public health research&practice
A JOURNAL OF THE SAX INSTITUTE

October 2022; Vol. 32(3):e3232226
https://doi.org/10.17061/phrp3232226
www.phrp.com.au

Research

# A call for joined-up action to promote nutrition across the first 2000 days of life using a food systems approach

Penelope Love[a,b,d], Rachel Laws[a,b], Megan Adam[a], Emma Esdaile[c] and Karen J Campbell[a,b]

[a] Institute for Physical Activity and Nutrition, Deakin University, Melbourne, VIC, Australia
[b] The Centre of Research Excellence in Translating Early Prevention of Obesity in Childhood (EPOCH-Translate CRE), Australia
[c] Charles Perkins Centre, School of Public Health, University of Sydney, NSW, Australia
[d] Corresponding author: penny.love@deakin.edu.au

## Article history

Publication date: 12 October 2022
Citation: Love P, Laws R, Adam M, Esdaile E, Campbell KJ. A call for joined-up action to promote nutrition across the first 2000 days of life using a food systems approach. Public Health Res Pract. 2022;32(3):e3232226. https://doi.org/10.17061/phrp3232226

## Key points

- Nutrition across the first 2000 days of life, from conception to age five, is critical in shaping lifelong nutrition and health outcomes
- A rapid review, policy mapping and key stakeholder interviews identified policy, programmatic and research opportunities regarding nutrition across the first 2000 days in Victoria, Australia
- The findings, which have applicability in other jurisdictions, show that more joined-up action and greater program and policy coherence is needed, with a funded capacity to facilitate delivery of coordinated and integrated services to address nutrition across the first 2000 days

## Abstract

**Introduction:** Nutrition across the first 2000 days of life, from conception to age five, is considered critical in shaping lifelong nutrition and health outcomes, with dietary patterns tracking from infancy into later childhood and adulthood. Identifying potential policy, programmatic, and research opportunities is essential to inform action in this area.

**Objectives:** This research was undertaken to provide an overview of the evidence support, policy mechanisms and stakeholder perspectives on opportunities for improving nutrition across the first 2000 days of life to guide future investments and to inform policy dialogues with relevant government, non-government and external agencies within the state of Victoria, Australia.

**Methods:** Underpinned by UNICEF's *Innocenti Framework,* this research comprised: a) a rapid review of existing systematic reviews (***n*** = 60) supplemented with key grey literature reports; b) mapping of potential policy and programmatic levers and partnerships against 14 identified areas; and c) qualitative semi-structured interviews with key stakeholders across health (*n* = 4), education (*n* = 2), local government (*n* = 1), non-government organisations/not-for-profits (*n* = 5), and peak bodies (*n* = 2).

**Results:** The 'caregiver behaviours' determinant within the *Innocenti Framework* yielded the largest number of systematic reviews and had the strongest alignment to existing policy frameworks. Victoria has a robust state-level policy mechanism for preventive health. However, policy voids were identified within the 'external food environment' and 'food supply chains' determinants due to a lack of regulation to restrict marketing and advertising by harmful food industries and no national food and nutrition plan. Thematic analysis of interviews revealed three key themes: a) continuity of care from pre-conception to childcare; b) consistency and strengthening of early years nutrition messages; and c) capacity for early years nutrition initiatives.

**Conclusion**: Numerous opportunities were identified to improve nutrition across the first 2000 days of life within national, state and local government systems, using policy, practice and research mechanisms. More joined-up action and greater program/policy coherence is needed, with funded capacity to facilitate the delivery of coordinated and integrated services to address nutrition in the first 2000 days of life. Further exploration is needed of the feasibility, acceptability and equity impacts, and in some cases effectiveness, of these opportunities in close collaboration with stakeholders.

## Introduction

Nutrition across the first 2000 days of life, from conception to age five, is considered critical in providing the foundations for optimum growth and development across the lifespan.[1,2] Despite widespread recognition of this, poor nutrition and related health outcomes are evident in early childhood, frequently tracking from infancy into childhood and adulthood.[2] Globally, suboptimal dietary behaviours are evident in young children, including declining breastfeeding rates by age 3–6 months, increased consumption of highly processed foods, and low fruit and vegetable intakes.[3] As a consequence, more than 41 million children aged under 5 years experience overweight/obesity[2], with associated negative health consequences[4], weight stigma and bullying[5], and substantial economic impacts.[6] Australia shows similar trends, with children aged 2–3 years not meeting dietary recommendations for vegetable consumption, consuming foods/beverages high in fats, sugars and sodium, and experiencing high rates of overweight/obesity (21%).[7]

A combination of food system factors frequently undermines the opportunity to establish healthy dietary behaviours.[3] This includes the provision of healthy, affordable and sustainable diets often not being a priority for food producers, manufacturers and suppliers when determining what foods to grow, produce, distribute and sell.[8] Identifying potential policy, programmatic and research opportunities is essential to inform and progress changes to the food system to optimise nutrition across the first 2000 days of life. Australia has a timely opportunity to prioritise action for early years nutrition through its recently released *National obesity strategy 2022–2032*[9], with a focus on developing a healthy, equitable food system. In addition, an accompanying statewide opportunity exists with the Victorian government's *Healthy kids, healthy futures* 5-year action plan[10] to support beneficial food provision across settings frequented by children. There is a strong policy mechanism for implementation through statutory state policy requirements – the *Public Health and Wellbeing Act 2008*[11], the *Victorian public health and wellbeing plan 2019–2023* (VPHWP), and Municipal public health and wellbeing plans (MPHWPs).[12] The Act requires the Victorian Department of Health to develop a VPHWP every 4 years, alongside an Outcomes Framework, which address priorities that impact health, including nutrition. The Act also requires each local government (municipality) to develop local MPHWPs in response to the VPHWP. Therefore, this mechanism provides an opportunity to align local and state health priorities. Applying a systems approach is also familiar within Victoria, as it was used to strengthen health promotion infrastructure within the *Healthy Together Initiative* during 2013–2015.[13]

This research was undertaken to provide an overview of the evidence support, policy mechanisms and stakeholder perspectives on opportunities to improve nutrition across the first 2000 days of life, to guide future investments and inform policy dialogues with relevant government, non-government and external agencies within Victoria, Australia. This research was commissioned by VicHealth, an independent statutory health promotion organisation in Victoria, as part of an Early Years Nutrition Scoping project and received ethics approval through Deakin University Faculty of Human Ethics Advisory Group (HEAG-H: 142_2020).

## Methods

We chose to use the UNICEF *Innocenti Framework*[8] as an underpinning conceptual model to explore determinants within the food system relevant to the first 2000 days of life. The Framework comprises four determinants: caregiver behaviours; personal food environments; external food environments; and food supply chains. In a healthy, sustainable food system, the interactions across these determinants independently and collectively have a role to play in ensuring children's healthy diets. Caregivers are considered the gatekeepers of "food procurement, preparation, supervision and eating practices of young children", namely parents, extended family, and carers/educators/other staff in early childhood education (ECE) settings.[8] Personal food environments relate to individual and household factors that influence food choice, such as purchasing power, access, convenience, and desirability.[8] The external food environment includes the price, availability, marketing and advertising of food, properties of food retail/food service outlets, and products. Together with the food supply chain – production, storage, processing, distribution, packaging, retail and markets, and waste disposal – these factors provide multiple opportunities to maximise or deplete the nutritional value of produce.[8]

The research comprised three components: a) a rapid review of existing systematic reviews supplemented with key grey literature; b) mapping of potential policy and programmatic levers and partnerships within the broader food system; and c) qualitative semi-structured interviews with key practice and policy stakeholders across a range of sectors to explore perceived policy and programmatic opportunities and points for intersectoral action.

## Rapid review

The rapid review was designed to provide a concise summary of evidence regarding what is likely to be effective in improving nutrition across the first 2000 days of life, using a food systems approach. A search strategy was developed to examine a range of public health scientific databases, targeting meta-analyses and systematic reviews published in English between January 2010 and July 2021. This was supplemented with expert recommendations identified from the grey literature. The Assessment of Multiple Systematic Reviews 2 (AMSTAR 2) was used to assess the methodological quality of included reviews. A total of 60 eligible systematic reviews were identified and assessed aligned with the following determinants: caregiver behaviours ($n$ = 49); personal food environments ($n$ = 7), external food environments ($n$ = 4). No reviews were included in relation to food supply chains. Using AMSTAR 2, quality was assessed as high for 11 reviews (18%), low for 21 (35%) and critically low for 28 (47%) reviews. The full rapid review is reported elsewhere.[14]

## Mapping report

The mapping report aimed to identify policy and programmatic levers and partnerships within the Victorian context to enhance nutrition in the first 2000 days of life. In consultation with VicHealth,[14] policy and programmatic areas were identified (Table 1), and a comprehensive online search was conducted between 1 July–21 August 2020 using keywords for these identified areas. Using the four iterative stages of policy content analysis[15], data were extracted for name, lead agency, and the extent to which the policy/program could be leveraged. Leverage was graded under three categories: policy infrastructure (strong alignment to existing policies/ programs; consultation with stakeholders required to adapt/implement); policy scaffolding (low-to-moderate alignment to existing policies/ programs; consultation with stakeholders required to develop and be fit-for-purpose); and policy void (an absence of alignment with existing policies/programs).

## Stakeholder interviews

The mapping report informed the creation of a list of key stakeholder organisations ($n$ = 21), developed in consultation with VicHealth. These included a range of sectors representing state health and education, local

**Table 1.** Statewide policy/program areas identified for mapping, aligned to UNICEF *Innocenti Framework* determinants[8]

| Policy | *Innocenti Framework* determinants |
|---|---|
| Supportive breastfeeding cultures | CB, EFE, PFE |
| Social marketing campaigns | CB |
| Opportunities in maternal and child health services to maximise nutrition support | CB |
| Food affordability schemes | PFE |
| Out-of-home advertising directed to children and parents of young children | EFE |
| Minimise the marketing of discretionary choices within government-controlled settings | EFE |
| Procurement policies to secure local produce in a range of government settings | FSC |
| **Programs** | |
| Nutrition support programs for parents/carers | CB |
| Nutrition support programs for care givers and management in ECE settings | CB |
| Use of mHealth (phonelines, websites, apps) to support nutrition | CB |
| Healthy food provision and promotion policies in settings young children occupy | EFE |
| Linking produce growers or food (re)distribution organisations directly to ECE sector, particularly in disadvantaged communities | EFE, FSC |
| Working with food retail about in-store promotion of foods and drinks | EFE |
| Linking produce growers directly with communities, particularly in regional areas | FSC, PFE |

CB =caregiver behaviour; EFE = external food environments; FSC = food supply chains; PFE = personal food environments

government, community health, non-government and not-for-profit organisations, and peak bodies. All identified stakeholder organisations were invited to participate in qualitative interviews. Consenting organisations nominated an appropriate interviewee based on the provided study information and understanding of the purpose of the interview. Fourteen interviews were conducted with representation across the identified sectors, namely health ($n$ = 4), education ($n$ = 2), local government ($n$= 1), non-government/not-for-profit organisations ($n$= 5), and peak bodies ($n$ = 2). Interviews occurred between August–September 2020 via the Zoom video conferencing platform, were of 45–60 minutes in duration, and audio recorded with consent, using a semi-structured interview guide (Supplementary File 1, available from figshare.com/articles/journal_contribution/Supplementary_File_1_Stakeholder_Interview_Guide_pdf/20967601). No incentives were offered or provided to participants. All interviews were transcribed verbatim by a professional transcribing service. They were inductively coded by one author (PL) using reflexive thematic analysis[16], identifying patterns of meaning and constructing candidate themes through an iterative process of data familiarisation, coding, categorisation and review. All coding was completed using NVivo12 (QSR International, Melbourne, Australia). Coding verification and consensus on final themes were developed in agreement by all researchers.

## Results

Findings from the three research components are summarised using the four determinants from UNICEF's *Innocenti Framework*.[8] (Table 2).

Thematic analysis of stakeholder interviewers revealed three key themes: continuity of care from pre-conception to childcare, consistency and strengthening of early years nutrition messages, and capacity for early years nutrition initiatives. Interviewees identified multiple points of potential intersection between services which could be enhanced to provide greater continuity of care for caregivers of young children. Early intervention in pregnancy (preferably pre-conception) and primary health care services (general practitioners, general practice nurses, dietitians) were considered missed opportunities to discuss maternal and infant nutrition. Supporting caregivers with consistent information was a key consideration in the context of continuity of care, especially through the delivery of evidence-based initiatives such as the Victorian INFANT Program.[17] Interviewees described limited capacity as a major barrier to the implementation of early years nutrition initiatives, with small local, state and national preventive health budgets. In line with this, they suggested there was a need for specifically funded capacity to coordinate early years prevention initiatives within each local government (municipality). This research identified a number of opportunities to improve nutrition across the first 2000 days of life, within national, state and local government systems, utilising policy, practice and research mechanisms (See Box 1 and Supplementary File 2, available from figshare.com/articles/journal_contribution/Supplementary_Fle_2_Detailed_opportunities_pdf/20967652). Further exploration is required, in collaboration with stakeholders, to determine the feasibility, acceptability and equity impacts of such actions.

**Box 1.** Key opportunities to improve nutrition across the first 2000 days of life

- **Consistency and continuity of early years nutrition messaging** to parents across services, (e.g. hospital midwifery and MCH services) and sectors (e.g. health, social, ECE).
- **Inclusion of breastfeeding within existing programs and policy frameworks**, with endorsement by key governing bodies.
- **Advocacy for nationally supportive policies to address social determinants,** including longer paid parental leave to support breastfeeding and expanding employment policy opportunities for those most at risk of food insecurity.
- **Advocacy for national and state government improvements to the external food environment,** including changes to labelling, composition, marketing regulations and fiscal levers, as well as a national food/nutrition policy.
- **Leveraging local/regional food systems policies,** including the expansion of farmer-to-consumer selling opportunities and community gardens; linking ECE services with primary producers for quality fruit and vegetables; supporting regional food hubs; protection of agricultural land/zoning of fast food and food retail outlets; and embedding food literacy skill development within food relief programs.
- **Leveraging state and local fiscal levers to support short food supply chains**, such as supporting regional food hubs and social enterprises and funding fruit and vegetable food vouchers for families experiencing disadvantages to use at farmer-to-consumer markets.
- **Funding local coordinating positions** focused on early years (including nutrition promotion) to facilitate the delivery of coordinated and integrated services.

| Study component | Behaviours of caregivers | Personal food environments | External food environments | Food supply chains |
|---|---|---|---|---|
| Rapid review | This determinant yielded the largest number of systematic reviews (*n* = 49), 9 of high quality.[13]<br>• Breastfeeding education and peer and professional counselling supported approaches to promote the duration of exclusive and any breastfeeding.<br>• Key elements of effective breastfeeding interventions were: support during the antenatal and postnatal period; longer duration of postpartum support; informative, social, emotional, and instructional support; focusing on breastfeeding self-efficacy; combining educational and counselling approaches; and involving health professionals and partners (especially fathers).<br>• Further research needed regarding tailored breastfeeding support for vulnerable and high-risk as well as targeting pregnant Indigenous women.<br>• Some evidence of the effectiveness of workplace interventions and the Baby Friendly Health Initiative (BFHI) to support breastfeeding, but insufficient evidence to support training of healthcare staff to improve staff knowledge and attitudes to breastfeeding, and compliance with BFHI or the International Code of Marketing of Breastmilk Substitutes.<br>• Mixed evidence regarding the impact of nutrition education delivered during pregnancy on maternal diet. | • Income supplementation, such as food vouchers, had the strongest evidence for improving healthy dietary intake, especially fruit and vegetables, with greater effect on younger and more disadvantaged children.[13]<br>• Emerging evidence supported a positive association between farmer-to-consumer sales and fruit and vegetable purchases or consumption; however, these were lower-quality studies.<br>• Grey literature reported the presence of local, healthy food outlets, such as farmers markets, as likely to enhance the purchase of healthy foods while supporting local agriculture and the regional economy.<br>• Gardening interventions showed a small but positive influence on children's fruit and vegetable consumption, however, included studies had methodological limitations. | • Evidence[13] strongly supported interventions to reduce the impact of marketing and advertising of sugar-sweetened beverages (SSBs) and other discretionary foods.<br>• Multi-component interventions considered most effective, with recommendations to engage families directly, take a settings-based approach (such as ECE), and include broad environmental approaches.<br>• Taxing SSBs and/or discretionary foods shown to influence purchasing and consumption behaviours.<br>• Removal of discretionary food/drink advertising during children's peak broadcast media viewing and digital media use considered one of the most cost-effective population-based policy measures for influencing children's health. | No systematic reviews were retrieved for this determinant; however, the grey literature reflected a substantial increase in focus on promoting healthy and sustainable food systems.[13]. |

**Table 2:** Study component findings aligned to UNICEF *Innocenti Framework* determinants[8] (continued)

| Study component | Behaviours of caregivers | Personal food environments | External food environments | Food supply chains |
|---|---|---|---|---|
| Rapid review (continued) | • Mixed evidence of the effectiveness of parent focused interventions on improving children's diets, but those directly engaging parents with interactive components more effective than passive information provision.<br>• Strong evidence for repeated exposure to vegetables to increase intake in parent focused and ECE interventions. | | | |
| Policy mapping | This determinant had the strongest alignment to existing policy infrastructure, most notably through the universal Victorian Maternal and Child Health (MCH) service and the *Key Ages and Stages* (KAS) Framework which offers 10 free consultations to review a child's health, growth and development up to age 5 years. The *Early Years Compact* (an agreement between state health and education departments and local governments) provides a key policy framework to strengthen the planning, development, and provision of services across the early years. The *Compact* informs local government action through the development of Municipal Early Years Plans, which are linked to statutory state policy requirements, the *Public Health and Wellbeing Act 2008* and the VPHWP. | Many potential opportunities via existing policies were identified relating to regional economic growth and employment; creating shorter food supply chains through emerging local and regional food systems policy; and food literacy programs to improve individuals knowledge and skills in planning, purchasing and preparing foods. Improving personal food environments through adequate household income, secure employment and sufficient wages was considered the most important policy lever; however, decisions regarding income support schemes to cover the cost of food (eg: food vouchers) occur at the national policy level. | The absence of regulation regarding advertising content and placement within the state's planning policy tool, the *Victorian Planning Provisions,* presents a policy void with little scaffolding to limit or regulate outdoor advertising content or reject planning permits for retail food outlets based on health and wellbeing grounds. Policy infrastructure does exist to minimise the marketing of discretionary foods/drinks within government-controlled settings through the Healthy Food Choices Framework and the Healthy Food Environments Policy, which align with the goal of the VPHWP. The implementation of these policies is supported by programs and services targeting food retail outlets and settings occupied by young children (such as ECE); however, these are not embedded through recurrent state government funding. | Unlike other similar high-income countries, Australia does not have a national food and nutrition plan[24,] and changes in government and industry influences continue to displace health from agricultural policy at the national level.[25] Despite this current national policy void, state level policy infrastructure is present via the VPHWP which aims to improve healthy food supply chains at a state level within government-controlled settings (hospitals/ health services, schools, ECE, libraries, parks, community settings), and the *Social Enterprise Strategy* which provides opportunity to direct funding to local food producers and a means of shortening food supply chains in regional areas through local food cooperatives. |

**Table 2:** Study component findings aligned to UNICEF *Innocenti Framework d*eterminants[8] (continued)

| Study component | Behaviours of caregivers | Personal food environments | External food environments | Food supply chains |
|---|---|---|---|---|
| Stakeholder interviews[a] | Stakeholders described a lack of continuity of care across antenatal and maternity hospital (midwifery) and postnatal (MCH) services as the biggest challenge to establishing evidence-based infant feeding practices, especially breastfeeding. Stakeholders shared concerns that disparity arose when there was no universal free antenatal education compared to the universal free postnatal care provided through the KAS *Framework*. The importance of greater consistency of early years nutrition messaging to parents via the health sector (antenatal care, MCH, general practice) as well as non-health settings (ECE, playgroups, kindergarten) was discussed. Social marketing campaigns were identified as opportunities to strengthen nutrition messages targeting the first 2000 days, with suggestions for campaigns to support primary producers, particularly vegetable growers, and a campaign positioning breastfeeding as 'the first food' aligned with the *Australian National Breastfeeding Strategy*. | Stakeholder perspectives centred on the value of food literacy initiatives to develop knowledge and skills among family members, to provide tailored information on specific health needs (such as diabetes), and to incorporate contemporary issues regarding environmentally sustainable nutrition practices. | Stakeholders recognised the importance of challenging harmful food industries, especially the marketing of discretionary food/drink, and described the importance of utilising the MPHWPs to integrate evidence-based initiatives such as establishing parenting rooms within public facilities and delivery of the INFANT Program.[17]. Stakeholders identified opportunities to expand existing state-wide initiatives, such as the Victorian Achievement Program and the Victorian Healthy Eating Advisory Service, to include a focus on breastfeeding, integrating the Australian Breastfeeding Association's "Breastfeeding Welcome Here" and Workplace Accreditation programs into retail outlets and workplaces. Of note, the MCH workforce as considered a highly influential advocate within the external food environment, being a conduit between caregivers and local government. | Stakeholders discussed the need for MPHWPs to include a local food plan to address food security, especially in the context of environmental sustainability. |

[a] Three key themes of stakeholder interviewer were: Continuity of care from pre-conception to childcare; consistency and strengthening of early years nutrition messages; and capacity for early years nutrition initiatives

BFHI = Baby Friendly Health Initiative; ECE = early childhood education; MCH = maternal and child health; SSB = sugar-sweetened beverages; MPHWP= *Municipal public health and wellbeing plan*; VPHWP = *Victorian public health and wellbeing plan*

## Discussion

While this research has a specific state and country context, namely Victoria, Australia, the applicability of these identified opportunities to other jurisdictions and countries are apparent in light of the supporting evidence.[14]

In the early years, caregivers have the most impact on shaping a child's eating behaviours.[8] Targeting caregiver behaviours is the usual starting point for developing evidence-based practice and government intervention, most notably in health service delivery but also more recently in the ECE sector.[18] Caregiver behaviours supportive of nutrition across the first 2000 days include healthy lifestyle behaviours during pregnancy, support, knowledge and self-efficacy to breastfeed, parenting confidence to feed, responsive feeding practices, provision of a variety of core foods, healthy family meals, food literacy, role modelling, and curriculum development to support developmentally appropriate healthy eating in ECE settings.[14] The key focus continues to be the development of a 'breastfeeding culture' and changing social attitudes through population-level promotion of breastfeeding, strengthening maternal legal rights (such as longer paid parental leave), legislation to limit marketing of breast milk substitutes, supporting maternal wellbeing, and continuity of care across health services.[19]

Personal food environments represent the individual and household factors that inform "why people chose to procure the foods that they do".[8] Across the first 2000 days of life and later, children are dependent upon decisions made for them by their caregivers. Ensuring healthy foods are accessible, available and affordable is essential to enable caregivers to provide healthy food options.[20] More importantly, household income needs to be adequate to achieve food and nutrition security, especially for single-parent households. In the absence of sufficient wages and income support, income supplement initiatives and the use of food vouchers, such as the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) in the US and Healthy Start in the UK, have been shown to reduce food insecurity at the household level and may increase vegetable consumption.[21,22]

External food environments are the interface between food systems and caregivers. They exist in specific sociocultural, political, physical and economic contexts, sharing common sites of activity, such as food retail and food service outlets, schools and ECE settings.[8] The advertising and marketing of discretionary foods (nutrient poor, energy dense foods high in energy, fat, added sugars and/or salt) is ubiquitous and it is well understood that caregivers of young children are influenced by marketing practices when making food choices for children.[23] Over the last decade, there has been a significant rise in commercially prepared baby and toddler food and drink products[24], with the majority considered to be ultra-processed.[25] The evidence is growing that ultra-processed foods/drinks have negative impacts on health.[26] The proliferation and marketing of these products as early childhood foods/drinks needs to be restricted through policy levers such as the World Health Organization (WHO) *Set of recommendations on the marketing of foods and non-alcoholic beverages to children*[27] and country responses to the WHO *International code of marketing of breastmilk substitutes* such as the *Marketing in Australia of infant formula (*MAIF*) agreement*[28] (although the MAIF is considered a policy void, being voluntary, self-regulated and not addressing toddler milks and commercially available complementary food).

The actors and activities involved in each stage of the food supply chain all shape dietary intakes. The *EAT-Lancet Commission on healthy diets from sustainable food systems*[29] and the Food and Agriculture Organization of the United Nations' report, *Food security and nutrition: building a global narrative towards 2030*[30], both argue for a shift towards a global food system with health, environmental sustainability, and equity at its core. Australia produces enough food to feed the population three times over[31], yet across the lifespan, dietary recommendations are not being achieved[7], and food distribution is inequitable, often scarce and more expensive and of poorer quality in regional and rural areas.[32,33] The presence of a national food/nutrition strategy linking agriculture, environmental sustainability, and health has been shown to positively change consumption behaviours through improvements along the food supply chain, such as the Scottish Governments' *Good food nation 2014–2025* policy.[34] There has been no national nutrition policy in Australia since 1992, and the current national agricultural plan focuses on high productive outputs primarily for export, supporting long and complex supply chains.[31]

## Conclusion

Policy makers, practitioners and researchers acknowledge the value of considering the research evidence, policy mechanisms and stakeholder perspectives when determining what course of action is likely to be most effective for promoting nutrition across the first 2000 days of life. This research has addressed these three considerations, identifying relevant opportunities that cut across the four determinants of *UNICEF's Innocenti Framework* to ensure children's healthy diets. Overall, this research highlights the potential and urgent need for more joined-up action using a food systems approach and funded capacity to facilitate delivery of coordinated and integrated services to address nutrition across the first 2000 days.

## Acknowledgements

This research was commissioned by VicHealth, an independent statutory health promotion organisation in Victoria, as part of an Early Years Nutrition Scoping project and had ethics approval through Deakin University Faculty of Health.

This paper is part of a special issue of the journal focusing on obesity prevention, which has been produced in partnership with the Health and Social Care Unit, School of Public Health and Preventive Medicine, Monash University, with support from VicHealth.

## Peer review and provenance

Externally peer reviewed, invited.

## Competing interests

None declared.

## Author contributions

PL, KC, RL developed the research concept. MA led the systematic review; EE led the policy mapping; PL led the stakeholder interviewing. PL led the writing of the manuscript. All authors were involved in finalising the manuscript.

## References

1. Moore T, Arefadib N, Deery A, West S. The first thousand days: an evidence paper; Victoria; Murdoch Children's Research Institute; 2017 [cited 2022 Aug 18]. Available from: www.rch.org.au/uploadedFiles/Main/Content/ccchdev/CCCH-The-First-Thousand-Days-An-Evidence-Paper-September-2017.pdf
2. World Health Organization. Report of the commission on ending childhood obesity; Geneva; WHO; 2016. [cited 2022 Aug 18]. Available from: www.who.int/publications/i/item/9789241510066
3. UNICEF. The state of the world's children 2019: children, food and nutrition. New York; UNICEF; 2019. [cited 2022 Aug 18]. Available from: www.unicef.org/reports/state-of-worlds-children-2019
4. Han JC, Lawlor DA, Kimm SY. Childhood obesity. Lancet. 2010;375(9727):1737–48.
5. Black N, Kassenboehmer SC. Getting weighed down: the effect of childhood obesity on the development of socioemotional skills. J Hum Cap. 2017;11(2):263–295.
6. World Obesity Federation. The economic impact of overweight & obesity in 8 countries. summary report; UK; World Obesity; 2021 [cited 2022 Aug 18]. Available from: data.worldobesity.org/publications/Economic-impact-overweight-obesity-in-countries-final.pdf
7. Australian Institute of Health and Welfare. Nutrition across the life stages. Canberra: AIHW; 2018 [cited 2022 Aug 18]. Available from: www.aihw.gov.au/reports/food-nutrition/nutrition-across-the-life-stages/summary
8. UNICEF. Food systems for children and adolescents: working together to secure nutritious diets. Italy: UNICEF Office of Research – Innocenti; 2018 [cited 2022 Aug 18]. Available from: www.unicef.org/documents/innocenti-framework-food-systems-children-and-adolescents
9. Australian Government. National obesity strategy 2022–2032. Canberra: Department of Health and Aged Care; 2022 [cited 2022 Aug 18]. Available from: www.health.gov.au/resources/publications/national-obesity-strategy-2022-2032
10. Victorian Government. Healthy kids, healthy futures. Victoria. Victorian Department of Health; 2021 [cited 2022 Aug 18]. Available from: www.health.vic.gov.au/health-strategies/healthy-kids-healthy-futures
11. Victorian Government. Public health and wellbeing act 2008. Melbourne: Victorian legislation; 2008 [cited 2022 Aug 30]. Available from: www.legislation.vic.gov.au/in-force/acts/public-health-and-wellbeing-act-2008/055
12. Victorian Government. Victorian public health and wellbeing plan 2019–2023, Melbourne: Victoria State Government; 2019 [cited 2022 Aug 18]. Available from: www.health.vic.gov.au/population-health-systems/municipal-public-health-and-wellbeing-planning
13. Bensberg M, Joyce A, Wilson E. Building a prevention system: infrastructure to strengthen health promotion outcomes. Int J Environ Res Public Health. 2021;18(4):1618.
14. Laws R, Adam M, Esdaile E, Love P, Campbell K. What works to improve nutrition and food sustainability across the first 2000 days of life: a rapid review. Nutrients. 2022;14(4):731.
15. Hall DM, Steiner R. Policy content analysis: qualitative method for analyzing sub-national insect pollinator legislation. MethodsX. 2020;14(7):100787.
16. Braun V, Clarke V. One size fits all? What counts as quality practice in (reflexive) thematic analysis? Qualitative Research in Psychology. 2021:328–52.
17. Love P, Laws R, Hesketh KD, Campbell KJ. Lessons on early childhood obesity prevention interventions from the Victorian Infant Program. Public Health Res Pract. 2019;29(1):e2911904.
18. Esdaile E, Thow AM, Gill T, Sacks G, Golley R, Love P, et al. National policies to prevent obesity in early childhood: using policy mapping to compare policy lessons for Australia with six developed countries. Obes Rev. 2019;20(11):1542–56.
19. Brown A. Breastfeeding as a public health responsibility: a review of the evidence. J Hum Nutr Diet. 2017;30(6):759–70.

20. World Health Organization. Consideration of the evidence on childhood obesity for the commission on ending childhood obesity: report of the ad hoc working group on science and evidence for ending childhood obesity. Geneva: WHO; 2016 [cited 2022 Aug 30]. Available from: apps.who.int/iris/bitstream/handle/10665/206549/9789241565332_eng.pdf;jsessionid=726689887BB821D73FBC6BEE50ACC17C?sequence=1. h
21. Loopstra R. Interventions to address household food insecurity in high-income countries. Proc Nut Soc. 2018;77(3):270–81.
22. Zhang Q, Alsuliman MA, Wright M, Wang Y, Cheng X. Fruit and vegetable purchases and consumption among WIC participants after the 2009 WIC food package revision: a systematic review. Adv Nutr. 2020;16(11):1646–62.
23. Smith R, Kelly B, Yeatman H, Boyland E. Food marketing influences children's attitudes, preferences and consumption: a systematic critical review. Nutrients. 2019;11(4):875.
24. Moumin NA, Green TJ, Golley RK, Netting MJ. Are the nutrient and textural properties of Australian commercial infant and toddler foods consistent with infant feeding advice?. Br J Nutr 2020;124(7):754–60.
25. McCann JR, Russell GC, Campbell KJ, Woods J. Nutrition and packaging characteristics of toddler foods and milks in Australia. Public Health Nutr. 2021;24(5):1153–65.
26. Lawrence MA, Baker PI. Ultra-processed food and adverse health outcomes. BMJ. 2019;365:2289.
27. World Health Organization. Set of recommendations on the marketing of foods and non-alcoholic beverages to children. Geneva; WHO;2010. [cited 2022 Aug 18] Available from: www.who.int/publications/i/item/9789241500210
28. Australian Government. Marketing infant formula in Australia. Canberra: Department of Health and Aged Care; 2022 [cited 2022 Aug 30]. Available from: www.health.gov.au/health-topics/pregnancy-birth-and-baby/breastfeeding-infant-nutrition/marketing-infant-formula
29. Willett W, Rockström J, Loken B, Springmann M, Lang T, Vermeulen S, et al. Food in the Anthropocene: the EAT–Lancet commission on healthy diets from sustainable food systems. Lancet. 2019;393(10170):447–92.
30. High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security. Food security and nutrition: building a global narrative towards 2030. Italy: Food and Agriculture Organization of the United Nations; 2020 [cited 2022 Aug 18]. Available from: www.fao.org/right-to-food/resources/resources-detail/en/c/1295540/
31. Australian Government. FOODmap: An analysis of the Australian food supply chain; Canberra: Australian Government Department of Agriculture, Fisheries and Forestry; 2012 [cited 2022 Aug 18]. Available from: www.agriculture.gov.au/agriculture-land/farm-food-drought/food/publications/foodmap-a-comparative-analysis
32. Love P, Whelan J, Bell C, Grainger F, Russell C, Lewis M, Lee A. Healthy diets in rural Victoria-cheaper than unhealthy alternatives, yet unaffordable. Int J Environ Res Public Health. 2018;15(11):2469.
33. Whelan J, Millar L, Bell C, Russell C, Grainger F, Allender S, Love P. You can't find healthy food in the bush: poor accessibility, availability and adequacy of food in rural Australia. Int J Environ Res Public Health. 2018;15(10):2316.
34. Scottish Government. Good food nation policy. Scotland; Scottish Government; 2014 [cited 2022 Aug 30]. Available from: www.gov.scot/policies/food-and-drink/good-food-nation/