Calculating the Incidence of Neurodiversity in the General Population

By Chloe R Cameron, 2021 Aug 22

Neurodiversity and neurodivergence are terms that are being more and more widely used both in business and in the general population, yet there is no official definition or quantification of this neurodivergent population available. This paper draws on medical and research data from countries that recognize and diagnose five of the most common conditions that the working definition of neurodivergence encompasses to calculate an estimated aggregate prevalence rate of these major neurodivergent conditions in the general population.

It is important to note that the diagnosis of neurodivergent conditions is not always straightforward or objective. Diagnosis often, especially for mild to moderate cases (and those who present differently, particularly women), relies on a subjective checklist format, which can lead to different recorded prevalence rates depending on who is evaluating and which definition they are using. In addition, most of the observational research that has been done to date focuses on children, which leaves a gap in information for neurodivergent adults who are living without a diagnosis. Despite the thought that children may "grow out of" some neurodivergent conditions as they enter adulthood, there is reason to believe that this is entirely not the case for some conditions (e.g. autism), while even conditions where this has thought to be true, such as ADHD, have shown persistence rates or correlation with adverse neurological conditions totaling 62.5%.[1] Presumably, many individuals who rank mild-moderate on their condition spectrum learn to cope in different ways in order to conform to social norms and are no longer "detectable" in adulthood. This would mean that they are still neurodivergent even if they are masking their natural behaviours and no longer exhibit enough of the behaviours to officially be diagnosed with the condition that they were previously diagnosed with. These factors make it extremely difficult for health care professionals to estimate reliable prevalence rates, contributing to a large range in published figures and a lack of information amongst different age groups. This commentary is not to criticize diagnostic methods but only to highlight the complexity of calculating prevalence rates today. After reviewing my calculations below, I welcome criticism and suggestions from the community on how to improve the accuracy of the figures or narrow the range, keeping in mind that my goal is to capture prevalence in the general population, not just the diagnosed population.

The work that has been done to-date to capture prevalence rates relies on one of two methods: standard medical diagnosis or observation using available medical definitions. Standard medical diagnosis relies on a person being presented to a medical professional and that professional determining based on the subjective checklist, as discussed above, that the person has a neurodivergent condition. This process is, at best, imprecise, and it can be extrapolated that many people who have neurodivergent tendencies, especially in the mild-moderate range of the corresponding condition spectrum, would potentially not be presented to a medical professional at all for diagnosis due to stigma or a lack of awareness, or may not be diagnosed correctly even if they were being medically evaluated. Therefore, I will assume that rates of standard medical diagnosis of neurodivergent conditions are perpetually low and cannot possibly encompass all cases of the conditions in the general population. On the other hand, observational information, such as that provided by overloaded teachers or parents, or even researchers, may, in some cases, overstate the prevalence of certain conditions. The most blatant example of this dichotomy is in the prevalence rates of the neurodivergent condition ADHD, where Faraone, Stephen V et al. found in 2003 that the rate of ADHD using the DSM-IV definition in lower prevalence studies averaged 4.95% while higher prevalence studies using the same DSV-IV definition found an average prevalence rate of 17.90%.[2] Although the ranges within other neurodivergent conditions are not as wide, many of the existing published prevalence rates still vary greatly from one another, indicating that these neurodivergent conditions are not necessarily well-understood yet. As we can see, neither of these methods provides true, consistent prevalence rates within the general population.

Table 1 summarizes information from lower and higher prevalence studies that have been published on incidence rates and calculates aggregated low and high rates, along with a simple average between the two range extremes to estimate the total prevalence of these five conditions combined in the general population. The intention of this calculation is not to provide an exact prevalence of each neurodivergent condition in the general population but instead to illustrate the approximate overall prevalence of these conditions combined. Based on these calculations, the estimated combined prevalence of neurodivergence due to ASD not including Asperger's Syndrome, ADHD, dyslexia, Asperger's Syndrome, and OCD is approximately 10.3%-26.2%, with the simple average estimate calculating to 18.2%. The high prevalence of comorbidity was taken into account for dyslexia and ADHD, because they present together very commonly, and represent the highest proportion of the overall prevalence rate amongst neurodivergent conditions. There are comorbidity rates among the other conditions that either vary or are insufficiently quantified in medical literature. It is anecdotally well-known that many people who have one condition have a second as well, and ignoring this overlap because there is inadequate reliable data would lead to overstated total neurodivergence prevalence rates. To estimate their impact, I have included an estimated comorbidity rate that uses the same average comorbidity rate that is published for ADHD and dyslexia. The rates may vary by condition, but the calculation provides an approximate value.

Table 1

	Autism/ ASD	Dyslexia	ADHD	Comorbidity (Dyslexia & ADHD)	Asperger's Syndrome	OCD	Estimated Comorbidity (All Other Conditions)	Total
Low	0.625%[i][3]	5.000%[4]	4.950%[5]	-1.617%[6]	0.003%[7]	2.300%[8]	-0.952%[9]	10.301%
High	1.852%[ii][10]	10.000%[11]	17.900%[12]	-4.534%[13]	0.484%[iii][14]	2.300%[15]	-1.349%[16]	26.169%
Estimate	0.996%[iv]	7.500%	11.425%	-3.075%[17]	0.244%	2.300%[18]	-1.150%[19]	18.239%

[i] Asperger's Syndrome does not appear to be included

[ii] Asperger's included

[iii] Not included in line total due to high ASD prevalence rate including Asperger's Syndrome – Asperger's high prevalence rate still shown for Estimate line calculation only

[iv] Calculated using average of low ASD rate and high ASD rate less high Asperger's Syndrome rate

These calculations did not attempt to estimate the precision of the sourced studies and could, therefore, be inaccurate to the extent that the source materials were inaccurate. The calculations are also not weighted by participant numbers in the various studies, as observational studies have far less participants than can be referenced in medical prevalence rates. However, as noted above, medical prevalence rates are undoubtedly lower than the actual prevalence in the general population since many individuals will go undiagnosed either due to stigma, awareness, or generally manageable differences and so observational data is important at this point in calculating a prevalence rate that is meant to capture true, not just diagnosed, incidences. As discussed previously, much of the observational information that is currently available focuses on children rather than adults, so the assumption that children with neurodivergent conditions remain neurodivergent to some extent throughout their lives regardless of the behaviours exhibited could be hotly contested by some, since the medical definition is currently not structured this way. Also, this number does not include all conditions that are considered to be part of the neurodivergent category. This work is not meant to exclude those people from the definition, but instead to provide an estimate of the aggregate prevalence of the five conditions that are currently most commonly associated with neurodivergence.

[1] Barbaresi WJ, Colligan RC, Weaver AL, Voigt RG, Killian JM, Katusic SK. Mortality, ADHD, and psychosocial adversity in adults with childhood ADHD: a prospective study. Pediatrics. 2013;131(4):637-644. doi:10.1542/peds.2012-2354

[2] Faraone, Stephen V et al. "The worldwide prevalence of ADHD: is it an American condition?." World psychiatry : official journal of the World Psychiatric Association (WPA) vol. 2,2 (2003): 104-13.

[3] Mayada et al. Global prevalence of autism and other pervasive developmental disorders. Autism Res. 2012 Jun; 5(3): 160–179.

[4] Siegel, Linda S. "Perspectives on dyslexia." Paediatrics & child health vol. 11,9 (2006): 581-7. doi:10.1093/pch/11.9.581

[5] Calculated using simple average from lower prevalence studies in Faraone, Stephen V et al. "The worldwide prevalence of ADHD: is it an American condition?." World psychiatry : official journal of the World Psychiatric Association (WPA) vol. 2,2 (2003): 104-13. Table 7.

[6] Calculated using simple average of comorbidity range in McGrath, L.M., Stoodley, C.J. Are there shared neural correlates between dyslexia and ADHD? A meta-analysis of voxel-based morphometry studies. J Neurodevelop Disord 11, 31 (2019). https://doi.org/10.1186/s11689-019-9287-8

[7] Fombonne E, Tidmarsh L. Epidemiologic data on Asperger disorder. Child Adolesc Psychiatr Clin N Am. 2003;12:15–21.

[8] Harvard Medical School, 2007. National Comorbidity Survey (NCSSC). (2017, August 21). Retrieved from https://www.hcp.med.harvard.edu/ncs/index.php. Data Table 1: Lifetime prevalence DSM-IV/WMH-CIDI disorders by sex and cohort.

[9] Calculated using simple average of comorbidity range in McGrath, L.M., Stoodley, C.J. Are there shared neural correlates between dyslexia and ADHD? A meta-analysis of voxel-based morphometry studies. J Neurodevelop Disord 11, 31 (2019). https://doi.org/10.1186/s11689-019-9287-8

[10] Maenner MJ, Shaw KA, Baio J, et al. Prevalence of Autism Spectrum Disorder Among Children Aged 8 Years — Autism and Developmental Disabilities Monitoring Network, 11 Sites, United States, 2016. MMWR Surveill Summ 2020;69(No. SS-4):1–12. DOI: http://dx.doi.org/10.15585/mmwr.ss6904a1external icon.

[11] Siegel, Linda S. "Perspectives on dyslexia." Paediatrics & child health vol. 11,9 (2006): 581-7. doi:10.1093/pch/11.9.581

[12] Calculated using simple average from higher prevalence studies in Faraone, Stephen V et al. "The worldwide prevalence of ADHD: is it an American condition?." World psychiatry : official journal of the World Psychiatric Association (WPA) vol. 2,2 (2003): 104-13. Table 7.

[13] Calculated using simple average of comorbidity range in McGrath, L.M., Stoodley, C.J. Are there shared neural correlates between dyslexia and ADHD? A meta-analysis of voxel-based morphometry studies. J Neurodevelop Disord 11, 31 (2019). https://doi.org/10.1186/s11689-019-9287-8

[14] Fombonne E, Tidmarsh L. Epidemiologic data on Asperger disorder. Child Adolesc Psychiatr Clin N Am. 2003;12:15–21.

[15] Harvard Medical School, 2007. National Comorbidity Survey (NCSSC). (2017, August 21). Retrieved from https://www.hcp.med.harvard.edu/ncs/index.php. Data Table 1: Lifetime prevalence DSM-IV/WMH-CIDI disorders by sex and cohort.

[16] Calculated using simple average of comorbidity range in McGrath, L.M., Stoodley, C.J. Are there shared neural correlates between dyslexia and ADHD? A meta-analysis of voxel-based morphometry studies. J Neurodevelop Disord 11, 31 (2019). https://doi.org/10.1186/s11689-019-9287-8

[17] Calculated using simple average of comorbidity range in McGrath, L.M., Stoodley, C.J. Are there shared neural correlates between dyslexia and ADHD? A meta-analysis of voxel-based morphometry studies. J Neurodevelop Disord 11, 31 (2019). https://doi.org/10.1186/s11689-019-9287-8

[18] Harvard Medical School, 2007. National Comorbidity Survey (NCSSC). (2017, August 21). Retrieved from https://www.hcp.med.harvard.edu/ncs/index.php. Data Table 1: Lifetime prevalence DSM-IV/WMH-CIDI disorders by sex and cohort.

[19] Calculated using simple average of comorbidity range in McGrath, L.M., Stoodley, C.J. Are there shared neural correlates between dyslexia and ADHD? A meta-analysis of voxel-based morphometry studies. J Neurodevelop Disord 11, 31 (2019). https://doi.org/10.1186/s11689-019-9287-8