



THE MAHA REPORT

MAKING OUR CHILDREN
HEALTHY AGAIN
(Assessment)

The President's Make America Healthy Again Commission

THE WHITE HOUSE
WASHINGTON

Contents

Purpose of This Assessment	5
Introduction	7
The Chronic Disease Crisis: A Generation at Risk	9
What is Driving the Increase in Childhood Chronic Disease?	16
Corporate Capture and the Revolving Door	18
Section 1. The Shift to Ultra-Processed Foods	20
A Closer Look at Ultra-Processed Foods	21
The Impact of Ultra-Processed Foods and the Vital Role of Whole Foods in Children’s Health	25
The Driving Forces Behind American Children’s Food Crisis	27
Government Programs Compounding the Issue	31
Section 2. The Cumulative Load of Chemicals in our Environment	35
Chemical Exposures	35
Why Children Are Uniquely Vulnerable to Environmental Chemicals	37
Corporate Influence	44
Scientific Research.....	44
Laws and Regulations.....	45
Section 3. The Crisis of Childhood Behavior in the Digital Age	46
The Decline of Physical Activity	46
Psychosocial Factors and Mental Health Crisis	47
Section 4. The Overmedicalization of Our Kids	55
American Children are on Too Much Medicine—A Recent and Emerging Crisis	55
Growth of the Childhood Vaccine Schedule	59
From Bench to Bedside: Mechanisms of Corporate Capture	63
Next Steps – Supporting Gold-Standard Scientific Research and Developing a Comprehensive Strategy	

DRAFT-DELIBERATIVE-PREDECISIONAL

Establishing the President’s Make America Healthy Again Commission

Executive Order 14212 of February 13, 2025

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Purpose of This Assessment

This report—*Make Our Children Healthy Again: Assessment*—is a call to action. It presents the stark reality of American children’s declining health, backed by compelling data and long-term trends. More importantly, it seeks to unpack the potential dietary, behavioral, medical, and environmental drivers behind this crisis. By examining the root causes of deteriorating child health, this assessment establishes a clear, evidence-based foundation for the policy interventions, institutional reforms, and societal shifts needed to reverse course.

To turn the tide and better protect our children, the United States must act decisively. During this administration, we will begin reversing the childhood chronic disease crisis by confronting its root causes—not just its symptoms. This means pursuing truth, embracing science, and enacting pro-growth policies and innovations to restore children’s health. Today’s children are tomorrow’s workforce, caregivers, and leaders—we can no longer afford to ignore this crisis.

After a century of costly and ineffective approaches, the federal government will lead a coordinated transformation of our food, health, and scientific systems. This strategic realignment will ensure that all Americans—today and in the future—live longer, healthier lives, supported by systems that prioritize prevention, wellbeing, and resilience.

But real transformation requires more than vision—it requires clarity. Before we act, we must fully understand the scope of the crisis, the conditions that created it, and the mechanisms through which it continues to grow. Without this foundation, interventions risk being reactive, fragmented, or ineffective.

To Make America’s Children Healthy Again, we must begin with a shared understanding of the magnitude of crisis and subsequently what’s likely driving it. This assessment provides that foundation—grounding future efforts in a common scientific basis that identifies four potential drivers behind the rise in childhood chronic disease that present the clearest opportunities for progress:

- **Poor Diet:** The American diet has shifted dramatically toward ultra-processed foods (UPFs), leading to nutrient depletion, increased caloric intake, and exposure to harmful additives. Nearly 70% of children’s calories now come from UPFs, contributing to obesity, diabetes, and other chronic conditions.
- **Aggregation of Environmental Chemicals:** Children are exposed to an increasing number of synthetic chemicals, some of which have been linked to developmental issues and chronic disease. The current regulatory framework should be continually evaluated to ensure that chemicals and other exposures do not interact together to pose a threat to the health of our children.
- **Lack of Physical Activity and Chronic Stress:** American children are experiencing unprecedented levels of inactivity, screen use, sleep deprivation, and chronic stress. These factors significantly contribute to the rise in chronic diseases and mental health challenges.
- **Overmedicalization:** There is a concerning trend of overprescribing medications to children, often driven by conflicts of interest in medical research, regulation, and

practice. This has led to unnecessary treatments and long-term health risks.

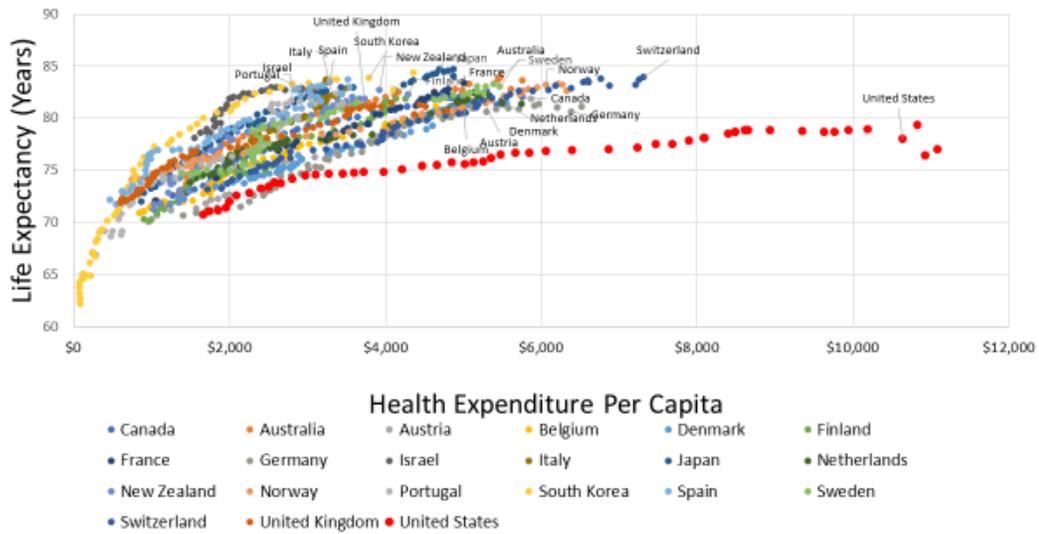
By examining each of these drivers, this assessment equips MAHA Commission stakeholders and partners with the facts needed to identify where and how policy interventions will likely have the most impact.

The sections that follow analyze the evidence, spotlight gaps, and map the terrain—laying the groundwork for coordinated, high-impact solutions.

Introduction

The health of American children is in crisis. Despite outspending peer nations by more than double per capita on healthcare, the United States ranks last in life expectancy among high-income countries – and suffers higher rates of obesity, heart disease, and diabetes.¹² Today’s children are the sickest generation in American history in terms of chronic disease and these preventable trends continue to worsen each year,³ posing a threat to our nation’s health, economy, and military readiness.

Life Expectancy and Health Expenditure Per Capita By Country (1970-2023)



Data Source: Our World in Data



In 2023 alone, national health expenditures were projected to grow by 4.4%,⁴ outpacing real U.S. GDP growth of just 2.5%.⁵ Yet despite the ever-growing financial investment in the U.S. healthcare system, Americans have little to show for it.

¹ Wager, E., Telesford, I., Rakshit, S., Kurani, N., & Cox, C. (2024, October 9). *How does the quality of the U.S. health system compare to other countries?* Peterson-KFF Health System Tracker. <https://www.healthsystemtracker.org/chart-collection/quality-u-s-healthcare-system-compare-countries/>.

² Tikkanen, R., & Abrams, M. K. (2020, January 30). *U.S. health care from a global perspective, 2019: Higher spending, worse outcomes?* The Commonwealth Fund. [https://doi.org/10.26099/7avy-fc29:contentReference\[oaicite:3\]{index=3}](https://doi.org/10.26099/7avy-fc29:contentReference[oaicite:3]{index=3})

³ Wisk, L. E., & Sharma, N. (2025). Prevalence and Trends in Pediatric-Onset Chronic Conditions in the United States, 1999-2018. *Academic Pediatrics*, 102810.

⁴ Centers for Medicare & Medicaid Services. (2024). National health expenditure (NHE) fact sheet. U.S. Department of Health and Human Services. <https://www.cms.gov/data-research/statistics-trends-and-reports/national-health-expenditure-data/nhe-fact-sheet>.

⁵ Bureau of Economic Analysis. (2024, February 28). Gross domestic product, fourth quarter and year 2023 (second estimate). *U.S. Bureau of Economic Analysis*. <https://www.bea.gov/news/2024/gross-domestic-product-fourth-quarter-and-year-2023-second-estimate>.

Over the past century, U.S. GDP has grown over 30,000%.⁶ **Today, American farmers feed the world, American companies lead the world, and American energy powers the world.** This economic growth has been a force for technology, health and agriculture innovations that have increased U.S. life expectancy by more than 30 years compared to 1900. But **the same forces of modernization and industrialization have also introduced threats to our health and revealed growing inefficiencies in our ability to respond to them.**

Over the past two generations, we have failed to address the alarming rise in childhood chronic disease. Federal and state policy have sometimes been guided more by corporate profit than the public interest. Many of our leading scientific and medical institutions have grown complacent, defaulting to symptom management rather than harnessing gold-standard science to prevent and reverse root causes. The U.S. food and agricultural systems have embraced ultra-processed ingredients and synthetic chemicals. Meanwhile, our healthcare system has over-medicalized children, frequently masking and compounding underlying issues. Coupled with rising screen addiction and sedentary lifestyles, these factors are converging to produce a chronically stressed, sick, and isolated generation. This crisis is undermining national resilience and competitiveness.

The purpose of this report is radical transparency about our current state to spur a conversation about how we can build a world – together – where:

- American farmers are put at the center of how we think about health.
- The American healthcare system thrives when disease is prevented and reversed, not just “managed” in a sick-care system.
- The Great American Comeback of energy dominance powers AI technology that will develop new tools and push the frontiers of science to help us better understand how to measure and reverse chronic disease.
- The next ten years see a revolution in living standards and prosperity, while we understand how to better manage the increased threats to our children’s health that come from industrialization.

America will begin reversing the childhood chronic disease crisis during this administration by getting to the truth of why we are getting sick and spurring pro-growth policies and innovations to reverse these trends.

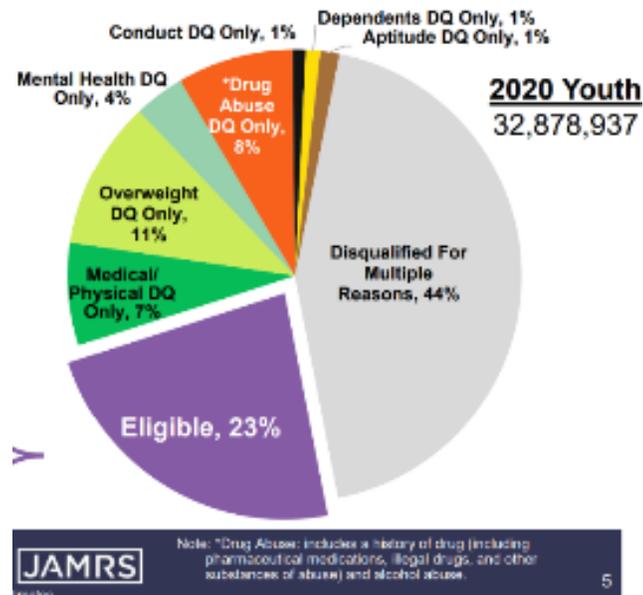
These concerning trends persist despite decades of federal investment in nutrition standards, physical activity campaigns, chemical risk assessments, and clinical quality initiatives. Still, childhood chronic disease continues to rise. To Make America’s Children Healthy Again, we must go further. This assessment begins with a shared understanding of the crisis.

⁶ Federal Reserve Bank of St. Louis. (n.d.). *Gross Domestic Product [GDP]*. FRED, Federal Reserve Economic Data. Retrieved May 16, 2025, from <https://fred.stlouisfed.org/series/GDP>.

The Chronic Disease Crisis: A Generation at Risk

America’s children are facing an unprecedented health crisis. Over 40% of the roughly 73 million children (aged 0-17) in the United States have at least one chronic health condition, according to the CDC, such as asthma, allergies, obesity, autoimmune diseases, or behavioral disorders.⁷ Although estimates vary depending on the conditions included, all studies show an alarming increase over time.^{8 9}

This chronic disease crisis has far-reaching consequences: Over 75% of American youth (aged 17-24) are ineligible for military service—primarily due to obesity, poor physical fitness, and/or mental health challenges.¹⁰



Here, we provide a brief overview of the problem – the main epidemiological trends related to childhood chronic disease in America, including obesity, diabetes, neurodevelopmental disorders, cancer, mental health, autoimmune disorders, and allergies.

⁷ National Survey of Children’s Health. (n.d.). *NSCH 2018-19: Number of current or lifelong health conditions, nationwide, age in 3 groups*. *ChildHealthData.org*. Retrieved February 24, 2021, from <https://www.childhealthdata.org>.

⁸ Wisk, L. E., & Sharma, N. (2025). Prevalence and Trends in Pediatric-Onset Chronic Conditions in the United States, 1999–2018. *Academic Pediatrics, 25*(4), 1028-10.

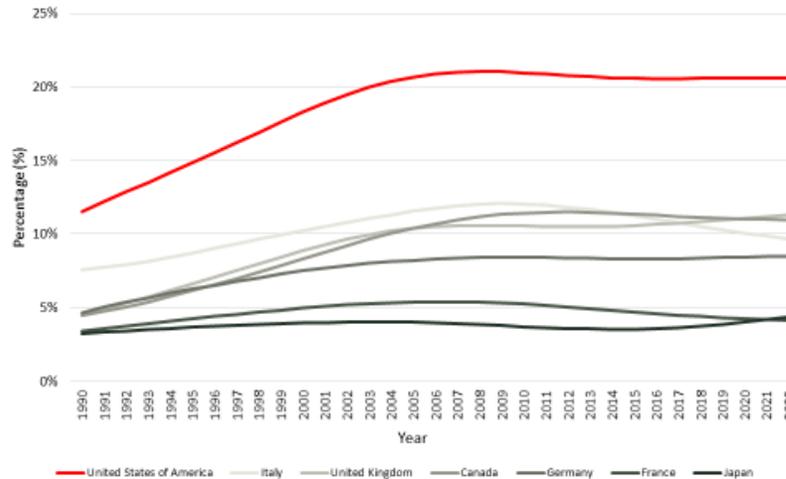
⁹ Bethell, C. D., Kogan, M. D., Strickland, B. B., Schor, E. L., Robertson, J., & Newacheck, P. W. (2011). A national and state profile of leading health problems and health care quality for US children: key insurance disparities and across-state variations. *Academic Pediatrics, 11*(3), S22-S33.

¹⁰ Novelly, T. (2022, September 28). New Pentagon study shows 77% of young Americans are ineligible for military service. *Military.com*. <https://www.military.com/daily-news/2022/09/28/new-pentagon-study-shows-77-of-young-americans-are-ineligible-military-service.html>.

Childhood Obesity is a Worsening Health Crisis

- Today in the U.S. more than 1 in 5 children over 6 years old are obese.¹¹ This is a more than 270% increase compared to the 1970s, when less than one in twenty children over 6 were obese.¹²
 - Rates of severe obesity increased by over 500% in the same period.
- The U.S. obesity rate is, on average, more than double that of its G7 peers.

Prevalence of Obesity Amongst G7 Countries, Ages 5-19 (1990-2022)



Data Source: World Health Organization 2025 data.who.int, Prevalence of Obesity Among Children and Adolescents Aged 5 to 19 Years, 1990-2022

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- Approximately 80% of obese teens will become obese adults obese into adulthood.¹³
- Around 70% of youth with obesity already have at least one risk factor for heart disease.¹⁴

¹¹ National Center for Health Statistics. (2021, January 29). *Prevalence of overweight, obesity, and severe obesity among children and adolescents aged 2–19 years: United States, 1963–1965 through 2017–2018*. Centers for Disease Control and Prevention (CDC).

¹² Fryar, C. D., Carroll, M. D., & Afful, J. (2020). Prevalence of overweight, obesity, and severe obesity among children and adolescents aged 2–19 years: United States, 1963–1965 through 2017–2018. NCHS Health E-Stats. <https://www.cdc.gov/nchs/data/hestat/obesity-child-17-18/obesity-child.htm>.

¹³ Simmonds, M., Llewellyn, A., Owen, C. G., & Woolacott, N. (2016). Predicting adult obesity from childhood obesity: a systematic review and meta-analysis. *Obesity reviews: an official journal of the International Association for the Study of Obesity*, 17(2), 95–107. <https://doi.org/10.1111/obr.12334>.

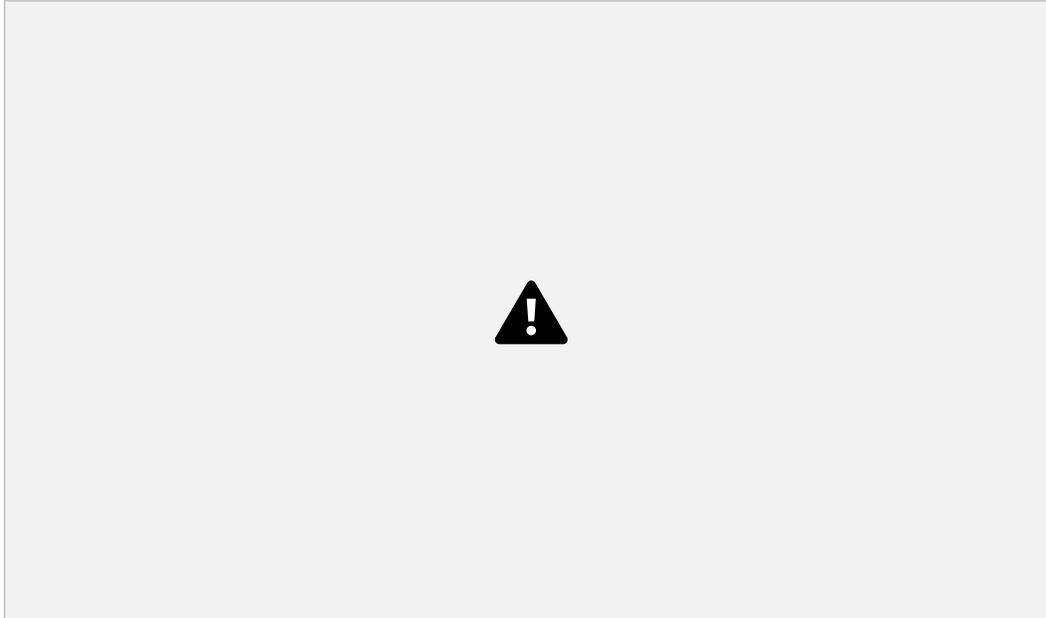
¹⁴ Freedman, D. S., Mei, Z., Srinivasan, S. R., Berenson, G. S., & Dietz, W. H. (2007). Cardiovascular risk factors and excess adiposity among overweight children and adolescents: the Bogalusa Heart Study. *The Journal of pediatrics*, 150(1), 12–17.e2. <https://doi.org/10.1016/j.jpeds.2006.08.042>.

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Diabetes is Increasing among American Youth

- In the 1980s, there were very few cases of type 2 diabetes in children, and incidence rates for both type 1 and type 2 diabetes have consistently increased the past 2 decades.^{15 16}
- Today, over 350,000 children have been diagnosed with diabetes (3.5 per 1,000).^{17 18} One study estimated a 65% increase in type 1 diabetes and a more than 600% increase in type 2 diabetes by 2060 if current trends continue.¹⁹
- Prevalence of pre-diabetes (elevated blood sugar levels but not high enough to be classified as diabetes) in teens is more than one in four teens, having more than doubled over the last 2 decades.^{20 21}



¹⁵ Cizza, G., Brown, R. J., & Rother, K. I. (2012). Rising incidence and challenges of childhood diabetes. A mini review. *Journal of endocrinological investigation*, 35, 541-546.

¹⁶ Divers, J., Mayer-Davis, E. J., Lawrence, J. M., et al. (2020). Trends in incidence of type 1 and type 2 diabetes among youths — Selected counties and Indian reservations, United States, 2002–2015. *MMWR Morbidity and Mortality Weekly Report*, 69(6), 161–165. <https://doi.org/10.15585/mmwr.mm6906a3>.

¹⁷ Centers for Disease Control and Prevention. (2023, November 29). National diabetes statistics report: Estimates of diabetes and its burden in the United States. <https://stacks.cdc.gov/view/cdc/148231>.

¹⁸ Fang, M., Wang, D., & Selvin, E. (2024). Prevalence of type 1 diabetes among US children and adults by age, sex, race, and ethnicity. *JAMA*, 331(16), 1411-1413.

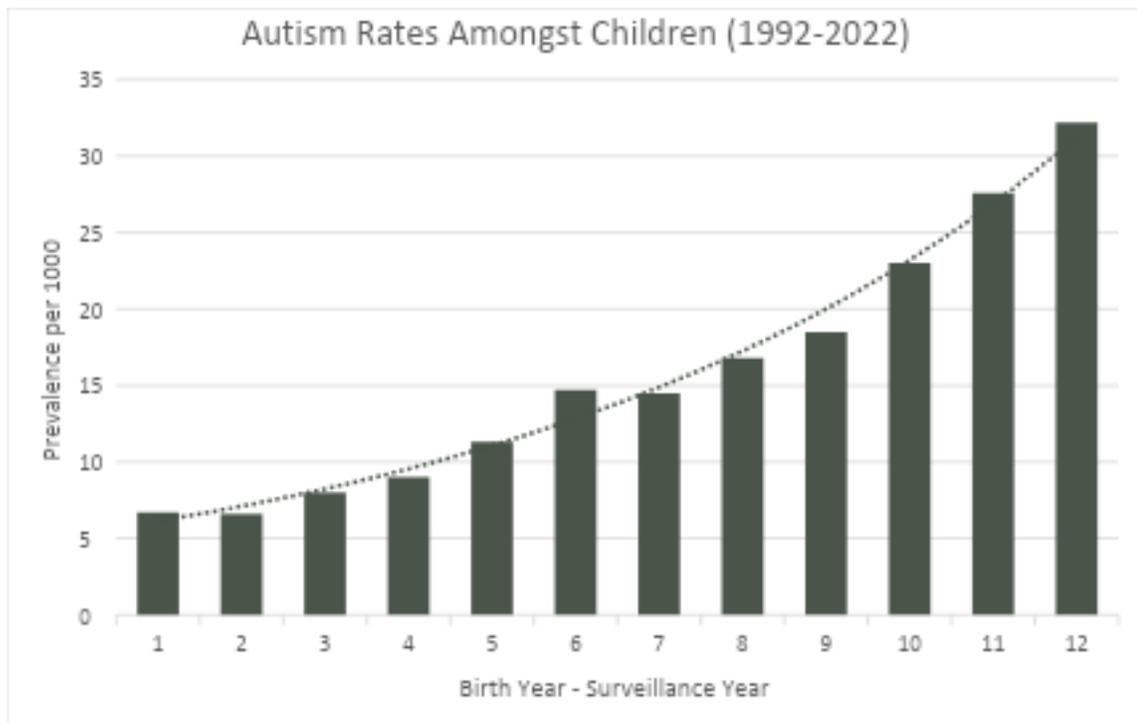
¹⁹ Tönnies, T., Brinks, R., Isom, S., Dabelea, D., Divers, J., Mayer-Davis, E. J., ... & Imperatore, G. (2023). Projections of type 1 and type 2 diabetes burden in the US population aged < 20 years through 2060: the SEARCH for diabetes in youth study. *Diabetes Care*, 46(2), 313-320.

²⁰ Liu, J., Li, Y., Zhang, D., Yi, S. S., & Liu, J. (2022). Trends in prediabetes among youths in the US from 1999 through 2018. *JAMA pediatrics*, 176(6), 608-611.

²¹ Andes, L. J., Cheng, Y. J., Rolka, D. B., Gregg, E. W., & Imperatore, G. (2020). Prevalence of prediabetes among adolescents and young adults in the United States, 2005-2016. *JAMA pediatrics*, 174(2), e194498-e194498.

Rates of Neurodevelopmental Disorders are Increasing

- Autism spectrum disorder impacts 1 in 31 children by age 8 and is estimated to be 3.4 times more common in boys than girls, according to the CDC.²² Rates also vary significantly by state – from 9.7 per 1,000 in Texas (Laredo) to 53 per 1,000 in California.²³ In 1960, autism occurred in less than 1 in 10,000 children.²⁴ ²⁵ In the 1980s, autism occurred at rates of 1 to 4 out of 10,000 children.²⁶



- Over 10% of children have been diagnosed with Attention Deficit Hyperactivity Disorder (ADHD), with approximately 1 million more children diagnosed in 2022 compared to 2016.²⁷
- Rates of other neurodevelopmental disorders and learning impairments are also

²² Centers for Disease Control and Prevention. (2024). Autism data & research. National Center on Birth Defects and Developmental Disabilities. <https://www.cdc.gov/autism/data-research/index.html>.

²³ Shaw, K. A., Williams, S., Patrick, M. E., et al. (2025). 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. *MMWR Surveillance Summaries*, 74(SS-2), 1–22. <https://doi.org/10.15585/mmwr.ss7402a1>.

²⁴ Talantseva, O. I., Romanova, R. S., Shurdova, E. M., Dolgorukova, T. A., Sologub, P. S., Titova, O. S., ... & Grigorenko, E. L. (2023). The global prevalence of autism spectrum disorder: A three-level meta-analysis. *Frontiers in psychiatry*, 14, 1071181.

²⁵ Treffert D. A. (1970). Epidemiology of infantile autism. *Archives of general psychiatry*, 22(5), 431–438. <https://doi.org/10.1001/archpsyc.1970.01740290047006>.

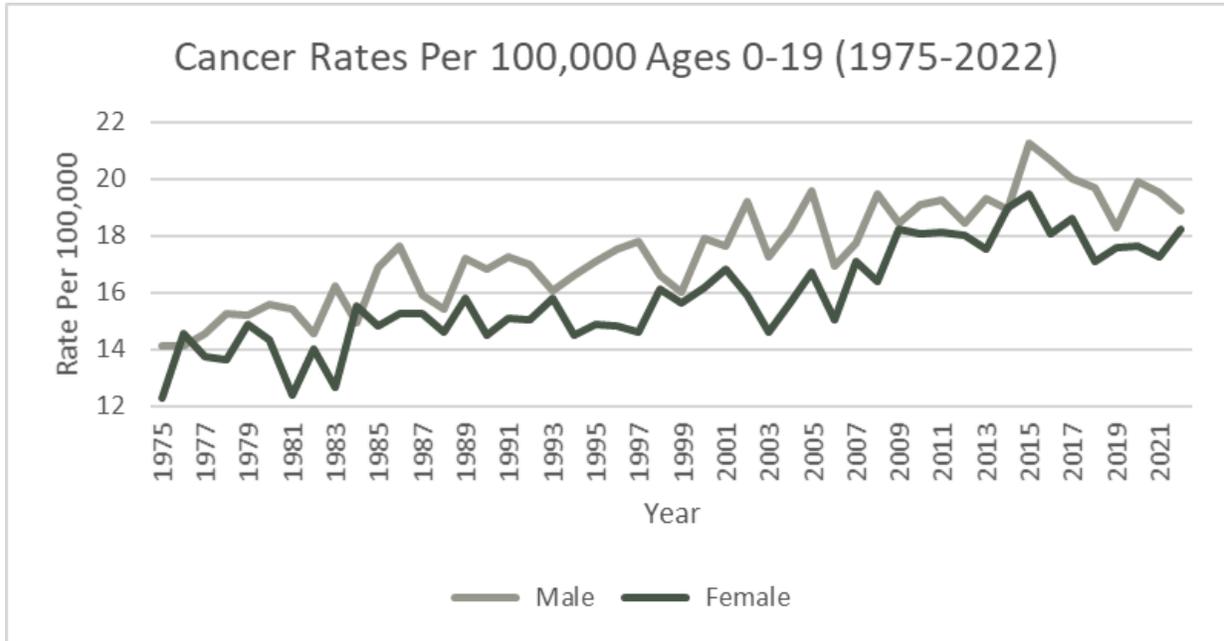
²⁶ <https://www.cdc.gov/mmwr/preview/mmwrhtml/ss5601a1.htm>.

²⁷ Danielson, M. L., Claussen, A. H., Bitsko, R. H., Katz, S. M., Newsome, K., Blumberg, S. J., ... & Ghandour, R. (2024). ADHD prevalence among US children and adolescents in 2022: diagnosis, severity, co-occurring disorders, and treatment. *Journal of Clinical Child & Adolescent Psychology*, 53(3), 343-360.

increasing.²⁸ ²⁹ Over 7.5 million K-12 students received special education services in 2023-24.³⁰

Childhood Cancer Incidence Has Risen Dramatically

- Childhood cancer incidence has risen over 40% since 1975..³¹



²⁸ Zablotsky, B., Ng, A. E., Black, L. I., & Blumberg, S. J. (2023, July 13). Diagnosed developmental disabilities in children aged 3–17 years: United States, 2019–2021 (NCHS Data Brief No. 473). Centers for Disease Control and Prevention. <https://stacks.cdc.gov/view/cdc/129520>.

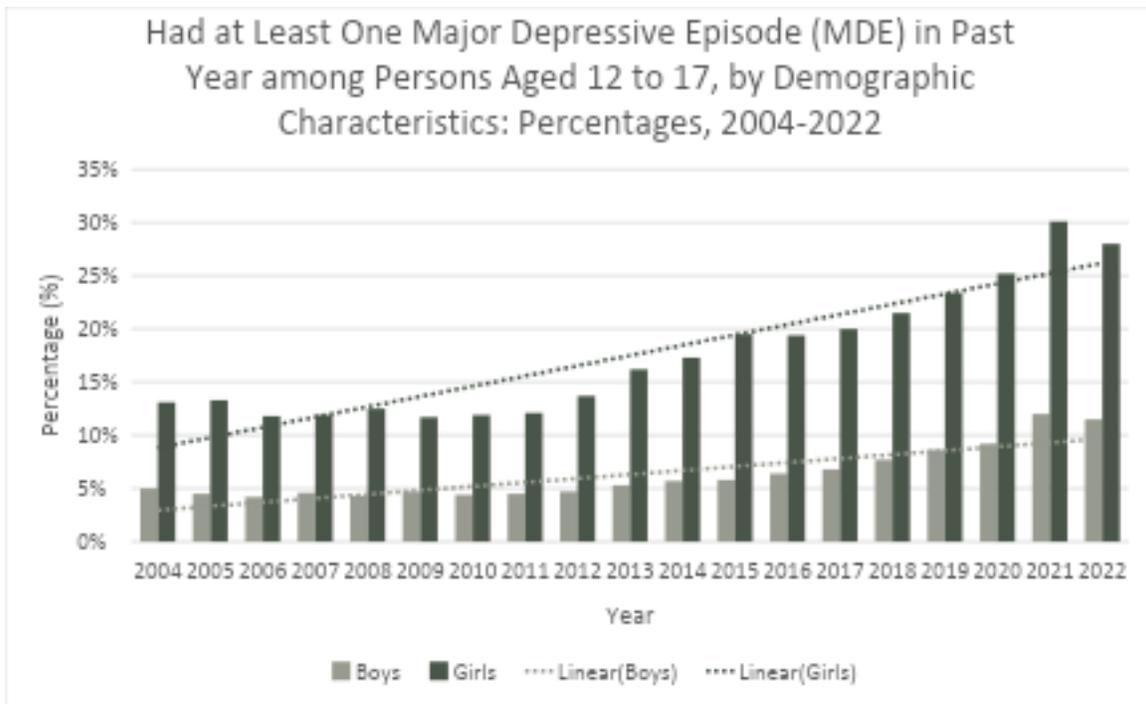
²⁹ Zablotsky, B., Black, L. I., Maenner, M. J., Schieve, L. A., Danielson, M. L., Bitsko, R. H., ... & Boyle, C. A. (2019). Prevalence and trends of developmental disabilities among children in the United States: 2009–2017. *Pediatrics*, 144(4).

³⁰ National Center for Education Statistics. (2024). *Students with disabilities*. Condition of Education. U.S. Department of Education, Institute of Education Sciences. <https://nces.ed.gov/programs/coe/indicator/cgg>.

³¹ National Cancer Institute, SEER-8 Registries, 1975-2022.

American Youth face a Mental Health Crisis

- Teenage depression rates nearly doubled from 2009 to 2019, and with more than 1 in 4 teenage girls in 2022 reporting a major depressive episode in the past year.^{32 33}
- Three million high school students seriously considered suicide in 2023.³⁴
- Suicide deaths among 10- to 24-year-olds increased by 62% from 2007 to 2021, and suicide is now the second leading cause of death in teens aged 15-19.³⁵
- The prevalence of diagnosed anxiety increased by 61% among adolescents between 2016 and 2023.³⁶
- Over 57% of girls report feelings of sadness and hopelessness, while suicidal ideation in teen girls has surged by 60% since 2010.³⁷



³² Substance Abuse and Mental Health Services Administration. (2024). *National Survey on Drug Use and Health (NSDUH)*. U.S. Department of Health and Human Services. Retrieved May 16, 2025, from <https://www.samhsa.gov/data/sites/default/files/reports/rpt53159/2023-nsduh-pop-slides-female.pdf>.

³³ Daly, M. (2022). Prevalence of depression among adolescents in the U.S. from 2009 to 2019: Analysis of trends by sex, race/ethnicity, and income. *Journal of Adolescent Health, 70*(3), 445–452. <https://doi.org/10.1016/j.jadohealth.2021.08.026>.

³⁴ Centers for Disease Control and Prevention. (2024). *Youth risk behavior survey data summary & trends report: 2013–2023*. U.S. Department of Health and Human Services. Retrieved May 16, 2025.

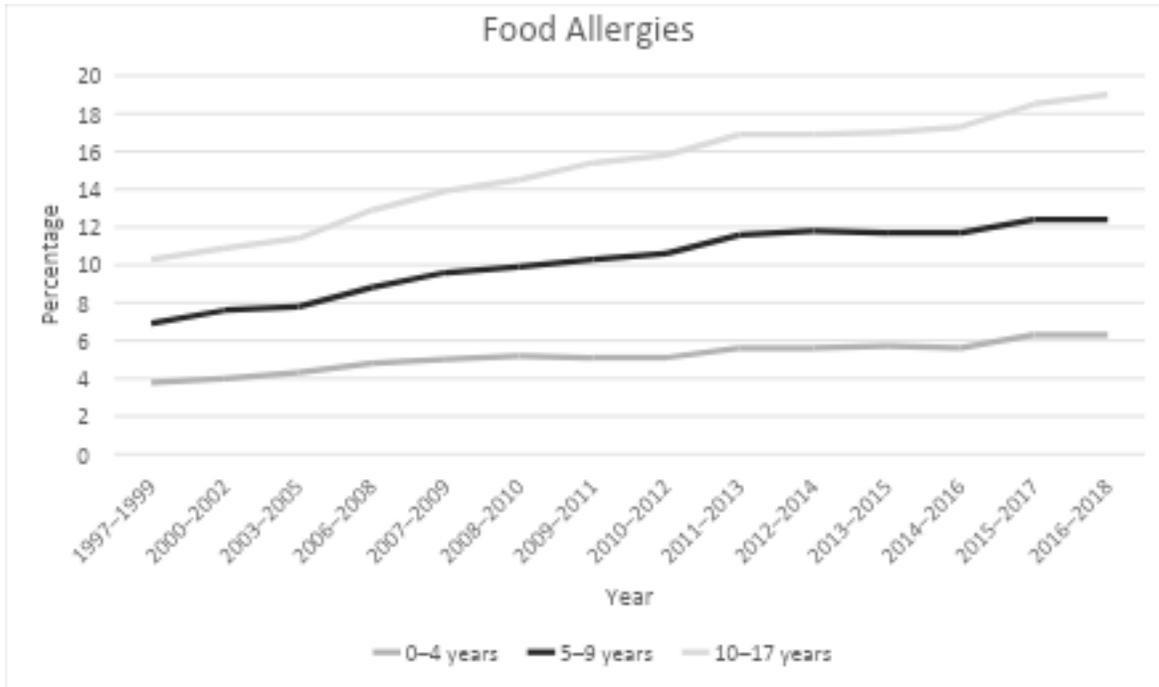
³⁵ Curtin, S. C., & Garnett, M. F. (2023). Suicide and homicide death rates among youth and young adults aged 10–24: United States, 2001–2021. *NCHS Data Brief, 471*. Hyattsville, MD: National Center for Health Statistics. <https://dx.doi.org/10.15620/cdc:128423>.

³⁶ Maternal and Child Health Bureau. (2023). *Adolescent mental and behavioral health data brief* [PDF]. U.S. Department of Health and Human Services. Retrieved May 16, 2025, from <https://mchb.hrsa.gov/sites/default/files/mchb/data-research/nsch-data-brief-adolescent-mental-behavioral-health-2023.pdf>.

³⁷ Centers for Disease Control and Prevention. (2023, February 13). *U.S. teen girls experiencing increased sadness and violence*. U.S. Department of Health and Human Services. <https://www.cdc.gov/media/releases/2023/p0213-yrbs.html>.

Allergies are Widespread, and Autoimmune Disorders are Rising

- Today, over 1 in 4 American children suffers from allergies, including seasonal allergies, eczema, and food allergies.³⁸
 - Eczema (atopic dermatitis) and skin allergies increased from 7.4% of children under 18 from 1997-1999 to 12.7% from 2016-2018.³⁹
- Between 1997 and 2018, childhood food-allergy prevalence rose 88%.⁴⁰
- Celiac disease rates have increased 5-fold in American children since the 1980s.^{41 42}
- Rates of Inflammatory Bowel Disease (IBD), including Crohn's, have increased by 25% over the last decade.⁴³



³⁸ Zablotzky, B., Black, L. I., & Akinbami, L. J. (2023). Diagnosed allergic conditions in children aged 0–17 years: United States, 2021. NCHS Data Brief, No. 459. National Center for Health Statistics. <https://www.cdc.gov/nchs/products/databriefs/db459.htm>.

³⁹ National Center for Health Statistics. (2019). *National Health Interview Survey (NHIS): Family core and sample child questionnaires*. <https://www.cdc.gov/nchs/data/hus/2019/012-508.pdf>.

⁴⁰ Centers for Disease Control and Prevention. (2019). *Health conditions among children under age 18, by selected characteristics: United States, average annual, selected years 1997–1999 through 2016–2018 (Health, United States, 2019, Table 12)*. National Center for Health Statistics. <https://www.cdc.gov/nchs/hs/data-finder.htm?year=2019&table=Table%2012>.

⁴¹ Catassi, C., Gatti, S., & Fasano, A. (2014). The new epidemiology of celiac disease. *Journal of pediatric gastroenterology and nutrition*, 59, S7-S9.

⁴² McGowan, K. E., Castiglione, D. A., & Butzner, J. D. (2009). The changing face of childhood celiac disease in North America: impact of serological testing. *Pediatrics*, 124(6), 1572-1578.

⁴³ Kappelman, M. D., Brensinger, C., Parlett, L. E., Hurtado-Lorenzo, A., & Lewis, J. D. (2025). Prevalence of pediatric inflammatory bowel disease in the United States: Pooled estimates from three administrative claims data sources. *Gastroenterology*, 168(5), 980–982. <https://doi.org/10.1053/j.gastro.2024.11.015>.

What is Driving the Increase in Childhood Chronic Disease?

Rising rates of childhood chronic disease are likely being driven by a combination of factors, including the food children are eating, the chemicals they are exposed to, the medications they are taking, and various changes to their lifestyle and behavior, particularly those related to physical activity, sleep and the use of technology. This report focuses on these four major drivers.

The food American children are eating

The American food system is safe but could be healthier. Most American children’s diets are dominated by ultra-processed foods (UPFs) high in added sugars, chemical additives, and saturated fats, while lacking sufficient intakes of fruits and vegetables. This modern diet has been linked to a range of chronic diseases, including obesity, type 2 diabetes, cardiovascular disease, and certain cancers.⁴⁴ The excessive consumption of UPFs has led to a depletion of essential micronutrients and dietary fiber, while increasing the consumption of sugars and carbohydrates, which negatively affects overall health.⁴⁵

- Nearly 70% of an American child’s calories today comes from ultra-processed foods⁴⁶ (increased from zero 100 years ago), many of which are designed to override satiety mechanisms and increase caloric intake.
- UPFs makeup over 50% of the diets of pregnant and postpartum mothers.⁴⁷

American children’s exposure to environmental chemicals

The cumulative load of thousands of synthetic chemicals that our children are exposed to through the food they eat, the water they drink, and the air they breathe may pose risks to their long-term health, including neurodevelopmental and endocrine effects.

- Over 40,000 chemicals are registered for use in the U.S.⁴⁸
- Pesticides, microplastics, and dioxins are commonly found in the blood and urine of American children and pregnant women—some at alarming levels.^{49 50 51}
- Children are particularly vulnerable to chemicals during critical stages of development—in utero, infancy, early childhood, and puberty. Research suggests that for some chemicals, this cumulative load of exposures may be driving higher rates of chronic

⁴⁴ Clemente-Suárez, V. J., Beltrán-Velasco, A. I., Redondo-Flórez, L., Martín-Rodríguez, A., & Tornero-Aguilera, J. F. (2023). Global Impacts of Western Diet and Its Effects on Metabolism and Health: A Narrative Review. *Nutrients*, 15(12), 2749. <https://doi.org/10.3390/nu15122749>.

⁴⁵ Martini, D., Godos, J., Bonaccio, M., Vitaglione, P., & Grosso, G. (2021). Ultra-Processed Foods and Nutritional Dietary Profile: A Meta-Analysis of Nationally Representative Samples. *Nutrients*, 13(10), 3390. <https://doi.org/10.3390/nu13103390>.

⁴⁶ Wang, L., Martínez Steele, E., Du, M., Pomeranz, J. L., O’Connor, L. E., Herrick, K. A., Luo, H., Zhang, X., & Mozaffarian, D. (2021). *Trends in consumption of ultraprocessed foods among US youths aged 2–19 years, 1999–2018*. *JAMA*, 326(6), 519–530. <https://doi.org/10.1001/jama.2021.10238>.

⁴⁷ Jouanne, K. M., Tinker, S. C., Vannucci, A., Chiu, C.-Y., & Bailey, R. L. (2022). Greater ultra-processed food intake during pregnancy and postpartum is associated with multiple aspects of lower diet quality. *Nutrients*, 14(20), 4290.

⁴⁸ U.S. Environmental Protection Agency. (2025, January 17). Now available: Latest update to the TSCA Inventory. <https://www.epa.gov/chemicals-under-tsca/now-available-latest-update-tsca-inventory-7>.

⁴⁹ LaKind, J. S., Verner, M. A., Rogers, R. D., Goeden, H., Naiman, D. Q., Marchitti, S. A., ... & Fenton, S. E. (2022). Current breast milk PFAS levels in the United States and Canada: after all this time, why don’t we know more?. *Environmental health perspectives*, 130(2), 025002.

⁵⁰ U.S. Environmental Protection Agency. (2015). *America’s children and the environment*. <https://www.epa.gov/americaschildrenenvironment>.

⁵¹ Ospina, M., Wong, L. Y., Baker, S. E., Serafim, A. B., Morales-Agudelo, P., & Calafat, A. M. (2019). Exposure to neonicotinoid insecticides in the US general population: Data from the 2015–2016 national health and nutrition examination survey. *Environmental research*, 176, 108555.

childhood diseases.^{52 53 54} Yet, current risk assessment methods may not allow us to fully understand how these exposures affect human health.

American children's pervasive technology use

Over the past four decades, American children have transitioned from an active, play-based childhood to a sedentary, technology-driven lifestyle, contributing to declines in physical and mental health. Specifically, these declines have been driven by increased screen time, reduced physical activity, and psychosocial stressors like loneliness, chronic stress, and sleep deprivation.

- Teens average nearly 9 hours of non-school screen time each day.^{55 56}
- Over 70% of children, and 85% of teens, fail to meet the 2024 federal guideline of 60 minutes of daily moderate-to-vigorous physical activity.^{57 58}
- Nearly 80% of U.S. high school students do not sleep at least 8 hours per night, up from 69% in 2009.⁵⁹
- Persistent sadness and hopelessness among U.S. high school students surged between 2011 to 2021 from 28% to 42%, with female students' suicidal ideation rising 58% from 19% to 30%.⁶⁰
- In 2024, 73% of 16–24-year-olds reported loneliness, with 15% of young men having no close friendships—a fivefold increase since 1990.⁶¹
- Teens using social media over 3 hours daily face double the risk of anxiety and depression, with a 2022 meta-analysis showing each additional hour increases depression risk by 13%, and girls face nearly four times the risk of boys.⁶²

American children are highly medicated – and it's not working

The health system has aggressively responded to these increases in childhood chronic disease with increasing rates of pharmaceutical drug prescriptions which may cause further harm to the health of American children when used inappropriately.

- Stimulant prescriptions for ADHD in the U.S. increased 250% from 2006 to 2016,⁶³

⁵² Elcombe, C. S., Evans, Neil P. & Bellingham, M. (2022) Critical review and analysis of literature on low dose exposure to chemical mixtures in mammalian in vivo systems. *Critical Reviews in Toxicology* 52, 221–238.

⁵³ Taiba, J., Beseler, C., Zahid, M., Bartelt-Hunt, S., Kolok, A., & Rogan, E. (2025). Exploring the joint association between agrichemical mixtures and pediatric cancer. *GeoHealth*, 9, e2024GH001236. <https://doi.org/10.1029/2024GH001236>.

⁵⁴ Kassotis, C. D., & Phillips, A. L. (2023). Complex mixtures and multiple stressors: evaluating combined chemical exposures and cumulative toxicity. *Toxics*, 11(6), 487.

⁵⁵ Common Sense Media. (2021). The common sense census: Media use by tweens and teens, 2021. <https://www.commonsensemedia.org/research/the-common-sense-census-media-use-by-tweens-and-teens-2021>.

⁵⁶ Anderson, M., Faverio, M., & Park, E. (2024, December 12). Teens, social media and technology 2024. Pew Research Center. <https://www.pewresearch.org/internet/2024/12/12/teens-social-media-and-technology-2024/>.

⁵⁷ Physical Activity Alliance. (2024). *2024 United States report card on physical activity for children and youth*. <https://www.physicalactivityalliance.com/reportcard>.

⁵⁸ Tomkinson, G. R., & Olds, T. S. (2007). Secular changes in pediatric aerobic fitness test performance: The global picture. *Medicine & Science in Sports & Exercise*, 39(5), 742–749. <https://doi.org/10.1249/mss.0b013e318031b51c>.

⁵⁹ Centers for Disease Control and Prevention. (2021). *Youth Risk Behavior Survey data summary & trends report: 2009–2021*. https://www.cdc.gov/healthyyouth/data/yrbs/pdf/YRBS_Data-Summary-Trends_Report2021_508.pdf.

⁶⁰ Centers for Disease Control and Prevention. (2021). *Youth Risk Behavior Survey data summary & trends report: 2009–2021*. https://www.cdc.gov/healthyyouth/data/yrbs/pdf/YRBS_Data-Summary-Trends_Report2021_508.pdf.

⁶¹ Cigna Corporation. (2024). *The loneliness epidemic: Insights from the 2024 Loneliness in America survey*. <https://www.cigna.com/about-us/newsroom/studies-reports/loneliness-epidemic>.

⁶² Ivie, E. J., Pettitt, A., Moses, L. J., & Allen, N. B. (2022). A meta-analysis of the association between adolescent social media use and depressive symptoms. *Journal of Affective Disorders*, 275, 165–174. <https://doi.org/10.1016/j.jad.2020.06.014>.

⁶³ Piper, B. J., Ogden, C. L., Simoyan, O. M., Chung, W., & Kim, M. (2018). *Trends in use of prescription stimulants in the United States and Territories, 2006 to 2016*. PLOS ONE, 13(11), e0206100. <https://doi.org/10.1371/journal.pone.0206100>.

despite evidence they did not improve outcomes long-term.⁶⁴

- Antidepressant prescription rates in teens increased by 1,400% between 1987 and 2014,⁶⁵ even though a systematic overview shows that psychotherapy is just as effective as drugs in the short term, and potentially more effective in the long term.⁶⁶
- Antipsychotic prescriptions for children increased by 800% between 1993 and 2009, with most of these medications prescribed for conditions not approved by the FDA for use in children.⁶⁷
- Studies find that more than 35% (equivalent to more than 15 million prescriptions) of childhood antibiotics are unnecessary⁶⁸ and that infants exposed to antibiotics in first 2 years of life are more likely to develop asthma, allergic rhinitis, atopic dermatitis, celiac disease, obesity, and ADHD.⁶⁹

Corporate Capture and the Revolving Door

Although the U.S. health system has produced remarkable breakthroughs, we must face the troubling reality that the threats to American childhood have been exacerbated by perverse incentives that have captured the regulatory bodies and federal agencies tasked with overseeing them. While Congress is ultimately in charge of authorizing federal regulatory agency research budgets, government funding has been a small portion of the totality of research dollars being spent on chronic childhood disease. The majority is funded by the food, pharmaceutical, and chemical, as well as special interest Non-Governmental Organizations (NGOs) and professional associations. The following examples illustrate how deep and widespread this influence has become across multiple sectors:

- **The food industry** funds the bulk of research in the field. A *BMJ* analysis found that industry spent over \$60 billion on drug, biotechnology, and device research in nutrition science;⁷⁰ by comparison, the government spends an estimated \$1.5 billion on nutrition research.⁷¹ Concerningly, industry-funded nutrition research may bias conclusions in favor of sponsors' products.⁷² Government funding for nutrition research through the NIH

⁶⁴ Jensen, P. S., Arnold, L. E., Swanson, J. M., Vitiello, B., Abikoff, H. B., Greenhill, L. L., ... & Hur, K. (2007). *3-year follow-up of the NIMH MTA study*. *Journal of the American Academy of Child and Adolescent Psychiatry*, 46(8), 989–1002. <https://doi.org/10.1097/CHI.0b013e3180686d48>.

⁶⁵ Zito, J. M., Zhou, E., Pennap, D., Burcu, M., Safer, D. J., & Ibe, A. (2020). Antidepressant use in Medicaid-insured youth: Trends, covariates, and future research needs. *Frontiers in Psychiatry*, 11, 113.

⁶⁶ Hetrick, S. E., McKenzie, J. E., Bailey, A. P., Sharma, V., Moller, C. I., Badcock, P. B., ... & Meader, N. (2021). New generation antidepressants for depression in children and adolescents: a network meta-analysis. *Cochrane Database of Systematic Reviews*, (5).

⁶⁷ Alexander, G. C., Gallagher, S. A., Mascola, A., Moloney, R. M., & Stafford, R. S. (2011). Increasing off-label use of antipsychotic medications in the United States, 1995–2008. *Pharmacoepidemiology and Drug Safety*, 20(2), 177–184.

⁶⁸ Fleming-Dutra, K. E., Hersh, A. L., Shapiro, D. J., Bartoces, M., Enns, E. A., File, T. M., Finkelstein, J. A., Gerber, J. S., Hyun, D. Y., Linder, J. A., Lynfield, R., Margolis, D. J., May, L. S., Merenstein, D., Metlay, J. P., Newland, J. G., Piccirillo, J. F., Roberts, R. M., Sanchez, G. V., ... Hicks, L. A. (2016). Prevalence of inappropriate antibiotic prescriptions among US ambulatory care visits, 2010–2011. *JAMA*, 315(17), 1864–1873. <https://doi.org/10.1001/jama.2016.4151>.

⁶⁹ Aversa, Z., Atkinson, E. J., Schafer, M. J., Theiler, R. N., Rocca, W. A., Blaser, M. J., & LeBrasseur, N. K. (2021, January). Association of infant antibiotic exposure with childhood health outcomes. In *Mayo Clinic Proceedings* (Vol. 96, No. 1, pp. 66–77). Elsevier.

⁷⁰ Mozaffarian, D., and N. G. Forouhi. 2018. Dietary guidelines and health—is nutrition science up to the task? *BMJ* 360:k822. <https://doi.org/10.1136/bmj.k822>.

⁷¹ Toole, A.A. & Kuchler, F. (2015). *Improving Health Through Nutrition Research: An Overview of the U.S. Nutrition Research System*. U.S. Department of Agriculture, Economic Research Service. ERR-182.

⁷² Lesser LI, Ebbeling CB, Goozner M, Wypij D, Ludwig DS (2007) Relationship between funding source and conclusion among nutrition-related scientific articles. *PLoS Med* 4(1): e5.

is only 4-5% of its total budget⁷³ and in some cases is subject to influence by food industry-aligned researchers.⁷⁴ Moreover, one analysis reported that 95% of the 2020 Dietary Guidelines Advisory Committee members had financial ties to food and pharmaceutical companies.⁷⁵

- **The chemical-manufacturing industry** spent roughly \$77 million on federal lobbying activities in 2024, while 60% of their lobbyists previously held federal posts.⁷⁶ In addition, more than ten thousand chemicals listed on the EPA's inventory are designated as confidential, and generic chemical names are used to identify them.⁷⁷
- **The pharmaceutical industry**, from 1999 to 2018, spent \$4.7 billion on lobbying expenditures at the federal level, more than any other industry.⁷⁸ In addition, 9 out of the last 10 FDA commissioners⁷⁹—and approximately 70% of the agency's medical reviewers⁸⁰—have gone on to work for the pharmaceutical industry. Over 80% of clinical departments and teaching hospitals at U.S. medical schools receive some degree of pharmaceutical funding, while half of the total costs for continuing medical education (CME) is funded by industry.⁸¹ ⁸² Between 2010 and 2022, industry provided \$6 billion to over 20,000 patient advocacy organizations.⁸³

⁷³ Fleischhacker, S. E., Woteki, C. E., Coates, P. M., Hubbard, V. S., Flaherty, G. E., Glickman, D. R., ... & Mozaffarian, D. (2020). Strengthening national nutrition research: rationale and options for a new coordinated federal research effort and authority. *The American journal of clinical nutrition*, 112(3), 721-769.

⁷⁴ Kearns, C. E., Schmidt, L. A., & Glantz, S. A. (2016). *Sugar industry and coronary heart disease research: A historical analysis of internal industry documents*. *JAMA Internal Medicine*, 176(11), 1680–1685. <https://doi.org/10.1001/jamainternmed.2016.5394>.

⁷⁵ Mialon, M., Serodio, P., Crosbie, E., Teicholz, N., Naik, A., & Carriedo, A. (2022). *Conflicts of interest for members of the U.S. 2020 Dietary Guidelines Advisory Committee*. *Public Health Nutrition*, 27(1), e69. <https://doi.org/10.1017/S136898002200035X>.

⁷⁶ *OpenSecrets*. (n.d.). *Federal lobbying: Industries summary (N13, 2021 cycle)*. <https://www.opensecrets.org/federal-lobbying/industries/summary?cycle=2021&id=N13>

⁷⁷ U.S. Environmental Protection Agency. (2025, January 17). TSCA Chemical Substance Inventory. <https://www.epa.gov/tsca-inventory>.

⁷⁸ Wouters, O. J. (2020). Lobbying expenditures and campaign contributions by the pharmaceutical and health product industry in the United States, 1999-2018. *JAMA Internal Medicine*, 180(5), 688-697.

⁷⁹ Foley, K. E. (2022, July 21). Trust issues deepen as yet another FDA commissioner joins the pharmaceutical industry. *Quartz*. <https://qz.com/1656529/yet-another-fda-commissioner-joins-the-pharmaceutical-industry>.

⁸⁰ Piller, C. (2018). *FDA's revolving door: Companies often hire agency staffers who managed their successful drug reviews*. *Science*. <https://www.science.org/content/article/fda-s-revolving-door-companies-often-hire-agency-staffers-who-managed-their-successful>.

⁸¹ Wouters, O. J. (2020). Lobbying expenditures and campaign contributions by the pharmaceutical and health product industry in the United States, 1999-2018. *JAMA Internal Medicine*, 180(5), 688-697.

⁸² Campbell, E. G., Weissman, J. S., Ehringhaus, S., Rao, S. R., Moy, B., & Goold, S. D. (2007). *Institutional academic-industry relationships*. *JAMA*, 298(15), 1779–1786. <https://doi.org/10.1001/jama.298.15.1779>.

⁸³ Pradhan, R. (2023, December 15). Millions of dollars flow from pharma to patient advocacy groups. *KFF Health News*. <https://kffhealthnews.org/news/article/health-202-pharma-money-patient-advocacy-groups-public-citizen/>.

Section 1. The Shift to Ultra-Processed Foods

Following World War 2, much of Europe and Asia’s agricultural system was destroyed, and the United States responded by increasing its agricultural output through mechanization, synthetic fertilizers, industrial-scale farming, and shelf-stable processing techniques to feed the world.

An outgrowth of this shift in food production and resulting abundant food supply was the increased development of ultra-processed foods, a category of industrially manufactured food products that undergo multiple physical and chemical processing steps and contain ingredients not commonly found in home kitchens. While there is no single, universally accepted definition of UPFs, the term is most commonly associated with the NOVA food classification system, “industrially manufactured food products made up of several ingredients (formulations) including sugar, oils, fats and salt and food substances of no or rare culinary use.”⁸⁴ Food substances of no culinary use include additives such as flavors, colorants, non-sugar sweeteners, and emulsifiers. Although definitions vary, for the purposes of this assessment, UPFs refer broadly to packaged and ready-to-consume products that are formulated for shelf life and/or palatability but are typically high in added sugars, refined grains, unhealthy fats, and sodium and low in fiber and essential nutrients. Research suggests that the industrial processing required to create UPFs—through additives and nutritional alterations—is a key contributor to their harmful health effects in children.^{85 86}

Though UPFs may have been created with good intentions for convenience purposes, food safety, and to allow for the ability for longer shelf life and preservation (which was important to ship food around the world), UPF consumption has gone up at an exponential rate as share of the American diet. Today, nearly 70% of an American child’s calories come from UPFs,⁸⁷ a dramatic change since the 1960s when most food was cooked at home using whole ingredients. It also coincided with significant declines in food prices as a total share of American household income.⁸⁸

Today, 90% of medical costs in the United States are tied to chronic conditions,⁸⁹ many of which are tied to diet.⁹⁰ The production of UPFs transforms the whole and healthy food produced by America’s farmers into food-like substances that have far different nutrient profiles than the original form. **Farmers are the backbone of America - and the most innovative and**

⁸⁴ Monteiro CA, Cannon G, Levy RB, et al. Ultra-processed foods: what they are and how to identify them. *Public Health Nutrition*. 2019;22(5):936-941. doi:10.1017/S1368980018003762.

⁸⁵ Gearhardt, A. N., Bueno, N. B., DiFeliceantonio, A. G., Roberto, C. A., Jiménez-Murcia, S., & Fernandez-Aranda, F. (2023). Social, clinical, and policy implications of ultra-processed food addiction. *BMJ (Clinical research ed.)*, 383, e075354. <https://doi.org/10.1136/bmj-2023-075354>.

⁸⁶ Mescoloto, S. B., Pongiluppi, G., & Domene, S. M. Á. (2024). Ultra-processed food consumption and children and adolescents' health. *Jornal de pediatria*, 100 Suppl 1(Suppl 1), S18–S30. <https://doi.org/10.1016/j.jpmed.2023.09.006>.

⁸⁷ Wang, L., Steele, E. M., Du, M., Pomeranz, J. L., O'Connor, L. E., Herrick, K. A., ... & Zhang, F. F. (2021). Trends in consumption of ultraprocessed foods among US youths aged 2-19 years, 1999-2018. *Jama*, 326(6), 519-530.

⁸⁸ U.S. Department of Agriculture, Economic Research Service. (2020, November). *Average share of income spent on food in the United States remained relatively steady from 2000 to 2019. Amber Waves*. <https://www.ers.usda.gov/amber-waves/2020/november/average-share-of-income-spent-on-food-in-the-united-states-remained-relatively-steady-from-2000-to-2019/>.

⁸⁹ Centers for Disease Control and Prevention. (2024, July 12). *Fast facts: Health and economic costs of chronic conditions*. <https://www.cdc.gov/chronic-disease/data-research/facts-stats/index.html>.

⁹⁰ Matthews, E. D., & Kurnat-Thoma, E. L. (2024). US food policy to address diet-related chronic disease. *Frontiers in Public Health*, 12, 1339859.

productive in the world. We continue to feed the world as the largest food exporter. The greatest step the United States can take to reverse childhood chronic disease is to put **whole foods produced by American farmers and ranchers at the center of healthcare.**

A Closer Look at Ultra-Processed Foods

A growing body of research associates UPFs with negative health outcomes, including in children.⁹¹

A closer examination of the statistics, particularly over time and in comparison with our global peers, reveals a troubling reality:

- Roughly 70% of the over 300,000 branded food products available in grocery stores today are ultra-processed.^{92 93}
- Over 50% of the calories consumed by Americans come from UPFs,⁹⁴ while peer countries like Portugal, Italy, and France average UPF consumption rates of just 10–31%.^{95 96 97} Meanwhile, over 40% of Americans are obese,⁹⁸ compared to less than 25% of the Portuguese,⁹⁹ Italian,¹⁰⁰ and French populations.¹⁰¹

Research is beginning to point to three key reasons why UPFs are detrimental to children's health:

1. Nutrient Depletion

The rise in UPF consumption has led to the dominance of three key ingredients in American children's diets: ultra-processed grains, sugars, and fats. These engineered components,

⁹¹ Lane, M. M., Gamage, E., Du, S., Ashtree, D. N., McGuinness, A. J., Gauci, S., ... & Marx, W. (2024). Ultra-processed food exposure and adverse health outcomes: umbrella review of epidemiological meta-analyses. *bmj*, 384.

⁹² Ravandi, B., Ispirova, G., Sebek, M., Mehler, P., Barabási, A.-L., & Menichetti, G. (2025). Prevalence of processed foods in major US grocery stores. *Nature Food*.

⁹³ U.S. Department of Agriculture, Agricultural Research Service. (2021, October). USDA Global branded food products database: How a unique public-private partnership has helped enhance public health and the sharing of open data (Version 3.1) [Fact sheet]. FoodData Central. https://fdc.nal.usda.gov/docs/USDA_Global_BFPD_1Pager_Oct2021.pdf.

⁹⁴ Juul, F., Parekh, N., Martinez-Steele, E., Monteiro, C. A., & Chang, V. W. (2022). Ultra-processed food consumption among US adults from 2001 to 2018. *The American journal of clinical nutrition*, 115(1), 211-221.

⁹⁵ Magalhães, V., Severo, M., Correia, D., Torres, D., de Miranda, R. C., Rauber, F., ... & Lopes, C. (2021). Associated factors to the consumption of ultra-processed foods and its relation with dietary sources in Portugal. *Journal of nutritional science*, 10, e89.

⁹⁶ Calixto Andrade, G., Julia, C., Deschamps, V., Srouf, B., Hercberg, S., Kesse-Guyot, E., ... & Bertazzi Levy, R. (2021). Consumption of ultra-processed food and its association with sociodemographic characteristics and diet quality in a representative sample of French adults. *Nutrients*, 13(2), 682.

⁹⁷ Marino, M., Puppo, F., Del Bo', C., Vinelli, V., Riso, P., Porrini, M., & Martini, D. (2021). A systematic review of worldwide consumption of ultra-processed foods: findings and criticisms. *Nutrients*, 13(8), 2778.

⁹⁸ Centers for Disease Control and Prevention. (2024, May 14). Adult obesity facts. U.S. Department of Health and Human Services. <https://www.cdc.gov/obesity/adult-obesity-facts/index.html>.

⁹⁹ Oliveira, A., Araújo, J., Severo, M., Correia, D., Ramos, E., Torres, D., ... & IAN-AF Consortium Carla Lopes Andreia Oliveira Milton Severo Duarte Torres Sara Rodrigues Elisabete Ramos Sofia Vilela Sofia Guiomar Luísa Oliveira Violeta Alarcão Paulo Nicola Jorge Mota Pedro Teixeira Simão Soares Lene Frost Andersen. (2018). Prevalence of general and abdominal obesity in Portugal: Comprehensive results from the National Food, nutrition and physical activity survey 2015–2016. *BMC public health*, 18, 1-9.

¹⁰⁰ Marcozzi, B., Lo Noce, C., Vannucchi, S., Di Lonardo, A., Damiano, C., Galeone, D., ... & Donfrancesco, C. (2024). Measured obesity and overweight in adults: the Italian Health Examination Survey 2023-CUORE Project. *European Journal of Public Health*, 34 (Supplement_3), ckae144-1441.

¹⁰¹ Fontbonne, A., Currie, A., Tounian, P., Picot, M. C., Foulatier, O., Nedelcu, M., & Nocca, D. (2023). Prevalence of overweight and obesity in France: the 2020 Obepi-Roche study by the "Ligue Contre l'Obésité". *Journal of Clinical Medicine*, 12(3), 925.

virtually nonexistent a century ago, now account for over two-thirds of all calories consumed by American children.¹⁰² The ultra-processing of these ingredients displaces nutrient-dense whole foods, resulting in a reduction of essential vitamins, minerals, fiber, and phytonutrients needed for optimal biological function. Analyzing each of the three ingredients reveals the severity of the nutrient depletion issue:

- **Ultra-Processed Grains:** Found in cakes, cookies, refined breads, candy, and snacks, these grains make up a large portion of the UPF calories that dominate daily intake. Processing grains involves the removal of the bran and germ, which strips away essential vitamins, minerals, and fiber. The stripping of these components can lead to blood sugar spikes,¹⁰³ increasing the risk of type 2 diabetes,¹⁰⁴ while also displacing healthier, nutrient-rich whole grains from the diet.
- **Ultra-Processed Sugars:** Found in 75% of packaged foods,¹⁰⁵ the average American consumes 17 teaspoons of added sugars daily, which amounts to 60 pounds annually.¹⁰⁶ This substantial intake, particularly of high fructose corn syrup and other added sugars, may play a significant role in childhood obesity, type 2 diabetes, and nonalcoholic fatty liver disease (NAFLD).¹⁰⁷ Alarmingly, 63% of the U.S. population aged 2 and older derives more than 10% of their daily calories from added sugars.¹⁰⁸
- **Ultra-Processed Fats:** Over the course of the 20th century, U.S. dietary fats shifted from minimally processed animal-based sources like butter and lard—rich in fat-soluble vitamins A, D, and E, supporting brain and immune health—to industrial fats from refined seed oils, such as soybean, corn, safflower, sunflower, cottonseed, and canola. Industrial refining reduces micronutrients, such as vitamin E and phytosterols. Moreover, these oils contribute to an imbalanced omega-6/omega-3 ratio, a topic of ongoing research for its potential role in inflammation.¹⁰⁹

2. Increased Caloric Intake

UPFs drive increased caloric intake and weight gain.¹¹⁰ Industrial processing inherent in UPF production leads to significant changes in fiber, protein, caloric density, and digestibility. Research suggests that these alterations could interfere with brain reward pathways and satiety

¹⁰² Wang, L., Steele, E. M., Du, M., Pomeranz, J. L., O'Connor, L. E., Herrick, K. A., ... & Zhang, F. F. (2021). Trends in consumption of ultraprocessed foods among US youths aged 2-19 years, 1999-2018. *Jama*, 326(6), 519-530.

¹⁰³ Musa-Veloso, K., Poon, T., Harkness, L. S., O'Shea, M., & Chu, Y. (2018). The effects of whole-grain compared with refined wheat, rice, and rye on the postprandial blood glucose response: A systematic review and meta-analysis of randomized controlled trials. *The American Journal of Clinical Nutrition*, 108(4), 759–774 <https://doi.org/10.1093/ajcn/nqy147>.

¹⁰⁴ Moradi, S., Hojjati Kermani, M. A., Bagheri, R., Mohammadi, H., Jayedi, A., Lane, M. M., ... & Suzuki, K. (2021). Ultra-processed food consumption and adult diabetes risk: a systematic review and dose-response meta-analysis. *Nutrients*, 13(12), 4410.

¹⁰⁵ White Jr, J. R. (2018). Sugar. *Clinical Diabetes*, 36(1), 74-76.

¹⁰⁶ Centers for Disease Control and Prevention. (2024, January 5). Get the facts: Added sugars. <https://www.cdc.gov/nutrition/php/data-research/added-sugars.html>.

¹⁰⁷ Yu, S., Li, C., Ji, G., & Zhang, L. (2021). The contribution of dietary fructose to non-alcoholic fatty liver disease. *Frontiers in Pharmacology*, 12, 783393..

¹⁰⁸ U.S. Department of Agriculture & U.S. Department of Health and Human Services. (2020). *Dietary Guidelines for Americans, 2020-2025* (9th ed.).

¹⁰⁹ Simopoulos, A. P. (2008). The importance of the omega-6/omega-3 fatty acid ratio in cardiovascular disease and other chronic diseases. *Experimental Biology and Medicine*, 233(6), 674–688.

¹¹⁰ Hall, K. D., Ayuketah, A., Brychta, R., Cai, H., Cassimatis, T., Chen, K. Y., Chung, S. T., Costa, E., Courville, A., Darcey, V., Fletcher, L. A., Forde, C. G., Gharib, A. M., Guo, J., Howard, R., Joseph, P. V., McGehee, S., Ouwerkerk, R., Raisingier, K., Rozga, I., ... Zhou, M. (2019). Ultra-Processed Diets Cause Excess Calorie Intake and Weight Gain: An Inpatient Randomized Controlled Trial of Ad Libitum Food Intake. *Cell metabolism*, 30(1), 67–77.e3. <https://doi.org/10.1016/j.cmet.2019.05.008>.

hormones, promote faster eating, and compromise gut fullness signals.¹¹¹ The refined ingredients in these foods can rapidly spike blood sugar and insulin levels¹¹² as well as damage the gut microbiome.¹¹³

Compelling experimental research further underscores these issues. A 2019 study¹¹⁴ published in *Cell* confined 20 adults to an NIH facility, where participants consumed unlimited UPFs for two weeks, followed by two weeks of unlimited unprocessed foods. Despite having identical caloric access, participants consumed roughly 500 fewer calories per day and lost 2 pounds on the unprocessed diet, while they gained 2 pounds on the ultra-processed diet. The researchers observed significantly higher levels of satiety hormones during the unprocessed phase, supporting the idea that UPFs may disrupt hunger signals, promote overeating, and contribute to weight gain.

Multiple peer-reviewed studies demonstrate that whole foods, on the other hand, contain built-in satiety mechanisms that help regulate appetite and reduce overeating. Specifically:

- Whole foods rich in dietary fiber stimulate the release of key satiety hormones.¹¹⁵ A 2016 analysis found that UPFs contributed significantly fewer grams of dietary fiber per calorie compared to minimally processed foods.¹¹⁶
- Foods that require more chewing increase oral exposure time, enhancing satiety signals.¹¹⁷ The texture of whole foods can influence satiety through differences in appetite sensations and gastrointestinal peptide release.¹¹⁸
- Protein is the most effective macronutrient for providing a satiating effect. In addition to stimulating the release of satiety hormones, protein requires more energy to digest than carbohydrates or fats, leading to a higher calorie burn during digestion.¹¹⁹

3. Inclusion of Food Additives

Over 2,500 food additives—including emulsifiers, binders, sweeteners, colorings, and preservatives—may be used to mimic the taste and texture of conventional food and increase

¹¹¹ Gupta, A., Osadchiy, V., & Mayer, E. A. (2020). Brain–gut–microbiome interactions in obesity and food addiction. *Nature Reviews Gastroenterology & Hepatology*, 17(11), 655–672.

¹¹² Delpino, F. M., Figueiredo, L. M., Bielemann, R. M., Da Silva, B. G. C., Dos Santos, F. S., Mintem, G. C., ... & Nunes, B. P. (2022). Ultra-processed food and risk of type 2 diabetes: a systematic review and meta-analysis of longitudinal studies. *International journal of epidemiology*, 51(4), 1120–1141.

¹¹³ Whelan, K., Bancel, A. S., Lindsay, J. O., & Chassaing, B. (2024). Ultra-processed foods and food additives in gut health and disease. *Nature Reviews Gastroenterology & Hepatology*, 21(6), 406–427.

¹¹⁴ Hall, K. D., Ayuketah, A., Brychta, R., Cai, H., Cassimatis, T., Chen, K. Y., Chung, S. T., Costa, E., Courville, A., Darcey, V., Fletcher, L. A., Forde, C. G., Gharib, A. M., Guo, J., Howard, R., Joseph, P. V., McGehee, S., Ouwerkerk, R., Raising, K., Rozga, I., ... Zhou, M. (2019). Ultra-Processed Diets Cause Excess Calorie Intake and Weight Gain: An Inpatient Randomized Controlled Trial of Ad Libitum Food Intake. *Cell metabolism*, 30(1), 67–77.e3. <https://doi.org/10.1016/j.cmet.2019.05.008>.

¹¹⁵ Dagbasi, A., Byrne, C., Blunt, D., Serrano-Contreras, J. I., Becker, G. F., Blanco, J. M., ... & Frost, G. (2024). Diet shapes the metabolite profile in the intact human ileum, which affects PYY release. *Science translational medicine*, 16(752), eadm8132.

¹¹⁶ Luiten, C. M., Steenhuis, I. H., Eyles, H., Mhurchu, C. N., & Waterlander, W. E. (2016). Ultra-processed foods have the worst nutrient profile, yet they are the most available packaged products in a sample of New Zealand supermarkets. *Public health nutrition*, 19(3), 530–538.

¹¹⁷ Lasschuijt, M. P., de Graaf, K., & Mars, M. (2021). Effects of oro-sensory exposure on satiation and underlying neurophysiological mechanisms—what do we know so far?. *Nutrients*, 13(5), 1391.

¹¹⁸ Stribițaia, E., Evans, C. E., Gibbons, C., Blundell, J., & Sarkar, A. (2020). Food texture influences on satiety: systematic review and meta-analysis. *Scientific reports*, 10(1), 12929.

¹¹⁹ Morell, P., & Fiszman, S. (2017). Revisiting the role of protein-induced satiation and satiety. *Food Hydrocolloids*, 68, 199–210. <https://www.sciencedirect.com/science/article/abs/pii/S0268005X1630340X>.

its shelf life.¹²⁰ Studies have linked certain food additives to increased risks of mental disorders, ADHD, cardiovascular disease, metabolic syndromes and even carcinogenic effects.¹²¹ Specific additives of potential concern include, but are not limited to:

- Certain **food colorings**, such as red 40, which is present in widely-consumed products have been associated with behavioral issues in children, such as increased hyperactivity and symptoms consistent with ADHD.^{122 123 124} Additionally, preliminary evidence suggests a possible association between the consumption of food colorings and autism, although further long-term research is necessary to establish a definitive link.¹²⁵
- **Titanium Dioxide**, widely used in a range of candies and sauces, may cause cellular and DNA damage.^{126 127}
- **Propylparaben**, a preservative used in baked goods and snacks, shows estrogenic activity, potentially disrupting hormonal balance.¹²⁸
- **Butylated Hydroxytoluene (BHT)**, found in common snacks and cereals, is a preservative that may be associated tumor growth in rodent studies.^{129 130}
- **Artificial Sweeteners** like aspartame, sucralose, and saccharin, used widely in diet sodas and sugar-free foods, have been observed to interfere with the gut microbiome in some studies.¹³¹ Gut microbiome shifts have been linked to obesity, metabolic issues, and possibly glucose intolerance.¹³² The classification of aspartame as possibly carcinogenic (Group 2B) by the International Agency for Research on Cancer (IARC)¹³³ further complicates the understanding of these widely used substances, especially given the existence of conflicting research results.

¹²⁰ National Research Council (US) Committee on Diet, Nutrition, and Cancer. Diet, Nutrition, and Cancer: Directions for Research. Washington (DC): National Academies Press (US); 1983. 8, Food Additives, Contaminants, Carcinogens, and Mutagens. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK216714/>.

¹²¹ Warner, J. O. (2024). Artificial food additives: hazardous to long-term health?. *Archives of disease in childhood*, 109(11), 882-885.

¹²² McCann, D., Barrett, A., Cooper, A., Crumpler, D., Dalen, L., Grimshaw, K., ... Stevenson, J. (2007). Food additives and hyperactive behaviour in 3-year-old and 8/9-year-old children in the community: A randomized, double-blinded, placebo-controlled trial. *The Lancet*, 370(9598), 1560-1567.

¹²³ Miller, M. D., Steinmaus, C., Golub, M. S., Castorina, R., Thilakartne, R., Bradman, A., & Marty, M. A. (2022). Potential impacts of synthetic food dyes on activity and attention in children: A review of the human and animal evidence. *Environmental Health*, 21(1), 45.

¹²⁴ Nigg, J. T., Lewis, K., Edinger, T., & Falk, M. (2012). Meta-analysis of attention-deficit/hyperactivity disorder or attention-deficit/hyperactivity disorder symptoms, restriction diet, and synthetic food color additives. *Journal of the American Academy of Child and Adolescent Psychiatry*, 51(1), 86-97.e8. <https://doi.org/10.1016/j.jaac.2011.10.015>.

¹²⁵ Bakthavachalu, P., Kannan, S. M., & Qoronfleh, M. W. (2020). Food Color and Autism: A Meta-Analysis. *Advances in neurobiology*, 24, 481-504. https://doi.org/10.1007/978-3-030-30402-7_15.

¹²⁶ Tran N, Le X, Gupta N, Milby T, Yu Y. Titanium dioxide: Evolving regulatory classification and possible health implications in humans and the environment. *Front Toxicol* 2022 Aug 11 ;4:9368057.

¹²⁷ EFSA Panel on Food Additives and Flavourings (FAF), Younes, M., Aquilina, G., Castle, L., Engel, K. H., Fowler, P., ... & Wright, M. (2021). Safety assessment of titanium dioxide (E171) as a food additive. *Efsa Journal*, 19(5), e06585.

¹²⁸ Hager E, et al. (2022). *Minireview: Parabens Exposure and Breast Cancer*. *Int J Environ Res Public Health*. 19(3):1873.

¹²⁹ National Toxicology Program. (2021). 15th report on carcinogens. *Report on carcinogens: carcinogen profiles*, 15, roc15. <https://ntp.niehs.nih.gov/sites/default/files/ntp/roc/content/profiles/butylatedhydroxyanisole.pdf>.

¹³⁰ Thompson, J. A., Bolton, J. L., & Malkinson, A. M. (1991). Relationship between the metabolism of butylated hydroxytoluene (BHT) and lung tumor promotion in mice. *Experimental lung research*, 17(2), 439-453.

¹³¹ Conz, A., Salmona, M., & Diomedea, L. (2023). Effect of non-nutritive sweeteners on the gut microbiota. *Nutrients*, 15(8), 1869.

¹³² Suez, J., Korem, T., Zeevi, D., Zilberman-Schapira, G., Thaiss, C. A., Maza, O., ... & Elinav, E. (2014). Artificial sweeteners induce glucose intolerance by altering the gut microbiota. *Nature*, 514(7521), 181-186.

¹³³ World Health Organization. (2023, July 14). Aspartame hazard and risk assessment results released. <https://www.who.int/news/item/14-07-2023-aspartame-hazard-and-risk-assessment-results-released>.

One notable example of concern around food additives is infant formula. In recent years, some American parents have turned to European formula brands, driven by supply concerns and questions regarding the number and types of additives found in U.S. formulas.¹³⁴

Additives in processed foods are consumed in complex combinations, where cumulative and synergistic effects may amplify harm beyond individual components.¹³⁵ Yet, testing often ignores these interactions, particularly in children. With dozens of additives consumed daily, these overlooked risks could be significantly impacting children's health.

The Impact of Ultra-Processed Foods and the Vital Role of Whole Foods in Children's Health

Human health and biology rely heavily on dietary inputs. During gestation, fetal development depends on maternal nutrition, influencing everything – from membrane composition and mitochondrial integrity to nervous system wiring and hormone regulation. This programming ultimately determines the child's long-term metabolic, cognitive, and immune resilience. UPFs make up over 50% of the diets of pregnant and postpartum mothers,¹³⁶ despite evidence that increased UPF consumption during pregnancy negatively impacts health outcomes for their children.¹³⁷

This trend is mirrored in the wider population, where the rise in UPF consumption poses threats to human health across the lifespan:

- A recent study published in *Nature Medicine* estimated that sugar-sweetened beverages alone may be responsible for ~1.2 million new cases of heart disease and 340,000 deaths worldwide in 2020 alone.¹³⁸
- An umbrella review of 45 meta-analyses published in the *BMJ* analyzing data from nearly 10 million participants, found that higher consumption of ultra-processed foods is linked to 32 adverse health outcomes, including increased risks of cardiovascular disease, cancer, type 2 diabetes, mental health disorders, and all-cause mortality.¹³⁹
- A study published in *JAMA Internal Medicine* followed over 44,000 adults and found that every 10% increase in the intake of UPFs was associated with a 14% increased risk of all-cause mortality.¹⁴⁰ This study adjusted for confounding factors like age, sex, physical

¹³⁴ Szalinski, C. (2022, June 24). Why US parents are choosing European baby formula. *The New York Times Wirecutter*. [https://www.nytimes.com/wirecutter/blog/us-parents-european-baby-formula/:contentReference\[oaicite:7\]{index=7}](https://www.nytimes.com/wirecutter/blog/us-parents-european-baby-formula/:contentReference[oaicite:7]{index=7}).

¹³⁵ Lau, K., McLean, W. G., Williams, D. P., & Howard, C. V. (2006). Synergistic interactions between commonly used food additives in a developmental neurotoxicity test. *Food and Chemical Toxicology*, 44(6), 1719–1725.

¹³⁶ Jouanne, K. M., Tinker, S. C., Vannucci, A., Chiu, C.-Y., & Bailey, R. L. (2022). Greater ultra-processed food intake during pregnancy and postpartum is associated with multiple aspects of lower diet quality. *Nutrients*, 14(20), 4290.

¹³⁷ Morales-Suarez-Varela M, Rocha-Velasco OA. Impact of ultra-processed food consumption during pregnancy on maternal and child health outcomes: A comprehensive narrative review of the past five years. *Clin Nutr ESPEN*. 2025 Feb;65:288-304. doi: 10.1016/j.clnesp.2024.12.006. Epub 2024 Dec 9. PMID: 39662587.

¹³⁸ Lara-Castor, L., O'Hearn, M., Cudhea, F., Miller, V., Shi, P., Zhang, J., ... & Mozaffarian, D. (2025). Burdens of type 2 diabetes and cardiovascular disease attributable to sugar-sweetened beverages in 184 countries. *Nature medicine*, 1-13.

¹³⁹ Lane, M. M., Gamage, E., Du, S., Ashtree, D. N., McGuinness, A. J., Gauci, S., ... & Marx, W. (2024). Ultra-processed food exposure and adverse health outcomes: umbrella review of epidemiological meta-analyses. *bmj*, 384.

¹⁴⁰ Schnabel, L., Kesse-Guyot, E., Allès, B., Touvier, M., Srour, B., Hercberg, S., ... & Julia, C. (2019). Association between ultraprocessed food consumption and risk of mortality among middle-aged adults in France. *JAMA Internal Medicine*, 179(4), 490–498.

activity, and overall diet quality to isolate the impact of UPF consumption on mortality risk.

As the consumption of UPFs has surged, children are increasingly neglecting the whole foods essential for their health.¹⁴¹ ¹⁴²Approximately 50% of children ages 2 to 18 skip discrete fruit entirely on any given day.¹⁴³ Research consistently shows that key micronutrients such as calcium, iron, potassium, and vitamin D, which are found in fruits and vegetables, are essential for children’s physiological functioning.¹⁴⁴ ¹⁴⁵ ¹⁴⁶

Research also consistently links diets centered on whole foods to lower rates of obesity, type 2 diabetes, heart disease, certain cancers, and mental illness.¹⁴⁷ ¹⁴⁸ This is not surprising. Diet and lifestyle significantly influence gene expression and cellular biology - ultimately determining our health outcomes.¹⁴⁹ ¹⁵⁰ For instance:

- Leafy greens supply magnesium and folate critical for energy production and other benefits.¹⁵¹
- Salmon delivers omega-3 fatty acids that help reduce cardiovascular risk and support brain health.¹⁵² ¹⁵³
- Legumes offer fiber and resistant starch that help nourish beneficial gut bacteria.¹⁵⁴ ¹⁵⁵

¹⁴¹ Guthrie, J. F., & Lin, B.-H. (2024). *Peeling open U.S. fruit consumption trends* (Economic Research Report No. 341). U.S. Department of Agriculture, Economic Research Service. <https://www.ers.usda.gov/publications/pub-details/?pubid=110658>.

¹⁴² Kim, S. A., Moore, L. V., Galuska, D., Wright, A. P., Harris, D., Grummer-Strawn, L. M., Merlo, C. L., Nihiser, A. J., & Rhodes, D. G. (2014, August 8). Vital Signs: Fruit and vegetable intake among children—United States, 2003–2010. *MMWR. Morbidity and Mortality Weekly Report*, 63(31), 671–676. <https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6331a3.htm>.

¹⁴³ Hoy, M. K., Clemens, J. C., & Moshfegh, A. J. (2021, June). *Intake of fruit by children and adolescents: What We Eat in America, NHANES 2017–2018* (FSRG Dietary Data Brief No. 38) [Data brief]. United States Department of Agriculture. <https://www.ncbi.nlm.nih.gov/books/NBK588714/>.

¹⁴⁴ Panzeri, C., Pecoraro, L., Dianin, A., Sboarina, A., Amone, O. C., Piacentini, G., & Pietrobelli, A. (2024). Potential Micronutrient Deficiencies in the First 1000 Days of Life: The Pediatrician on the Side of the Weakest. *Current obesity reports*, 13(2), 338–351.

¹⁴⁵ Rivera, J. A., Hotz, C., González-Cossío, T., Neufeld, L., & García-Guerra, A. (2003). The effect of micronutrient deficiencies on child growth: A review of results from community-based supplementation trials. *The Journal of Nutrition*, 133(11), 4010S–4020S. <https://doi.org/10.1093/jn/133.11.4010S>.

¹⁴⁶ Soliman, A., De Sanctis, V., & Elalaily, R. (2014). Nutrition and pubertal development. *Indian journal of endocrinology and metabolism*, 18(Suppl 1), S39–S47. <https://doi.org/10.4103/2230-8210.145073>.

¹⁴⁷ Sofi, F., Cesari, F., Abbate, R., Gensini, G. F. & Casini, A. (2008) Adherence to Mediterranean diet and health status: meta-analysis. *BMJ* 337, a1344.

¹⁴⁸ O’neil, A., Quirk, S. E., Housden, S., Brennan, S. L., Williams, L. J., Pasco, J. A., ... & Jacka, F. N. (2014). Relationship between diet and mental health in children and adolescents: a systematic review. *American journal of public health*, 104(10), e31-e42.

¹⁴⁹ Landecker, H. (2011). Food as exposure: Nutritional epigenetics and the new metabolism. *BioSocieties*, 6(2), 167

¹⁵⁰ Mierziak, J., Kostyn, K., Boba, A., Czemplik, M., Kulma, A., & Wojtasik, W. (2021). Influence of the bioactive diet components on the gene expression regulation. *Nutrients*, 13(11), 3673.

¹⁵¹ Duthie, S. J. Folate and cancer: how DNA damage, repair and methylation impact on colon carcinogenesis. (2021) *J. Inherit. Metab. Dis.* 34, 101–109 (2011); Liu, D. *et al.* Increased provision of bioavailable Mg through vegetables could significantly reduce the growing health and economic burden caused by Mg malnutrition. *Foods* 10, 2513.

¹⁵² Tsoupras, A., Brummell, C., Kealy, C., Vitkaitis, K., Redfern, S., & Zabetakis, I. (2022). Cardio-protective properties and health benefits of fish lipid bioactives; the effects of thermal processing. *Marine Drugs*, 20(3), 187.

¹⁵³ Innes, J. K. & Calder (2020), P. C. Marine omega-3 (n-3) fatty acids for cardiovascular health: an update for 2020. *Int. J. Mol. Sci.* 21, 1362.

¹⁵⁴ Chen, Z., Liang, N., Zhang, H., Li, H., Guo, J., Zhang, Y., Chen, Y., Wang, Y., & Shi, N. (2024). Resistant starch and the gut microbiome: Exploring beneficial interactions and dietary impacts. *Food Chemistry: X*, 21, 101118.

¹⁵⁵ Kadyan, S., Deka, G., Mudi, S. R., Bhardwaj, N., Singh, V., & Yadav, D. (2022). *Prebiotic potential of dietary beans and pulses and their resistant starch for ageing-associated gut and metabolic health*. *Nutrients*, 14(9), 1726. <https://doi.org/10.3390/nu14091726>.

- Nuts contain magnesium that helps reduce oxidative stress and enhances activity of mitochondrial enzymes.^{156 157 158}
- Beef contains protein that maintains skeletal muscle, which plays a key role in regulating metabolic health.^{159 160}
- Whole milk and other dairy products are rich sources of calcium, vitamin D, and bioactive fatty acids, which support bone health, help regulate inflammation and may reduce the risk of type 2 diabetes.¹⁶¹

Some of the most compelling dietary intervention data comes from randomized controlled trials (RCTs) of reduced-carbohydrate diets in adults and children to reverse obesity,¹⁶² type 2 diabetes,¹⁶³ Metabolic Dysfunction-Associated Steatotic Liver Disease (MASLD), and risk factors for heart disease¹⁶⁴ such as hypertension. Both UPF reduction and reduced-carbohydrate diets are hypothesized to work by addressing the root cause of these diseases: insulin resistance.¹⁶⁵ While reduced-carbohydrate diets have been studied in several two-year trials, including one with five-year follow-up data,¹⁶⁶ RCTs on UPFs have typically lasted only two weeks, highlighting the critical need for more extensive research, especially with children.

The Driving Forces Behind American Children’s Food Crisis

UPFs are built into the fabric of the post-World War 2 American society and economy. The convenience of “fast food” and the food processing and delivery industry that facilitates them is viewed, internationally, as a distinctly “American” innovation. UPFs have allowed us to save money and to “eat on the run,” but today’s over-reliance on UPFs is damaging the health of American children. This crisis results, in large part, from decades of policies that have undermined the food system and perpetuated the delivery of unhealthy food to our children.

¹⁵⁶ Souza, A. C. R., Vasconcelos, A. R., Dias, D. D., & Komoni, G. (2023). The integral role of magnesium in muscle integrity and aging: a comprehensive review. *Nutrients*, 15(24), 5127.

¹⁵⁷ O’Neil, C. E., Nicklas, T. A., & Fulgoni, V. L. (2015). *Tree nut consumption is associated with better nutrient adequacy and diet quality in adults*. *Nutrients*, 7(1), 595–610. <https://doi.org/10.3390/nu7010595>.

¹⁵⁸ Liu, M. & Dudley, S. C. (2024) Magnesium, oxidative stress, inflammation and cardiovascular disease. *Antioxidants* 9, 907 (2020).

¹⁵⁹ Church, D. D., Hirsch, K. R., Park, S., Kim, I.-Y., Schutzler, S. E., Ferrando, A. A., Wolfe, R. R., & Rasmussen, B. B. (2024). *The anabolic response to a ground beef patty and soy-based meat alternative: A randomized controlled trial*. *The American Journal of Clinical Nutrition*, 120(5), 1085–1092. <https://doi.org/10.1016/j.ajcnut.2024.06.002>.

¹⁶⁰ Kim, G. & Kim, J. H. (2020) Impact of skeletal muscle mass on metabolic health. *Endocrinol. Metab.* 35, 1–6.

¹⁶¹ Górska-Warsewicz H, Rejman K, Laskowski W, Czeczotko M. Milk and Dairy Products and Their Nutritional Contribution to the Average Polish Diet. *Nutrients*. 2019 Aug 1;11(8):1771. doi: 10.3390/nu11081771. PMID: 31374893; PMCID: PMC6723869.

¹⁶² Zhang, Y., He, T., Hu, Y., & Gao, C. (2024). Low-Carbohydrate Diet is More Helpful for Weight Loss Than Low-Fat Diet in Adolescents with Overweight and Obesity: A Systematic Review and Meta-Analysis. *Diabetes, Metabolic Syndrome and Obesity*, Volume 17, 2997–3007. <https://doi.org/10.2147/dms0.s467719>.

¹⁶³ Yuan, X., Wang, J., Yang, S., Gao, M., Cao, L., Li, X., Hong, D., Tian, S., & Sun, C. (2020). Effect of the ketogenic diet on glycemic control, insulin resistance, and lipid metabolism in patients with T2DM: a systematic review and meta-analysis. *Nutrition & Diabetes*, 10(1). <https://doi.org/10.1038/s41387-020-00142-z>.

¹⁶⁴ Fechner, E., Smeets, E., Schrauwen, P., & Mensink, R. (2020). The Effects of Different Degrees of Carbohydrate Restriction and Carbohydrate Replacement on Cardiometabolic Risk Markers in Humans—A Systematic Review and Meta-Analysis. *Nutrients*, 12(4), 991. <https://doi.org/10.3390/nu12040991>.

¹⁶⁵ Cucuzzella, M., Bailes, J., Favret, J., Paddu, N., & Bradley, A. B. (2024). Beyond Obesity and Overweight: The Clinical Assessment and Treatment of Excess Body Fat in Children. In *Current Obesity Reports* (Vol. 13, Issue 2, pp. 276–285). Springer Science and Business Media LLC. <https://doi.org/10.1007/s13679-024-00565-0>.

¹⁶⁶ McKenzie, A. L., Athinarayanan, S. J., Van Tieghem, M. R., Volk, B. M., Roberts, C. G. P., Adams, R. N., Volek, J. S., Phinney, S. D., & Hallberg, S. J. (2024). 5-Year effects of a novel continuous remote care model with carbohydrate-restricted nutrition therapy including nutritional ketosis in type 2 diabetes: An extension study. *Diabetes Research and Clinical Practice*, 217, 111898. <https://doi.org/10.1016/j.diabres.2024.111898>.

Consolidation of the Food System

Our agricultural system has historically focused on abundance and affordability. The progress we have made is largely thanks to the hard work of American farmers, ranchers, and food scientists. However, the rise of UPFs has corresponded with a pattern of corporatization and consolidation in our food system. Today's diet-related chronic disease crisis, demand a closer examination of this pattern and its broader impact. Key observations include:

- Farmers today receive a small share of consumer food spending; in 2023, only 16 cents of every dollar spent on food went to farmers, while 84 cents was absorbed by food manufacturers, marketers, and distributors.¹⁶⁷
- A small number of corporations control a large share of food production, processing, distribution, and retail. Many of the core products of “Big Food” companies are UPFs and nutrient-poor foods and beverages. This trend of consolidation began in earnest in the late 1980s and early 1990s, when the two largest U.S. tobacco companies transformed into major players in the packaged food industry through aggressive acquisitions.^{168 169} Four companies control 80% of the meat market in the U.S.¹⁷⁰
- The regulation of the food industry also presents challenges to smaller farmers and smaller food producers. Key regulations, such as the Food Safety Modernization Act (FSMA) enacted in 2011, implemented rigorous compliance requirements for food safety that smaller farms often lack the resources to meet. This has inadvertently led to increased costs and burdensome paperwork that disproportionately impact family-run operations.¹⁷¹ Similarly, the implementation of the Hazard Analysis and Critical Control Points (HACCP) system has further complicated operations for smaller producers without the expertise or capital to navigate such comprehensive safety protocols.¹⁷²

Distorted Nutrition Research and Marketing

The public depends on scientific research and the media for information about the food we consume. The food industry has increasingly influenced these critical sources of public information, diminishing the integrity of information available to consumers:

- A *BMJ* analysis found that while industry spent over \$60 billion on drug, biotechnology, and medical device research in nutrition science,¹⁷³ the government spent \$1.5 billion on

¹⁶⁷ U.S. Department of Agriculture, Economic Research Service. (2023). Food dollar series: Overview. <https://www.ers.usda.gov/data-products/food-dollar-series/>.

¹⁶⁸ Nguyen, K. H., Glantz, S. A., Palmer, C. N., & Schmidt, L. A. (2019). Tobacco industry involvement in children's sugary drinks market. *BMJ*, 364.

¹⁶⁹ Nguyen, K. H., Glantz, S. A., Palmer, C. N., & Schmidt, L. A. (2020). Transferring racial/ethnic marketing strategies from tobacco to food corporations: Philip Morris and Kraft General Foods. *American journal of public health*, 110(3), 329-336.

¹⁷⁰ MacDonald, J. M. (2024, January 25). Four largest U.S. meatpackers' share of cattle and hog purchases surged after 1980 [Chart]. Economic Research Service, U.S. Department of Agriculture. Retrieved May 9, 2025, from <https://www.ers.usda.gov/data-products/chart-gallery/chart-detail?chartId=108341>.

¹⁷¹ Boys, K. A., Ollinger, M., & Geyer, L. L. (2015). The Food Safety Modernization Act: implications for US small scale farms. *American journal of law & medicine*, 41(2-3), 395-405.

¹⁷² Dima, A., Radu, E., & Dobrin, C. (2024). Exploring Key Barriers of HACCP Certification Adoption in the Meat Industry: A Decision-Making Trial and Evaluation Laboratory Approach. *Foods*, 13(9), 1303.

¹⁷³ Mozaffarian, D., and N. G. Forouhi. 2018. Dietary guidelines and health—is nutrition science up to the task? *BMJ* 360:k822. <https://doi.org/10.1136/bmj.k822>.

nutrition research.¹⁷⁴ While it's not a direct comparison, the contrast still illustrates a striking disparity.

- Government funding by the NIH for nutrition research is only 4-5% of its total budget¹⁷⁵ and in some cases can be subjected to influence by food industry-aligned researchers.¹⁷⁶
- Industry funding skews the outcomes of nutrition research. In 2018, 13% of articles in the top 10 most cited nutrition journals reported industry involvement, and 56% of these studies yielded favorable results, compared to just 10% of non-industry studies.¹⁷⁷ A meta-analysis further revealed that 0% of interventional nutrition studies funded by the industry reported unfavorable health conclusions regarding soft drinks, juices, and milk, while 37% of studies backed by non-industry funding did; the likelihood of reaching a favorable conclusion in studies that received industry funding was 7.61 times higher compared to studies that did not receive any industry funding.¹⁷⁸
- According to one study, children are exposed to 15 food ads per day, with over 90% promoting products high in fat, sugar, and sodium.¹⁷⁹ This constant exposure has been linked to increased cravings for and consumption of sugary beverages and other unhealthy products.^{180 181 182}

Compromised Dietary Guidelines

The Dietary Guidelines for Americans (DGA) have been the foundation of national nutrition policy. They attempt to shape what millions of Americans eat by influencing programs like the Supplemental Nutrition Assistance Program (SNAP) and the National School Lunch Program, and by setting food standards for the military, prisons, and veterans' care. The DGA also influences public health campaigns, nutrition labels, and food industry practices, making them one of the most powerful forces in the U.S. food system.^{183,184}

¹⁷⁴ Toole, A.A. & Kuchler, F. (2015). *Improving Health Through Nutrition Research: An Overview of the U.S. Nutrition Research System*. U.S. Department of Agriculture, Economic Research Service. ERR-182.

¹⁷⁵ Fleischhacker SE, Woteki CE, Coates PM, Hubbard VS, Flaherty GE, Glickman DR, Harkin TR, Kessler D, Li WW, Loscalzo J, Parekh A, Rowe S, Stover PJ, Tagtow A, Yun AJ, Mozaffarian D. Strengthening national nutrition research: rationale and options for a new coordinated federal research effort and authority. *Am J Clin Nutr*. 2020 Sep 1;112(3):721-769. doi: 10.1093/ajcn/nqaa179. PMID: 32687145; PMCID: PMC7454258.

¹⁷⁶ Kearns CE, Schmidt LA, Glantz SA. Sugar Industry and Coronary Heart Disease Research: A Historical Analysis of Internal Industry Documents. *JAMA Intern Med*. 2016 Nov 1;176(11):1680-1685. doi: 10.1001/jamainternmed.2016.5394. Erratum in: *JAMA Intern Med*. 2016 Nov 1;176(11):1729. doi: 10.1001/jamainternmed.2016.6774. PMID: 27617709; PMCID: PMC5099084.

¹⁷⁷ Sacks G, Riesenber D, Mialon M, Dean S, Cameron AJ (2020) The characteristics and extent of food industry involvement in peer reviewed research articles from 10 leading nutrition-related journals in 2018. *PLoS ONE* 15(12): e0243144.

¹⁷⁸ Lesser LI, Ebbeling CB, Goozner M, Wypij D, Ludwig DS (2007) Relationship between funding source and conclusion among nutrition-related scientific articles. *PLoS Med* 4(1): e5.

¹⁷⁹ Harris JL, Pomeranz JL, Lobstein T, Brownell KD. A crisis in the marketplace: how food marketing contributes to childhood obesity and what can be done. *Annu Rev Public Health*. 2009;30:211-25.

¹⁸⁰ Tsochantaridou, A.; Sergentanis, T.N.; Grammatikopoulou, M.G.; Merakou, K.; Vassilakou, T.; Kornarou, E. Food Advertisement and Dietary Choices in Adolescents: An Overview of Recent Studies. *Children* 2023, 10, 442.

¹⁸¹ Smith R, Kelly B, Yeatman H, Boyland E. Food Marketing Influences Children's Attitudes, Preferences and Consumption: A Systematic Critical Review. *Nutrients*. 2019 Apr 18;11(4):875.

¹⁸² Cairns G, Angus K, Hastings G, Caraher M. Systematic reviews of the evidence on the nature, extent and effects of food marketing to children. A retrospective summary. *Appetite*. 2013 Mar;62:209-15.

¹⁸³ National Academies of Sciences, Engineering, and Medicine; Health and Medicine Division; Food and Nutrition Board; Committee to Review the Process to Update the Dietary Guidelines for Americans. *Redesigning the Process for Establishing the Dietary Guidelines for Americans*. Washington (DC): National Academies Press (US); 2017 Nov 16. 2, Role and Purposes of the Dietary Guidelines for Americans: Evaluation and Findings. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK469833/>.

¹⁸⁴ U.S. Department of Health and Human Services & U.S. Department of Agriculture. (2020). *Dietary Guidelines for Americans, 2020-2025* (9th ed.).

While the DGA's do emphasize the importance of whole foods such as fruits, vegetables, whole grains, lean proteins, and unsaturated fats as well as recommend limiting added sugars, saturated fats, and excess sodium,¹⁸⁵ they are often presented in technical language that can be difficult for the average person to understand. This complexity may contribute to the worrying statistic that less than 10% of Americans follow a diet that aligns fully with the DGA.¹⁸⁶ Additionally, there are more fundamental criticisms of the DGA's approach that warrant serious consideration.

Specifically, the DGA:

- **Maintain problematic reductionist recommendations,**^{187 188} such as:
 - Advising people to “reduce saturated fat” or “limit sodium” instead of focusing on minimizing ultra-processed foods.
 - Treating all calories similarly, rather than distinguishing between nutrient-dense foods and ultra-processed products.
- **Remain largely agnostic to how foods are produced or processed:** There is little distinction between industrially processed foods and home-cooked or whole foods if their nutrient profiles look similar. Added sugars, saturated fats and sodium are treated as proxies for ultra-processed foods. For instance, a cup of whole-grain ready to eat fortified breakfast cereal and a cup of oatmeal with fruit might both count as “whole grain servings,” and the guidelines do not weigh in on differences in processing.
- **Do not explicitly address UPFs:** The 2025 Dietary Guidelines Advisory Committee (DGAC) under the Biden Administration opted not to issue recommendations limiting UPFs. Although they concluded that a diet higher in UPFs was associated with greater risk of obesity and/or being overweight, they graded the evidence as “limited.”¹⁸⁹ The DGAC noted methodological discrepancies in existing studies—particularly variations in defining and measuring UPFs—rather than an absence of concern or research rigor. Meanwhile, other countries explicitly urge citizens to avoid or limit UPFs:
 - **Brazil's** guidelines explicitly advise people to “avoid ultra-processed foods.” and emphasize home cooking, shared meals, and cultural food traditions.¹⁹⁰
 - **Japan's** guidelines, rooted in traditional dietary culture, emphasize staple foods, side dishes, and moderation, and stress portion variety, food education in schools, and daily physical activity.¹⁹¹
 - **The Nordic countries'** guidelines (2023) recommend “minimal intake of...processed foods containing high amounts of added fats, salt, and sugar.”¹⁹²

¹⁸⁵ U.S. Department of Health and Human Services & U.S. Department of Agriculture. (2020). Dietary Guidelines for Americans, 2020-2025 (9th ed.).

¹⁸⁶ Wilson, M. M., Reedy, J., & Krebs-Smith, S. M. (2016). American diet quality: where it is, where it is heading, and what it could be. *Journal of the Academy of Nutrition and Dietetics*, 116(2), 302-310.

¹⁸⁷ Tapsell LC, Neale EP, Satija A, and Hu FB. (2016) Foods, Nutrients, and Dietary Patterns: Interconnections and Implications for Dietary Guidelines. *Advances in Nutrition* 7(3). <https://doi.org/10.3945/an.115.011718>.

¹⁸⁸ Mozaffarian, D., Rosenberg, I., & Uauy, R. (2018). History of modern nutrition science—implications for current research, dietary guidelines, and food policy. *Bmj*, 361.

¹⁸⁹ United States Department of Agriculture & Health and Human Services. (2025). Myths vs. Facts: Correcting Misinformation about the Dietary Guidelines. https://www.cspinet.org/sites/default/files/2025-04/1.%20DGA%20Myths%20vs%20Facts_CSPI.pdf.

¹⁹⁰ Ministry of Health of Brazil. (2014). Dietary guidelines for the Brazilian population (2nd ed.). https://bvsmms.saude.gov.br/bvs/publicacoes/dietary_guidelines_brazilian_population.pdf.

¹⁹¹ Ministry of Health, Labour and Welfare & Ministry of Agriculture, Forestry and Fisheries. (2005). Japanese food guide spinning top. https://www.maff.go.jp/e/policies/tech_res/attach/pdf/shokuiku-1.pdf.

¹⁹² Nordic Council of Ministers. (2023, June 20). Nordic nutrition recommendations 2023: Integrating environmental aspects. <https://www.norden.org/en/publication/nordic-nutrition-recommendations-2023>.

- They also integrate nutrition and reducing food waste in one framework that prioritizes whole grains, legumes, root vegetables, and sustainable fish.
- **France's** guidelines encourage cooking from scratch, enjoying minimally processed foods, limiting ultra-processed, high sugar/fat items, and seasonal, local, and organic choices.^{193 194}

The DGA have a history of **being unduly influenced by corporate interests**. For example:

- The infamous 1992 Food Pyramid, which was influenced by research from the sugar industry,^{195 196 197} recommended carbohydrates at the base of the pyramid and made no differentiation between refined grains and whole grains.
- In 2015, the DGAC recommendation to reduce processed meat consumption faced pushback from the meat production industry, which led to these recommendations being removed from the final published guidelines.¹⁹⁸
- A recent analysis found that 95% of the 2020DGAC members had some form of relationship with industry actors, most often through research funding but also as board members, speakers/honoraria, or consultants.¹⁹⁹

Government Programs Compounding the Issue

Over the past 50 years, several well-intentioned government programs have been launched to improve children's nutrition and access to food. However, as these programs have grown in size and complexity, many have drifted from their original goals:

Traditional Field Crops vs. Specialty Crops: Historically, federal crop insurance programs have primarily covered traditional field crops like wheat, corn, and soybeans, while providing much less support for specialty crops such as fruits, vegetables, tree nuts, and nursery plants.²⁰⁰ While specialty crop coverage has been expanding, it still only accounted for 17% of the entire federal crop insurance portfolio by liability during crop year 2017, and subsidies for fruits, vegetables, tree nuts, and support for organic foods account for a mere 0.1% of the 2018 Farm Bill.²⁰¹ Just over 80% of Farm Bill spending is devoted to the Supplemental Nutrition Assistance Program, described further below.

¹⁹³ Delamaire, C., Escalon, E., & Noiro, L. (2019). Recommendations concerning diet, physical activity and sedentary behaviour for adults (62 p.). Santé publique France. <https://www.santepubliquefrance.fr>.

¹⁹⁴ Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail (ANSES). (2024, January 17). *ANSES updates its food consumption guidelines for the French population* <https://www.anses.fr/en/content/anses-updates-its-food-consumption-guidelines-french-population>.

¹⁹⁵ Kearns, C. E., Schmidt, L. A., & Glantz, S. A. (2016). Sugar Industry and Coronary Heart Disease Research: A Historical Analysis of Internal Industry Documents. *JAMA Internal Medicine*, 176(11), 1680–1685.

¹⁹⁶ Nestle, M. (1993). Food lobbies, the food pyramid, and US nutrition policy. *International Journal of Health Services*, 23(3), 483–496.

¹⁹⁷ Nestle, M. (2013). Food politics: How the food industry influences nutrition and health. In *Food Politics*. University of California press.

¹⁹⁸ Nestle M. (2018). Perspective: Challenges and Controversial Issues in the Dietary Guidelines for Americans, 1980-2015. *Advances in nutrition* 9(2), 148–150. <https://doi.org/10.1093/advances/nmx022>.

¹⁹⁹ Mialon, M., Serodio, P. M., Crosbie, E., Teicholz, N., Naik, A., & Carriedo, A. (2022). Conflicts of interest for members of the US 2020 dietary guidelines advisory committee. *Public health nutrition*, 27(1), e69. <https://doi.org/10.1017/S1368980022000672>.

²⁰⁰ Congressional Research Service. Federal crop insurance: specialty crops. R45459 (2019).

²⁰¹ Agriculture Improvement Act of 2018 (Public Law 115–334, Dec. 20, 2018); USDA Economic Research Service Based on Congressional Budget Office, Direct Spending Effects for the Agriculture Improvement Act of 2018 (2018 Farm Bill), December 11, 2018; USDA Budget Explanatory Notes, NIFA & AMS, 2021-2024.

The Supplemental Nutrition Assistance Program (SNAP) served on average 42 million low-income Americans per month with Federal SNAP spending totaling \$113 billion in fiscal year 2023.^{202 203} 1 in 5 American children 17 and under receive SNAP benefits.²⁰⁴ SNAP participants can buy everything on grocery store shelves with the exception of alcohol, hot foods, tobacco and non-food products.²⁰⁵

- Children receiving SNAP benefits are more likely to consume greater quantities of sugar-sweetened beverages and processed meats compared to income-eligible nonrecipients,^{206 207} by one estimate, nearly twice as much will be spent by SNAP on UPFs and sugar-sweetened beverages (\$21 billion) compared to fruits and vegetables (\$11 billion) in FY2025.^{208 209}
- SNAP participants face worsening health outcomes compared to non-participants, exhibiting elevated disease risks: according to one study, they are twice as likely to develop heart disease, three times more likely to die from diabetes, and have higher rates of metabolic disorders.²¹⁰ Additionally, children on SNAP can struggle to meet key dietary guidelines and perform poorly on key health indicators when compared with income-eligible and higher income nonparticipants.²¹¹
 - o The costs for these preventable diseases fall directly on taxpayers. Roughly 60% of SNAP participants received Medicaid in 2019, highlighting the connection between healthcare costs and suboptimal nutritional services.²¹²

SNAP currently has incentives in place to encourage increased consumption of fruit, vegetables, dairy, and whole grains. These incentive programs encourage healthy eating by making nutritious food more accessible and affordable through coupons, discounts, gift cards, bonus items, or extra funds.²¹³ Other countries steer food-assistance recipients toward healthier

²⁰² Food and Nutrition Service, U.S. Department of Agriculture. (n.d.). Short history of SNAP. Retrieved May 5, 2025, from <https://www.fns.usda.gov/snap/history>.

²⁰³ *Supplemental Nutrition Assistance Program (SNAP)—Key Statistics and Research* | Economic Research Service. (n.d.). Retrieved May 4, 2025, from <https://www.ers.usda.gov/topics/food-nutrition-assistance/supplemental-nutrition-assistance-program-snap/key-statistics-and-research>.

²⁰⁴ Bureau, U. C. (n.d.). *Supplemental Nutrition Assistance Program (SNAP): 2022*. Census.Gov. Retrieved May 4, 2025, from <https://www.census.gov/library/fact-sheets/2022/demo/p70fs-199.html>.

²⁰⁵ Food and Nutrition Service, U.S. Department of Agriculture. (n.d.). What Can SNAP Buy?. Retrieved May 20, 2025, from <https://www.fns.usda.gov/snap/eligible-food-items>.

²⁰⁶ Mande, J., & Flaherty, G. (2023). Supplemental Nutrition Assistance Program as a health intervention. *Current Opinion in Pediatrics*, 35(1), 33.

²⁰⁷ Smith, T. A., & Gregory, C. A. (2023). Food insecurity in the United States: Measurement, economic modeling, and food assistance effectiveness. *Annual Review of Resource Economics*, 15(1), 279–303.

²⁰⁸ Garasky, S., Mbwana, K., Romualdo, A., Tenaglio, A., & Roy, M. (2016). Foods typically purchased by SNAP households (Summary). U.S. Department of Agriculture, Food and Nutrition Service.

²⁰⁹ *Make America Healthy Again: Stop Taxpayer-Funded Junk Food*. (2025, January 16). The Foundation for Government Accountability. <https://thefga.org/research/make-america-healthy-again-stop-taxpayer-funded-junk-food/>.

²¹⁰ Conrad, Z., Rehm, C. D., Wilde, P., & Mozaffarian, D. (2017). Cardiometabolic Mortality by Supplemental Nutrition Assistance Program Participation and Eligibility in the United States. *American Journal of Public Health*, 107(3), 466–474.

²¹¹ Mande, J., & Flaherty, G. (2023). Supplemental Nutrition Assistance Program as a health intervention. *Current Opinion in Pediatrics*, 35(1), 33.

²¹² Macartney, S., & Ghertner, R. (2023, January). How many people who receive one safety net benefit also receive others? U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation. <https://aspe.hhs.gov/sites/default/files/documents/5bd792aeea69a2259bc93b3dfd9110b3/program-overlap-datapoint.pdf>.

²¹³ U.S. Department of Agriculture, Food and Nutrition Service. (n.d.). SNAP healthy incentives. Retrieved May 17, 2025, from <https://fns-prod.azureedge.us/snap/healthy-incentives>.

dietary choices rather than merely emphasizing caloric intake. For example, South Korea and Chile implement food voucher programs similar to SNAP but prioritize domestic and nutritious food products, effectively guiding recipients toward healthier eating habits.^{214 215}

The School Breakfast Program and National School Lunch Program (NSLP) operates in nearly 100,000 schools covering more than 30 million children,²¹⁶ with an annual cost of \$24 billion,²¹⁷ and yet:

- Schools that receive federal lunch subsidies are required to follow a meal pattern that limits added sugars, sodium, and carbohydrates, but do not set limits on UPF consumption, leading to excessive intake of sugar, processed carbohydrates, processed fats, and sodium among children.²¹⁸
- To get into schools, many food companies have reformulated their products with minor ingredient adjustments to qualify for the federal Smart Snack program by meeting the school nutrition standards, which children can purchase separate from school meals.²¹⁹
 - There are concerns that providing these snacks in school can confuse students' perceptions of healthy foods,²²⁰ especially since Smart Snacks are often virtually indistinguishable from less-nutritious versions of fast food products available outside of school.²²¹

While the U.S. has long had programs that both incentivize fruits and vegetables, other countries' school lunch programs have additional standards and guidelines. In France, schools are required to source half their products from local sources and prohibit vending machines.²²² Japanese schools typically prepare meals on-site using whole ingredients, often from local farms and school gardens.²²³ Nordic countries, such as Sweden and Finland, have established guidelines that emphasize unprocessed foods while strictly limiting high-fat, high-sugar, and high-sodium processed items.^{224 225}

²¹⁴ *Food insecurity and food assistance programmes across OECD countries: Overcoming evidence gaps* (OECD Food, Agriculture and Fisheries Papers No. 183; OECD Food, Agriculture and Fisheries Papers, Vol. 183). (2022). <https://doi.org/10.1787/42b4a7fa-en>.

²¹⁵ *Food and Nutrition Assistance Policies in Korea: Focus on Food Voucher Program*. (2023, March 1). FFTC Agricultural Policy Platform (FFTC-AP). <https://ap.fttc.org.tw/article/3293>.

²¹⁶ *National School Lunch Program* | Food and Nutrition Service. (n.d.). Retrieved May 4, 2025, from <https://www.fns.usda.gov/nslp>.

²¹⁷ *Child Nutrition Programs—National School Lunch Program* | Economic Research Service. (n.d.). Retrieved May 4, 2025, from <https://www.ers.usda.gov/topics/food-nutrition-assistance/child-nutrition-programs/national-school-lunch-program>.

²¹⁸ U.S. Department of Agriculture, Food and Nutrition Service. (2024). National School Lunch Program Meal Pattern. <https://www.fns.usda.gov/school-meals/nutrition-standards/nslp-meal-pattern>.

²¹⁹ All foods sold at school during the school day are required to meet nutrition standards. The Smart Snacks in School regulation applies to foods sold a la carte, in the school store, vending machines, and any other venues where food is sold to students. <https://www.fns.usda.gov/school-meals/nutrition-standards/smartsnacks>.

²²⁰ Jensen, M. L., McCann, M., Fleming-Milici, F., Mancini, S., & Harris, J. L. (2022, April). Food industry self-regulation: Changes in nutrition of foods and drinks that may be advertised to children. UConn Rudd Center for Food Policy & Health. <https://uconnruddcenter.org/research/food-marketing>.

²²¹ Harris, J. L., Hyary, M., & Schwartz, M. B. (2016). Effects of offering look-alike products as smart snacks in schools. *Childhood Obesity*, 12(6), 432-439.

²²² Sylvie Avallone et al., "School Meals Case Study: France," School Meals Coalition (2023), https://www.schoolmealscoalition.org/sites/default/files/2024-05/Avallone_et_al_2023_School_Meals_Case_Study_France_.pdf.

²²³ International Confederation of Dietetic Associations. (n.d.). *National School Lunch Program (Japan)*. Sustainability Case Studies. Retrieved May 5, 2025, from <https://icdasustainability.org/case-study/national-school-lunch-program/>.

²²⁴ Food and Agriculture Organization of the United Nations. (n.d.). *Sweden: School food*. Retrieved May 5, 2025, from <https://www.fao.org/platforms/school-food/around-the-world/europe-and-central-asia/sweden/en>.

²²⁵ Food and Agriculture Organization of the United Nations. (n.d.). *Finland: School food*. Retrieved May 5, 2025, from <https://www.fao.org/platforms/school-food/around-the-world/europe-and-central-asia/finland/en>.

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) is one example of a government program that is focused exclusively on the nutritional health of its participants—pregnant and breastfeeding women, women who recently had a baby, infants, and children up to 5 years of age. WIC provides nutrition education, food assistance, and support to approximately 6.7 million women and children up to age five as of 2024.²²⁶ WIC has a proven track record of improving children’s health:

- WIC allows health-conscious food purchase that are adjusted according to participants’ life stage nutritional needs, including increased fruit and vegetable consumption, reductions in juice consumption, and reductions in calorie intake.^{227 228}
- Research has shown that recipients experience improved pregnancy outcomes, better birth weights, higher immunization rates, improved diet quality, and cognitive gains.^{229 230}
- A study showed the 2009 WIC food package change may have helped reverse increasing childhood obesity rates.²³¹

²²⁶ U.S. Department of Agriculture, Food and Nutrition Service. (2025). WIC National Level Annual Summary FY 1974-2024. <https://www.fns.usda.gov/pd/wic-program>.

²²⁷ Schultz DJ, Byker Shanks C, Houghtaling B. The impact of the 2009 Special Supplemental Nutrition Program for Women, Infants, and Children Food Package revisions on participants: a systematic review. *J Acad Nutr Diet*. 2015;115(11):1832–1846

²²⁸ Ng SW, Hollingsworth BA, Busey EA, Wandell JL, Miles DR, Poti JM. Federal nutrition program revisions impact low-income households’ food purchases. *Am J Prev Med*. 2018;54(3):403–412.

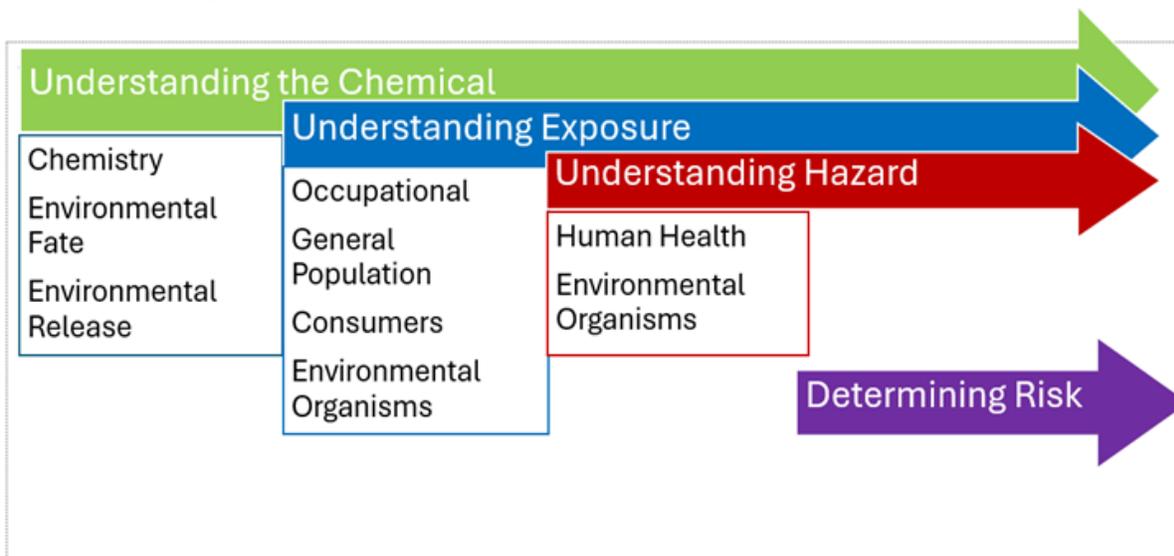
²²⁹ American Public Health Association. (2024, August). *Bridging the gap: Federal food access programs and their impact on food insecurity*. https://www.apha.org/getcontentasset/6f04791d-d297-4bfb-a03d-f1b32b822648/7ca0dc9d-611d-46e2-9fd3-26a4c03ddcbb/food_access_programs_report.pdf.

²³⁰ Caulfield, L. E., Bennett, W. L., Gross, S. M., Hurley, K. M., Ogunwole, S. M., Venkataramani, M., Lerman, J. L., Zhang, A., Sharma, R., & Bass, E. B. (2022). *Maternal and child outcomes associated with the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)* (Comparative Effectiveness Review No. 253). Agency for Healthcare Research and Quality.

²³¹ Daepf, M. I. G., Gortmaker, S. L., Wang, Y. C., Long, M. W., & Kenney, E. L. (2019). WIC food package changes: Trends in childhood obesity prevalence. *Pediatrics*, 143(5), e20182841.

Section 2. The Cumulative Load of Chemicals in our Environment

Chemical Exposures



Protecting children has been a priority for the federal executive branch for nearly 30 years, and yet, as science and technology advance there is a need to assess our current system to ensure it continues to be effective in utilizing the best tools and information available. In 1997, President Bill Clinton signed Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, which required federal agencies to make it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children and ensure effective policies, programs, activities, and standards that address them.²³² Environmental health and safety risks were defined as risks to health or to safety that are attributable to products or substances that the child is likely to come in contact with or ingest, such as the air we breathe, the food we eat, the water we drink or use for recreation, the soil we live on, and the products we use or are exposed to. The EO created the President’s Task Force on Environmental Health Risks and Safety Risks to Children and the Interagency Forum on Child and Family Statistics.^{233 234} As depicted by the figure above, the U.S. Environmental Protection Agency (EPA) has a robust risk-based approach that considers hazard and exposure for assessing the risks of chemicals, including pesticides, to human health and the environment.

²³² Executive Order 13045 of April 21, 1997: *Protection of children from environmental health risks and safety risks*. *Federal Register*, 62 (78), 19885–19888. Retrieved from <https://www.govinfo.gov/content/pkg/FR-1997-04-23/pdf/97-10695.pdf>.

²³³ President’s Task Force on Environmental Health Risks and Safety Risks to Children. *President’s Task Force on Environmental Health Risks and Safety Risks to Children*. National Institute of Environmental Health Sciences. <https://ptfcehs.niehs.nih.gov/>.

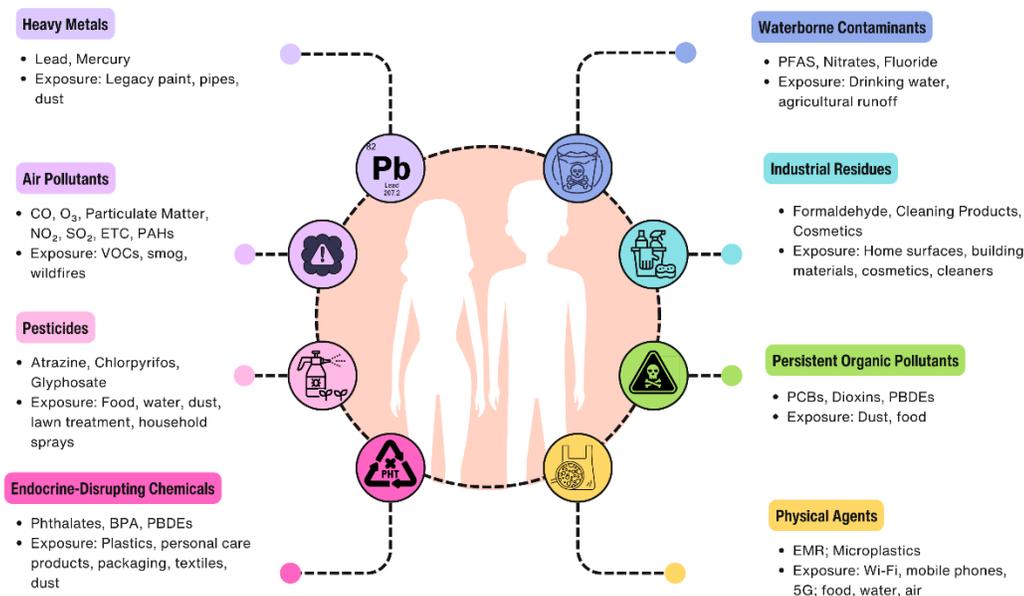
²³⁴ Federal Interagency Forum on Child and Family Statistics. (n.d.). *Forum on Child and Family Statistics*. Retrieved, from <https://www.childstats.gov/forum/>.

Since 2000, the EPA has been tracking indicators of children’s environmental well-being through *America’s Children and the Environment (ACE)*.²³⁵ ACE tracks chronic childhood disease in children (e.g., asthma, ADHD, autism, childhood cancers, and obesity) and summarizes trends over time for specific environmental exposures (e.g., air pollutants, drinking water contaminants, and chemicals in food). Many ACE indicators show significant improvements over time—such as exposure to lead which has been reduced over 90% since the 1970s and >70% reduction in key pollutants such as carbon monoxide, ozone, particulate matter (PM), nitrogen dioxide, and sulfur dioxide.²³⁶

However, in 2025—28 years after EO 13045 was signed—childhood health has largely worsened, and there is a growing concern about the link between environmental health risks, particularly cumulative risks, and chronic disease. Furthermore, in the past nearly 30 years, the chemicals children are exposed to have grown - and no country fully understands how the cumulative impact of this growth impacts health.

Exposure Pathways

Chemical Classes and Common Exposure Pathways



It is critical to recognize that chemicals are important tools that are inextricably linked to economic growth and innovations - helping to feed, shelter, and power every American and maintain food safety standards. Yet regulatory and medical systems around the world largely

²³⁵ U.S. Environmental Protection Agency. (n.d.). Basic information about ACE: America's Children and the Environment. <https://www.epa.gov/americaschildrenenvironment/basic-information-about-ace>.

²³⁶ U.S. Environmental Protection Agency. (2024). ACE environments and contaminants. <https://www.epa.gov/americaschildrenenvironment/ace-environments-and-contaminants>.

evaluate chemicals or chemical classes individually and may be neglecting potential synergistic effects and cumulative burdens, thereby missing opportunities to translate cumulative risk assessment into the clinical environment in meaningful ways.^{237 238 239} The cumulative effect of multiple chemical exposures and impact on children over time is not fully understood.^{240 241}

No country in the world has fully accounted for **the fact that children are often exposed to complex mixtures of chemicals**. The rapid progression of AI technology creates new opportunities to develop tools to better evaluate the environmental exposures of chronic diseases in children.²⁴² The great challenge of the next decade is for government and industry around the world to understand the impacts of the *cumulative* chemical exposure that a child faces. This presents an opportunity for American technologic innovation to develop new risk evaluation tools and to promote solutions.

The U.S. government is committed to fostering radical transparency and gold-standard science to better understand the potential cumulative impacts of environmental exposures. We must understand and ameliorate any potential links between cumulative chemical exposure and childhood chronic disease. This cannot happen through a European regulatory system that stifles growth. It will happen through a renewed focus on fearless gold-standard science throughout the federal government and through unleashing private sector innovation to understand and reduce the cumulative chemical load on our children. It is critical the U.S. evaluate the current environmental regulatory structure and determine ways to continue to promote economic growth through innovation, while also evolving our frameworks for promoting children’s health.

Why Children Are Uniquely Vulnerable to Environmental Chemicals

Children are not “little adults” when it comes to environmental chemicals.²⁴³ Exposure to these substances can begin at conception and continue throughout childhood, adolescence, and into adulthood, accumulating over time. The placenta and umbilical cord do not serve as impenetrable barriers; they can allow hundreds of industrial chemicals and pollutants to reach the developing fetus.²⁴⁴ Once children are exposed to these substances, several unique characteristics make newborns, children, and adolescents particularly vulnerable. Here are some key factors that heighten their risk:

²³⁷ Elcombe, C. S., Evans, Neil P. & and Bellingham, M. Critical review and analysis of literature on low dose exposure to chemical mixtures in mammalian in vivo systems. *Critical Reviews in Toxicology* 52, 221–238 (2022).

²³⁸ Vermeulen, R., Schymanski, E. L., Barabási, A. L., & Miller, G. W. (2020). The exposome and health: Where chemistry meets biology. *Science*, 367(6476), 392–396. <https://doi.org/10.1126/science.aay3164>.

²³⁹ Rappaport SM, Smith MT. Epidemiology. Environment and disease risks. *Science*. 2010 Oct 22;330(6003):460-1. doi: 10.1126/science.1192603. PMID: 20966241; PMCID: PMC4841276.

²⁴⁰ Taiba, J., Beseler, C., Zahid, M., Bartelt-Hunt, S., Kolok, A., & Rogan, E. (2025). Exploring the joint association between agrichemical mixtures and pediatric cancer. *GeoHealth*, 9, e2024GH001236. <https://doi.org/10.1029/2024GH001236>.

²⁴¹ Kassotis, C. D., & Phillips, A. L. (2023). Complex mixtures and multiple stressors: evaluating combined chemical exposures and cumulative toxicity. *Toxics*, 11(6), 487.

²⁴² Kleinstreuer, N., & Hartung, T. (2024). Artificial intelligence (AI)—it’s the end of the tox as we know it (and I feel fine). *Archives of Toxicology*, 98(3), 735–754.

²⁴³ Landrigan, P. J., & Landrigan, M. M. (2018). Children and environmental toxins: What everyone needs to know®. Oxford University Press.

²⁴⁴ Mathiesen, L., Buerki-Thurnherr, T., Pastuschek, J., Aengenheister, L., & Knudsen, L. E. (2021). Fetal exposure to environmental chemicals; insights from placental perfusion studies. *Placenta*, 106, 58–66. <https://doi.org/10.1016/j.placenta.2021.01.025>.

- **Sensitive Developmental Windows:** Even minor exposures during critical periods—in utero, infancy, early childhood, and adolescence—can result in developmental delays or permanent harm.^{245 246 247}
- **Developing Immune Systems:** Young children have maturing immune systems, making them susceptible to chemical exposures that can disrupt lifelong immune development.^{248 249}
- **Detoxification Challenges:** Babies struggle to detoxify chemicals as effectively as adults, allowing chemicals to accumulate in their smaller bodies.^{250 251}
- **Accelerated Brain Development:** Early childhood is marked by rapid brain development, with up to one million new neural connections forming every second.²⁵² Toxic exposures during this time can derail neurodevelopment, leading to lifelong learning disabilities and behavioral disorders.^{253 254}
- **Endocrine Disruption:** Multiple developmental stages, from fetal growth to onset of puberty, are regulated via exquisitely sensitive hormonal signaling that can be disrupted by endocrine-disrupting chemicals, impacting growth trajectories and outcomes from conception through early adulthood.²⁵⁵
- **Adolescent Brain Remodeling:** The brain undergoes a second phase of remodeling during adolescence, particularly in regions responsible for impulse control and emotion.²⁵⁶ Neurotoxic substances—such as solvents and heavy metals—can have lasting effects that extend well beyond the teenage years.^{257 258}

²⁴⁵ Rodulfo-Cárdenas, R., Morales-Álvarez, A., García-Muñoz, M., Bonilla-Aldana, D. K., & Rodríguez-Morales, A. J. (2023). The influence of environmental particulate matter exposure during late gestation and early life on the risk of neurodevelopmental disorders: A systematic review of experimental evidences. *Environmental Research*, 236, 116792.

²⁴⁶ National Research Council & Institute of Medicine. (2000). *From neurons to neighborhoods: The science of early childhood development*. National Academies Press.

²⁴⁷ Ames, J. L., Sharma, V., & Lyall, K. (2025). Effects of early-life PFAS exposure on child neurodevelopment: A review of the evidence and research gaps. *Current Environmental Health Reports*, 12(1), 9.

²⁴⁸ von Holst, H., Nayak, P., Dembek, Z., & Buehler, S. (2021). Perfluoroalkyl substances exposure and immunity, allergic response, infection, and asthma in children: Review of epidemiologic studies. *Heliyon*, 7, e08160.

²⁴⁹ DeWitt, J. C., Peden-Adams, M. M., Keil, D. E., & Dietert, R. R. (2012). Current status of developmental immunotoxicity: early-life patterns and testing. *Toxicologic pathology*, 40(2), 230–236. <https://doi.org/10.1177/0192623311427709>.

²⁵⁰ Scheuplein, R., Charnley, G., & Dourson, M. (2002). Differential sensitivity of children and adults to chemical toxicity. I. Biological basis. *Regulatory toxicology and pharmacology: RTP*, 35(3), 429–447. <https://doi.org/10.1006/rtph.2002.1558>.

²⁵¹ Naji-Talakar, S., Sharma, S., Martin, L. A., Barnhart, D., & Prasad, B. (2021). Potential implications of DMET ontogeny on the disposition of commonly prescribed drugs in neonatal and pediatric intensive care units. *Expert Opinion on Drug Metabolism & Toxicology*, 17(3), 273–289. <https://doi.org/10.1080/17425255.2021.1858051>.

²⁵² Center on the Developing Child at Harvard University. (n.d.). Brain Architecture. Retrieved from <https://developingchild.harvard.edu/key-concept/brain-architecture/>.

²⁵³ Hauptman, M., & Woolf, A. D. (2017). Childhood ingestions of environmental toxins: What are the risks? *Pediatric Annals*, 46(10), e466–e471. <https://doi.org/10.3928/19382359-20170925-01>.

²⁵⁴ Sappamrer, R., & Hongsibsong, S. (2019). Effects of prenatal and postnatal exposure to organophosphate pesticides on child neurodevelopment in different age groups: A systematic review. *Environmental Science and Pollution Research*, 26, 18267–18290.

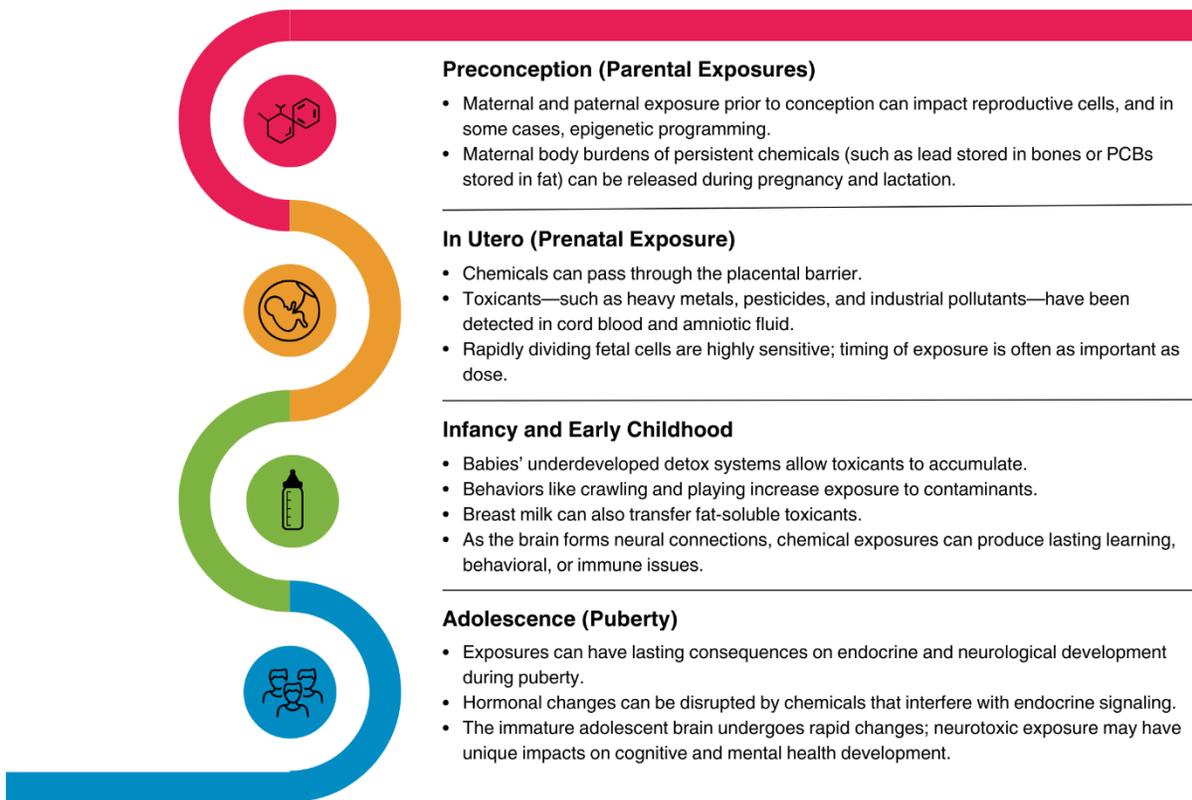
²⁵⁵ Gore, A. C., Chappell, V. A., Fenton, S. E., Flaws, J. A., Nadal, A., Prins, G. S., Toppari, J., & Zoeller, R. T. (2015). EDC-2: The Endocrine Society's Second Scientific Statement on Endocrine-Disrupting Chemicals. *Endocrine reviews*, 36(6), E1–E150. <https://doi.org/10.1210/er.2015-1010>.

²⁵⁶ American College of Pediatricians. (2017). *The Teenage Brain: Under Construction*.

²⁵⁷ Grandjean, P., & Landrigan, P. J. (2014). Neurobehavioural effects of developmental toxicity. *The Lancet. Neurology*, 13(3), 330–338. [https://doi.org/10.1016/S1474-4422\(13\)70278-3](https://doi.org/10.1016/S1474-4422(13)70278-3).

²⁵⁸ Theron, L. C., Fouché, A., Lau, C., & van Niekerk, L. (2022). A systematic review of the mental health risks and resilience among pollution-exposed adolescents. *Journal of Psychiatric Research*, 146, 55–66.

Child Development Stages and Associated Health Risks Posed by Common Toxicants



While children are uniquely vulnerable, they are also exposed to hazardous substances in different ways:

- Virtually every breastmilk sample (important for infant health, growth, and development) tested in America contains some level of persistent organic pollutants (POPs), including pesticides, microplastics, and dioxins.²⁵⁹ ²⁶⁰ Breastfeeding is the top recommendation for infant nutrition but the data indicates the pervasiveness of the exposures in American life.

²⁵⁹ LaKind, J. S., Verner, M. A., Rogers, R. D., Goeden, H., Naiman, D. Q., Marchitti, S. A., ... & Fenton, S. E. (2022). Current breast milk PFAS levels in the United States and Canada: after all this time, why don't we know more?. *Environmental health perspectives*, 130(2), 025002.

²⁶⁰ Calabrese, E. J. (1982). Human breast milk contamination in the United States and Canada by chlorinated hydrocarbon insecticides and industrial pollutants: current status. *Journal of the American College of Toxicology*, 1(3), 91-98.

- Infants and toddlers ingest much more household dust than adults, much of which contains detectable levels of lead, flame retardants, and pesticide residues.^{261 262}
 - With infants putting their hands and objects in their mouths nearly ten times per hour, they are frequently ingesting invisible contaminants, such as lead dust, which often exceeds federal hazard levels in many homes nationwide.^{263 264}
 - The 2009 American Healthy Homes Survey, a collaborative effort by EPA and HUD, demonstrated the widespread presence of pesticides in U.S. homes, with almost 90% showing measurable levels of at least one insecticide on their floors.²⁶⁵
 - Nearly 25% of U.S. children live within close proximity to one of 1,341 Superfund sites -areas contaminated with industrial toxic waste which, depending on their level of contamination and clean up status, could further compound their risk for chemical exposure and associated adverse outcomes.^{266 267 268}
 - More than eight billion pounds of pesticides are used each year in food systems around the world, with the U.S accounting for roughly 11%, or more than one billion pounds.²⁶⁹
- 270

The Executive Order establishing the MAHA Commission directed this assessment to evaluate the threat that “certain chemicals, and certain other exposures pose to children with respect to chronic inflammation or other established mechanisms of disease, using rigorous and transparent data.”

Children are exposed to numerous chemicals, such as heavy metals, PFAS, pesticides, and, phthalates, via their diet, textiles, indoor air pollutants, and consumer products.^{271 272} Children’s unique behaviors and developmental physiology make them particularly vulnerable to potential

²⁶¹ U.S. EPA. Exposure Factors Handbook 2011 Edition (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-09/052F, 2011.

²⁶² Ozkaynak, H., Xue, J., Zartarian, V. G., Glen, G., & Smith, L. (2011). Modeled estimates of soil and dust ingestion rates for children. *Risk analysis: an official publication of the Society for Risk Analysis*, 31(4), 592–608. <https://doi.org/10.1111/j.1539-6924.2010.01524>.

²⁶³ Jacobs, D. E., Clickner, R. P., Zhou, J. Y., Viet, S. M., Marker, D. A., Rogers, J. W., Zeldin, D. C., Broene, P., & Friedman, W. (2002). The prevalence of lead-based paint hazards in U.S. housing. *Environmental health perspectives*, 110(10), A599–A606. <https://doi.org/10.1289/ehp.021100599>.

²⁶⁴ Xue, J., Zartarian, V., Tulve, N., Moya, J., Freeman, N., Auyeung, W., & Beamer, P. (2010). A meta-analysis of children’s object-to-mouth frequency data for estimating non-dietary ingestion exposure. *Journal of Exposure Science & Environmental Epidemiology*, 20, 536–545.

²⁶⁵ Stout, D. M., 2nd, Bradham, K. D., Egeghy, P. P., Jones, P. A., Croghan, C. W., Ashley, P. A., Pinzer, E., Friedman, W., Brinkman, M. C., Nishioka, M. G., & Cox, D. C. (2009). American Healthy Homes Survey: a national study of residential pesticides measured from floor wipes. *Environmental science & technology*, 43(12), 4294–4300. <https://doi.org/10.1021/es8030243>.

²⁶⁶ United States Environmental Protection Agency. (2022). Current NPL updates: New proposed NPL sites and new NPL sites. <https://www.epa.gov/superfund/current-npl-updates-new-proposed-npl-sites-and-new-npl-sites>.

²⁶⁷ United States Environmental Protection Agency. (2015). Superfund, Brownfields and RCRA corrective action sites near 63 percent of the U.S. population. <https://www.epa.gov/cleanups/superfund-brownfields-and-rcra-corrective-action-sites-near-63-percent-us-population>.

²⁶⁸ Shrader-Frechette, K., & Biondo, A. M. (2020). Protecting children from toxic waste: Data-usability evaluation can deter flawed cleanup. *International Journal of Environmental Research and Public Health*, 17, 424.

²⁶⁹ Food and Agriculture Organization of the United Nations. (2023, December 18). Pesticides use and trade, 1990-2022.

²⁷⁰ U.S. Geological Survey. (n.d.). Pesticides. Retrieved from <https://www.usgs.gov/centers/ohio-kentucky-indiana-water-science-center/science/pesticides>.

²⁷¹ U.S. Environmental Protection Agency. (n.d.). Understanding Exposures in Children’s Environments. from <https://www.epa.gov/healthresearch/understanding-exposures-childrens-environments>.

²⁷² Huffling, K., & McLaughlin, J. E. (2022). Pediatric Chemical Exposure: Opportunities for Prevention. *Journal of Pediatric Health Care*, 36(1), 27–33. <https://doi.org/10.1016/j.pedhc.2021.07.009>.

adverse health effects from these cumulative exposures,²⁷³ many of which have no historical precedent in our environment or biology.²⁷⁴

A limited review of the epidemiological and clinical studies of several environmental exposures reveals that certain studies, though findings vary, show these exposures, including when combined, may affect children's health. Though findings that show risk often contrast with findings that show minimal, if any, risk, this still demonstrates the need for continued studies from the public and private sectors, especially the NIH, to better understand the cumulative load of multiple exposures and how it may impact children's health, including exposures from:

- **PFAS:** a large group of more than 12,000 distinct synthetic chemicals widely used for water-, oil-, and stain-resistance in products, such as nonstick cookware, food packaging, textiles, cosmetics, and firefighting foam.²⁷⁵ According to a recent review by *the National Academies of Sciences, Engineering and Medicine*,²⁷⁶ high levels of certain types of PFAS exposure has been associated with a variety of health effects, including immune suppression and, changes in cholesterol in children. Announced in May 2025, EPA will implement national enforceable drinking water standards for two PFAS compounds in drinking water and consider regulatory determinations for another four PFAS compounds, in line with a new agency-wide strategy.
- **Microplastics:** plastic fragments less than 5 millimeters in size used frequently in products such as clothing, medicine, and shower gels.²⁷⁷ One single-site study in 2025 showed that the concentration found in Americans' brain tissue increased by 50% between 2016 and 2024.²⁷⁸ Some studies have additionally found that microplastics often carry endocrine-disrupting chemicals that interfere with hormonal development and potentially trigger early puberty—especially in girls—and heighten the risks of obesity, infertility, and hormone-related cancers.^{279 280 281}
- **Fluoride:** an inorganic salt first added to water in 1945 to combat cavities.²⁸² By 2022, over 60% of Americans—more than 70% of those on Community Water Systems—were

²⁷³ Roberts, J. R., Karr, C. J., & Council On Environmental Health (2012). Pesticide exposure in children. *Pediatrics*, 130(6), e1765–e1788. <https://doi.org/10.1542/peds.2012-2758>.

²⁷⁴ Gore, A. C., Chappell, V. A., Fenton, S. E., Flaws, J. A., Nadal, A., Prins, G. S., Toppari, J., & Zoeller, R. T. (2015). EDC-2: The Endocrine Society's Second Scientific Statement on Endocrine-Disrupting Chemicals. *Endocrine reviews*, 36(6), E1–E150. <https://doi.org/10.1210/er.2015-1010>.

²⁷⁵ Interstate Technology & Regulatory Council (ITRC). (2023) *PFAS Technical and Regulatory Guidance Document and Fact Sheets* PFAS-1. Washington, D.C.: Interstate Technology & Regulatory Council, PFAS Team. <https://pfas-1.itrcweb.org/>.

²⁷⁶ National Academies of Sciences, Engineering, and Medicine. (2022). *Guidance on PFAS exposure, testing, and clinical follow-up*. National Academies Press: Washington, DC.

²⁷⁷ Rahman, A., Sarkar, A., Yadav, O. P., Achari, G. & Slobodnik, J. Potential human health risks due to environmental exposure to nano- and microplastics and knowledge gaps: A scoping review. *Science of The Total Environment* 757, 143872 (2021).

²⁷⁸ Nihart, A. J., Garcia, M. A., El Hayek, E., Liu, R., Olewine, M., Kingston, J. D., et al. (2025). Bioaccumulation of microplastics in decedent human brains. *Nature Medicine*, 31(4), 1114–1119. <https://doi.org/10.1038/s41591-024-03453-1>.

²⁷⁹ Amran, N. H., Zaid, S. S. M., Mokhtar, M. H., Manaf, L. A. & Othman, S. Exposure to Microplastics during Early Developmental Stage: Review of Current Evidence. *Toxics* 10, 597 (2022).

²⁸⁰ Soliman, A. T. et al. Long-term health consequences of central precocious/early puberty (CPP) and treatment with Gn-RH analogue: a short update: Long term consequences of precocious puberty. *Acta Biomedica Atenei Parmensis* 94, e2023222–e2023222 (2023).

²⁸¹ Campanale, C., Massarelli, C., Savino, I., Locaputo, V., & Uricchio, V. F. (2020). A Detailed Review Study on Potential Effects of Microplastics and Additives of Concern on Human Health. *International Journal of Environmental Research and Public Health*, 17(4), 1212. <https://doi.org/10.3390/ijerph17041212>.

²⁸² Reported by Div of Oral Health, National Center for Chronic Disease Prevention and Health Promotion, CDC. Achievements in Public Health, 1900-1999: Fluoridation of Drinking Water to Prevent Dental Caries. <https://www.cdc.gov/mmwr/preview/mmwrhtml/mm4841a1.htm>.

consuming fluoridated water.²⁸³ A 2025 systematic review published in *JAMA Pediatrics*, analyzing 74 high-quality studies, found a statistically significant association between exposure to fluoride above recommended levels and reduced IQ levels in children.²⁸⁴ EPA is currently conducting a review of additional research that will inform any potential revisions to the federal drinking water standard.²⁸⁵

- **Electromagnetic Radiation (EMR):** an exposure due to the proliferation of cell phones²⁸⁶, Wi-Fi routers, cell towers, and wearables)²⁸⁷ Some studies have linked EMR exposure to reduced sperm counts and motility but not quality.²⁸⁸ The NIH’s National Toxicology Program identified “clear evidence” of DNA damage and increased cancer risk in rats.²⁸⁹ However, a recent systematic review of over 50 studies found low to inadequate evidence on impact in children and called for more high-quality research.²⁹⁰
- **Phthalates:** used primarily to make plastics more flexible, durable, and long-lasting, are found in vinyl flooring, food packaging, dust, personal care products, medical devices, and synthetic fabrics. Research shows continuous exposure to certain phthalates can trigger hormone dysregulation and reproductive and developmental problems for babies in-utero and infants.²⁹¹ The FDA has restricted the use of several phthalates in food packaging and industry has discontinued use over time.²⁹²
- **Bisphenols:** a group of industrial chemicals primarily used to manufacture polycarbonate plastics and epoxy resins are found in consumer goods such as food and beverage containers.²⁹³ Some studies have shown bisphenols to be endocrine-disrupting²⁹⁴ by mimicking estrogen and interfering with hormone signaling

²⁸³ CDC. 2022 Water Fluoridation Statistics. *Community Water Fluoridation*

<https://www.cdc.gov/fluoridation/php/statistics/2022-water-fluoridation-statistics.html> (2024).

²⁸⁴ Taylor KW, Eftim SE, Sibrizzi CA, et al. Fluoride Exposure and Children’s IQ Scores: A Systematic Review and Meta-Analysis. *JAMA Pediatr.* 2025;179(3):282–292. doi:10.1001/jamapediatrics.2024.5542.

²⁸⁵ U.S. Environmental Protection Agency. (2025, April 7). EPA will expeditiously review new science on fluoride in drinking water [Press release]. <https://www.epa.gov/newsreleases/epa-will-expeditiously-review-new-science-fluoride-drinking-water> (epa.gov).

²⁸⁶ Mobile Fact Sheet. *Pew Research Center* <https://www.pewresearch.org/internet/fact-sheet/mobile/> (2024).

²⁸⁷ Frank, J. W. Electromagnetic fields, 5G and health: what about the precautionary principle? *J Epidemiol Community Health* 75, 562–566 (2021).

²⁸⁸ Yu, G. et al. Current progress on the effect of mobile phone radiation on sperm quality: An updated systematic review and meta-analysis of human and animal studies. *Environmental Pollution* 282, 116952 (2021).

²⁸⁹ Melnick, R. Regarding ICNIRP’S Evaluation of the National Toxicology Program’s Carcinogenicity Studies on Radiofrequency Electromagnetic Fields. *Health Physics* 118, 678 (2020).

²⁹⁰ Bodewein, L., Dechent, D., Graefrath, D., Kraus, T., Krause, T., & Driessen, S. (2022). Systematic review of the physiological and health-related effects of radiofrequency electromagnetic field exposure from wireless communication devices on children and adolescents in experimental and epidemiological human studies. *PLoS One*, 17(6), e0268641.

²⁹¹ Meeker, J. D., Sathyanarayana, S., & Swan, S. H. (2009). Phthalates and other additives in plastics: Human exposure and associated health outcomes. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 364(1526), 2097–2113. <https://doi.org/10.1098/rstb.2008.0268>.

²⁹² U.S. Environmental Protection Agency. (2024, December). EPA Finalizes TSCA Risk Evaluation for Diisononyl Phthalate (DINP).

²⁹³ <https://www.fda.gov/food/food-packaging-other-substances-come-contact-food-information-consumers/bisphenol-bpa-use-food-cont-act-application>.

²⁹⁴ Matuszczak, E., Komarowska, M. D., Debek, W., & Hermanowicz, A. (2019). The impact of Bisphenol A on fertility, reproductive system, and development: A review of the literature. *International Journal of Endocrinology*, 2019, 4068717.

and the reproductive system in animals and humans.^{295 296} Public concern about safety has resulted in a use ban for some products.^{297 298}

- **Crop Protection Tools:** including pesticides, herbicides, and insecticides. Some studies have raised concerns about possible links between some of these products and adverse health outcomes, especially in children, but human studies are limited.^{299 300 301} For example, a selection of research studies on a herbicide (glyphosate) have noted a range of possible health effects, ranging from reproductive and developmental disorders as well as cancers, liver inflammation and metabolic disturbances.^{302 303 304 305} In experimental animal and wildlife studies, exposure to another herbicide (atrazine) can cause endocrine disruption and birth defects.³⁰⁶ Common exposures include lawn care, farming, and pesticide residues; however, a large-scale FDA study of pesticide residues (2009-2017) found the majority of samples (>90%) were compliant with federal standards.³⁰⁷ More recent data from the USDA's Pesticide Data Program found that 99% of food samples tested in 2023 were compliant with EPA's safety limit.³⁰⁸ Federal government reviews of epidemiologic data for the most common herbicide did not establish a direct link between use according to label directions and adverse health outcomes, and an updated U.S. government health assessment on common herbicides is expected in 2026.

²⁹⁵ Braun JM, Hauser R. Bisphenol A and children's health. *Curr Opin Pediatr.* 2011 Apr;23(2):233-9. doi: 10.1097/MOP.0b013e3283445675. PMID: 21293273; PMCID: PMC6028937.

²⁹⁶ National Toxicology Program. (2021). *NTP research report on the consortium linking academic and regulatory insights on bisphenol A toxicity (CLARITY-BPA): A compendium of published findings* (Research Report 18). <https://doi.org/10.22427/NTP-RR-18>.

²⁹⁷ den Braver-Sewradj, S. P., van Spronsen, Rob & and Hessel, E. V. S. (2020) Substitution of bisphenol A: a review of the carcinogenicity, reproductive toxicity, and endocrine disruption potential of alternative substances. *Critical Reviews in Toxicology* 50, 128–147.

²⁹⁸ EFSA Panel on Food Contact Materials, Enzymes and Processing Aids, Barat Baviera, J. M., Bolognesi, C., Chesson, A., Cocconcelli, P. S., & Fernandez-Cruz, M. L. (2023). Re-evaluation of the risks to public health related to the presence of bisphenol A (BPA) in foodstuffs. *EFSA Journal*, 21(4), e06857.

²⁹⁹ Myers, J. P., Antoniou, M. N., Blumberg, B., Carroll, L., Colborn, T., Everett, L. G., ... & Benbrook, C. M. (2016). Concerns over use of glyphosate-based herbicides and risks associated with exposures: a consensus statement. *Environmental Health*, 15(1), 19.

³⁰⁰ Roberts, J. R., Karr, C. J., Paulson, J. A., Brock-Utne, A. C., Brumberg, H. L., Campbell, C. C., ... & Wright, R. O. (2012). Pesticide exposure in children. *Pediatrics*, 130(6), e1757-e1763. <https://doi.org/10.1542/peds.2012-2757>.

³⁰¹ Nougadère, A., Sirot, V., Cravedi, J. P., Vasseur, P., Feidt, C., Fussell, R. J., ... & Hulin, M. (2020). Dietary exposure to pesticide residues and associated health risks in infants and young children—results of the French infant total diet study. *Environment international*, 137, 105529.

³⁰² Hall, M., Ashley-Martin, J., Till, C., Hu, J., Lanphear, B., Curl, C., ... & Hyland, C. (2025). Associations of prenatal glyphosate exposure with child neurodevelopment in a Canadian pregnancy cohort study. *Environment International*, 109480.

³⁰³ von Ehrenstein, O. S., Ling, C., Cui, X., Cockburn, M., Park, A. S., Yu, F., Wu, J., & Ritz, B. (2019). Prenatal and infant exposure to ambient pesticides and autism spectrum disorder in children: Population based case-control study. *BMJ*, 364, I962. <https://doi.org/10.1136/bmj.I962>.

³⁰⁴ Eskenazi, B., Gunier, R. B., Rauch, S., Kogut, K., Perito, E. R., & Mendez, X. (2023). Association of lifetime exposure to glyphosate and aminomethylphosphonic acid (AMPA) with liver inflammation and metabolic syndrome at young adulthood: Findings from the CHAMACOS study. *Environmental Health Perspectives*, 131(3), 037001.

³⁰⁵ Zhang, L., Rana, I., Shaffer, R. M., Taioli, E., & Sheppard, L. (2019). Exposure to glyphosate-based herbicides and risk for non-Hodgkin lymphoma: a meta-analysis and supporting evidence. *Mutation Research/Reviews in Mutation Research*, 781, 186-206.

³⁰⁶ Rohr, J. R., & McCoy, K. A. (2010). A qualitative meta-analysis reveals consistent effects of atrazine on freshwater fish and amphibians. *Environmental health perspectives*, 118(1), 20-32.

³⁰⁷ Liang, C. P., Sack, C., McGrath, S., Cao, Y., Thompson, C. J., & Robin, L. P. (2021). US Food and Drug Administration regulatory pesticide residue monitoring of human foods: 2009-2017. *Food Additives & Contaminants: Part A*, 38(9), 1520-1538.

³⁰⁸ U.S. Department of Agriculture, Agricultural Marketing Service. (2024, November 7). *USDA releases 2023 Pesticide Data Program Annual Summary*. <https://www.ams.usda.gov/press-release/usda-releases-2023-pesticide-data-program-annual-summary>.

Importantly, the Executive Order establishing the MAHA Commission directed the involved agencies to work with farmers to ensure that United States food is the healthiest, most abundant, and most affordable in the world. American farmers are critical partners in the success of the Make America Healthy Again agenda. All the involved agencies are therefore committed to ensuring not just the survival, but the prosperity, of American Farmers. American farmers rely on these products, and actions that further regulate or restrict crop protection tools beyond risk-based and scientific processes set forth by Congress must involve thoughtful consideration of what is necessary for adequate protection, alternatives, and cost of production. Precipitous changes in agricultural practices could have an adverse impact on American agriculture and the domestic and global food supply. The federal government will continue to regularly review the safety of these important crop protection tools.

Corporate Influence

Scientific Research

A significant portion of environmental toxicology and epidemiology studies are conducted by private corporations.³⁰⁹ Reports in 2023 indicate that the largest pesticide manufacturers spent billions on research initiatives.^{310 311 312 313} Limited comparisons between industry-funded research versus non-industry studies have raised concerns over potential biases in industry-funded research.

These disparities are potentially due to bias in study design and reporting, along with publication bias favoring positive findings in academic research.^{314 315} Such biases amplify potential discrepancies in the literature and limit the scientific publication of unfavorable results:

- An analysis of a common pesticide found that 50% of non-industry research found it harmful, compared to 18% of industry-funded studies, which also reported fewer significant adverse results (9% vs. 33%).³¹⁶

³⁰⁹ Bero, L., Anglemyer, A., Vesterinen, H. & Krauth, D. (2016) The relationship between study sponsorship, risks of bias, and research outcomes in atrazine exposure studies conducted in non-human animals: Systematic review and meta-analysis. *Environment International* 92–93, 597–604.

³¹⁰ Agricultural Transformation in Focus at Corteva Agriscience 'Growing for Good' Initiative.

<https://www.corteva.com/resources/media-center/agricultural-transformation-in-focus-at-corteva-agriscience-growing-for-good-initiative.html> (2023).

³¹¹ BAYER CONVERTS R&D INVESTMENT INTO INNOVATIVE PRODUCTS | BayerTraits | Crop Science US.

<https://www.cropscience.bayer.us/news-press/bayer-traits/bayer-converts-r-and-d-investment-into-innovative-products> (2023).

³¹² Syngenta Financial Report 2023.

<https://www.syngenta.com/sites/default/files/bond-investor-information/financial-results/financial-report-2023.pdf> (2023).

³¹³ BASF Group - BASF Report 2023. <https://report.basf.com/2023/en/combined-managements-report/basf-group.html> (2023).

³¹⁴ Mlinarić, A., Horvat, M., & Šupak Smolčić, V. (2017). Dealing with the positive publication bias: Why you should really publish your negative results. *Biochemia medica*, 27(3), 030201. <https://doi.org/10.11613/BM.2017.030201>.

³¹⁵ Bero, L., Anglemyer, A., Vesterinen, H. & Krauth, D. (2016) The relationship between study sponsorship, risks of bias, and research outcomes in atrazine exposure studies conducted in non-human animals: Systematic review and meta-analysis. *Environment International* 92–93, 597–604.

³¹⁶ Bero, L., Anglemyer, A., Vesterinen, H. & Krauth, D. (2016) The relationship between study sponsorship, risks of bias, and research outcomes in atrazine exposure studies conducted in non-human animals: Systematic review and meta-analysis. *Environment International* 92–93, 597–604.

- An analysis of 115 studies before 2005 revealed that 100% of chemical industry-funded studies declared BPA safe, while over 90% of non-industry research identified harm at low doses.^{317 318}
- Recently analyzed confidential documents from industry leaders revealed that the PFAS industry focused on suppressing unfavorable research and distorting public discourse, effectively delaying public awareness of its dangers.³¹⁹
- Secondary analysis of approximately 2,500 “high production volume” chemicals suggests that further toxicological studies may be necessary to ensure adequate understanding of their potential health effects.^{320 321 322}

Additionally, some industry leaders have engaged in promoting ghostwriting and sponsored reviews to influence the scientific literature. Notably, this ghostwriting strategy mirrors tactics used by the tobacco industry to distort scientific consensus.³²³

Laws and Regulations

Corporate influence stretches beyond extensive involvement in scientific research to include active governmental lobbying:

- In 2024, the chemical-manufacturing lobby spent roughly \$77 million on federal influence activities—placing the industry among Washington’s top spenders.³²⁴
- In 2023, 60% of chemical-sector lobbyists previously held federal posts.³²⁵

As a result of this influence, the regulatory environment surrounding the chemical industry may reflect a consideration of its interests. For example, more than ten thousand chemicals listed on EPA’s inventory are designated as confidential and generic chemical names are used to identify them.

³¹⁷ Vom Saal, F. S., & Vandenberg, L. N. (2021). Update on the Health Effects of Bisphenol A: Overwhelming Evidence of Harm. *Endocrinology*, 162(3), bqaa171. <https://doi.org/10.1210/endo/bqaa171>.

³¹⁸ vom Saal, F. S., & Hughes, C. (2005). An extensive new literature concerning low-dose effects of bisphenol A shows the need for a new risk assessment. *Environmental health perspectives*, 113(8), 926–933. <https://doi.org/10.1289/ehp.7713>.

³¹⁹ Gaber N, Bero L, Woodruff T.J. The Devil they Knew: Chemical Documents Analysis of Industry Influence on PFAS Science. *Ann Glob Health*. 2023 Jun 1;89(1):37. doi: 10.5334/aogh.4013. PMID: 37273487; PMCID: PMC10237242.

³²⁰ Department of Toxic Substances Control. (n.d.). Emerging chemicals of concern. Retrieved May 14, 2025, from <https://dtsc.ca.gov/emerging-chemicals-of-concern>.

³²¹ S. Environmental Protection Agency. (2008). Initial risk-based prioritization of high production volume (HPV) chemicals (EPA/600/R-08/075). Washington, DC: U.S. EPA.

³²² Gaber, N., Bero, L., & Woodruff, T. J. (2023). The Devil they Knew: Chemical Documents Analysis of Industry Influence on PFAS Science. *Annals of global health*, 89(1), 37. <https://doi.org/10.5334/aogh.401>.

³²³ Nakajima, N. (2021). Green Advertising and Green Public Relations as Integration Propaganda. *Bulletin of Science, Technology & Society* 21, 334–348.

³²⁴ OpenSecrets. (2024). Chemical & related manufacturing: Lobbying, 2024.

<https://www.opensecrets.org/federal-lobbying/industries/summary?cycle=2024&id=N13>.

³²⁵ OpenSecrets.org. (n.d.). *Federal Lobbying: Industries Summary (N13, 2021 Cycle)*. from <https://www.opensecrets.org/federal-lobbying/industries/summary?cycle=2021&id=N13>.

Section 3. The Crisis of Childhood Behavior in the Digital Age

Over the past four decades, American children have transitioned from an active, play-based childhood to a sedentary, technology-driven lifestyle, contributing to increases in chronic physical and mental health disease. Jonathan Haidt, a social psychologist and co-author of *The Anxious Generation*, terms this shift the “Great Rewiring of Childhood,” driven by increased screen time, reduced physical activity, and psychosocial stressors such as loneliness, chronic stress, and sleep deprivation.³²⁶

The Decline of Physical Activity

Physical activity, encompassing moderate-to-vigorous exercise, aerobic fitness, and reduced sedentary time, is critical for child health and well-being.³²⁷ However, American youth have seen a steady decline in activity and cardiorespiratory fitness over decades, contributing to rising obesity, diabetes, mental health disorders, and cardiometabolic risks.^{328 329 330} Studies show:

- **Aerobic Fitness Among U.S. Children Has Declined:** U.S. children experienced a significant decline in aerobic fitness for decades; an international study ranked the aerobic fitness of U.S. children 47th out of 50.^{331 332} A 2020 Scientific Statement from the American Heart Association (AHA) reported that nearly 60% of American children (specifically 12- to 15-year-olds) do not have healthy cardiorespiratory fitness (CRF).³³³
- **Very Few Children Meet Daily Physical Activity Recommendations:** More than 70% of children aged 6-17 (rising to 85% in teens) did not meet the 2024 federal minimum recommendation of daily moderate-to-vigorous physical activity.³³⁴

³²⁶ Haidt, J. (2024). *The Anxious Generation: How the Great Rewiring of Childhood Is Causing an Epidemic of Mental Illness*. Penguin Press.

³²⁷ U.S. Department of Health and Human Services. (2018). *Physical Activity Guidelines for Americans* (2nd ed.). <https://health.gov/paguidelines/second-edition/>.

³²⁸ Ogden, C. L., Carroll, M. D., Curtin, L. R., Lamb, M. M., & Flegal, K. M. (2010). Prevalence of high body mass index in US children and adolescents, 2007–2008. *JAMA*, 303(3), 242–249.

³²⁹ Ortega, F. B., Ruiz, J. R., Castillo, M. J., & Sjöström, M. (2008). Physical fitness in childhood and adolescence: a powerful marker of health. *International Journal of Obesity*, 32(1), 1–11.

³³⁰ Donnelly, J. E., et al. (2016). Physical activity, fitness, cognitive function, and academic achievement in children: A systematic review. *Medicine & Science in Sports & Exercise*, 48(6), 1197-1222.

³³¹ Lang, J. J., Tremblay, M. S., Léger, L., Olds, T., & Tomkinson, G. R. (2016). International variability in 20 m shuttle run performance in children and youth: Who are the fittest from a 50-country comparison? A systematic literature review with pooling of aggregate results. *British Journal of Sports Medicine*, 52(4), 276–282. <https://doi.org/10.1136/bjsports-2016-096224>.

³³² American Heart Association. (2013, November 19). Children’s cardiovascular fitness declining worldwide. ScienceDaily. <https://www.sciencedaily.com/releases/2013/11/131119112809.htm>.

³³³ Zachariah, J. P., Jone, P. N., Agbaje, A. O., Ryan, H. H., Trasande, L., Perng, W., Farzan, S. F., & American Heart Association Council on Lifelong Congenital Heart Disease and Heart Health in the Young; Council on Cardiovascular and Stroke Nursing; Council on Epidemiology and Prevention; Council on Lifestyle and Cardiometabolic Health; and Council on Clinical Cardiology (2024). Environmental Exposures and Pediatric Cardiology: A Scientific Statement From the American Heart Association. *Circulation*, 149(20), e1165–e1175. <https://doi.org/10.1161/CIR.000000000000123A>.

³³⁴ Physical Activity Alliance. (2024). 2024 U.S. Report Card on Physical Activity for Children and Youth.

<https://paamovewithus.org/wp-content/uploads/2024/11/2024-US-Report-Card-on-Physical-Activity-for-ChildFINAL-11.2024.pdf>.

Several factors contribute to this “physical activity deficit”:

- **Reduced Active School Transportation:**
 - In 1969, 48% of K-8 students usually walked or bicycled to school,³³⁵ declining to 12.7% in 2009.³³⁶
- **Diminished In-School Activity and Recess:** Since the 1970s, recess and physical education (PE) have steadily declined.^{337 338 339}
 - Weekly recess time fell by 60 minutes since 2001, and PE access dropped by 32% since 1990.^{340 341}
 - In 2025, U.S. public school PE minutes fell short of SHAPE America’s targets, for all age groups with elementary and middle schools offering about an hour less PE than recommended.³⁴²
- **Limited Recess Policies:**
 - In 2022, only 10 states mandated daily recess for elementary students.³⁴³
 - Fewer than half of U.S. school districts had formal recess policies, with many treating recesses as optional.³⁴⁴
- **Screen Time Impact on Sedentary Behavior:**
 - Nearly half of teens report being online almost constantly³⁴⁵ while excessive screen time exposure has been linked to physical inactivity.³⁴⁶

Psychosocial Factors and Mental Health Crisis

Parallel to the decline in physical activity, American youth face a deepening psychosocial crisis. This is marked by rising mental health disorders, significant sleep deficits, chronic stress, and pervasive loneliness, all exacerbated by the widespread influence of technology. The crisis persists despite rising therapy rates, with some suggesting it may exacerbate issues.

³³⁵ National Center for Safe Routes to School. (2011). How children get to school: School travel patterns from 1969 to 2009. http://www.saferoutesinfo.org/sites/default/files/resources/NHTS_school_travel_report_2011_0.pdf.

³³⁶ Ibid.

³³⁷ Barros, R. M., Silver, E. J., & Stein, R. E. K. (2011). Recess, physical education, and elementary school student outcomes. *Economics of Education Review*, 30(6), 1358–1364.

³³⁸ Dills, A. K., Morgan, H. N., & Rotthoff, K. W. (2011). Recess, physical education, and elementary school student outcomes. *Economics of Education Review*, 30(5), 889-900.

³³⁹ Institute of Medicine. (2013). *Educating the student body: Taking physical activity and physical education to school*. National Academies Press. <https://www.ncbi.nlm.nih.gov/books/NBK201501/>.

³⁴⁰ Spiegel, S. (2022). How much recess should kids get? U.S. News & World Report. <https://www.usnews.com/education/k12/articles/how-much-rece>.

³⁴¹ Centers for Disease Control and Prevention. (2004). Participation in high school physical education—United States, 1991–2003. *Morbidity and Mortality Weekly Report*, 53(36), 844–847.

³⁴² Kern, B. D., Wilson, W. J., Killian, C. M., van der Mars, H., Simonton, K., Woo, D., & Wallhead, T. (2025). Physical education access in U.S. public schools: A multistate, multiregion study. *Journal of Teaching in Physical Education*.

³⁴³ Mlynek, A. (2022, October 14). How much recess should kids get? U.S. News & World Report. <https://www.usnews.com/education/k12/articles/how-much-recess-should-kids-get>.

³⁴⁴ McGinn, J. (2022, May 12). Recess guidelines vary greatly from state to state. *The Hechinger Report*. <https://hechingerreport.org/recess-guidelines-vary-greatly-from-state-to-state/>.

³⁴⁵ Faverio, M., & Sidoti, O. (2024, December 12). Teens, social media and technology 2024. Pew Research Center. <https://www.pewresearch.org/internet/2024/12/12/teens-social-media-and-technology-2024/>.

³⁴⁶ Minges, K. E., Owen, N., Salmon, J., Chao, A., Dunstan, D. W., & Whittemore, R. (2015). Reducing youth screen time: qualitative metasynthesis of findings on barriers and facilitators. *Health psychology: official journal of the Division of Health Psychology, American Psychological Association*, 34(4), 381–397. <https://doi.org/10.1037/hea0000172>.

Declining Sleep

Sleep is foundational to health, essential for children’s physical, mental, and cognitive development. Yet, American children, particularly adolescents, face a nationwide sleep crisis, with up to 75% of 17–18-year-olds reporting inadequate sleep and 95% of 12th graders getting less than recommended sleep time.^{347 348} While specific data before 2000 is limited, sleep duration has likely declined since the 1960s, driven by societal shifts like increased screen use and academic pressure.^{349 350 351}

Circadian rhythms, regulated by sunlight and disrupted by artificial light, play a critical role in sleep health. Morning sunlight synchronizes the body’s internal clock, boosting mood and metabolism, while nighttime light exposure, affecting 99% of Americans due to widespread light pollution, suppresses melatonin production and increases risks of metabolic disorders.^{352 353 354}

- **High School Students:** In 2021, 78% of U.S. high school students reported sleeping less than the recommended 8 hours per night on school nights, a rise from 69% in 2009. This trend disproportionately impacted female students (81%) and 12th graders (83%).^{355 356}
- **Younger Children:** In 2020-2021, 35% of children aged 4 months to 14 years had inadequate sleep.³⁵⁷
- **Light Exposure:** Natural sunlight can reach up to 100,000 lux, significantly brighter than typical indoor lighting (100–300 lux), yet individuals, including children, typically receive only 1–2 hours daily in environments exceeding 1,000 lux.³⁵⁸ Additionally, 36% of parents, according to one study, report leaving electronic devices powered on in their children’s bedrooms at night, contributing to sleep disruption through blue light exposure.³⁵⁹

³⁴⁷ Basch, C. E., Basch, C. H., Ruggles, K. V., & Rajam, S. (2014). Prevalence of sleep duration on an average school night among 4 nationally representative successive samples of American high school students, 2007–2013. *Preventing Chronic Disease*, 11, E216.

³⁴⁸ Twenge, J. M., Krizan, Z., & Hisler, G. (2017). Decreases in self-reported sleep duration among U.S. adolescents 2009–2015 and association with new media screen time. *Sleep Medicine*, 39, 47–53.

³⁴⁹ National Sleep Foundation. (2014). 2014 Sleep in America Poll: Sleep in the Modern Family. <https://www.thensf.org/wp-content/uploads/2021/03/2014-Sleep-in-America-poll-summary-of-findings-FINAL-upd.pdf>.

³⁵⁰ Hale, L., & Guan, S. (2015). Screen time and sleep among school-aged children and adolescents: A systematic literature review. *Sleep Medicine Reviews*, 21, 50–58.

³⁵¹ Yuan, N. (2015, October 8). Among teens, sleep deprivation an epidemic. *Stanford Medicine News Center*. <https://med.stanford.edu/news/all-news/2015/10/among-teens-sleep-deprivation-an-epidemic.html>.

³⁵² Blume, C., Garbazza, C., & Spitschan, M. (2019). Effects of light on human circadian rhythms, sleep and mood. *Somnologie*, 23(3), 147–156. <https://doi.org/10.1007/s11818-019-00215-x>.

³⁵³ Falchi, F., et al. (2016). The new world atlas of artificial night sky brightness. *Science Advances*, 2(6), e1600377. <https://doi.org/10.1126/sciadv.1600377>.

³⁵⁴ Versteeg, R. I., Stenvers, D. J., Kalsbeek, A., Bisschop, P. H., Serlie, M. J., & la Fleur, S. E. (2016). Nutrition in the spotlight: Metabolic effects of environmental light. *Proceedings of the Nutrition Society*, 75(4), 451–463.

³⁵⁵ Centers for Disease Control and Prevention. (2023). Youth Risk Behavior Survey Data Summary & Trends Report: 2011–2021. U.S. Department of Health and Human Services. https://www.cdc.gov/healthyyouth/data/yrbs/pdf/YRBS_Data-Summary-Trends_Report2023_508.pdf.

³⁵⁶ Centers for Disease Control and Prevention. (2010). Youth Risk Behavior Surveillance—United States, 2009. *MMWR Surveillance Summaries*, 59(SS-5), 1–142. <https://www.cdc.gov/mmwr/pdf/ss/ss5905.pdf>.

³⁵⁷ Centers for Disease Control and Prevention. (2024, November 1). FastStats: Sleep in children. U.S. Department of Health and Human Services. <https://www.cdc.gov/sleep/data-research/facts-stats/children-sleep-facts-and-stats.html>.

³⁵⁸ Smolensky, M. H., Sackett-Lundeen, L. L., & Portaluppi, F. (2015). Nocturnal light pollution and underexposure to daytime sunlight: Complementary mechanisms of circadian disruption and related diseases. *Chronobiology International*, 32(8), 1029–1048.

³⁵⁹ Bedrosian, T. A., & Nelson, R. J. (2017). Timing of light exposure affects mood and brain circuits. *Translational Psychiatry*, 7(1), e1017. <https://doi.org/10.1038/tp.2016.262>.

Chronic sleep deprivation has severe consequences:

- **Metabolic Health:** Six days of four-hour nightly sleep reduces insulin sensitivity and impairs glucose tolerance.³⁶⁰
- **Physiological Impact:** Sleep loss elevates oxidative stress and inflammation, contributing to insulin resistance.³⁶¹
- **Screen Time:** Evening screen time from electronic devices in children’s bedrooms delays melatonin production by up to 1.5 hours in children, disrupting sleep onset.^{362 363}

³⁶⁴

Poor sleep exacerbates mental health disorders, creating a vicious cycle.

Chronic Stress

Chronic stress among youth has surged, particularly since 2010, with mental distress scores rising sharply in 2022.^{365 366} Stress has become pervasive, with roughly 50% of Americans reporting frequent stress, a 16% increase over the past two decades. Stress levels have likely increased since the 1980s due to growing academic and social pressures.³⁶⁷

- **Prevalence:** In 2021, the CDC reported that 42% of U.S. high school students experienced persistent feelings of sadness or hopelessness, up from 28% in 2011.³⁶⁸ Female students faced disproportionate impacts, with 57% reporting persistent sadness or hopelessness and a 58% increase in suicidal ideation from approximately 19% in 2011 to 30% in 2021.³⁶⁹ Approximately 20–25% of adolescents reported anxiety symptoms and 15–20% reported depressive symptoms, with girls showing significantly higher rates.³⁷⁰

³⁶⁰ Spiegel, K., Leproult, R., & Van Cauter, E. (1999). Impact of sleep debt on metabolic and endocrine function. *The Lancet*, 354(9188), 1435–1439.

³⁶¹ Kanagasabai, T., Dhanoa, R., Kuk, J. L., & Ardern, C. I. (2022). Inflammation, oxidative stress, and antioxidant micronutrients as mediators of the relationship between sleep, insulin sensitivity, and glycosylated hemoglobin. *Frontiers in Endocrinology*, 13, 897784.

³⁶² Figueiro, M. G., Wood, B., Plitnick, B., & Rea, M. S. (2015). The impact of light from computer monitors on melatonin levels in college students and children. *Pediatrics*, 136(4), e916–e923.

³⁶³ National Sleep Foundation. (2014). 2014 Sleep in America Poll: Sleep in the Modern Family.

<https://www.thensf.org/wp-content/uploads/2021/03/2014-Sleep-in-America-poll-summary-of-findings-FINAL-upd.pdf>.

³⁶⁴ Gooley, J. J., et al. (2011). Exposure to room light before bedtime suppresses melatonin onset and shortens melatonin duration in humans. *Journal of Clinical Endocrinology & Metabolism*, 96(3), E463–E472. <https://doi.org/10.1210/jc.2010-2098>.

³⁶⁵ Twenge, J. M., Cooper, A. B., Joiner, T. E., Duffy, M. E., & Binau, S. G. (2019). Age, period, and cohort trends in mood disorder indicators and suicide-related outcomes in a nationally representative dataset, 2005–2017. *Journal of Abnormal Psychology*, 128(3), 185–199.

³⁶⁶ Centers for Disease Control and Prevention. (2022). Youth Risk Behavior Surveillance System (YRBSS) overview.

[https://www.cdc.gov/\(https://www.cdc.gov/children-mental-health/data-research/index.html\)](https://www.cdc.gov/(https://www.cdc.gov/children-mental-health/data-research/index.html)).

³⁶⁷ American Psychological Association. (2023). Stress in America 2023: A nation recovering from collective trauma.

<https://www.apa.org/news/press/releases/stress/2023/collective-trauma-recovery>.

³⁶⁸ Centers for Disease Control and Prevention. (2023). Youth Risk Behavior Survey data summary & trends report: 2011–2021. U.S. Department of Health and Human Services, National Center for HIV, Viral Hepatitis, STD, and TB Prevention, Division of Adolescent and School Health. https://www.cdc.gov/healthyyouth/data/yrbs/pdf/YRBS_Data-Summary-Trends_Report2023_508.pdf.

³⁶⁹ Jones, S. E., Ethier, K. A., Hertz, M., DeGue, S., Le, V. D., Thornton, J., Geda, S., Dittus, P. J., Queen, B., & Grant, A. M. (2022). Mental health, suicidality, and connectedness among high school students during the COVID-19 pandemic—Adolescent Behaviors and Experiences Survey, United States, January–June 2021. *MMWR Supplements*, 71(3), 16–21.

<https://doi.org/10.15585/mmwr.su7103a3>.

³⁷⁰ Keyes, K. M., Kreski, N. T., & Li, G. (2022). Changes in mental health and substance use among US adolescents during the COVID-19 pandemic. *JAMA Pediatrics*, 176(12), 1226–1234. <https://doi.org/10.1001/jamapediatrics.2022.3737>.

- **Physiological Consequences:** Chronic stress triggers inflammatory cytokines (e.g., CRP, IL-6), linking it to obesity, type 2 diabetes, and cardiovascular disease.³⁷¹ It also impairs mitochondrial function and elevates oxidative stress.³⁷²

Many psychologists, including Jonathan Haidt, attribute the rise in adolescent mental health issues to increased smartphone use and declining in-person interactions, which is supported by peer-reviewed studies on social media’s psychological impacts.³⁷³

Loneliness Epidemic

Loneliness among American youth has surged since the 1970s, driven by declining in-person interactions and digital isolation. The UK’s Tackling Loneliness Strategy highlights global parallels, emphasizing loneliness as a public health crisis with profound impacts on youth well-being.³⁷⁴ For American children, this reflects a loss of community and play, compounding mental and physical health risks:

- **Prevalence in young people:** Over three in five Americans feel lonely, a 13% increase since 2018, with 73% of 16-24-year-olds reporting loneliness, a trend worsening since the 1970s. Young men are particularly affected, with 15% reporting no close friendships, a fivefold increase since 1990.^{375 376}
- **Prevalence in children:** Approximately 20% of U.S. children aged 6-11 experience social difficulties indicative of loneliness, such as trouble making or keeping friends, a condition exacerbated by reduced unstructured play.³⁷⁷
- **Health Risks:** Loneliness in children is associated with increased risks of depression and anxiety, posing significant health challenges.^{378 379 380}

Technology’s Systemic Impact

Since 2010, smartphones, social media, and gaming have reshaped childhood, and have likely helped to drive mental health declines through social deprivation, sleep disruption, attention fragmentation, and addiction.³⁸¹ American youth are increasingly tethered to digital devices, displacing physical activity and in-person interactions.

³⁷¹ Liu, W., Zhang, Y., & Li, H. (2020). Chronic stress and inflammation: The role of cytokines in metabolic diseases. *Journal of Clinical Investigation*, 130(10), 5123-5135. <https://doi.org/10.1172/JCI139553>.

³⁷² Allen, J., Romay-Tallon, R., Brymer, K. J., Caruncho, H. J., & Kalynchuk, L. E. (2018). Mitochondria and mood: Mitochondrial dysfunction as a key player in the manifestation of depression. *Frontiers in Neuroscience*, 12, 112.

³⁷³ Twenge, J. M., & Campbell, W. K. (2019). Media use is linked to lower psychological well-being: Evidence from three datasets. *Psychiatric Quarterly*, 90(2), 311–331. <https://doi.org/10.1007/s11126-019-09630-7>.

³⁷⁴ U.K. Government. (2023). Tackling Loneliness Annual Report: The Fourth Year.

<https://www.gov.uk/government/publications/loneliness-annual-tackling-loneliness-annual-report-march-2023-the-fourth-year>.

³⁷⁵ Cox, D. A., Streeter, R., & Wilde, D. (2021, June 8). The state of American friendship: Change, challenges, and loss. *The Survey Center on American Life*. <https://www.americansurveycenter.org/the-state-of-american-friendship-change-challenges-and-loss/>.

³⁷⁶ Cigna. (2020). *Loneliness and the workplace: 2020 report*.

<https://www.cigna.com/static/docs/loneliness-and-the-workplace-2020-report.pdf>.

³⁷⁷ U.S. Department of Health and Human Services, Health Resources and Services Administration. (2021). National Survey of Children’s Health, 2020-2021 [Data set]. Maternal and Child Health Bureau.

<https://mchb.hrsa.gov/data-research/national-survey-childrens-health>.

³⁷⁸ Farrell, A. K., Li, Y., & Vitoroulis, I. (2023). Loneliness and well-being in children and adolescents during the COVID-19 pandemic: A systematic review. *Frontiers in Psychiatry*, 14, 1087713.

³⁷⁹ Cacioppo, J. T., Cacioppo, S., Capitanio, J. P., & Cole, S. W. (2014). The neuroendocrinology of social isolation. *Annual Review of Psychology*, 66, 733–767.

³⁸⁰ Qualter, P., Brown, S. L., Munn, P., & Rotenberg, K. J. (2010). Childhood loneliness as a predictor of adolescent depression: A longitudinal study. *Journal of Child Psychology and Psychiatry*, 51(7), 803–811.

³⁸¹ Haidt, J. (2024). *The Anxious Generation: How the Great Rewiring of Childhood Is Causing an Epidemic of Mental Illness*. Penguin Press.

- **Device Ownership and Media Use:** In 2024, 95% of U.S. teens aged 13-17 had access to smartphones, and 46% report being online “almost constantly,” up from 24% in 2015. In 2021, teens aged 13-18 averaged approximately 8 hours and 39 minutes of non-school screen time daily.^{382 383}

The Negative Impact of Social Media on Children’s Mental Health

The near-ubiquitous presence of social media in the lives of American adolescents, with up to 95% of teens regularly using at least one or more of these platforms³⁸⁴—is increasingly correlated with a concerning rise in mental health challenges, particularly among younger users. With the vast majority of teenagers engaging with these platforms, understanding the nuanced consequences and mental health impacts of social media on their developing well-being is of critical public health importance:

- **High Usage and Mental Health Risks:** Adolescents spending more than three hours per day on these platforms may be at heightened risks of mental health issues such as anxiety and depression compared to their peers with lower usage.³⁸⁵
- **Dose-Response Relationship:** A 2022 meta-analysis of studies on adolescents found that each additional hour spent daily on social media was associated with a 13% increase in the risk of depressive symptoms, with adolescent girls showing higher associations than boys.³⁸⁶
- **Internal Industry Findings:** A social media company’s internal findings documented its platform’s negative effects on young users, including: worsening body image issues in one in three teenage girls; links drawn by teen users between the platform and suicidal thoughts; one in five teens reporting the platform made them feel worse about themselves; aggravation of existing mental health conditions in struggling teens.³⁸⁷
- **Emotional Distress:** A randomized controlled trial involving youth with emotional distress demonstrated that limiting social media use to one hour per day resulted in statistically significant reductions in self-reported depression, anxiety, and fear of missing out (FOMO).³⁸⁸ Another randomized controlled trial where participants deactivated their social media accounts for four weeks found statistically significant improvements in subjective well-being, including increased happiness and life satisfaction, and reduced symptoms of depression and anxiety.³⁸⁹

³⁸² Common Sense Media. (2021). The common sense census: Media use by tweens and teens, 2021.

<https://www.commonsensemedia.org/research/the-common-sense-census-media-use-by-tweens-and-teens-2021>.

³⁸³ Anderson, M., Faverio, M., & Park, E. (2024, December 12). Teens, social media and technology 2024. Pew Research Center.

<https://www.pewresearch.org/internet/2024/12/12/teens-social-media-and-technology-2024/>.

³⁸⁴ Office of the Surgeon General. (2023). Social media and youth mental health: The U.S. Surgeon General’s advisory. U.S.

Department of Health and Human Services. <https://www.ncbi.nlm.nih.gov/books/NBK594759/>.

³⁸⁵ Riehm, K. E., Feder, K. A., Tormohlen, K. N., Crum, R. M., Young, A. S., Green, K. M., Pacek, L. R., La Flair, L. N., & Mojtabai, R. (2019). Associations between time spent using social media and internalizing and externalizing problems among US youth. *JAMA Psychiatry*, 76(12), 1266-1273. <https://doi.org/10.1001/jamapsychiatry.2019.2325>.

³⁸⁶ Liu, S., Wing, T., Zou, J., Chen, S., Liu, W., Zhou, K., Pu, J., & Liu, J. (2022). Time spent on social media and risk of depression in adolescents: A dose-response meta-analysis. *International Journal of Environmental Research and Public Health*, 19(9), 5164. <https://doi.org/10.3390/ijerph19095164>.

³⁸⁷ Wells, G., Horwitz, J., & Seetharaman, D. (2021, September 14). Facebook knows Instagram is toxic for teen girls, company documents show. *The Wall Street Journal*.

<https://www.wsj.com/articles/facebook-knows-instagram-is-toxic-for-teen-girls-company-documents-show-11631620739>.

³⁸⁸ Davis, C. G., & Goldfield, G. S. (2025). Limiting social media use decreases depression, anxiety, and fear of missing out in youth with emotional distress: A randomized controlled trial. *Psychology of Popular Media*, 14(1), 1–11. (Published online 2023).

³⁸⁹ Allcott, H., Braghieri, L., Eichmeyer, S., & Gentzkow, M. (2020). The welfare effects of social media. *American Economic Review*, 110(3), 629-676.

Corporate Influence on Children’s Social Media Use

Technology corporations suggest a reach over childhood health that stretches well beyond the direct harms of screen exposure, actively shaping the contours of scientific discourse and the public-health policies that follow. The pervasive influence of major technology firms on the digital environment of children has prompted significant scrutiny, particularly regarding the alignment of corporate practices with child protection frameworks and the erosion of parental oversight:

- **Content Control and Censorship:** During COVID-19, the tech platforms became quasi-public utilities for health messaging. Court records and Congressional research show federal agencies urged—or in some cases pressed—platforms to suppress content questioning pediatric vaccine-risk profiles or school-closure policies.^{390 391}
- **Dark-pattern purchases:** An FTC settlement found a leading game platform used in-app flows that let minors carry out purchases and surrender data “*without any parental involvement.*”³⁹²

These informal, largely invisible coordination between agencies and platforms—coupled with undisclosed ranking algorithms—compresses the range of permissible debate on childhood-health questions and can bury legitimate scientific concerns while impacting parental supervision. Recognizing this hidden architecture is a crucial step toward improving childhood health and restoring transparency in the digital age.

Family Dynamics and Socio Economics

- Frequent family meals are associated with teens having lower rates of disordered eating, alcohol and substance use, violent behavior, and feelings of depression or thoughts of suicide in adolescents.³⁹³
- Single-family homes are associated with worse mental health outcomes in teens.³⁹⁴
 - Double the rate of internalizing disorders (i.e. Anxiety & Depression).
 - Triple the rates of externalizing disorders (i.e. ADHD, conduct disorder).
- The single-family home rate in the U.S. has increased from 9% in 1960 to 28% in 2012.³⁹⁵
- Children from lower socioeconomic backgrounds are two to three times more likely to develop mental health issues.³⁹⁶

³⁹⁰ State of Missouri v. Biden, No. 23-30445 (5th Cir. Oct. 3, 2023). <https://www.ca5.uscourts.gov/opinions/pub/23/23-30445-CV0.pdf>.

³⁹¹ Knight First Amendment Institute at Columbia University. (n.d.). *Jawboning and the first amendment*. Retrieved from <https://knightcolumbia.org/research/jawboning>.

³⁹² Federal Trade Commission. (2024, December 9). FTC sends refund payments to consumers impacted by Epic Games' unlawful billing practices [Press release]. <https://www.ftc.gov/news-events/news/press-releases/2024/12/ftc-sends-refund-payments-consumers-impacted-epic-games-unlawful-billing-practices>.

³⁹³ Harrison, M. E., Norris, M. L., Obeid, N., Fu, M., Weinstangel, H., & Sampson, M. (2015). Systematic review of the effects of family meal frequency on psychosocial outcomes in youth. *Canadian Family Physician*, 61(2), e96-e106.

³⁹⁴ Behere, A. P., Basnet, P., & Campbell, P. (2017). Effects of family structure on mental health of children: A preliminary study. *Indian Journal of Psychological Medicine*, 39(4), 457-463.

³⁹⁵ Amato, P. R., Patterson, S., & Beattie, B. (2015). Single-parent households and children's educational achievement: A state-level analysis. *Social Science Research*, 53, 191-202.

³⁹⁶ Reiss, F. (2013). Socioeconomic inequalities and mental health problems in children and adolescents: A systematic review. *Social Science & Medicine*, 90, 24-31.

Nature Exposure Impacts Childhood Mental Health

A concern has been raised that children are spending less time outdoors and in nature, resulting in a range of behavioral problems and negative health effects exemplified in the 2005 book “Last Child in the Woods” by Richard Louv.³⁹⁷

- Increasing childhood nature exposure is associated with improved psychological well-being and emotional functioning as well as reduced stress and ADHD symptoms.³⁹⁸
- Parents have reported decreased ADHD symptoms after their children participated in activities in green areas compared to non-green areas.^{399 400}
- In a controlled experiment, children with ADHD who took a walk in a park showed improved attention performance, compared to those who walked in urban setting.⁴⁰¹

Balancing the Paradox: Overdiagnosis, Genuine Distress, and Intervention Risks

Children’s mental health in America presents a paradox for clinicians and policymakers: overdiagnosis of conditions like ADHD, depression, and anxiety coexists with a genuine rise in distress. This tension, driven by factors like screen time, social isolation, and academic pressure discussed earlier, complicates efforts to address youth mental health effectively.

Data confirms a real rise in youth mental health struggles. National surveys report that the number of adolescents experiencing persistent sadness or hopelessness increased from 28% in 2011 to 42% in 2021.⁴⁰² Suicide rates for ages 10–24 rose 62% from 2007 to 2021, after remaining stable from 2001 to 2007,⁴⁰³ and emergency department visits for self-harm among ages 10–14 surged 63% from 2009 to 2018.⁴⁰⁴

Yet, overdiagnosis remains a significant concern. Research shows ADHD has the strongest evidence of overdiagnosis, with studies noting that for youth with milder symptoms, “the harms associated with an ADHD diagnosis may often outweigh the benefits.”⁴⁰⁵ Schools, eager to “fix kids” by addressing behavioural challenges, may inadvertently contribute to this trend by encouraging diagnoses to access support, potentially mislabelling typical developmental behaviours as disorders. Similar concerns exist for depression and anxiety, where overdiagnosis

³⁹⁷ Louv, R. (2005). *Last child in the woods: Saving our children from nature-deficit disorder*. Algonquin Books of Chapel Hill.

³⁹⁸ Bozaslan, H., & Karakaş, G. (2023). The effect of exposure to nature on children’s psychological well-being: A systematic review of the literature. *Urban Forestry & Urban Greening*, 81, 127856.

³⁹⁹ Kuo, F. E., & Faber Taylor, A. (2004). A potential natural treatment for attention-deficit/hyperactivity disorder: Evidence from a national study. *American Journal of Public Health*, 94(9), 1580-1586.

⁴⁰⁰ Bratman, G. N., Anderson, C. B., & Berman, M. G. (2019). Nature and mental health: An ecosystem service perspective. *Science Advances*, 5(7), eaax0903. <https://doi.org/10.1126/sciadv.aax0903>.

⁴⁰¹ Faber Taylor, A., & Kuo, F. E. (2009). Children with attention deficits concentrate better after walk in the park. *Journal of Attention Disorders*, 12(5), 402-409.

⁴⁰² Kaiser Family Foundation. (2024, February 6). Recent trends in mental health and substance use concerns among adolescents. <https://www.kff.org/mental-health/issue-brief/recent-trends-in-mental-health-and-substance-use-concerns-among-adolescents/>.

⁴⁰³ Curtin, S. C., & Garnett, M. F. (2023). *Suicide and homicide death rates among youth and young adults aged 10–24: United States, 2001–2021* (NCHS Data Brief No. 471). National Center for Health Statistics. <https://dx.doi.org/10.15620/cdc:128423>.

⁴⁰⁴ Centers for Disease Control and Prevention. (2023). Data and statistics on children’s mental health.

<https://www.cdc.gov/children-mental-health/data-research/index.html>.

⁴⁰⁵ Kazda, L., Bell, K., Thomas, R., McGeechan, K., Sims, R., & Barratt, A. (2021). Overdiagnosis of attention-deficit/hyperactivity disorder in children and adolescents: A systematic scoping review. *JAMA Network Open*, 4(4), e215335.

risks labelling normal emotional or developmental challenges as clinical conditions, potentially increasing diagnoses without clear evidence that these youth benefit from treatment.^{406 407}

Dominant mental health approaches, often relying on reductive diagnoses and targeted treatments, face scrutiny for overlooking environmental factors. Some interventions may even cause harm. For example, universal school-based mental health programs can inadvertently increase distress in certain adolescents by encouraging rumination, though evidence is debated.⁴⁰⁸

Such over-pathologization may lead to interventions that fail to address root causes. Echoing these concerns, Abigail Shrier's 2024 book, *Bad Therapy: Why the Kids aren't Growing Up*,⁴⁰⁹ contends that interventions like therapy and Social-Emotional Learning programs may weaken resilience by pathologizing normal emotions. This perspective raises concerns that practices like trauma-informed care and gentle parenting potentially pathologize normal emotions, undermine resilience, and contribute to rising anxiety and depression rates among children and teenagers. Though controversial and disputed by many experts, this perspective remains viable and warrants rigorous scientific investigation to either confirm or refute its validity.

⁴⁰⁶ Merten, E.C., Cwik, J.C., Margraf, J., & Schneider, S. (2017). Overdiagnosis of mental disorders in children and adolescents (in developed countries). *Child and Adolescent Psychiatry and Mental Health*, 11, 5.

⁴⁰⁷ Frances, A., & Batstra, L. (2013, August 20). Why are so many children being diagnosed with mental disorders? *Psychiatric Times*. <https://www.psychiatrictimes.com/view/why-are-so-many-children-being-diagnosed-mental-disorders>.

⁴⁰⁸ Foulkes, L., & Andrews, J. L. (2023). Are mental health awareness efforts contributing to the rise in reported mental health problems? A call to test the prevalence inflation hypothesis. *New Ideas in Psychology*, 69, 101010. <https://doi.org/10.1016/j.newideapsych.2023.101010>.

⁴⁰⁹ Shrier, A. (2024). *Bad Therapy: Why the Kids Aren't Growing Up*. Penguin.

Section 4. The Overmedicalization of Our Kids

Medical overuse in children typically occurs by well-intended physicians and parents attempting to help a child. It has been estimated that roughly one-third of healthcare spending in the United States is wasteful and does not improve patient health.⁴¹⁰ American healthcare operates in a marketplace where incentives, when misaligned, can foster and encourage overuse by allowing stakeholders to maximize profits at the expense of consumer health and wellbeing. In recent decades, American children have, as a product of these misaligned incentives, been subject to an unprecedented period of over-prescription driven, in large part, by corporate influence, with demonstrable consequences for their health.

The information below offers an assessment of how the medical system may be exacerbating the chronic disease epidemic in children and is summarized from the published scientific literature.

American Children are on Too Much Medicine—A Recent and Emerging Crisis

One in five U.S. children are estimated to have taken at least one prescription medication in the past 30 days, with ongoing use most pronounced among adolescents, among whom 27% take one or more daily prescription drugs.⁴¹¹ Time trends suggest the current breadth of prescription drug exposure in US children is of relatively recent origin:

- **Stimulant prescriptions, drugs used to treat ADHD** in the US, **doubled** from 2006-2016;⁴¹² by 2022 11% of children had an ADHD diagnosis, with boys having a rate of nearly 1 in 4 by age 17.⁴¹³
- **Antidepressant** prescriptions were written for greater than 2 million adolescents in 2022,⁴¹⁴ a 1400% increase from 1987-2014.⁴¹⁵
- **Antipsychotic** use in US kids rose 800% 1995-2009, 66% of which was off-label for issues like ADHD or “aggression.”⁴¹⁶
- **Antibiotics** for outpatient children reached 49 million in 2022.⁴¹⁷ It has been estimated that about 35% are unnecessary, suggesting every year about 15 million children are prescribed unnecessary antibiotics, offering only risk with no chance of benefit.⁴¹⁸

⁴¹⁰ McGinnis, J. M., Stuckhardt, L., Saunders, R., & Smith, M. (Eds.). (2013). Best care at lower cost: the path to continuously learning health care in America. Institute of Medicine.

⁴¹¹ Martin CB, Hales CM, Gu Q, Ogden CL. (2019) Prescription drug use in the United States, 2015–2016. NCHS Data Brief, no 334. Hyattsville, MD: National Center for Health Statistics.

⁴¹² Piper, B. J., Ogden, C. L., Simoyan, O. M., Chung, W., & Kim, M. (2018). Trends in use of prescription stimulants in the United States and Territories, 2006 to 2016. PLOS ONE, 13(11), e0206100.

⁴¹³ Centers for Disease Control and Prevention. (2024, November 19). Data and statistics on ADHD. <https://www.cdc.gov/adhd/data/>(<https://beta.cdc.gov/adhd/data/index.html>).

⁴¹⁴ Chua, K. P., Volerman, A., Zhang, J., Hua, J., & Conti, R. M. (2024). Antidepressant dispensing to US adolescents and young adults: 2016–2022. *Pediatrics*, 153(3).

⁴¹⁵ Zito, J. M., Zhou, E., Pennap, D., Burcu, M., Safer, D. J., & Ibe, A. (2020). Antidepressant use in Medicaid-insured youth: Trends, covariates, and future research needs. *Frontiers in Psychiatry*, 11, 113.

⁴¹⁶ Alexander, G. C., Gallagher, S. A., Mascola, A., Moloney, R. M., & Stafford, R. S. (2011). Increasing off-label use of antipsychotic medications in the United States, 1995–2008. *Pharmacoepidemiology and Drug Safety*, 20(2), 177–184.

⁴¹⁷ CDC, “Outpatient Antibiotic Prescriptions — United States, 2022” (for prescription volume and pediatric prescribing rates).

⁴¹⁸ Fleming-Dutra, K. E., Hersh, A. L., Shapiro, D. J., Bartoces, M., Enns, E. A., File, T. M., ... & Hicks, L. A. (2016). Prevalence of inappropriate antibiotic prescriptions among US ambulatory care visits, 2010-2011. *Jama*, 315(17), 1864-1873.

- **Asthma drug** prescriptions increased 30% 1999-2008;⁴¹⁹ an estimated 25-40% of mild cases are overprescribed.⁴²⁰
- **GLP-1 drug** use is increasingly common among US kids,⁴²¹ very likely influenced by the American Academy of Pediatrics (AAP) strong recommendation to use weight loss drugs and surgery “early and at the highest available intensity.”⁴²²

These time trends significantly outpace more moderate increases seen in other developed countries. Psychotropics for ADHD are one example, prescribed 2.5 times more in US than in British children⁴²³, and 19 times more than in Japanese youth.⁴²⁴ ⁴²⁵ The crisis of overdiagnosis and overtreatment in children is therefore both empirically evident, and proportionally specific to American youth.

While excessive medical intervention in the US healthcare system is broadly recognized,⁴²⁶ there has been less attention given to direct harms experienced by Americans due to overtreatment. Despite this there exists a robust evidence base demonstrating significant and costly (both financially and in terms of human suffering) harms experienced by children due to overtreatment at the hands of American healthcare.

Of note, as this report lists representative examples of demonstrably harmful practices in children, many will depend on readers’ understanding of a core principle of evidence-based medicine: interventions shown to offer no benefit when compared to placebo are harmful. All medical interventions involve some risk of biological adverse effects, as well as cost, resource investment, opportunity cost, and human capital. From an evidence-based standpoint, these harms are the only potential impact when using interventions proven to have no benefit. Therefore, in some of the examples given below, the net harmfulness of a listed example is understood by virtue of the proven absence of a benefit, that is frequently learned when an undertested, but commonly used, intervention is properly evaluated in a randomized controlled trial, which is the gold standard of evidence in medicine.

Examples of proven harms due to overtreatment include:

- **Psychiatric drugs**, commonly used in children are known to cause serious, and often dangerous, short term adverse effects, such as, seizures, manic episodes, QT prolongation, discontinuation withdrawal syndrome as listed on FDA labels.⁴²⁷

⁴¹⁹ https://www.meps.ahrq.gov/data_files/publications/st341/stat341.shtml.

⁴²⁰ Farber, H. J., Wang, G., Guerra, J., & Tsao, K. (2017). Overprescribing of Oral Corticosteroids for Children With Asthma. *Pediatrics*, 139 (Supplement 1), S58–S59.

⁴²¹ Lee JM, Sharifi M, Oshman L, Griauzde DH, Chua K. Dispensing of Glucagon-Like Peptide-1 Receptor Agonists to Adolescents and Young Adults, 2020-2023. *JAMA*. 2024;331(23):2041–2043. doi:10.1001/jama.2024.7112.

⁴²² <https://publications.aap.org/aapnews/news/22965/AAP-s-first-clinical-practice-guideline-on-obesity>.

⁴²³ McCarthy, S., Wilton, L., Murray, M. L., Hodgkins, P., Asherson, P., & Wong, I. C. (2012). The epidemiology of pharmacologically treated attention deficit hyperactivity disorder (ADHD) in children, adolescents and adults in UK primary care. *BMC pediatrics*, 12, 1-11.

⁴²⁴ Ishizuya, A., Enomoto, M., Tachimori, H., Takahashi, H., Sugihara, G., Kitamura, S., & Mishima, K. (2021). Risk factors for low adherence to methylphenidate treatment in pediatric patients with attention-deficit/hyperactivity disorder. *scientific reports*, 11(1), 1707.

⁴²⁵ Calculations made from references 391, 399, and 400.

⁴²⁶ Lyu, H., Xu, T., Brotman, D., Mayer-Blackwell, B., Cooper, M., Daniel, M., ... & Makary, M. A. (2017). Overtreatment in the united states. *PLoS one*, 12(9), e0181970.

⁴²⁷ Solmi, M., Fornaro, M., Ostinelli, E. G., Zangani, C., Croatto, G., Monaco, F., ... & Correll, C. U. (2020). Safety of 80 antidepressants, antipsychotics, anti-attention-deficit/hyperactivity medications and mood stabilizers in children and adolescents with psychiatric disorders: a large scale systematic meta-review of 78 adverse effects. *World Psychiatry*, 19(2), 214-232.

- **Adenotonsillectomy** for children with sleep apnea, an historically common procedure, conferred no benefit in trials,⁴²⁸ suggesting the many, and often severe, harms of this surgery are unnecessary.
- **Tympanostomy tubes** for recurrent ear infections, despite being recommended by professional societies,⁴²⁹ did not reduce infections in trials—showing common surgeries cause harm without offering benefits.⁴³⁰
- **Blood tests for inflammation** in infants with fever routinely led to a cascade of unnecessary, invasive, and harmful further testing such as spinal taps—but were broadly recommended by professional society guidelines.⁴³¹
- **ADHD, depression, and “intellectual disability”** are diagnosed disproportionately in children relatively young for their school grade, suggesting misdiagnosis leads to unnecessary drugs, treatments, and social stigma.⁴³²
- **New generation antidepressants**, despite widespread use, in children offer only a “small and unimportant” reduction in depression symptoms according to a meta-analysis of 26 studies.⁴³³
- **Antibiotics** are over-prescribed to millions of US children annually, causing serious harms like rashes, diarrhea, recurrent infections, allergic reactions, and antibiotic resistance.⁴³⁴
- **Antidepressants, stimulants, antipsychotics, and other psychiatric drugs**, when stopped, often lead to disabling and prolonged physical dependence and withdrawal symptoms.⁴³⁵
- **Specific antipsychotics** in adolescent boys, when compared to placebo, cause 5 times more gynecomastia (male breast growth),⁴³⁶ 4 times more extrapyramidal effects, and 6-8 times more significant weight gain.⁴³⁷
- **Topiramate**, commonly prescribed throughout the 2000s off-label to children for migraine headaches, were presumed effective in children given known efficacy in adults; however, no high-quality trials in children existed.^{438 439} In 2017, the first high-quality trial

⁴²⁸ Waters KA, Chawla J, Harris MA, et al. Cognition after early tonsillectomy for mild OSA. *Pediatrics*. 2020;145(2): e20191450

⁴²⁹ Rosenfeld, R et al (2022). Clinical practice guideline: Tympanostomy tubes in children (update). *Otolaryngology–Head and Neck Surgery*, 2022: 166(1_suppl), S1–S55.

⁴³⁰ Hoberman, A., Preciado, D., Paradise, J. L., Chi, D. H., Haralam, M., Block, S. L., ... & Shaikh, N. (2021). Tympanostomy tubes or medical management for recurrent acute otitis media. *New England Journal of Medicine*, 384(19), 1789-1799.

⁴³¹ Sturgeon, J.P., et al. C-Reactive Protein (CRP) levels in neonatal meningitis in England: an analysis of national variations in CRP cut-offs for lumbar puncture. *BMC Pediatr* 18, 380 (2018).

⁴³² Root, A., Brown, J. P., Forbes, H. J., Bhaskaran, K., Hayes, J., Smeeth, L., & Douglas, I. J. (2019). Association of relative age in the school year with diagnosis of intellectual disability, attention-deficit/hyperactivity disorder, and depression. *JAMA pediatrics*, 173(11), 1068-1075

⁴³³ Hetrick SE, et al. New generation antidepressants for depression in children and adolescents: a network meta-analysis. *Cochrane Database of Systematic Reviews* 2021, Issue 5. Art. No.: CD013674.

⁴³⁴ Llor, C., & Bjerrum, L. (2014). Antimicrobial resistance: risk associated with antibiotic overuse and initiatives to reduce the problem. *Therapeutic advances in drug safety*, 5(6), 229-241.

⁴³⁵ Horowitz MA, Frammer A, Hengartner MP, Sørensen A, Taylor D. Estimating Risk of Antidepressant Withdrawal from a Review of Published Data. *CNS Drugs*. 2023 Feb;37(2):143-157. doi: 10.1007/s40263-022-00960-y. Epub 2022 Dec 14. PMID: 36513909; PMCID: PMC9911477.

⁴³⁶ Etminan M, Carleton B, Brophy JM. Risperidone and Risk of Gynecomastia in Young Men. *J Child Adolesc Psychopharmacol*. 2015 Nov;25(9):671-3. doi: 10.1089/cap.2015.0024. Epub 2015 Aug 19. PMID: 26287371.

⁴³⁷ Cohen, D., Bonnot, O., Bodeau, N., Consoli, A., & Laurent, C. (2012). Adverse effects of second-generation antipsychotics in children and adolescents: a Bayesian meta-analysis. *Journal of clinical psychopharmacology*, 32(3), 309-316.

⁴³⁸ Powers, S. W., Coffey, C. S., Chamberlin, L. A., Ecklund, D. J., Klingner, E. A., Yankey, J. W., ... & Hershey, A. D. (2017). Trial of amitriptyline, topiramate, and placebo for pediatric migraine. *New England Journal of Medicine*, 376(2), 115-124.

⁴³⁹ U.S. Food and Drug Administration. (2014, March 28). FDA approves Topamax for migraine prevention in adolescents [Press release]. <https://wayback.archive-it.org/7993/20170112222908/http://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm391026.htm>.

was published, demonstrating the drug did not improve migraines in children⁴⁴⁰ but did cause suicidal thoughts and behaviors as acknowledged on the FDA drug label.⁴⁴¹ Following this trial, prescriptions of the Topiramate dropped for children with migraines.

The above examples represent harms that have been carefully studied and thus well proven. However, in the setting of childhood growth and development there remains an important likelihood of undetected but potentially major long-term repercussions. Established harms in children may therefore be thought of as the tip of a potentially vast iceberg representing both detectable short term negative effects, and potentially hidden negative effects with long term implications. While long term research on the developmental and adult-stage impact of most commonly used drugs for children is limited, there are contributory human data that raise important questions. **Examples include:**

- **SSRIs:** Used to treat depression and anxiety, SSRIs carry a black box warning⁴⁴² due to established incidents of suicidal thinking and behavior caused by the drugs in adolescents—such incidents are difficult to separate from progression of baseline disease and therefore may go largely undetected.
- **Stimulants:** According to best trial data available, these widely used ADHD drugs cause long-term height loss averaging an inch,⁴⁴³ of note, the only long-term trial found exclusively short-term (14-month) behavior benefits, which were not found at 3 years.⁴⁴⁴ Indeed, at 3, 5, 8, and 14 years, no benefits were seen in grades, relationships, achievement, behavior, or any other measure.
- **GLP-1 Agonists:** Increasingly common,⁴⁴⁵ these popular weight-loss and diabetes drugs with complicated metabolic effects lack neurodevelopmental and other long term safety data, raising the specter of unforeseen problems that interrupt, damage, or impair metabolism and growth development.
- **Child Chemical and Surgical Mutilation** carries major risks related to puberty blockers, cross-sex hormones, and surgeries, including irreversible effects like infertility.⁴⁴⁶ The AMA⁴⁴⁷ and AAP⁴⁴⁸ recommend these medications and procedures, however, despite an

⁴⁴⁰ Powers, S. W., Coffey, C. S., Chamberlin, L. A., Ecklund, D. J., Klingner, E. A., Yankey, J. W., ... & Hershey, A. D. (2017). Trial of amitriptyline, topiramate, and placebo for pediatric migraine. *New England Journal of Medicine*, 376(2), 115-124.

⁴⁴¹ U.S. Food and Drug Administration. (2008, December 16). Information for healthcare professionals: Suicidal behavior and ideation and antiepileptic drugs [FDA Alert]. <https://wayback.archive-it.org/7993/20170404234152/https://www.fda.gov/Drugs/DrugSafety/PostmarketDrugSafetyInformationforPatientsandProviders/ucm100192.htm>.

⁴⁴² Food and Drug Administration. (2018). Suicidality in Children and Adolescents Being Treated With Antidepressant Medications. FDA. <https://www.fda.gov/drugs/postmarket-drug-safety-information-patients-and-providers/suicidality-children-and-adolescents-being-treated-antidepressant-medications>.

⁴⁴³ Swanson, J.M. et al 2017. Young adult outcomes in the follow-up of the multimodal treatment study of attention-deficit/hyperactivity disorder: Symptom persistence, source discrepancy, and height suppression. *Journal of Child Psychology and Psychiatry*, 58(6), pp.663-678.

⁴⁴⁴ Jensen, P. S., Arnold, L. E., Swanson, J. M., Vitiello, B., Abikoff, H. B., Greenhill, L. L., ... & Hur, K. (2007). 3-year follow-up of the NIMH MTA study. *Journal of the American Academy of Child & Adolescent Psychiatry*, 46(8), 989-1002.

⁴⁴⁵ Lee, J. M., Sharifi, M., Oshman, L., Griauzde, D. H., & Chua, K. P. (2024). Dispensing of glucagon-like peptide-1 receptor agonists to adolescents and young adults, 2020-2023. *Jama*, 331(23), 2041-2043.

⁴⁴⁶ HHS Releases Comprehensive Review of Medical Interventions for Children and Adolescents with Gender Dysphoria | HHS.gov.

⁴⁴⁷ <https://www.ama-assn.org/press-center/ama-press-releases/ama-states-stop-interfering-health-care-transgender-children>.

⁴⁴⁸ <https://publications.aap.org/aapnews/news/25340/AAP-reaffirms-gender-affirming-care-policy>.

HHS review finding no long-term evidence for safety (or effectiveness) and short-term evidence of “very low quality.”⁴⁴⁹

- **Antibiotics:** Children exposed to antibiotics in the first 2 years of life are more likely to develop asthma, allergic rhinitis, atopic dermatitis, celiac disease, overweight, obesity, and ADHD.⁴⁵⁰ The antibiotic prescription rate from birth until age 2 is over 2,500 antibiotic prescriptions for every 1,000 children this age.⁴⁵¹
- **Acid suppressants (PPIs, H2 antagonists)** in their first year of life are more likely later in childhood to develop food and drug allergies, anaphylaxis, allergic rhinitis, and asthma,⁴⁵² findings that again require careful long-term investigation.

Compounding the crisis of known and potential long-term harms of pediatric overtreatment is a lack of pediatric-specific trials creating a critical knowledge gap. In many settings of pediatric care authorities, guidelines, and healthcare providers rely largely on dosing and safety profiles from adult studies.⁴⁵³

Growth of the Childhood Vaccine Schedule

The Executive Order establishing the MAHA Commission directed the study of any potential contributing causes to the childhood chronic disease crisis, including medical treatments, and to “assess the threat that potential over-utilization of medication... pose[s] to children with respect to chronic inflammation or other established mechanisms of disease, using rigorous and transparent data, including international comparisons.”

Vaccines benefit children by protecting them from infectious diseases. But, as with any medicine, vaccines can have side effects that must be balanced against their benefits. Parents should be fully informed of the benefits and risks of vaccines. Many of them have concerns about the appropriate use of vaccines and their possible role in the growing childhood chronic disease crisis.

- Since 1986, for the average child, by one year of age, the number of recommended vaccines on the CDC childhood schedule has increased from 3 injections to 29 injections (including in utero exposures from vaccines administered to the mother). Of course,

⁴⁴⁹ U.S. Department of Health and Human Services. (2025). Treatment for pediatric gender dysphoria: Review of evidence and best practices. Office of Population Affairs. <https://opa.hhs.gov/>.

⁴⁵⁰ Aversa, Z., Atkinson, E. J., Schafer, M. J., Theiler, R. N., Rocca, W. A., Blaser, M. J., & LeBrasseur, N. K. (2021, January). Association of infant antibiotic exposure with childhood health outcomes. In *Mayo Clinic Proceedings* (Vol. 96, No. 1, pp. 66-77). Elsevier.

⁴⁵¹ Fleming-Dutra, K. E., Hersh, A. L., Shapiro, D. J., Bartoces, M., Enns, E. A., File, T. M., Finkelstein, J. A., Gerber, J. S., Hyun, D. Y., Linder, J. A., Lynfield, R., Margolis, D. J., May, L. S., Merenstein, D., Metlay, J. P., Newland, J. G., Piccirillo, J. F., Roberts, R. M., Sanchez, G. V., ... Hicks, L. A. (2016). Prevalence of inappropriate antibiotic prescriptions among US ambulatory care visits, 2010-2011. *JAMA*, 315(17), 1864-1873. <https://doi.org/10.1001/jama.2016.4151>.

⁴⁵² Mitre, E., Susi, A., Kropp, L. E., Schwartz, D. J., Gorman, G. H., & Nylund, C. M. (2018). Association between use of acid-suppressive medications and antibiotics during infancy and allergic diseases in early childhood. *JAMA pediatrics*, 172(6), e180315-e180315.

⁴⁵³ Bourgeois FT, Murthy S, Pinto C, Olson KL, Ioannidis JP, Mandl KD. Pediatric versus adult drug trials for conditions with high pediatric disease burden. *Pediatrics*. 2012;130(2):285-292. doi:10.1542/peds.2012-0139.

parents may choose to delay to a later age or forego one or more of these vaccines.⁴⁵⁴

- The number of vaccinations on the American vaccine schedule exceeds the number of vaccinations on many European schedules, including Denmark, which has nearly half as many as the U.S.^{456 457 458} Yet, no trials have compared the advisability and safety of the U.S. vaccine schedule as compared to other nations.⁴⁵⁹
- Unlike other pharmaceutical products, vaccines are unique in that all 50 states enforce some form of vaccine mandate for public school enrollment although almost all states allow exemptions for religious and/or personal reasons.⁴⁶⁰ In contrast, over half of European countries—including the UK—do not require childhood vaccination.⁴⁶¹

Despite the growth of the childhood vaccine schedule, there has been limited scientific inquiry into the links between vaccines and chronic disease, the impacts of vaccine injury, and conflicts of interest in the development of the vaccine schedule. These areas warrant future inquiry:

Clinical trials: Our understanding of vaccine safety and any links to chronic disease would benefit from more rigorous clinical trial designs,^{462 463} including the use of true placebos, larger sample sizes, and longer follow-up periods. Many vaccines on the CDC’s childhood schedule involved small participant groups, had no inert placebo-controlled trials, and had limited safety monitoring, some lasting six months or less—raising concerns about the ability to detect rare or long-term adverse effects.

Complications and the Vaccine Safety Surveillance System:

Vaccines can have a wide range of adverse effects. Manufacturers are only required by Federal law to list these adverse events in their package insert if they have a basis to believe there is a

⁴⁵⁴ <https://www.cdc.gov/vaccines/schedules/images/schedule1983s.jpg>; No new vaccines were added to the schedule between 1983-1989.

⁴⁵⁵ Centers for Disease Control and Prevention. (2025, January 16). Advisory Committee on Immunization Practices recommended immunization schedule for children and adolescents aged 18 years or younger—United States, 2025. *MMWR. Morbidity and Mortality Weekly Report*, 74(2), 26–29. <https://www.cdc.gov/mmwr/volumes/74/wr/pdfs/mm7402a2-H.pdf>.

⁴⁵⁶ Ministère de la Santé et de la Prévention. (2025, April 28). Calendrier des vaccinations 2025.

<https://sante.gouv.fr/prevention-en-sante/preserver-sa-sante/vaccination/calendrier-vaccinal>.

⁴⁵⁷ UK Health Security Agency. (2025, January 22). Routine childhood immunisations from 1 January 2025.

https://assets.publishing.service.gov.uk/media/678f8be6ec88969ba1bc2ada9/UKHSA_13197_Routine_Childhood_imms_schedule_04.pdf.

⁴⁵⁸ Danish Health Authority. (2019, August 20). The Danish childhood vaccination programme. Statens Serum Institut.

<https://en.ssi.dk/vaccination/the-danish-childhood-vaccination-programme>.

⁴⁵⁹ IOM (Institute of Medicine). 2013. *The childhood immunization schedule and safety: Stakeholder concerns, scientific evidence, and future studies*. Washington, DC: The National Academies Press. (“Experts who addressed the committee pointed not to a body of evidence that had been overlooked but rather to the fact that existing research has not been designed to test the entire immunization schedule” and “studies designed to examine the long-term effects of the cumulative number of vaccines or other aspects of the immunization schedule have not been conducted.”).

⁴⁶⁰ National Conference of State Legislatures. (2025, May 7). State non-medical exemptions from school immunization requirements. <https://www.ncsl.org/health/state-non-medical-exemptions-from-school-immunization-requirements>.

⁴⁶¹ Farina S, Maio A, Gualano MR, Ricciardi W, Villani L. Childhood Mandatory Vaccinations: Current Situation in European Countries and Changes Occurred from 2014 to 2024. *Vaccines (Basel)*. 2024 Nov 20;12(11):1296. doi: 10.3390/vaccines12111296.

⁴⁶² Benn, C. S., Fisker, A. B., Rieckmann, A., Sørup, S., & Aaby, P. (2020). Vaccinology: time to change the paradigm?. *The lancet infectious diseases*, 20(10), e274-e283.

⁴⁶³ Benn, C. S., Amenyogbe, N., Björkman, A., Domínguez-Andrés, J., Fish, E. N., Flanagan, K. L., ... & Aaby, P. (2023). Implications of non-specific effects for testing, approving, and regulating vaccines. *Drug Safety*, 46(5), 439-448.

causal relationship between the drug and the occurrence of the adverse event.⁴⁶⁴ There are, however, many possible adverse events for which there is inadequate evidence to accept or reject a causal relationship.^{465 466}

Vaccine reactions are supposed to be evaluated in the United States through a range of federal agencies.⁴⁶⁷ The Vaccine Adverse Event Reporting System (VAERS) relies on passive reporting by physicians and others, but provides incomplete “early warning” observational data. Many health care professionals do not report to VAERS because they are not mandated to do so or they may not connect the adverse event to a vaccination.^{468 469}

The Vaccine Safety Datalink (VSD) system, established in 1990, works with healthcare organizations to monitor and study adverse events using electronic health records, covering 15 million people.^{470 471} However, deidentified data in the VSD, paid for by taxpayers, is not generally available to scientists outside of the VSD network to conduct analyses or replicate findings using VSD data. Furthermore, the CDC has noted that VSD studies are likely prone to confounders and bias; it is also geared towards studying short-term outcomes and is not well-suited to studying associations between vaccination and longer-term chronic disease conditions.⁴⁷²

Conflicts of interest: The National Childhood Vaccine Injury Act of 1986 was enacted in response to liability concerns surrounding injuries linked to the three routine childhood vaccines in use at the time.⁴⁷³ The law shields vaccine manufacturers from liability for vaccine-related injuries, creating a unique regulatory and legal framework. This framework creates financial disincentives for pharmaceutical companies to identify safety issues either pre- or post-licensure. Congress made HHS responsible for vaccine safety in the Mandate for Safer Childhood Vaccines.⁴⁷⁴ However, HHS also has the conflicting duty to promote vaccines and to defend them against claims of injury in the National Vaccine Injury Compensation Program.⁴⁷⁵ In fact, HHS has faced lawsuits for failing to fulfill basic duties under the Mandate for Safer

⁴⁶⁴ U.S. Department of Health and Human Services, Food and Drug Administration. (2006). *Guidance for industry: Adverse reactions section of labeling for human prescription drug and biological products—Content and format* [PDF]. <https://www.fda.gov/media/72139/download>.

⁴⁶⁵ Maglione, M. A., Gidengil, C., Das, L., Raaen, L., Smith, A., Chari, R., ... & Goetz, M. B. (2014). Safety of Vaccines Used for Routine Immunization in the United States. *Evidence report/technology assessment*, (215), 1-740.

⁴⁶⁶ Clayton, E. W., Rusch, E., Ford, A., & Stratton, K. (Eds.). (2012). *Adverse effects of vaccines: evidence and causality*. Institute of Medicine.

⁴⁶⁷ Gee, J., Shimabukuro, T. T., Su, J. R., Shay, D., Ryan, M., Basavaraju, S. V., ... & Anderson, S. (2024). Overview of US COVID-19 vaccine safety surveillance systems. *Vaccine*, 42, 125748.

⁴⁶⁸ Lazarus R. *Electronic Support for Public Health - Vaccine Adverse Event Reporting System (ESP:VAERS) - Final Report*. (Prepared by Harvard Pilgrim Health Care, Inc. under Grant No. R18 HS017045). Rockville, MD: Agency for Healthcare Research and Quality, 2010. See:

<https://digital.ahrq.gov/ahrq-funded-projects/electronic-support-public-health-vaccine-adverse-event-reporting-system#nav-publications>.

⁴⁶⁹ Hibbs, B. F., Moro, P. L., Lewis, P., Miller, E. R., & Shimabukuro, T. T. (2015). Vaccination errors reported to the vaccine adverse event reporting system, (VAERS) United States, 2000–2013. *Vaccine*, 33(28), 3171-3178.

⁴⁷⁰ McNeil, M. M., Gee, J., Weintraub, E. S., Belongia, E. A., Lee, G. M., Glanz, J. M., ... & DeStefano, F. (2014). The Vaccine Safety Datalink: successes and challenges monitoring vaccine safety. *Vaccine*, 32(42), 5390-5398.

⁴⁷¹ Fahey, K. R. (2015). The pioneering role of the Vaccine Safety Datalink Project (VSD) to advance collaborative research and distributed data networks. *eGEMs*, 3(1), 1195.

⁴⁷² Glanz, J. M., Newcomer, S. R., Jackson, M. L., Omer, S. B., Bednarczyk, R. A., Shoup, J. A., ... & Sukumaran, L. (2016). White Paper on studying the safety of the childhood immunization schedule in the Vaccine Safety Datalink. *Vaccine*, 34, A1-A29.

⁴⁷³ U.S. Department of Health and Human Services, Health Resources and Services Administration. (n.d.). *About vaccine compensation*.

<https://www.hrsa.gov/vaccine-compensation/about>.

⁴⁷⁴ 42 U.S.C.300aa-27.

⁴⁷⁵ 42 U.S.C.300aa-10.

Childhood Vaccines such as its requirement to submit biannual reports to Congress on how it has made vaccines safer.⁴⁷⁶

Scientific and Medical Freedom: Open scientific discussion and inquiry has become more difficult with the expansion of childhood vaccine mandates and public health—combined with efforts to combat vaccine hesitancy.⁴⁷⁷ Physicians who question or deviate from the CDC’s vaccine schedule may face professional repercussions, including scrutiny from licensing boards and potential disciplinary action. The American Medical Association (AMA), for example, adopted a new policy aimed at “addressing public health disinformation” that called to “ensure licensing boards have the authority to take disciplinary action against health professionals for spreading health-related disinformation.”⁴⁷⁸ This dynamic discourages practitioners from conducting or discussing nuanced risk-benefit analyses that deviate from official guidelines—even when those analyses may be clinically appropriate. It also discourages physicians and scientists from studying adverse reactions. This silences critical discussion, discourages reporting to safety systems and hampers vaccine research, and undermines the open dialogue essential to protecting and improving children’s health.

⁴⁷⁶ <https://www.congress.gov/118/meeting/house/117456/witnesses/HHRG-118-JU05-Wstate-SiriEsqA-20240626.pdf>.

⁴⁷⁷ Elisha, E., Guetzkow, J., Shir-Raz, Y., & Ronel, N. (2024, March). Suppressing Scientific Discourse on Vaccines? Self-perceptions of researchers and practitioners. In *Hec Forum* (Vol. 36, No. 1, pp. 71-89). Dordrecht: Springer Netherlands.

⁴⁷⁸ American Medical Association. (2022, June 13). *AMA adopts new policy aimed at addressing public health disinformation*. <https://www.ama-assn.org/press-center/ama-press-releases/ama-adopts-new-policy-aimed-addressing-public-health-disinformation>.

From Bench to Bedside: Mechanisms of Corporate Capture

The overmedicalization of American children, characterized by escalating prescription rates, unwarranted interventions, and declining health outcomes, signals a critical policy failure where corporate profitability supersedes the health of children. While in the 1960s U.S. healthcare achieved excellent health outcomes for children while spending at a level consistent with other developed nations, today's system far outspends sister nations while delivering far worse outcomes.

This phenomenon is largely propelled by “corporate capture,” in which industry interests dominate and distort scientific literature, legislative actions, academic institutions, regulatory agencies, medical journals, physician organizations, clinical guidelines, and the news media. The pharmaceutical industry, with its vast resources and influence, is a primary driver of this capture, though similar dynamics pervade the food and chemical industries, further exacerbating health challenges. This analysis details the mechanisms of corporate capture through a “bench to bedside” framework, followed by an examination of the systemic frailties that perpetuate industry dominance.

At a granular level, this suggests the poor health and increased morbidity of our children is multifactorial and includes, most prominently, the corporate capture of medical knowledge. The distortion and influence of medical education, medical knowledge, and therefore clinical guidelines and practice, has led providers to over-diagnose and over-prescribe, and over-use by children, while largely ignoring the potential population-level impact of diet, lifestyle, and environment as focal points for health, healing, and wellness.

Corporate capture entails the systematic distortion of scientific literature, regulatory processes, clinical practices, and public discourse by pharmaceutical and healthcare industries, all aimed at maximizing profits. These mechanisms illustrate a trajectory from initial research to pervasive market saturation and narrative control.

1. Distorting Scientific Literature

In medical school, doctors are taught high quality care is based on the scientific evidence presented in peer reviewed articles published in reputable medical journals. Embedded in this dictum are several assumptions:

- That medical research is broadly focused on the most common and serious health challenges.
- That journal articles include the most relevant findings on benefits and harms.
- That the publication of articles in reputable journals is tantamount to an attestation and confirmation that the reports are faithfully distilled representations of original study data.
- That peer reviewers are unbiased and have the biomedical, analytic, and scientific expertise to filter and curate study reports, assuring they are methodologically valid, presented fairly, and interpreted correctly.

These assumptions are often incorrect

- In the United States, private industry funds five times as many clinical trials than all U.S. Federal agencies combined including the NIH.⁴⁷⁹ Since 1999, 97% of the most frequently cited clinical trials received funding from industry.⁴⁸⁰ The number of citations is a measure of papers' impact,⁴⁸¹ suggesting nearly all of the most impactful clinical trials have been funded by industry.
- Medical journals often do not have access to patient-level data from pharmaceutical research and therefore cannot vouch for the accuracy or completeness of the data they see. Industry data is firewalled, and companies generally allow no one other than employees to see it⁴⁸²—doctors and patients must therefore rely on the good faith of corporations to present an honest picture of their research.
- Peer review, the gatekeeping attribute that defines medical journals, is ineffective and biased; reviewers at top journals are untrained,⁴⁸³ ineffective when tested,⁴⁸⁴ and many have financial ties to drug companies.⁴⁸⁵

Drug companies, therefore, exercise corporate control over the research agenda, corporate control of the research findings seen by patients and doctors, and corporate influence over the review of those findings. These are the structural components comprising the corporate capture of medical information.

Despite the broad inability of scientists or journalists to obtain access to original research data from pharmaceutical companies, there is an overwhelming body of scientific evidence supporting the conclusion that pharmaceutical industry dominance of research leads to distorted and misleading information routinely published in top journals, while journals and their content are routinely manipulated and controlled by industry money:

- Pharmaceutical companies often craft studies and papers designed to favor their products. Evidence shows industry studies are *much* more likely to report favorable outcomes,⁴⁸⁶ exaggerating benefits and underreporting harms.⁴⁸⁷
- Editorials and opinion pieces in top journals are often written by biased, industry funded authors, and therefore disproportionately conclude the drugs in question are safe and effective.⁴⁸⁸

⁴⁷⁹ Ehrhardt, S., Appel, L. J., & Meinert, C. L. (2015). Trends in National Institutes of Health funding for clinical trials registered in ClinicalTrials.gov. *Jama*, 314(23), 2566-2567.

⁴⁸⁰ Patsopoulos, N. A., Ioannidis, J. P., & Analatos, A. A. (2006). Origin and funding of the most frequently cited papers in medicine: database analysis. *Bmj*, 332(7549), 1061-1064.

⁴⁸¹ Garfield, E. (1996). Fortnightly review: how can impact factors be improved?. *Bmj*, 313(7054), 411-413.

⁴⁸² Goldacre, B., Lane, S., Mahtani, K. R., Heneghan, C., Onakpoya, I., Bushfield, I., & Smeeth, L. (2017). Pharmaceutical companies' policies on access to trial data, results, and methods: audit study. *Bmj*, 358.

⁴⁸³ Kusumoto, F. M., Bittl, J. A., Creager, M. A., Dauerman, H. L., Lala, A., McDermott, M. M., ... & Peer Review Task Force of the Scientific Publications Committee. (2023). Challenges and controversies in peer review: JACC review topic of the week. *Journal of the American College of Cardiology*, 82(21), 2054-2062.

⁴⁸⁴ Hall, R. P. (2022). Effective peer review: who, where, or what?. *JID Innovations*, 2(6).

⁴⁸⁵ Nguyen, D. D., Murayama, A., Nguyen, A. L., Cheng, A., Murad, L., Satkunasivam, R., & Wallis, C. J. (2024). Payments by drug and medical device manufacturers to US peer reviewers of major medical journals. *JAMA*, 332(17), 1480-1482.

⁴⁸⁶ Lexchin, J., Bero, L. A., Djulbegovic, B., & Clark, O. (2003). Pharmaceutical industry sponsorship and research outcome and quality: systematic review. *bmj*, 326(7400), 1167-117.

⁴⁸⁷ Stamatakis, E., Weiler, R., & Ioannidis, J. P. (2013). Undue industry influences that distort healthcare research, strategy, expenditure and practice: a review. *European journal of clinical investigation*, 43(5), 469-475.

⁴⁸⁸ Sharma, S., Booth, C. M., Eisenhauer, E. A., & Gyawali, B. (2021). Do editorialists with industry-related conflicts of interest write unduly favorable editorials for cancer drugs in top journals?. *Journal of the National Comprehensive Cancer Network*, 19(11), 1258-1263.

- Medical journal economics: Medical journals rely for profitability on revenue from industry (advertising and reprints), thus journals reap handsome profits when publishing successful studies of drugs.⁴⁸⁹
- More than half of top medical journal editors have been paid directly by drug companies, often as funding for research; though most payments were modest there were two notable outliers who received general payments of greater than \$1M in 2014.⁴⁹⁰
- Despite incentives to favor industry, some of the world’s most respected medical journal editors have publicly expressed disgust and loathing for industry’s impact on the content and nature of medical journals, including:⁴⁹¹
 - Richard Horton, editor of *The Lancet*: “Journals have devolved into information laundering operations for the pharmaceutical industry.”
 - Marcia Angell, former editor of the *New England Journal of Medicine*: Criticized industry for becoming “primarily a marketing machine” and co-opting “every institution that might stand in its way.”
 - Richard Smith, former editor of the *BMJ*: “Medical journals are an extension of the marketing arm of pharmaceutical companies.”
 - Arnold Relman, former editor of the *New England Journal of Medicine*: “The medical profession is being bought by the pharmaceutical industry, not only in terms of the practice of medicine, but also in terms of teaching and research. The academic institutions of this country are allowing themselves to be paid agents of the pharmaceutical industry. I think it’s disgraceful.”

One of the world’s most prestigious journals published an article critiquing pharmaceutical advertisements, and lost an estimated \$1-1.5 million in advertising revenue, revealing “the true colors of the pharmaceutical industry, which was willing to flex its considerable muscles when it felt its interests were threatened.”⁴⁹²

2. Exerting Potentially Undue Influence

Evidence suggests that pharmaceutical money strongly influences congressional legislation through lobbying and the manipulation of patient advocacy groups, and exerts considerable financial control over the FDA and its employees:

- From 1999 to 2018, the pharmaceutical industry spent \$4.7 billion on lobbying expenditures at the federal level, more than any other industry.⁴⁹³
- Industry-funded patient advocacy groups often present as independent entities, pressuring regulatory bodies to prioritize rapid access to new treatments over safety.⁴⁹⁴

⁴⁸⁹ Lexchin J, Light DW. Commercial influence and the content of medical journals. *BMJ*. 2006 Jun 17;332(7555):1444-7.

⁴⁹⁰ Liu, J. J., Bell, C. M., Matelski, J. J., Detsky, A. S., & Cram, P. (2017). Payments by US pharmaceutical and medical device manufacturers to US medical journal editors: retrospective observational study. *bmj*, 359.

⁴⁹¹ Smith, R. (2005). Medical journals are an extension of the marketing arm of pharmaceutical companies. *Plos medicine*, 2(5), e138.

⁴⁹² Lexchin, J., & Light, D. W. (2006). Commercial influence and the content of medical journals. *Bmj*, 332(7555), 1444-1447.

⁴⁹³ Wouters, O. J. (2020). Lobbying expenditures and campaign contributions by the pharmaceutical and health product industry in the United States, 1999-2018. *JAMA Internal Medicine*, 180(5), 688-697.

⁴⁹⁴ Kaiser Health News. (2018). “Pre\$cription for Power: Patient Advocacy Groups Take In Millions From Drugmakers. Is There a Payoff?” Retrieved from KHN Pre\$cription for Power.

- Between 2010 and 2022, industry provided \$6 billion to over 20,000 patient advocacy organizations.⁴⁹⁵
- 9 of 10 past FDA commissioners have gone on to work in the pharmaceutical industry;⁴⁹⁶ similarly, roughly 70% of FDA medical examiners ultimately find employment in the industry.⁴⁹⁷

3. Widening Markets and Influencing Clinical Practice

The pharmaceutical, device, and related healthcare industries have used a broad range of tactics to maximize profits, many of them explicitly untethered to improvements in child health. Such tactics typically have the impact of distorting and widening markets for industry product sales. Examples include:

- In prior studies, 80% of clinical departments at U.S. medical schools and teaching hospitals are funded directly by the pharmaceutical industry.⁴⁹⁸
- Industry sponsorship of education for medical students and physicians typically promotes drugs, encourages off-label prescribing, and contributes to polypharmacy in kids.⁴⁹⁹
- Half of Continuing Medical Education courses in the U.S. are funded by the pharmaceutical industry.⁵⁰⁰ Studies find sponsored courses profoundly impact physician behavior, increasing prescribing of the sponsor’s drug;⁵⁰¹ industry studies show the return on investment for this averages \$3.56 for every dollar spent.⁵⁰²
- Industry donations to the CDC Foundation are believed to influence federal public health campaigns, highlighting “awareness” of selected child conditions to justify more diagnosis and drug use.⁵⁰³ The CDC foundation openly advertises that “you can advance CDC’s work on a specific health threat by supporting a CDC foundation program” and have “the ability to target investments where most needed.”⁵⁰⁴ Such conflicts of interest may have influenced CDC work, related to hepatitis C screening and chronic kidney disease, as noted in a BMJ investigation.⁵⁰⁵
- Clinical guidelines written by respected professional societies and organizations provide a particularly powerful and potentially amplified influence target for industry. Studies suggests there is considerable funding and effort in this direction, with notable consequences. Examples include:

⁴⁹⁵ Pradhan R. (2025). More than two-thirds of patient advocacy groups studied received funding from drug, medical device companies. KFF Health News.

<https://kffhealthnews.org/news/article/health-202-pharma-money-patient-advocacy-groups-public-citizen/>.

⁴⁹⁶ Foley, K. E. (2022, July 21). Trust issues deepen as yet another FDA commissioner joins the pharmaceutical industry. *Quartz*.

<https://qz.com/1656529/yet-another-fda-commissioner-joins-the-pharmaceutical-industry>.

⁴⁹⁷ Piller, C. (2018). FDA’s revolving door: Companies often hire agency staffers who managed their successful drug reviews. *Science*. Retrieved from

<https://www.science.org/content/article/fda-s-revolving-door-companies-often-hire-agency-staffers-who-managed-their-successful>.

⁴⁹⁸ Campbell EG, Weissman JS, Ehringhaus S, et al. Institutional academic-industry relationships. *JAMA*. 2007;298(15):1779-1786.

⁴⁹⁹ Angell, M. (2004). *The Truth About the Drug Companies: How They Deceive Us and What to Do About It*. Random House

⁵⁰⁰ Brody, H. (2009). Pharmaceutical industry financial support for medical education: Benefit, or undue influence? *Journal of Law, Medicine & Ethics*, 37(3), 451–460. <https://doi.org/10.1111/j.1748-720X.2009.00407>.

⁵⁰¹ Fugh-Berman, A. (2021). Industry-funded medical education is always promotion. *BMJ*, 373, n1273.

⁵⁰² Healy, M. (2007, August 6). *In short, marketing works*. Los Angeles Times.

<https://www.latimes.com/archives/la-xpm-2007-aug-06-he-effectiveness6-story.html>.

⁵⁰³ Jeanne Lenzer, “Centers for Disease Control and Prevention: protecting the private good?” *BMJ*, May 15, 2015.

⁵⁰⁴ CDC Foundation. (n.d.). Take Action. Retrieved May 15, 2025, from <https://www.cdcfoundation.org/take-action>.

⁵⁰⁵ Lenzer, J. (2015). Centers for Disease Control and Prevention: protecting the private good?. *bmj*, 350.

- Studies have found the majority of clinical guideline panelists in the US have financial ties to pharmaceutical or device companies.⁵⁰⁶
- The American Diabetes Association’s (ADA) type 2 diabetes guideline, with 94% of authors reporting conflicts, recommends aggressive glucose control through drugs; research indicates this may often worsen outcomes.⁵⁰⁷
- The ADA guideline also recommends treating “prediabetes” with drugs despite limited evidence of long-term benefits,⁵⁰⁸ consistent with marketing of “conditions” like pre-hypertension and pre-hyperlipidemia.
- The majority of the panelists who composed the DSM-5 were found to have conflicts of interest⁵⁰⁹ and their recommendations loosened criteria for ADHD and bipolar disorder, driving a 40-fold increase in diagnoses in children 1994-2003,⁵¹⁰ with a rise in prescriptions for antipsychotics and stimulants.⁵¹¹
- Pharmaceutical companies have settled with U.S. government, including for major settlements of \$430 million,⁵¹² \$2.2 billion,⁵¹³ and \$3 billion.⁵¹⁴

4. Influencing Media, Disincentivizing Public Criticism

The corporate capture of media, primarily through lavish advertising campaigns that are uniquely targeted to American consumers (no other developed country allows direct advertising of drugs to consumers, other than New Zealand where such advertising is heavily regulated and federally controlled)⁵¹⁵ confers a notable level of reliance on the industry by those that benefit financially. While in the U.S. the pharmaceutical industry has the First Amendment right to have these advertisements, studies suggest that they have a strong influence on those who view them, potentially increasing inappropriate prescriptions.

⁵⁰⁶ Neuman, J., Korenstein, D., Ross, J. S., & Keyhani, S. (2011). Prevalence of financial conflicts of interest among panel members producing clinical practice guidelines in Canada and United States: Cross-sectional study. *BMJ*, 343, d5621.

⁵⁰⁷ Hunt, L. M., Arndt, E. A., Bell, H. S., & Howard, H. A. (2021). Are Corporations Re-Defining Illness and Health? The Diabetes Epidemic, Goal Numbers, and Blockbuster Drugs. *Journal of Bioethical Inquiry*, 18(3), 477-497.

⁵⁰⁸ Lean, M. E. J., et al. (2023). Management of Type 2 Diabetes: ADA Standards of Medical Care in Diabetes. *Diabetes Care*, 46(Suppl 1), S1-S292.

⁵⁰⁹ Cosgrove, L., Bursztajn, H. J., Erlich, D. R., Wheeler, E. E., & Shaughnessy, A. F. (2014). Tripartite conflicts of interest and high stakes patent extensions in the DSM-5. *Psychotherapy and Psychosomatics*, 83(5), 272–278.

⁵¹⁰ <https://w.astro.berkeley.edu/~kalas/ethics/documents/ethics/Researchers%20Fail%20to%20Reveal%20Full%20Drug%20Pay%20-%20NYTimes.com.pdf>.

⁵¹¹ Frances, A. (2013). Saving Normal: An Insider’s Revolt Against Out-of-Control Psychiatric Diagnosis, DSM-5, Big Pharma, and the Medicalization of Ordinary Life. William Morrow.

⁵¹² U.S. Department of Justice. (2004). Warner-Lambert to Pay \$430 Million to Resolve Criminal & Civil Health Care Liability Relating to Off-Label Promotion. DOJ Press Release. Retrieved from justice.gov.

⁵¹³ U.S. Department of Justice. (2013, November 4). Johnson & Johnson to pay more than \$2.2 billion to resolve criminal and civil investigations [Press release]

<https://www.justice.gov/archives/opa/pr/johnson-johnson-pay-more-22-billion-resolve-criminal-and-civil-investigations>.

⁵¹⁴ Goodnough, A. (2012, July 2). Glaxo agrees to pay \$3 billion in fraud settlement. *The New York Times*.

<https://www.nytimes.com/2012/07/03/business/glaxosmithkline-agrees-to-pay-3-billion-in-fraud-settlement.html>.

⁵¹⁵ Toop, L., & Mangin, D. (2007). Industry funded patient information and the slippery slope to New Zealand. *BMJ*, 335(7622), 694–695.

In 2023, drug companies spent over \$5 billion on television advertisements.⁵¹⁶ While many more studies exist on drugs used by adults,^{517 518 519 520} two specific studies on children are broadly illustrative of the problem:

- Direct to Consumer (DTC) advertising for ADHD drugs in children were found to use vague symptom lists including typical childhood behaviors; the ads led parents to overestimate ADHD prevalence and to request ADHD drugs inappropriately.⁵²¹
- Similarly, DTC advertising for antidepressants in teenagers were found to employ vague symptom lists that overlap with typical adolescent behaviors; this was also associated with inappropriate parental requests for antidepressants.⁵²²

⁵¹⁶ Bulik, B. S. (2025, January 17). Can the Trump 2.0 administration cancel pharma marketers' \$5 billion TV ad spending? Marketing & Pharma.

<https://marketingandpharma.com/can-the-trump-2-0-administration-cancel-pharma-marketers-5-billion-tv-ad-spending/>.

⁵¹⁷ Layton, J. B., et al. (2017). Association between direct-to-consumer advertising and testosterone testing and initiation in the United States, 2009-2013. *JAMA*, 317(11), 1159-1166.

⁵¹⁸ Hollon, M. F. (2006). Direct-to-consumer advertising: A haphazard approach to health promotion. *The American Journal of Managed Care*, 12(4), 225-230.

⁵¹⁹ Woloshin, S., & Schwartz, L. M. (2008). Giving legs to restless legs: A case study of how the media helps make people sick. *The New England Journal of Medicine*, 358(8), 839-841.

⁵²⁰ Mintzes, B. (2005). Direct-to-consumer advertising of prescription drugs: implications for the patient-physician relationship. *The Lancet*, 366(9487), 789-791.

⁵²¹ Shah, M. B., et al. (2008). Direct-to-consumer advertising and the rise in ADHD medication use among children. *Pediatrics*, 122(5), e1055-e1060.

⁵²² Findling, R. L., et al. (2009). Direct-to-consumer advertising of psychotropic medications for youth: A growing concern. *Journal of Child and Adolescent Psychopharmacology*, 19(5), 487-492.

Next Steps – Supporting Gold-Standard Scientific Research and Developing a Comprehensive Strategy

To close critical research gaps and guide efforts to better combat childhood chronic disease in America, the following research initiatives are recommended:

1. **Addressing the Replication Crisis:** NIH should launch a coordinated initiative to confront the replication crisis, investing in reproducibility efforts to improve trust and reliability in basic science and interventions for childhood chronic disease.
2. **Post-Marketing Surveillance:** NIH and FDA should build systems for real-world safety monitoring of pediatric drugs and create programs to independently replicate findings from industry-funded studies.
3. **Real-World Data Platform:** Expand the NIH-CMS autism data initiative into a broader, secure system linking claims, EHRs, and environmental inputs to study childhood chronic diseases.
4. **AI-Powered Surveillance:** Create a task force to apply AI and machine learning to federal health and nutrition datasets for early detection of harmful exposures and childhood chronic disease trends.
5. **GRAS Oversight Reform:** Fund independent studies evaluating the health impact of self-affirmed GRAS food ingredients, prioritizing risks to children and informing transparent FDA rulemaking.
6. **Nutrition Trials:** NIH should fund long-term trials comparing whole-food, reduced-carb, and low-UPF diets in children to assess effects on obesity and insulin resistance.
7. **Large-scale Lifestyle Interventions:** Launch a coordinated national lifestyle-medicine initiative that embeds real-world randomized trials—covering integrated interventions in movement, diet, light exposure, and sleep timing—within existing cohorts and EHR networks.
8. **Drug Safety Research:** Support studies on long-term neurodevelopmental and metabolic outcomes of commonly prescribed pediatric drugs, emphasizing real-world settings and meaningful endpoints.
9. **Alternative Testing Models:** Invest in New Approach Methodologies (NAMs), such as organ-on-a-chip, microphysiological systems, and computational biology, to complement animal testing with more predictive human-relevant models.
10. **Precision Toxicology:** Launch a national initiative to map gene–environment interactions affecting childhood disease risk, especially for pollutants, endocrine disruptors, and pharmaceuticals.

Some of the steps to implement these research initiatives are already underway and others will begin this in the near future. In parallel, the MAHA Commission will immediately begin working on developing the strategy to make our children healthy again—due in August 2025. We invite all of America, especially the private sector and academia, to be part of the solution.