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Review Paper

The Dahlgren-Whitehead model of health determinants: 30 years on and still chasing rainbows

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ABSTRACT

This year marks the 30th anniversary of the Dahlgren and Whitehead model of the main determinants of health, sometimes known as 'The Rainbow Model'. In this article, we reflect on developments over those thirty years before going on to look to the future. We start by telling the story of our model's idiosyncratic journey from initial rejection to worldwide acclaim. We reflect on the many ways in which the model has been used over the years and why it has proved illuminating for people in so many different positions. It is equally important to understand what it does *not* do and what it was *never intended* to do, as sometimes the conceptual debate gets side-tracked by mistaken assumptions. We take some space to outline how we ourselves use the model with the complementary Diderichsen Framework to explain the pathways and mechanisms by which the known determinants of health bring about the social gradients in health that are observed within countries. We conclude by looking to the future and what further needs to be done to capture insights for action on the determinants and drivers of health and of growing inequalities in the post-pandemic world.

This year marks the 30th anniversary of the Dahlgren and Whitehead model of the main determinants of health,[1] sometimes known as 'The Rainbow Model'. In this article, we reflect on developments over those thirty years before going on to look to the future.

An accidental success

Today, the so-called 'Dahlgren and Whitehead model' of the main determinants of population health has become the most widely used model of its kind worldwide, but it had a rather unpromising start to life. In 1991, we were commissioned by the World Health Organisation Regional Office for Europe (WHO) to prepare a policy-friendly report on policies and strategies to promote equity in health. This followed on from a warmly received briefing on concepts and principles of equity and health, which was commended for being in an accessible language for politicians and policy advisors across Europe.[2]

We wanted this second report to be equally accessible and set about refining an underpinning model which would visually illustrate the layers of influence on population health and provide a simple framework for thinking about the policy response of the different sectors involved in tackling these determinants. The international advisory group to which we first presented it, however, rejected it as being 'too complicated' for the intended audience and advised us to leave it out of the WHO report. The report was, therefore, duly published in 1992, minus the model.[3] We were, however, reluctant to scrap the model. The Swedish Institute for Futures Studies, where Göran was employed at the time, offered to print our background paper with the 'rainbow' diagram as an occasional paper in late 1991.[1]

From there, the model started a 'word of mouth' journey, first being used in a background paper for an international King's Fund initiative on developing a national strategy for 'Tackling inequalities in health' in 1993,[4] later extended and published as a chapter in a King's Fund Book of the initiative.[5] Participants in the King's Fund initiative started to pick up the model and cite it in their work, and it found its way into a government strategy document entitled 'Variations in Health: what can the Department of Health and the NHS do?'.[6] It has to be remembered that this was in a period when no official documents in the United Kingdom could use the phrase 'inequalities in health' and had to make do with euphemisms such as 'variations': nonetheless, this document proved to be a turning point.

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From then on, the model took on a life of its own, popping up in major inquiries concerning inequalities in health, starting with the Acheson Inquiry in the United Kingdom,[7] spanning local to global levels– from local Directors of Public Health annual reports to national strategies in Europe and the Americas to reports from international bodies. Ironically, the model came back full circle to appear in WHO publications where once it had been rejected. Our original report for WHO that triggered this whole journey was eventually translated into over twenty European languages and led to the development of our WHO 'Levelling up' strategies.[8,9]

Thirty years on, a Google search for the model produces half a million hits – in peer reviewed papers, student textbooks, dissertations, government reports, online training courses and so on. The image has been recreated on medals and badges awarded as prizes. It has even been used as a symbol for public health work in general, with public health officers in one Swedish county wearing pins on their jackets with this symbol.

In 2015, the model was chosen by the United Kingdom's Economic and Social Research Council as part of its 50th-anniversary celebrations as one of the 50 key achievements over the past 50 years of social science research that were 'important work of research that have had a major impact on our lives', with the citation 'The Dahlgren-Whitehead rainbow model remains one of the most effective illustrations of health determinants and has had widespread impact in research on health inequality and influences' (https://esrc.ukri.org/about-us/50-years-of-esrc/50-achievements/the-dahlgren-whitehead-rainbow/).

What is so useful about the model and why?

As the model spread, we sometimes puzzled what was so useful about it and for whom? From our conversations with users of the model around the world over the past 30 years, some common themes emerge time and time again.

Triggering a 'lightbulb moment'

The rainbow model appears to broaden horizons – encouraging people to think beyond health services and the health sector to the wider social determinants of health in local environments and society as a whole. It seems that this has proved particularly helpful conceptually for professionals and policymakers operating in diverse sectors outside the health sector. It helps them escape from the commonly held notion that health is determined largely by the formal health services, and encourages them to consider what they can do in their own sector to influence the health of the population that they serve. Margaret vividly recalls a housing officer for a city council coming up to her early on and explaining that the model caused a '*lightbulb moment*' for him: he recounted how he suddenly realised that his work in housing could influence the health of local residents and where he fitted into the grand scheme of things.

Imbodying true multisectoral action

The model has proved useful in getting people in different sectors to work together on a common goal. It seems to give each sector an ownership and responsibility to develop and implement its own strategies for promoting health and reducing inequalities, starting and based on the existing reality in that sector. These can be thought of as natural policy experiments. Each sector can then – when needed – initiate collaboration with other sectors. Previous models typically gave the health sector a leading role in promoting inter-sectoral actions for health. The role of the health sector was often to initiate the collaboration with, and give support to, other sectors, which tends to lead to the medicalisation of actions and a loss of ownership in other sectors of their public health policies and action.

Combining a holistic perspective with simplicity

Basic features of the model that appear to 'click' with people are its holistic view of the main determinants of health, combined with its relative simplicity. It is quite easy to understand, compared with other models with many boxes and arrows going in different directions. Furthermore, the determinants of health in the rainbow can be health promoting (salutogenic), protective (e.g. a vaccine) or health-damaging risks. Other models typically focus mainly or solely on risk factors.

Focussing on determinants of health rather than the causes of different diseases

In contrast to more medicalised models, which start with the causes of a specific disease, the rainbow model focuses on the determinants of *health*. This has proved advantageous, both conceptually and strategically. First, it sets free the power of many more professionals and people in their daily lives to affect change compared with disease-focused models, where actions are seen as the preserve of medicine. Second, focusing on the determinants of health makes it possible to develop a comprehensive strategy related to one main determinant of health. In disease-specific strategies, there is a risk of fragmentation of preventive actions when the same risk factor is found in the aetiology of many different diseases. This is because strategies for each disease are often developed independently of each other and contain multiple suggestions for tackling the risk factor common to them all. The likely result is uncoordinated actions initiated by specialists in the treatment of different diseases. They typically have very limited knowledge of how to reduce certain risk factors/determinants of health outside their immediate field. Consequently, the positive health effects of preventive actions are likely to be reduced in disease-specific strategies compared with comprehensive strategies for the determinants of health.

Offering a theoretical framework to structure research on social determinants of health

Judging by the literature, researchers have found the model useful in many different types of research study to help consider layers of influences on health, expanding perspectives outwards to the possible role of wider and wider determinants of health, and building up a complete picture. It has even been used as a kind of logic model in systematic reviews to help identify relevant intervention studies in diverse fields.[10]

What the model does *not* do and how we remedy that

Despite, or possibly because of, the apparent simplicity of the Dahlgren and Whitehead model, its purpose is sometimes misunderstood, which can cause the discourse surrounding determinants to go a little astray. One of the most common mistakes is assuming that it is a model of the determinants of *inequalities* in health: it is not. The model conceptualises the main determinants of health for the whole population, which may differ from the most significant determinants of the social inequalities in health observed in that same population. To give one example from Sweden, nowadays, dangerous working conditions have ceased to be a major determinant of ill health in the Swedish population overall, but exposure to poor working conditions is still a significant determinant of the inequalities we see between the health of those in professional

compared to unskilled occupations in Sweden. It is, therefore, of critical importance to make a clear distinction between the main determinants of health as related to the whole population and the main determinants of social inequalities in health.

To fully understand the determinants (root causes) of inequalities within a country, we need to take a further conceptual leap and focus on the pathways and mechanisms by which the known determinants of health in the Dahlgren and Whitehead model bring about the social gradients in health that are observed within countries. In our teaching and research, we often use the Diderichsen model of pathways to inequalities in health and associated policy entry points for this purpose.[11] Finn Diderichsen proposes four main mechanisms operating on the determinants of health: differential power and resources; differential exposure; differential vulnerability; and differential consequences of being sick. Working out which mechanisms are operating and in which contexts help to identify the most appropriate strategies for tackling resulting inequalities. Guidance on methodological issues involved in using the Diderichsen model can be found in Diderichsen et al. 2019.[12]

Margaret has done this exercise most recently in relation to the socio-economic and ethnic inequalities emerging with the COVID-19 pandemic.[13] The evidence shows that more disadvantaged groups in the United Kingdom have had *greater exposure* to COVID-19 infection because of the jobs they do and overcrowded living conditions. Once they catch COVID, they have *greater vulnerability* to complications of the disease and greater severity, due in part to exacerbation from their higher rates of other pre-existing health conditions and weakened immune systems from previous health damage. The *social and economic consequences* of the pandemic also continue to fall heaviest on the more disadvantaged groups and communities in the country, widening inequalities in health between disadvantaged and affluent groups still further. A further development of the 'Diderichsen model' for the study of COVID-19 is found in Katikireddi et al. 2020.[14] Our 2007 'Levelling Up' report for WHO explains how to use the Dahlgren and Whitehead model and the Diderichsen model in a complementary way as a basis for strategies to 'level up' the health gradient.[9]

We would like to take this opportunity to mention one particular criticism levelled at the '*rainbow* model' from time to time, to put the record straight. It is sometimes dismissed in academic circles as useless as an analytic tool for empirical testing of causal pathways. This is mildly irritating because we always feel like responding 'but it was never intended to serve that purpose!'. The model is simply a visual representation of the concept of the main determinants of the health of populations, conveying the message that many are *social* determinants, forming interconnected layers of influence and amenable to organised action by society. It can be and has been used to give a framework for research and systematic reviews on social determinants of health, as explained above, but it was never intended, and indeed is of no use, for empirical testing of hypotheses about causal links between determinants. This stands in contrast to the Diderichsen model of mechanisms and pathways to inequalities in health described above, which does provide an analytic framework for empirically determining the mechanisms that are operating and their relative importance in generating inequalities in health in different social contexts. We highly recommend it for that purpose.[11]

Onwards and upwards

Reflection on the past 30 years has helped us identify where to go from here, to develop the model so that it is adapted to the burning issues of the day.

First, we need to find ways to better illustrate the vertical links between the social, economic and cultural determinants of health and those of lifestyle. This is needed to reinforce the point that many lifestyles are structurally determined. There is a common, flawed assumption that the lifestyles of different socio-economic groups are freely chosen, ignoring the reality that lifestyles are shaped in important ways by the social and economic environments in which people live. Take nutrition, for example, Whether families with young children eat a healthy diet depends not only on whether parents 'choose' nutritious food, but also what food is accessible to them and whether they have sufficient income to afford that food. In turn, the availability of good quality foodstuffs at

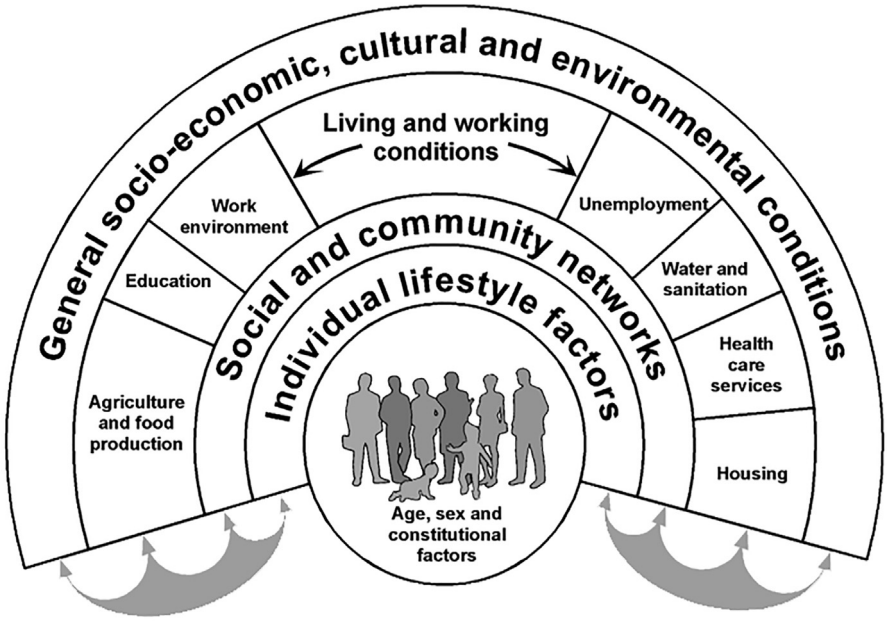

Fig. 1. The main determinants of health.

a reasonable price depends on agricultural policy, the existence of subsidies and taxes, and regulation of the content of processed food and drinks and so on. We know that some find it useful to use the rainbow model when discussing these structurally determined lifestyles.

We attempted to illustrate this interconnectedness in our WHO 'Levelling up' reports by including multidirectional arrows across the four layers of determinants, as in Fig. 1 (from Dahlgren and Whitehead, 2007[9]). But these vertical relationships need to be further developed in writing and illustrated in the model as it is becoming more urgent than ever to counter continued lifestyle drift and associated policy drift towards individual behaviour change strategies and away from more effective structural interventions.

Second, there is a current debate about the importance of the commercial determinants of health and whether they have been neglected by the public health community, including a critique of these not being given sufficient prominence in the Dahlgren and Whitehead model (Maani et al., 2020[15]). By 'commercial determinants', Maani and colleagues refer to factors that adversely influence health, which stems from the profit motive; the examples they give concentrate on the strategies of tobacco, alcohol and food and beverage producers to promote their products. While we acknowledge that the impact of commercial interests should always be analysed, we deliberately do not define 'commercial interests' as a determinant in its own right to be included in the rainbow model. In a rebuttal to Maani and colleagues, we explain how we consider profit-driven commercial interests as 'driving forces' that are related to almost all determinants of health except genetic factors. They influence, for example, what we eat and drink, our access to health services and the quality of the air we breathe. And, crucially, we argue that these driving forces are not limited to the antics of commodity producers but extend to the increasing role that commercial companies play in other sectors of importance for health development and equity, such as privatisation of education and care services, not forgetting the associated political drivers of almost all determinants of health.[16] While in our WHO 'Levelling Up' reports, we have explained the importance of commercial and political drivers and how they promote privatisation at the expense of equity, we are working on further developments together with Finn Diderichsen to illustrate this point more explicitly.

In relation to this burning issue, we want to emphasise the importance of needs-based good quality health services on equal terms for the whole population. The reality in many countries – including the British and Swedish tax-financed health care systems – is that market-oriented health care reforms are widening the social inequalities in access and quality of care.[17] The classical inverse care law is indeed a reality in most countries. Combating these increasing inequalities in access to care caused by commercial drivers is of critical importance in any strategy for reducing social inequalities in health.

Third, and similarly, there is a growing debate about the influence of racism on health and whether it should be incorporated as a determinant of health in the model. It is our view that, *conceptually*, racism should not be included as a determinant of health but rather be conceptualised as an important 'driving force' influencing almost all determinants of health in the model and driving the social and ethnic patterning of determinants. With this perspective, racism is an extremely important driver of ethnic inequalities – operating through three *mechanisms* articulated by Jennifer Yip and colleagues: *racial discrimination and stigma* shaping the experience of determinants at the individual and community levels; *institutional racism* shaping the living and working conditions and essential goods and services that people have access to; and *structural racism* influencing the impact of the overarching socio-economic, cultural and environmental conditions experienced by different groups in society.

Defining these components of racism as 'driving forces', acting on the basic determinants of health in the various layers, highlights the importance of undertaking this kind of equity analysis on how racism operates.

Above all, it is clear from the disturbing population health developments globally that now more than ever, we, as a public health community, need to advocate for concerted action on the social determinants of health and the drivers of those determinants that are generating growing inequalities. If the Dahlgren and Whitehead model can continue to evolve as above, then it may have a useful role in the framing of that action, but concepts are not enough. We need to take action, in whatever sphere of influence we operate, to tackle inequalities in health and 'build back fairer'[18] in the post-pandemic world.

Author statements

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None declared.

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