

Perspectives and Debates

Can sustainable health behaviour contribute to ensure healthy lives and wellbeing for all at all ages (SDG 3)? A viewpoint

Gloria Macassa^{1,2}

¹Department of Public Health and Sports Sciences, University of Gävle, Sweden; ²EPIUnit – Instituto de Saúde Pública, Universidade do Porto, Porto, Portugal

Abstract

Sustainable health behaviours and, specifically, eating a sustainable diet and engaging in regular physical activity are health-promoting behaviours that can simultaneously contribute to reduction of greenhouse gases which are known to contribute to climate change. Good health usually facilitates societal development, and development often promotes improved health. However, while good health may be a prerequisite for societal development, some behavioural determinants of health, such as attitudes towards the environment, and people's lifestyles and consumption patterns, can impede the sustainability of the development process in the longer term. This perspective paper argues that there is a need to rethink 21st century health promotion practices by pairing sustainability literacy with health promotion for changing dietary and physical activity behaviour patterns to improve population health and contribute to the achievement of Sustainable Development Goal 3 (to ensure healthy lives and promote wellbeing for all at all ages).

Introduction

This viewpoint paper contributes to the debate about the need for a visionary health promotion approach for sustainable health behaviours (with focus on a sustainable diet, and physical activity) as well as sustainability literacy that will have an impact on today's and future generations' health and wellbeing. Firstly, it describes the connection health promotion and sustainable development, then the concepts of sustainable health behaviours, sustainable diets and physical activity and sustainability literacy. Secondly it discusses how a sustainable diet and physical activity can be promoted within the context of sustainable development.

Health promotion and sustainable development

Health promotion which is the process of enabling people to increase control over, and to improve, their health is expected to play an important (and transformative) role in achieving sustain-

able development Goal 3 (ensure health for all and at all ages). Furthermore, health promotion as an approach, intends to alter the environmental, economic and institutional and social contexts in which decisions relating to health and well-being are made, while focus on equity and the sustainability agenda.¹⁻³ On the other hand, sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their needs.⁴⁻⁶ This development needs to take place in three interconnected areas: economic, environmental and social. The expectation is that if they are combined and the combined developments are applied in the real-world context and in real-world situations, they can create a steady base for a sustainable world which can support everybody and from which everybody can benefit.^{5,6} The first mentioned, economic sustainability, is seen as the ability of the economy to indefinitely support a defined level of economic production. It is an economy where decisions are made in the most prudent way possible with respect to the other aspects of sustainability. Furthermore, it is suggested that, when good business practices are incorporated with the social and environmental aspects of sustainability, the result is significantly more positive.^{5,6}

The second, environmental sustainability, can be defined as a "condition of balance, resilience, and interconnectedness" that "allows human society to satisfy its needs while neither exceeding the capacity of its supporting ecosystems to continue to regenerate the services necessary to meet those needs, nor by [its] actions diminishing biological diversity".⁷ The main purpose of environmental sustainability is to minimize the impact of human activities on the environment and, furthermore, to encourage the restoration and preservation of our natural habitat.⁷

Social sustainability, the other hand, is related to efforts that promote the general improvement of society. This is the aspect of sustainability that supports the concept of intergenerational justice, meaning that future generations are entitled to the same, or greater, quality of life as current generations.^{8,9} The social sustainability dimension of sustainability includes issues such as labour rights, health equity, community development via public involvement and social capital, participation, support, justice and responsibility, community resilience, cultural competence, and human adaptation. The social dimension of sustainable development is equally important as the other two dimensions,^{8,9} and it includes health. Health, according to the World Health Organization

Significance for public health

In the context of sustainable development, health promotion to bring about behaviour change in diet and physical activity patterns will require new approaches that also include sustainability literacy. Furthermore, sustainable health behaviour will contribute to curbing greenhouse gases that are linked to climate change which have consequences for population health and wellbeing.

(WHO), is a “state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity”.¹⁰ Good health usually facilitates societal development, and development often promotes improved health. However, while good health may be a prerequisite for development, some behavioural determinants of health, such as attitudes towards the environment, and people’s lifestyles and consumption patterns, can impede the sustainability of the development process in the longer term. Equally, development which is economically desirable, e.g., in agriculture and industry, may have harmful consequences for health and the environment.¹⁰⁻¹³ Health has a crucial role in economic development but it also needs to be seen as an ecological characteristic of populations, reflecting the wider conditions of the social and natural environments.^{14,15} Also, as engrained in the WHO definition,¹⁴ health is “a state of complete physical, mental and social wellbeing”, as well as environmental wellbeing; which emphasizes the importance of social and personal resources as well as physical capabilities. It is suggested that people primarily think about health in terms of personal and family matters, which translates into a view that health is an asset that can be negotiated via personal behavioural choices and personal access to the formal health care system.¹⁵ However, a population’s health is a reflection of the level of its biological (including mental) functioning, as permitted by the conditions of the environment. Sustainable population health over time requires a stable and productive natural environment that: i) yields assured supplies of food and fresh water; ii) has a relatively constant climate in which climate-sensitive physical and biological systems do not change for the worse; and iii) retains biodiversity (a fundamental source of both present and future value). For the human species, as a species of “social animals” in the extreme, the richness, texture, stability and equity of the social environment (e.g., social capital) is also fundamentally important to population health.¹⁵ Therefore, population health becomes more than either a causal input or an incidental consequence of economic development. It becomes a central criterion. The purpose of “development”, presumably, is to improve the conditions and enjoyment of life for human societies (and to do so in a way that entails sharing those benefits equitably). It can be argued that a development path that does not include sustained improvements in health does not constitute “sustainable development”.¹⁵

In order to have sustainable population health we need to practice health promotion that will foster sustainable health behaviour and sustainable lifestyles. Health promotion is thought to have a fundamental role in realizing the 2030 Sustainable Development Goals (SDGs) agenda.¹⁶⁻²⁰ In contrast to the millennium development goals (MDGs), the 2030 SDGs agenda highlights health as a component of all the SDGs and a critical element of the process of developing an equitable and sustainable future.

Sustainable health behaviours

Health behaviours (also called “health-related behaviours”) are actions taken by individuals that affect health, morbidity and mortality in any society.²¹⁻²⁴ According to Short *et al.*, these actions may be intentional or unintentional, and can promote or detract from the health of the actors and/or others.²² Health behaviours can be of distinct nature, such as health care seeking, smoking, substance use, diet, physical activity, sleep, sexual behaviour, and adherence to prescribed medical treatments.^{22,23} Health behaviours are frequently discussed as individual-level behaviours, but they can be measured and summarized for individuals, groups or populations. Health behaviours are dynamic, varying over the lifespan, across cohorts, settings, and time.

On the other hand, sustainable behaviours are those behaviours carried out by individuals or groups, that contribute to the three

sustainability objectives of environmental protection, social development and economic prosperity as collective goals of societies, as described above in the definition of “sustainable development”.^{24,25} Sustainable behaviours include, among others: water conservation, energy conservation, waste management and recycling, maintenance and promotion of biodiversity and ecologically significant habitats, transportation, community participation and local decision making, use of local services and amenities, and healthy lifestyles (including diet and physical activity). It has been said that sustainable behaviours are a cluster of habits and behavioural patterns that are embedded in society and facilitated by structures such as institutions, social norms and infrastructure, which frame and guide individual choice, leading to minimization of natural resources use and waste generation. The benefits of these behaviours impact all in an equal way, being beneficial for health and development.²⁵

Furthermore, from a psychological point of view, sustainable behaviours can be defined as a set of actions aimed to protect the socio-physical resources of this planet.^{25,26} Although “sustainable behaviour” is, in practical terms, synonymous with “pro-environmental behaviour”, the latter term has been used to emphasize efforts to protect the natural environment, while the former describes actions aimed at protecting both the natural and the human (social) environment.²⁵⁻²⁷ Some have argued that sustainable behaviours can be seen as anticipatory – as behaviours that are future-oriented, by definition, because they consider the needs of forthcoming generations coincidentally with the satisfaction of present needs.²⁵⁻³¹ Tapia-Fonllen and colleagues propose that there are four types of sustainable behaviours: pro-ecological, frugal, altruistic, and equitable behaviours. Pro-ecological behaviours are considered purposeful and effective for actions related to natural resources conservation.³¹ Frugal behaviours are behaviours related to a decreased level of consumption or to austere measures intended to diminish the impact of human behaviour on availability and renewability of natural resources. This is the opposite of consumerism. Frugal behaviours are characterized by reduced consumption, selective purchasing, and concerns about how waste is disposed.^{28,29,31} Altruistic behaviours, on the other hand, are related to a motivational state with the goal of increasing others’ wellbeing. This type of behaviour is based on consideration of future consequences while also embracing personal responsibilities.^{27,30,31} Equitable behaviours, lastly, are behaviours that are based on sharing the satisfaction of needs between today’s and future generations. Furthermore, equity also implies a balance between human wellbeing and ecosystems integrity, making possible the access of resources for people and the preservation of the physical environment.^{27,31,32} In recent years, it has been argued that sustainability literacy should be part of the process that aims to help behavioural change.³³ “Sustainability literacy” is defined as “the knowledge, skills and mind sets that allow individuals to become deeply committed to building a sustainable future and assisting in making informed and effective decisions to this end”.³³ Similarly to health literacy, which is crucial to developing health-related knowledge, adopting healthy lifestyles, and benefiting from health care services, sustainability literacy will ensure that individuals, communities and societies will also be able to change their behaviours in such a way that they also contribute to the triple bottom line of sustainability. For instance, Payne suggests that sustainability literacy is an increasingly important competency for all professionals, no matter what their area of specialism.³⁴ Therefore, public health professionals would need to master this competency as they face a new challenge of promoting population health through sustainable development (especially promotion of sustainable health behaviours).

Sustainable diet and physical activity

Sustainable healthy diets are dietary patterns that promote all dimensions of individuals' health and wellbeing, produce low environmental pressure and impact, are accessible, affordable, safe and equitable, and are culturally acceptable.²⁴ In addition, sustainable healthy diets are important for achieving optimal growth and development of all individuals and supporting functioning and physical, mental and social wellbeing at all life stages for present and future generations, contributing to preventing all forms of malnutrition (i.e. undernutrition, micronutrient deficiency, overweight and obesity), reducing the risk of diet-related non-communicable diseases, and supporting the preservation of biodiversity and planetary health. It is posited that sustainable healthy diets must combine all the dimensions of sustainability to avoid unintended negative consequences, thus requiring collaboration of various entities.²⁴ Sustainable diets cannot exist in a vacuum; they need to correspond with sustainable food systems that constitute the main pillar for successful public health outcomes and thus ensure human wellbeing. It has been argued that diets, which are made up of different foods that contain both macro- and micronutrients and other important health-promoting properties, are born of food systems.^{35,36} According to Fanzo and Davis food systems produce, package, process, ship, and sell the food consumed around the world. They involve more than food production and ensuring [that] those foods are available: they are central to improving food security and nutrition, ensuring social and gender equity, reducing rural poverty, promoting efficient management of natural resources, and improving the resilience of populations who rely on them for their livelihoods.³² In addition, sustainable diets rely on a sustainable food system.³⁶

Another sustainable behaviour which has a major impact on morbidity, mortality and disability is physical activity. According to Bjørnarå and colleagues, "sustainable physical activity" includes those activities that are conducted with "sufficient duration, intensity and frequency for promoting health, yet without excessive expenditure of energy for food, transportation, training facilities or equipment".³⁷ Sustainable physical activities have low environmental impact and are culturally and economically acceptable and accessible. Regular physical activity improves health in people of all ages and is one of the most important lifestyle choices that we can make. Physical activity improves heart and lung function, muscular fitness, strengthens bones and helps individuals maintain a healthy weight.³⁸

Furthermore, it decreases risk of coronary heart disease and colon and breast cancers. In the mental health sphere, physical activity improves quality of sleep and mental function, and reduces symptoms of depression.³⁹⁻⁴¹ However, it has been pointed out that there are potential harmful effects to exercising in high air pollution areas.⁴² Sustainable physical activity can simultaneously provide the benefits of regular physical activity and benefits related to sustainability (e.g., reduction of CO₂ emissions through reduction in transport use). Bjørnarå and co-authors point out that active transportation represents a carbon-free option as well as an opportunity for enhanced physical activity. Moreover, they argue that reduced use of equipment and overall appliances in everyday tasks may contribute to an energy balance through increased physical activity, which in turn decreases resource use.³⁷

Overall, a balance between food intake and energy expenditure can contribute to less food production as well as energy savings. There is a suggestion that certain habits involving physical activities that can be considered sustainable (e.g., active transportation) are likely to provide time efficiency as well as increased levels of physical activity.⁴² Hamer and Chida report that cycling and walk-

ing contribute to about 11% reduction in cardiovascular risk,⁴¹ as well as decreased risk of metabolic syndrome, diabetes type 2 and cancer.⁴¹ For instance, a study associated cycling with a 30% decrease in mortality.⁴³

Active physical activity (e.g., walking, running, cycling) can contribute to health promotion at all ages and throughout the life cycle (i.e., in children, adolescents, adults and the elderly) as well as at community and societal levels.^{44,45}

A future research agenda to enhance sustainable health behaviours and, specifically, sustainable diets and physical activity behaviours should consider health promotion activities through the life course including especially moments of change. According to the Developmental Origins of Health and Disease (DOHaD) hypothesis, childhood and adolescence are crucial times in the life course when interventions are the most effective and can therefore contribute to foster healthy behaviours into adulthood and old age.⁴⁶⁻⁴⁸

Discussion and Conclusion

Rethinking 21st century health promotion towards achievement of sustainable population health and sustainable development Goal 3 (ensuring health and wellbeing for all at all ages)

Sustainable health behaviour entails regular health behaviours with a commitment to today's and future generations. This means improving quality of life through reduction of morbidity, mortality and disability. Furthermore, sustainable health behaviour entails an opportunity for promoting health through harvesting behaviours that can simultaneously contribute to reduction of greenhouse gases which are known to be related to climate change. Some argue that although health behaviour changes can collectively have economic and social benefits,³⁴ they primarily provide individual benefits.⁴⁹ Therefore, the effect of sustainable health behaviours may be less visible than that of pro-social behaviours. According to some authors, sustainable behaviours often require collective as opposed to individual action.^{49,50} It is argued that a large group of people must undertake sustainable behaviours so that the benefits are tangible in society. For instance, White and colleagues studied sustainable behaviours from the perspective of consumer behaviour and concluded that people were more inclined to engage in pro-environmental behaviours when the message or context leveraged psychological factors such as social influence, habit information, individual self, feelings of cognition, and tangibility.²⁵ Others argue that marketing can be of help in trying to understand sustainable consumer behaviours which can at times seem somewhat contradictory in the context of sustainability. However, as pointed out by White et al, the apparent contradiction may be fictitious, since marketing and sustainability are inextricably intertwined.²⁵

This view point attempts to contribute to the discussion on whether sustainable diets and physical activity are possible, but most importantly whether they can contribute to population health promotion and achievement of SDG 3: Health for all at all ages. I argue that, in order to promote health through sustainable behaviours and lifestyles (specifically diet and physical activity), we may need the contributions of other disciplines (beyond public health and sports science), such as marketing, sociology, psychology and sustainability, to be able to discern how individuals and communities can become healthier within the context of sustainable development. A greater challenge than adherence to sustain-

able healthy behaviours and health promotion may be people's non-adoption of sustainable behaviours (such as eating a sustainable diet and engaging in sustainable physical activity) despite their desire to adopt them. For instance, regarding pro-environmental behaviours, one study found that consumers had favourable attitudes towards pro-environmental behaviours,⁵¹ but then did not act on them.⁵²⁻⁵⁴ Also, the achievement of sustainable health behaviours need to be carried out through a systems approach.⁵⁵ This would mean engagement of other non-healthy sector actors (e.g., agriculture, energy, urban planning and transportation).^{55,56} For instance, the achievement of Goal 3 through sustainable diets and physical activity would indirectly be linked to other sustainable goals such as: Goal 2 -end hunger, achieve food security and improved nutrition and promote sustainable agriculture; Goal 7 -ensure access to affordable, reliable, sustainable and modern energy for all; Goal 11 -make cities and human settlements inclusive, safe, resilient and sustainable; Goal 12 -ensure sustainable consumption and production patterns; Goal 13 - take urgent action to combat climate change and its impacts; Goal 14 -conserve and sustainably use the oceans, seas and marine resources for sustainable development; Goal 15 -protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation, and halt biodiversity loss.⁵⁶ Furthermore, the achievement of sustainable health behaviour at the population level will require collaboration with other sectors and institutions beyond health which relate to sustainable development Goal 17 (to strengthen the means of implementation and revitalize the global partnership for sustainable development).⁵⁷ This is in line with those who argue that in order to achieve the SDG 3, it is important to also take into account "Health in all Policies" (HiAP).⁵⁸ This is because the majority of targets in Goal 3 relate to disease control or individual health care, but disease and health status have long been acknowledged as the manifestations and outcomes of the dynamic interaction between individual biology and social, economic, and environmental health determinants; therefore, they can be transformed only through coherent, coordinated, and equity-promoting intersectoral policies and actions.⁵⁸ Health in All Policies is an approach to public policies across sectors that systematically takes into account the health implications of decisions, seeks synergies, and avoids harmful health impacts in order to improve population health and health equity.⁵⁸

Behaviour change is always complex and it needs individual and collective engagement. According to Bandura, when people observe others engaging in an action, this may increase perceptions of collective efficacy or "a group's shared belief in its conjoint capabilities to organize and execute the courses of action required to produce given levels of attainment".⁵⁴ Furthermore others point out that promoting behaviour change is complex and it requires a solid understanding of how people behave in different situations and contexts.^{59,60} Therefore attempts to achieve sustainable behaviour change (diet and physical activity) through health promotion needs to take place across different arenas (e.g. schools, workplaces, elderly homes, neighbourhoods, etc.) at local, regional and national levels to ensure that it reflects people's real circumstances.^{61,62} In this viewpoint, I argue that public health and sustainable development are intrinsically related in a way that achieving sustainable development largely depends on a healthy populace (that practice sustainable healthy behaviours). Public health represents not only a significant outcome, but a precondition of sustainable development as well. In addition, public health and sustainable development are closely interrelated; both emphasize the need to think about the long term, to work in concert with others, and to integrate environmental, social, and economic factors

into decision making.⁶³⁻⁶⁷ There is a need to rethink 21st century health promotion practices by pairing health promotion strategies aimed at behaviour change (dietary and physical activity change) with sustainability literacy (which is currently absent in interventions aimed to promote health behaviour change) in order to improve population health and contribute to the achievement of SDG 3 (health and wellbeing for all at all ages).

Correspondence: Gloria Macassa, gloria.macassa@hig.se

Key words: Sustainable behaviours, health promotion, sustainable diet and physical activity, sustainability literacy, SDG3

Received for publication: 30 November 2020.

Accepted for publication: 12 April 2021.

©Copyright: the Author(s), 2021

Licensee PAGEPress, Italy

Journal of Public Health Research 2021;10:2051

doi:10.4081/jphr.2021.2051

This work is licensed under a Creative Commons Attribution NonCommercial 4.0 License (CC BY-NC 4.0).

References

1. United Nations. Resolution A/RES/70/1. Transforming our world: the 2030 agenda for sustainable development. United Nations; 2015. Accessed: 08 March 2021. Available from: http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E
2. United Nations Development Programme. Sustainable development goals. Geneva: United Nations; 2015. Accessed: 08 March 2021. Available from: <https://www.un.org/sustainabledevelopment/sustainable-development-goals/>
3. World Health Organization. The Ottawa Charter for Health Promotion. Health promotion. Geneva: World Health Organization; 1986. Accessed: 08 March 2021. Available from: <http://www.who.int/healthpromotion/conferences/previous/ottawa/en/>
4. Morton S, Pencheon D, Squires N. Sustainable development goals (SDGs) and their implementation. British Medical Bulletin 2017; 124:81-90.
5. Klarin T. The concept of sustainable development: from its beginning to the contemporary issues. Zagreb Int Rev Econom Business 2018;21:67-94.
6. Morelli J. Environmental sustainability: A definition for environmental professionals. J Environ Sustain 2011;1.2.
7. Vallance S, Perkins HC, Dixon JE. What is social sustainability? A clarification of concepts. Geoforum 2011;42:342-8.
8. Åhman H. Social sustainability – society at the intersection of development and maintenance. Local Environ 2013;18:1153-66.
9. WHO. Constitution of the World Health Organization. Geneva: World Health Organization; 2005.
10. Sartorius N. The meanings of health and its promotion. Croat Med J 2006;47:662-4.
11. Leonardi F. The definition of health: towards new perspectives. Int J Health Serv 2018;48:735-48.

12. World Health Organization. Health in the context of sustainable development: background document: prepared by Y. von Schirmding and C. Mulholland for WHO meeting: "making health central to sustainable development: planning the health agenda for the World Summit on Sustainable Development". World Health Organization; 2002.
13. McMichael A. Population health as the "bottom line" of sustainability: a contemporary challenge for public health researchers. *Eur J Public Health* 2006;16:579-82.
14. Fortune K, Becerra-Posada F, Buss P, et al. Health promotion and the agenda for sustainable development, WHO Region of the Americas. *Bull World Health Organ* 2018;96:621-6.
15. Pedersen KB, Land B, Kjaergård B. Duality of health promotion and sustainable development perspectives on food waste reduction strategies. *J Transdiscip Environ Stud* 2015;14:6-18.
16. Labonté R. Health promotion in an age of normative equity and rampant inequality. *Int J Health Policy Manag* 2016;5:675-82.
17. Setti AFF. Health promotion in the implementation of SDG. In: Leal Filho W, Wall T, Azeiteiro U, Azul A, Brandli L, Özuyar P, Editors. *Good health and well-being. encyclopedia of the UN sustainable development goals*. Cham: Springer; 2018. p. 1-9.
18. Buttriss J, Riley H. Sustainable diets: Harnessing the nutrition agenda. *Food Chemistry* 2013;140:402-407.
19. Spencer G, Corbin JH, Miedema E. Sustainable development goals for health promotion: a critical frame analysis. *Health Promot Int* 2019;34:847-58.
20. Williams K, Dair C. A framework of sustainability behaviours that can be enabled through the design of the neighbourhood-scale developments. *Sustain Devet* 2007;15:160-73.
21. Short SE, Mollborn S. Social determinants and health behaviours: conceptual frames and empirical advances. *Curr Opin Psychol* 2015;5:78-84.
22. Bishop FL, Lauche R, Cramer H, et al. Health behaviour change and complementary medicine use: National health interview survey 2012. *Medicina (Kaunas)* 2019;55:632.
23. FAO, WHO. Sustainable healthy diets-guiding principles. Rome: FAO; 2019. Available from: <http://www.fao.org/3/ca6640en/ca6640en.pdf>
24. Bamberg S. Changing environmentally harmful behaviors: a stage model of self-regulated behavioural change. *J Environ Psychol* 2013;34:151-9.
25. White K, R Habib R, J. Hardisty DJ. How to SHIFT Consumer behaviours to be more sustainable: A literature review and guiding framework. *J Mark* 2019;83:22-49.
26. Stern Paul C. Contributions of psychology to limiting climate change. *Am Psychol* 2011;66:303-14.
27. Corral-Verdugo V, Frías-Armenta M, García-Cadena C. Introduction to the psychological dimensions of sustainability. In: Corral-Verdugo V, Frías-Armenta M, García-Cadena C, Editors. *Psychological Approaches to Sustainability*. New York: Nova Science; 2010. p. 3-18.
28. De Young, R. Some psychological aspects of a reduced consumption lifestyle: The role of intrinsic satisfaction and competence motivation. *Environ Behav* 1996;28:358-409.
29. Iwata O. Coping style and three psychological measures associated with environmentally responsible behavior. *Soc Behav Personal* 2002;30:661-9.
30. Batson CD. The altruism question: Toward a social psychological answer. Hillsdale: Erlbaum; 1991.
31. Tapia-Fonllen C, Coral-Verdugo V, Fraijo-Sing B, Duron-Ramos MF. Assessing sustainable behaviour and its correlates: a measure of pro-ecological frugal, altruistic and equitable actions. *Sustainability* 2013;5:711-23.
32. Fanzo J, Davis C. Can diets be healthy, sustainable and equitable? *Curr Obesity Rep* 2019;8:495-503.
33. Ansari EW, Stibbe A. Public health and the environment: What skills for sustainability literacy and why? *Sustainability* 2009;1:425-440.
34. Payne L. Motivating sustainability literacy. *ITALICS* 2010;9:1-10.
35. FAO, IFAD, UNICEF, WFP, WHO. *The State of Food Security and Nutrition in the World 2018: building climate resilience for food security and nutrition*. Rome: FAO; 2018. Available from: <http://www.fao.org/3/I9553EN/i9553en.pdf>
36. Haddad L, Hawkes C, Waage J, et al. *Food systems and diets: facing the challenges of the 21st century*. London: Global Panel on Agriculture and Food Systems for Nutrition; 2016. Accessed: 10 March 2021. Available from: <https://openaccess.city.ac.uk/id/eprint/19323/>
37. Bjørnara HB, Torstveit MK, Slo TH, Bere E. Is there such a thing as sustainable physical activity? *Scand J Med Sci Sports* 2017;27:366-72.
38. Warburton DER, Bredin SSD. Health benefits of physical activity: a systematic review of current systematic reviews. *Curr Opin Cardiol* 2017;32:541-56.
39. Paluska SA, Schwenk TL. Physical activity and mental health. *Current concepts*. *Sport Med* 2000;29:167-80.
40. Hamer M, Chida Y. Active commuting and cardiovascular risk: a meta analytic review. *Prev Med* 2008;46:9-13.
41. de Nazelle A, Nieuwenhuijsen MJ, Anto JM, et al. Improving health through policies that promote active travel: a review of evidence to support integrated health impact assessment. *Environ Int* 2011;37:766-77.
42. Matthews CE, Jurj AL, Shu X-O, et al. Influence of exercise, walking, cycling, and overall non exercise physical activity on mortality in Chinese women. *Am J Epidemiol* 2007;165:1343-50.
43. Reiner M, Niermann C, Jekaic D, Woll A. Long-term health benefits-a systematic review of longitudinal studies. *BMC Public Health* 2013;13:813.
44. Westertep KR. Changes in physical activity over the lifespan: impact on body composition and sarcopenic obesity. *Obes Rev* 2018;19:S8-13.
45. Barker ME, Baird J, Tinati T, et al. Translating developmental origins: Improving the health of women and their children using a sustainable approach to behaviour change. *Healthcare (Basel)* 2017;5:17-30.
46. Bay JL, Mora HA, Sloboda DM, Morton SM. Adolescent understanding of DOHaD concepts: A school-based intervention to support knowledge translation and behaviour change. *J Dev Orig Health Dis* 2012;3:469-82.
47. Bay JL, Morton SM, Vickers MH. Realizing the potential of adolescence to prevent transgenerational conditioning of non-communicable disease risk: Multi-sectoral design frameworks. *Healthcare (Basel)* 2016;4:39.
48. Forum for the Future. *Sustainability literacy: knowledge and skills for the future*. Report of a consultation workshop. Forum for the Future; 2004.
49. Klöckner CA. *The psychology of pro-environmental communication: beyond standard information strategies*. London: Palgrave Macmillan; 2015.
50. Leverack G. The challenge of behaviour change and health promotion. *Challenges* 2017;8:25.
51. Bamberg S, Rees J, Seebauer S. Collective climate action: Determinants of participation intention in community-based

- pro-environmental initiatives. *J Environ Psychol* 2015;43:155-65.
52. Trudel R, Cotte J. Does it pay to be good? *Sloan Manage Rev* 2009;50:60-8.
53. Auger P, Devinney TM, Louviere JJ. Using best-worst scaling methodology to investigate consumer ethical beliefs across countries. *J Bus Ethics* 2007;70:229-326.
54. Bandura A. *Self-efficacy: The exercise of control*. New York: Worth Publishers; 1997.
55. Barbier EB, Burgess J. The sustainable development goals and the systems approach to sustainability. *Economics Discussion Paper No. 2017-28*. Available from: <http://www.economics-ejournal.org/economics/discussionpapers/2017-28>
56. UN. *United Nations Sustainable Development Goals Platform*. 2019. Accessed: 8 March 2021. Available from: <https://sustainabledevelopment.un.org/index.html>
57. Nunes AR, Lee K, O'Riordan T. The importance of an integrating framework for achieving the Sustainable Development Goals: the example of health and well-being. *BMJ Global Health* 2016;1:e000068.
58. Buss PM, Fonseca LE, Galvão LAC, et al. Health in all policies in the partnership for sustainable development. *Rev Panam Salud Publica* 2016;40:186-91.
59. Gifford R, Nilsson A. Personal and social factors that influence pro-environmental concern and behaviour: A review. *Int J Psychol* 2014;49:141-57.
60. Ivanova D, Stadler K, Steen-Olsen K et al. Environmental impact assessment of household consumption. *J Ind Ecol* 2016;20:526-36.
61. Yamin P, Fei M, Saadi L, Levy S. Using social norms to change behaviour and increase sustainability in the real world: a systematic review of the literature. *Sustainability* 2019;11:5847.
62. Dawkins E, Axelsson K, Benoist L et al. Advancing sustainable consumption at the local government level: A literature review. *J Clean Prod* 2019;231:1450-1462.
63. Dooris M, Baybutt M. Connecting sustainable development and public health: A critical exploration with reference to NHS and criminal justice settings. Preston: University of Central Lancashire.
64. Adshead F, Thorpe A, Rutter J. Sustainable development and public health: a national perspective. *J R Inst Public Health* 2006;120:1102-5.
65. Public Health Agency of Canada. *Sustainable development in public health: A long term journey begins*. Ottawa: Public Health Agency of Canada; 2006.
66. Porritt J. Healthy environment-healthy people: the links between sustainable development and health. *J R Inst Public Health* 2005;119:952-3.
67. Pluye P, Potvin L, Denis JL. Making public health programs last: conceptualizing sustainability. *Eval Program Plann* 2004;27:121-33.