

## Stuttering and Smoking Frequency: A Longitudinal Analysis of Adolescence and Young Adults

Molly M Jacobs

Department of Health Sciences Information and Management,  
East Carolina University, USA

### \*Corresponding authors

Molly Jacobs, Department of Health Sciences Information and Management,  
East Carolina University, 600 Moye Blvd. Mail Stop 668 Health Sciences  
Building 4340E Greenville, NC 27834, USA

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### Abstract

**Purpose:** Previous research exploring the association between stuttering and cigarette smoking has been confounded by failure to control for confounding factors, improper empirical specification and inadequate data. Due to these and other limitations, previous studies have found no association between stuttering and smoking. This study examines the relationship using a longitudinal sample of adolescents and young adults controlling for previous smoking, alcohol consumption and mood disorders.

**Methods:** Regression analyses utilizes the Longitudinal Survey of Adolescent to Adult Health—a panel study following a cohort of 12 to 17-year-olds into adulthood with four repeated interviews—to assess the relationship between adult smoking frequency and stuttering controlling for age, demographic and parental characteristics, depression, anxiety and adolescent smoking and alcohol consumption.

**Results:** Stuttering is highly predictive of adult smoking frequency, even after controlling for alcohol use, early-life smoking habits and mood disorders. The high correlation between smoking and age consumption suggest that patterns smoking begin in adolescence and continue into adulthood.

**Conclusion:** Findings indicate that, all else held constant, individuals who stutter smoke more frequently than their fluent counterparts. Stress relief, social inclusivity or belongingness could induce individuals who stuttering to use smoking as a form of social capital or to facilitate inclusivity.

### Introduction

Approximately 20 to 25 percent of the U.S. population currently smokes currently, but rates are much higher, 35 to 65 percent, in individuals with mood disorders or physical, mental and emotional disabilities [1-3]. These individuals are not only more likely to smoke, but they also smoke more frequently and are less likely to quit [4]. Research explaining the correlation between mood disorders and smoking has been inconclusive, but hypotheses include cyclic mutual dependence, shared genetic or socioeconomic predisposition or self-medicating distress relief [5-7]. Despite overwhelming evidence linking mood disorders with cigarette smoking, relatively few studies have addressed smoking among individuals with stuttering—a group disproportionately impacted by mood disorders including, neuroticism, social phobia,

anxiety and depression [8-12]. Stuttering is a communication disorder characterized by the repetition of sounds, syllables, or words that inhibits the normal flow of speech with no known cause or cure and is associated with high levels of anxiety, depression and other mood disorders [13, 14].

While 10 percent of children stutter, 75 percent outgrow this tendency. The remaining 25 percent are left with a lifelong communication disorder [15]. Stuttering can have a profound impact quality of life, relationships and self-esteem [16, 17]. Similar to other chronic and disabling conditions, stuttering is often associated with anxiety, neuroticism and depression [19-22].

Research has shown that some individuals use alcohol, drugs and

cigarettes could also be used to foster inclusivity or prevent isolation [23, 24]. However, only a handful of studies have examined this phenomenon among PWS. Ardila et al. (1994) investigated the association between stuttering and nervous system disorders, including drug abuse and smoking, finding that 40 percent of PWS were smokers, compared with 25 percent of those who did not stutter (PWNS) [25]. Heelan, et al. (2016) used a longitudinal sample of British natives/immigrants to investigate the association between stuttering and smoking and alcohol consumption [26]. Their results indicated no significant association between stuttering and alcohol consumption or stuttering and smoking at any of the ages they examined. Finally, Craig, et al. (2003) noted an increased tendency to use alternative coping strategies among people seeking treatment for stuttering, but smoking was not included as a possible correlate [27]. Finally, Sermas and Cox (1982) noted similar results pertaining to alcoholism in PWS but did not specifically examine differentials in cigarette smoking frequency.

Given the lack of comprehensive research detailing the differential in smoking frequency between PWS and PWNS, this study compares the frequency of cigarette smoking using a nationally representative sample of adolescents in the US. This analysis exploits the longitudinal nature of the available data to determine the relationship between young adult smoking frequency and stuttering. Analysis controls for potentially confounding factors including smoking frequency during adolescence, alcohol consumption frequency during adolescence, use of other types of tobacco and demographic and parental characteristics. Results show that those PWS smoke, on average, four more days per month than those without a fluency disorder. These findings suggest that PWS could use smoking to ease social anxiety, promote inclusivity or assuage fear of negative evaluation in social situations [28, 29].

## Methods

**Data:** To evaluate the association between stuttering and adult smoking frequency, this study utilizes data from the National Longitudinal Survey of Adolescent Health (Add Health). Add Health contains data on respondents' social, economic, psychological, and physical well-being as well as contextual information on the family, community, peers, and relationships allowing environments and behaviors in adolescence to be linked with outcomes in young adulthood. Respondents were first interviewed in 1994-1995 when they were 12 to 17 years old then again in 1996-1996, 2001-2002, 2007-2008 and 2016-2019 when they were 13 to 18, 18 to 26, 24 to 32 and 33 to 41 years old respectively. This study utilizes data from the beginning and end of the panel—Waves I and IV—when respondents were 13 to 18 and 24 to 32 years old respectively.

**Stuttering:** In Wave IV, respondents indicated whether they had “a problem with stuttering or stammering.” This survey item was used to identify respondents as people with stuttering (PWS) and people with no stuttering (PWNS). Only 62 respondents (unweighted) reported stuttering, which represents 1.8 percent of the sample. Sample statistics are provided in (Table I).

**Table I: Add Health Wave I and VI Sample Descriptive Statistics (N=2935)**

	Min	Max	Mean	Std Error
Male	0	1	0.47	0.01
Hispanic	0	1	0.09	0.02
Black	0	1	0.09	0.01
Anxiety	0	0	0.18	0.01
Stutter	0	1	0.02	0.00
Parent Married	0	1	0.97	0.01
Parent Education	1	10	5.54	0.11
Age1	12	21	15.69	0.10
Age4	24	34	28.56	0.10
Depression1	0	26	6.42	0.12
Depression4	0	26	5.29	0.11
Other Tobacco1	0	30	0.90	0.13
Other Tobacco4	0	28	0.31	0.06
Alcohol Consumption1	0	6	3.35	0.06
Alcohol Consumption4	0	6	2.54	0.06
Smoking Days1	0	30	9.87	0.44
Smoking Days4	0	30	12.49	0.37
	PNS (N=2876)		PWS (N=59)	
	Mean	Std. Err.	Mean	Std. Err.
Male	0.47	0.01	0.56	0.08
Hispanic	0.09	0.02	0.12	0.06
Black	0.09	0.01	0.21	0.08
Anxiety	0.18	0.01	0.25	0.08
Parent Married	0.97	0.01	0.91	0.05
Parent Education	5.55	0.11	5.20	0.31
Age1	15.69	0.10	15.71	0.32
Age4	28.56	0.10	28.60	0.32
Depression1	6.38	0.12	8.50	0.87
Depression4	5.22	0.11	8.80	0.95
Other Tobacco1	0.90	0.13	0.78	0.58
Other Tobacco4	0.31	0.06	0.06	0.06
Alcohol Consumption1	3.35	0.06	3.02	0.41
Alcohol Consumption4	2.56	0.06	1.37	0.32
Smoking Days1	9.82	0.45	12.52	2.23
Smoking Days4	12.42	0.36	16.20	2.75

**Depression:** Depression was measured using the Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977)—a measure strongly correlated with diagnoses of major depression in samples of adolescents (e.g., Prescott et al., 1998). The scale consists of nine items each rated on a 4-point scale

(0=never rarely, 1=sometimes, 2=a lot of the time, 3=most of the time, 4=all of the time). Responses are summed resulting in a depression scale ranging from 0 to 27, with higher scores indicating more frequent feelings of depression.

**Anxiety:** Respondents indicate whether they had ever been told by a doctor, nurse, or other health care provider that they have an anxiety or panic disorder.

**Smoking:** Smoking frequency is measured as the number of days out of the last 30 that respondents smoked cigarettes. While other measures of smoking frequency exist in the literatures, these have been deemed unreliable in self-reported survey data particularly among young or adolescent populations [30-35].

**Other tobacco use:** Since cigarette users often switch between various forms of tobacco, it is important to control for use of these additional products when estimating cigarette use [36, 37]. “Other tobacco” is measured as the number of times in past month respondents used “chewing tobacco (such as Redman, Levi Garrett, or Beechnut) or snuff (such as Skoal, Skoal Bandits, or Copenhagen).”

**Alcohol Consumption:** Individuals who use tobacco are four times more likely than the general population to consume alcohol regularly [38]. Furthermore, the use of alcohol is often coupled with the use of tobacco, or vice versa, a behavior known as polysubstance use [39-41]. Alcohol use over the past year is categorized as 1) every day or almost every day, 2) 3 to 5 days a week, 3) 1 or 2 days a week, 4) 2 or 3 days a month, 5) once a month or less, 6) 1 or 2 days in the last 12 months or 7) never. **Demographic Characteristics:** Demographic characteristics include race, age, gender, and ethnicity.

**Parental Characteristics:** To capture the effects of household characteristics and parental influence on respondent behavior, parental education and marital status are included in the regression. **Empirical Analysis:** The relationship between smoking frequency in adulthood (Wave IV) and stuttering was assessed using multiple linear regression in SAS 9.4 (Cary, NC). The regression model includes indicators of smoking frequency in early life, frequency of other tobacco use, frequency of alcohol consumption, depression, anxiety and parental and demographic characteristics were included. All analyses were performed in SAS 9.4 (Cary, NC) using the proc surveyreg procedure to account for the complex Add Health survey design and clustering of respondents. Estimates were weighted to reflect sampling variation.

## Results

**Characteristic Comparison PWS vs. PWNS:** The sample was 46 percent male and over 20 percent minority race and ethnicity. Hispanic and black respondents are more likely to report stuttering than their majority counterparts, comprising 13 and 22 percent of PWS respectively. Stuttering is more prevalent among males who comprise 52 percent of PWS. Average age in Waves I and IV, 15 and 29 respectively, was similar for PWNS and PNS. Parents of

PWS and PWNS show minor differences. Both parents of PWS and PWNS were either currently or had previously been married (91 percent,  $sd=0.05$ ). On average, parents of PWS and PWNS had completed high school or an associate degree (PWS: 5.22,  $sd=31$ ; PWNS: 5.55,  $se=0.11$ ) and there was not statistically significant difference in the means ( $p=0.151$ ).

Mean depression score was 6.5 ( $SD=0.12$ ) in Wave I and 5.3 ( $SD=0.11$ ) in Wave IV. PWS had an average score of 8.85 ( $SD=.79$ ) and 8.84 ( $SD=.89$ ) in Waves I and IV respectively. Standardized Cronbach's alpha coefficients ranged from 0.80 in Wave I to 0.82 in Wave IV. Only 18 percent ( $SD=0.37$ ) of PWNS reported being diagnosed with an anxiety condition, compared to 26 percent ( $SD=0.44$ ) of PWS—a statistically significant difference ( $\chi^2=19.10$ ,  $p\text{-value}<0.001$ ). In Wave I, PWS report smoking 12.51 ( $sd=2.11$ ) days per month compared to 9.94 ( $sd=0.43$ ) by PWNS. In Wave IV, both groups report smoking more frequency (PWS=16.82,  $sd=2.54$ ; PWNS=12.19,  $sd=0.36$ ). Chi-Square test indicate a statistically significant difference between PWS and PWNS in both waves ( $p\text{-values}=0.002$ ). The frequency for use of other tobacco products is included to capture this switching behavior and polysubstance use. PWS and PWNS used other tobacco products, on average, less than one day a month in Wave I (PWS=0.71 days, PWNS=0.93 days) and Wave IV (PWS=0.06 days, PWNS=0.30 days) and differences were not statistically significant ( $p=0.141$ ). Finally, PWNS and PWS consume alcohol roughly one or two days per week (PWS=3.38,  $SD=0.05$ ; PNWS=3.06,  $SD=3.38$ )—and the difference was not statistically significant ( $p=0.236$ ).

**Regression Analysis:** Smoking frequency in adulthood (when respondent were 26 to 34 years old) was captured by the number of days smoked in the last 30. Smoking frequency was neither significantly related to frequency of other tobacco use ( $p=0.62$ ) nor alcohol consumption ( $p=0.36$ ) suggesting minimal switching behavior and substance clustering among teens and young adults [42]. On average, blacks (-2.37,  $se=1.17$ ,  $p<0.05$ ) and Hispanics (-4.05,  $se=0.00$ ,  $p<0.05$ ) smoked two and four days less per month, respectively, than other racial/ethnic groups. These findings are consistent with other studies suggesting that young blacks gravitate towards other substances such as marijuana or alcohol rather than cigarettes [43]. Age was negatively related to the number of smoking days per month (-1.32,  $se=0.23$ ,  $p<0.05$ ) indicating that smoking levels diminished with age. Recent evidence suggests that smoking rates have been declining among young people as use of electronic cigarettes and inhaled vapor products have become more widely used [44]. Parents' marital status had a slightly negative impact on smoking frequency (-0.74,  $se=0.16$ ,  $p<0.05$ ), while parental education was not significantly associated with adult smoking frequency ( $p=0.37$ ). These suggest that household stability was a more significant driver of cigarette use than socioeconomic or educational level. Not surprisingly, the frequency of smoking in adolescence (Wave I) is highly correlated with smoking in adulthood. For each day smoked per month in adolescence, respondents smoke an additional 0.36 ( $se=0.03$ ) days in adulthood.

**Table II: Relationship between Adult Smoking Frequency and Adolescent Stuttering**

Parameter	Estimate (Std Err)	t-Value
Intercept	34.86* (4.08)	8.54
Stutter	3.63* (2.01)	3.81
Anxiety	1.32 (1.09)	1.21
Smoking Days1	0.35* (0.03)	11.26
Depression1	0.01 (0.08)	0.17
Hispanic	-4.05* (1.31)	3.10
Black	-2.37* (1.17)	2.02
Male	0.79 (0.81)	0.98
Age1	-1.32* (0.23)	5.79
Other Tobacco Use1	0.03 (0.05)	0.50
Alcohol Consumption1	0.15* (0.16)	0.93
Parent Married	-0.74* (0.16)	4.78
Parent Education	-1.55 (1.70)	0.91
N=2935		
Dependent Variable: Smoking Days4		
* = Significant at 95%		
Estimates are weight using longitudinal sampling weights		

Even after controlling for previous smoking frequency and other potential confounding conditions, stuttering was significant associated with smoking frequency. PWS smoke, on average 3.63 (se=2.01) more days per month in adulthood than their fluent counterparts. While evidence suggests that PWS often experience social embarrassment and fear scrutiny in a broad range of social contexts, neither level of depression nor diagnosis of an anxiety disorder were significantly related to smoking frequency [45]. Research did find that stuttering is frequently associated with elevated high levels of anxiety, particularly in social or group settings, but it is highly likely that experiences of social or situational anxiety did not result in formal medical diagnosis of an anxiety disorder [46]. Add Health only included questions concerning the diagnosis of an anxiety disorder which showed no significant correlation with adult smoking frequency [47, 48].

## Discussion

This study showed that PWS smoke, on average, three to four days more per month than PWNS. Race/ethnicity, age, parental education and previous smoking frequency were also significantly related to adult smoking frequency, while emotional disorders and parental marital status were not deterministic. Findings are consistent with those of Ardila, et al. 1994 who showed a higher prevalence of smoking among PWS compared to PWNS. Similarly, Strong, et al. 2016 concluded that smoking and use of other substances were more prevalent among those with disabilities—classifying stuttering as a disability [49, 50]. McAllister, et al. (2013) focused on a similar sample of adolescents and young adults with stuttering, other speech difficulties and other developmental issues controlling for psychological and social distress using the malaise inventory. They concluded that respondents who stutter

were more likely to experience adverse outcomes in adulthood. Similar research suggests that adults with speech difficulties other than stuttering may also be vulnerable to social anxiety and phobia, which, if undiagnosed, could manifest in behaviors such as substance use or dependence [51-53].

Despite the limited literature concerning smoking among PWS, two notable studies—Iverach, et al. (2010) and Heelan, et al. (2016)—focused on smoking in PWS. However, differences in data structure, sampling method and empirical strategy resulted in different findings. For example, Iverach et al. (2010) focused on substance use disorders which, by definition, occur only in circumstances where substance use leads to health issues or problems at work, school, or home. Furthermore, Iverach, et al. (2010) used a sample of 92 persons seeking treatment for stuttering. As the authors concede, adults seeking treatment for stuttering may be less likely to self-medicate with substances than adults who stutter in the community as evidenced by their treatment-seeking behavior.

Similarly, differences between the sample utilized by Heelan, et al. (2016) and those respondents analyzed in this study likely contributed to different results. Heelan, et al. (2016) used a longitudinal panel of individuals born in March 1958 who were either born or immigrated to Great Britain. Smoking levels were compared at 16, 23, 33, 41, 46, 50 and 55 years of age using a binary dependent variable indicating smoking >10 cigarettes/day or >14 units/week. Use of a binary indicator can obscure sample heterogeneity by concealing frequency changes within the prescribed thresholds. Additionally, Heelan, et al.'s respondents were a 1950s born population of British nationals—a cultural and generationally different group that those studied here. Finally, Heelan, et al. included measurement taken over a 40-year period. This study focused adolescents and young adults—a much smaller age range than Heelan employed.

Despite evidence linking stuttering to both mental and physical difficulties among individuals of all ages and lifestyles, results vary by sample, method and type of analysis. Therefore, additional research is needed to thoroughly assess the smoking behavior of those with communication or behavioral disabilities [54-56].

**Limitations:** As with all forms of secondary data research, this study faces several limitations. First, all data was based on self-reported data and subject to misinformation, misinterpretation, bias, favorability stigma and non-compliance. Second, the Add Health sample cohort includes individuals who were 12 to 17 years old in the 1995-1996 school year when initially interviewed and 24 to 32 years old in 2008-2009 when re-interviewed. The five-year age gap could present a significant amount of unobserved respondent heterogeneity given the developmental milestones achieved during these pivotal years. While analysis accounted for use of alcohol and other tobacco products, Add Health does not provide any indicator of electronics cigarette or vapor inhalation use which is widely used among adolescents and young adults and likely correlated with cigarette use. Finally, studies have shown correlations between substance use and varying degrees of social anxiety. While the degree of social anxiety could explain the correlation observed between stutter and cigarette consumption,

this study can conjecture as to the causality due to lack of available data on respondent social anxiety.

## Conclusion

Longitudinal studies of adult smoking have shown that, behind smoking earlier in life, emotional difficulties in childhood/adolescence were the second most predominant predictor of adult smoking habits particularly among individuals with disabilities [57]. This study tests the correlation between communication difficulties and adult smoking using a large-scale longitudinal panel [58]. While previous analyses found no conclusive association between stuttering and cigarette use, lack of self-reported data, failure to account for co-occurring mood disorders and inappropriate empirical specification confounded results. This study found that PWS smoked, on average, three to four more days per month compared to PWNS. Consistent with recently literature, smoking was negatively related to age and minority race/ethnicity. Results were robust after controlling for previous smoking frequency, frequency of alcohol consumption, depression, anxiety and demographic and parental characteristics. While the mechanism underlying higher smoking frequency among PWS is outside the scope of this analysis, psychological and sociological studies suggest that social phobia, self-consciousness and embarrassment could explain the higher smoking frequency observed in conjunction with stuttering [59-61]. Furthermore, in certain context and situations, smoking can be used to promote social participations or as a form of social capital [62]. Despite causality, these findings are cause for concern for two reasons. First, smoking can exacerbate communication disorders making speaking more difficult [63]. Second, the known physical and mental health consequences of smoking can have lifelong consequences [64-68]. Therefore, speech language pathologists treating PWS should recognize this association and raise awareness when warranted.

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## References

1. Mineur YS, Picciotto MR (2009) Biological basis for the comorbidity between smoking and mood disorders. *Journal of dual diagnosis* 5: 122-130.
2. Moore D, Greer BG, Li L (1994) Alcohol and other substance use/abuse among people with disabilities. *Journal of Social Behavior and Personality* 9: 369.
3. el-Guebaly N, Currie S, Williams J, Wang J, Beck CA, et al. (2007) Association of mood, anxiety, and substance use disorders with occupational status and disability in a community sample. *Psychiatric Services* 58: 659-667.
4. Cargill BR, Emmons KM, Kahler CW, Brown RA (2001) Relationship among alcohol use, depression, smoking behavior, and motivation to quit smoking with hospitalized smokers. *Psychology of addictive behaviors* 15: 272.
5. Cerdá M, Sagdeo A, Galea S (2008) Comorbid forms of psychopathology: key patterns and future research directions. *Epidemiologic reviews* 30: 155-177.
6. Hall W, Degenhardt L, Teesson M (2009) Reprint of "Understanding comorbidity between substance use, anxiety and affective disorders: Broadening the research base". *Addictive Behaviors* 34: 795-799.
7. Kushner MG, Abrams K, Borchardt C (2000) The relationship between anxiety disorders and alcohol use disorders: a review of major perspectives and findings. *Clinical psychology review* 20: 149-171.
8. Bloodstein O, Bernstein-Ratner N (2008) *A Handbook on Stuttering*, 6th edn (New York, NY: Thomson-Delmar).
9. Treon M, Dempster L, Blaesing K (2006) MMPI-2/A assessed personality differences in people who do, and do not, stutter. *Social Behavior and Personality: an international journal* 34: 271-294.
10. Blumgart E, Tran Y, Craig A (2010) Social anxiety disorder in adults who stutter. *Depression and Anxiety* 27: 687-692.
11. Craig A, Tran Y (2006) Chronic and social anxiety in people who stutter. *Advances in Psychiatric Treatment* 12: 63-68.
12. Bray MA, Kehle TJ, Lawless KA, Theodore LA (2003) The relationship of self-efficacy and depression to stuttering. *American Journal of Speech-Language Pathology. Am J Speech Lang Pathol* 12: 425-431.
13. Foundas AL, Bollich AM, Corey DM, Hurley M, Heilman KM (2001) Anomalous anatomy of speech-language areas in adults with persistent developmental stuttering. *Neurology* 57: 207-215.
14. Iverach L, Jones M, O'Brian S, Block S, Lincoln M, et al. (2010) Mood and substance use disorders among adults seeking speech treatment for stuttering. *Journal of Speech, Language, and Hearing Research J Speech Lang Hear Res* 53: 1178-1190.
15. Frigerio-Domingues C, Drayna D (2017) Genetic contributions to stuttering: the current evidence. *Molecular genetics & genomic medicine* 5: 95-102.
16. Choi D, Conture EG, Walden TA, Lambert WE, Tumanova V (2013) Behavioral inhibition and childhood stuttering. *Journal of Fluency Disorders* 38: 171-183.
17. Jones RM, Conture EG, Walden TA (2014) Emotional reactivity and regulation associated with fluent and stuttered utterances of preschool-age children who stutter. *Journal of Communication Disorders* 48: 38-51.
18. Goodwin RD, Jacobi F, Thefeld W (2003) Mental disorders and asthma in the community. *Archives of General Psychiatry* 60: 1125-1130.
19. Patten SB, Beck CA, Williams JVA, Barbui C, Metz LM (2003) Major depression in multiple sclerosis: A population-based perspective. *Neurology* 61: 1524-1527.
20. Swinkels WAM, Kuyk J, de Graaf EH, van Dyck R, Spinhoven P (2001) Prevalence of psychopathology in Dutch epilepsy inpatients: A comparative study. *Epilepsy and Behavior* 2: 441-447.
21. Wang JL, Reimer MA, Metz LM, Patten SB (2000) Major depression and quality of life in individuals with multiple sclerosis. *International Journal of Psychiatry in Medicine* 30: 309-317.
22. Harden CL, Maroof DA, Nikolov B, Fowler K, Sperling M, et al. (2007) The effect of seizure severity on quality of life in epilepsy. *Epilepsy and Behavior* 11: 208-211.
23. Bolton J, Cox B, Clara I, Sareen J (2006) Use of alcohol and drugs to self-medicate anxiety disorders in a nationally representative sample. *Journal of Nervous and Mental Disease*

- 194: 818-825.
24. Stewart SH, Morris E, Mellings T, Komar J (2006) Relations of social anxiety variables to drinking motives, drinking quantity and frequency, and alcohol-related problems in undergraduates. *Journal of Mental Health* 15: 671-682.
  25. Ardila A, Bateman J, Niño CR, Pulido E, Rivera DB, et al. (1994) An epidemiologic study of stuttering. *Journal of Communication Disorders* 27: 37-48.
  26. Austin A, Herrick H, Proescholdbell S, Simmons J (2016) Disability and exposure to high levels of adverse childhood experiences: Effect on health and risk behavior. *North Carolina Medical Journal* 77: 30-36.
  27. Craig A, Hancock K, Tran Y, Craig M (2003) Anxiety levels in people who stutter. *Journal of Speech, Language, and Hearing Research J Speech Lang Hear Res* 46: 1197-1206.
  28. Craig A (1990) An investigation into the relationship between anxiety and stuttering. *Journal of Speech and Hearing Disorders* 55: 290-294.
  29. Turnbaugh KR, Guitart B, Hoffman PR (1979) Speech clinicians' attribution of personality traits as a function of stuttering severity. *Journal of Speech and Hearing Research* 22: 37-45.
  30. Hatziandreu EJ, Pierce JP, Fiore MC, Grise V, Novotny TE, et al. (1989) The reliability of self-reported cigarette consumption in the United States. *American Journal of Public Health* 79: 1020-1023.
  31. Klesges RC, Debon M, Ray JW (1995) Are self-reports of smoking rate biased? Evidence from the Second National Health and Nutrition Examination Survey. *Journal of clinical epidemiology* 48: 1225-1233.
  32. Caraballo RS, Giovino GA, Pechacek TF (2004) Self-reported cigarette smoking vs. serum cotinine among US adolescents. *Nicotine & Tobacco Research* 6: 19-25.
  33. Dolcini MM, Adler NE, Lee P, Bauman KE (2003) An assessment of the validity of adolescent self-reported smoking using three biological indicators. *Nicotine & tobacco research* 5: 473-483.
  34. Fowler Jr FJ, Stringfellow VL (2001) Learning from experience: Estimating teen use of alcohol, cigarettes, and marijuana from three survey protocols. *Journal of Drug Issues* 31: 643-664.
  35. Brenner DJ, Miller RC, Huang YHEJ, Hall EJ (1995) The biological effectiveness of radon-progeny alpha particles. III. Quality factors. *Radiation research* 142: 61-69.
  36. Sugarman R (2001) *Regulating tobacco*. Oxford University Press on Demand.
  37. Jain VM, Karibasappa GN, Dodamani AS, Mali GV (2017) Estimating the carbohydrate content of various forms of tobacco by phenol-sulfuric acid method. *Journal of education and health promotion* 2017: 6.
  38. Drobles DJ (2002) Concurrent alcohol and tobacco dependence: mechanisms and treatment. *Alcohol Research & Health* 26: 136.
  39. Moss HB, Chen CM, Yi HY (2014) Early adolescent patterns of alcohol, cigarettes, and marijuana polysubstance use and young adult substance use outcomes in a nationally representative sample. *Drug and alcohol dependence* 136: 51-62.
  40. Nelson SE, Van Ryzin MJ, Dishion TJ (2015) Alcohol, marijuana, and tobacco use trajectories from age 12 to 24 years: Demographic correlates and young adult substance use problems. *Development and psychopathology* 27: 253-277.
  41. Tomczyk S, Isensee B, Hanewinkel R (2016) Latent classes of polysubstance use among adolescents—a systematic review. *Drug and Alcohol Dependence* 160: 12-29.
  42. Chiolero A, Wietlisbach V, Ruffieux C, Paccaud F, Cornuz J (2006) Clustering of risk behaviors with cigarette consumption: a population-based survey. *Preventive medicine* 42: 348-353.
  43. Arrazola RA, Singh T, Corey CG (2015) Tobacco Use Among Middle and High School Students—United States, 2011–2014. *Morbidity and Mortality Weekly Report* 64: 381-385.
  44. Lucherini M, Rooke C, Amos A (2019) “They’re thinking, well it’s not as bad, I probably won’t get addicted to that. But it’s still got the nicotine in it, so...”: Maturity, Control, and Socializing: Negotiating Identities in Relation to Smoking and Vaping—A Qualitative Study of Young Adults in Scotland. *Nicotine and Tobacco Research* 21: 81-87.
  45. Craig A, Blumgart E, Tran Y (2009) The impact of stuttering on the quality of life in adults who stutter. *Journal of fluency disorders* 34: 61-71.
  46. Ezrati-Vinacour R, Levin I (2004) The relationship between anxiety and stuttering: A multidimensional approach. *Journal of fluency disorders* 29: 135-148.
  47. Johnson JG, Cohen P, Pine DS, Klein DF, Kasen S, et al. (2000) Association between cigarette smoking and anxiety disorders during adolescence and early adulthood. *Jama* 284: 2348-2351.
  48. McCabe RE, Chudzik SM, Antony MM, Young L, Swinson RP, et al. (2004) Smoking behaviors across anxiety disorders. *Journal of anxiety disorders* 18: 7-18.
  49. Strong C, Juon HS, Ensminger ME (2016) Effect of adolescent cigarette smoking on adulthood substance use and abuse: the mediating role of educational attainment. *Substance use & misuse* 51: 141-154.
  50. McAllister J, Collier J, Shepstone L (2013) The impact of adolescent stuttering and other speech problems on psychological well-being in adulthood: evidence from a birth cohort study. *International journal of language & communication disorders* 48: 458-468.
  51. Conti-Ramsden G, Botting N (2004) Social difficulties and victimization in children with SLI at 11 years of age. *Journal of Speech, Language, and Hearing Research* 47: 145-161.
  52. Campbell TF, Dollaghan CA, Rockette HE, Paradise JL, Feldman HM, et al. (2003) Risk factors for speech delay of unknown origin in 3-year-old children. *Child Development* 74: 346-357.
  53. Fujiki M, Brinton B, Todd C (1996) Social skills of children with specific language impairment. *Language, Speech and Hearing in Schools* 25: 195-202.
  54. Klijs B, Mackenbach JP, Kunst AE (2011) Obesity, smoking, alcohol consumption and years lived with disability: A Sullivan life table approach. *BMC Public Health* 11: 378.
  55. Heydarpour P, Manouchehrinia A, Beiki O, Mousavi SE, Abdolalizadeh A, et al. (2018) Smoking and worsening disability in multiple sclerosis: A meta-analysis. *Acta Neurologica Scandinavica* 138: 62-69.
  56. Kahraman T, Ozdogar AT, Abasiyanik Z, Ozakbas S (2020) Associations between smoking and walking, fatigue,

- depression, and health-related quality of life in persons with multiple sclerosis. *Acta Neurologica Belgica* 2020: 1-8.
57. Slopen N, Kontos EZ, Ryff CD, Ayanian JZ, Albert MA, et al. (2013) Psychosocial stress and cigarette smoking persistence, cessation, and relapse over 9–10 years: a prospective study of middle-aged adults in the United States. *Cancer Causes & Control* 24: 1849-1863.
58. Yeoman K, Safranek T, Buss B, Cadwell BL, Mannino D (2013) Peer reviewed: adverse childhood experiences and adult smoking, Nebraska, 2011. *Preventing chronic disease* 10.
59. Eichorn N, Pirutinsky S, Marton K (2019) Effects of different attention tasks on concurrent speech in adults who stutter and fluent controls. *Journal of fluency disorders* 61: 105714.
60. Tichenor S, Yaruss JS (2020) Repetitive Negative Thinking, Temperament, and Adverse Impact in Adults Who Stutter. *American Journal of Speech-Language Pathology* 29: 201-215.
61. Jamal M, Does AWVD, Penninx BW, Cuijpers P (2011) Age at smoking onset and the onset of depression and anxiety disorders. *Nicotine & Tobacco Research* 13: 809-819.
62. Lindström M, Moghaddassi M, Bolin K, Lindgren B, Merlo J (2003) Social participation, social capital and daily tobacco smoking: a population-based multilevel analysis in Malmö, Sweden. *Scandinavian Journal of Public Health* 31: 444-450.
63. Pourcain BS, Mandy WP, Heron J, Golding J, Smith GD, et al. (2011) Links between co-occurring social-communication and hyperactive-inattentive trait trajectories. *Journal of the American Academy of Child & Adolescent Psychiatry* 50: 892-902.
64. West R (2017) Tobacco smoking: Health impact, prevalence, correlates and interventions. *Psychology & health* 32: 1018-1036.
65. Cheng YC, Rostron BL, Day HR, Stanton CA, Hull LC, et al. (2017) Patterns of use of smokeless tobacco in US adults, 2013–2014. *American journal of public health* 107: 1508-1514.
66. Craig AR, Hancock K (1995) Self-reported factors related to relapse following treatment for stuttering. *Australian Journal of Human Communication Disorders* 23: 48-60.
67. Lai HMX, Cleary M, Sitharthan T, Hunt GE (2015) Prevalence of comorbid substance use, anxiety and mood disorders in epidemiological surveys, 1990–2014: A systematic review and meta-analysis. *Drug and alcohol dependence* 154: 1-13.
68. Lampe L, Slade T, Issakidis C, Andrews G (2003) Social phobia in the Australian national survey of mental health and well-being (NSMHWB). *Psychological Medicine* 33: 637.

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