HEALTH, SAFETY, AND SCHOOL BENEFITS

SAFE ROUTES TO SCHOOL PROGRAM IMPLEMENTATION & STUDENT OUTCOMES

FEBRUARY 2021

NEW JERSEY Safe Routes

saferoutesnj.org

ACKNOWLEDGEMENTS

The New Jersey Safe Routes Program, supported by the New Jersey Department of Transportation, is a statewide initiative with a mission to partner with schools and communities to prioritize and implement opportunities for people to walk, bike, or travel by other wheeled devices. By focusing on improvements to support active travel by youth, we believe we can create conditions that are safe, healthy, equitable, and appealing for all. The New Jersey Safe Routes Resource Center assists public officials, transportation and health professionals, and the general public in creating safer and more accessible walking and bicycling environments for children in New Jersey through education, training, and research. This report was supported by the New Jersey Department of Transportation with funding from the United States Department of Transportation's Federal Highway Administration. New Jersey and the United States Government assume no liability for its contents or its use thereof.

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INTRODUCTION

The Safe Routes program's primary focus is to encourage students to use active transportation such as walking, bicycling or using other micromobility devices, such as scooters and skateboards, to travel to and from school. Since the program began in 2005, the Safe Routes program has successfully increased the number of children walking and bicycling to school. This paper reviews the direct and indirect benefits of Safe Routes program implementation for children and the community. Although efforts have been made to differentiate the benefits in various categories, they are often connected.

THE BENEFITS EXPLORED HERE CAN BE CLASSIFIED UNDER FOUR HEADINGS:

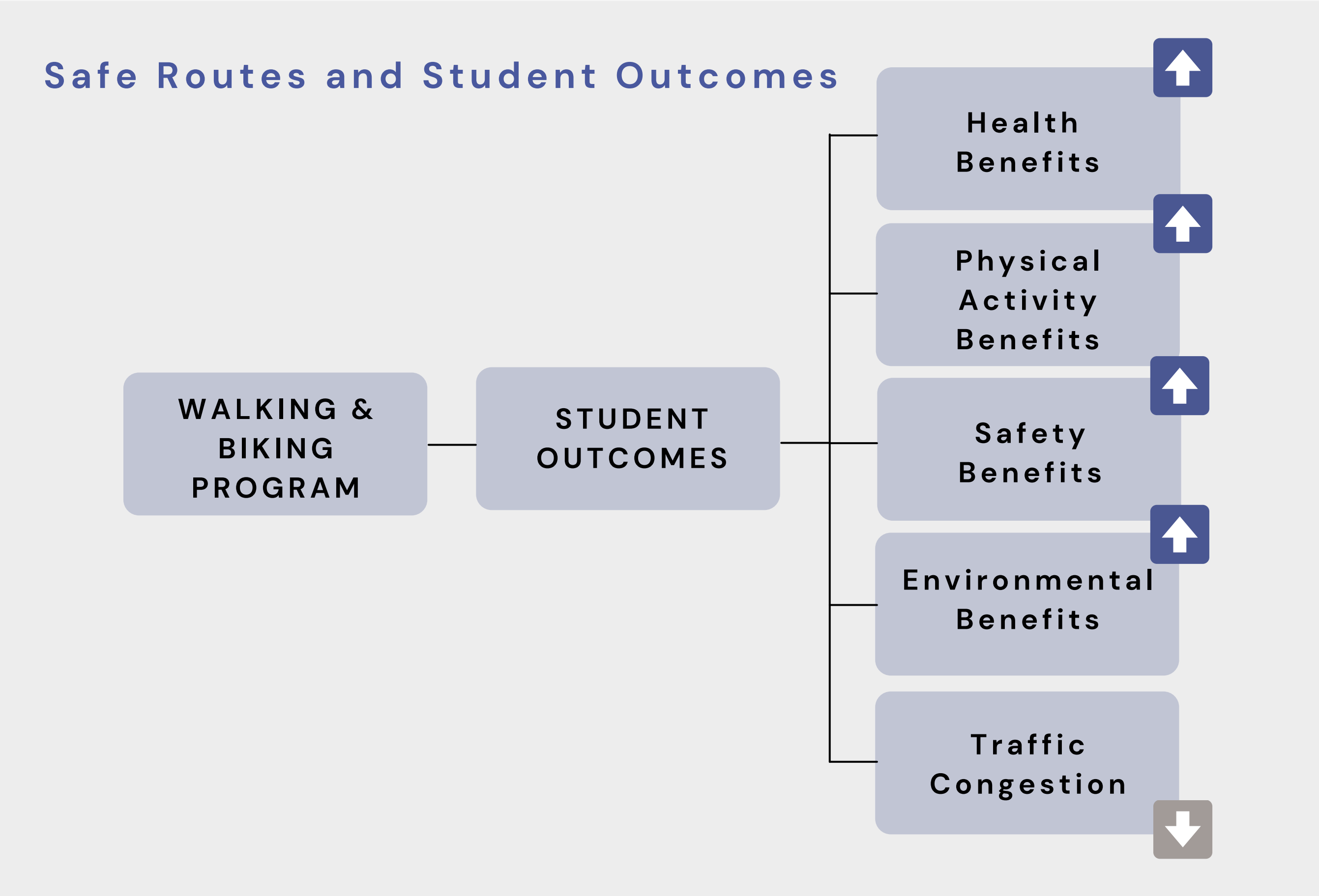
1. Youth Health Benefits
2. Academic Performance
3. Safety
4. Pollution & Traffic Congestion

1.YOUTH HEALTH BENEFITS

Safe Routes programs encourage active school transportation, which is positively associated with lower levels of obesity and is inversely related to body mass index (BMI). (Mendoza, Watson, Nguyen, Cerin, Baranowski, and Nicklas, 2011)

The national childhood obesity rate has leveled off after increasing steadily between the mid-1970s and 2000s, yet it remains alarmingly high. The obesity rate among children ages 6 to 11 has more than quadrupled in the last 40 years; the rate in children ages 2 to 5 and adolescents ages 12 to 19 have more than tripled. (Fryar, Carroll, and Ogden, 2016) Children who are overweight or obese are at a greater risk for high blood pressure, type 2 diabetes, and heart disease. Those who are overweight or obese during childhood are also likely to remain so into their adulthood. (Wang, Chyen, Lee, and Lowry, 2008)

BLACK & HISPANIC YOUTH TEND TO HAVE SIGNIFICANTLY HIGHER OBESITY RATES THAN WHITE YOUTH.



In 2015-16, nationally, the obesity rate among non-Hispanic black (22.0%) and Hispanic (25.8%) youth were higher than among non-Hispanic whites (14.1%) and non-Hispanic Asian (11.0%) youth. (Hales, Carroll, Fryar, and Ogden, 2017) The prevalence of obesity has economic implications; childhood obesity is estimated to cost $14 billion every year, and adult obesity could cost between $147 billion and $210 billion annually. (Robert Wood Johnson Foundation, 2016)

Although obesity rates have been declining in New Jersey over the past decade, obesity continues to be a concern. In 2017-18, New Jersey's obesity rate for children ages 10-17 was 15 percent. In 2016, the obesity rate for children ages 2 to 4 in households enrolled in the WIC program was also 15 percent. (Robert Wood Johnson Foundation, 2019)

ACTIVE COMMUTING TO SCHOOL IS ONE INTERVENTION THAT CAN COMBAT CHILDHOOD OBESITY.

The relationship of adiposity, which includes body mass index z-score (BMIz), obesity, percentage body fat, waist circumference, and active school transportation, was studied in 12 countries among populations ranging from low- to high-income and different levels of physical activity, nutrition, and available transportation. (Sarmiento, Lemoine, Gonzalez, Broyles, Denstel, and Larouche, 2015)

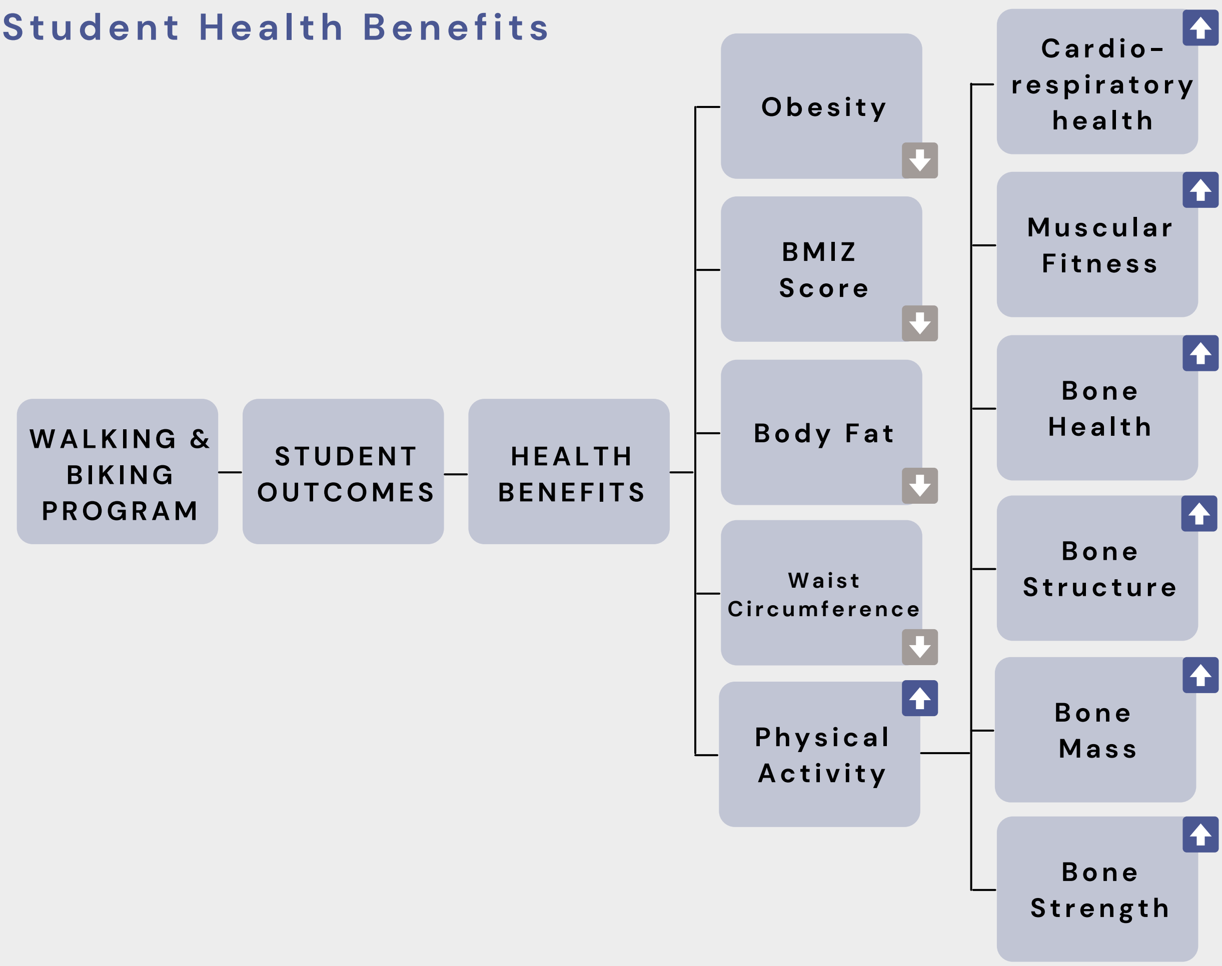
CHILDREN WHO USED ACTIVE SCHOOL TRANSPORTATION WERE LESS LIKELY TO BE OBESE, HAD LOWER BMIZ, LOWER PERCENTAGE BODY FAT, AND SMALLER WAIST CIRCUMFERENCE THAN THOSE WHO USED PASSIVE TRANSPORTATION.

Children who usually bicycled to school had both a lower BMIz and a lower waist circumference. In these studies, the relationship of active commuting to school with lower levels of obesity held across countries, socioeconomic groups, sex, race, and ethnicity. (Sarmiento et al, 2015)

There is strong evidence that, in children and adolescents, higher levels of physical activity are associated with favorable outcomes of health indicators like cardiorespiratory and muscular fitness, weight status, bone health, bone structure, bone mass, bone strength, and adiposity. (US Department of Health and Human Services, 2018) Physical activity is positively associated with cardiometabolic health, suggested by moderate evidence.

These findings are supportive of the assertion that, in promoting active school transport, the Safe Routes program contributes to improved health among students.

Student Health Benefits



2. ACADEMIC PERFOMANCE

Physical activity, including walking and bicycling to and from school, improves student academic performance. Forty-six percent of U.S. children ages 6 to 11 fail to meet the recommendation of fewer than 2 hours of recreational sedentarism (screen time) per day in addition to the nonrecreational sedentarism that can occur when children sit to perform schoolwork, go to and from school, and engage in recess, lunch, and after-school programs. (Fakhouri, Hughes, Brody, Kit, and Ogden, 2013, and Kohl and Cook, 2013) A strong correlation between increased physical activity and improvement in children's grades, test scores, and cognitive abilities was found in a literature review of over 150 studies and a meta-analysis of 59 studies.

A study of 20,000 students walking to school concluded that students who walk to school spend more time exercising than their counterparts who do not walk to school. They were found to be more attentive and performed better on tasks requiring concentration. Notably, these effects lasted up to four hours after they arrived at school. (Goodyear, 2013)

PHYSICAL ACTIVITY, AS WELL AS PHYSICAL FITNESS, MAY BE RELATED TO COGNITIVE OUTCOMES DURING DEVELOPMENT

Many promising results link physical education, academic achievement, and the role that schools can play in facilitating the connection. Increases in the number of physical education classes in a week, recess breaks, active breaks in the classroom, and participation in extracurricular sports or other physical activities have been shown to influence academic performance. A meta-analysis found a positive relationship between physical activity and cognition in school-age youth (ages 4 to 18), suggesting that physical activity, as well as physical fitness, may be related to cognitive outcomes during development. (Sibley and Etnier, 2003)

Positive relationships were observed for perceptual skills, I.Q., verbal tests, mathematics tests, memory, and developmental level/academic readiness. (Sibley and Etnier, 2003) An increase in physical education from two days per week to every day was positively correlated with academic achievement (meaning math, reading, and writing test scores). The likelihood of passing both mathematics and English achievement tests increased with the number of fitness tests passed during physical education class, and the odds of passing the mathematics achievement tests were inversely related to a student's weight status (underweight, healthy weight, at-risk overweight, and overweight). (Chomitz, Slining, McGowan, Mitchell, Dawson, and Hacker, 2009)

CHILDREN WERE LESS JITTERY AND LETHARGIC WHILE BEING MORE FOCUSED AND ENGAGED IN CLASSROOM ACTIVITIES WHEN THEY HAD AN ACTIVE BREAK THAN WHEN THEY DID NOT HAVE A BREAK.

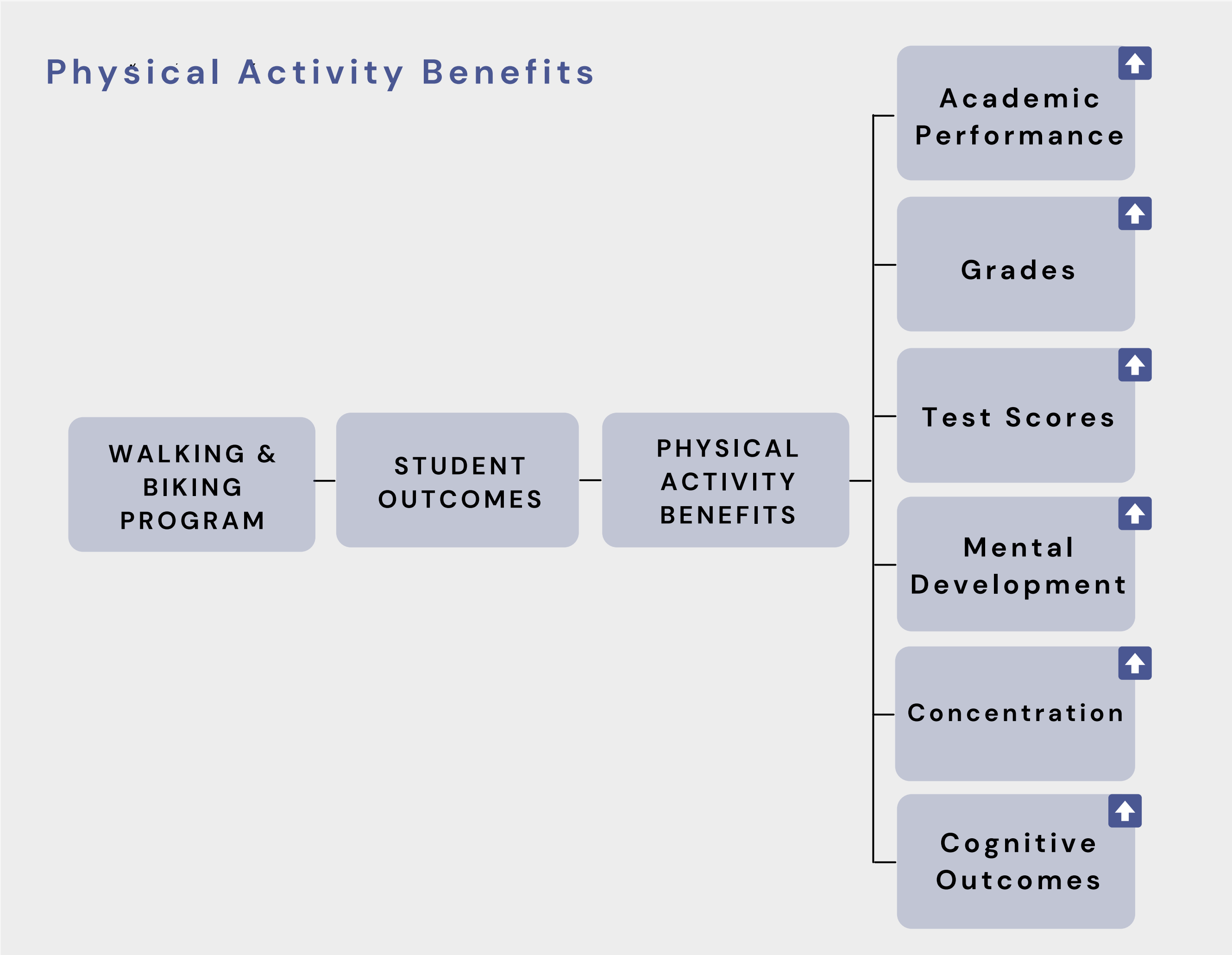
Studies on break time also highlight positive relationships between physical activity and academic performance. Fourth-grade students who participated in directed physical activity during recess had significantly higher concentration scores than those who spent time at the library. (Caterino and Polak, 1999) Children were less jittery and lethargic while being more focused and engaged in classroom activities when they had an active break than when they did not have a break. (Jarrett, Maxwell, Dickerson, Hoge, Davies, and Yetley, 1998) The overall classroom behavior, based on the teacher's ratings, were significantly better for students who had a break every day for at least 15 minutes than for those who did not. (Barros, Silver, and Stein, 2009)

Second-grade students showed greater concentration and higher math achievement after engaging in brief movement breaks consisting of five minutes of vigorous exercise one hour after lunch. (Maeda and Randall, 2003) A higher frequency of behavior consistent with class rules was observed when teachers led them in daily ten-minute regimens of physical activities (such as jumping, rolling, hopping, twisting). (Mahar, Murphy, Rowe, Golden, Shields, and Raedeke, 2006)

A study on the impacts of the Texas I-CAN! program found that the curriculum-based activities improved time on the task immediately following the breaks, especially in children who were overweight, from being on task 58 percent of the time on typical instruction days to 93 percent of the time after the breaks. (Greico, Jowers, and Bartholomew, 2009)

Participation in interscholastic sports was associated with higher math grades, higher math standardized test scores, and higher overall GPAs. (Stephens and Schaben, 2002) A positive correlation was found between sports participation and school completion rates, (Fredricks and Eccles, 2006) as well as between participation in after-school activities and sports and homework completion and class attendance. (Harrison and Narayan, 2003)

These studies highlight the integral role that schools play in facilitating physical activity to improve academic outcomes. Safe Routes initiatives can help provide that physical activity, making it a worthwhile consideration for schools hoping to boost academic achievement, cognitive development, and promote healthy lifestyles for their students. Successful active transport interventions can address policy and infrastructure barriers to children's physical activity beyond the school day. (Stephens and Schaben, 2002)



3. SAFETY

Safety is a primary focus of the Safe Routes program. Federal funding for Safe Routes programs supports infrastructure projects that improve a community's walkability, such as the construction of sidewalks, crosswalks, and walkways. These improvements encourage community residents to walk to nearby destinations whenever possible.

The Safe Routes program's successful implementation has increased the number of students who prefer walking to school. The results of a large-scale study, spread across four United States regions, indicated that engineering improvements were associated with an 18 percent increase in walking and biking to school. (McDonald, Steiner, Lee, Roulac-Smith, Zhu and Yang, 2014) A study of data from 53 schools in four states showed that walking and biking increased overall from 12.8 percent to 19.8 percent after completing Safe Routes projects. (Stewart, Moudon, Claybrook, 2014)

As more students walked and biked to school, the need for improved safety infrastructure increased along the Safe Routes corridor. These engineering improvements, implemented as part of the Safe Routes program, increase students' walking and biking and improve safety.

Improvements like sidewalks, crosswalks, and walkways make active transport to school safer, instill confidence in parents in allowing their children to walk to school, and encourage more students to walk to school.

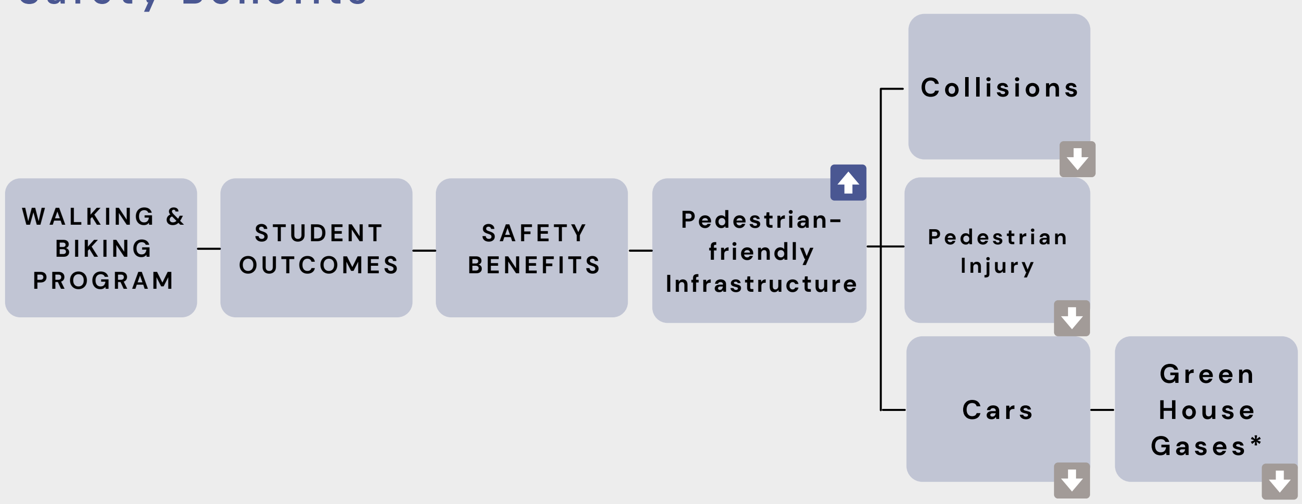
USING SIDEWALKS REDUCES THE CHANCE OF A PEDESTRIAN BEING STRUCK BY A VEHICLE BY UP TO

50%

A comparison of students living equidistant from school showed the effects of successful implementation of the Safe Routes program. Students who lived near developed Safe Routes infrastructure projects were more likely to walk to school than students who lived equally close to school but with no infrastructure improvements. (Stewart et al, 2014)

While Safe Routes programs have improved students' walking rates, they have also made neighborhoods safer and improved the environment. As more students walk and bike to school, there has been reduced car usage to drop students off. In New York City, in areas where Safe Routes projects were implemented and improvements were made for increased walkability, the pedestrian injury rate for children and young adults between the ages of 5 and 19 decreased by 44 percent. (Muennig, Epstain, Li, DiMaggio, 2014) In California, when researchers analyzed the effect of Safe Routes infrastructure at 47 schools, the results indicated that the number of collisions within 250 feet of Safe Routes projects was significantly lower than before infrastructure improvements. (Ragland, Pande, Bigham, and Cooper, 2014) The number of injured children declined by 22 percent over a period of eight years after the implementation of the Safe Routes improvements. (Orenstein, Gutierrez, Rice, Cooper, and Ragland, 2007) When an increase in walking and bicycling due to Safe Routes projects and increased exposure to risk are factored in, the Safe Routes program showed a decreased rate of injuries and a net benefit in safety for affected students.49 Cost-benefit comparisons performed by Caltrans showed the cost per collision reduction ranging between $40,397 and $282,779. (Orenstein et al, 2007) Engineering improvements like sidewalks, exclusive pedestrian signal phasing, single-lane roundabouts, pedestrian refuge islands, and increased intensity of roadway lighting yield the most significant increases in pedestrian safety. (Retting, Ferguson, and McCartt, 2003) The modifications of the built environment can substantially reduce the risk of pedestrian-vehicle crashes. (Orenstein et al, 2007)

Safety Benefits



4. POLLUTION AND TRAFFIC CONGESTION IN SCHOOL ZONES

When parents drive children to school, they cite convenience as a primary reason. (McDonald and Aalborg, 2009) However, numerous parents driving children to school results in pollution and traffic congestion in the school zone.

Pollution

Buses and cars are the principal sources of pollutants in the school environment. Children spend almost half a day at school, and the school environment should promote their health and well-being. Traffic pollution, idling vehicles, and school buses expose children to a multitude of harmful particles like fine and ultra-fine particles as well as gases such as nitrogen oxides, carbon monoxide, and ozone. (McAuley and Pedroso, 2012) These gases remain in the nearby atmosphere after the vehicles are gone, which affects the indoor and outdoor air quality near a school. (Wert, 2013) An idling car burns half a gallon of gasoline per hour and emits twenty pounds of carbon dioxide. (California Assembly Concurrent Resolution No. 160, 2016) When idling for one minute, a vehicle releases more carbon monoxide than smoke from three packs of cigarettes. On a given day, more than 85 percent of cars coming to drop off or pick up students idle for more than 8 minutes outside school. (Kelly, 2016)

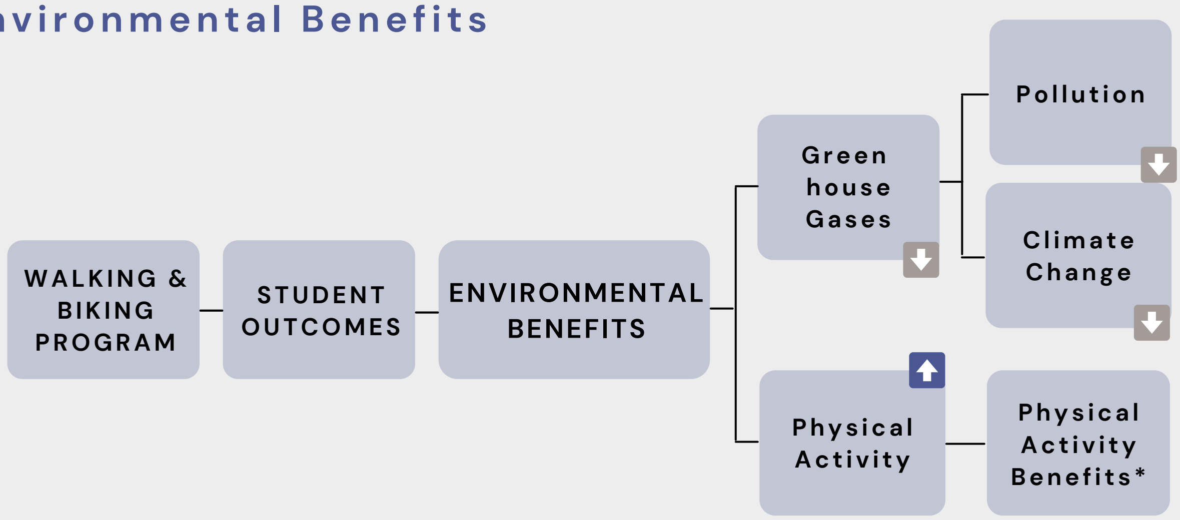
School buses use diesel fuel instead of gasoline. Exhaust from diesel engines is more harmful than gasoline and is designated as carcinogenic. Particulate matter is present at a significant level. Exhaust from idling pollutes the air in and around vehicles and enters school buildings through air intakes, doors, and open windows. (United States Environmental Protection Agency, 2020)

SCHOOL CHILDREN WHO ARE EXPOSED TO AIR POLLUTION HAVE LOWER SCHOOL PERFORMANCE WHEN COMPARED TO SCHOOL CHILDREN WHO WERE EXPOSED TO LESS POLLUTION

Recent studies on the effect of indoor air quality on students' health show that an increase in a child's exposure to carbon monoxide, particulate matter, and ozone is directly associated with a significant increase in a child's respiratory treatment. (Beatty and Shimshack, 2014) Pollution spread through motor vehicles' idling exposes the children to excess exhaust and smoke, which can stunt lung growth and contribute to many lung disorders, including asthma, (Kelly, 2016) among other adverse health effects. (Beatty and Shimshack, 2014; Kweon, Mohai, Lee, and Sametshaw, 2016; California Assembly Concurrent Resolution No. 160, 2016)

There have been numerous studies on the effect of air quality on children in the last two decades. These studies have found that school children who are exposed to air pollution have lower school performance when compared to school children who were exposed to less pollution. (Kweon et al, 2016)

Environmental Benefits



Traffic Congestion

Traffic congestion can be a source of traffic collisions, child pedestrian injuries, and deaths. (McDonald et al, 2014) Child pedestrian injuries due to traffic are more likely to occur in settings with on-street parking and high traffic volumes, where children can emerge unexpectedly from behind parked cars. (Rivas, Viana, Moreno, Amato, Reche, 2014) Apart from affecting parent drivers and other commuters, school traffic congestion can cause problems for students, school staff, and community residents in and around schools. (Vigne, 2007)

Parents driving their children to school can account for 20 to 30 percent of traffic volume on the road during peak morning travel time traffic. (Snyder, 2012) According to a national pedestrian safety review, pedestrian crashes peak in the afternoon. About one-third of pedestrian crashes occur during weekday rush-hours. (Kimley Horn, 2017) Heavy traffic volume can increase crashes in the school zone due to vehicles blocking drivers' view of small children. (Snyder, 2012)

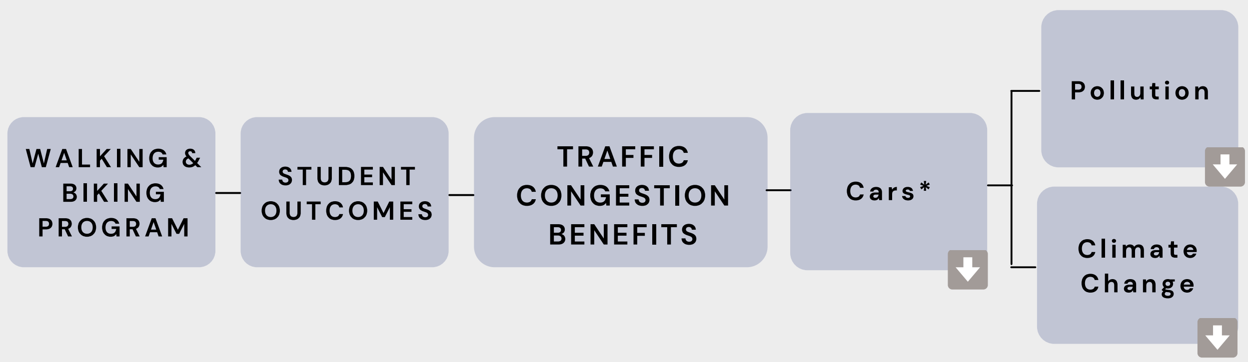
THE MOST COMMON RISKY CHILD PEDESTRIAN BEHAVIORS WERE CROSSING AT UNCONTROLLED MIDBLOCK LOCATIONS AND CROSSING BETWEEN PARKED CARS.

TRAFFIC CONGESTION AROUND SCHOOLS WAS ASSOCIATED WITH DOUBLE PARKING, REVERSING, AND CROSSING BETWEEN PARKED CARS

Risky drop-off behaviors by private vehicles are frequently observed around schools, which may contribute to collision risk. (Rothman, Buliung, Howard, Macarthur, and Macpherson, 2017) A study identified the riskiest driver behaviors as dropping off children on the opposite side of the road from the school and reversing dangerously. (Rothman et al, 2017)

The Safe Routes program offers strategies to decrease traffic in the school zone through school zone design changes. Non-infrastructure programs, such as walking school buses and walk and bike to school days, reduce the need for vehicles, thereby decreasing the number of vehicles in use in the school zone. (La Vigne, 2007) With the improvement of pedestrian and bicycle routes to schools as an integral part of an overall infrastructure plan, a municipality can reduce traffic congestion and lessen air pollution. (Pennsylvania State Department of Transportation, 2021) As vehicle use in the school zone declines, students' exposure to harmful pollutants and other hazardous conditions decreases, creating a safer environment for children.

Figure 6



CASE STUDY EXAMPLES

The information in the reading provides examples of the direct and indirect benefits of the Safe Routes program. Successful implementation of the Safe Routes program shows definite and long-lasting effects. A study was conducted in four different areas of the United States to understand the changes following Safe Routes program implementation. (Pedroso, 2008) The following provides examples of program impacts:

I. Columbia, Missouri

- 10 elementary schools have participated since the 2007-08 school year.
- More children walk independently to school and less traffic congestion outside schools during drop-off and pick-up times as reported by parents.
- 80 percent of 350 walking bus registrations walked every day, 224 estimated automobile miles per day were avoided.
- This reduces 40,320 miles each school year, producing 20 fewer tons of greenhouse gases and pollutants.

II. Las Cruces, New Mexico

- Hill Rise Elementary School conducted surveys after the implementation of the SRTS program.
- Surveys documented a 7.3 percentage point reduction in school trips made by a family car from 85.4 percent to 78.1 percent, equivalent to 38 fewer cars.
- This reduces 5,130 miles driven on trips to schools, equating to approximately 2.3 tons of fewer greenhouse gases and pollutants.

III. Longmont, Colorado

- The three participating schools had substantial participatory numbers as soon as the program started.
- Out of 16,000 enrolled students, the students coming to school via car dropped from 55 percent to 42 percent equaling 4,250 fewer car trips per day.
- This amounts to 2.6 million fewer vehicle miles over a school year.
- The annual reduction is 1,190 tons of carbon dioxide emission and 72 tons of other pollutants, including carbon monoxide, nitrous oxide, and hydrocarbons.

IV. Windsor, Vermont

- In one school year, the percentage of children walking to and from school each day increased from 14 percent to 33 percent of all students.
- Drop-offs from family cars decreased by ten percentage points, leading to a reduction of 8,280 miles per school year, amounting to 4.5 tons of reduction of greenhouse gases and other pollutants.

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