

#### Overview of Childhood Obesity

*United States.* Childhood obesity is of global concern due to its drastic impact on health, cognitive development, and psychosocial function. Traditionally, obesity incident rates positively correlate with advancing age throughout the lifetime (Majcher et al., 2021). For example, approximately 26% of 2 to 5-year-olds, 41.5% of 16 to 19-year-olds, and 73.6% of adults over the age of 19 are living with overweight and obesity in the United States (Fryar et al., 2020; Skinner et al., 2018). However, there have been recent spikes in the prevalence of obesity specifically among the age range of 2 to 5-year-olds (Skinner et al., 2018), indicating obesity may now be impacting children at earlier ages.

*Nevada.* During the years of 2014-2016 in the state of Nevada, 11.7% of 2 to 4-year-olds and 16% of youth ages 10-17 met criteria for obesity (Robert Wood Johnson Foundation, n.d.). Likewise, 32.4% of Nevada kindergartners in the 2019-2020 school year were overweight or obese, a 2.53% increase from the year prior (Nevada Institute for Children's Research and Policy, 2021). As the age of onset for obesity becomes younger, children are at a higher risk of long-term physical, cognitive, and socioeconomic difficulties. Furthermore, obesity in early childhood is highly predictive of long-term obesity, further warranting the need to increase efforts toward prevention and early intervention (Cunningham et al., 2017).

#### Risk Factors

Risk factors for childhood obesity are broken down into two primary categories, causes and contributors. Causes are intrinsic factors which are addressed at the individual level, whereas contributors are extrinsic and require systemic change within a population. Some causes for childhood obesity include lack of physical activity, increased sedentary time, sugar sweetened beverage consumption, and lack of breastfeeding within the first 6 months of life (Haboush-Deloye et al., 2021). Socioeconomic status has been shown to be a primary contributor to childhood obesity, both in utero and in the first 5 years of life (Hemmingsson, 2018). Additional contributors include structural racism, adverse childhood experiences (ACEs), and food insecurity (Mackey et al., 2022; Tester et al., 2020; Wiss & Brewerton, 2020).

The research above indicates addressing risk factors for obesity in early childhood are the best preventive method. Specifically, breastfeeding, nutrition, and physical activity in early childhood are key primary prevention efforts needing to be supported, especially in minority populations. Community engagement programs need to be equitable and person/family centered, following social justice and antiracism system frameworks.

#### Health and Economic Impact

Childhood obesity leads to a myriad of complications, impacting both health and economic wellbeing. Short-term complications include those such as emotional and behavioral disorders, asthma, systemic inflammation, liver complications, and musculoskeletal problems. On the other hand, long-term complications include cardiovascular disease, diabetes, some cancers, musculoskeletal disorders in adulthood leading to disability, and premature death (Di Cesare et al., 2019). Likewise, there is a drastic mental and emotional impact of obesity. Children with obesity report significantly lower quality of life when compared to healthy children and adolescents, and comparable quality of life ratings as children diagnosed with cancer (Schwimmer et al., 2003).

Over half of adults with obesity developed the disease during childhood (Ward et al., 2017), resulting in a multitude of long-term physical and financial costs. Lifetime direct medical costs of the long-term effects of childhood obesity have been estimated to be approximately \$19,000 per child, accumulating to over \$14 billion nationally (Finkelstein

et al., 2014). These numbers do not account for additional indirect costs, such as absenteeism, work productivity, disability, premature mortality, or insurance-related costs. Updated analyses from the Milken Institute estimated a cost of 5.57% gross domestic product (GDP) and \$0.976 trillion in combined economic and social costs to America in 2014, and spiking to 6.76% GDP and \$1.389 trillion in 2018 with forecasted estimates to continue to rapidly increase over the next several years (Lopez et al., 2020).

## Surveillance

Interventional programs and preventive efforts are difficult to implement if researchers and clinicians are unable to acquire population-level data on specific conditions. As such, the Centers for Disease Control and Prevention (CDC) mandates a list of diagnoses in which physicians and providers are required to report, including infectious diseases and chronic diagnoses such as cancer. However, diagnoses such as heart disease, metabolic syndrome, and obesity are much more difficult to quantify a specific diagnostic date due to the chronic, slowly progressive nature of these diseases. As such, a consistent, effective measurement for height and weight indicators would improve statewide surveillance, and subsequently improving the ability to track overweight and obesity rates in youth and adolescents.

The United States Preventive Services Task Force found age- and sex-adjusted body mass index (BMI) percentile is the accepted measurement to detect overweight and obesity in children and adolescents. Due to the high feasibility and low cost of this assessment in the clinical setting, the task force recommends primary care providers screen for obesity in all children and adolescents 6 years of age and older (US Preventive Services Task Force, 2017). There was insufficient research on children younger than 6 years of age, therefore hindering the recommendation from addressing younger ages. The CDC Growth Charts are based on the below criteria:

**Table 1.** BMI Percentiles in Children and Teens (Barlow, 2007)

Weight Status Category	Percentile Range
Underweight	Less than the 5 <sup>th</sup> percentile
Healthy Weight	5 <sup>th</sup> percentile to less than the 85 <sup>th</sup> percentile
Overweight	85 <sup>th</sup> to less than the 95 <sup>th</sup> percentile
Obesity	95 <sup>th</sup> percentile or greater

Despite the growing prevalence and burden of overweight and obesity, there continues to be a lack of height and weight surveillance data. Surveillance is an integral part of routine monitoring, program implementation, and evaluation strategies. The Centers for Disease Control and Prevention (CDC) recently performed a survey of statewide key informants to determine the number of states that meet surveillance criteria for childhood and adolescent BMI data. To be consistent with current public health surveillance definitions, the study required the following criteria in order for a state to meet standards (Blondin et al., 2016):

1. Height and weight must be measured and reported by a trained professional
2. Data are state representative for the age groups included in the survey or census
3. Data are collected at least every 2 years with plans to continue
4. Data are aggregated, analyzed, and reported at the state level

Current data collection processes in Nevada fail to meet this surveillance criteria. In total, 14 of the 50 states adequately met this criteria, with 13 of the 14 collecting data in school-based programs and 5 of those states additionally collecting electronic health record (EHR) based surveillance data through pilot programs (Blondin et al.,

2016). An additional 21 states, including Nevada, reported height and weight data collection. However, none of these state protocols met surveillance criteria, with a primary reason being a lack of statewide funding to maintain the program. The states which did collect BMI data utilized the height and weight surveillance system to detect disparities of demographic and socioeconomic status among individuals with overweight and obesity, suggesting a lack of statewide surveillance undermines the progress and efforts toward mitigating the childhood obesity epidemic.

**Current Data in Nevada**

As previously noted, the significant lack of surveillance data to track Nevada childhood obesity rates not only mitigates preventive efforts, but also hinders the ability of our state to effectively monitor interventional programs. The table below provides the current childhood obesity data in Nevada and the specific demographics collected in each survey for disaggregation purposes.

**Table 2.** Childhood Obesity Data in Nevada

Data Source	Frequency	Disaggregation categories					Household Income	Strengths	Limitations
		Race	Sex	Age	County				
Women, Infants, and Children Participant and Program Characteristics (WIC)	Biennial	✓		✓			✓	Assesses multiple outcomes	Not representative of the state
National Immunization Survey-Breastfeeding Indicators	Annual			✓				Nationally representative sample of breastfeeding behaviors	Limited to birth-1 year old, self-report
2017-2018 National Survey of Children's Health	Annual	✓	✓	✓					Limited to 6-11 years old
Kindergarten Health Survey	Annual	✓	✓			✓		Representative of the state	Specific to kindergarten; measures are self-reported
Youth Risk Behavior Surveillance System (YRBSS)	Biennial	✓		✓				Provides information on healthy behaviors	Limited to high school ages, self-report

Currently, Women, Infants, and Children Participant and Program Characteristics (WIC), the Youth Risk Behavior Surveillance System (YRBSS), and the Kindergarten Health Survey (KHS) are the only state-specific data collection systems in Nevada monitoring childhood weight status. However, WIC solely collects data on children aged 4 and younger among low-income families, YRBSS is limited to specific age ranges, and the KHS is a self-reported survey completed by parents of children entering kindergarten at Nevada public schools. Each of these data collection systems are limited due to their specificity of population samples. The remaining data collection systems are nationally-based, and unable to disaggregate lower than at the state level. This limits the ability of our state to effectively assess the at-risk populations and the impact of current and future statewide obesity prevention efforts.

## **Policy and Legislation**

The Nevada Revised Statute (NRS 392.420) subsection 2 requires the height and weight assessment of students by a school nurse or other qualified professional in school districts in counties with a population of at least 100,000 individuals. During the 81<sup>st</sup> Nevada Legislative Session in 2021, the grade levels were modified to include biennial assessment of 4<sup>th</sup> and 7<sup>th</sup> grades only. However, this is currently only inclusive of Clark and Washoe counties and there is currently a lack of standardized reporting methods among school districts. School districts with a population of less than 100,000 are encouraged to collect this data in addition to the required visual, auditory, and scoliosis assessments, although it is not mandated at this time.

## **Implications to Public Health**

Childhood obesity is a serious public health concern, affecting both the health and economic stability of our future generations. The estimated annual costs of childhood obesity far outweigh the current budgets for preventative programs and interventions, shedding light on a much-needed change. There is a strong link between an earlier age of onset and worsened long-term prognosis into adulthood (Cunningham et al., 2017), therefore indicating that the rates of adult obesity, and subsequently total expenditures, are forecasted to continue to rise. However, beyond implications to obesity prevalence alone, the mere presence of obesity causes elevations in systemic inflammation, insulin resistance and can lead to many chronic health conditions such as diabetes, heart disease and cancer within the pediatric population (Hales et al., 2017; Styne et al., 2017; Xu & Xue, 2016). Subsequently, there are 13 cancers that have been shown to have a high correlation to obesity and sedentary behaviors (Avgerinos et al., 2019; Friedenreich et al., 2021). The investment in statewide and local BMI surveillance is a necessary priority in Nevada in order to guide clinicians, public health professionals, and policymakers toward effective and cost-effective responses to the childhood obesity epidemic.

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