

Editorial

Cite this article: Hanson MA, Poston L, and Gluckman PD (2019) DOHaD – The challenge of translating the science to policy. *Journal of Developmental Origins of Health and Disease* 10: 263–267. <https://doi.org/10.1017/S2040174419000205>

Received: 9 July 2018
Revised: 22 February 2019
Accepted: 22 March 2019
First published online: 14 May 2019

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DOHaD – The challenge of translating the science to policy

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Abstract

The DOHaD Society has passed its 10th birthday, so it seems an appropriate time to reflect on what has been achieved and the Society's aspirations. At the 10th International Congress in Rotterdam in November 2017, Peter Gluckman (the Society's first President) delivered a plenary lecture entitled 'DOHaD – addressing the science-policy nexus: a reality check'; in opening the Congress, Mark Hanson (second, and out-going President) highlighted the success of the Society but also the challenges it now faces in achieving impact for its work in the global health arena, i.e. beyond the research agenda; and in assuming the role of the third President, Lucilla Poston highlighted the need for the Society to grasp opportunities to change health care policy, whilst persevering with basic research and well-planned intervention studies. In this review we summarise the points made in these three presentations and issue a call to action to the membership to take up the challenge of taking the Society's work to the next level of translating science to policy.

Introduction: the current status of DOHaD

The International DOHaD Society was formally established in 2003 and from the outset had both basic science and clinical medical missions. At the time of writing, the membership of the DOHaD Society is 852 with members in 63 countries. The Society has national or regional chapters or affiliate societies in Canada, Japan, Australia/New Zealand, USA, Pakistan, France, China, the Ibero-American region, and others are being developed. Since the Society was founded, the science of DOHaD has flourished: Google Scholar searches give over 9000 hits, and DOHaD-related papers are routinely published in a range of high-impact journals. The Society established J. DOHaD, which has been highly successful with a current impact factor of 2.07. DOHaD researchers have been successful in winning funding from a range of government, charitable and philanthropic bodies and from the private sector. In addition, some major funders have launched competitive funding schemes specifically in DOHaD: a good example is the HeLTI initiative supported by the Canadian Institutes of Health Research, with government funding from South Africa, India, China as well as Canada. Research cohorts initiated before conception will be followed up for up to 10 years in these four countries in relation to interventions to reduce non-communicable disease (NCD) risk factors such as childhood obesity.

The wider impact of DOHaD

In contrast to the traction being gained by DOHaD-related research, its impact on healthcare and clinical practice has been relatively slight. Healthcare professionals (HCPs) may be aware of the concept of DOHaD, but they are unlikely to see it as directly relevant to their work. There are several reasons for this. One is quite simply that the DOHaD Society has not spelt out how large the contribution of DOHaD mechanisms to later disease is likely to be, for example in terms of attributable risk as is standard for many other risk factors such as smoking or obesity. Nor are there simple statements on what actions HCPs might take to operationalise DOHaD concepts. There has been some progress – for example the International Federation of Obstetricians and Gynecologists (FIGO) Working Group on Adolescent, Preconception and Maternal Nutrition set out recommendations based on DOHaD concepts¹ and this group has now joined with the FIGO Hyperglycaemia in Pregnancy Working Group to form a new NCD committee. FIGO has championed the universal measurement of blood glucose in pregnancy by HCPs as a means to reduce risk of gestational diabetes, which confers great NCD risk across generations.² In addition to not knowing what action, if any, to take, HCPs usually see the health outcomes of DOHaD as long term – i.e. related to NCDs in middle age. Given other more pressing priorities, it is hardly surprising that DOHaD concepts have not been acted upon by HCPs. Furthermore, there is a lack of specificity and conviction as to what might be done beyond what is already

accepted even if not always practised: namely balanced diets in pregnancy (whatever that means in local context), avoidance of alcohol, tobacco, violence and drugs in pregnancy, managing rather than preventing gestational diabetes, supporting breastfeeding and nurturing care of the newborn.

DOHaD is now recognised by several NGOs, which may in time help to address the point above, although considerable work is needed to achieve this. At the United Nations, Clause 26 of the Political Declaration on the Prevention and Control of NCDs issued in September 2011³ states “(We) note also with concern that maternal and child health is inextricably linked with non-communicable diseases and their risk factors, specifically as pre-natal malnutrition and low birthweight create a predisposition to obesity, high blood pressure, heart disease and diabetes later in life; and that pregnancy conditions such as maternal obesity and gestational diabetes are associated with similar risks in both the mother and her offspring.” The linked initiative of the Global Strategy for Women’s, Children’s and Adolescents’ Health⁴ makes reference to DOHaD⁵ and makes the economic case strongly in stating that “implementing the *Global Strategy* . . . would yield tremendous returns by 2030: at least a 10-fold return on investments in the health and nutrition of women, children and adolescents through better educational attainments, workforce participation and social contributions.” Such emphasis on preconception and adolescent health effectively endorses the DOHaD agenda and offers a simple, yet neglected, health care message.^{6–9} Nonetheless, the UN Political Declaration arising from the High Level Meeting on NCDs in September 2018¹⁰ makes little reference to the importance of maternal and child health in NCD prevention.

DOHaD is now established in several WHO initiatives. As early as 2006, WHO released a report on optimising the outcomes of pregnancy¹¹ which addressed DOHaD concepts. More recently, the discussions of the meeting on Early Childhood Development in 2013¹² have been incorporated into the recent Nurturing Care document from PMNCH.¹³ Other initiatives include the life course approach to healthy ageing,^{14,15} childhood environmental health¹⁶ and the Lancet series on preconception.^{8,9} But probably the WHO initiative with the strongest link to DOHaD is the Ending Childhood Obesity (ECHO) Commission,¹⁷ which made recommendations adopted at the World Health Assembly in May 2017. The ECHO Commission’s report emphasises that addressing childhood obesity is not just a matter for the health system in any society or region; and that a life course approach to prevention needs to be used, with the focus not only on the priming conditions in early development setting responses to later challenges but also on such later challenges themselves, e.g. the obesogenic environment.

Unlike the Millennium Development Goals, NCDs figure within the Sustainable Development Goals (SDGs) especially SDG3.¹⁸ However, nutrition and the importance of young people¹⁹ and gender issues underpin most if not all the SDGs.

The importance of nutrition in DOHaD raises the issue of the role of the global and regional corporate food companies, especially those producing and aggressively marketing infant formula and unhealthy snacks. The regulation of their activities is complex and has largely been focused on restricting their competition with breastfeeding. As the ECHO Commission noted, while the WHO has made recommendations on the marketing of unhealthy foods to children,²⁰ few countries have taken concrete actions to address this challenge. One positive step is however the shift to tackling the obesogenic environment, e.g. the sugar-sweetened beverages levy in the UK, and the challenge to industry to take 20% of the sugar

content out of food most commonly eaten by children by 2020, as part of the government’s Childhood Obesity: A plan for action.²¹

There are some international organisations which are attempting to address these conflicts between the role of the private sector as the provider of safe foods and the marketing of inappropriate foods. Some of these have come from the industry itself (e.g. the International Life Sciences Institute). The UN Global Compact, which engages the private sector, has launched several new platforms of which the Health is Everyone’s Business platform targets SDG3 and has DOHaD engagement.²² Given the importance of young people, as current or future parents, in establishing demand for DOHaD initiatives, it is good that many members of the Society are involved in various types of public engagement activities.^{23,24} These are raising awareness of DOHaD messages, an important step in the co-creation of preventative programmes. Some national governments appear supportive of these initiatives, although much more need to be done here: the demand for public health services is a crucial part of generating provision of such services. However, this is not the only factor which influences policy decision-making.

DOHaD and Health Policy

The fundamental issue in translating DOHaD science into health policy concerns framing and conveying the message. The Society has not, in our opinion, done this adequately. There remains uncertainty at the level of policy-makers about the need for action. There are several reasons for this. One concerns the perception that DOHaD is all about very long-term outcomes. The early epidemiological observations, for example of Barker and colleagues,²⁵ linked low birthweight to cardiovascular or metabolic disease many decades later. And this paradigm for DOHaD has dominated the research agenda ever since.

It has required the development of a life course model in which the earliest events affect the trajectory of risk to start to shift the agenda. At early stages of the pathway, there are health outcomes which are much more relevant to both government policies and the concerns of the population, such as childhood obesity, early indices of cardiovascular and metabolic risk, and particularly neurocognitive and emotional development.

A pathway-dependent model of health does not always make it easy to identify the points at which intervention will be most effective, especially as the NCD causation pathway is complex.²⁶ The underlying determinants are too substantial and too diffuse to be easily included in policy-making in the short term: globalisation, urbanisation, population ageing and social determinants of health. There are a range of common risk factors, which are modifiable and which do figure in policy, but they are not specific to DOHaD: smoking, unhealthy diets, physical inactivity, harmful use of alcohol, parental health, air pollution and environmental chemicals. Other causes, such as genetics and age, are not modifiable. Next, there are a range of intermediate risk factors which have been the province of clinical medicine in terms of risk assessment and therapy: raised blood sugar or blood pressure, blood lipid profile, overweight/obesity, poor lung function.

While international agendas such as those focussing on NCDs attract attention and may generate philanthropic funding, agencies such as WHO do not directly create policy. Nation states determine their policy domestically even if international agencies such as WHO produce guidelines, for example by creating monitoring systems or methods. Although as noted above, DOHaD concepts are implicit in international agendas such as the SDGs, any progress on DOHaD will have to be a matter for national systems.

Relatively few governments have picked up even the shorter term outcomes of DOHaD such as childhood obesity or neurocognitive development.

If DOHaD protagonists are to affect policy, they must be aware of how policies are made. Policy-making is a complicated business and involves multiple actors, both formal and informal, elected and non-elected. Finding a common language is therefore extremely important. Policy is often about making choices between (sometimes directly competing) options that affect different groups of stakeholders in different ways, in part because they have different sets of values. Moreover, there may be conflicting views on what is appropriate in terms of State intervention, or interference. No matter how strong it is, scientific evidence cannot make policy, only inform policy-making. Policy-making has many other dimensions – including public opinion, electoral contract, mixed priorities and impact on a range of stakeholders. Nonetheless, evidence can inform policy by a range of means. It can explain complex systems so that points of intervention can be established: this could be relevant to DOHaD. It can define options and explore the impact of each and, because evidence derives in part from evaluation of programmes, this can be helpful in informing policy for programmes already in place. We stress, however, that evidence of a problem is usually not helpful unless there is a potential practical, useable and policy- and politically-acceptable solution available. Policy will seldom change without this, because policy-making is usually relatively short-term and incremental over time. This does not favour DOHaD. In addition, policy-makers usually have a limited bandwidth and are resistant to change unless some major external force drives them to focus on a particular problem.

In an analysis of the achievements of global health networks, Schiffman²⁷ notes that the most effective have a simple, moral or ethical platform which is hard to ignore or countermand. DOHaD has not developed such a platform or framing device. It has tended to focus on NCD risk reduction and, leaving aside the questions of the long latency perceived to operate between risk induction during development and clinical outcome, we have to recognise that “risk” means different things to policy-makers than to scientists, and that there is sometimes little appreciation of it by the wider public.

There are some simple lessons which DOHaD protagonists can learn from those engaged with science policy advice. The first concerns the way in which evidence is presented. Policy-makers seldom respond to unsolicited reports, so it is important to capitalise on opportunities offered by invitation to give evidence. Any whiff of hubris or arrogance can detract from the evidence presented, however strong. Likewise, if the evidence or interpretation is contestable it will have little impact, and the same applies to evidence which derives only from one scientific discipline – seen as a silo – rather than from multidisciplinary perspectives. DOHaD could have strength here, because it is an interdisciplinary science, but researchers have not sufficiently engaged with other disciplines, especially the social sciences, and too few have made the much needed transition from observational to intervention studies. Modes of transdisciplinary evidence synthesis are difficult but are evolving. Evidence presented is therefore often seen as siloed and thus is met with questions: these may be for clarification or be more challenging. Not answering them will severely diminish prospects of influencing policy.

Like all researchers, DOHaD scientists have to remember that, in giving evidence, they are just that – scientists, and need to propose evidence-informed strategies and where possible pragmatic solutions. Opining on values, policy-making processes or other

wider issues will diminish the impact of their evidence, as will engage in inappropriate advocacy. Oliver et al.²⁸ and Cairney and Oliver²⁹ review some of these issues, stressing the need to shift from trying to increase the impact of evidence, as if evidence-informed policy making were the same as evidence-based medicine, towards a better understanding of what influences policy-making, including the underlying theory.

The issues above must cause us to ask some fundamental questions about the likely impact of DOHaD research on health policy. The first might be whether a focus on obesity and NCDs is the most appropriate at this time. Obesity research is a very contested area, with multiple actors, NGOs and CSOs and substantial funding from various sources. However, it probably does not really appeal to policy-makers as, despite much work, there is no clear way forward. Its consequences are long-term and the DOHaD perspective is little recognised by adult physicians such as cardiologists or diabetologists who wrestle with the consequences of obesity. The wider public is in many respects tired of hearing about obesity, with the attributions of blame and the lack of clarity on the individual actions needed. As noted above, DOHaD does not offer a clear indication of the developmental contribution, in terms of attributable risk, to conditions such as obesity or NCDs. This information is critical to policy-makers who have to decide if DOHaD will deliver a cost-effective strategy to reduce NCDs. So, DOHaD at present is not in a position to offer evidence for the magnitude of the reversible components of the problem or indeed an effective and acceptable, or economically effective solution. Without this DOHaD offers very little which policy-makers can own.

In contrast, the kind of work that Meaney and his colleagues have done relating maternal and perinatal stress to neurodevelopmental outcomes in children³⁰ offers very different opportunities, as does the increasingly recognised lifelong impact of exposure to air pollution in pregnancy and early childhood.³¹ Governments around the world are focused on issues of human capital development and the economic impact of cognitive and behavioural development is undeniable and fits with the well-established acceptance of the long-term benefits of education. It plays to the relative short-termism of most public policies. In this context it is striking how limited has been DOHaD research in this field.

DOHaD science and policy: where to from here?

From the discussion above, it seems that DOHaD science and evidence still remain largely experimental, based on epidemiology and animal research. Whilst it is commencing, there has been little interventional research in humans. Of this research, several randomised controlled trials in pregnant women or in infants have shown no short- or long-term benefit to the child, and very few a positive and persistent effect. In view of the uniformly small responses to the intervention in terms of improvement in fetal growth or reduction in gestational weight gain, the naysayer might be forgiven for dismissing DOHaD. Extrapolation from animals, as in neuroscience, is unlikely to be as compelling as once thought – we only have to look at the limitations of research on parturition in other species to appreciate why well-conducted human studies are essential. These still remain to be done, and as a Society we must invest the time and effort to redress this inadequacy.

How, therefore, might the science of DOHaD progress in order to have more impact? We suggest that it needs to adopt more of a systems-based approach and, in order to accelerate the move towards interventions, to be integrated with other such

interventions applied to young people. Consideration needs to be given to whether it is at present possible to derive some idea of the size of the effects which would be expected from an effective intervention in the short and longer term. In addition, we need to be clear about whether DOHaD research is aimed at answering the right questions. For example, much time and effort was expended in the early days of DOHaD on studies linking birthweight to later outcomes: this is now seen to be far less relevant. But are the long-term determinants of appetite, food and physical activity preference and other related behaviours a valid area for new research which builds on the unique perspective of DOHaD? From a policy point of view the issues of the magnitude of the problem and the evidence of effective, measurable impact through interventions are paramount. But we should consider whether we are focussing on the most appropriate outcomes: perhaps childhood and emotional cognitive development, with impact on educational outcomes – possibly linked through this context to childhood obesity – and human capital are more relevant to policy-makers. Given that narrative can sometimes be more influential than data, we can see how a platform for DOHaD might be established.

Those recent reports that have shifted the DOHaD focus to preconception health^{8,9}, widely disseminated and with excellent media coverage, also provide less frequently targeted outcomes for DOHaD impact, exploration and intervention. The evidence base for preconceptional health and reproductive outcomes is incontrovertible and DOHaD can back it with impunity. We should capitalise on this opportunity to support lifestyles that improve reproductive health amongst women and their partners, whilst keeping an eye to lifelong health, but with a more immediate message. Transition away from the Society's traditional mantra focused on the later risk of NCDs, which to many young people must appear too distant a problem, would provide more tangible impact. At the same time the DOHaD research community should continue to develop preconceptional interventions designed to deliver information on longer term outcomes. To achieve this we should consider population-based complex interventions, integrating education, social support, lifestyle and the environment, moving away from cohort studies, and with a view to evaluation at a population scale. The concept of health in the first 1000 days has taken a solid hold and, importantly, we should continue our efforts through clinical trials to improve clinical outcomes in pregnancy including treatment of conditions such as hyperglycaemia or hypertension whilst encouraging breastfeeding and childhood physical activity, and contributing to improved childhood nutrition.

Finally, it sometimes feels as if we are travelling a lonely road in DOHaD. We need as a Society to make alliances with other groups if we are to influence policy. There are many such groups we should link to: in science with life course, human development, nutrition, education, women's health and mental health researchers; in society with women's rights, education and teenager's activities; with non-government and civil society organisations such as First 1000 Days, The Partnership for Maternal, Newborn and Child health (PMNCH, WHO), the Non Communicable Disease (NCD) Alliance etc; with professional bodies for HCPs, educators, social workers; in the public sector with organisations that link the science community and the policy community such as the International Network For Government Science Advice (INGSA); and with the private sector where appropriate. We will find such allies welcoming, we believe, as many of them are similarly involved in attempting to influence policy-making in health but also in education, justice

and social development. If we can take this forward to the point of implementation research, DOHaD will have an extremely influential future.

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