

Major conditions strategy – interventions in childhood - a life course approach.

A summary of evidence.

June 2023

Introduction.

Many adult conditions have their origins in childhood either through exposure to health determinants (which may have positive or negative effects) or lifestyles (often relating to the behaviours within their family or local communities). While exposures to various health determinants and lifestyles may not be causative of the adult condition there is epidemiological evidence that they contribute to the development of both health and disease. Considering interventions in adulthood for adult conditions undermines the potential for intergenerational improvements in health based on improving the health of children working closely with their parents and the communities in which they grow, play, live and work.

An understanding of life course pathway epidemiology^{1*} to understand the development of disease or resilience. A biologically plausible pathway starts with an individual being **predisposed** through genetic, biological or social factors, but only when exposed to determinants does that individual become **vulnerable** to a particular **health condition**. Further exposures relating to the physical or social environment then precipitate a health condition. Further exposures to health determinants (including access to health care) determine whether the health condition develops **comorbidities** that in turn leads to **disability** and potential **disadvantage**.

¹ *life course epidemiology as ‘the study of long-term biological, behavioural and psychosocial processes that link adult health and disease risk to physical or social exposures acting during gestation, childhood, adolescence, earlier in adult life or across generations’.¹

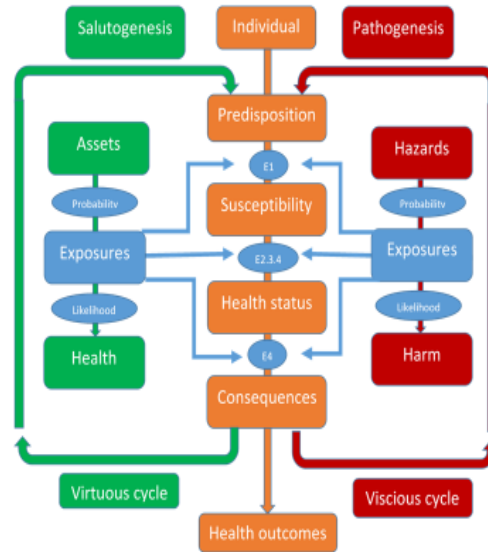


Diagram representing the Diagram1: interaction between exposures to hazards and assets throughout the life course pathway on health outcomes.

While the majority of medicine studies exposure to hazards that have the potential to cause ill health, disease or conditions, it is equally important from an epidemiological perspective to consider exposure to assets that have the potential to create health, resilience and well-being.

While there may not be an immediate connection between cancer, cardiovascular disease and dementia there is epidemiological evidence that early nutrition, early life experience, sub optimal development often relating to poverty casts a long shadow throughout life for those individuals deprived of the ideals often encapsulated in human rights. Reference: Marmot Institute of Health Equity².

For that reason four additional policy elements have been added to the list of adult conditions namely low birth weight, school readiness, obesity and educational attainment which to a greater or lesser degree result from the combined exposures of health determinants and lifestyles through the period of childhood.

The conditions

- cancers
- cardiovascular disease, including stroke and diabetes
- chronic respiratory diseases
- dementia

² <https://www.instituteofhealthequity.org/home>

- mental ill health
- musculoskeletal disorders

Extras for childhood

- low birth weight
- school readiness
- obesity
- school achievement

Cancers

The evidence base for interventions specifically targeting all forms of cancer in pregnancy and childhood is limited, however there is a consensus that the following determinants operate throughout the pregnancy and childbirth.

1. Maternal lifestyle factors:

- Maternal smoking during pregnancy has been associated with an increased risk of childhood cancer. Therefore, smoking cessation during pregnancy is advised to reduce this risk. (Reference: Windham et al., 2013)
- Maintaining a healthy weight before and during pregnancy is also important, as maternal obesity has been linked to an increased risk of certain childhood cancers. (Reference: Schüz et al., 2015)

2. Breastfeeding:

- Breastfeeding has been associated with a reduced risk of childhood leukemia, particularly acute lymphoblastic leukemia (ALL). Exclusive breastfeeding for the first six months of life is recommended. (Reference: Martin et al., 2007)

3. Healthy lifestyle habits: Encouraging a healthy lifestyle throughout childhood can contribute to reducing the risk of cancer in adulthood. This includes promoting regular physical activity, a balanced diet rich in fruits and vegetables, and limiting alcohol consumption. (Reference: World Cancer Research Fund/American Institute for Cancer Research, 2018)

4. Vaccinations:

- The human papillomavirus (HPV) vaccine is recommended to prevent cervical, anal, and oropharyngeal cancers later in life. Vaccination should be initiated before teenagers, both male and female, become sexually active. (Reference: Markowitz et al., 2021)
- Hepatitis B vaccination in infancy reduces the risk of liver cancer. (Reference: Chang et al., 2009)

5. Environmental exposures:

- Minimizing exposure to known **carcinogens** during pregnancy and childhood is important. This includes reducing exposure to secondhand smoke, limiting exposure to radiation and avoiding unnecessary exposure to chemicals with potential carcinogenic properties. (Reference: GBD 2019 Risk Factors Collaborators, 2020). Exposure to nanoparticles particularly relating to plastic degradation requires further exploration.
- **Sun protection:** Childhood sun exposure and sunburns are known risk factors for skin cancer. Encouraging sun-protective measures such as using sunscreen, wearing protective clothing, and seeking shade can help reduce the risk of skin cancer in adulthood. (Reference: Whiteman et al., 2016)

References:

- Anderson LM, et al. (2009). Environmental tobacco smoke and fetal health: Systematic review and meta-analysis. *Archives of Pediatrics & Adolescent Medicine*, 163(7), 635-641.
- Windham GC, et al. (2013). Maternal smoking, demographic, and lifestyle factors in relation to daughter's age at menarche. *Paediatric and Perinatal Epidemiology*, 27(4), 373-380.
- Schüz J, et al. (2015). Obesity and risk of cancer in children and adults: Results from the CONCORD-2 study. *Cancer Epidemiology*, 39(5), 714-721.
- Martin RM, et al. (2007). Breast-feeding and childhood cancer: A systematic review with metaanalysis. *International Journal of Cancer*, 120(4), 871-875.
- Markowitz LE, et al. (2021). HPV vaccination recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Recommendations and Reports*, 70(4), 1-29.
- GBD 2019 Risk Factors Collaborators. (2020). Global burden of 87 risk factors in 204 countries and territories, 1990-2019: A systematic analysis for the Global Burden of Disease Study 2019. *The Lancet*, 396(10258), 1223-1249.
- Chang MH, et al. (2009). Long-term effects of hepatitis B immunization of infants in preventing liver cancer. *Gastroenterology*, 137(3), 863-869.
- Whiteman DC, et al. (2016). Association of childhood sun exposure with risk of melanoma and nonmelanoma skin cancer. *JAMA Dermatology*, 152(9), 979-985.
- World Cancer Research Fund/American Institute for Cancer Research. (2018). Diet, Nutrition, Physical Activity and Cancer: a Global Perspective. Continuous Update Project Expert Report.

Cardiovascular disease, including stroke and diabetes

Individual and genetic factors also play a significant role in determining an individual's risk potential for genomic prediction of risk.

1. Maternal lifestyle factors:

- Maintaining a healthy weight before and during pregnancy is important, as maternal obesity is associated with an increased risk of CVD and diabetes in offspring. (Reference: Whitaker et al., 2008)
- Promoting a healthy diet during pregnancy, including adequate intake of fruits, vegetables, whole grains, and lean proteins, can help reduce the risk of CVD and diabetes in offspring. (Reference: Cheng et al., 2009)
- 2. Breastfeeding:**
 - Breastfeeding has been associated with a lower risk of developing CVD, stroke, and type 2 diabetes later in life. Both shorter and longer durations of breastfeeding have shown beneficial effects. (Reference: Gunderson, 2009)
- 3. Childhood lifestyle factors:**
 - Encouraging regular physical activity during childhood is important for long-term cardiovascular health. Physical activity helps maintain a healthy weight, reduces the risk of obesity, and improves cardiovascular fitness. (Reference: Andersen et al., 2006)
 - Promoting a healthy diet in childhood, emphasizing whole foods, fruits, vegetables, and minimizing consumption of processed foods and sugary drinks, can reduce the risk of CVD and diabetes later in life. (Reference: Mozaffarian et al., 2012)
- 4. Prevention of childhood obesity:**
 - Childhood obesity is a major risk factor for CVD and diabetes in adulthood. Implementing strategies to prevent and manage childhood obesity, including healthy dietary habits and regular physical activity, can significantly reduce the risk of these conditions. (Reference: Singh et al., 2008)

References:

- Whitaker RC, et al. (2008). Obesity in the first 6 months of life and risk of obesity in childhood. *Pediatrics*, 121(1), e172-e179.
- Cheng G, et al. (2009). Maternal diet and offspring's risk of cardiovascular disease. *American Journal of Clinical Nutrition*, 89(3), 907S-911S.
- Gunderson EP. (2009). Breastfeeding after gestational diabetes pregnancy: Subsequent obesity and type 2 diabetes in women and their offspring. *Diabetes/Metabolism Research and Reviews*, 25(2), 99-105.
- Andersen LB, et al. (2006). All-cause mortality associated with physical activity during leisure time, work, sports, and cycling to work. *Archives of Internal Medicine*, 166(22), 2438-2445.
- Mozaffarian D, et al. (2012). Heart disease and stroke statistics—2012 update: A report from the American Heart Association. *Circulation*, 125(1), e2-e220.
- Singh AS, et al. (2008). Tracking of childhood overweight into adulthood: A systematic review of the literature. *Obesity Reviews*, 9(5), 474-488.

Chronic respiratory diseases

Chronic respiratory diseases are influenced by various factors, including genetics, environmental exposures throughout life, and individual susceptibility.

1. Maternal lifestyle factors:

- Avoiding tobacco smoke exposure during pregnancy is crucial, as maternal smoking and exposure to secondhand smoke are associated with an increased risk of respiratory conditions in offspring. Pregnant women should be supported in quitting smoking and avoiding secondhand smoke exposure. (Reference: Burke et al., 2012)
- Reducing exposure to indoor and outdoor air pollutants during pregnancy, such as particulate matter and volatile organic compounds, may help reduce the risk of respiratory diseases in offspring. (Reference: Jedrychowski et al., 2015)

2. Breastfeeding:

- Breastfeeding has been associated with a lower risk of respiratory infections, asthma, and wheezing in childhood, which can contribute to a reduced risk of chronic respiratory diseases later in life. Both exclusive breastfeeding and breastfeeding duration have shown protective effects. (Reference: Lodge et al., 2020)

3. Prevention and management of childhood respiratory infections:

- Childhood respiratory infections, such as respiratory syncytial virus (RSV) and influenza, can increase the risk of developing chronic respiratory diseases in adulthood. Vaccination against influenza and, in certain high-risk cases, RSV, along with preventive measures like hand hygiene and avoiding close contact with sick individuals, can help reduce the burden of respiratory infections. (Reference: Collins et al., 2020)

4. Reduction of environmental triggers:

- Minimizing exposure to environmental triggers, such as indoor and outdoor air pollutants (e.g., smoke, dust, allergens), can help prevent the development or exacerbation of chronic respiratory diseases in childhood and later in life. Strategies include proper ventilation, avoidance of tobacco smoke, and reducing exposure to allergens. (Reference: Goldizen et al., 2020)

References:

- Burke H, et al. (2012). Prenatal and passive smoke exposure and incidence of asthma and wheeze: Systematic review and meta-analysis. *Pediatrics*, 129(4), 735-744.
- Jedrychowski W, et al. (2015). Prenatal exposure to fine particles and polycyclic aromatic hydrocarbons and birth outcomes: A two-pollutant approach. *International Archives of Occupational and Environmental Health*, 88(3), 343-355.
- Lodge CJ, et al. (2020). Breastfeeding and asthma and allergies: A systematic review and meta-analysis. *Acta Paediatrica*, 109(1), 8-21.
- Collins SA, et al. (2020). Respiratory syncytial virus vaccines for preventing lower respiratory tract infection in infants and young children. *Cochrane Database of Systematic Reviews*, 2020(1), CD013518.

- Goldizen FC, et al. (2020). Indoor and outdoor particulate matter and endotoxin levels in Australian schools: A systematic review. *Environmental Pollution*, 266(Pt 3), 115344.

Dementia

Dementia is a multifactorial condition influenced by a combination of genetic, environmental, and lifestyle factors throughout the lifespan. Interventions during pregnancy and childhood may contribute to reducing the risk of developing dementia later in life but the evidence base is poor due to lack of long-term epidemiological studies and intervention trials.

1. Maternal lifestyle factors:

- Maintaining a healthy lifestyle before and during pregnancy is important, as maternal health can influence the development of the fetal brain. Factors such as a balanced diet, regular physical activity, and avoiding tobacco smoke exposure may have indirect benefits for brain health in offspring. (Reference: Anstey et al., 2017)

2. Early-life education and cognitive stimulation:

- Engaging in educational activities and cognitive stimulation during childhood and adolescence has been associated with a reduced risk of dementia later in life. Higher levels of education and engaging in mentally stimulating activities, such as reading, learning musical instruments, or playing board games, have shown potential protective effects. (Reference: Livingston et al., 2020)

3. Cardiovascular health promotion:

- Several cardiovascular risk factors, such as hypertension, diabetes, and high cholesterol, are associated with an increased risk of dementia. Promoting cardiovascular health through interventions such as healthy eating, regular physical activity, and maintaining a healthy weight can help reduce the risk of both cardiovascular disease and dementia. (Reference: Livingston et al., 2020)

4. Prevention and management of brain injuries:

- Traumatic brain injuries (TBIs) have been linked to an increased risk of dementia. Taking measures to prevent TBIs, such as promoting safe environments, implementing sports safety protocols, and using protective gear, can help reduce the risk. Prompt management and appropriate rehabilitation following a TBI are also important. (Reference: Livingston et al., 2020)

References:

- Anstey KJ, et al. (2017). Fetal brain development and later cognitive outcomes. *BMC Pregnancy and Childbirth*, 17(Suppl 2), 270.

- Livingston G, et al. (2020). Dementia prevention, intervention, and care: 2020 report of the Lancet Commission. The Lancet, 396(10248), 413-446.

Mental ill health

1. Maternal mental health:

- Addressing maternal mental health during pregnancy is crucial, as maternal mental health has an impact on fetal development. Identifying and treating maternal mental health conditions, such as depression and anxiety, can have potential benefits for the child's mental health outcomes. (Reference: Field, 2010)

2. Nurturing and responsive caregiving:

- Providing nurturing and responsive caregiving during infancy and early childhood is associated with better mental health outcomes in later life. Establishing secure attachment relationships and promoting positive parent-child interactions can contribute to the child's emotional well-being. (Reference: Bowlby, 2008)

3. Early childhood interventions:

- High-quality early childhood interventions that focus on promoting social-emotional development, providing supportive environments, and addressing risk factors can have long-term benefits for mental health outcomes. Examples include early education programs and home visiting programs that support parents in their caregiving role. (Reference: Reynolds et al., 2011)

4. Prevention of adverse childhood experiences (ACEs):

- Adverse childhood experiences, such as abuse, neglect, or household dysfunction, can significantly increase the risk of mental health problems in adulthood. Preventing ACEs through efforts such as child protection policies, parenting support programs, and community-based initiatives can help reduce the burden of mental ill health. (Reference: Felitti et al., 1998)

5. Mental health promotion in schools:

- Implementing school-based mental health promotion programs that focus on building resilience, fostering social-emotional skills, and providing support can contribute to better mental health outcomes in childhood and adolescence, which may have long-term benefits for mental health in adulthood. (Reference: Patton et al., 2016)

References:

- Field T. (2010). Postpartum depression effects on early interactions, parenting, and safety practices: A review. Infant Behavior & Development, 33(1), 1-6.

- Bowlby J. (2008). Attachment and Loss: Volume 1, Attachment (3rd ed.). Basic Books.
- Reynolds AJ, et al. (2011). Early childhood intervention and adult life outcomes. *Pediatrics*, 127(5), 849-857.
- Felitti VJ, et al. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) Study. *American Journal of Preventive Medicine*, 14(4), 245-258.
- Patton GC, et al. (2016). Global patterns of mortality in young people: A systematic analysis of population health data. *The Lancet*, 387(10036), 2317-2326.

Musculoskeletal disorders

Genetics, and other lifestyle factors throughout life also play a role in the development of MSDs, maintaining a healthy lifestyle, regular physical activity, and appropriate medical care, can contribute to promoting musculoskeletal health.

1. Maternal lifestyle factors:

- Maintaining a healthy weight before and during pregnancy is important, as maternal obesity is associated with an increased risk of MSDs in offspring. Excessive maternal weight gain during pregnancy can also contribute to increased birth weight, which may affect musculoskeletal health. (Reference: Nohr et al., 2009)
- Ensuring adequate intake of calcium, vitamin D, and other nutrients during pregnancy can support optimal musculoskeletal development in the foetus. (Reference: Laskey et al., 2006)

2. Early-life physical activity:

- Encouraging regular physical activity during childhood and adolescence is crucial for musculoskeletal health. Weight-bearing activities, such as running and jumping, promote bone development and strength. Engaging in age-appropriate exercise and sports activities helps develop healthy muscles, bones, and joints. (Reference: Heinonen et al., 2015)

3. Healthy nutrition:

- Providing a balanced diet during childhood and adolescence, including adequate intake of calcium, vitamin D, and other essential nutrients, is essential for proper musculoskeletal development. Nutritional deficiencies can impair bone mineralization and increase the risk of musculoskeletal problems. (Reference: Cashman et al., 2008)

4. Prevention of injuries:

- Promoting safety measures, such as using proper protective equipment, implementing safe sports practices, and ensuring a safe home environment, can help reduce the risk of musculoskeletal injuries during childhood and adolescence. Preventing injuries can contribute to better long-term musculoskeletal health. ACL injuries in girls. (Reference: Emery et al., 2012)

References:

- Nohr EA, et al. (2009). Obesity, gestational weight gain, and the risk of becoming overweight and obese later in life. *American Journal of Clinical Nutrition*, 90(6), 1632-1638.
- Laskey MA, et al. (2006). Does maternal diet influence neonatal bone mineral content? *Acta Paediatrica*, 95(7), 734-739.
- Heinonen A, et al. (2015). Influence of physical activity on bone mass in middle-aged women: An 8-year prospective study. *Osteoporosis International*, 26(5), 1449-1457.
- Cashman KD, et al. (2008). Dietary calcium intake, vitamin D status, and bone health in postmenopausal women in rural Ireland. *Journal of Bone and Mineral Research*, 23(3), 417-422.
- Emery CA, et al. (2012). Injury prevention in child and adolescent sport: Whose responsibility is it? *Clinical Journal of Sport Medicine*, 22(6), 452-461.

Low birth weight

The evidence base for interventions to reduce LBW is extensive and evolving. Implementing an approach that addresses multiple factors, including healthcare access, nutrition, and psychosocial support, is required to achieve the best outcomes.

1. Preconception care:

- Ensuring optimal health before conception is essential. Women should receive preconception counseling, including advice on achieving a healthy weight, managing chronic conditions, such as diabetes or hypertension, and avoiding harmful substances like tobacco and alcohol. Addressing these factors can contribute to reducing the risk of LBW. (Reference: Hillemeier et al., 2008)

2. Adequate nutrition:

- Promoting a well-balanced and nutrient-rich diet before and during pregnancy is crucial for optimal fetal growth. Women should be encouraged to consume a variety of foods, ensuring adequate intake of macronutrients, such as proteins and healthy fats, as well as micronutrients, including iron, folic acid, and other vitamins and minerals. Nutritional supplementation, as recommended by healthcare providers, can also play a role in reducing the risk of LBW. (Reference: Ramakrishnan et al., 2012)

3. Prenatal care:

- Accessing early and regular prenatal care is associated with improved pregnancy outcomes, including reduced risk of LBW. Prenatal care provides opportunities for healthcare providers to monitor maternal health, manage chronic conditions, provide appropriate interventions, and offer guidance on healthy behaviors. (Reference: Kotelchuck, 2007)

4. Smoking cessation:

- Encouraging smoking cessation before and during pregnancy is crucial, as tobacco use is strongly associated with LBW. Pregnant women who smoke should receive comprehensive support, including counseling and access to cessation resources. Quitting smoking during pregnancy has shown to improve birth outcomes, including reducing the risk of LBW. (Reference: Cnattingius, 2004)

5. Addressing psychosocial factors:

- Addressing psychosocial factors, such as maternal stress, depression, and intimate partner violence, is important for promoting healthy pregnancies. Psychosocial support, counseling, and appropriate interventions can help reduce stress and improve maternal well-being, potentially contributing to a reduced risk of LBW. (Reference: Orr et al., 2002)

References:

- Hillemeier MM, et al. (2008). Preconception service utilization, risk behaviors, and preconception care. *American Journal of Obstetrics and Gynecology*, 199(2), 129.e1-129.e6.
- Ramakrishnan U, et al. (2012). Preconception nutrition intervention for adolescent girls and its effects on pregnancy and birth outcomes: A systematic review and meta-analysis. *PLoS ONE*, 7(6), e37770.
- Kotelchuck M. (2007). The Adequacy of Prenatal Care Utilization Index: Its US distribution and association with low birthweight. *American Journal of Public Health*, 97(2), 362-371.
- Cnattingius S. (2004). The epidemiology of smoking during pregnancy: Smoking prevalence, maternal characteristics, and pregnancy outcomes. *Nicotine & Tobacco Research*, 6(Suppl 2), S125-S140.
- Orr ST, et al. (2002). Psychosocial stressors and low birthweight in an urban population. *American Journal of Preventive Medicine*, 22(5),

School readiness

Several evidence-based interventions during pregnancy and early childhood have shown potential to enhance school readiness. Improving school readiness is potentially the most cost-effective intervention influencing the life course.

1. Maternal health and prenatal care:

- Promoting maternal health and providing adequate prenatal care are foundational to supporting school readiness. Maternal health factors, such as reducing stress, receiving proper nutrition, managing chronic conditions, and avoiding harmful substances, contribute to optimal fetal development. Access to prenatal care allows for monitoring maternal health and addressing any potential risks. (Reference: Giallo et al., 2015)

2. Early childhood education and childcare:

- High-quality early childhood education programs and childcare services play a vital role in preparing children for school. Enrolling children in structured learning environments that promote cognitive, social, and emotional development has been linked to improved school readiness outcomes. Programs that provide stimulating activities, engaging interactions, and supportive relationships with caregivers have shown positive effects. (Reference: Burchinal et al., 2010)

3. Parental involvement and support:

- Actively involving parents in their child's learning and development is crucial for school readiness. Providing parents with resources, information, and support on effective parenting practices, early literacy promotion, and stimulating activities can have a positive impact. Parenting programs that enhance parent-child interactions, communication, and involvement in learning activities have shown benefits for school readiness. (Reference: Sénéchal et al., 2008)

4. Language and literacy promotion:

- Promoting early language and literacy skills is key to school readiness. Reading aloud to children, engaging in conversations, and exposing them to a print-rich environment contribute to language development and literacy skills. Early literacy interventions that incorporate interactive reading strategies and promote early language skills have demonstrated positive effects on school readiness outcomes. (Reference: Mol et al., 2008)

5. Health and nutrition support:

- Ensuring children's health and nutrition needs are met is vital for optimal development and school readiness. Access to nutritious meals, regular healthcare, and screenings for developmental delays or health issues contribute to readiness for school. Nutrition interventions that address food insecurity and provide nutritional support have shown benefits. (Reference: Shonkoff et al., 2012)

References:

- Giallo R, et al. (2015). Maternal mental health in the perinatal period: Risk factors, assessment, and treatment. *International Review of Psychiatry*, 27(4), 307-322.
- Burchinal MR, et al. (2010). Threshold analysis of association between child care quality and child outcomes for low-income children in pre-kindergarten programs. *Early Childhood Research Quarterly*, 25(2), 166-176.
- Sénéchal M, et al. (2008). The effect of family literacy interventions on children's acquisition of reading from kindergarten to grade 3: A meta-analytic review. *Review of Educational Research*, 78(4), 880-907.
- Mol SE, et al. (2008). The effect of systematic early literacy interventions by child care professionals on literacy skills of preschool children: A meta-analysis. *Early Childhood Research Quarterly*, 23(4), 516-529.
- Shonkoff JP, et al. (2012). The Lifelong Effects of Early Childhood Adversity and Toxic Stress. *Pediatrics*, 129(1), e232-e246.

Educational attainment/school achievement/preparation for adult hood

Evidence-based interventions implemented during these periods can contribute to enhancing school achievement outcomes.

1. Early Childhood Education:

- Participation in high-quality early childhood education programs has consistently shown positive effects on school achievement. These programs provide structured learning environments, promote cognitive and socio-emotional development, and foster school readiness skills. Longitudinal studies have demonstrated that children who attend quality early childhood education programs tend to have better academic outcomes in later years. (Reference: Belfield et al., 2006)

2. Parental Involvement and Support:

- Active parental involvement and support play a crucial role in promoting school achievement. Engaging parents in their child's education, providing resources and support, and maintaining open lines of communication with teachers have been associated with improved academic outcomes. Parental involvement can positively influence students' motivation, behavior, and educational aspirations. (Reference: Jeynes, 2005)

3. Early Literacy Promotion:

- Promoting early literacy skills in infancy and early childhood is important for long-term academic success. Reading aloud to children, providing access to books, and

encouraging early language development have been linked to better reading abilities and language skills. Early literacy interventions that focus on phonological awareness, vocabulary development, and early reading instruction have shown positive effects on school achievement. (Reference: Bus et al., 1995)

4. Socioemotional Development:

- Promoting positive socioemotional development in early childhood has implications for school achievement. Programs that enhance social skills, emotional regulation, and self-control have been associated with better academic performance. Promoting a positive school climate and providing social-emotional learning opportunities in school settings also contribute to improved school achievement. (Reference: Durlak et al., 2011)

5. Targeted Academic Support:

- early recognition of learning difficulties and provision of targeted academic support and interventions to students at risk of falling behind can help improve school achievement. Individualized instruction, tutoring, and small group interventions focusing on specific academic areas, such as reading or math, have been shown to benefit students' academic outcomes, particularly for those who are struggling academically. (Reference: Hattie et al., 1996)

References:

- Belfield CR, et al. (2006). The High/Scope Perry Preschool Program: Cost–Benefit Analysis Using Data from the Age-40 Followup. *Journal of Human Resources*, 41(1), 162-190.
- Jeynes WH. (2005). A meta-analysis of the relation of parental involvement to urban elementary school student academic achievement. *Urban Education*, 40(3), 237-269.
- Bus AG, et al. (1995). Joint Book Reading Across Cultures: A Comparison of Surinamese-Dutch, Turkish-Dutch, and Dutch Parent-Child Dyads. *Journal of Literacy Research*, 27(4), 529-546.
- Durlak JA, et al. (2011). The Impact of Enhancing Students' Social and Emotional Learning: A Meta-Analysis of School-Based Universal Interventions. *Child Development*, 82(1), 405-432.
- Hattie J, et al. (1996). A synthesis of research on effective interventions for building reading fluency with elementary students with learning disabilities. *Remedial and Special Education*, 17(6), 315-327.

Meta-summary.

Many adult conditions including cancers, cardiovascular disease, including stroke and diabetes, chronic respiratory diseases, dementia, mental ill health and musculoskeletal disorders have their origins in childhood. To overlook the potential for improvements in adult health and well-being by ignoring the health determinants operating throughout childhood would underestimate the potential benefits of a whole life cycle approach.

Improving pregnancy outcomes, supporting early childhood development, promoting determinants that improve health and protecting children from hazards are not only the rights enshrined in the UN Convention on the Rights of the Child, but also make societal, health service and economic sense since they reduce future burdens and are generally cost effective. Of particular importance would be improving:

- birth outcomes,
- school readiness,
- physical, mental and social health
- preparation for adult hood.

Using evidence-based programmes for:

1. better nutrition, (food grown sustainably)
2. better relationships (parenting, school-based, adolescent)
3. more exercise, (active travel + access to green spaces)
4. better housing, in better communities (reduced carbon footprints)
5. reduced exposure to toxins (tobacco, alcohol, air-pollution, food related)
6. access to appropriate "early interventions"
7. education, education, education!
8. specific prevention e.g. vaccination and cancer risk