

The White Paper for Children's Health

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Table of Contents

TABLE OF CONTENTS	I
LIST OF FIGURES	II
LIST OF TABLES	III
1. INTRODUCTION.....	1
1.1. FOREWORD	1
1.2. CHILDREN’S HEALTH ISSUES AROUND THE GLOBE	3
1.3. CHILDREN’S HEALTH ISSUES IN TAIWAN	5
1.4. ESTABLISHMENT OF IMPORTANT ISSUES IN THIS WHITE PAPER	10
2. THE IMPACT ON AIR QUALITY IN A LIVING ENVIRONMENT OF CHILDREN’S HEALTH	12
2.1 LITERATURE REVIEW ON THE IMPACT ON AIR QUALITY IN A LIVING ENVIRONMENT OF CHILDREN’S HEALTH	14
2.2 STUDY REGARDING THE RELEVANCE BETWEEN AIR QUALITY IN A LIVING ENVIRONMENT AND ASTHMA.....	18
2.3. SUMMARY	25
3. THE IMPACT OF DIET ON CHILDREN’S HEALTH	26
3.1. LITERATURE REVIEW ON THE IMPACT OF DIET ON CHILDREN’S HEALTH.....	28
3.2. STUDY REGARDING THE RELEVANCE BETWEEN DIET AND CHILD DISEASES.....	31
4. THE IMPACT OF ELECTRONIC PRODUCT-USE HABITS ON CHILDREN’S HEALTH	35
4.1. LITERATURE REVIEW ON THE IMPACT OF ELECTRONIC PRODUCT-USE HABITS ON CHILDREN’S HEALTH	37
4.2. ANALYSIS ON CHILDREN’S DISEASES CAUSED BY ELECTRONIC PRODUCT-USE HABITS.....	40
4.3. SUMMARY	43
5. CONCLUSION.....	45

List of Figures

FIGURE 1 : BIRTH RATE AND DEATH RATE PREDICTION	1
FIGURE 2 : 2018 CHILDREN AND NATIONAL HEALTH SERVICE SEEKING RATE	5
FIGURE 3 : NUMBER OF CHILDREN SEEKING MEDICAL SERVICES FOR ASTHMA IN INDIVIDUAL SEASONS AND THE TIME TREND IN 2010–2015	19
FIGURE 4 : OUTPATIENT NUMBER OF CHILDREN WITH FIRST ASTHMA ATTACK VS. AIR QUALITY MONITORING DATA	20
FIGURE 5 : OUTPATIENT NUMBER OF CHILDREN WITH FIRST ASTHMA ATTACK VS. AIR QUALITY MONITORING DATA – NORTHERN TAIWAN	21
FIGURE 6 : OUTPATIENT NUMBER OF CHILDREN WITH FIRST ASTHMA ATTACK VS. AIR QUALITY MONITORING DATA – SOUTHERN TAIWAN.....	21
FIGURE 7 : OUTPATIENT NUMBER OF CHILDREN WITH FIRST ASTHMA ATTACK VS. AIR QUALITY MONITORING DATA – CENTRAL TAIWAN.....	22
FIGURE 8 : OUTPATIENT NUMBER OF CHILDREN WITH FIRST ASTHMA ATTACK VS. AIR QUALITY MONITORING DATA – EASTERN TAIWAN	22
FIGURE 9 : ANALYSIS FOR THE RELEVANCE BETWEEN OUTPATIENT NUMBER OF CHILDREN WITH FIRST ASTHMA ATTACK AND AIR QUALITY MONITORING DATA	23
FIGURE 10 : ANALYSIS FOR THE RELEVANCE BETWEEN OUTPATIENT NUMBER OF CHILDREN WITH FIRST ASTHMA ATTACK AND AIR QUALITY MONITORING DATA	24
FIGURE 11 : 2011–2015 OUTPATIENT NUMBER OF CHILDREN AND TEENAGERS WITH HYPERTENSION.....	32
FIGURE 12 : 2011–2015 OUTPATIENT NUMBER OF CHILDREN AND TEENAGERS WITH DIABETES	32
FIGURE 13 : 2011–2015 OUTPATIENT NUMBER OF CHILDREN AND TEENAGERS WITH DISORDERS OF LIPOID METABOLISM	33
FIGURE 14 : 2011–2015 OUTPATIENT NUMBER OF CHILDREN AND TEENAGERS WITH OBESITY AND OTHER OVERNUTRITION	33
FIGURE 15 : 2011–2015 DISTRIBUTION OF OUTPATIENTS WITH NEARSIGHTEDNESS	42

List of Tables

TABLE 1 : SECOND-HAND SMOKING EXPOSURE RATE FOR CHILDREN BORN IN TAIWAN.....	6
TABLE 2 : PREVALENCE RATE FOR FIRST-GRADERS WITH NEARSIGHTEDNESS.....	7
TABLE 3 : PREVALENCE RATE FOR SIXTH-GRADERS WITH NEARSIGHTEDNESS	7
TABLE 4 : 2011–2015 DISTRIBUTION OF PATIENTS WITH THEIR FIRST ASTHMA ATTACK	18
TABLE 5 : OUTPATIENT NUMBER DISTRIBUTION FOR CHILDREN WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER.....	40
TABLE 6 : OUTPATIENT NUMBER DISTRIBUTION FOR CHILDREN WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER.....	41

1. Introduction

1.1. Foreword

The health in one's childhood will directly affect his or her health in adulthood. Moreover, it will affect the competitiveness of a country in the future. UNICEF (United Nations Children's Fund) emphasizes that the simplest way to assess the level of a country is to assess whether that country cares about children's health. According to the population prediction from 2020 to 2070 by National Development Council, the number of births in 2019 was 178,000 people and the number of deaths was 176,000 with a net increase of 1,000 people (see Figure 1). The crude birth rate curve and the crude death rate curve will intersect by 2020. After 2020, the crude death rate will become higher than the crude birth rate. The net change in population will become a natural decrease. In the age of a low birth rate, children become even more precious.

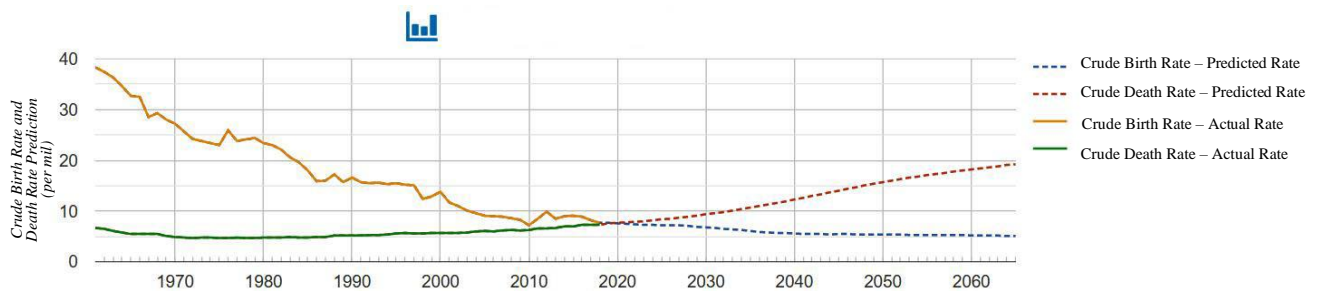


Figure1 : Birth Rate and Death Rate Prediction

(Source: National Development Council "Population Prediction of the Republic of China (2020 to 2070)," August 2020)

Children's health is an important foundation for the future development and competitiveness of a country. Under the severe problem of a low birth rate, the issue of children's health becomes even more important. This White Paper reviews domestic and international research regarding children's health conditions and finds that we are facing some important children's health issues around the globe. For example, poor air quality will influence a child's health; poor diet will lead to the risk of disease when the children are growing up in the future. What's more, there's concern for children overly using electronic products. As a result, the government in Taiwan has been focusing on children's health issues. To create a friendly environment for children to grow up in, the Executive Yuan approved the "Corresponding Project for the Low Birth Rate" in 2018 and now continues to modify the strategy of the Project. In the Project, the government focuses on children's health rights and protection. The latest 2021 Policy Guideline¹ published by the Executive Yuan also mentions

¹ National Development Council- The 2011 National Development plan
https://www.ndc.gov.tw/Content_List.aspx?n=BCD0AD83BC2FC94C

that the government will carry out the UN Convention on the Rights of the Child and that policies for children will become the main policy focus in the health and welfare field. Other policies of the government include promoting a food safety and nutrition program, focusing on children's eyesight health, cooperating with the Environmental Protection Administration to promote health knowledge and launch a printed literature version using Chinese phonetic alphabets. What's more, the Executive Yuan complies with TFDA laws to restrict advertising content after 9 o'clock in the evening, launched teacher-parent manuals for ADHD kids on campus, as well as established a children's medical care network to improve the quality of emergency children's health care. In addition, public health and social welfare services are connected to improve the children's health index. From the above strategies, we can see that the government deeply emphasizes children's health promotion and people's rights for seeking medical advice in the country.

As the pioneer for children's health protection and initiative, PCA Life Taiwan (hereinafter referred to as "PCALT") has been working with the Taiwan Fund for Children and Families for over 20 years since 2000. PCALT has fundraised an amount of over NTD150 million and helped over 27,000 children stay away from violence. Children are the foundation of society and the hope of our future. PCALT is the first insurance company in Taiwan involving in child related issues and has been continuously involved in related initiatives. This year, PCALT invites the government, the industry and the academic professionals to support and acquire opinions from the Research Center of Big Data, Taipei Medical University and a professional physician team to complete the first "White Paper of Children's Health" proposed by an insurance company in Taiwan.

In this White Paper, we generally discuss current children's health issues both domestically and internationally. For important child issues, we perform analysis with historical data as well as domestic/international literature in recent years. Additionally, we invite scholars, experts and physicians to be our consultants to discuss the meaning behind the data from professional perspective. PCALT not only responds to the government policy, but also works actively to encourage society to pay more attention to children's living status. We hope that through our initiative, we can improve children's health ultimately. In the future, PCALT will continue to exert our social influence as an advocate to wake society so that it can focus on and care more about children's health and protection issues.

1.2. Children’s health Issues around the Globe

According to the World Health Organization (hereinafter referred to as WHO) and research reports in crucial medical journals, common health problems that children under 12 (elementary school-age children) are facing globally can be classified into 5 categories as follows:

I. Childhood Obesity

On February 19, 2020, the WHO, United Nations Children’s Fund (UNICEF) and The Lancet performed a “Global Children Welfare Investigation.” The results of the Investigation show that the number of obese children in the world has now been 11 times more than the number in 1975. The World Obesity Federation also points out that obesity prevention will become a challenge in the global public health field. The childhood obesity problem is becoming a real issue for countries around the world. The problem will cause great damage to the health, education and living quality of a country.

II. Respiratory Problems in Children

According to a study released in 2019 on Lancet Planetary Health, an English medical journal, there were 4 million children suffering from asthma due to transport air pollution every year in the world. That number equaled to 11,000 new cases a day, and Taiwan was in the top 4 list in the world (420 children in every 100,000 children suffer from asthma). The WHO proposed a “More than 90% of the world’s children breathe toxic air every day” report in 2018 stating that the outdoor environment and the domestic air pollution were significantly harmful to children’s health in the world. In addition, air pollution would affect the development of the nervous system and cognitive ability. What’s worse, air pollution might also lead to respiratory problems, such as asthma and acute bronchitis. Children that are exposed to highly polluted air will have a higher risk of suffering from cardiovascular disease and other chronic diseases. Moreover, children are easily affected by air pollution since they breathe faster than adults and their living space are closer to the ground. As pollutants in the air tend to concentrate on the space that is closer to the ground, children will contact pollutants in the air more easily than adults do.

III. Vision Problems of Children

According to a statistical report of the WHO in 2009, over 120 million children in the world have vision problems. Among these problems, ametropia was the main vision problem for children (World Health Organization, 2009). Asia has the most nearsighted population around the globe. The National Health Commission of the People’s Republic of China released a National Nearsighted Teenagers and Children Investigation in 2018. The results of the Investigation showed

that the overall nearsightedness rate for children and teenagers was 53.6%. In elementary school, the rate of 15.7% for first graders became 59% when they became sixth graders. The reasons that the number of nearsighted children increase include children not having enough outdoor activity time and spending too much time on electronic devices without correct distance and angle. These causes lead to eye fatigue.

IV. Children with Chronic Conditions

Chronic conditions among children have become one of the public health issues that the world focuses on widely. Recently, our way of living has changed drastically. The rate of children with chronic conditions is rising rapidly. Common chronic conditions include asthma, hyperlipidemia and diabetes. Especially for obese children with higher BMI and wider waistline, their risk of having metabolic syndrome is 10 to 20 times more than children with normal body weight. For children with 90th percentile of BMI in Taiwan, 29.3% of boys and 28.4% of girls have metabolic syndrome. Most of them have diabetes. When compared with children at the same age, more than half of the children with type 2 diabetes also suffer from obesity. Obesity also causes a higher cholesterol level and blood pressure.

V. Internet Addiction Disorder

Recently, gaming disorder has become a public health issue that the world focuses on. At the end of 2017, the WHO officially listed “Gaming Disorder” as a mental disorder. The criteria of having the disorder are playing games continuously every day and spending more than 12 hours on the Internet to an extent that one’s daily routine is affected. If the above symptoms last for more than 12 months, problems regarding the individual, family, society, his/her schoolwork and job will easily show.

From the five main children’s health issues we can learn that the WHO has been focusing on children’s health from different perspectives in recent years. Moreover, we can find that the WHO gradually transforms from a disease-oriented organization to become an organization that promotes and builds a healthy lifestyle. The main goal is to build a healthy environment for children in order to establish a great foundation for their healthy lifestyle in the future.

1.3. Children’s health Issues in Taiwan

According to the latest statistical data of the Ministry of Health and Welfare (MOHW) in 2020, the medical expenses of children (under the age of 12) in Taiwan are increasing every year. In 2018, children spent 40.7 billion health assurance points². The number was 5.8% higher than the number in 2017 and 0.2% higher than the number in 2016. If we observe from the number of children seeking³ for medical services, there were 2.368 million children on outpatient visit in 2018. The number was 1.0% lower than the number in 2016. The outpatient visit prevalence in 2018 was 98,000 children for every 100,000 children, 124 children higher than 2017 and 117 children higher than 2016, respectively. Compared with the outpatient visit prevalence for the general population (95,000 people for every 100,000 people), the number was 2,847 people higher.

If we observe what diseases cause children to seek medical services, “respiratory diseases” (mainly acute upper/lower respiratory tract infection and flu) was the top one of the first 10 diseases in 2018.. It is obvious that school-age children are easily affected by the flu virus and tend to have cross infection as they gather around to study. Compared with the national health service seeking rate⁴, the rate for children seeking medical services for “respiratory diseases” and “diseases of eye and adnexa” is higher than that of the national population. (see Figure 2).

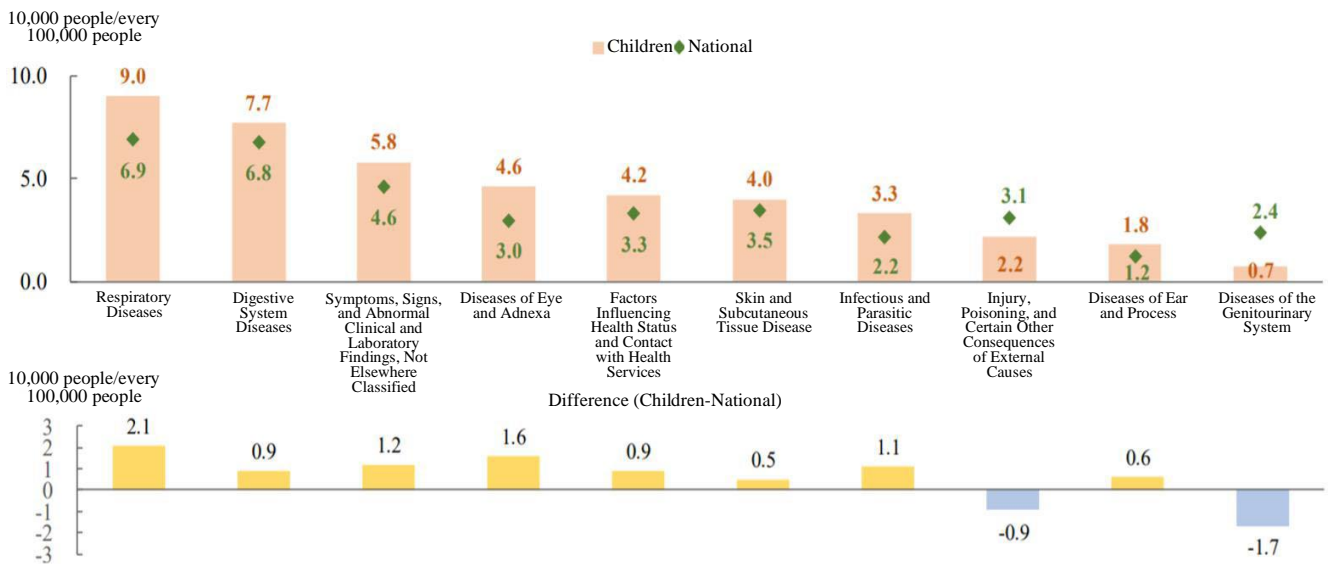


Figure 2 : 2018 Children and National Health Service Seeking rate – Based on Categories of Children’s Main Diseases

² Points for the health insurance fee are the units that hospitals and the National Health Insurance Administration use to calculate medical expenses. 1 point equals approximately NTD0.8–0.9.

³ The statistical rate of visitations based on patients discharged (including outpatient, residential, emergency, etc.) divided by the middle-aged population and multiplied by 100,000.

⁴ National Health Insurance Health Service Seeking Rate in Out-Patient Departments for Every 100,000 People (Patient Number in Out-Patient Departments/Mid-year Population* 100,000)

“Respiratory diseases” include acute upper respiratory tract infection and flu, pneumonia, other acute lower respiratory tract infections, chronic diseases of tonsils and adenoids, chronic obstructive pulmonary disease, bronchiectasis and asthma. The main reasons that cause respiratory diseases include flu virus infections, living environment, diet and air pollution. In the cohort study performed on infants born domestically by the MOHW, the MOHW continues to perform follow-up on these children from the age of 18 months to 12 years old. It found that more than 50%⁵ of these child samples are exposed to second-hand smoking in their households and other indoor/outdoor environments (see Table 1). The MOHW also states that more than half of these children lived in a poor living environment within the week before the interview.

Table 1 : Second-hand Smoking Exposure Rate for Children Born in Taiwan(Unit: %)

	Effective Sample Size	By Sex		
		Both	Male	Female
2006 (Prevalence of exposure to secondhand smoke for 18-month-old Children)	19,994	55.3	55.3	55.3
2008 (Prevalence of exposure to secondhand smoke for 3-year-old Children)	19,746	58.9	59.7	58.1
2010 (Prevalence of exposure to secondhand smoke everywhere except for pre-school and babysitter’s house at age 5)	19,646	54.3	55.2	53.4
2013–2014 (Prevalence of exposure to secondhand smoke everywhere except for school and after-school class at age 8)	19,452	52.6	52.5	52.8
2017–2018 (Prevalence of exposure to secondhand smoke everywhere at age 12)	18,810	54.7	54.9	54.5z

Source: Health Promotion Administration, Ministry of Health and Welfare, 2018 Statistical Yearbook of Health Promotion

In the category of children “Diseases of Eye and Adnexa,” nearsightedness takes up the highest percentage. According to the Eyesight Investigation for Children and Teenagers, the prevalence rate for first graders with nearsightedness was 19.8%⁶ and the prevalence rate for sixth graders with nearsightedness was 70.6% in 2017 (see Tables 2 and 3). The percentage of nearsightedness

5 The number of interviewees who answered that “in the past week, there were people smoking in front of me in public spaces”/effective sample size*100%

6 The calculation of the prevalence rate in a study is to divide the number of people with certain diseases by the total number of people in the study. The prevalence rate will be presented in a percentage or fraction. Or it might be presented in the number of people with the disease in every 10,000 or every 100,000 people.

risers rapidly with the increase in children’s age. The reason for the increase of nearsightedness prevalence rate is mainly because of environmental factors and poor writing/reading habits. For example, the lack of activity space, the increasing use of phones and iPads and the distance with a book or a phone/iPad being too short.

Table 2 : Prevalence Rate for First-graders with Nearsightedness (Unit: %)

	Effective Sample Size	By sex		
		Both	Male	Female
2010	1,011	17.9	18.1	17.6
2017	425	19.8	20.2	19.5

Source: 2010 “A Survey of Myopia and Other Refraction Issues in 6–18 Year-Old Students in Taiwan”; 2017 “Eyesight Monitoring and Investigation Project for Children and Teenagers”

Table 3 : Prevalence Rate for Sixth-graders with Nearsightedness (Unit: %)

	Effective Sample Size	By sex		
		Both	Male	Female
2010	1,132	62.0	62.3	61.8
2017	493	70.6	66.7	75.3

Source: 2010 “A Survey of Myopia and Other Refraction Issues in 6–18 Year-Old Students in Taiwan”; 2017 “Eyesight Monitoring and Investigation Project for Children and Teenagers”

Other than the above diseases of children, child obesity and Internet Addiction Disorder are the two main children’s health issues that people pay attention to the most. National Health Research Institutes has released a “2030 Suggestions for Child Medical and Health Strategy.” In the Suggestions, it is pointed out that according to the student physical-examination data performed by the Ministry of Education in 2016, the prevalence rate of elementary school students being overweight and obese was 28.1%. The risk factors include skipping breakfast, eating out and drinking lots of sugared beverages. Meanwhile, National Health Research Institutes performed a study targeting 8,110 students at the age of 10–18 who had played online games in the previous year from 169 schools. The Institutes used the international diagnostic criteria to perform an investigation and found 3.1% of the students were already addicted to the Internet. This incident is worthy of the attention of the government, including health and education units.

We have literature in Chapter II and this Section (Children's health Issues around the Globe/in Taiwan) sorted, and we find that children's health issues are usually related to "live environment," "diets" and "electronic product-use habit." The findings are summarized as follows:

I. Change in the living environment

Our living environment is changing rapidly. Air pollution has become one of the environmental health and hazard issues that individual fields focus a lot on. What's worse, particulate matters (PM₁₀) and fine particulate matters (PM_{2.5}) have been proven by the International Agency for Research on Cancer to be a group 1 carcinogen to humans. They will elevate the chance for children to suffer from cancer. The main reason why Taiwan has so many children with allergies is because of the exhaust emissions brought about by burning petrol and coal which pollutes the outdoor environment and make it worse. In addition, if there are people smoking in a child's household, the child will be faced with the hazard of second-hand smoke and third-hand smoke. All these factors elevate the chance for children to have allergy or even asthma. Meanwhile, air pollution also results in negatively influencing the development of a child's neurobehavioral outcome such as autism spectrum disorder and attention deficit hyperactivity disorder (ADHD).

II. Change in the diet

Since the 1960's, with the economic growth, we are having more western food and becoming used to a western lifestyle. As a result, obesity has become a common modern plague in modern society. The busy industrialized and business society make parents busy at work. In the past, most people cooked at home and focused more on having a balanced and healthy diet. In contrast, modern people mostly eat out. Moreover, influenced by western culture, the processed meals in restaurants have more seasonings added to present a better appearance and flavor. Unknowingly, people eat more salty, oily and sweet food. Therefore, the burden on their body is getting heavier and heavier. Less parent-child interaction and the limit of living space in urban areas nowadays lead us to perform more stationary activities. For example, watching TV and gaming has become our main leisure activities. People nowadays perform fewer physical activities and have a less healthy diet. Additionally, people don't cook at home and instead eat out. These factors are closely related to childhood obesity and worse nearsightedness. According to the analysis in the "Child and

Adolescent Behaviors in Long-term Evolution from 2001 to 2009⁷,” the percentage of staying up late, having sweets, playing on the computer or gaming continuously increased with time during the elementary school stage. The change in family structure, lifestyle and diet brings about significant influence on children’s health.

III. Change in the electronic product-use habit

The prosperous development of the Internet and electronic media brings us convenience in life. However, the side effect of excessive use of electronic products is something we should not ignore. Even adults cannot prevent themselves from getting addicted to electronic products, not to mention children who are mentally and intellectually immature. The addiction may cause physical problems, including headache, dizziness, fatigue and insomnia. Moreover, the addiction may affect children’s interpersonal communication and mental development. To learn more about the status of the latest digital application and its change for individuals using cell phones, the National Development Council performed an investigation in July 2019. The investigation results showed that more phone users under the age of 20 thought that they had Internet or phone addiction problems. The percentage increased from 29.3% in 2018 to 54.0% in 2019. If teenagers do not have proper electronic product-use habit in their childhood, they are more likely to have trouble restricting themselves from using the Internet. Moreover, the problem is getting more serious and has become a social problem that we are forced to pay attention to.

⁷ The Child and Adolescent Behaviors in Long-term Evolution (CABLE) Project is a long-term follow-up project performed by the National Health Research Institutes since 2001.

1.4. Establishment of Important Issues in this White Paper

With analyses of the National Health Insurance Administration database and the outpatient children statistics in the country, this White Paper references literature and studies in Taiwan and abroad. In addition, scholars, experts, physicians and consultants were invited to discuss and analyze the meaning behind the statistics to explore key influences on children's health development. Three main issues in the White Paper were established as follows:

I. Explore the impact of air quality in the living environment on children's health and EXPECT children can grow up in a healthy and safe environment.

Diet and lifestyle could be improved by making better choices, but we cannot decide what we breathe in. This suggests the importance of air quality of the environment. We hope that through study and discussion, we can learn more about the impact on the living environment on children's health. Moreover, we can analyze the environmental risk that may influence children's health. We are hoping that this White Paper can raise people's consciousness and gather their attention so that we can work on constructing a healthy environment for children to grow up in.

II. Explore the impact on diet of children's health to lower the risk of children suffering from diseases.

From traditional agricultural society to a wealthy modern society, obesity takes place from poor nutrition. The type of diseases humans had used to be contagious diseases, accidental injuries and other acute diseases. However, people nowadays mostly have cardiovascular diseases and chronic diseases resulting from over nutrition. In the past, people often thought that "childhood obesity does not lead to real obesity problems." What people didn't know is that habits cultivated in childhood can significantly affect the lifestyle and health in his/her adulthood. Luckily, we can correct children's poor diet and lifestyle through education and intervention by parents and teachers. We hope that society can learn about the potential risks of childhood obesity and metabolic syndrome through our exploration on these issues. As a result, the health of citizens can be improved.

III. Explore the impact on electronic product-use habits of children's health and promote correct habits and health information.

It is inevitable that we will have to use electronic products in our modern life. However, with an active aim to foster children's physical and mental health, we should reduce children's addiction to electronic products and the Internet through precautionary measures to minimize the impacts and hazards. The government, school and parents play important roles on this issue.

With respect to the three main issues, we will be performing further discussion about the following Chapter. We will propose important influential factors of children's health and remind the public that prevention is better than cure. What's more, we will urge all fields in society to pay attention to children's health issues.

2. The Impact on Air Quality in A Living Environment of Children's Health

Taiwan is at the cross point of Northeast Asia and Southeast Asia. The air quality of our living environment is not only influenced by domestic pollutants but by the seasonal pollutants or pollutants spread from neighboring countries occasionally. Object that cause air pollution include ozone, particulate matters, sulfur dioxide, nitrogen dioxide, carbon monoxide and lead. The above pollutants might come from different sources. Some of them are generated in the natural environment and some of them are generated by humans. Volcanic ash generated during volcanic eruption is the pollutant generated in the natural environment. Carbon monoxide emissions released from vehicles and sulfur dioxide released from factories are pollutants generated due to human activities.

The fine particulate matters that we often hear about $PM_{2.5}$ are small particulate matters suspended in the air. These particulate matters are able to penetrate deep into the alveolar sacs and flow around our body of blood circulation. They will cause us to feel unwell or even cause diseases. The standard daily average value $PM_{2.5}$ recognized by the Environmental Protection Administration is 35 ($35\mu g/m^3$) and in excess of this, you will be exposed to danger. According to the standard of the WHO, the $PM_{2.5}$ annual average is required to be less than $10\mu g/m^3$. Otherwise, particulate matters will present a significantly negative impact on the health of the human body. As a result, the Environmental Protection Administration actively promotes the amendment of the Air Pollution Control Act to establish more concrete behaviors. Compared the changes in the Air Quality Monitoring Report in the recent 10 years according to the 2018 Air Quality Monitoring Report released by the Environmental Protection Administration, we found that the monitoring data onto the recent 10 years show that the annual average concentration of particulate matters (PM_{10} , fine particulate matters $PM_{2.5}$), sulfur dioxide (SO_2), nitrogen dioxide (NO_2) and carbon monoxide (CO) is dropping but the annual average concentration of ozone (O_3) is climbing. The results tell us that the problem is improved after the government effectively controlled various sources of pollution emissions and that the public is becoming more aware of environmental protection issues.

How exactly will air pollution affect children? In the "Air Pollution and Children's health: Prescribing Clean Air" proposed by the WHO on October 30, 2018, the impact on outdoor/household air pollution of children's health was assessed. The report showed that 93% of the children under the age of 15 (1.8 billion children) were exposed to air pollution in an environment where the criteria exceeded the limits. Children are more likely to be affected by air pollution since their living space is closer to the ground. As pollutants in the air tend to concentrate

in the space that is closer to the ground (such as the location of a vehicle exhaust pipe), children will contact pollutants in the air more easily than adults do. What's more, children breathe faster than adults do. As a result, they will absorb more pollutants. For a family that frequently uses polluting fuels on lighting, heating and cooking, a newborn or child is easily affected by household air pollution. This section will elaborate more on the impact on domestic air quality of children's health.

2.1 Literature Review on the Impact on Air Quality in A Living Environment of Children's Health

The Child Welfare League Foundation targeted 3 areas in Northern, Central and Southern Taiwan and chose 2 elementary schools that were located on arterial roads or that were near a large pollution source in respective areas to perform the "Investigation on Parents' Knowledge on Air Pollution and Impact on Children" from October to December in 2017. The Investigation results showed that nearly 90% of the parents thought air pollution problems were getting more and more serious. What's more, 87.0% of the parents once asked their children to not participate in outdoor activities that often due to the poor air quality. Professor Kuo Yu-Liang from the National Institute of Environmental Health Sciences, National Health Research Institutes and his research team performed investigations on children from the ages of 6–15 in 2011, 2016 and 2017. They observed the average short-term effect of air pollution in 7 days. The results showed that even with a short exposure time, if children were exposed to high concentrations of $PM_{2.5}$ and the ozone, their vital capacity were still affected. According to a study in The New England Journal of Medicine in 2015, $PM_{2.5}$ air pollution would reduce the pulmonary index score, trigger asthma and chronic tracheitis. What's worse, it could increase the admission rate and mortality rates of respiratory diseases. In the following section, we will elaborate more on the literature with respect to diseases that might affect children's health.

I. Dermatitis

When a child is constantly exposed to a living environment that has poor air quality, such as an environment with high concentrations of $PM_{2.5}$, the organ that directly contacts the air, which is the skin, will inevitably be affected. Therefore, their skin conditions will become worse especially for children with atopic dermatitis or related skin diseases, it is more likely for them to have red, swollen and itchy skin eruption due to stimulation. As a result, they might scratch their skin too hard.

J. Invest. (2008)⁸ performed a long-term follow-up investigation on 3,061 newborns and found that newborns that lived in a household that was within 50 meters from the main road had higher percentage chance of developing hay fever, eczema and asthma. In addition, exposure to nitrogen dioxide was proven to be strongly related to the development of eczema. Environ. (2010)⁹ targeted 6,683 children at the age of 9 to 11 to perform an investigation. The air

8 Traffic-related air pollution, climate, and prevalence of eczema in Taiwanese school children. J. Invest. Dermatol., 128:2412–2420, 2008

9 Air pollution exposure during critical time periods in gestation and alterations in cord blood lymphocyte distribution: a cohort of livebirths. Environ. Health., 9:46, 2010.

pollution concentration in the neighborhood where these children lived in was recorded for 3 years. The following conclusion was acquired: If a child lived in a neighborhood with a higher average air pollution (PM₁₀, nitrogen oxides and carbon monoxide) concentration, the percentage acquiring eczema was clearly higher. In addition to outdoor air pollution, we are required to pay attention to the generation of air pollution in indoor environments. The biological source of indoor air pollution includes air and particulates. Pets produce dander and human beings produce dander and have loose hairs that fall. Dust mites that live in our bed, on our rug and furniture will produce enzymes and feces. They release formaldehyde that cause the wall to mold and generate mycotoxin and spores. What's more, the air conditioning system may also cause legionella pneumonia and generate fungus. Without proper ventilation, the air pollution will accumulate and lead to a pollution level higher than in an outdoor environment. Allergy (2012)¹⁰ targeted 380 children who were under the age of 7 and had atopic dermatitis to perform an investigation. It was found that children whose household had an indoor renovation within 5 years had more serious atopic dermatitis syndromes.

Additionally, the volume of air pollution is related to the degeneration of skin conditions. Int. Arch. (2011)¹¹ targeted 41 children who were between the ages of 8 to 12 and had atopic dermatitis to perform an investigation. The results showed that if the concentration of PM_{0.1} in air was higher, the itchiness caused by atopic dermatitis would be worse. The two had a linear positive correlational relationship. J. Allergy Clin. (2013)¹² targeted 22 children who were between the ages of 3 to 7 and had atopic dermatitis to perform an investigation. It was found that when the concentration of PM₁₀、PM_{2.5}, toluene and volatile organic compounds in the air was high, these children would have skin conditions.

With the above study results, we can acquire the conclusion that outdoor air pollution will trigger the development of eczema, asthma and atopic dermatitis and that indoor air pollution, such as the air pollution caused by interior decoration, will also increase the chance for the development of eczema. The other finding is that if the concentration of air pollution is higher, the eczema symptoms will be more serious.

10 Surveillance of home environment in children with atopic dermatitis: a questionnaire survey. Asian Pac. Allergy., 2:59–66, 2012.

11 Effects of prenatal and perinatal exposure to fine air pollutants and maternal fish consumption on the occurrence of infantile eczema. Int. Arch. Allergy Immunol., 155:275–281, 2011.

12 Symptoms of atopic dermatitis are influenced by outdoor air pollution. J. Allergy Clin. Immunol., 132:495–498, 2013.13 Hui-Ying Chung; Hui-Ying Chung; Chun-Chieh Tseng; Lih-Ming Yiin, Associations between outdoor air pollutants and first occurrence of asthma in pre-school children, Taiwan Journal of Public Health, Volume 35, Issue 2 (2016/04/01), P199-208

II. Children with Respiratory Allergies

Respiratory allergies are a common disease for children in Taiwan. Some children with more severe allergies will have symptoms of asthma and chest tightness. What's more, asthma among children causes quite a burden. According to a statistical record of the MOHW in 2018, nearly 280,000 children and teenagers under the age of 14 sought medical services for asthma. Among these children, 80% of the children were under 9. Asthma attacks often occur in one's childhood. About half of the children with asthma have their first asthma attack before they turn 2, and about 80% of the children with asthma have their first asthma attack when they are between 5 to 6. A recent study shows that other than the genetic factor, certain dangerous factors will trigger an asthma attack or aggravate the conditions. The incidence rate of asthma for preschool children in Taiwan is related to pollution emitted from transportation¹³. The high humidity and ozone concentration in the summer as well as the dry weather in the winter will lead to a higher number of asthma patients with inpatient admission¹⁴.

Several different studies have pointed out that second-hand smoking is related to asthma conditions and the increase of medical requirements and death rate from complications. *Ann Allergy Asthma Immunol* (2015)¹⁵ studied 25 research papers related to asthma and found that if children with asthma were surrounded by second-hand smoking, the chance of them having an acute attack and being hospitalized was twice as likely. What's worse, their pulmonary functions would drop.

Chang-Ching Wei (2018)¹⁶ found in her study that air pollution might lead to asthma conditions. Moreover, the increased pollutants and suspended particulate matters in the air might cause allergic conjunctivitis and bring about retinal inflammation, which might lead to worse nearsightedness. Allergic conjunctivitis usually occurs when the season is changing. The symptoms include red and itchy eyes and worse palpebral eczema. Especially when the concentration of PM_{2.5} is high, there will be more patients seeking for health services in eye clinics. Most patients feel that their eyes are dry, and their eyes overly react to indoor lighting. Some patients can barely open their eyes. The stimulation of allergic conjunctivitis will cause

13 Hui-Ying Chung; Hui-Ying Chung; Chun-Chieh Tseng; Lih-Ming Yiin, Associations between outdoor air pollutants and first occurrence of asthma in pre-school children, *Taiwan Journal of Public Health*, Volume 35, Issue 2 (2016/04/01), P199-208

14 The short-term association between asthma hospitalizations, ambient temperature, other meteorological factors and air pollutants in Hong Kong a time-series study, Lam HC, Li AM, Chan EY, *Thorax*,71:1097-1109,2016.

15 Effects of secondhand smoke exposure on asthma morbidity and health care utilization in children: a systematic review and meta-analysis, *Ann Allergy Asthma Immunol*, Nov;115(5):396-401,2015.

16 Wei , Chang-Ching 、 Yung-Jen Kung 、 Chin-Sheng Chen 、 Ching-Yao Chang 、 Chao-Jen Lin 、 Peng-Tai Tien 、 Hsing-Yi Chang 、 Hsuan-Ju Chen 、 Yong-San Huang 、 Lin, Hui-Ju 、 Wan, Lei , Allergic Conjunctivitis-induced Retinal Inflammation Promotes Myopia Progression *EBioMedicine* · 2018 Feb · 28():274-286 The unit of each index is as follows: PM2.5(μg/m3), PM10(μg/m3), NO2(ppb), O3(ppb), SO2(ppb), CO (ppm), Outpatient (number of patients)

children's eye focus to continuously adjust. After some time, it will lead to refractive error and pseudo myopia.

To summarize the above studies, we can conclude that the possible cause of respiratory allergies is pollution, allergens in the household or workspace and second-hand smoking. Allergic conjunctivitis may also result in worse nearsightedness.

III. Impact on children's learning abilities and decline in memory.

PLOS One performed an investigation on elementary school students in Barcelona, Spain to find out more about the relevance between the pollution emitted from transportation and the damages to children's cognitive development in 2015. This study showed that in the area where air pollution was bad, children's cognitive development was slower. In the area where air pollution was more serious, the concentration level of children would drop by 19.2% ($p < 0.001$). Their memory skills to learn and study a language would also drop by an average of 3.4%. This large-scale study performed repetitive and objective measurements. It showed that children in the area where air pollution was more serious had worse cognitive abilities.

2.2 Study Regarding the Relevance Between Air Quality in A Living Environment and Asthma

Asthma is the most common chronic respiratory disease for children in Taiwan. To study the relevance between air quality and asthma, the Research Center of Big Data, Taipei Medical University, used statistical data of asthma diseases and air quality index in Taiwan as the basis to perform an analysis. Data used included the number of child patients (under 12) with history of asthma in 2011–2015 and air pollution index from 77 air quality monitoring stations.

The results of the study showed that from 2011 to 2015, about 557,000 children sought medical services for their first asthma attack. Among these children, 56.4% of them were boys and 43.6% of them were girls (see Table 4). More than 80% of the children have their first asthma attack at preschool age. The occurrence rate of boys is higher than that of girls. Asthma attacks often disturb the daily routine of children. Parents will also feel stressful when taking care of their children.

Table 4 : 2011–2015 Distribution of Patients with Their First Asthma Attack

		Number of Patients	Percentage
Total Number of Patients		557,722	100%
Gender	Female	243,228	43.6%
	Male	314,494	56.4%
Age Group	0–6	463,919	83.2%
	7–12	93,803	16.8%
Area	Central Area	110,295	19.8%
	Eastern Area	17,735	3.2%
	Northern Area	317,087	56.9%
	Southern Area	112,605	20.2%

We draw a run chart (see Figure 3) based on the time that patients first sought medical services and the number of patients in 2011–2015. We find that peaks for children to seek medical services for asthma will be reached when the season is changing and when it's winter and spring (Q4 and Q1 in the next year).

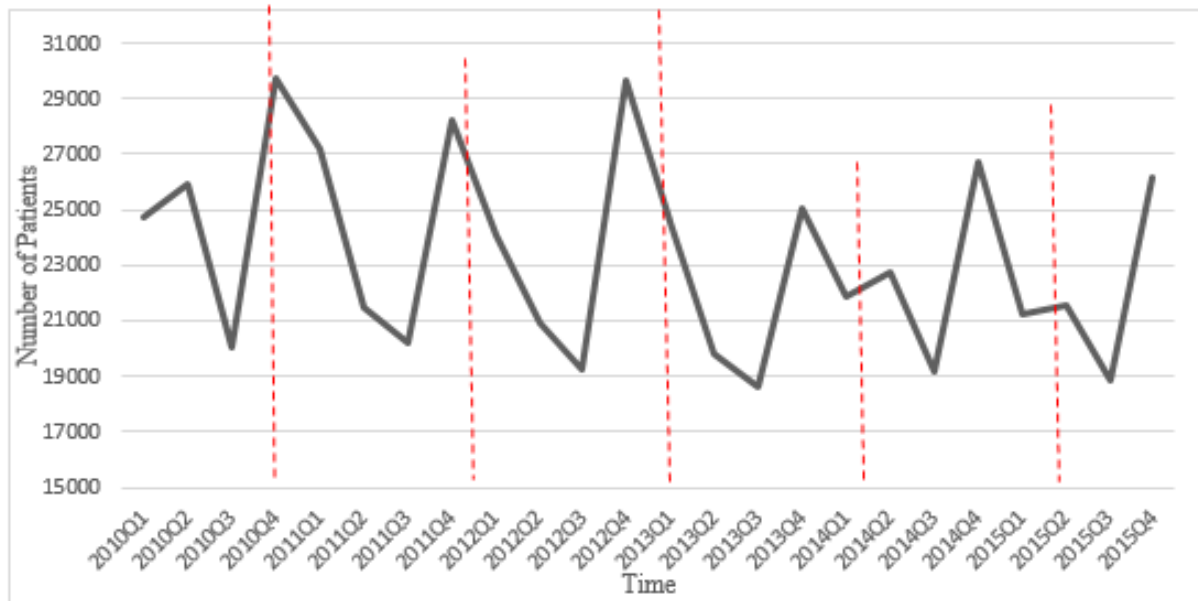


Figure 3 : Number of Children Seeking Medical Services for Asthma in Individual Seasons and the Time Trend in 2010–2015

If we observe the rise and decline of the number of patients seeking medical services and the 6 indexes (PM_{10} particulate matters, $PM_{2.5}$ fine particulate matters, NO_2 nitrogen dioxide, O_3 ozone, carbon monoxide and SO_2 sulfur dioxide) in the air quality monitoring data, we will find that the rise and decline of the number of children first seeking medical services is consistent with the air quality monitoring index (see Figure 4). That is, in January, March to April and October to December, children are more likely to have asthma attacks. Air quality is poor during the seasonal changes between spring to summer and fall to winter.

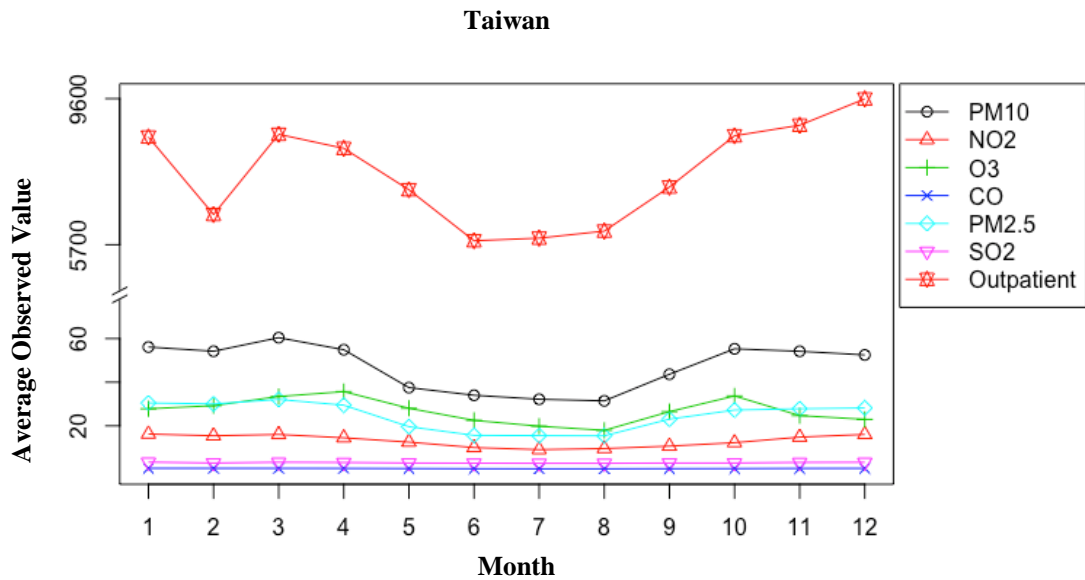


Figure 4 : Outpatient Number of Children with First Asthma Attack vs. Air Quality Monitoring Data¹⁷

We then divide the country into 4 areas, Northern, Central, Southern and Eastern Areas, for the observation (see Figure 5~8). We find that the air pollution index value in Southern Taiwan is the highest. According to the air pollution index in 6 municipalities in 2017, Tainan City and Kaohsiung City had the most areas with $AQI^{18} > 100$. Moreover, the concentration of $PM_{2.5}$ in the Central and Southern areas was higher than the concentration of it in the Northern area.

¹⁷ The unit of each index is as follows: $PM_{2.5}$ ($\mu g/m^3$), PM_{10} ($\mu g/m^3$), NO_2 (ppb), O_3 (ppb), SO_2 (ppb), CO (ppm), Outpatient (number of patients)
¹⁸ AQI is the definition for air quality index. When $AQI > 100$, human health may be influenced.

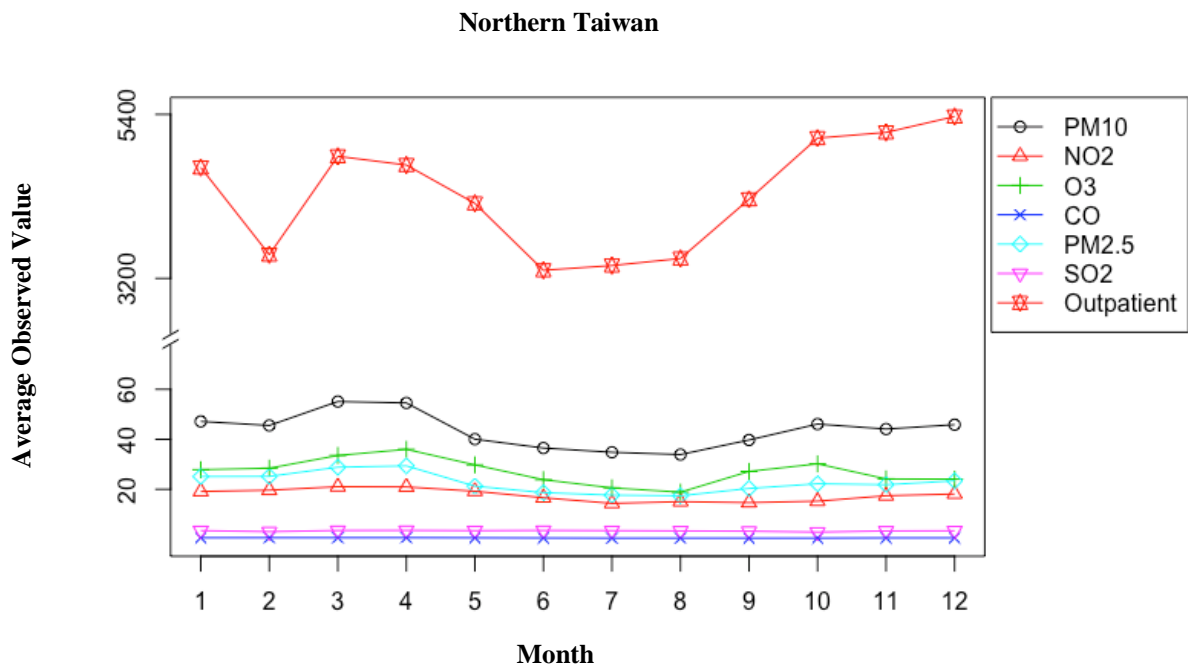


Figure 5 : Outpatient Number of Children with First Asthma Attack vs. Air Quality Monitoring Data – Northern Taiwan

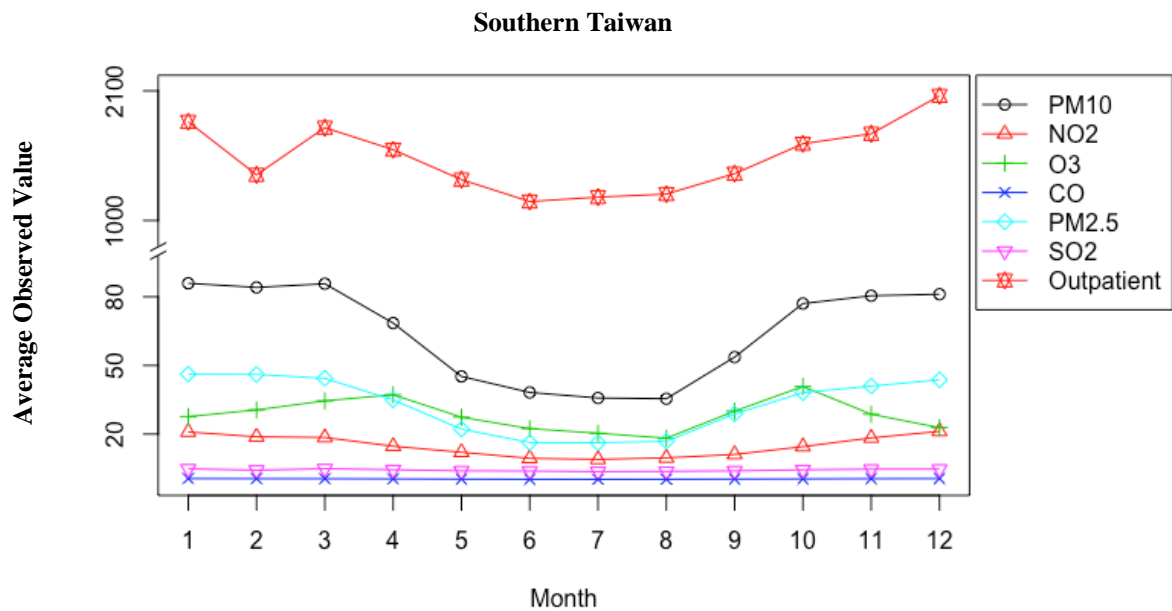


Figure 6 : Outpatient Number of Children with First Asthma Attack vs. Air Quality Monitoring Data – Southern Taiwan

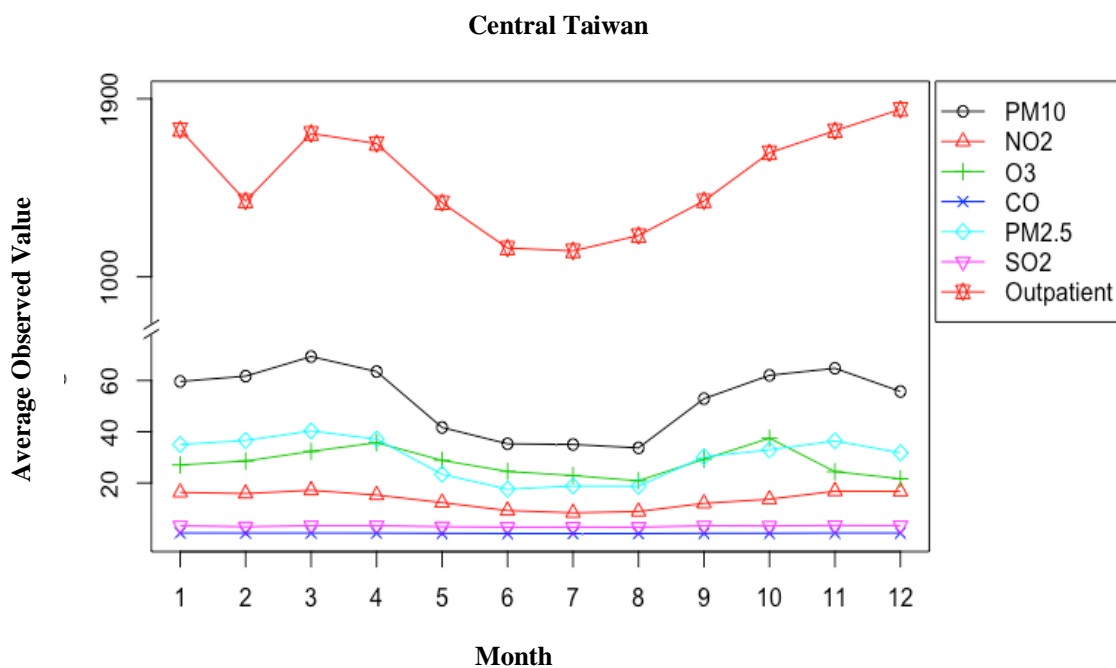


Figure 7 : Outpatient Number of Children with First Asthma Attack vs. Air Quality Monitoring Data – Central Taiwan

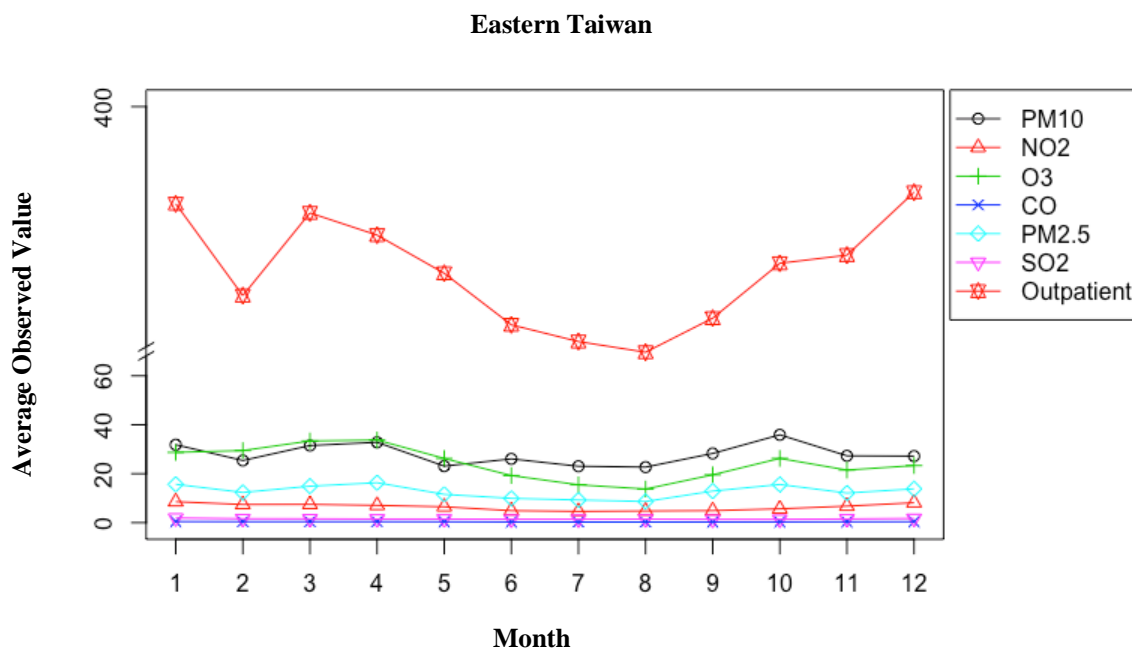


Figure 8 : Outpatient Number of Children with First Asthma Attack vs. Air Quality Monitoring Data – Eastern Taiwan

Finally, we observe to find out whether the outpatient number of children with asthma attacks is related to air pollutants (see Figure 9). In the following analysis chart, if the color of the circle is closer to dark blue, it has higher relevance. On the right, if the correlation coefficient is greater than 0.7, it represents higher relevance. If the circle is marked with a cross, it represents no relevance. The result shows that: The correlation coefficient between the number of child outpatients with asthma and nitrogen dioxide (NO₂) is 0.72. The correlation coefficient between the number of child outpatients with asthma and the ozone is 0.23. The correlation coefficients between the number of child outpatients with asthma and other factors are between 0.5–0.7. The number of child outpatients with asthma has a positive correlation with individual air quality indexes. That is, the number of child outpatients with asthma in Taiwan has a positive correlation with air factors. If we observe based on different areas, the number of child outpatients with asthma in Central/Southern Taiwan is highly relevant to air factors (see Figure 10).

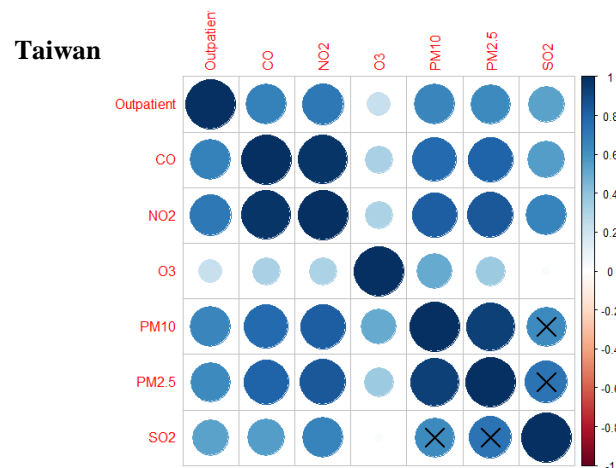


Figure 9 : Analysis for the Relevance between Outpatient Number of Children with First Asthma Attack and Air Quality Monitoring Data

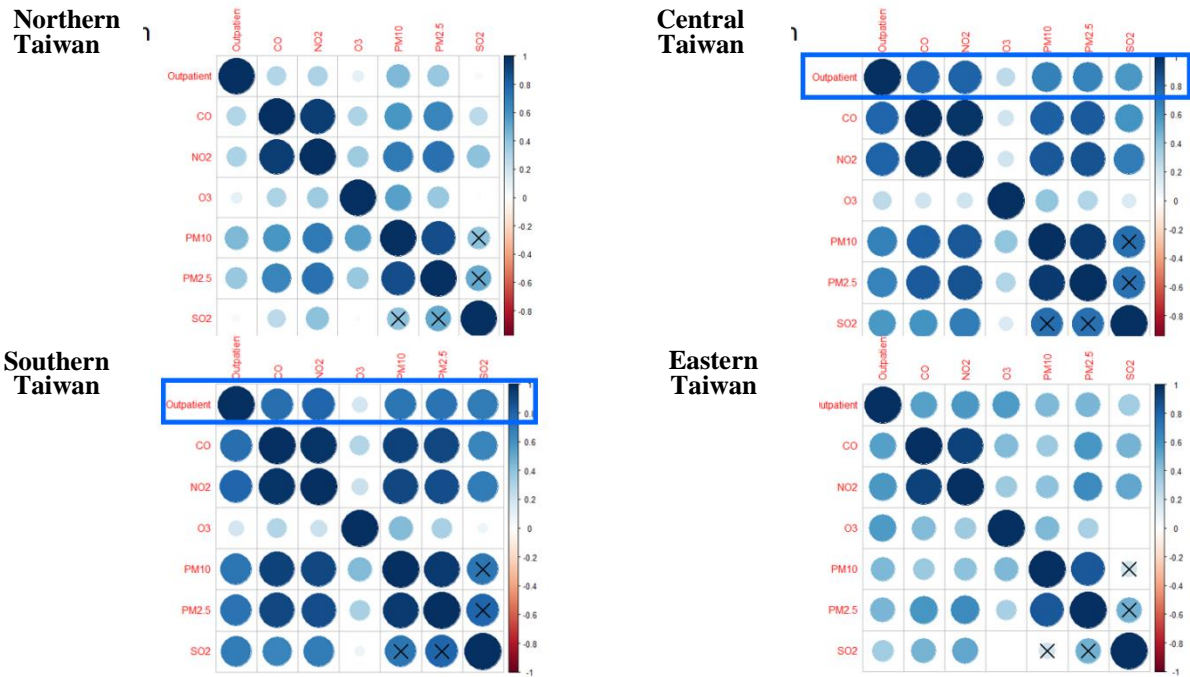


Figure 10 : Analysis for the Relevance between Outpatient Number of Children with First Asthma Attack and Air Quality Monitoring Data – Based on Individual Areas

If we view analyses in this section, we will find that: the number of child outpatients with asthma in Taiwan is highly relevant to the air pollution index. The variation trend of air pollution is similar to the variation trend of the number of hospital admissions for asthma.

2.3. Summary

From domestic/international research literature we find that the air quality in a living environment has great impact on children's health. Poor air quality may cause skin diseases, respiratory problems, vision problems and it may even affect children's learning and concentration abilities. Moreover, asthma is at the top of the list of children's chronic disease. Asthma is obviously a burden for children themselves and their caregivers. It will also exhaust our medical resources. In addition, when the morbidity rate of asthma and the mortality rate for children are high, it is more likely that more complications may occur. If one has asthma attacks during childhood repeatedly and the conditions become worse, the max pulmonary function he/she can acquire during adolescence or early adulthood will decrease. As a result, the risk for him/her to have chronic obstructive pulmonary disease (COPD) will increase.

If we observe the relevance between the child asthma outpatient data and the air quality index, we will find that the annual variation trend for the number of child outpatients with asthma in Taiwan is similar to that for the historical air pollution index. Additionally, the number of child outpatients with asthma in Taiwan has a positive correlation with air quality factors. The air pollution index value in Southern Taiwan is the highest among the 4 areas in Taiwan. In addition, the number of child outpatients with asthma in Central/Southern Taiwan is highly relevant to air factors. Main pollutants in the air in the Southern Area include PM_{10} , $PM_{2.5}$, NO_2 and SO_2 .

The main reasons that cause air pollution in Taiwan includes terrain, rainfall, mixing layer height, sunshine, wind direction and human economic development. The risk of having a respiratory disease will increase as long as you are exposed to a high concentration of $PM_{2.5}$, regardless of long or short exposure time. The impact on sensitive groups is even more significant. After extensive meetings with the Research Center of Big Data, Taipei Medical University and pediatricians, we have reached a conclusion. It is suggested that children should be exposed to fewer triggering factors in the environment. For example, they should not be exposed to allergens and second-hand smoking or air pollution in the environment. What's more, parents should pay attention to children's care at home to lower the chance for them to have allergies. We would also like to remind parents that they should maintain a hypoallergenic home environment for children. When children are facing exposure to air pollution, masks should be used as a coping measure. In addition, a good lifestyle should be maintained, and children should get enough exercise. Diets with less deep-fried food should be maintained to boost the immune system.

3. The Impact of Diet on Children’s Health

Most grown-ups cultivate their diet during childhood. As a result, a good diet in childhood can usually be maintained even when a child grows up. The behavior of poor long-term diet will result in the occurrence of future chronic diseases. After observing children’s diet habits in Taiwan, we listed 3 main issues in the following:

I. Over Intake of High-calorie Food

Affected by westernized diet and fast-food, sweet food and snack ads and promotion on TV, children eat a lot of foods containing high calories without having actual nutrition. According to the “Child Diet Habit Investigation” performed by the Child Welfare League Foundation in 2015, we find that 72% of children have an unbalanced diet and 10% of them are picky eaters. More than 20% of children do not have vegetables and fruit daily, and 56% of children have snacks 3 days a week. What’s worse, 26% of children had snacks as their main meal. For children who often eat snacks as their main meal, it is more likely that they are picky eaters compared with children with a balanced diet. The abnormality rate in blood pressure, blood sugar and blood lipids for overweight and obese children is two times more than that of normal children. If we do not pay attention to the unbalanced diet of these children, their health may be significantly affected in the future.

II. Preference of Oily, Salty, and Overly Sweetened Food

Besides high-calorie food, oily, salty and overly sweetened foods may directly damage children’s taste appetite. Oily, salty and overly sweetened foods tend to trigger metabolic syndrome and hurt our liver and kidney function. What’s worse, they may cause endocrine disorders, trigger negative emotions and influence our intelligence. In 2012, the John Tung Foundation performed an investigation and found that compared with adults, children prefer salty food and had it more often. For example, they like fried chicken, Taiwanese fried chicken and chips. The daily sodium intake of elementary school boys and girls was 4,815mg and 4,493mg, respectively. The numbers were way higher than those of adults (4,498mg and 3,511mg). What’s worse, the number was so much higher than the recommended amount (2,400mg) for adults.

III. Drinking Sweetened Beverages Too Often

Having plenty of beverage stands is something you can only see in Taiwan. However, that causes people to become used to the habit of having one of these beverages daily. According to the 2013–2016 Nutrition and Health Survey in Taiwan released in 2019, 9.6% of males between the ages of 7–12 had more than 2 bottles of sweetened beverages daily.” The

percentage for females was 8.4%. The number for males was 1.1–2.2 times higher than that of females. In all age groups, an average number of 27.7% of males “had 1–2 bottles of sweetened beverages daily.” The average percentage for females was 25.8%. The number for males was 1.0–1.4 times higher than that for females. When performing advanced analysis, we found that for males aged 7–18 mainly have sweetened milk tea, sweetened tea and sports drinks. As for females aged 7–18, they mainly have sweetened milk tea, sweetened tea, yogurt drinks and carbonated drinks. Overly sweetened beverages will result in over consumption of sugar for children and that will cause problems with respect to children’s health and physical development. Besides sugar, we should also stay alert to caffeine contained in soda, coke and milk tea. Children’s metabolism for caffeine is slower than adult’s. The younger a child is, the worse his/her tolerance for caffeine is. Caffeine will disturb a child’s emotions and sleep.

Modern people nowadays are mostly busy at work and mostly eat out. However, to add flavor to food most restaurants add too much seasoning or change the way food is cooked. As a result, foods in restaurants are mostly oily, salty or very sweet. When eating out too often, children may become picky eaters or have nutritional imbalance conditions and may become used to having heavily seasoned food. It is parents’ hope that their children will grow up healthily. However, we are facing crises in children’s diets: Children have unbalanced diets and are picky eaters, a high-calorie and heavy-tasting diet and have snacks and beverages as their meals. For practical purpose and convenience, parents choose to eat out. Children often acquire their diets from their caregivers. As a result, if parents do not control children’s diets and lack the “food education” concept, children’s health will face severe threats in the long run.

3.1. Literature Review on the Impact of Diet on Children's Health

Childhood obesity caused by poor diet has been recognized as the most severe challenge for the public health field in the 21st century. Commission on Ending Childhood Obesity, WHO, points out that the population of overweight or obese infants/children (ages of 0–5) around the globe has increased from 32 million in 1990 to 41 million in 2016. If the current trend continues to develop, the number of overweight or obese infants/children around the world will become 70 million in 2025.

The child body weight and height data released by the Ministry of Education shows that the obesity rate of elementary school students in 2017 was 14.6%. The number dropped by 1.5% compared with 2013. In contrast, the obesity rate in other countries is rising. Obesity prevention work performed in Taiwan has been proven to be effective. The WHO released the prevalence of obesity for children at the age between 5–19 in the world in 2016. We compared the prevalence of obesity for children at the age between 5–17 in the “2014–2017 Nutrition and Health Survey in Taiwan” with the prevalence rate of 20 other APEC countries. What's more, we used the definition of obesity for children aging 5–19 established by the WHO and acquired the Body Mass Index (BMI) $\geq +2$ standard deviations above the median for calculation. The results for boys (13.4%) and girls (8.0%) were both listed as 11th. When compared with 11 other Asian countries of APEC, the number of boys was listed as 5th and the number of girls was listed as 4th.

Childhood obesity is a complicated health issue since it brings about different levels of impacts on children's health. In the “Childhood Obesity Prevention Practice Guideline” released by the MOHW in 2018, diseases resulting from obesity are classified into the following 8 categories:

I. Dyslipidemia

The prevalence of dyslipidemia in obese children is gradually increasing. When these kids enter adulthood, they may have complications sooner than normal people do because of obesity. Childhood obesity is one of the seriously dangerous factors for cardiovascular diseases, especially when combined with the conditions of dyslipidemia, insulin resistance syndrome and hypertension¹⁹. A research report that followed up on the subject for 21 years shows that if a person suffers from obesity and dyslipidemia from childhood, his carotid intima-media thickness will increase significantly. If an obese child also has metabolic syndrome, his carotid intima-media thickness will increase even more significantly²⁰.

19 Freedman DS, Mei Z, Srinivasan SR, Berenson GS, Dietz WH. Cardiovascular risk factors and excess adiposity among overweight children and adolescents: the Bogalusa Heart Study. *J Pediatr.* 2007; 150(1):12–7.

20 Stelzer I, Zelzer S, Raggam RB, Prüller F, Truschnig-Wilders M, Meinitzer A, Schnedl WJ, Horejsi R, Möller R, Weghuber D, Reeves G, Postolache TT, Mangge H. Link between leptin and interleukin-6 levels in the initial phase of obesity related inflammation. *Transl Res.* 2012;159:118–24.

II. Dysglycemia

Childhood obesity is related to pre-diabetes/type 2 diabetes (T2DM). Just like other countries in the world, type 2 diabetes is diabetes that children and teenagers in Taiwan commonly have. Obesity is the most dangerous factor that causes type 2 diabetes for children. Compared with children/teenagers with type 1 diabetes (T1DM), the most significant feature for children/teenagers who have type 2 diabetes is obesity²¹.

III. Hypertension

Obesity is directly related to hypertension for children. The percentage for overweight children with hypertension is 4–14%, and the percentage for obese children with hypertension is 11–23%²². Moreover, the relevance between adulthood obesity and hypertension can usually be traced back to childhood. Mechanisms of childhood obesity-induced hypertension interact with one another. Currently, it is found that blood vessels will be damaged by inflammation and that endothelial cells become damaged and this can lead to oxidative stress²³.

IV. Metabolic syndrome

It has been proven that obesity is one of the dangerous factors for acquiring metabolic syndrome. When children have a higher BMI and wider waistline, the risk for them to acquire metabolic syndrome will increase by 10 to 20 times over the chance for children with normal body weights. As a result, BMI and waistline are the 2 important predictable factors for metabolic syndrome²⁴. If children have obesity problems from childhood to adulthood for a longer amount of time, the risk for them having cardiovascular diseases will increase. What's more, it is proven that the development and accumulation of fibrous plaques and coronary artery calcium actually start from childhood²⁵.

V. Nonalcoholic fatty liver disease

Nonalcoholic fatty liver disease is a kind of chronic liver disease. This disease is closely related to obesity. It is also the most common liver disease for children in the USA. For children with nonalcoholic fatty liver disease, obesity is one of the predictable factors for the

21 Wei JN, Sung FC, Lin CC, Lin RS, Chiang CC, Chuang LM. National surveillance for type 2 diabetes mellitus in Taiwanese children. *JAMA*. 2003;290:1345-50.

22 Sorof JM, Lai D, Turner J, Poffenbarger T, Portman RJ. Overweight, ethnicity, and the prevalence of hypertension in schoolaged children. *Pediatrics* 2004; 113(3 Pt 1): 475–82.

23 Kotsis V, Stabouli S, Papakatsika S, Rizos Z, Parati G. Mechanisms of obesity induced hypertension. *Hypertens Res* 2010; 33: 386–93.

24 Chu NF, Chin HC, Wang SC. Prevalence and Anthropometric Risk of Metabolic Syndrome in Taiwanese Adolescents. *ISRN Cardiol*. 2011;2011:743640.

25 Freedman DS, Kahn LK, Dietz WH, Srinivasan SR, Berenson GS. Relationship of childhood obesity to coronary heart disease risk factors in adulthood: the Bogalusa Heart Study. *Pediatrics*. 2001; 108:712–718.

development of the disease²⁶. In addition, children with nonalcoholic fatty liver disease have a higher chance to continue having obesity problems in their adulthood ²⁷.

VI. Obstructive sleep apnea

When observing breathing conditions of obese children in their sleep, it is found that 59% of the subjects have obstructive sleep apnea²⁸. Obese children with obstructive sleep apnea will require longer sleeping time during the day and that will affect their living quality. The condition will influence the neurocognitive function and lower their mobility ability. What's worse, the burden for the heart and lungs will become heavier and thus increase their chance of having metabolic syndrome.

VII. Musculoskeletal abnormalities

Being overweight and obese may even result in dysfunction of joints. Compared children with normal body weight at the same age, obese children have significantly problems in their knee joints, ankle joints and feet. Overweight or obese children tend to suffer from muscle pain, knee joint pain and ankle joint pain. Being overweight or obese may also lead to bone fracture²⁹ and negatively impact a child's exercise behavior, including muscle strength and balance. What's worse, obesity will influence plantar flexion and cause the flatfoot problem³⁰.

VIII. Mental and emotional disorders

Most obese children think they are less attractive. Not only feel frustrated but easily get trapped in a vicious cycle of a twisted self-image and continuous pain³¹. When getting older, the self-esteem of obese children will become lower. Older obese children have very low self-esteem with respect to their body and appearance when compared with younger obese children³². Compared with children with normal body weight, the prevalence of attention-deficit/hyperactivity disorder for obese children is greater³³.

26 Schwimmer, J.B.; Deutsch, R.; Rauch, J.B.; Behling, C.; Newbury, R.; Lavine, J.E. Obesity, insulin resistance, and other clinicopathological correlates of pediatric nonalcoholic fatty liver disease. *J. Pediatr.* 2003;143: 500–5.

27 Cioffi, C.E.; Welsh, J.A.; Cleeton, R.L.; Caltharp, S.A.; Romero, R.; Wulkan, M.L.; Konomi, J.V.; Frediani, J.K.; Vos, M.B. Natural History of NAFLD Diagnosed in Childhood: A Single-Center Study. *Children* 2017; 4: 34.

28 M. Kalra, T. Inge, V. Garcia et al., "Obstructive sleep apnea in extremely overweight adolescents undergoing bariatric surgery," *Obesity Research*, 2005;. 13:1175–9.29 Krul M, Van Der Wouden JC, Schellevis FG, Van Suijlekom-Smit LWA, Koes BW. Musculoskeletal problems in overweight and obese children. *Ann Fam Med* 2009;7: 352–6.

29 Krul M, Van Der Wouden JC, Schellevis FG, Van Suijlekom-Smit LWA, Koes BW. Musculoskeletal problems in overweight and obese children. *Ann Fam Med* 2009;7: 352–6.

30 Wearing SC, Henning EM, Byrne NM, Steele JR, Hills AP. The impact of childhood obesity on musculoskeletal form. *Obes Rev* 2006;7:20918.

31 Taylor A, Wilson C, Slater A, Mohr P. Self-esteem and body dissatisfaction in young children and associations with weight and parenting style. *Clin Psychol.* 2012;16:25–35.

32 Daniels SR, Jacobson MS, McCrindle BW, Eckel RH, Sanner *BMCirculation.* 2009 Apr 21; 119(15):e489-517.

33 Cortese S, Angriman M, Maffei C, Isnard P, Konofal E, Lecendreux M, Purper-Ouakil D, Vincenzi B, Bernardina BD, Mouren MC. Attention-deficit/hyperactivity disorder (ADHD) and obesity: a systematic review of the literature. *Crit Rev Food Sci Nutr.* 2008 Jun;48(6):524-37.

3.2. Study Regarding the Relevance Between Diet and Child Diseases

In the above section, we discussed diseases that may be triggered by childhood obesity. Other than some diseases, such as bone abnormalities, it is difficult to detect the existence of most diseases when children are under 12. The main reason for that is because the symptoms of these diseases are not yet obvious. Moreover, children do not have their blood pressure and blood sugar tested regularly. When children enter adolescence, their body functions become mature; therefore, symptoms of diseases will gradually show. After they start to feel unwell, they will seek medical services. This section takes reference from the 2011–2015 National Health Insurance Annual Statistics released by the Department of Statistics, MOHW and uses the outpatient numbers of the 0–12 age group and the 13–18 age group to analyze statistics of “obesity disease.”

We categorize “hypertension,” “diabetes,” “disorders of lipoid metabolism” and “obesity and other overnutrition” as “obesity disease” according to literature and studies. We observe the difference of outpatient numbers for the 0–12 age group and the 13–18 age group. From Figure 8 to Figure 10, we find that the 13–18 teenager age group has a higher number of patients seeking medical services for hypertension, diabetes and disorders of lipoid metabolism when compared to the 0–12 age group. Although compared to the 0–12 age group, the 13–18 teenager age group has a lower number of patients seeking medical services for obesity and other overnutrition, the number is gradually rising (Figure 11). With the rising prevalence of obesity among teenagers, parents should take precautions for their children from childhood. Parents should get involved and make sure children have healthy diet and do exercise. Parents should not focus on controlling their children’s body weight in an unhealthy way. Instead, they should focus on changing their lifestyle and diet as a family.

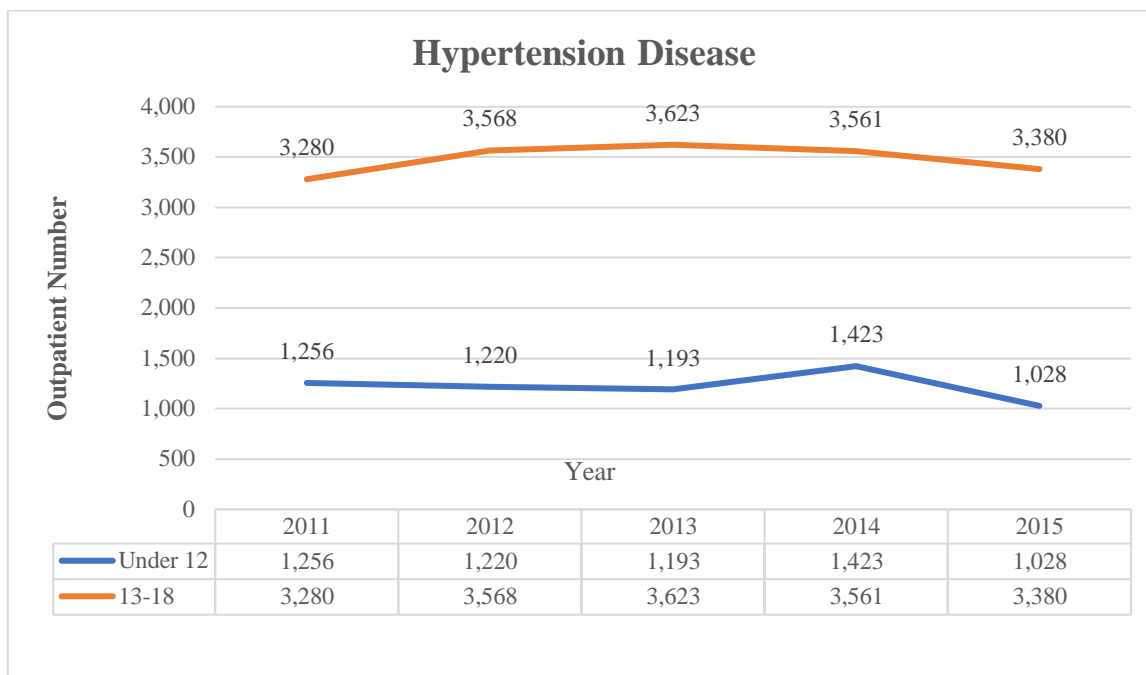


Figure 11 : 2011–2015 Outpatient Number of Children and Teenagers with Hypertension

(Source: 2011–2015 National Health Insurance Annual Statistics)

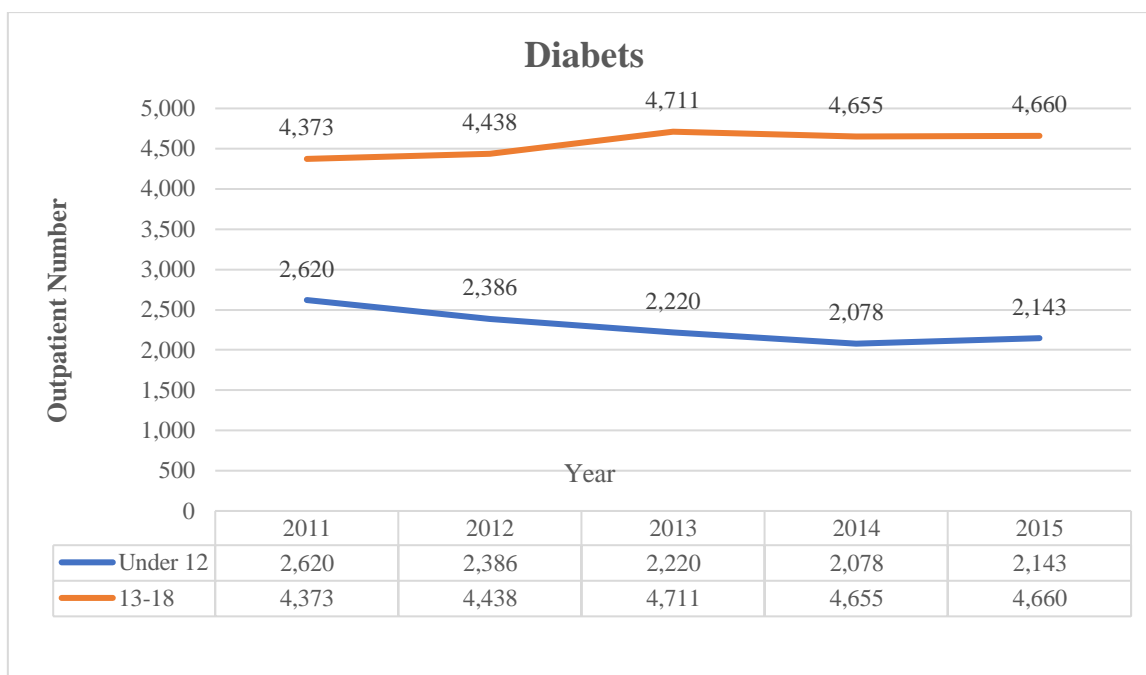


Figure 12 : 2011–2015 Outpatient Number of Children and Teenagers with Diabetes

(Source: 2011–2015 National Health Insurance Annual Statistical)

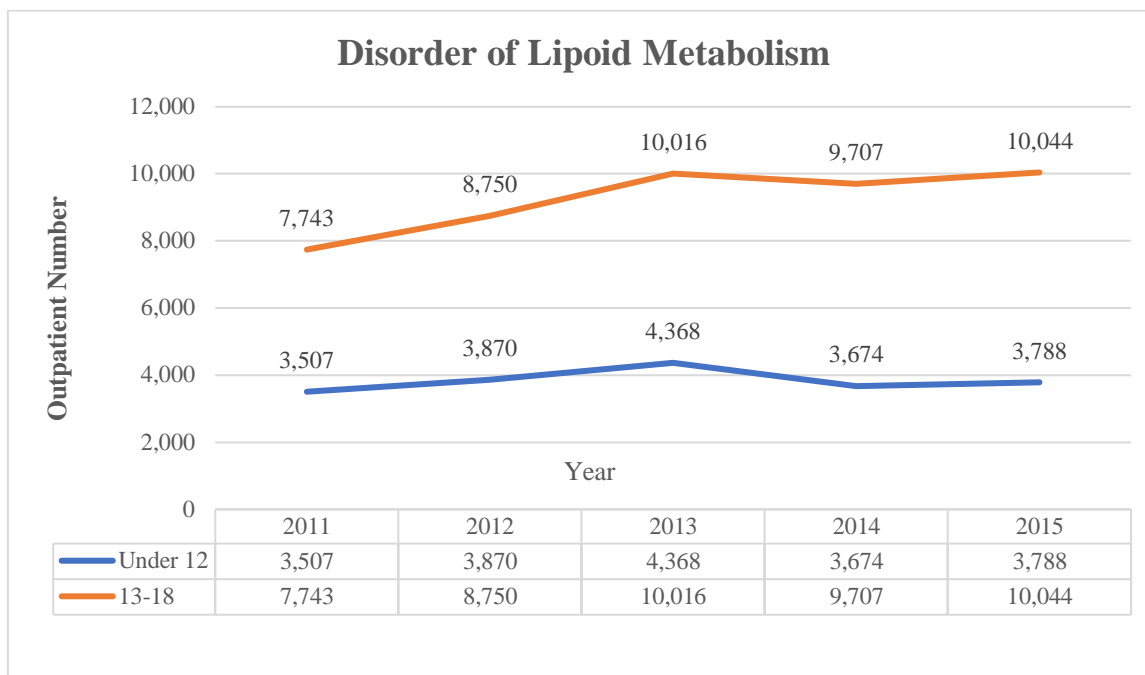


Figure 13 : 2011–2015 Outpatient Number of Children and Teenagers with Disorders of Lipoid Metabolism

(Source: 2011–2015 National Health Insurance Annual Statistical)

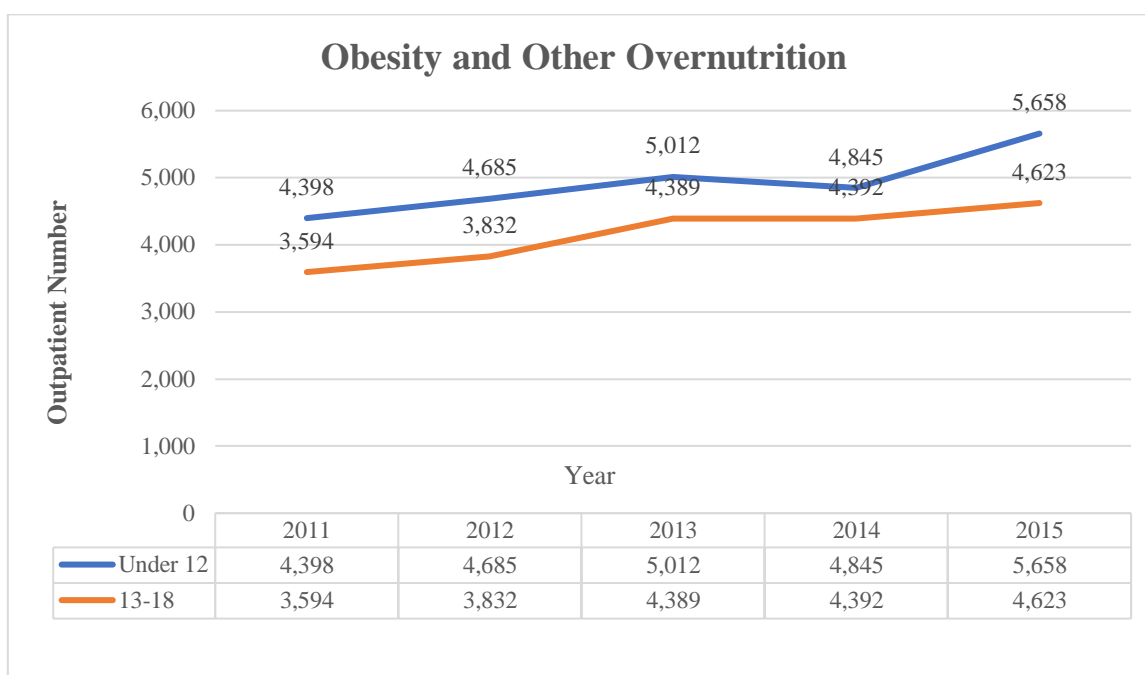


Figure 14 : 2011–2015 Outpatient Number of Children and Teenagers with Obesity and Other Overnutrition

(Source: 2011–2015 National Health Insurance Annual Statistical)

3.3. Summary

We summarized the literature review in Section 1 and the annual trend of number of outpatients with obesity in Section 2 and acquired the following conclusion:

1. Childhood obesity is directly related to several diseases, including blood lipids and blood sugar abnormalities, hypertension, metabolic syndrome, nonalcoholic fatty liver disease and mental and emotional disorders.
2. And the reason that causes childhood obesity is the poor diet, such as having too much high-calorie food, oily and salty food and sweetened beverages.
3. With the rising prevalence of obesity among teenagers, parents should take precautions for their children from childhood. Parents should get involved and make sure children have healthy diets and exercise.

The diet cultivated in one's childhood will have an impact on the lifestyle when he/she enters adolescence and adulthood. Children's living environment is closely related to their family. For example, the style of family activity, dining time and diet are all key factors for the development of childhood obesity. Parents play an important role in the prevention of childhood obesity for children under the age of 12. As for school-age children, their connection with the school environment becomes closer. School hours and schedule, physical and nutritional education related courses and relationship with peers are the factors that affect the development of childhood obesity.

From the perspective of lifestyle, the key in the work of preventing obesity for school aged children is to reduce the time for sedentary activities. Sedentary activity is the activity that seldom involves body (physical) movement or that only burns few calories. Several studies performed by different countries all found that school-age children and teenagers mostly have sedentary activities when they are awake or have spare time. These sedentary activities include watching TV and using a computer. As a result, they burn fewer calories and the risk of them being obese increases. Physical activity is directly related to calorie burning. It plays an important role in preventing childhood obesity. When designing relative precaution measures, we should be focusing on the self-efficacy and the cardiorespiratory fitness of physical activities. What's more, we should pay attention to the physical activity levels and improve children's willingness to exercise. Environmental and mental factors will affect our dieting behavior and lifestyle. Pediatricians suggest that parents take effective behavior intervention methods, such as monitoring, control of temptation, change of dieting process, support and encouragement as well as cognitive restructuring. These are key to maintaining long term weight loss. They are also important factors for preventing weight gain again. That is, only with good lifestyle and diet can we continue to stay in shape for a long term.

4. The Impact of Electronic Product-use Habits on Children's Health

Recently, with the rapid development of technology, electronic products have become essential in modern life. Although electronic products allow people to have a more convenient life, they may lead to Internet Addiction Disorder if people do not use them correctly³⁴. We can see lots of mental health concerns behind the issue of Internet Addiction Disorder, such as compulsive Internet use and anxious and depressive tendencies. Internet Addiction Disorder has a significant impact on children's brain and cognitive development. Moreover, it will affect their concentration ability and cause vision problems.

The Health Promotion Administration appointed a team in National Taiwan University to perform a "Children and Teenager Eyesight Monitoring Investigation" in 2017. Results of the investigation show that from kindergarten children to high school students, they all have experiences with using electronic products. Additionally, the percentage of electronic product usage increases with age. For the percentage of cell phone use, 44.9% of kindergarten children and 60.9% of high school students use cell phones after school on weekdays. As for the time of cell phone use, the average use time for kindergarten children after school is 32.2 minutes, 42.5 minutes for elementary school students, junior high school students for over an hour, which is 72.6 minutes, and 95.9 minutes for high school students. If we add the time of using PCs and tablets on weekdays, the electronic product use time will become longer. In addition, during holidays or summer and winter vacation, the time will become longer.

According to a study performed by psychiatrist Lai Jou-Yin and ophthalmologist Shih Chih-Wei from Taipei City Hospital³⁵, the difference between smart communication devices nowadays and electronic products in the past is that smart communication devices nowadays have smaller screens. This will require users to get closer to the screen to see the message on it. Besides this, the brightness of screens on modern electronic devices is higher. When staring at a bright object for a long time, the burden on the retina macula will become greater. What's more, the environment for using electronic devices nowadays is unstable. A lot of people use their smart devices on moving vehicles or in their bed. The above features will require users to read in a shorter distance and this can lead to worse nearsightedness for children and teenagers. Strong light may also increase the number of free radicals in people's eyes and this will impact the retina and other parts of eyes.

34 At the end of 2017, the WHO officially listed "Gaming Disorder" as a mental disorder. The criteria of having the disorder is playing games continuously every day and spending more than 12 hours on the Internet to an extent that one's daily routine is affected. The disorder may be accompanied by symptoms of emotional disorders. Continuous observation by physicians for over a year is required to confirm the diagnosis.

35 / Taipei City Hospital Songde Branch Psychiatrist Lai Jou-Yin Taipei City Hospital Zhongxing Branch Ophthalmologist Shih Chih-Wei, Electronic Product Addiction Will Impact Your Physical and Mental Health, Healthy City No.114

When looking at a moving object, eyes will continue focusing on that object and this will lead to eye fatigue symptoms, such as swollen and painful eyes, eye dryness, headaches and nausea. In addition, when we concentrate on staring at one object for too long, we blink less. As a result, keratitis, conjunctivitis and dry eye syndrome may often happen.

Besides the influence caused by misusing electronic products and poor using habits, Internet Addiction Disorder is another matter that we need to pay attention to. In the latest “International Classification of Disease” (ICD-11) published by the WHO in 2018, “Gaming Disorder” is classified as a mental illness. Different from the “Internet Addiction Disorder” in the past, the WHO is now focusing more on “Gaming Disorder” and performs related research on the behavior of gaming addiction. The category of “Mobile Gaming Disorder” in Gaming Disorder is something worthy of our attention. The main criteria for the determination of the addiction include overindulging to an extent of having negative impact, tolerance and withdrawal symptoms. Symptoms of gaming addiction are quite similar with traditional addictive behaviors.

To learn more about children and teenagers’ mobile addictive disorder in Taiwan, an assistant researcher, Lin Yu-Hsuan, and his research team from the Institute of Population Health Sciences, National Health Research Institutes performed a large-scale investigation on 10,775 students from 4th graders to 12th-graders in the country. The result of the investigation shows that students with mobile addiction disorder spend much more time on mobile devices. What’s more, they are more willing to spend money on mobile games. Among elementary school students with mobile gaming disorder, 21.4% of them are willing to purchase game points and treasures in the game. The number of students who are willing to spend in games for junior high school students is 36.3% and the number for high school students is 42.2%. The willingness of them to spend money on the game is way higher than that of normal students.

The creation of digital mobile carrier makes internet connections more accessible. Social media, instant messaging, apps and mobile games increase the possibility of compulsive phone use. This behavior will affect one’s time management, study, social life, work and family life. It is found in the study that people with anxiety, long-term depression and interpersonal interaction withdrawal conditions tend to have Internet addiction problems more easily. With the overuse of the Internet, patients are also likely to show withdrawal symptoms. For example, when they are asked to stop using the computer, they present their frustration, such as depression, anger and emptiness. Additionally, they may have a hard time keeping focused or have no peace of mind and feel restless. These problems are worthy of the public’s attention. This Chapter will be discussing the impact of electronic product-use habits on children’s health.

4.1. Literature Review on the Impact of Electronic Product-use Habits on Children's Health

In the past decade, the percentage of children owning a mobile device (such as smart phones and tablets) has increased³⁶. Overuse of smart phones may present potential impact on our mental health. For example, it may lead to depression³⁷ and affect our sleep³⁸. Exclusive features of mobile media and technology not only have impacts on children's sleep but bring other potential health risks for children. The musculoskeletal pain and unwellness caused by using smart phones and tablets are proven to be health risks of using hand-held devices³⁹. What's more, obesity is a broad issue for humans' physical health. For example, watching TV, using a computer and playing online games are causes that lead to childhood obesity⁴⁰.

In the following section, we will be discussing the potential impact of improper electronic product-use habits on children's health from 3 perspectives.

I. Impact on sleep

The use of social media, tablets and smart phones is related to decreases in sleep duration. When overusing the above items, sleep time will be negatively affected⁴¹. Problematic social networking or Internet Addiction Disorder are related to the increased amount of time for sleep disruptions⁴².

II. Activity and Risk of Obesity

When one spends too much time on social media and gaming, it is observed that sitting too much is significantly related to the development of obesity⁴³.

III. Other physical health indexes

- i. The behavior of spending too much time on phones is related to the increase in neck and

36 Rideout, V. (2013). Zero to eight: Children's media use in America in 2013. San Francisco, CA: Common Sense Media.

37 Elhai, J. D., Dvorak, R. D., Levine, J. C., & Hall, B. J. (2017). Problematic smartphone use: A conceptual overview and systematic review of relations with anxiety and depression psychopathology. *Journal of Affective Disorders*, 207, 251-259. <http://dx.doi.org/10.1016/j.jad.2016.08.030>

38 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

39 Berolo S, Wells RP, Amick Iii BC. Musculoskeletal symptoms among mobile hand-held device users and their relationship to device use: a preliminary study in a Canadian university population. *Appl Ergon* 2011; 42(2):371-8.40 Ng, M., Fleming, T., Robinson, M., Thomson, B., Graetz, N., Margono, C., et al.(2014). Global, regional, and national prevalence of overweight and obesity in children and adults during 1980-2013: A systematic analysis for the Global Burden of Disease Study 2013. *The Lancet*, 384(9945), 766-781.

40 Ng, M., Fleming, T., Robinson, M., Thomson, B., Graetz, N., Margono, C., et al.(2014). Global, regional, and national prevalence of overweight and obesity in children and adults during 1980-2013: A systematic analysis for the Global Burden of Disease Study 2013. *The Lancet*, 384(9945), 766-781.

41 Jean M Twenge, Zlatan Krizan, Garrett Hisler (2017) .Decreases in self-reported sleep duration among U.S. adolescents 2009-2015 and association with new media screen time, *Sleep Med* . 2017 Nov;39:47-53.

42 Vernon, L., Modecki, K. L., & Barber, B. L. (2017). Tracking effects of problematic social networking on adolescent psychopathology: The mediating role of sleep disruptions. *Journal of Clinical Child and Adolescent Psychology*, 46(2), 269-283.

43 Tseng, Wei-Shun (2018), Mobile technology behaviors and relationships of parent-child interaction for preschool children – An example of Taipei area in Taiwan.

back pain⁴⁴, eye fatigue⁴⁵ and headache.

- ii. The average daily mobile use time for children who fit the diagnoses criteria of dry eye syndrome is greater than that for children without dry eye syndrome⁴⁶.
- iii. Teenagers and children who spend a lot of time on digital media are more likely to show symptoms of attention deficit hyperactivity disorder (ADHD)⁴⁷. Furthermore, we can predict whether children will have symptoms of ADHD at the age of 7 from the time they spend watching TV at the age of 1–3 every day. An increase of an hour spending for watching TV will lead to an increase of 9% in the chance of having ADHD. When a child spends 2.9 hours more on TV compared to normal children, his/her chance of having ADHD will become 28%⁴⁸. Additionally, Internet Addiction Disorder is related to some mental illness, including substance use disorder, ADHD, depression, social phobia and hostility.⁴⁹
- iv. The overuse of mobiles and tablets has the most direct correlation with the impact on children's eyes. The Health Promotion Administration, MOHW performed a "Children and Teenager Eyesight Monitoring Investigation" in 2017. The result of the investigation shows that the nearsightedness rate for students of all grades in elementary school increases compared to the data of 2000. The nearsightedness rate for 6th graders rose sharply to 70%.

A study performed by the research team in the National Health Research Institutes in 2018 shows that 3.1% of teenagers/children in Taiwan have Gaming Disorder. In Taiwan, in every 30 junior high school/elementary school students, there is 1 child who is highly addicted to online gaming. Among these addicted children, it is apparent that the number of boys is greater than the number of girls. In addition, some scholars in Taiwan performed research on the potential impact of overusing electronic products on children:

44 Kim, H., Yeun, Y., & Kim, S. (2016). Preventive effects of stretching and stabilization exercises on muscle fatigue in mobile phone users. *Journal of Physical Therapy Science*, 28(9), 2529-2532.

45 Jayanti P Acharya*, Indranil Acharya and Divya Waghrey, *Community Medicine & Health Education* Acharya et al., *J Community Med Health Educ* 2013.

46 K.D.Kim,M.H. Park, Y.J.Kim, T.Moon, Y.H. Lee,S.D.Hyun,T.Gwon,C.S.Hwang, Ferroelectricity in undoped-HfO thin film induced by deposition temperature control during atomic layer deposition,*J.Mater.Chem.C4*(2016)6864-6872.47 Sheri Madigan, PhD1,2; Dillon Browne, PhD3; Nicole Racine, PhD1,2; et al,Association Between Screen Time and Children's Performance on a Developmental Screening Test, *JAMA Pediatr.* 2019;173(3):244-250.

47 Sheri Madigan, PhD1,2; Dillon Browne, PhD3; Nicole Racine, PhD1,2; et al,Association Between Screen Time and Children's Performance on a Developmental Screening Test, *JAMA Pediatr.* 2019;173(3):244-250.

48 Frederick J Zimmerman (2007). Associations Between Content Types of Early Media Exposure and Subsequent Attentional Problems . *PEDIATRICS* 120(5):986-92

49 Yen, J. Y., Yen, C. F., Chen, C. S., Tang, T. C., & Ko, C. H. (2009). The association between adult ADHD symptoms and Internet addiction among college students: The gender difference. *Cyber Psychology & Behavior*, 12(2), 187-191.49 Chang, F. C., Chiu, C. H., Chen, P. H. Chiang, J. T., Miao, N. F., Chuang, H. Y., & Liu, S. (2019). Children's use of mobile devices, smartphone addiction and parental mediation in Taiwan. *Computers in Human Behavior*, 93, 25-32.

- I. On average, a 5th grader spends 11 hours using smart phones or tablets every week. Among 5th graders, 15.2% of them are addicted to their smart phones. Parents that have more sense regarding risk perception and educational intervention are likely to restrict their children's use of mobile devices. Moreover, for children who have poor academic performance, who suffer from depression, who spend lots of time on smart phone/tablet games, who often use social networking services and instant messaging, their parents restrict less and intervene less⁵⁰.
- II. Using electronic devices and watching the screen for a long time will bring about impacts on children's physical and mental health. What's more, the percentage of Asian children who have Internet Addiction Disorder is high. Parents' performing educational interventions will be helpful for reducing the time children spend on electronic devices. The reduced usage time can help improve children's sleep quality and concentration⁵¹.
- III. Internet Addiction Disorder will damage children's learning and concentration abilities. Therefore, it is suggested that early intervention should be performed to foster normal development of learning and concentration abilities for children in their childhood⁵²

50 Chang, F. C., Chiu, C. H., Chen, P. H., Chiang, J. T., Miao, N. F., Chuang, H. Y., & Liu, S. (2019). Children's use of mobile devices, smartphone addiction and parental mediation in Taiwan. *Computers in Human Behavior*, 93, 25-32.

51 Lin, Y. M., Kuo, S. Y., Chang, Y. K., Lin, P. C., Lin, Y. K., Lee, P. H., ... & Chen, S. R. (2020). Effects of parental education on screen time, sleep disturbances, and psychosocial adaptation among Asian preschoolers: A randomized controlled study. *Journal of Pediatric Nursing*.

52 Kuo, S. Y., Chen, Y. T., Chang, Y. K., Lee, P. H., Liu, M. J., & Chen, S. R. (2018). Influence of internet addiction on executive function and learning attention in Taiwanese school-aged children. *Perspectives in Psychiatric Care*, 54(4), 495-500.⁵² Construction of a Safe Environment for Children. Establishment of Comprehensive Health Promotion Policy – Interview of Wang Ying-Wei, Director of the Health Promotion Administration, MOHW

4.2. Analysis on Children’s Diseases Caused by Electronic Product-use Habits

Children’s addiction of electronic devices and the Internet may lead to impacts on their vision. In addition, we learn from domestic/international literature that the addiction has a correlation with “attention deficit hyperactivity disorder” (ADHD). This Section discusses the findings on medical services seeking conditions for nearsightedness and ADHD for children during 2011–2015. This study uses the number of child outpatients (under 12) visits for nearsightedness and ADHD for the first time during 2011 to 2015.

4.2.1 Attention deficit hyperactivity disorder

Attention deficit hyperactivity disorder (ADHD) is a kind of nervous and mental disease. The prevalence of ADHD around the world is 5–12%. The number differs due to the use of different diagnostic tools, diagnoses criteria and sources of case samples. Domestic studies performed in Taiwan show a number of 5–7%. From Table 5 we can see that on average, there are more than 20,000 children seeking medical services for ADHD every year. The male to female ratio among these children is 3:1. The reason for the cause of the ratio difference in childhood is partly because boys and girls behave differently. Compared with girls, boys have more explicit behaviors (impulsiveness, hyperactivity, disruptive behavior, etc.) As a result, it is easier to find that a boy has ADHD in an early stage, so that diagnosis and treatment can be performed. In contrast, girls have more implicit behaviors, such as poor concentration abilities, anxiety and depression. Therefore, it is more difficult to detect the disease in an early stage.

Table 5 : Outpatient Number Distribution for Children with Attention Deficit Hyperactivity Disorder

Classification		Female	Male
Number of Patients Seeking Medical Services for the First Time		33,136	102,849
Age	0–6	16,558 (50.0%)	50,168 (48.8%)
	7–12	16,578 (50.0%)	52,681 (51.2%)

**Table 6 : Outpatient Number Distribution for Children with Attention Deficit
Hyperactivity Disorder**

Classification		Female	Male
Number of Patients Seeking Medical Services for the First Time		33,136	102,849
Number of Patients Seeking Medical Services in the History	2010	5,679 (17.1%)	18,369 (17.9%)
	2011	5,928 (17.9%)	18,386 (17.9%)
	2012	5,548 (16.7%)	17,256 (16.8%)
	2013	5,527 (16.7%)	16,934 (16.5%)
	2014	5,311 (16.0%)	16,084 (15.6%)
	2015	5,143 (15.5%)	15,820 (15.4%)

Although the outpatient numbers of ADHD patients over the years did not rise significantly for the higher prevalence of Internet Addiction Disorder, in medical clinical research, it was found that 80% of the children with Internet and electronic device addiction were diagnosed with ADHD. The main reason for that is because besides having the symptom of poor concentration, children with ADHD also suffer from emotional symptoms and require special care. While they are growing up, they may have poor academic performance, a bad interpersonal relationship or psychological trauma. As a result, they need to find a way out and have some comfort. These often result in their overuse of Internet and electronic products. Once children are addicted to the Internet or electronic products, it will be very difficult for them to quit the addiction. What's more, when they are prevented from using devices, they will fly into a rage. From the above fact we can learn that ADHD is related to the withdrawal symptoms of Internet Addiction Disorder.

4.2.2 Vision impairment

From the above, we learn that children's nearsightedness becomes worse because of features of mobile screens and their amount of use. Moreover, due to the frequent contraction of the ciliary muscle, the symptoms of eye soreness, eye dryness and eye fatigue will become worse. Strong light may also increase the amount of free radicals in people's eyes and this will impact the retina and other parts of the eye. When looking at a moving object, eyes will continue focusing on that object and this will lead to the symptoms of swollen and painful eyes, eye dryness, headache and nausea. In addition, when we concentrate on staring at one object for too long, we blink less. Blinking is an important mechanism for tears to be distributed on our eyeballs evenly to serve as a protective

layer. As a result, phubbers often have keratitis, conjunctivitis and dry eye syndrome. When we observe the outpatient number distribution for children seeking medical services for nearsightedness from 2011 to 2015, we find that the number gradually increases every year (see Figure 12). If control and prevention measures are not performed, more children will become nearsighted in the following years. It is estimated that their risk of acquiring macular degeneration, glaucoma, cataract and retinal detachment after 20 years is high.

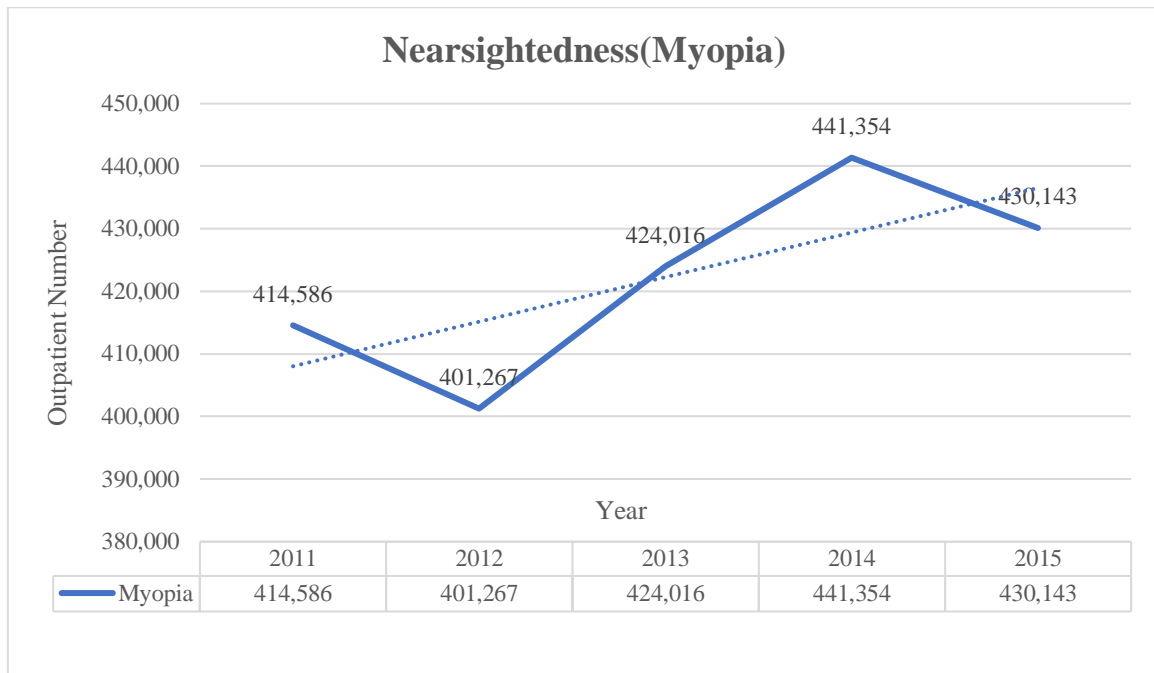


Figure 15 : 2011–2015 Distribution of Outpatients with Nearsightedness

4.3. Summary

From relative domestic/international literature and studies discussed in this Chapter, we can learn that the misuse or overuse of electronic products has an impact on children's health. It causes nearsightedness. What's worse, it affects children's sleep quality, learning and concentration abilities and may lead to the development of obesity. From statistics and research, we also found that the outpatient numbers of ADHD over the years did not rise significantly for the higher prevalence of Internet Addiction Disorder, but in medical clinical research, it was found that 80% of the children with Internet and electronic device addiction were diagnosed with ADHD. From historical statistics, the number of children seeking medical services for nearsightedness gradually increases every year. If control and prevention measures are not performed, the risk for them acquiring macular degeneration, glaucoma, cataract and retinal detachment will be high when they enter adulthood.

However, in this digital era, the complete restriction of forbidding children to use electronic products may result in the loss of competitiveness. Therefore, physicians and experts state that the appropriate use of digital technology will bring us concrete benefits in our life. For example, we can use technology to closely monitor our daily routine and schedule a to-do list to improve our efficiency. Therefore, children can become more self-disciplined.

To avoid the negative impact brought about by overusing electronic devices, physicians and experts suggest that adjusting how we use and when we use electronic products is also very important. For example, not using electronic products while you eat. Parents and children can interact more. What's more, diverse hobbies should be cultivated such as a regular exercise habit. In addition, ophthalmologists suggest that the appropriate amount of use time for mobiles and tablets is 30 minutes. After using electronic products for 30 minutes, we should let our eyes rest for 10 minutes. We can stare at a distant object or close our eyes to relax the eye muscles. Another important thing is that we should use electronic products at an appropriate distance. For mobile use, we should maintain a distance of at least 30 centimeters. And for computer screen, we should maintain a distance of at least 60 centimeters. Finally, we should choose the appropriate environment. It is not suitable for us to use electronic products on a moving vehicle, in a dim room or under the sun.

The development of electronic products brings about great convenience for modern people. The technology allows us to contact other people immediately. Besides this, we can acquire immediate information and kill time by using electronic products. What's more, the technology allows us to

widely perform distance learning and remote working during the time of the Covid-19 pandemic in 2020. While we are enjoying the convenience of electronic products, we are required to pay attention to subsequent impacts and developments. We should help children cultivate the right habit for using e-products. Therefore, we can use smart communication and electronic devices easily and healthily.

5. Conclusion

Children are the backbone of the country in the future, they need to be raised in a well-developed fundamentals. . Children’s health conditions and living environment while growing up are closely related to the health and disease in their adulthood. As a result, “Healthy Start” should be the focus for governments policy around the world. The Health Promotion Administration, MOHW is the responsible unit for fostering health promotion in Taiwan. It establishes public health policies that meet public’s needs in Taiwan. It fosters family health and community health promotion as well as protects the health of males, females, the elderly and children.⁵³ For the fostering of children’s health, the Administration provides 7 preventive health care services for children under 7 including physical checkup, disease development examination and vision examination. As a result, children’s vision problems can be detected at an early stage and children with vision problems can be referred for treatment. It is important for children to have relative health checkups as easy as possible, so that appropriate treatments can be provided within the period when the disease is still treatable. As a result, the damage caused by the disease on children’s bodies and intelligence can be reduced to a minimum. Therefore, we need to work together to improve children’s health status in Taiwan.

As a pioneer in the field of child protection, PCALT responds to the government’s policy by advocating “iBaby-Protecting Children for a Better Future.” With the “White Paper of Children’s Health,” PCALT proposed 3 main child issues – the impact of air quality in a living environment on children’s health, the impact of diet on children’s health and the impact of electronic product-use habits on children’s health. In this White Paper, historic data as well as domestic/international literature and research in recent years were analyzed. Additionally, scholars, experts and physicians as consultants to perform cross-field discussion on the meaning behind the data. PCALT invites all fields in society to pay attention to child related issues to protect children and to enable them to make accomplishments in the future.

Three key factors are concluded as follows:

- I. Poor air quality in a living environment has an impact on children’s health since it may cause skin diseases, respiratory problems, vision problems and it may even affect children’s learning and concentration abilities.**

From domestic/international research literature, air quality in a living environment has a great impact on children’s health. Poor air quality may cause skin diseases, respiratory

⁵³ Construction of a Safe Environment for Children. Establishment of Comprehensive Health Promotion Policy – Interview of Wang Ying-Wei, Director of the Health Promotion Administration, MOHW

problems, vision problems and it may even affect children's learning and concentration abilities. Take children's asthma for example, asthma is obviously a burden for children themselves and their caregivers. It will also exhaust medical resources. If one has asthma attacks during childhood repeatedly without appropriate precautions or treatment, the conditions will become worse, the max pulmonary function he/she can acquire during adolescence or early adulthood will decrease. As a result, the risk for him/her to have chronic obstructive pulmonary disease (COPD) will increase.

From relative data analyses, the annual variation trend for the number of child outpatients with asthma in Taiwan were found to be similar to that for the air pollution index in history. The air pollution index value in Southern Taiwan is the highest among the 4 areas in Taiwan. Main pollutants in the air include PM₁₀, PM_{2.5}, NO₂ and SO₂. Therefore, the risk for a child of having a respiratory disease will increase as long as he or she is exposed to a high concentration of PM_{2.5}, regardless of long or short exposure time. The impact on sensitive groups is even more significant. Pediatricians suggest that children should be exposed to fewer triggering factors in the environment. For example, they should not be exposed to allergens and second-hand smoking or air pollution in the environment. What's more, parents should pay attention to children's care at home and avoid producing more PM_{2.5} at home. Parents should maintain a hypoallergenic home environment for children. When children are facing exposure to air pollution, masks should be used as a coping measure. In addition, a good lifestyle should be maintained, and children should get enough exercise. A diet with less deep-fried food should be maintained to boost the immune system.

II. Poor diet habits are likely to cause childhood obesity. They are also related to the development of blood lipids and blood sugar abnormalities, hypertension and metabolic syndrome.

According to a study, childhood obesity is directly related to several diseases, including blood lipids and blood sugar abnormalities, hypertension, metabolic syndrome, nonalcoholic fatty liver disease and mental and emotional disorders. From relative data analyses we also found that the 13–18 teenager age group has a higher number of patients seeking medical services for hypertension, diabetes and disorders of lipid metabolism when compared to the 0–12 age group. What's more, the prevalence of obesity increases with age. Therefore, parents should take precautions in children's childhood. Furthermore, the diet cultivated in one's childhood will have an impact on the health when he/she enters adolescence and adulthood.

The reason that causes childhood obesity is poor diet. Another reason is that our busy industrialized and business society makes parents busy at work. As a result, people mostly eat out. What's more, we have more processed food nowadays and some children are brought up by their grandparents. Unknowingly, children have more salty, oily and overly sweetened food. On the other hand, families now have less parent-child interaction time. Furthermore, due to smaller living spaces in the city, we perform more stationary activities nowadays. For example, watching TV and gaming has become our main leisure activities. People nowadays perform fewer physical activities and have unbalanced diets, causing children to become used to having too much high-calorie food, oily and salty food and overly sweetened beverages. These are the factors that lead to childhood obesity.

In the "Obesity Prevention Strategy in Taiwan" established by the Health Promotion Administration, MOHW, it is mentioned that since children spend most of their time at school, the structural environment at school is helpful in quickly improving students' diet and physical activity habits. With the improvement of dining environment, food provision and physical activity environment, schools provide relative health promotion education to correct students' deviation regarding dietary and physical activity habits. Meanwhile, we suggest that parents take effective behavior intervention methods, such as monitoring, control of temptation, change of dieting process, support and encouragement as well as cognitive restructuring. These will help children cultivate a good lifestyle and diet.

It is the responsibility of parents and schools to cultivate correct concepts and habits with respect to their diet for children. With education, promotion and actual adjustment and change in life, children can cultivate the correct diet when they are little. This is the only way to construct a foundation for health.

III. The misuse of electronic products may result in children's nearsightedness and cause problems of children's sleep quality, learning and concentration abilities. What's worse, it may lead to the development of obesity.

With the development of technology, it has become inevitable for us to use electronic products. According to the "2019 Investigation Report of Social Media Use for Children and Teenagers"⁵⁴ conducted by the Child Welfare League Foundation, the average age for a Taiwanese child to have a cell phone is 10.1 years old, and 87% of children and teenagers

54 Children's Welfare Alliance-2019 survey report on the use of social software by children: <https://reurl.cc/x0eMD4>

have a social media account. On average, every child has 3.8 social media accounts. According to the “Electronic Device Use for Children”⁵⁵ survey conducted by PCALT , it is found that 65% of interviewed parents stated their children studying in the elementary school have their own electronic devices. These show how common electronic devices have become among children.

However, the misuse of electronic products in one’s childhood will bring about significant physical and mental impacts on children. A minor impact is directly affecting children’s time management and study. While a major impact, it may affect children’s social and family life. What’s worse, the addiction may cause the development of diseases. In 2018, the WHO has announced that “Gaming Disorder” officially became a mental disorder. Relative domestic/international literature and studies suggest that the misuse or overuse of electronic products has an impact on children’s health. It not only causes nearsightedness but also affects children’s sleep quality, learning and concentration abilities and may lead to the development of obesity. From statistics and research, we also find that 80% of the children with Internet and electronic device addiction were diagnosed with ADHD. In addition, the number of children seeking medical services for nearsightedness gradually increases every year. If control and prevention measures are not performed, the risk for them acquiring macular degeneration, glaucoma, cataract and retinal detachment will be high when they enter adulthood.

However, in this digital era, it is impossible to completely forbid children from using electronic products. Instead we should consider, how can parents help and manage children to use electronic products? It is also important to manage how and when to use electronic products. When using a mobile or tablet, proper rest, proper use distance, and proper lighting environment all help reduce the impact of using electronic products.

This White Paper aims to promote a healthy environment for children and instill a healthy lifestyle when they are young and help build the framework for an entire lifetime of healthy habits. Those issues which arise in the White Paper also echo the government’s policy. As a thought leader in Child Protection areas, PCALT will keep demonstrate our commitment to the society responsibility and arise public awareness of children’s health problems and child protection issues through different initiatives and create a vision of societal happiness. To help Taiwan’s Children live better, with healthier lives

⁵⁵ Survey time 2020/09/23 (Wednesday) 18:00 - 2020/10/04 (Sun) 23:59, the Prudential Life online questionnaire "Children's 3C Use Survey", Btheeffective sample number is 1,019, after excluding college students' parents, a total of 774 copies.