over and investigate!
- A statement of the Scientific Question.
- Hypothesis statement.
- Summary of Variables (Manipulated, Responding, Controlled).
- Materials List.
- Procedure List.
- A detailed, labelled illustration of experimental set up.
- A summary of Results (copy of tables). Photographs work very well to show visual changes that occurred during an experiment.
- A summary of Managed Data (copy of graphs and charts).
- A summary of Conclusions.
- Any interesting background information or illustrations.
- Your name, grade, and School name.

All information on the slides should be either typed or very neatly hand-written. Keep in mind that it is easier to fill in too much space than it is to cram work into too little space. Your Science Fair Log Book, Journal, and Final Report should be available, along with as much of the actual experimental set up as is possible or permissible.

Remember to make DUPLICATES of everything in the logbook and/or final report that needs to be on the Google Slides! This includes graphs and data tables.

LOG BOOK CHECKLIST

Before handing in your project Log Book, be sure you have gone over the Log Book Check-List (**Appendix H).** This is an excellent way to make sure that everything is in order and complete before your logbook is marked. Remember: Your logbook is the tool you will have used to collect all the information you needed to conduct an excellent experiment and to write up a great final report. It doesn't have to be super-neat, but should be legible and organized!



Science Fair Handbook - Appendix A

LOG BOOK CHECKLIST

Before handing in your project Log Book for evaluation, please refer to this checklist and make sure that everything is complete. Check off what you have done as you complete it and hand this list in with your Log Book.

- ❑ 1. Title page with the title of your experiment (from display board) centred on the page, and your name, grade and school in the lower right-hand corner.
- ❑ 2. You have completed your Table of Contents and included it after the Title Page.
- ❑ 3. You have included your Acknowledgments page listing all sources of outside help.
- ❑ 4. Your Scientific Question is written out, along with a brief explanation of why you chose it.
- ❑ 5. Your Variables (Manipulated, Responding, and Controlled) are written out.
- ❑ 6. Your complete Background Research Section is included.
- ❑ 7 Your Hypothesis is clearly stated.
- ❑ 8. Your experiment materials are listed.
- ❑ 9. Your experiment Procedure is complete and includes an illustration of your set up.
- ❑ 10. Your Data Tables and a brief summary paragraph is included.
- ❑ 11. Your graphs and charts are complete.
- ❑ 12. Conclusions are discussed in detail.
- ❑ 13. Applications are discussed.
- ❑ 14 Further Questions are suggested.
- ❑ 15. How the project can be improved is included.
- ❑ 16. If AI is used, it is declared as to how it is used.

❑ 17. Your journal is completed and put into your logbook. You may wish to place your journal in a plastic sleeve in the logbook so that it does not get misplaced.