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Socioeconomic Factors of Childhood Obesity and Family Intervention Models

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Abstract: Childhood obesity is a global public health challenge, with a significant increase in obesity rates in developing countries such as China. This paper focuses on the socioeconomic factors influencing childhood obesity and family intervention models. Socioeconomic dimensions such as family income, parental education level, and living environment affect children's dietary and physical activity behaviors through multiple mechanisms, resulting in differences in obesity rates among different groups. Family intervention measures are key to coping with childhood obesity, covering nutrition education, promotion of physical activity, and behavioral change. Although these measures have certain effects on weight management in the short term, long-term maintenance and promotion face challenges such as resource limitations and low parental participation. This paper emphasizes that the prevention and control of childhood obesity require multisector cooperation, community participation, and making supportive policies to improve the overall environment. Future research should focus on personalized intervention, the application of digital health technologies, long-term effect evaluation, and exploration of early life stages and genetic factors to provide scientific evidence for prevention and control of childhood obesity.

Keywords: Obesity; Children; Family Intervention.

1. Introduction

Childhood obesity is one of the most serious global public health crises of the 21st century. Over the past four decades, the obesity rates of global children and adolescents have continued to rise, with particularly significant growth in middle-and low-income countries, this reflects the impact of economic development on traditional diets and lifestyles, leading to an increase in childhood obesity rates, it is not only a health issue but also a development challenge. Childhood obesity has far-reaching consequences, in the short term, it causes problems such as respiratory and bone and joint issues as well as psychological distress, over the long term, it will cause various chronic diseases in adulthood, putting pressure on national healthcare systems, it on public health is important, and intervention is urgently needed. Childhood obesity is influenced by multiple factors including genetics, physiology, and behavior, among which socioeconomic status is a key factor, its mechanism of action is complex and varies by the stage of a country's development. The family is the core environment for children's growth, and parents' behaviors and parenting styles directly affect children's health. Family intervention models are considered effective approaches to coping with childhood obesity. This paper conducts a systematic review on the socioeconomic factors influencing childhood obesity, critically analyze the theoretical basis, application, effectiveness, and challenges of family intervention models, and provide scientific evidence for making more targeted, fair, and sustainable strategies for the prevention and control of childhood obesity.

2. Epidemiology and Current Situation of Childhood Obesity

2.1. Global and Regional Epidemic

The global epidemic of childhood obesity is alarming. Over the past few decades, the rates of overweight and obesity among children and adolescents have been continuously rising worldwide, especially in middle-and low-income countries, where the growth trend is notable. This phenomenon is closely related to the rapid economic development and urbanization in these countries. In the early stages of economic development, obesity was once regarded as a sign of affluence because higher income meant access to more high-energy-density foods. However, as the economy further develops, this epidemiological pattern is changing, with the burden of obesity gradually shifting from high socioeconomic groups to low socioeconomic groups, which is similar to the epidemiological transition experienced in developed countries. This shift suggests that as economies grow, a pervasive "obesogenic environment" begins to emerge, subsequently, with the improvement of health awareness among high socio-economic groups, the obesity begins to prevail among low socioeconomic groups who have easier access to cheap, high-energy-density foods and lack healthy lifestyle.

China, as the world's largest developing country, the trend of childhood obesity is particularly worrying. According to data from 2020, the rate of overweight and obesity among 6-17-year-old boys in urban areas of China has reached 19%, reflecting the severe public health challenges faced during rapid economic development. This data not only highlights the urgency of the issue but also foretells the potential for significant health and socioeconomic burdens in the future. The evolution of this epidemiological pattern requires us to not only focus on the obesity rates but also to deeply understand the underlying socioeconomic drivers in order to develop more forward-looking and targeted intervention strategies[1].

2.2. Health Risks of Childhood Obesity

The health risks associated with childhood obesity are

extensive and far-reaching, affecting not only physical health but also psychological and social development. In the past, many chronic diseases related to obesity were considered exclusive to adulthood, but now they are increasingly being diagnosed in childhood and often present more severe symptom and treatment difficulties [2].

In physical health, childhood obesity significantly increases the risk of various chronic diseases, including:

Metabolic diseases: The age at onset of type 2 diabetes (T2DM) is moving up, the prevalence rate of non-alcoholic fatty liver disease (NAFLD) is rising, and there is an increase in metabolic syndrome such as dyslipidemia and hypertension. The early appearance of these diseases means that children will be exposed to pathological physiological states for a longer time, potentially leading to more severe complications and poorer physical condition in adulthood.

Cardiovascular diseases: Obese children are more prone to early symptoms of cardiovascular diseases such as hypertension, dyslipidemia, and atherosclerosis, increasing the risk of cardiovascular diseases in adulthood.

Skeletal and joint problems: Excessive weight imposes an added burden on bones and joints, may lead to orthopedic issues such as slipped epiphysis, genu varum, and flat feet.

Respiratory problems: Sleep apnea hypopnea syndrome is more common in obese children, which may affect sleep quality and cause sleeplessness.

In addition to physical health problems, childhood obesity also has significant impacts on psychological health of children:

Mental health problems: Obese children often suffer from discrimination and bullying due to their appearance, leading to low self-esteem, poor body image, depression, and anxiety. These psychological distresses not only affect children's emotional health but may also hinder their normal social development and academic performance. Obese children may have difficulty participating in peer activities due to physical limitations, leading to social isolation and further exacerbating psychological burdens.

Therefore, coping with childhood obesity is not only to improve current health conditions but also to guarantee their quality of life.

3. Impact of Socioeconomic Factors on Childhood Obesity

The occurrence and development of childhood obesity are profoundly influenced by a complex array of socioeconomic factors, these factors do not exist in isolation but are interwoven, collectively shaping an environment that may either promote or inhibit childhood obesity, understanding these mechanisms is crucial for making targeted and equitable intervention strategies.

3.1. Family Income and Education Level

Family income and parental education level are two core socioeconomic indexes that affect childhood obesity. In developed countries, a negative correlation is typically observed between income and education level and childhood obesity, it means that the lower the income and education level, the higher the rate of childhood obesity. However, in middle-and low-income countries, this relationship may be more complex, in the early stages of economic development, higher socioeconomic status may be associated with higher obesity rates, but this relationship reverses later. This "transitional" pattern suggests that the drivers of obesity evolve as countries develop. Initially, obesity may be related to energy-dense foods, but later it is more associated with food quality and the living environment, low socioeconomic groups are more vulnerable to obesogenic environments[3].

Specifically, lower family income directly limits the ability of families to purchase healthy foods. Nutritious foods such as fresh fruits, vegetables, whole grains, and lean meats are usually more expensive than processed foods, sugary drinks, and fast food. This makes low-income families more likely to choose cheap, high-energy-density, and low-nutrient foods to meet their daily energy needs. Additionally, lower parental education levels are often associated with a lack of health knowledge, leading to insufficient understanding of nutrition guidelines, and a lack of resources in creating a healthy environment for children. Educational differences may also affect parents' access, understanding, and adoption of health information, thereby influencing their parenting practices and family health behaviors. Therefore, education plays a important role in health education, and its absence becomes a significant risk factor.

3.2. Living Environment, Food Accessibility, and Community Resources

The living environment in which children reside has a decisive impact on their dietary and physical activity patterns. In socioeconomically disadvantaged areas, the phenomenon of "food deserts" is common, where healthy, fresh food options are scarce, while cheap, unhealthy processed foods and fast-food restaurants are abundant. These areas are often full of extensive marketing of unhealthy, high-energy-density foods, further shaping residents' food choices. This environment makes it difficult for even families with good intentions to obtain or afford nutritious foods.

Furthermore, low-income communities often lack safe and accessible sports facilities such as parks, playgrounds, and community sports centers. If the outdoor environment is unsafe or lacks special activity spaces, children's opportunities for physical activity will be greatly reduced, leading to increased sedentary behavior. The existence of such an "obesogenic environment" means that individual choices are largely constrained by structural factors. This is not merely a matter of individual willpower but a systemic barrier to healthy living faced by certain socioeconomic groups. When healthy foods are expensive or difficult to obtain, and safe activity spaces are scarce, even the most motivated families find it challenging to adopt and maintain healthy behaviors. This creates a vicious cycle where socioeconomic disadvantage is transformed into environmental disadvantage, thereby exacerbating the problem of childhood obesity[4].

3.3. Cultural Background, Lifestyle and Parenting Practice

Cultural background, traditional lifestyle and parenting practice also have a significant impact on the occurrence and development of childhood obesity. In some cultures, chubby children are regarded as a symbol of health, wealth or good care, and this traditional belief may cause parents to do not realize their children's overweight or obesity, thus delaying or resisting early intervention. This cultural belief may become an important obstacle to identifying and coping with childhood obesity, highlighting the need for cultural sensitivity in health education, promoting evidence-based

health practices while respecting traditions[5].

In addition, the lifestyle and parenting practices within the family also have a direct impact on children's weight condition. Parents' own obesity, unhealthy eating habits, lack of physical activity and excessive screen use time can influence children's behavior patterns. For example, if parents often consume high-fat and high-sugar foods or spend a long time in watching TV or playing with mobile phones, children are likely to imitate these behaviors. Unhealthy feeding practices, such as overfeeding, using food as a reward or punishment, may also lead to children's eating disorders and weight gain. These family-level deciding factor create an obesogenic environment within the family, making it easier for children to develop unhealthy habits.

3.4. Social Stratification and Health Disparities

The interaction of the above-mentioned socioeconomic factors ultimately leads to significant health disparities in childhood obesity; disadvantaged groups bear a disproportionate burden of the disease. When a family faces low income, low education level, limited access to healthy food and unsafe living environment simultaneously, these factors do not simply add up but interact to form a synergy, greatly amplifying the risk of obesity. This makes childhood obesity not only a medical issue but also a profound social equity issue.

Table 1. Influence mechanism of major socioeconomic factors on childhood obesity

socioeconomic factor	main influence mechanism	specific influence on childhood obesity
household income	restrict the purchasing power of healthy food	intake of high energy density and low nutrient foods is increased, sports activities is increased
parents' educational level	lack of health knowledge and skills, lack of health literacy	unhealthy eating habits and parenting practices, low participation in sports activities
living environment	lack of safe sports activity space, inconvenient transportation	sports activities are reduced, outdoor activities are restricted
food accessibility	"food desert" phenomenon, widespread unhealthy food marketing	insufficient intake of healthy food, intake of high sugar and high-fat foods is increased
community resource	lack of community health projects and facilities	cannot obtain health education and support; limited opportunities for sports activities
cultural background	traditional ideas, specific eating habits	insufficient awareness of obesity; high-energy food intake; improper feeding method

From the perspective of social justice, the ability of certain groups to obtain and maintain health is systematically restricted, which is unacceptable. Therefore, effectively solving childhood obesity requires not only medical intervention but also broad social change to reduce social inequality and promote health equity. It means that policymakers and public health professionals must recognize that the root of childhood obesity often lie in deeper socioeconomic structures rather than individual behavioral choices.

4. Theoretical Foundation and Practice of Family Intervention Models

Given the central role of the family in children's growth and behavior shaping, family intervention models are widely recognized as a key strategy in coping with childhood obesity. These interventions are generally based on the theories of behavioral science and health psychology, aiming to promote healthy weight in children by changing the family environment and behavioral patterns.

4.1. Nutrition Education and Dietary Management Strategies

Nutrition education is a core component of family intervention, aiming to enhance the nutritional knowledge and dietary management skills of family members, its principles include promoting balanced diets, controlling portion sizes, choosing healthy foods, and understanding food label information. Effective nutrition education is not merely about imparting knowledge but also emphasizes the development of practical skills and the role of parents as role models. For instance, teaching parents how to read nutrition labels, identify foods with high sugar, salt, and fat, and prepare healthy meals at home.

It is crucial that nutrition education is highly culturally adapted and individualized. Considering the diverse cultural backgrounds, economic conditions, and eating habits of different families, one-size-fits-all educational methods are often ineffective. For example, recommending expensive organic foods to low-income families is impractical. Therefore, effective nutrition education needs to be adjusted according to the specific circumstances of each family, focusing on economically feasible healthy food choices and integrating local dietary cultures to ensure its relevance and feasibility. As the primary decision-makers in family food procurement and preparation, parents' active participation and behavioral changes in nutrition education are crucial for children to develop healthy eating habits [6].

4.2. Physical Activity and Intervention of Sedentary Behaviors

Physical activity and intervention of sedentary behaviors are another important pillar of family intervention. These strategies aim to increase children's daily physical activity levels and reduce sedentary behaviors such as watching TV and playing mobile games. Interventions usually include encouraging active exercise, setting screen time limits, and creating a positive family exercise environment.

Parents play a key role as role models in promoting children's physical activity. If parents are actively involved in physical activities, children are more likely to develop exercise habits. Moreover, providing children with safe and accessible play opportunities is crucial. This directly echoes the importance of community resources discussed above in socioeconomic factors. If the community lacks parks, playgrounds, or sports facilities, families, even with the best intentions, may find it difficult to effectively promote children's outdoor activities. Therefore, family intervention need to be combined with community environmental support

to achieve the best results. By encouraging family members to participate in physical activities together, not only can children's energy expenditure be increased, but also parent-child relationships can be strengthened and a positive lifestyle can be cultivated.

4.3. Behavior Change and Psychological Support

Behavior change are key tools in family intervention for promoting the formation and maintenance of healthy habits, it includes goal setting, self-monitoring, positive reinforcement, etc. For example, families can jointly set specific and measurable physical activity goals (such as walking for 30 minutes every day) and monitor their activities through activity logs. When children achieve their goals, parents should give positive verbal praise to reinforce their healthy behaviors[7].

Parent training is crucial in behavior change interventions because parents are the main drivers of behavioral change within the family. Through training, parents can learn how to effectively apply these behavior management skills, how to deal with children's possible resistance during the behavior change process, and how to create a supportive environment for children. Furthermore, providing psychological support to both children and parents is also very important. Obese children may face psychological issues such as low self-esteem and anxiety, while parents may feel stressed when managing their children's weight and dealing with challenges. Psychological counseling and support groups can help them manage emotional distress, enhance coping skills, and thus better participate in and adhere to intervention programs.

4.4. Construction and Application of Multi-component Comprehensive Intervention Model

Given the complexity of childhood obesity problem, single intervention methods often fail to achieve long-term and comprehensive effects. Therefore, multi-component comprehensive intervention model is considered more effective approaches, integrating nutrition education, physical activity, and behavioral change strategies. This comprehensive approach can simultaneously intervene in children and families from multiple dimensions such as diet, exercise, and behavioral habits, thereby coping with obesity more comprehensively.

For instance, "Family Healthy Weight Program" is a typical multi-component comprehensive intervention model, which may include regular family health education sessions, personalized dietary guidance from nutritionists, exercise program suggestions from sports coaches, and behavioral counseling from psychologists. By integrating these different components, the intervention plan can more comprehensively meet the needs of families and promote more sustainable behavioral changes. The superiority of multi-component intervention lies in its recognition that obesity is the result of the interaction of multiple factors such as energy intake and expenditure imbalance, behavior, environment, and genetic, therefore, multi-component intervention model for childhood obesity can produce synergy, thereby achieving more significant and lasting weight management effects.

4.5. Crucial Role of Parental Involvement in Interventions

Parental involvement is the cornerstone of the success of all family intervention models. Children's growth environment and behavioral patterns are largely influenced by their parents. Parents are not only examples of their children but also decision-makers and executors in family food procurement, meal preparation, sports activity arrangements, and screen time management, their active participation and commitment are crucial for the formation and maintenance of children's healthy behaviors[8].

Parental involvement is not merely about following the instructions of the intervention plan; more importantly, it is to bear the responsibility and to create a supportive family environment for their children. It means that parents need to understand and agree with the importance of healthy lifestyle, be willing to invest time and effort in changing family habits, and continuously support and encourage their children. Without the active participation of parents, any interventions for children may be difficult to bring about lasting changes in the family environment. Therefore, intervention designs must aim to empower parents, making them active drivers of family health change rather than passive recipients of information.

Table 2. Common family intervention models and their core elements and goals

intervention mode	core element	main objective
nutrition education and dietary management	dietary guidance, food selection, portion control, food label interpretation	improve dietary structure and enhance nutritional knowledge
physical activity and sedentary behavior intervention	reduce sedentary time and engage in physical activities	enhance energy consumption and develop exercise habits
behavioral change and psychological support	goal setting, self-monitoring, proactive reinforcement, occasional management, parent training	develop healthy habits and enhance self-efficacy
multi-component comprehensive intervention	integrate diet, exercise, behavioral, family health plan	realize weight management and promote healthy lifestyle

5. Effect Evaluation and Challenges of Family Intervention Models

5.1. Comparison of Different Intervention Models

Family intervention models show varying degrees of effectiveness in managing childhood obesity. Generally, multi-component comprehensive intervention models are usually more effective than single-component ones (such as those focusing only on diet or only on physical activity), especially in short-term weight loss. It reflects the complexity of obesity itself, as it is the result of the combined effects of diet, physical activity, psychological, and social environmental factors. Therefore, a comprehensive approach that can cope with these interrelated factors simultaneously is more likely to bring about significant and lasting changes.

However, although multi-component interventions have

achieved success in the short term, maintaining weight loss in the long term remains a major challenge. Many studies have shown that after the intervention ends, children and families are often unable to maintain the weight management achievements they have made, weight regain. It suggests that the interventions may not have solve the persistent environmental pressures that contribute to obesity or fails to develop the intrinsic motivation and self-efficacy necessary to sustain healthy behaviors after the intervention period[9].

5.2. Long-Term Effect and Sustainability

Achieving and maintaining long-term effect in childhood weight management is a complex issue influenced by multiple factors. Compliance is key; if families cannot consistently follow the intervention plan, the effects are unlikely to last. Family support is crucial, it means that family members need to work together to incorporate healthy eating and physical activity into their daily lives and support each other in facing challenges. Furthermore, changes in the external environment have a decisive impact on long-term sustainability. Even if healthy habits are formed within the family, if the external environment (such as lack of safe activity spaces or abundance of unhealthy food advertisements) continues to pose obstacles to healthy behaviors, maintaining these habits will become extremely difficult. It highlights the limitations of family interventions, they cannot independently play a role away from the broader social and policy environment. In order to achieve sustainable change, the efforts of families must be gain support from communities and policy environments, creating a synergy, and makes healthy choices easier and more choices.

5.3. Obstacles and Challenges During Implementation

During the implementation of family intervention models, there are numerous obstacles and challenges, these obstacles often disproportionately affect the socioeconomically disadvantaged groups who need intervention the most.

Insufficient resources: Many families face economic pressures and cannot afford healthy food or the costs of participating in intervention programs. Moreover, intervention programs themselves may also be constrained by funding and personnel, making it difficult to provide adequate support.

Time constraints: For parents in low-income families, long working hours and multiple responsibilities often cause them to lack the time and energy to participate in intervention programs.

Low parental motivation or participation: Some parents may have insufficient awareness of the dangers of childhood obesity or lack the motivation and confidence to make changes. Cultural differences, language barriers, or distrust of the medical system may also lead to low parental participation.

Cultural barriers: Traditional beliefs (such as "chubby is healthy"), specific dietary habits, and parenting styles may conflict with intervention recommendations, making it difficult for families to accept or follow the interventions.

Difficulties in promotion and scaling: Even effective intervention programs may face challenges in large-scale promotion, these are often related to issues such as resources, personnel training, and local adaptability.

These challenges are rooted in socioeconomic disadvantages, making it harder for the most vulnerable groups to obtain and adhere to interventions, thereby exacerbating childhood obesity problem.

5.4. Cultural Adaptability and Equity Considerations

When designing and implementing family interventions, cultural adaptability and equity are crucial considerations. An intervention may be effective in one cultural background but ineffective or even counterproductive in another cultural background. Cultural adaptability involves a deep understanding and integration of community values, beliefs, traditional customs, and lifestyles. For instance, dietary advice needs to take into account local traditional foods and cooking methods. Ignoring cultural nuances may lead to low participation, poor compliance, and ultimately widen health disparities, because the interventions may only be effective for those meet mainstream cultural norms.

Equity demands that interventions can effectively reach and serve families from all socioeconomic and cultural backgrounds, especially those vulnerable groups most affected by obesity. It means that intervention design must fully consider the specific needs and challenges of different groups, provide flexible service models, and remove participation barriers. For example, providing free or subsidized services, implementing interventions within the community, and adopting culturally sensitive communication methods. By co-designing interventions with the community rather than merely designing for them, the relevance, acceptability, and effect of the intervention can be ensured, thereby promoting health equity.

Table 3. Challenges and coping strategies during the implementation of family intervention models

challenge	concrete manifestation	coping strategy
insufficient resources	economic burden, insufficient project funds	provide free or subsidized services, seek fund support
time limit	parents have long working hours and heavy family responsibilities	flexible intervention schedule, online intervention
lack of parental motivation	lack of awareness, confidence, and willingness to change obesity	motivational interview, provide peer support; emphasize gradual progress
cultural barrier	conflict of traditional ideas, differences in dietary habits	cultural sensitivity training, community participatory design
difficulties of long-term maintenance	behavioral rebound, lack of continuous support	build support network, strategies for integrating into daily life

6. Policy Suggestions

6.1. Policy Making

To effectively cope with the complex public health challenge of childhood obesity, it is insufficient to rely solely on family-level interventions, a systematic, multi-level approach is necessary, multiple policies need to be made to coping with childhood obesity, and create an "empowering environment" that promotes healthy choices. Such an environment reduces the burden on individual willpower and effectively ease health inequalities caused by socioeconomic disparities[10].

Specific policy suggestions include:

Promoting a healthy food environment: Implement subsidy policies for healthy foods to make them more affordable for low-income families. Moreover, strictly limit unhealthy food marketing for children, especially in schools and media. Develop and enforce school nutrition standards to ensure healthy meal options in schools.

Improving the physical activity environment: Invest and maintain safe, accessible public parks, playgrounds, and community sports facilities, particularly in socio-economically disadvantaged areas, encourage urban planning to incorporate walking and cycling into daily commutes, creating an "active city" environment.

Integrating health education: systematically incorporate nutrition and physical activity education into school curricula and cultivate children's health knowledge and skills from an early age.

These policies aim to fundamentally cope with childhood obesity by changing the external environment.

6.2. Cross-sector Collaboration and Community Engagement

The determinants of childhood obesity cover multiple fields, including health, education, urban planning, social welfare, agriculture, and the food industry. Therefore, approaching this challenge requires breaking down traditional departmental barriers and building genuine cross-sector collaboration mechanisms. For instance, the health department can provide professional guidance and clinical services, the education department can be responsible for school health education and physical education, the urban planning department can design urban spaces conducive to physical activity, and the social welfare department can offer economic help and family support. Isolated departmental are limited in coping such complex, interrelated issues.

Furthermore, active community participation is crucial to ensure the intervention. Community residents are the best understanders of their own needs, and their involvement can ensure that interventions meet local specific needs and preferences. By establishing community committees, conducting community health promotion activities, and training community health workers, childhlood obesity problrm can be more easily solved. Only through coordinated cross-sector efforts and in-depth community participation can truly comprehensive and effectiver strategies for preventing and controlling childhood obesity be made.

7. Future Research Direction

Despite significant progress in stduying the socioeconomic factors of childhood obesity and family interventions, there are still many critical areas that require in-depth exploration in future research to enhance the precision and sustainability of interventions:

Personalized Interventions: Given the diversity and complexity of childhood obesity, future research should explore how to develop more personalized intervention programs based on individual physical condition, behavioral characteristics, socioeconomic condition, and cultural preferences.

Digital Health Technologies: Fully utilize mobile applications, online platforms, wearable devices, and artificial intelligence to expand the coverage of interventions, improve compliance, and achieve more precise personalized support.

Long-Term Follow-Up Studies: Conduct longer-term follow-up studies to assess the long-term effects and sustainability of different intervention models and identify key factors influencing weight maintenance.

Cost-benefit Analysis: Conduct rigorous cost-benefit analyses of different intervention strategies to guide the rational allocation of limited public health resources, ensuring that interventionS are not only effective but also economically feasible and promotable.

Genetic factors and environmental interaction: Further explore the role of genetic factors in childhood obesity and the complex interaction between genetics and socioeconomic environment to provide basis for more precise prevention and intervention of childhood obesity.

8. Conclusion

Childhood obesity has become a global public health crisis, the continuous rise in its prevalence poses a serious challenge to the children's health, social well-being, and national economy. This paper studies the current epidemiological status of childhood obesity, and reveals the crucial roles of socioeconomic factors such as family income, parental education levels, living environment, food accessibility, community resources, and cultural background. These factors are not isolated but interwoven, collectively shaping the "obesogenic environment" of children, leading to significant health inequalities among different socioeconomic groups.

Given the central role of families in shaping children's behaviors, family intervention models focusing on nutrition education, promotion of physical activity, behavior change, and multi-component comprehensive interventions are considered important strategies to cope with childhood obesity. While these interventions have shown some short-term success in weight management, they face numerous challenges in maintaining long-term effects and widespread application, including resource limitations, insufficient parental engagement, lack of cultural adaptability, and the persistent pressure of the obesogenic environment. It suggests that efforts at the individual and family levels are not enough.

Therefore, this paper believes effectively coping with childhood obesity requires a multi-level and integrated strategy. This not only requires continuous support and empowerment of families to help them establish and maintain healthy lifestyles but also calls for various supportive policies to improve the overall social environment. This includes promoting a healthy food environment, enhancing access to physical activity spaces, and integrating health education into school curricula. Moreover, cross-sector collaboration and broad community participation are keys to achieving these policy goals.

Ultimately, solving childhood obesity is a social

responsibility that transcends individual responsibility, requiring coordinated efforts at the individual, family, community, and policy levels, to eliminate systemic barriers that lead to childhood obesity. Future research should continue to explore personalized interventions, digital health technologies, and cost-benefit analyses to provide a scientific basis for more precise and sustainable strategies to prevent and control childhood obesity. Through continuous research, policy-making, and multi-party collaboration, we can effectively reverse the epidemic trend of childhood obesity, promote health equity, and create a healthier future for the next generation.

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