A blueprint for health system sustainability in the UK

Towards a bottom-up solution to the impending health and care crisis

A CONSENSUS POSITION PAPER

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United Kingdom

All enquiries to: info@anhinternational.org

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"This is a time of great transformation – of simultaneous breakdown/breakthrough - affecting all aspects of our human endeavour, not least our approach to human health and wellbeing. Our present responsibility is not simply for our own health, but for future generations, and the wider fabric of life on which we all depend.

This timely, far-reaching and well-researched report lays critical foundations for future pathways towards a necessary regenerative health system that does nothing more, nor nothing less, than embody the logic of life. We humans are very much part of life, and would do well to adhere to the wisdom life bestows us. It's time to move beyond overly-reductive lenses that may well have served us in the Industrial era, to now see with new eyes, and recognise the holistic nature of life.

Force-fitting mechanistic and reductive methods creates ever widening and deepening systemic consequences for ourselves, our future, and the rich diversity of life on Earth. We know this. The time has come to embrace the ecological principles of life, and this comprehensive report goes right to the heart of the matter. It forms a key part of the backbone of this necessary {r}evolution towards ecological consciousness."

Giles Hutchins, Regenerative Leadership specialist, Chair of The Future Fit Leadership Academy, cofounder of Regenerators, and author of *The Nature of Business*, *The Illusion of Separation* and *Future Fit*.

"I salute this Blueprint for Sustainable Healthcare. We urgently need a radical change in our approach to healthcare to ensure the future health of our society. A system of healthcare that is safe, effective and affordable must include of a wide range of integrated health practices, including traditional and scientific herbalism, to serve our citizens with care, compassion and value."

Sebastian Pole, Master Herbsmith and co-founder Pukka Herbs, MAPA, MRCHM, MURHP

"The UK healthcare system is broken and our families are the casualties. Only a radical rethink will create a healthier future. This document assembles a truly holistic perspective, calling on historic traditions and established modern research to create a human-centred model that I believe our children and grandchildren deserve."

Cheryl Thallon, Founder & Managing Director, Viridian Nutrition

"As a clinician, researcher and educator on functional and lifestyle medicine for over 35 years I have reviewed many proposals for inducing cultural change in behaviour to facilitate improvements in health. This document will set a new benchmark in its progressive and actionable steps for implementation and oversight.

Functional Medicine provides a comprehensive framework for one to one care, but its foundations also translate into community and national health promotion and sustainability – as the leading UK education Organisation for Functional and Lifestyle medicine, we are pleased to endorse this paper as a creative and structural blueprint for expanding personal control over health generation."

Michael Ash DO, ND, BSc, RNT, Managing Director, Clinical Education

We have entered the epoch of personalised health. With it comes the opportunity to reassert health ownership. Who owns your health? Gone is the time when protocol management, coupled with pharmaceutical medication was going to save humanity from the vagaries of disease. There is no one size fits all in health. If there was, there would be no disease. Instead each of us is unique, if we can understand better our biochemistry along with the interactions between our genes and our environments, then we will be able to assess better what our bodies require to function optimally. With that will be a shift from disease management, to disease prevention and, most importantly, to the attainment of optimal health.

This ground-breaking document details the essence of what so many of us have spent our careers working towards - a commitment to changing healthcare. It offers, in an easily accessible language, a change to the current dogma of healthcare. Supported by compelling science, the multi-faceted approach presented in this blueprint shows how individuals can be empowered to reclaim their health. In doing so, they will relieve health care systems of the near impossible pressures on resources that threaten to make them no longer viable.

To the reader: I urge you to not read this document passively. Instead, utilise the knowledge contained within these pages to galvanise your health, and that of your families and friends. In doing so, you will be part of the much-needed revolution in how we as humans manage our health.

Chris Moore, Managing Director, Nordic Group

AUTHORS

Principal author	Robert Verkerk PhD
Contributing authors	Meleni Aldridge Melissa Smith Jerome Burne

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Caroline Peyton (Naturopathic Nutrition Association)
Roger Groos (General Naturopathic Council)
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Dawn Thomas
Jacqueline Breslin
Sebastian Pole
Nicola Packer
Jackie Day
Eoghan O'Brien
Richard Eaton
Dr Antonia Wrigley
Karin Mont

ENDORSEMENTS

This document has been endorsed by the following associations, organisations and individuals.

Individuals

Ascending alphabetical order.

Michael	Ash	*DO, ND, BSc, RNT*	Managing Director, Clinical Education
David	Balen	*Cert PFS.*	Chairman, Balens Ltd
Dr Keith	Beasley	*PhD*	Reiki Master/Teacher
Katie	Bolland	*BSc Hons (Nutritional Therapy)*	Nutritional Therapist
Benjamin	Brown	*ND*	Author of *The Digestive Health Solution*, Ed of *J Orthomol Med*, Contributing Ed *Integr Health Appl Nutr*
Dr Alyssa	Burns-Hill	*PhD, MSc, FRSPH*	Fellow of the Royal Society for Public Health
Christina	Colligan	*mBANT, IFM, ANP, CNHC*	Nutritional therapist
Dr Martin Daniel	Connaughton	*PhD, BSc (Hons), CDip AF*	Managing Director and Owner of ConnauTech Ltd
Robin	Daly		Founder, Yes to Life
Sue	De Cesare		Executive Director, Yes to Life
Dr Jeanne A	Drisko	*MD, CCT*	Former Medical Director, Integrative Medicine, Kansas University Medical Center
Richard	Eaton	*LL.B (Hons)*	Advocate for Complementary and Alternative Medicine and Natural Health
Dr Nyjon	Eccles	*BSc, MBBS, MRCP, PhD*	Integrated Medicine physician
Nick	Foyle	*MCIPD ACIB*	Learning and Development Professional
Jayney	Goddard	*MSc, FCMA, Lic.LCCH, Dip.ACH, FRSM*	President, The Complementary Medical Association
Sandra	Goodman	*PhD*	Editor Positive Health PH Online
Patrick	Holford	*BSc, DipION, FBANT, NTCNHC*	Author of 37 books on nutrition, including *The Optimum Nutrition Bible*, *The Low GL-Diet Bible*, *Optimum Nutrition for the Mind*, *Food is Better Medicine than Drugs*

Bryan	Hubbard	*Journalist, publisher*	*What Doctors Don't Tell You*
Giles	Hutchins		Regenerative Leadership specialist, Chair of The Future Fit Leadership Academy, cofounder of Regenerators, and author of *The Nature of Business*, *The Illusion of Separation* and *Future Fit*
Meilyr	James	*BSc (Hons) DBTh DAcu AcuC DIr MGNI*	*Medical Herbalist, Acupuncturist and Iridologist*
Jamie	Johnson	*CNC, CFMP, AFMCP*	Performance Nutrition and Functional & Lifestyle Medicine and Strength & Conditioning specialist
Dr Samantha	Jugdev	*Dental Surgeon*	Affiliate of British Homeopathic Dental Association and the Faculty of Homeopathy
Mark	Killick	*BSc, Dip ION, mBANT*	Nutritional therapist
Peter	Kindersley		Sheepdrove Organic Farm, Berkshire
Don	Mei		Director, AcuMedic
Chris	Moore		Managing Director, Nordic Group: Nordic Laboratories, Nordic Clinic & Nordic VMS
Sebastian	Pole	*Lic OHM, Ayur HC*	Co-founder, Pukka Herbs
Janelle	Scialla		Principal of Earthworks School for the Healing Arts
Dr Andrew	Sikorski	*MBBS MRCGP FFHom DFFP*	General practitioner
Dr Dawn	Thomas	*BA, MA, PhD (Lond)*	Epidemiologist, Independent Researcher
John	Vincent		Co-founder, Leon Restaurants
Lord Ken	Ward-Atherton	*MBRCP, MARH, LFHom, BAWMA (Fellow), JHMA (Fellow), ICNM (Fellow)*	Integrative medicine practitioner
Tim	Westwell		Co-founder, Pukka Herbs
Dr Xandria	Williams	*PhD, MSc, DIC, ARCS, ND, MRN.*	Biochemist, nutritionist, naturopath, psychotherapist
Dr Antonia	Wrigley	*BSc, MBBS, MRCGP,*	General practitioner; Vice Chair, British Holistic Medicine Association

Organisations and Associations

Ascending alphabetical order.

Alliance of Registered HOMEOPATHS

BAF BRITISH ACUPUNCTURE FEDERATION

BHMA Re-imagining Healthcare

CNELM

COLLEGE OF MEDICINE AND INTEGRATED HEALTH

ACHO

Earthworks School for the Healing Arts

HRI HOMEOPATHY RESEARCH INSTITUTE

nna NATUROPATHIC NUTRITION ASSOCIATION

Omnes Healing Community | Service | Spiritual Development Energy Re-balancing

ANP Association of Naturopathic Practitioners

BRITISH ACADEMY FOR LIFESTYLE MEDICINE

CMA THE COMPLEMENTARY MEDICAL ASSOCIATION

YES TO LIFE YOUR OPTIONS FOR CANCER

Companies

Ascending alphabetical order.

ABUNDANCE & HEALTH
HIGH PERFORMANCE NUTRIENTS

AcuMedic

BALENS
Specialist Insurance Brokers

CancerOptions
Consultancy, Research and Coaching

CANSURVIVE
RESOURCE & TRAINING CENTRE

LEON
NATURALLY FAST FOOD

naturaldoctor®
HARLEY STREET

Nordic Group

Nordic Laboratories

nucleotide nutrition

positivehealth Online
PH
Integrated Medicine for the 21st Century

pukka

The Natural Choice

viridian
The leading brand of ethical vitamins

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EXECUTIVE SUMMARY & FOREWORD

EXECUTIVE SUMMARY

1. What sort of health care system do we want? For most British people, healthcare is synonymous with the NHS and its founding promise of ***"universal healthcare, according to need, not ability to pay"***. But increasingly that promise looks under threat. The growing shortfall in funding now runs into billions of pounds, with measures such as recruiting overseas doctors and nurses or decentralisation all having failed to fix an increasingly broken and unsustainable system. (Sections 2.1-2.3, pp. 17-22).

2. If health care is to become sustainable, we need to - as a society - radically change how we manage our health. The focus has got to be as much, if not more, on what goes on outside, rather than within, the NHS. It must therefore go well beyond the organisational, medical and funding complexities of how the NHS delivers healthcare services and products to diseased people. (Section 1.2, p.11).

3. The public needs to become much more engaged in its own health optimisation, and that requires a public that is empowered to eat, move, relax and sleep in ways that dramatically reduce the risk of preventable diseases such as heart disease, type 2 diabetes and obesity. The direct and indirect costs to the UK economy of just two of these diseases, type 2 diabetes and obesity, are estimated at around £55 billion per annum. (Section 2.3, p. 22).

4. The NHS must also transform from being essentially a disease management system – dedicated to treating people mainly after they become sick - into part of a larger, upstream-focused health and resilience support system. Such systems aim to identify and mitigate causes and triggers of disease, or potential disease, as early as possible in their cycle, or before they even manifest (see Fig. 13, p. 89).

5. This position paper proposes a universal framework, based on ecological and sustainability principles, aimed at allowing qualified health professionals, regardless of their respective modalities (disciplines), to work collaboratively and with full participation of the public in efforts to maintain or regenerate health and wellbeing. Accordingly, rather than offering 'fixes' for the NHS, the paper offers an approach that may significantly reduce the NHS's current and growing disease burden that is set to reach crisis point given current levels of demand and funding. (Section 3, p. 35 & 5, p. 77).

6. A major factor driving the relentlessly rising costs of the NHS is its over-reliance on pharmaceuticals to treat a variety of preventable, chronic disorders. These are the result — not of infection or trauma — but rather of our 21st century lifestyles, to which the human body is not well adapted. The failure of pharmaceutically-based approaches to slow down, let alone reverse, the dual burden of obesity and type 2 diabetes means wider roll-out of effective multi-factorial approaches are desperately needed. (Sections 1.2, p. 11, 2.2, p. 19 & 5.1, p. 81).

7. The NHS was created at a time when infectious diseases were the biggest killers. This is no longer the case, which is why the NHS must become part of a wider system that facilitates health regeneration or maintenance. The paper describes the major mechanisms underlying these chronic metabolic diseases, which are claiming an increasingly large portion of NHS funding. It identifies 12 domains of human health, many of which are routinely thrown out of balance by our contemporary lifestyles. The most effective way of treating lifestyle disorders is with appropriate lifestyle changes that are tailored to individuals, their needs and their circumstances. Such approaches, if appropriately supported and guided, tend to be far more economical and more sustainable as a means of maintaining or restoring people's health. (Section 3.2, p. 41).

8. A sustainable health system, as proposed in this position paper, is one in which the individual becomes much more responsible for maintaining his or her own health and where more effort is invested earlier in an individual's life prior to the downstream manifestation of chronic, degenerative and preventable diseases. Substantially more education, support and guidance than is typically available in the NHS today will need to be provided by health professionals, informed as necessary by a range of markers and diagnostic techniques. Healthy dietary and lifestyle choices and behaviours are most effective when imparted early, prior to symptoms of chronic diseases becoming evident and before additional diseases or disorders (comorbidities) have become deeply embedded. (Section 3.3, p. 51, 3.4 p. 58 & 4.3, p. 72).

9. The paper sets out 10 hallmarks of sustainable health systems that are centred on the needs of individuals while also being focused on health regeneration or optimisation. Hallmarks include significantly reduced pharmaceutical use as first-line treatment for dietary and lifestyle mediated disorders, financial and social frameworks that encourage the use of non-drug, lifestyle 'prescriptions', and much greater engagement and autonomy by the individual. (Section 5, p. 77).

10. The timing of the position paper's release coincides not only with a time when the NHS is in crisis, but also when the UK is deep in negotiations over its extraction from the European Union (EU). The paper includes the identification of EU laws that are incompatible with sustainable health systems, that the UK would do well to reject when the time comes to re-consider the British statute books following the implementation of the Great Repeal Bill. (Section 6.5, p. 106).

11. Successfully implementing such seismic changes in the ways that we manage our health will inevitably be met with opposition, notably from those with interests in maintaining the status quo. The paper identifies likely impediments and sets out ways to counter them. (Section 6, p. 97).

12. Creating sustainable health systems cannot succeed without public, local community, scientific, medical and political support. To help develop a consensus approach that will allow progress towards more sustainable health systems, this position paper recommends the establishment of trans-disciplinary working groups independent of the NHS or any vested interests. The working groups will aim to agree, by consensus, standardised approaches to assessing multi-system health and resilience status, the economics of different types of health systems, appropriate policy and regulatory measures, and approaches that both minimise social inequalities and maximise long-term sustainability. (Section 7.1-7.4, pp. 115-120).

13. Outputs from the working groups will be used as the basis on which to establish pilot trials in a variety of clinical and non-clinical settings. The aim of these pilot trials will be to evaluate 'proof of concept', including the effectiveness, perceived value, sustainability and net costs and benefits of the proposed collaborative and participatory approaches, as compared with standard care and existing public health measures. (Section 7.4, p. 120).

14. Assuming success of the pilot trials, larger scale testing and evaluation will be urged. It is expected that wide-scale adoption and roll-out of collaborative and participatory approaches to health and resilience creation, modelled on ecological and sustainability principles, could dramatically improve the sustainability of health systems for future generations. Such approaches will also likely reduce per capita healthcare costs while improving health outcomes, value and quality of life. (Section 7.5, p. 124).

15. This paper represents the first comprehensive attempt to apply sustainability principles to the management of human health in the context of our current understanding of human biology and ecology, tailored specifically to the UK's unique situation. It embodies approaches that work with, rather than against, nature. Sustainability principles have already been applied successfully to other sectors such as energy, construction and agriculture.

16. It is now imperative that the diverse range of interests and specialisms involved in the management of human health come together. We owe it to future generations to work together urgently, earnestly and cooperatively to develop and thoroughly evaluate new ways of managing and creating health in our society. This blueprint represents a collaborative effort to give this process much needed momentum.

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FOREWORD

Imagine a health system focused on health creation and optimisation rather than disease treatment or management. Where the majority of the population maintain high levels of health and resilience throughout most of their lives. Where healthcare takes place not just in clinics, surgeries and hospitals, but also in our homes, schools and workplaces. A system where we'd reap the rewards for honing the necessary skills and knowledge to optimise our biological potential.

It might seem some way off – but it's achievable if wider consensus can be achieved. While it might seem like science fiction to shift from a fossil-fuel based economy to one based on hydrogen in the coming decades, Japan has already made that commitment and the country and its people are set on making it happen.

If the British populace want a high level of health to be available to future generations, something as radical as Japan converting to a hydrogen economy needs to happen to the way the British people manage their health.

The UK presents a particular challenge for sustainability in health and social care. That challenge is related to the very thing so many Brits hold so dear to their hearts: the NHS. This year the NHS has turned 70 years old and it continues, with justification, to be widely regarded as the 'jewel in the crown' of the UK's social welfare system. It is paid for by the taxpayer – so regardless of the size of your wallet or where you live, you can receive healthcare, in principle, for free.

But what happens when taxes can't cover the costs of the service anymore? Or you're afflicted with a chronic or autoimmune disease the NHS has no real answer for? Simon Stevens, head of Public Health England, as well as the King's Fund, the think tank that oversees the NHS and its future, keeps issuing warnings that the NHS is running out of money and can't go on delivering what is expected of it. Without a seismic shift in the country's approach to healthcare, the outlook for the health of future generations and the knock-on social and economic impacts looks bleak, given the projected demands on the NHS and likely levels of funding in the coming decades.

Key to the severity and scale of the NHS's future challenges is its capacity (or lack thereof) to effectively deal with the growing burden from preventable, non-communicable diseases. We don't hear doctors referring to their ability to cure the likes of heart disease, cancer, obesity, type 2 diabetes, chronic respiratory diseases or Alzheimer's disease. They also have poor success with many of the autoimmune diseases that are now developing faster than any other category of disease. A big reason for the poor outcomes in treating these diseases is that mainstream medical doctors lack the resources and educational background to implement the multi-factorial, multi-modality approaches required. That's despite general awareness that so many of these diseases are actually preventable.

Another problem is that the NHS doesn't presently do enough to help create or inspire health and wellbeing. It is, by its very nature and history, disease-centric. By the time a patient becomes aware of symptoms of a chronic illness and gets seen by a doctor, the disease or comorbidities (additional, related diseases/disorders) are often deep-seated. That makes them not only much more difficult to slow or halt, let alone reverse, it also makes efforts to treat these long-standing diseases very expensive.

If that wasn't enough, the tools and training made available to doctors and nurses simply don't prepare them adequately for the onslaught they face from non-communicable diseases, comorbidities and an ageing population. What gets delivered is often a case of 'too little, too late.' Pharmacological approaches remain the mainstay of primary care delivery, the prescribed drugs more often than not targeting only symptoms, rather than the underlying cause(s) of disease.

This position paper isn't about deciphering new ways of solving the NHS's many internal problems. It focuses, instead, on what can be done, collaboratively, largely outside the NHS, to help significantly lighten its preventable, non-communicable disease burden.

That means proactively encouraging people to get into the driving seat to take control of their own health. It means shifting the emphasis from

being disease-centric to focusing on health optimisation - and creation. It is about being inclusive, rather than exclusive, in the process engaging a large workforce of health and fitness professionals which has been mostly marginalised by the medical mainstream's somewhat rigid approach to evaluating evidence and clinical effectiveness. Policy and regulation, often claimed to have been developed to protect the interests of the citizen, have in some cases had exactly the opposite effect. The result has been unjust censorship that prevents the benefits of particular foods or ingredients being communicated to the public, along with violation of the fundamental rights and freedoms of the individual.

In the development of this position paper, we've taken extensive soundings and inputs from many organisations, leading clinicians, scientists and researchers, including through an open consultation process. The level of endorsement for this position paper reflects the powerful commitment to radical change.

We are resolute: If key actors on all sides of the health debate can come together to help develop a consensus-based, innovative and dynamic approach to health optimisation that is based on good science, envisioned through the lens of sustainability, positive change can occur rapidly.

We have a duty, surely, to ensure future generations benefit from health systems that embody the ecological principles that are responsible for bringing our species this far in our own evolution.

Robert Verkerk MSc DIC PhD FACN
Founder, executive & scientific director
Alliance for Natural Health International
December 2018

SECTION 1
INTRODUCTION

1. INTRODUCTION

1.1 Aims of the Position Paper

The principal aims of this position paper are:

1. To identify the **primary underlying drivers of the chronic disease burden**, with a specific focus on preventable, non-communicable diseases that are not readily corrected by conventional methods
2. To establish **feasible ways in which individuals can become more empowered and engaged in their own health and resilience optimisation**
3. To revise the **concept of the 'health system' in ecological terms** so it is recognised as the system that exists within and around every person. This includes all internal and external interactions that affect health, whether biological, social or societal. By contrast, the 'healthcare system' involves all of the people, organisations, structures and resources that are brought to bear to support the health systems of individuals
4. To propose **a 'universal language' built on the principles of systems' biology and ecology** that individuals can use for health optimisation and management. This language must be meaningful and empowering to lay individuals as well as being relevant to any health or fitness professionals guiding them, regardless of their modality of practice
5. To propose **a mechanism by which participating individuals are offered the facility of managing 12 key zones of their 'ecological terrain' through three levels of evaluation.** These are self-evaluation, guided self-evaluation and practitioner-evaluation. These rely on evaluation of both 'hard' and 'soft' biomarkers. Similarly, interventions intended to balance any one or more of these zones can be delivered at three levels: self-care, guided self-care, and health professional-delivered care
6. To advance **10 criteria ('hallmarks') that can be used by healthcare professionals, as well as clinics, other organisations and communities engaged in healthcare or health optimisation**, that must be fulfilled for healthcare systems to be considered 'sustainable'. Sustainability is considered from the viewpoint of the healthcare system's capacity to continue to function effectively in the long-term, as well as in terms of its economic and environmental sustainability
7. To identify **political, economic/financial, scientific, structural, legal/regulatory, educational, social and cultural impediments** to the development of a sustainable healthcare system in the UK
8. To provide, via 'working groups', **recommendations that facilitate the co-creation of a pilot to evaluate the feasibility and effectiveness of the proposed principles of healthcare sustainability**. 'Demonstration trials' will be developed using a consensus approach and will include evaluation of health outcomes as well as economic, political and social impacts
9. To propose **a framework that can lead to the thorough evaluation of the potential of a full-scale, sustainable healthcare system based around upstream health optimisation and disease prevention.** Of paramount importance is the evaluation of its potential, at a national level, to substantially reduce the preventable disease burden on the NHS while also improving the health, resilience and quality of life of the UK population.

1.2 Background

Established healthcare delivery systems, namely the culmination of people, institutions, structures and resources that deliver healthcare services to meet the health needs of target populations, are facing unparalleled pressure the world over.

In the case of the National Health Service (NHS) itself, there is a growing risk that the delivery of high quality healthcare to those in need will increasingly fail. The reasons are multiple and include financial failure[1], poor management and leadership[2,3], and excessive burden from multiple comorbid chronic diseases and a rapidly ageing population.[4]

In 2001, Derek Wanless, former CEO of Natwest Bank was invited by the UK government to review long-term trends affecting the health service in the UK and determine the resources required for the NHS's sustainability while diminishing health inequalities.[5] Following a consultation, Wanless was invited to provide an update, culminating in a second report released in December 2003.[6]

The scenario analysis undertaken by Wanless' team showed clearly that the only adequate, long-term solution for the NHS involved reducing the burden on it by increasing public engagement by individuals in their own care. Wanless' final report, which included consultation input from a diverse range of actors, included many recommendations, such as better integration of health and social care. This and some other recommendations have been acted upon, as evidenced, for example, by the publication of the Healthy Lives, Healthy People public health strategy report in 2012, passage of the Health and Social Care Act 2012, the launch of the One You project (www.nhs.uk/oneyou), and the Personalise Health and Care 2020 framework for empowering the public with data and digital information.[7]

A Department of Health and Social Care initiative on Comorbidity, led by Dr Amina Eitsi-Selmi and involving various experts, highlighted the need for the promotion of health, wellbeing and disease prevention, while also defining the needs and wants of the comorbid populations in different geographic regions. The report, published in 2014, stated ***"Comorbidity is one of the most important issues facing health systems in the developed world today and the single disease approach is unable to address this problem appropriately."***

The NHS launched a sustainability plan in 2016,[8] the central aim of which is to reduce environmental impact and adapt better to climate change. Interestingly, the NHS has chosen to limit the meaning of the term 'sustainability' to environmental issues, when in fact the term provides a very useful framework for dealing with the sustainability of the healthcare system as a whole, including the underlying challenges facing autonomy, engagement and delivery of advice, services or products. The term is especially meaningful given the questions over the viability of the current structure, organisation, education and delivery of mainstream healthcare.

The King's Fund that has frequently warned of the risk of the NHS's financial vulnerability, in a report by John Appleby,[9] has restricted use of the term sustainability in relation to the NHS to its fiscal and economic meanings.

This position paper focuses primarily on one of Wanless' recommendations, arguably the most important one, namely efforts to increase engagement in the individual's own care. It also addresses community-based approaches, the principle of which was considered in the comorbidities report led by Dr Amina Eitsi-Selmi (above). A key goal is to address ways in which factors that might contribute to potential comorbidities can be identified and dealt with at a much earlier stage in an individual's life. Success in this area will prevent a much larger proportion of the population becoming an unnecessary burden on the established healthcare system, which itself has been able to do little other than manage symptoms.

The Government has addressed the vital need to decentralise responsibility for public health and to shift it more in the direction of the individual and communities. However, it appears that public health efforts to move in this direction have primarily focused on the established healthcare system. It has largely ignored the key areas of expertise and health support within communities that fall outside that system.

Reliable comparative data from high quality studies are not available to rigorously compare

outcomes in individuals who respond only to Government dietary and lifestyle guidelines and use NHS services, as compared to those who are reliant on advice, guidance and support outside the established medical system. However, there is suggestive and anecdotal evidence that personalised dietary and lifestyle advice that addresses the underlying causes of disease delivers substantially better outcomes than conventional, 'one-size fits-all' approaches.[10]

Primary care in the UK typically relies on very short consultations averaging under 10 minutes per patient[11] as well as the prescription of pharmacological agents, very few of which are available for first-line treatment of obesity or type 2 diabetes.[12] In fact, bariatric surgery has been found to be more effective at preventing or causing remission from type 2 diabetes in obese patients than conventional medical therapy.[13] While bariatric surgery may be effective in treating many cases of morbid obesity, it is not without complications and side effects that may include death.[14] It cannot be regarded as a cost-effective and sustainable solution for the majority of the overweight and obese.[15]

Additionally, in a primary care setting, there is rarely time to hand-hold patients with complex conditions sufficiently to yield clinical effectiveness,[16] or to support the patient in overcoming the emotional or psychological blocks to undertaking programmes that involve significant dietary and lifestyle modification.[17]

National health statistics show a continuing rise of the incidence of both type 2 diabetes and obesity.[18] This reflects the net failing of the healthcare system and insufficient appropriate engagement or self-care by individuals within communities.

In the UK, in the decade from 2005 to 2015, the proportion of adults who were either overweight or obese rose from 60.5% to 62.9%. Those who were morbidly obese rose from 1.8% to 2.9%. Interestingly, during the same period, there was a decrease in both the prescription of anti-obesity drugs and the use of bariatric surgery. UK data are summarised in Figure 1.[19]

This position paper does not aim to comment on or criticise current medical practice in the NHS. It aims primarily to show what would be required to increase engagement by the public in their own health management, in ways that are both effective and sustainable, where necessary, with guidance from relevant health and lifestyle professionals. There is a considerable untapped resource in communities that could work in a more coordinated way to yield profound benefits for the long-term health and resilience of the nation, while significantly reducing the burden on primary and secondary care in the NHS.

The World Health Organization's Global Strategy on Diet, Physical Activity and Health launched in 2004 stresses the importance of multi-organisation collaboration, including with nongovernmental organisations and grassroots organisations. Its far-reaching goals have ***"immense potential for public health gains worldwide"*** through the prevention of non-communicable diseases. These are incorporated into the United Nations Millennium Development Goals. The principles put forward in this position paper are entirely consistent with these goals.

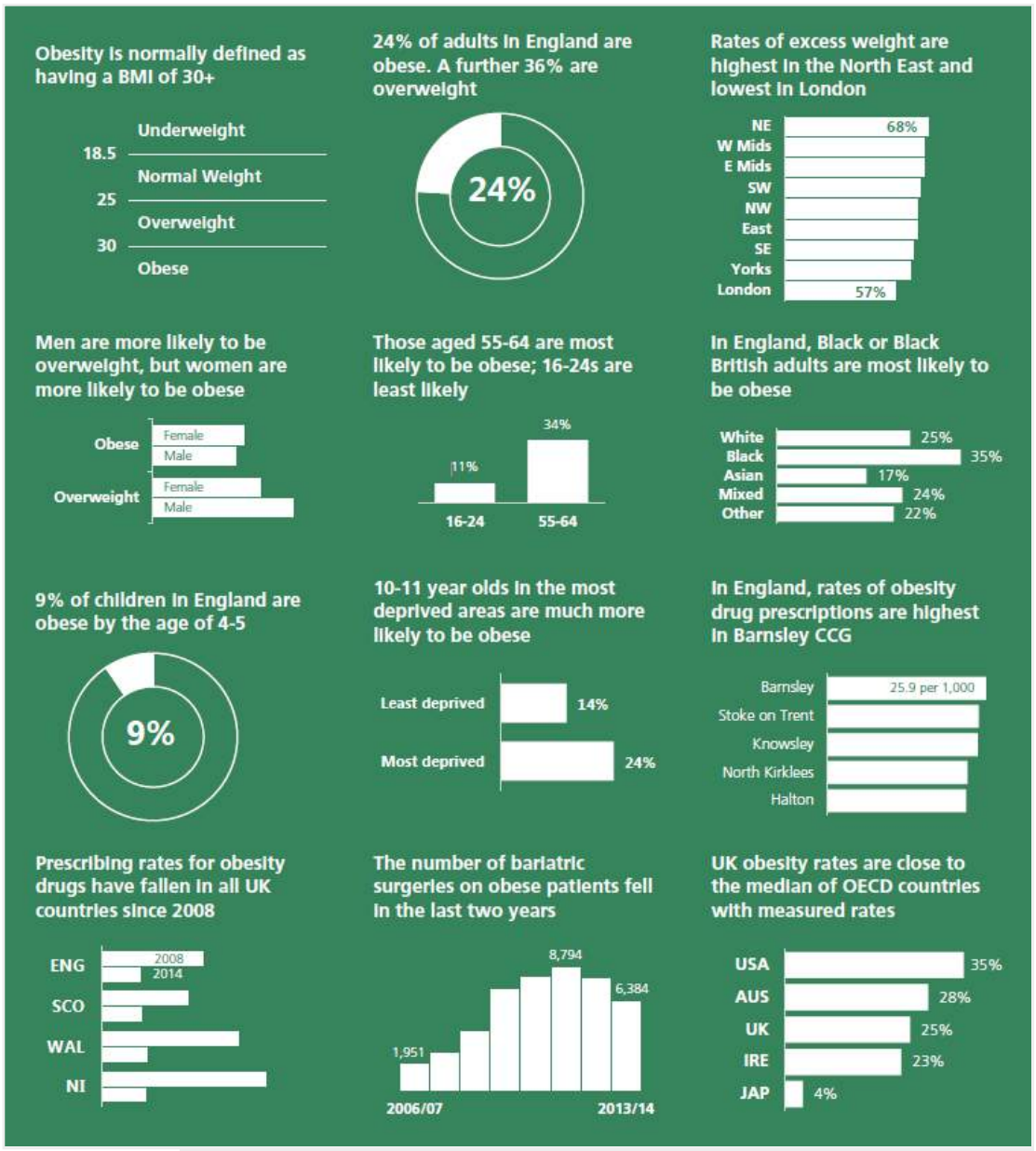

Figure 1. Summary graphic from House of Commons Library briefing paper on obesity (2017)[20]

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SECTION 2
PROBLEM IDENTIFICATION


“Should I be your God or your guide?”

2. PROBLEM IDENTIFICATION

2.1 What's wrong with the way we manage our health?

There is a general disconnect between our individual need and desire for health and resilience, and the delivery of healthcare services and public health policy that ostensibly exist to help the public achieve this. The result is that vast numbers in society do not achieve anything like their biologically and environmentally determined health potential. Instead, they spend significant parts of their lives, especially during their latter years, at sub-optimal states of health. In the process, society incurs unnecessary costs for preventable diseases, and individuals pay heavily both financially and in terms of quality of life.

There are several reasons for this disconnect. Among the most important are:

- The term 'health', as a transient state of human existence, is understood in many different ways among different groups in society. Very few, including many health professionals within the conventional biomedical system, understand the extraordinary complexity of the biological and ecological systems required to maintain a high level of health and resilience, especially into older age. In the case of non-communicable diseases, most healthcare efforts are devoted to disease treatment, not health creation or optimisation. Treatment is generally applied too late in the disease cycle. This often results in both costly and resource intensive solutions that have poor or limited outcomes
- There has been a tendency to treat health as a commodity in which 'healthcare' or 'doctoring' is applied primarily to diseased individuals as and when there appears sufficient economic value in doing so. This approach is sometimes referred to as ***"value-based healthcare"*** where value is defined as ***"health outcomes relative to the cost of achieving them"***[1]
- Society has tended to delegate responsibility for health assessment and 'treatment' away from the individual and to medical doctors. However, doctors do not receive comprehensive, formal training on multi-causal factors that contribute to preventable diseases, including nutrition, lifestyle, socio-economic and behavioural factors, that all influence the origin of disease[2,3]
- Many individuals, especially among lower socio-economic groupings, have become disengaged with the process of taking responsibility for their own health. They may also feel disempowered and confused over which nutritional, lifestyle or other behavioural choices they could make to improve their health status or reduce their risk of disease
- Since the commercialisation of antibiotics in the post-WWII period, pharmaceutical agents have become the dominant intervention delivered in primary care. Drugs have single or limited therapeutic targets and aim primarily to reduce disease symptoms rather than address the underlying causes, or causes of the causes, of disease(s)[4]

- Prescribed drugs have become one of the leading causes of death in society.[5] A recently published study of 26 years of data from countries in the Organisation for Economic Co-operation and Development (OECD) (1981-2007) shows that the greater the level of pharmaceutical expansion in a country, the greater the negative impact on health outcomes in older women (over age 65) and on medical professionalisation and specialisation.[6] The short duration and nature of primary care consultations have evolved to allow general practitioners to match, increasingly with support from IT or 'expert systems', symptoms of disease with particular drugs to allow their efficient prescription within severely time-restricted consultations (often less than 10 minutes)

- In the case of complex, chronic diseases and comorbidities with multi-factorial origins, specialisation in secondary care has led to individual consultants addressing only limited and disjoined parts of the whole system, thereby limiting benefits and outcomes[7]

- There is insufficient recognition by the mainstream medical system of the improvement in health outcomes that can be gained by appropriately addressing a limited constellation of common underlying dysfunctions. These include chronic systemic inflammation,[8] excessive oxidative stress,[9] mitochondrial dysfunction,[10] poor immune system modulation, imbalanced gut microbiota[11] and neurotransmitter imbalances,[12] all of which are strongly influenced by epigenetic factors and the individual's environment[13,14,15,16,17]

- There is insufficient knowledge or understanding among healthcare professionals and the public alike of the upstream nature and causes of metabolic and endocrine dysfunction that underpin most metabolic diseases. These include obesity, type 2 diabetes, most cardiovascular diseases, some forms of cancer and most cases of Alzheimer's disease. Additionally, there is an inadequate understanding of the underlying causes, triggers or mediators of most autoimmune diseases, including Graves' disease, Hashimoto's thyroiditis, lupus, type 1 diabetes, multiple sclerosis, rheumatoid arthritis, ulcerative colitis and Crohn's disease.

- Dysfunction across multiple systems that leads to the development, or expression, of preventable chronic or autoimmune diseases is often attributable to not one, but multiple factors. Among the most important are those associated with contemporary diets and lifestyles.[18]

- The mainstream healthcare system, including the NHS, is not well set up to identify dysfunctions in one or more body systems prior to the manifestation of clinical symptoms of disease. Nor is it well adapted to supporting patients, using personalised protocols, in making changes to their behaviour, their diets or their lifestyles that help prevent these diseases.

2.2 The UK's metabolic disease crisis

It is becoming increasingly clear that a small constellation of dysfunctions affecting the regulation of metabolism principally via the endocrine, immune, neurological and gastro-intestinal systems are associated with most chronic, non-communicable diseases. These diseases include cardiovascular disease, obesity, type 2 diabetes, many forms of cancer, and Alzheimer's disease (**Section 1.1, p. 9**). The majority of this disease burden is preventable.[19]

It is generally accepted that dietary choices and lifestyle behaviours are the most potent modifiable factors influencing the potential for disease or health. However, the nature of the metabolic dysfunction that triggers or mediates disease is not uniformly understood or appreciated by health authorities, the mainstream medical establishment or the public. This is despite an abundance of evidence that demonstrates both the underlying mechanisms and adverse outcomes caused by long-term dysregulation of multiple systems (see below).

This section aims to summarise the ways in which dietary choices and lifestyles associated with the 21st century have a powerful tendency to precipitate a series of failings in metabolic and endocrine function. These can lead to underlying conditions that drive persistent low grade inflammation, insulin resistance, oxidative stress, mitochondrial dysfunction and immune system imbalance. These processes, in turn, are among the most important drivers of the main preventable chronic diseases, including obesity and type 2 diabetes.

Public health recommendations to reduce caloric intake have repeatedly failed to reduce the rise in obesity rates. It is therefore unlikely that Public Health England's latest campaign, launched in March 2018,[20] that again focuses on the public's need to reduce energy intake, will have much impact on obesity incidence. The campaign aims to not only reduce the public's caloric intake by 20%, it also aims to encourage reduced consumption of 13 different commercially produced food groups by 2024. These views are driven by a continued reliance on the increasingly shaky 'energy balance' hypothesis to explain obesity; the 'carbohydrate-insulin' model is one of several hypotheses seen as more relevant by clinicians.

Public Health England argues, based on epidemiological data, that UK adults currently consume 200 to 300 excess (kilo)calories. This is the basis for encouraging the 20% reduction in food intake. However, as behavioural studies on obesity have shown time and time again, telling people to eat less overall while reducing consumption of unhealthy food groups appears not to significantly improve net outcomes.[21]

For most people, especially obese people, stepping down to a base diet that comprises 400 / 600 / 600 kcal for breakfast, lunch and dinner respectively means going on a crash diet, these diets having a spectacular reputation for failing.[22] Common reactions to such diets are: hypoglycaemia, depression, anxiety or acute hunger between meals. Snacking on high sugars-containing, or ultra-processed, carbohydrate-based foods (**Fig. 2, p. 20**) is then highly likely, defeating the purpose of the reduced calorie diet and bringing about classic yo-yoing.

Caloric restriction cannot and should not be carried out in isolation without addressing other aspects of metabolic and endocrinological dysfunction that are associated with obesity and other metabolic diseases. In most obese people, satiety and hunger signals are scrambled, this being associated with the dysregulation of multiple hormones, kinases and nutrient-sensing pathways that affect both feeding behaviour and energy balance.[23,24,25]

Indeed, as shown by the body of evidence accumulated in various reviews, nutritional or dietary ketosis is a normal physiological state induced by limiting carbohydrates.[ibid] Nutritional ketosis is an in-built, adaptive state that has evolved as a means of dealing with food scarcity. It is characterised by homeostasis (the optimum balanced state) of whole-body metabolism, even during extended conditions of food and carbohydrate deprivation. Regaining metabolic homeostasis can not only re-establish normal weight through the loss of visceral (fat stored around our organs) and adipose fat (fat stored beneath the skin), it also has multiple other valuable health benefits. These include the 're-

Figure 2. *Top*: Common ultra-processed, refined carbohydrate-based foods that are associated with metabolic dysregulation; *Bottom*: varied whole vegetables and fruit, the basis of healthy diets.

setting' of signalling systems controlling the function of metabolic pathways that in turn can normalise glycaemic control, feeding behaviour and energy balance.[26]

Accordingly, carbohydrate restriction that induces nutritional ketosis has been shown to lead to ***"spontaneous caloric reduction and subsequent improvement in emerging markers of CVD*** [cardiovascular disease] ***in overweight/ obese men who are otherwise healthy."***[27]

It should be noted that although humans are required to consume protein and lipids to sustain life, carbohydrates are not essential. As such, they should be viewed as semi-essential or conditionally-essential macronutrients, rather than essential macronutrients.

The science of appetite regulation continues to emerge and is dauntingly complex. It involves the gut (including its microbiome), the brain, the central and autonomic nervous system, the endocrine system, the immune system, adipose tissue and a large number of signalling compounds and nutrient-sensing systems.[28]

Signalling hormones and kinases are critical not only to the control of hunger and satiety, but also to determine how energy is stored, and how and when stored fat is converted to free fatty acids for use as a substrate to produce adenosine triphosphate (ATP) (the body's primary fuel) in the mitochondrial matrix. Key hormones include insulin, the 'fat storage hormone'; leptin, the 'energy balance hormone'; ghrelin, the 'hunger hormone'; adiponectin, the 'fat-burning hormone' and cholecystokinin (CKK), the 'gastric emptying' hormone.

Layered on top of this complex neuro-endocrine control of blood glucose and insulin, feeding behaviour, appetite regulation and energy balance, are the effects of differing patterns of microbial community structure within the gut microbiome. Animal and human studies have confirmed that altered community patterns of microbiota, especially an increase in the relative abundance of bacteria from the phyla Firmicutes (gram-positive) compared with Bacteroidetes (gram-negative), is associated with obesity.[29]

The opposite pattern, especially significant numbers of the mucin-consuming bacterium ***Akkermansia muciniphila***, a prominent member of the Bacteroidetes, is associated with weight loss or healthy weight.[30]

"spontaneous caloric reduction and subsequent improvement in emerging markers of CVD in overweight/ obese men who are otherwise healthy."

Layered on top of the hormonal and microbial control systems affecting feeding behaviour, energy use and storage are a series of interacting, nutrient-sensing signalling systems such as mTOR, AMPK and Sirt.[31] These are strongly affected by different foods, patterns of feeding and physical activity, as well as by environmental factors. They include our access to food, the nature and properties of the food,[32] and a range of social and cultural norms and pressures affecting diets and lifestyles.[33]

Most obese and type 2 diabetic people present with significant low-grade (aseptic) systemic inflammation, a wide range of metabolic disturbances, insulin resistance, cardiometabolic dysregulation, metabolic syndrome and other mortality risk factors.[34,35] This metabolic dysregulation occurs not only because of 'over-nutrition', but because of excessive frequency of eating (e.g., regular snacking between main meals), an excessive consumption of carbohydrates especially highly refined, high glycaemic starchy carbohydrates, insufficient intake of appropriate ('healthy') fatty acids, and the over-consumption of fats with unhealthy fatty acid profiles (especially excessive ***n***-6 / ***n***-3 (Omega-6 / Omega-3) ratio of polyunsaturated fats). These behaviours are commonly associated with sedentary lifestyles.[36] It is noteworthy that low fat dietary guidelines have been issued by UK and other health authorities for over 30 years in the absence of adequate scientific evidence.[37]

This dysregulated metabolism causes brain injury through inflammation of glial and other cells,[38] and impacts emotional, cognitive and sensory centres in the brain, including a blunted desire to exercise. Accordingly, for those with obesity or metabolic syndrome, internal 'voices'

that encourage unhealthy eating behaviours may be heard more loudly than any government edicts that recommend caloric restriction by around 200 to 300kcal per day.

2.3 The economic cost of the UK's 'diabesity' crisis

Recent data suggest that the combined direct and indirect costs of obesity in the UK is in the order of £33 billion per annum, with those for type 2 diabetes at around £22 billion per annum. These costs are broken down in Table 1.

Table 1. Recent estimates of the direct and indirect costs of the dual burden of obesity and type 2 diabetes in the UK.

Cost type	Obesity[a] (£ billion pa)	Type 2 diabetes[b] (£ billion pa)
Direct costs, including treatment, management and complications	6.1	8.8
Indirect costs (to wider society, lost productivity)	27	13
TOTAL	**33.1**	**21.8**

Data sources:
[a] Based on data from 2010/11 derived from Hex N, Bartlett C, Wright D, Taylor M, Varley D. Estimating the current and future costs of Type 1 and Type 2 diabetes in the UK, including direct health costs and indirect societal and productivity costs. Diabet. Med. 2012; 29: 855–862.
[b] Public Health England. Guidance: Health matters: obesity and the food environment. 31 March 2017. [https://www.gov.uk/government/publications/health-matters-obesity-and-the-food-environment/health-matters-obesity-and-the-food-environment--2] [last accessed 10 April 2018].

Improved engagement in appropriate self-care and guided self-care has the potential to substantially reduce the burden from these - and other preventable, non-communicable diseases. Three scenarios, in which direct and indirect costs of just obesity and type 2 diabetes are reduced by 10%, 25% and 50% respectively would result in cost savings for the UK of £5.5 billion, £13.7 billion and £27.4 billion per annum respectively.

"In 2016, 26 per cent of adults were classified as obese ... In 2016/17, 1 in 5 children in Year 6 and 1 in 10 children in Reception were classified as obese."

- NHS Digital, Statistics on Obesity, Physical Activity and Diet, 2018

2.4 Current deficiencies in self-care, prevention and disease treatment

Mean life expectancy on its own is not a good measure of how well a population manages its health. However, it is of interest that in 2011, life expectancy at birth was double that of 1841, despite a large part of this change being the result of reduced infant and child mortality rates during the first half of the 20th century, and gains in life expectancy of older ages during the last half century (**Fig. 3**).[39]

Modal and median life expectancy, adult life expectancy, healthy life expectancy (HLE), disability-free life expectancy (DFLE), age of disability and quality of life adjusted years (QALYs) are among the key factors that help to build a picture of the combined effectiveness of self-care and interactions with health and social care services, both public and private. Many of these data are recorded in the UK on a regular basis, the latest report including data from 2014-16.[40]

These data show that half of female newborns in the UK today could expect to still be alive at the age of 85.8 years, while half of male newborns could expect to be alive until 82.3 years. However, in terms of the burden on the healthcare system, most female deaths (modal life expectancy) are expected at age 88.9 and most male deaths aged 86.4 years. This amounts to a 3 to 4 year increase compared with data from 2001-3.

Healthy life expectancy, by contrast, is considerably shorter, being just 63.7 years for females and 63.1 years for men. Additionally, modelling predictions suggest a clear trend towards an increasing prevalence of disability in the UK, as shown by Guzman-Castillo et al (2017) in Lancet Public Health (**Fig. 4**).

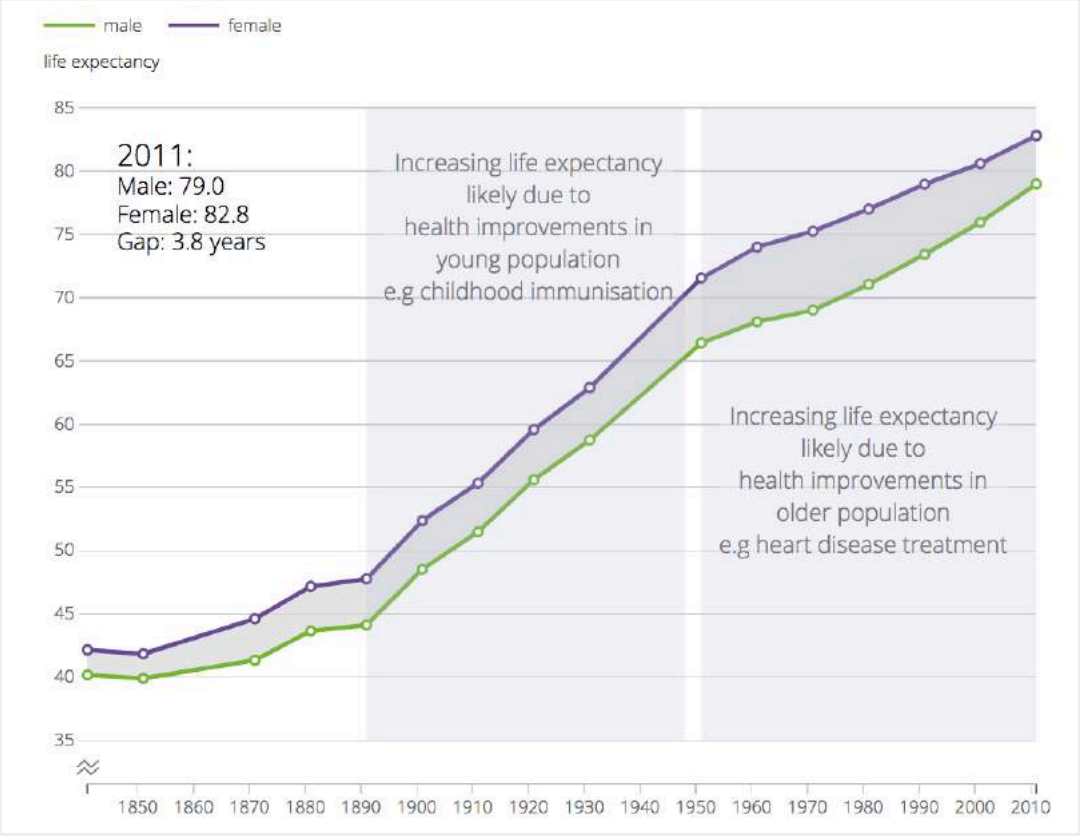

Figure 3. Life expectancy at birth, England and Wales, 1841-2011.
Source: Office for National Statistics. Decennial Life Tables.[ibid]

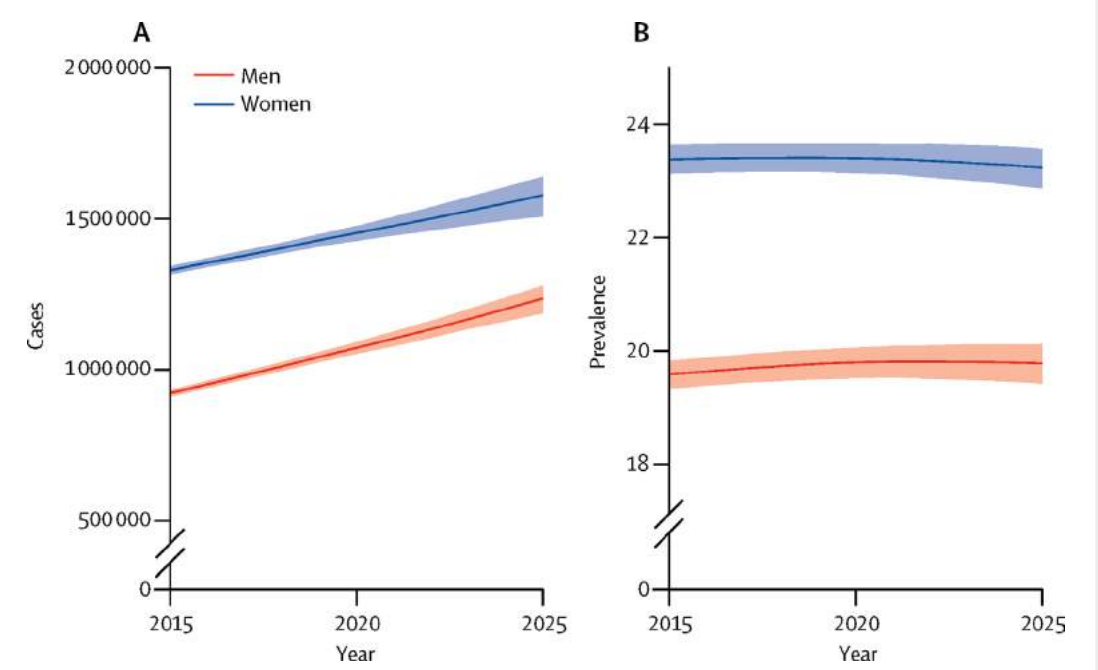

Figure 4. Projected number of cases (A) and prevalence (B) of disability in men and women aged 65 years and older from 2015-25. Source: Guzman-Castillo et al (2017).[41]

Long, healthy lives with low prevalence of disease and disability reduce, not increase, the overall disease burden. For example, the 2014-16 data would suggest the Scottish population represents a lower burden than the English, Welsh or Northern Irish populations. This is because people living in Scotland spend the highest proportion of their lives living in ***"good"*** health, despite having the lowest life expectancy.

By contrast, the greatest challenges to health system sustainability will result from high life expectancies and high rates of disease and disability. Most data now suggest this is precisely the direction in which the majority of the UK population is heading.

The healthcare burden has untold consequences on society, with the potential to cause social chaos. Additionally, increasing pressure on doctors is causing escalating levels of burnout.[42,43]

To ensure the lowest health and social care burden, and hence the sustainability of the health and care system in the UK, it is of paramount importance that effective self-care occurs in ways that substantially reduce preventable, chronic diseases. Concomitantly, effective self-care should aim to maximise disability- and disease-free life expectancy and quality of life.

The UK population's reliance on the 'free' services of the NHS has cultivated a non-participatory relationship between medical doctors and their patients. The mainstream medical profession is often viewed as excessively paternalistic in its approach and the public tends to be disengaged, disempowered, insufficiently informed and co-dependent on NHS services.

By contrast, the greatest challenges to health system sustainability will result from high life expectancies and high rates of disease and disability. Most data now suggest this is precisely the direction in which the majority of the UK population is heading.

To be successful, effective self-care should meet a number of criteria that go well beyond mere self-medication. These should include:

- Disease prevention efforts that prioritise younger populations outside typical healthcare settings, prior to a) the pre-clinical development of chronic diseases (including over-fat and obesity), b) the manifestation of clinical symptoms of these diseases, and, preferably, c) before disease-inducing dietary and lifestyle patterns become deeply embedded or 'hardwired' into the individual's behaviour and his/her social and cultural context

- Health optimisation and resilience, in addition to disease prevention. Critical to health optimisation in human beings is the development of psychological, physiological and metabolic resilience. In ecology, resilience is a measure of a system's capacity to maintain structure and function in the presence of stress.[44] In contrast, in the fields of psychology and the social sciences there have been many proposed definitions of resilience, including 'the capacity of a dynamic system to adapt successfully to disturbances that threaten the viability, function, and development of that system' and 'a process to harness resources in order to sustain well-being'.[45] All of these and many other definitions apply to the broader application of the principle of resilience in relation to human health. Additionally, resilience brought about by the optimum function of multiple systems within the body (e.g. autonomic nervous system, central nervous system, gastro-intestinal system, muscular and skeletal system, neuro-endocrine system) may serve as a useful marker for long-term, disease-free health and well-being. Resilience is likely a more relevant concept to use as the basis for evaluating 'health and well-being status' than the term 'health', which has diverse interpretations, and is often associated with the presence or absence of disease

- Recognition of human resilience as part of an ecological, adaptive, multi-factorial system. Such an approach is evident in the principles implicit in the Meikirch model (Fig. 5, p. 28). In this model, processes within an individual that define his or her state of health at any point in time are viewed as part of a complex, adaptive system that includes five key components of health. These are: life's demands, biologically given potential (BGP), personally acquired potential (PAP), social determinants and environmental determinants (Fig 2, p. 20).[46,47,48,49,50] The model proposes that BGP is large at birth and diminishes with age, while the PAP is negligible at birth and accumulates with life experience, having the ability to offset limitations in a person's BGP. The model also identifies 10 complex interactions that must be addressed for an individual to optimise his or her health and resilience potential. The model has been demonstrated to considerably enhance individual responsibility for health[ibid]

- All citizens having access to a diverse pool of health and fitness professionals that are able to interpret an individual's health status using a common 'language'. These individuals should be able to guide individuals, rather than dictate to them. Such guided, participatory health care helps the individual to move towards their agreed health and resilience goals, while facilitating empowerment, engagement and autonomy

- Minor ailments should, as far as possible, be able to be managed or treated by self-care outside the formal healthcare system. However, health professional guidance or support, which may be face-to-face or virtual depending on individual needs, along with access to relevant health-related products and services, should be readily available.

The village of Meikirch, Switzerland, the birthplace of the Meikirch model

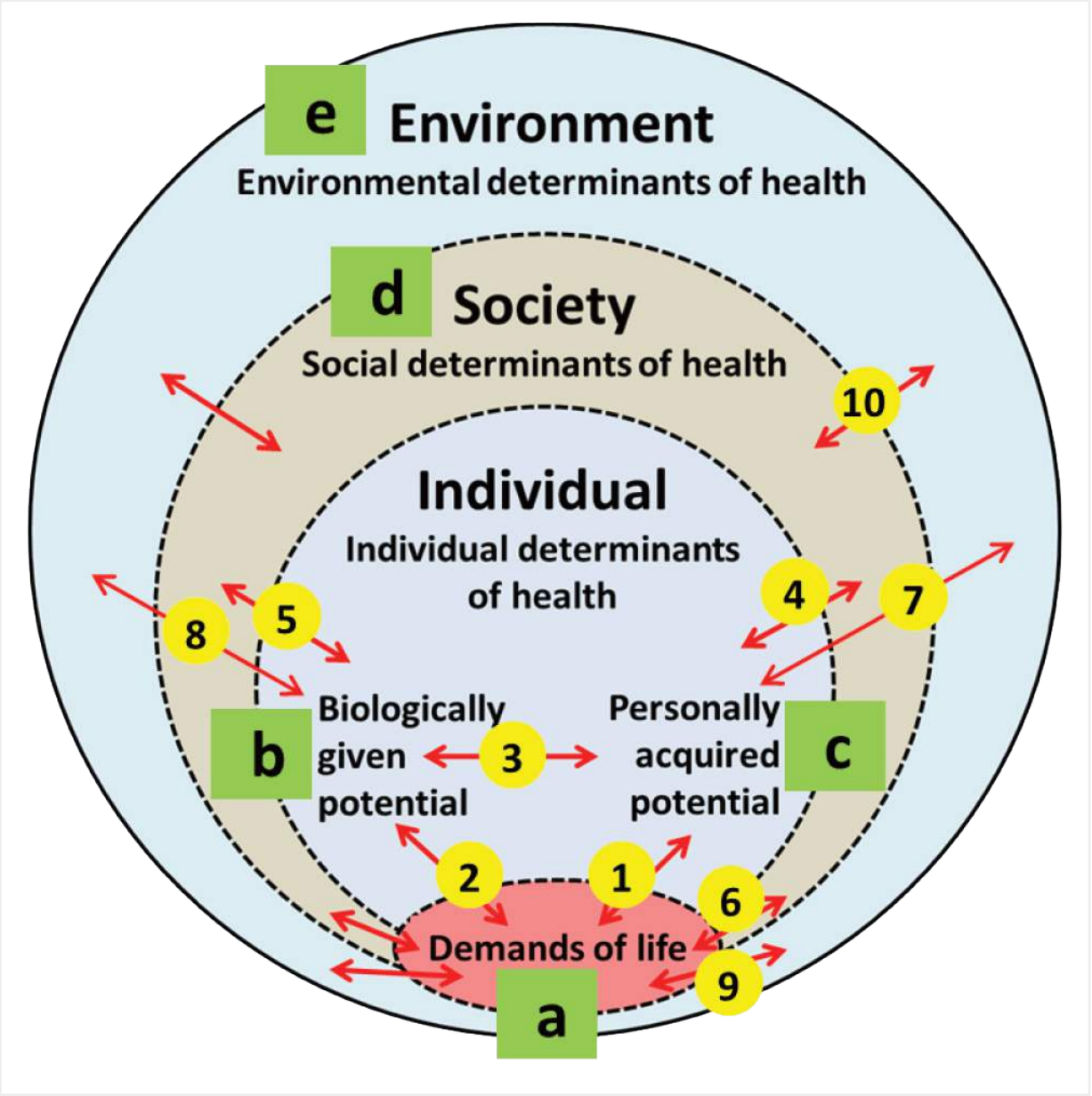

Figure 5. The Meikirch model consists of 5 components (a-e) and ten complex interactions (1-10). Source: Bircher & Hahn (2016).[47]

2.5 The problem of scientific uncertainty and conflicting information for citizens

A common and often great challenge facing the public is uncertainty. This uncertainty stems from multiple sources, including the difficulty of establishing the causes or drivers of ill-health, as well as a common lack of confidence in commonly prescribed or recommended interventions, that may include a prescription from a GP or consultant. Uncertainty is further compounded by a lack of scientific consensus in many areas of medicine and often conflicting information from health influencers (e.g., in the media, or on the Internet).

The development of evidenced-based medicine (EBM) was intended as a means of supporting clinical decision-making in a way that would devalue forms of information that did not subscribe to the same principles. However, on the whole, EBM has failed to serve its originally intended purpose to improve the quality of clinical practice, for many and complex reasons.[51,52,53,54] Among these is the excessive reliance on randomised controlled trials (RCTs) that aim to determine the efficacy of a specific (or very limited combinations of) therapeutic effect(s) while removing the influence of a number of factors known to have considerable influence on clinical outcomes in the real world. These include the regression to the mean, the natural history of the disease, placebo and nocebo effects, the Hawthorn effect, the patient-doctor relationship, psycho-social factors, and any concomitant treatments or unaccounted non-pharmacologic factors.[55]

This means that efficacy of a specific therapeutic intervention as measured by RCTs may have little bearing on the effectiveness of a treatment, combined with other environmental and behavioural factors, as experienced in the real world. Knowledge of what works best in the real world is referred to variously as 'clinical experience' and 'medical intuition'. Yet by de-emphasising ***"intuition and unsystematic clinical experience"***,[56] EBM - as interpreted in the development of NICE (National Institute for Health & Care Excellence) guidelines - has managed to alienate doctors from patients. It has also moved clinical practice in most NHS primary care settings further away from, rather than closer to, a person-centred approach based in the real world. A person-centred approach that places the person at the heart of everything the NHS does and takes into account ***"the needs and preferences"*** of the individual is constitutionally required in England (NHS Constitution, Principle 4).[57]

A person-centred approach that places the person at the heart of everything the NHS does and takes into account "the needs and preferences" of the individual is constitutionally required in England (NHS Constitution, Principle 4).

The scientific uncertainty around the benefits or harms of specific interventions is not adequately understood by the public, or indeed even by many health professionals. The degree of uncertainty in data on efficacy of specific interventions is well illustrated by the ongoing programme of work at BMJ Clinical Evidence, which continues to show that 50% of 3000 interventions evaluated are of unknown benefit, and only 11% are proven to be beneficial (**Fig. 6, p. 30**).[58]

Additionally, as alluded to above, proof of efficacy does not necessarily imply effectiveness under real world conditions. For example, if an intervention(s) is shown to produce the expected (beneficial) result under ideal conditions in a given population group, it does not follow that the same result would be shown in the event of a pragmatic trial designed to assess effectiveness in all real world clinical, social and environmental settings.[59]

There can also be considerable conflict in the advice being issued to the public by government health authorities, specialist patient support groups and readily available, ostensibly authoritative, information on the Internet (***"Dr***

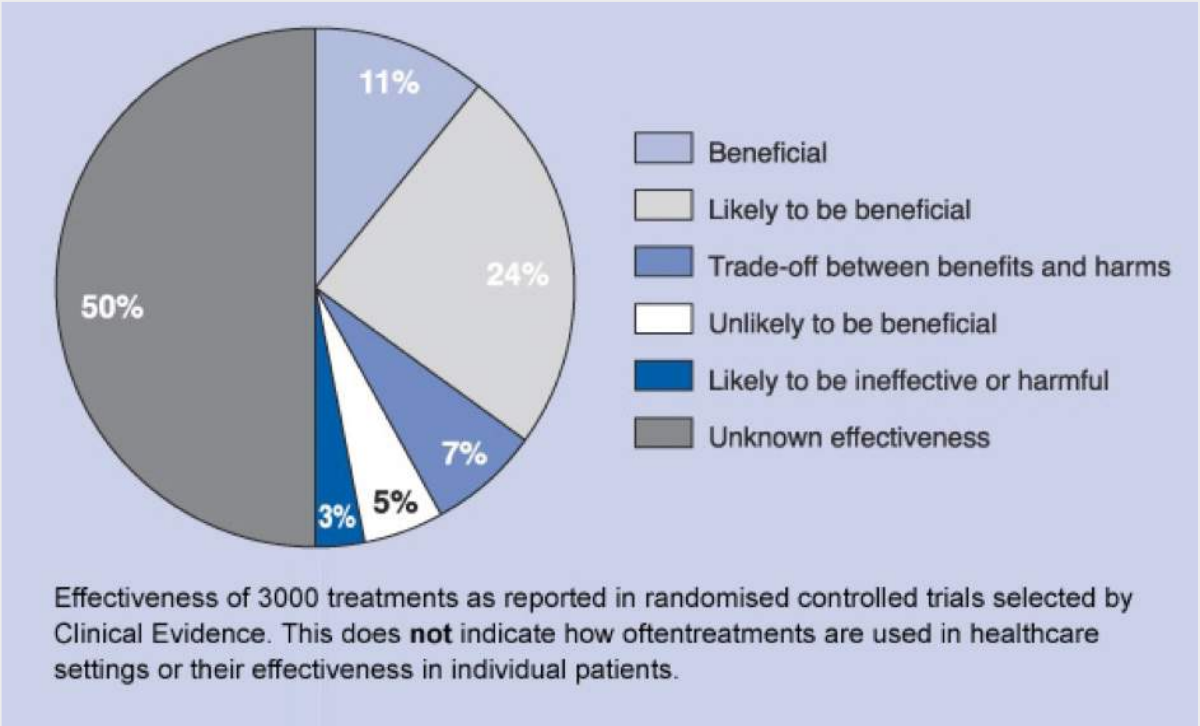

Figure 6. Effectiveness of 3000 treatments as reported in randomised controlled trials selected by Clinical Evidence. This does not indicate how often treatments are used in healthcare settings or their effectiveness in individual patients. Source: BMJ Clinical Evidence[58]

Google"). This can be deeply de-motivating for members of the public. A particularly conspicuous conflict relates to advice for type 2 diabetes.

NHS Choices states that type 2 diabetes may be able to be prevented ***"by making lifestyle changes"*** including ***"eating a healthy, balanced diet"***.[60] It then links back to NHS Choices' 'healthy eating' page[61] which focuses on the importance of consuming '5 A DAY'. This 5-a-day recommendation regards all fruits and vegetables as a homogenous group despite ample evidence showing great variations in sugars, fibre, polyphenols, vitamins, minerals and secondary compounds in different fruits or vegetables, and their multiple forms.

The Eatwell Guide by the Food Standards Agency,[62] the central plank of UK nutrition guidelines, continues to recommend that 50% of total energy intake every day is sourced from carbohydrates. This is of concern given carbohydrates cannot be regarded as essential macronutrients; it is excess and chronic carbohydrate consumption, particularly as mono-and di-saccharides or as highly refined carbohydrates, that have been established as the primary culprit in the development of poor glycaemic control and insulin resistance, the precursors to type 2 diabetes.[63]

By contrast, Diabetes UK, that represents patients, recommends restricting carbohydrates on the basis of scientific evidence[64] (including low carb meal plans),[65] supports low carb high fat (LCHF) diets as well as the X_PERT programme. This programme is operated by diabetes researcher and dietician, Trudi Deakin,[66] an outspoken LCHF diet aficionado with years of clinical experience supporting both the safety and effectiveness of low or very low carb diets.

In the absence of reliable, unbiased information accessible to the public that accepts and accurately communicates the degree of certainty (or uncertainty) around the benefits and risks of specific interventions, or combinations of interventions, it is very difficult for individuals to make informed decisions about health and care options that are most likely to yield positive outcomes.

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SECTION 3

TOWARDS A UNIFIED MODEL OF HUMAN HEALTH CREATION

A more coordinated and collaborative approach to health optimisation could be greatly facilitated by achieving significant scientific agreement on a unified model.

3. TOWARDS A UNIFIED MODEL OF HUMAN HEALTH OPTIMISATION

3.1 The human ecological terrain

The complexity and multi-factorial nature of preventable chronic and autoimmune diseases and comorbidities is well-recognised.[1,2,3] However, there is a lack of consensus in primary care, or among health professionals trained in different modalities, as to what should be the primary focuses for health optimisation. This not only requires the optimisation of the health status and resilience of an individual, according to his or her life demands and available resources, it also requires optimised prevention or treatment of disease. Among the challenges that make achieving consensus on the most appropriate health-related strategies for a given individual in space and time are:

a) widely held differences in views of human biological function,

b) differing belief systems instilled through different types of training and experience, and

c) whether a reductionist or a more holistic approach is adopted.

There is also increasing general recognition that a 'one size fits all' approach to disease prevention or treatment rarely yields the best possible outcomes for most people. More personalised approaches may be more beneficial for the majority given the needs of individuals vary so greatly (e.g., different genetic backgrounds, environments, life demands, etc.). This discord in approach continues through to civil society where the divergence of views on human health and the factors that most influence it can be disempowering to the individual.

A more coordinated and collaborative approach to health optimisation could be greatly facilitated by achieving significant scientific agreement on a unified model. There is growing consensus that a systems biology and ecological approach could provide the basis for such significant agreement.[4,5]

Such an approach recognises each human being as a complex, genetically and epigenetically unique organism, which interacts with a myriad of biotic and abiotic (biological and physical) factors in variable and changing internal and external environments.

"There is also increasing general recognition that a 'one size fits all' approach to disease prevention or treatment rarely yields the best possible outcomes for most people."

Evidence — limited as it is — from the USA and UK shows that practice-level patient engagement in primary care to date has had only limited success for the triple aim of better health, better care and more affordable cost.[6] Sharma & Grumbach[ibid] propose 9 different strategies for enhancing patient engagement at the practice-level, along a continuum. This ranges from 'consultation' (least engaged) to 'partnership' and 'shared leadership' (most engaged). The strategies, that include patients as quality improvement (QI) partners, patient advisory councils and patient assistance

in training clinic staff, are all laudable. If implemented these kinds of collaborative and participatory approaches clearly have the potential to significantly enhance engagement and improve outcomes.

However, they assume no change in the overall approach to managing health or interpreting health, resilience or disease status or risk. A unified model of human health optimisation, with which both individuals and their selected health professionals can engage, could be transformational.

The field of systems biology is increasingly being applied to biomedical research and clinical medicine. Leroy Hood and colleagues from the Institute of Systems Biology have identified five pillars of systems biology approaches to medicine (also referred to as 'translational systems medicine'), as follows:[7]

- Viewing biology, and consequentially medicine, as an informational science is one key to deciphering complexity
- Holding systems biology, infrastructure and strategy as the holy trinity of biology (i.e., using biology to drive technology and computation development), thereby endorsing cross-disciplinary culture and democratisation of data generation and data-analysis tools
- Holistic, systems experimental approaches enabling deep insights into disease mechanisms and new approaches to diagnosis and therapy through analysing the dynamics of disease processes
- Using emerging technologies to provide large-scale data acquisition and permit exploration of new dimensions of patient data space
- Transforming analytic tools to allow deciphering of the billions of data points for each individual - sculpting in exquisite detail the wellness and disease landscapes.

Such a whole system approach[8] represents a substantial deviation from the reductionistic, mechanistic approaches that have characterised mainstream medicine since the era of Pasteur.[9] It fundamentally changes how health is addressed both by the individual and his or her health professional.[10] The recognition of the importance of a systems biology approach has spawned various holistic and integrative systems of clinical medicine. Many recognise the importance of multi-factorial dietary and lifestyle modifications as among the most powerful influences on health status and resilience.

These include Predictive, Preventive, Personalised and Participatory (P4) Systems Medicine,[11,12,13] personalised lifestyle medicine,[14] and functional medicine.[15]

The Institute for Functional Medicine was founded in the USA in 1991 with seven defining characteristics:[16]

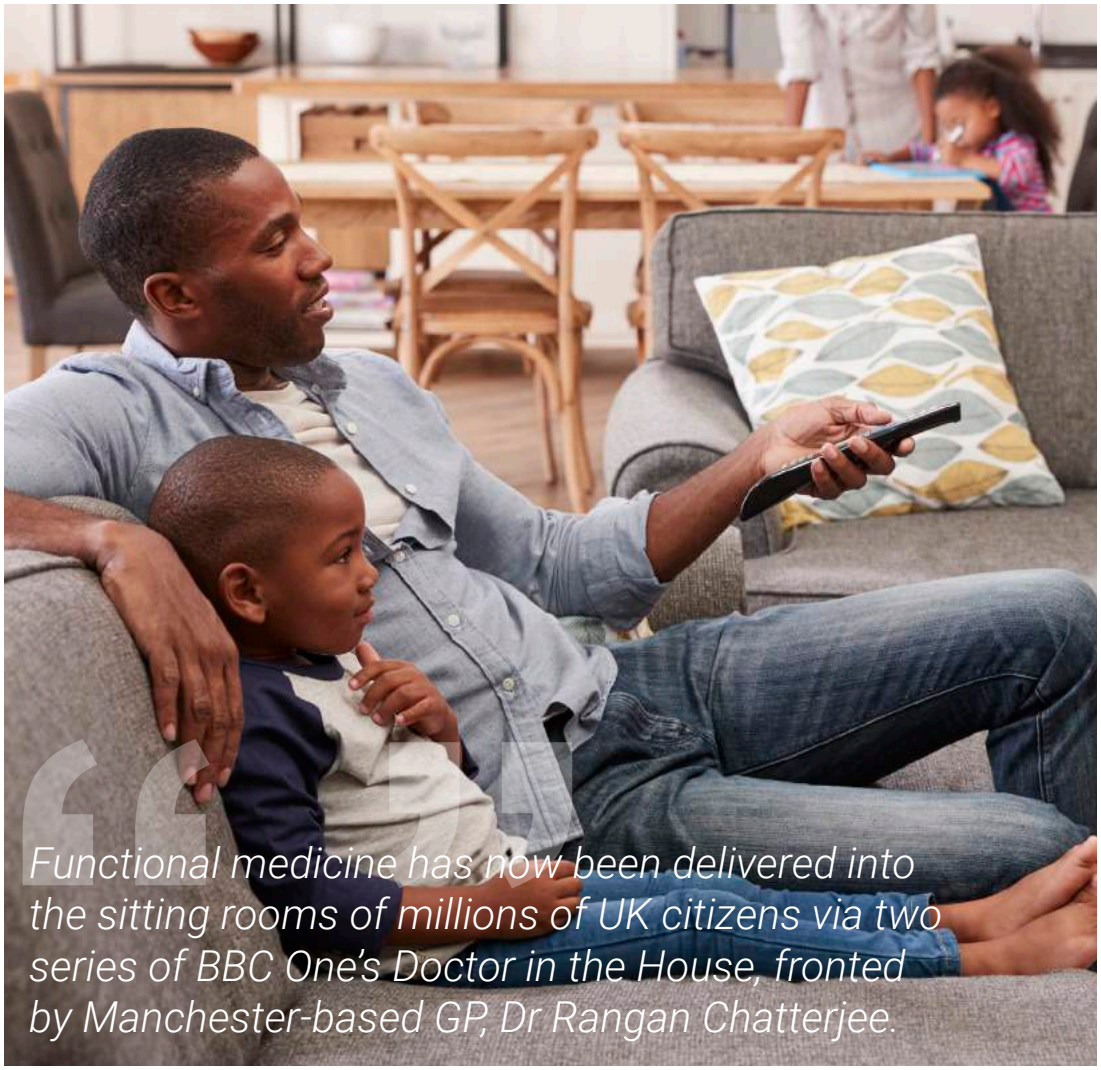
- Patient-centred versus disease-centred
- Systems biology approach: web-like interconnections of physiological factors
- Dynamic balance of gene-environment interactions
- Personalised treatment based on biochemical individuality
- Promotion of organ reserve and sustained health span
- Health as a positive vitality—not merely the absence of disease
- Function versus pathology focused.

A unified model of human health optimisation with which both individuals and their selected health professionals can engage could be transformational.

Today, nearly 3 decades on, the 'personalised' characteristic of functional medicine is considered within a broader, epigenetic context, taking note of an individual's likely genetic expression, as well as his or her behaviour and environment. That includes social, socio-economic, cultural, chemical and bioenergetic aspects.

These holistic approaches to health optimisation are gaining immense popularity both with the public and with increasing numbers of health professionals, including medical doctors. Among the reasons are improved practitioner-patient relationship, greater patient engagement and better reported outcomes compared with conventional approaches dominated by use of pharmacological agents.[17]

Functional medicine has now been delivered into the sitting rooms of millions of UK citizens via two series of BBC One's Doctor in the House, fronted by Manchester-based GP, Dr Rangan Chatterjee.[18,19] The principles of drug-free self-care have been solidified in Dr Chatterjee's bestseller, ***The 4 Pillar Plan: How to Relax, Eat, Move and Sleep Your Way to a Longer, Healthier Life*** (2017, Penguin).



3.2 The 12 domains of the human ecological terrain

The potential of the human body to re-establish homeostasis is often under-estimated by those clinicians who rely largely on mono-therapeutic, especially pharmacologically-based, approaches to complex diseases.

For over 15 years, we (the collective behind this project) have collaborated with clinicians specialised in a wide variety of different modalities spanning the spectrum from integrative, to complementary or alternative medicine (CAM), through to traditional systems of medicine. Common to all these differing modalities is an interest in person-centred, rather than disease-centred approaches. The approaches are also nearly always holistic, rather than reductionist (over-simplified and often misleading). In order to find a common ground between the different modalities, we have gained consensus over the primary elements or domains of health which are subject to independent or inter-dependent homeostatic control. In this light, 12 distinct, modifiable, domains of health are identified in this position paper, making up what we describe as the 'ecological terrain' (Fig. 7, p. 42).

By appreciating where sub-optimal function in one or more of these domains is present, an individual, and/or collaborating health professionals, are able to prioritise action, interventions or behaviour change. This may be through self-care or by guidance or interventions delivered or recommended by an appropriate health professional or coach.

The 12 domains of the ecological terrain are elaborated in the proceeding sub-sections.

> *"In this light, 12 distinct, modifiable, domains of health are identified in this position paper, making up what we describe as the 'ecological terrain'."*

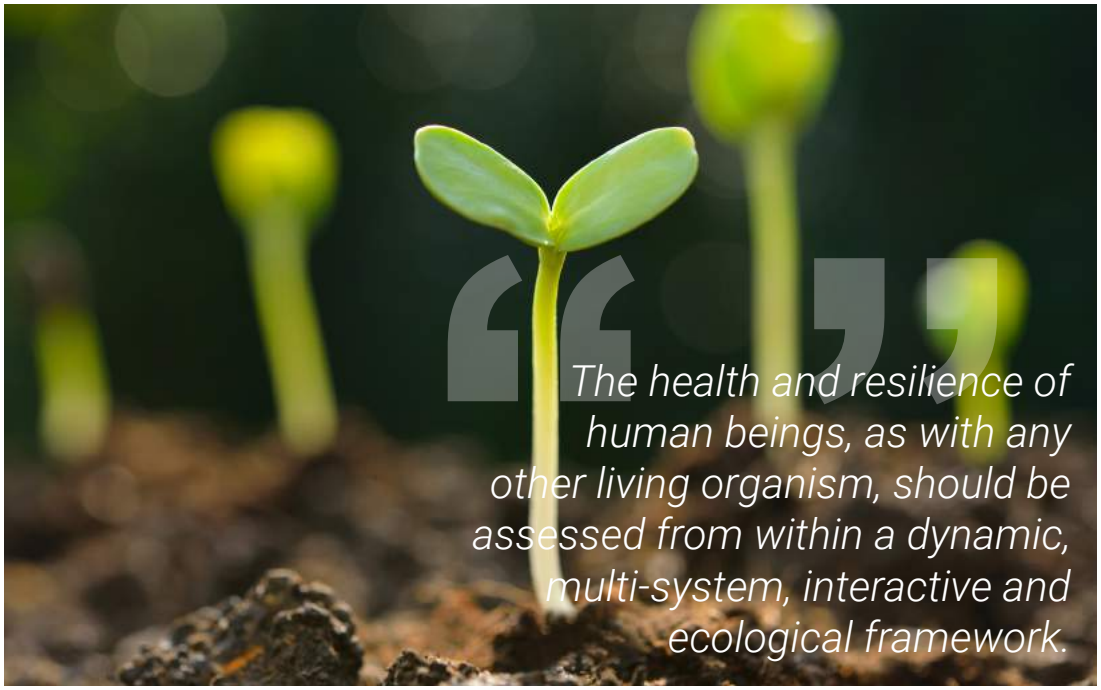


Figure 7. The 12 domains of an individual's ecological terrain. Whole body homeostasis is achieved through the attainment of optimal function across all 12 inter-dependent domains.

3.2.1 Genetic and epigenetic background

Goal: Appreciate the genetic and epigenetic background of the individual

While every human is unable to choose the genes with which they enter the world, our environments and diets modify gene expression and our ability to attain the potential established by our genetic background. Accordingly, to use the terminology of the Meikirch model, our biological given potential (BGP) can be modified by our personally acquired potential (PAP).[20] Rapid gene sequencing techniques now mean it is straight forward to assess specific, well validated genetic variations (single nucleotide polymorphisms or SNPs) that are modifiable by dietary and lifestyle choices.[21] Knowledge of specific SNPs may be helpful as a means of informing an individual as to which dietary and lifestyle modifications should be prioritised.[22] In many cases, genetic data will not be available, however indirect data on genetic risk may be acquired from records of familial histories of specific diseases.

3.2.2 Glycaemic control and metabolic flexibility

Goal: Establish glycaemic control and metabolic flexibility

Chronic, excess exposure to blood sugar is the principal mechanism that drives insulin resistance and subsequently the development of type 2 diabetes. Long-term hyperglycaemia in turn appears to trigger vascular metabolic memory that means diabetes complications are often difficult to overcome even when normoglycaemia is re-established.[23,24] It is therefore essential that normal glycaemic control is restored as soon as is practicably possible in every individual. This includes the capacity to metabolise fatty acids for fuel (i.e., keto-adaptation) (Section 2.2, p. 19; Fig. 8, p. 45).

3.2.3 Gastrointestinal system and microbiome function

Goal: Optimise function of gastrointestinal system and microbiome

A properly functioning gastrointestinal system and associated microbiome is fundamental to good health and resilience. One important function is the proper digestion and assimilation of nutrients, which are needed in specific amounts by all cells of the body and body systems (Fig. 10, p. 58). The gut and microbiome, however, are intimately associated with multiple other systems, from the brain and central nervous system, to the immune system, the neuro-endocrine system and the cardiovascular system. Emerging evidence reveals that alterations in the community structures of the gut microbiota are strongly associated with obesity and related metabolic diseases; adverse changes are commonly associated with diets high in carbohydrates, and a higher ratio of the bacteria from the phylum Firmicutes (gram-positive bacteria) compared to that of Bacteroidetes (gram-negative bacteria).[25] Digestive complaints such as cramping, bloating, constipation and diarrhoea are among the most common reasons people visit their GP. Yet most GPs have inadequate formal training on nutrition and gut health and are often unable to identify causes or possible solutions. Chronic exposure to foods or food Ingredients that trigger intolerances or sensitivities may lead to gut dysbiosis (imbalance), an increase in unregulated control of gut permeability ('leaky gut'), increased risk of irritable bowel syndrome (IBS), long-term conditions such as chronic fatigue syndrome and fibromyalgia, as well as autoimmune conditions, including inflammatory bowel diseases such as Crohn's disease, ulcerative colitis and rheumatoid arthritis.

3.2.4 Mitochondrial function

Goal: Optimise mitochondrial function

Mitochondria are the energy-yielding organelles within human (and other animal) cells. Apart from specific, relatively uncommon mitochondrial diseases, a growing proportion of the population, especially those who are largely sedentary, suffer from mitochondrial deficiency. This is an extremely common condition in which mitochondrial density and volume is reduced compared with a person in vital health. Such deficiency is also strongly associated with sarcopenia (muscle wasting) and frailty in sedentary or older individuals. The result of mitochondrial deficiency is less available energy in the form of the body's primary fuel, namely adenosine triphosphate (ATP), with consequent multi-system impacts. These include fatigue, malaise, lack of capacity for physical activity and reduced immune competence. Metabolic homeostasis is greatly influenced by the re-establishment of metabolic flexibility in an individual, this requiring that energy-yielding systems in the body can derive ATP from fatty acids, ketone bodies as well as carbohydrates (Section 2.2, p. 19; Fig. 8, p. 45).

3.2.5 Immune system function and inflammatory status

Goal: Optimise immune system function

The immune system, which operates through interactions with multiple other systems, most notably the gut mucosa and microbiome; the endocrine system; the skeletal system (bone marrow); the nervous system and the dermis, is the primary host defence system that responds and protects the body from pathogens and tissue trauma. The immune system is a layered defence system, including both the innate immune system that provides an immediate, non-specific response, and the highly specific, cell-mediated system, also referred to as the adaptive immune system. These systems involve a very wide range of cells, molecules, signalling proteins and receptors. Key immune cells include the following types of leukocyte (white blood cell): neutrophils, eosinophils, basophils, lymphocytes (including Natural Killer [NK] cells in the innate system and Killer T cells and Helper T cells in the adaptive system) and monocytes. Key receptors involved in adaptive immunity are toll-like receptors (TLRs), expressed on the membranes of leukocytes including dendritic cells, macrophages, NK cells and glial cells of the central nervous system. Cytokines, such as interleukins, and adipokines (secreted by adipose tissue) are key signalling molecules that affect the function of the immune system. Important disorders of the immune system include immunodeficiency, where the function of the immune system is under-active compared with a competent system, and autoimmune conditions, where the immune system fails to distinguish properly between self and non-self and so attacks otherwise healthy, uninfected parts of the body. Chronic low-grade inflammation, a systemic condition that occurs independently of infection and that is commonly associated with persistent oxidative stress (Section 3.2.6, p. 46), results in the protracted up-regulation (constant over-activation) of the immune system and underpins all chronic diseases, including cardiovascular disease, cancer, type 2 diabetes, obesity, osteoarthritis and neurodegenerative diseases, such as Alzheimer's. A healthy immune system is one that is well modulated, neither over- or under-active (i.e., can turn 'on' and 'off'), can mount effective responses to pathogens, and maintains the ability to differentiate self from non-self.

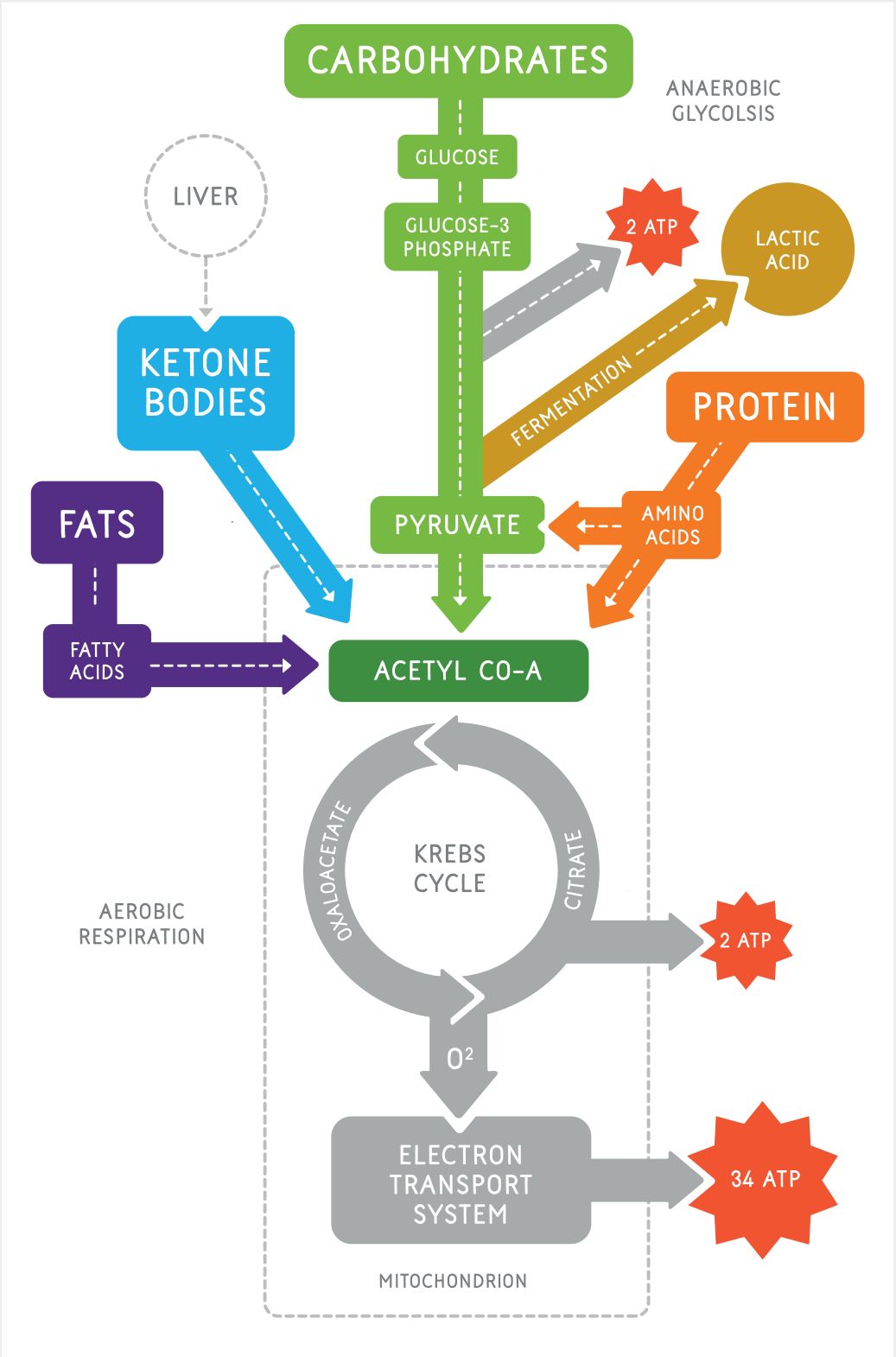


Figure 8. Metabolic flexibility refers to the capacity of an individual to smoothly transition, depending on life's demands, between deriving energy from carbohydrates, fatty acids, ketones or proteins, while also being able to utilise the most efficient energy-yielding system at any specific time (i.e., creatine phosphate/phosphagen, anaerobic glycolysis or aerobic glycolysis).

3.2.6 Oxidative stress status

Goal: Limit persistent oxidative stress

The body produces reactive oxygen species (ROS) ('free radicals') that are required for cellular function and a wide range of normal physiological processes. An example is the release of nitric oxide in the endothelium of arteries to trigger dilation during exercise. However ROS can also be involved in the pathogenesis of diseases, especially cardiovascular diseases, notably when oxidative stress arises over an extended period. Persistent oxidative stress is a condition in which there is a long-term imbalance between the production of ROS and the body's ability to scavenge and detoxify reactive intermediates or to repair resultant damage. ROS include superoxide anion, hydrogen peroxide, hydroxyl radical, organic hydro peroxide, alkoxy and peroxyl radicals, hypochlorous acid and peroxynitrite.[26] In a healthy body, both endogenous antioxidants (produced within the body), such as glutathione, and exogenous dietary antioxidants from fruits, vegetables and other botanical sources, are able to scavenge ROS sufficiently to avoid persistent oxidative stress. Excessive ROS react with and cause damage to functional lipids, proteins and DNA. Persistent oxidative stress is a risk factor in a wide range of, particularly age-related, chronic diseases, including cardiovascular diseases, metabolic diseases such as type 2 diabetes, obesity and some forms of cancer, osteoarthritis and neurodegenerative diseases. A balanced and varied diet, replete with representatives of all 6 colours of the 'phytonutrient spectrum' (**Fig. 10, p. 58**) provide important defense agaist damaging, excess ROS.

3.2.7 Neuroendocrine system function

Goal: Optimise neuroendocrine function

The neuroendocrine system refers to the interaction between the neurological and endocrine (hormonal) system, effectively creating a super-system that also links the gut to the brain. The neurological system is comprised of the brain, spinal cord, ganglia and nerves, and is connected to cells of sensory and effector tissues). The endocrine system, in contrast, consists of ductless glands that secrete hormones that act systemically or target specific organs or processes. Both systems interact so closely that, from a health management perspective, dealing with each of the two systems separately is not helpful. Central to the function of the neuroendocrine system is the control of the hypothalamus-pituitary-adrenal (HPA) axis that regulates the function of the parasympathetic and sympathetic parts of the autonomic nervous system, so regulating stress, basal metabolism, circadian rhythms, growth, feeding behaviour, reproduction (including sexual activity), water/salt balance, and lactation. The normal function of the neuroendocrine system is thus critical to not only a diverse range of basic physiological processes but also to many aspects of behaviour and psychological state. Neuroendocrine dysfunction may be triggered or mediated by trauma (especially brain injury), psycho-social and emotional stress (including as a result of post-traumatic stress disorder), xenobiotic (environmental chemical) exposure, gastro-intestinal disorders, overweight, obesity and numerous other factors.

3.2.8 Circulatory system function

Goal: Optimise circulatory system function

The circulatory system is essentially comprised of two fluid-based systems within the body that use the heart as its primary pump, namely the cardiovascular system and the lymphatic system. The cardiovascular system, which is closed, is comprised of the heart, blood and blood vessels (arteries, veins and capillaries), while the lymphatic system is open and includes lymphatic vessels, lymph capillaries, lymph nodes and organs, and lymphatic tissues and circulating lymph. Oxygen, carried in haemoglobin within red blood cells, and nutrients diffuse across blood vessel layers into the extracellular fluid (ECF) that includes blood plasma and the interstitial fluid that bathes cells. The ECF allows oxygen and nutrients to be transported to target cells and tissues, while also allowing the removal of carbon dioxide and waste compounds. The cardiovascular system includes a loop that allows oxygen-depleted blood to be pumped away from the heart to the lungs (via the pulmonary artery) and to be returned, now oxygenated, (via the pulmonary vein) to the heart. Dysfunctions in the circulatory system are the most common forms of disease and causes of death in most industrialised countries. They include hypertension (high blood pressure), atherosclerosis (the most common type of coronary heart disease involving hardening and narrowing of the arteries by the formation of plaques), peripheral artery disease and cardiomyopathy. These conditions can lead to angina, heart failure, heart attack, stroke and abnormal heart rhythms (arrhythmia).

3.2.9 Toxic burden and biotransformation

Goal: Minimise toxic burden and optimise biotransformation

The human body is well adapted to dealing with both endogenous and exogenous toxins. However there is increasing evidence that an excessive burden of new-to-nature exogenous toxins linked to industrialisation and globalisation absorbed from atmospheric pollutants, foods, water, personal care products and pharmaceuticals, may over-burden in-built detoxification and biotransformation systems. The Globally Harmonised System of classification and labelling of chemicals (GHS) (revision 6, 2015) identifies 10 categories of health hazard, namely acute toxicity, skin corrosion/irritation, serious eye damage/eye irritation, respiratory or skin sensitisation, germ cell mutagenicity, carcinogenicity, reprotoxicity (toxic to reproduction), specific target organ toxicity/single exposure, specific target organ toxicity/repeated exposure, and aspiration hazard. Exposure routes may be prenatal, oral, inhalation, dermal or, in the case of vaccine adjuvants, intra-muscular. Biotransformation refers to the processes by which the body attempts, via a two-phase enzyme-controlled process, to chemically transform, conjugate and eliminate toxins. Single nucleotide polymorphisms (SNPs) (that reflect our individual genetic variations) affect specific biotransformation enzymes and may cause individuals to present with chemical, or multiple chemical, hypersensitivity.[27] Toxin overload may lead to abnormally high oxidative stress, so causing DNA, cell or membrane damage, a known trigger for environmentally-mediated cancers. It may also cause dysregulaton of the xenobiotic nuclear receptors, a condition known to be associated with a wide range of chronic diseases, including asthma, type 2 diabetes, obesity, atherosclerosis, osteoporosis and many forms of cancer.[28,29]

3.2.10 Structural integrity status

Goal: Development and maintenance of optimally functional membranes, tissues, skin and musculoskeletal systems

Integrity and functionality of membranes within and surrounding individual cells of the body, bodily tissues, skin and musculoskeletal system, are essential for optimal health. Integrity declines with chronological age and associated programmed senescence, especially from middle-age and beyond. Loss of integrity is affected by multiple factors including genetics, environment and behaviour. However, the rate of loss can be modified significantly by the individual, such as through specific behaviours (e.g., weight-bearing physical activity, degree of sun exposure), dietary choices (e.g., nutritional status,[30] glycation,[31] meal frequency),[32] and autophagy (e.g., caloric restriction,[33] intake of natural autophagy mimetics).[34,35] The musculoskeletal system comprises the muscular and skeletal components (notably muscles, skeleton, tendons, ligaments, joints) that support the weight of the body, maintain specific positions and produce controlled and precise movements, including locomotion.[36] There is increasing evidence of a close interface between metabolic complications (e.g., metabolic syndrome, obesity) and a compromised musculoskeletal system, including impaired muscle integrity, persistent atrophy, tendinopathy, osteoporosis and limitation of locomotory movement.[37] The skin is the largest multifunctional organ of the body due to its very large surface area.[38] It provides protection, sensation, thermoregulation, biochemical/metabolic, and immune functions. Toxins and waste products are eliminated by the skin via sweat and the sebaceous glands making it an important consideration for healthy detoxification.[39] Additionally, age-related changes in skin integrity and barrier function, that can in turn be influenced by skin care regimens as well as long-term nutritional and lifestyle patterns, may affect individual susceptibility to various skin-related pathologies such as pruritis, dermatitis and infections (e.g., cellulitis).[40]

3.2.11 Psychological and cognitive function

Goal: Enhance psychological, cognitive and emotional wellbeing

Stable and resilient mental health and cognitive function is central to whole body health and resilience. Given an abundance of evidence that shows the physical body cannot be separated from the brain and mind, considerations of psychological and emotional well-being, along with cognitive function, must be afforded equivalent priority to conditions of the physical body.[41] This is particularly the case for any whole body, person-centred approach to health optimisation. The prevalence of mental health disorders, along with the loss of psychological resilience or cognitive function, is growing rapidly and threatening to overwhelm health and social services.[42] Social disconnectedness and perceived isolation (loneliness) have distinct associations with physical and mental health. They are also independently associated with lower levels of self-rated physical health.[43] Individuals who lack community support or report frequent feelings of loneliness tend to suffer higher rates of morbidity and mortality, as well as infection, depression, and cognitive decline.[44,45,46,47] As revealed by the Meikirch model, social as well as environmental (external) determinants of health may be as important as individual (internal) ones (Section 2.4, p. 24). Cognitive function is highly modifiable if targeted sufficiently early in an individual's life and is affected by such factors as long-term glycaemic control,[48] nutrition,[49] oral function,[50] physical activity,[51] adiposity,[52] neuroendrocrine function and stress.[53] There is extensive clinical evidence (see previous references within this sub-section) that targeting the root cause of these imbalances using, for example, nutritional and lifestyle interventions, along with other non-pharmacological modalities, can significantly improve psychological, emotional and cognitive function.

3.2.12 Psychosocial-emotional health status

Goal: Stress adaptation and transformation, optimisation of intrinsic biorhythms and satisfaction of higher emotional needs

Individuals must be considered within the context of the wider ecosystem within which they interact. This includes the social, familial and wider social community and environment. The demands of an individual's life, including his or her desire to satisfy higher emotional needs (e.g. life purpose, meaning) allow each person to explore and develop his or her personally acquired potential (PAP) within the constraints of the biologically given potential (BGP). In turn, as exemplified by the Meikirch model, multiple and complex interactions occur between individuals, their social circles and their environment.[20] Negative interactions, particularly when persistent over years or even decades, may eventually manifest downstream as mental health or chronic diseases. It is critically important to address likely upstream determinants or causes. This may include tackling complex issues, with guidance by an appropriately qualified and experienced health professional, such as challenging relationships, bereavement, abuse, early life trauma, loneliness, feuds and estrangement, addiction, insufficient time outdoors or other challenges associated with urbanisation. The stress response in humans (and other animals) is a sophisticated neuroendocrine response mediated through the autonomic (unconscious) nervous system that has evolved to deal rapidly with occasional threats. Psycho-social stress occurs when an individual perceives stress in ways that tax or overwhelm his or her adaptive capacity.[54] Such stress can also be driven by biological or physiological factors outside of the individual's control. There is an extensive body of evidence suggesting that chronic stress creates a misalignment of neuroendocrine control along the hypothalamus-pituitary-adrenal (HPA) axis.[55] Evidence suggests that additional systems are also involved, including the gut and gonads.[56] In turn, chronic stress typically triggers an up-regulation (hyper-activity) of the immune system leading to low-grade inflammation.[57] Heart rate variability (HRV) is recognised as a robust marker of the stress response.[58] Stress transformation involves not only the reduction of psycho-social and emotional stress, but also changes in the perception of stress, such as the transformation of negative to positive stress. Social jet lag refers to the misalignment of biological and social time and is becoming more widely accepted as a significant stressor.[59,60] Societal schedules may interfere considerably with individual, clock gene influenced, sleep preferences. 'Late bird' chronotypes are often more at risk than 'early bird' ones, given the more extreme misalignment of their biorhythms with social norms.[61] Following on from Maslow's proposal of a hierarchy of human needs, Carl Rogers and other leading psychologists have recognised that the satisfaction of higher human needs, including self-acceptance and self-actualisation, is a prerequisite of a fully-functioning person.[62] Carol Ryff, professor of psychology at the University of Wisconsin-Madison, identified often-neglected aspects of personal functioning that represent core dimensions of emotional wellbeing.[63]They include engagement in life purpose, realisation of personal talents and enlightened self-knowledge.[64] The same author has recently reviewed 750 studies that use this model of psychological (eudaimonic) wellbeing that emphasises the satisfaction of higher needs for the realisation of human potential.[65] Michel Poulain, Gianni Pes and Dan Buettner have isolated five regions of the world with cohorts of especially great longevity and low disease rates ('blue zones'). They determined that these cohorts share 9 common characteristics, including identified life purpose, engagement in spirituality or religion, and the prioritisation of family and social life.[66,67] Michael Steger and colleagues have shown the importance for long-term health of identifying meaning in life at an early stage (in adolescents).[59] Chronic psycho-social stress and long-term emotional imbalance have been found to be strongly associated with various chronic and degenerative diseases, including anxiety and depression, coronary heart disease, obesity, type 2 diabetes, Alzheimer's disease and related inflammatory and metabolic disorders.[68,69]

FOOD4HEALTH GUIDE

Revision 1, June 2018

FOR ADULTS AND CHILDREN OVER 6

Plant-dominant, diverse, low starchy carb, anti-inflammatory, high nutrient-density – priorities for healthy eating!

Daily consumption of a diverse, varied and balanced range of fresh, largely unprocessed, whole foods with a macronutrient ratio by energy roughly of 20%, 25% and 55% for protein, complex carbohydrates and healthy fats, respectively. Intermittent fasting, that includes 5 hours or more between meals and 12 hours or more overnight, coupled with regular physical activity and ample rest, is the foundation for a healthy lifestyle.

FOOD4HEALTH VISUAL DAILY 'PLATE'

6 FOOD GROUPS EVERY DAY

Percentages refer to amounts **by weight** (not energy contribution)

1. **40% VEGETABLES** (unprocessed) - with ample healthy fats
   - 6 colours of the 'rainbow' (green, red, yellow, orange, blue/black/purple, white/tan)
2. **10% FRUITS** (unprocessed)
3. **10% GRAINS** (gluten-free whole grains and pseudo-grains) e.g. amaranth, buckwheat, millet, oats, quinoa, teff, rice, sorghum)
4. **10% HIGH 'HEALTHY FAT' FOODS** e.g. avocado, tree nuts (almond, walnut, brazil, macadamia, etc.), seeds (chia, flax, etc.), coconut [or dairy, if tolerant] yoghurt, egg (yolk)
5. **25% PROTEIN-RICH FOODS** - with ample healthy fats
6. **5% CONCENTRATED NUTRIENTS** e.g. non-irradiated herbs and spices, herbal teas, food supplements

10 KEY GUIDELINES

1. Macronutrient contribution by energy (kcal or kJ) should be approximately 20% protein (4 kcal/g), 25% carbohydrates (4 kcal/g) and 55% fats (9 kcal/g) - based on daily 'plate' illustrated above
2. Minimise consumption of highly processed foods and avoid all refined carbohydrates
3. Consume plenty of fresh, raw or lightly cooked plant foods (vegetables and fruit, in a roughly 4:1 ratio) that include all 6 colours of the 'rainbow' each day (green, red, yellow, orange, blue/black/purple, white/tan)
4. Avoid high-temperature cooking methods (frying, grilling, BBQ), unless brief. Minimise heat-damage to proteins, fats, vegetables, starches and other carbs by using slow cooking methods
5. Healthy fats for cooking include virgin coconut oil, unfiltered extra virgin olive oil, virgin avocado oil, safflower oil, and butter or ghee (the latter two only if no lactose intolerance). Other healthy fats for addition to other foods include oils of flaxseed, hempseed and macadamia
6. Consume plenty of fresh herbs and non-irradiated, preferably organic, spices, along with herbal teas (with real herbs/spices, not flavourings)
7. Avoid snacking and try to maintain 5 or more hours between meals
8. Consume at least 1.5 litres of spring or filtered water daily between meals (more if exercising intensively)
9. Avoid all foods which trigger sensitivity, intolerance or allergy
10. Seek advice from a qualified and experienced nutritional health professional on the most appropriate concentrated sources of nutrients, herbal teas and/or supplements (concentrated sources of nutrients)

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Figure 9. ANH-Intl Food4Health Guidelines: alternative, science-based guidance on healthy eating that considers dietary quality as much as quantity (visually by weight, but also by energy contribution).

3.3 Evaluating an individual's ecological terrain

Evaluation of function within each domain of the ecological terrain may occur in three distinct ways:

Self-evaluation by the individual;

Guided evaluation, in which a practitioner, health or fitness professional is able to help the individual interpret self-recorded or acquired data, and;

Practitioner evaluation, these relating largely to biomedical (disease or disease risk biomarker) testing or evaluation methods that typically need to be ordered and interpreted by a qualified health professional.

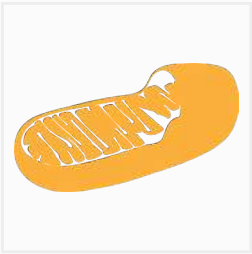
In all cases, the individual should have full access to his or her health data to encourage engagement, participation with peers and healthcare professionals, and collaboration between health-related professionals.

Examples of evaluation methods that apply to each, along with potential interventions which may apply, are given in Table 2 (p. 52).

> *"...the individual should have full access to his or her health data to encourage engagement, participation with peers and healthcare professionals, and collaboration between health-related professionals."*

Table 2. A generalised example of how three levels of evaluation within each of the 12 domains of an individual's ecological terrain, including potential interventions, can be implemented to maintain, improve or restore each.

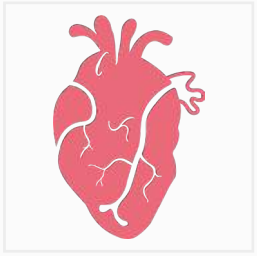
SYSTEM FOCUS	SELF-RECOGNITION / EVALUATION	GUIDED SELF-EVALUATION	PRACTITIONEREVALUATION	POTENTIAL INTERVENTION(S)
1. Genetic and epigenetic background 	• Poor health and/or vitality despite healthy diet/lifestyle • Family history of chronic disease • Research on familial medical history/ancestry/ethnicity	• Increasing knowledge and awareness through self-education and practitioner guidance (PAP)[20]	• Detailed case history taking[70,71] • Low-penetration metabolically-mediated epigenetic testing (cheek swab)[72,73,74] • Familial medical records	• Personalised nutritional and lifestyle protocol based on known or suspected genetic susceptibility • Multimodal protocols tailored to individual's current health status and goals[75,76,77]
2. Glycaemic control and metabolic flexibility 	• Carbohydrate cravings • Blood sugar spikes and lows (hypoglycaemia)[78] • Strong desire to eat/ snack every few hours • Central adiposity, e.g. measured via waist to height ratio (optimum <0.5)[79]	• Evaluating eating patterns via a food diary • Tracking anthropometrics on body composition scales • Central adiposity, measured via waist to height ratio (optimum <0.5)[79] • Continuous blood glucose monitoring[80] • Skinfold callipers	• Functional testing[81] e.g. fasting blood glucose, fasting insulin, post-prandial blood glucose, HbA1c, fat-handling markers, serum β-hydroxybutyrate (BHB)[82] • Anthropometric data[83,84] (e.g., from body impedance analysis [BIA]) • Assessment of food diary/ eating patterns and food types[85]	• Personalised nutritional protocol (low carbohydrate/ glycaemic load [GL])[86] • Activity and movement protocol[87] • Targeted food/botanical/herbal supplements, herbal teas[88]

SYSTEM FOCUS	SELF-RECOGNITION / EVALUATION	GUIDED SELF-EVALUATION	PRACTITIONEREVALUATION	POTENTIAL INTERVENTION(S)
3. Gastrointestinal system and microbiome function 	• Digestive discomfort e.g. bloating, flatulence, heartburn, nausea • Constipation, diarrhoea, cramping • Sensitivity to certain foods	• Maintenance of a symptom diary for discussion in practitioner consultation • Maintenance of a food diary for discussion in practitioner consultation	• Detailed case history taking • Functional testing e.g. organic acids,[89] stool testing (incl. microbiota mapping), intestinal permeability, lipopolysaccharides (LPS)[90], calprotextin (faecal,[91] plasma[92]), SIBO breath test,[93] *H. pylori*[94] • Identification of potential food intolerances/sensitivity • Holistic approach to individual (gut/brain connection)[95]	• Personalised nutritional protocol (macro-/micro- nutrient balance, food frequency/ feeding windows)[96] • Dietary exclusion of foods/ingredients with known intolerances/ sensitivities/allergies[97] • Targeted prebiotic/probiotic and food/botanical/herbal supplements, herbal teas[98] • Increase consumption of fermented foods[99]
4. Mitochondrial function 	• Feeling tired all the time • Lack of energy • Lack of motivation for physical activity • Immune challenged	• Tracking fatigue levels during the day (e.g. Fatigue Severity Scale[100], PERFORM[101]) • Tracking effects of short HIIT sessions[102]	• Functional screening - patient's history, results of functional testing (blood work, organic acids), mitochondrial function profile[103] • Nutrient sufficiency assessment • Neuroendocrine assessment[104]	• Nutritional, movement and lifestyle protocol[105] • Time restricted feeding • Nutrients (micronutrients, MCTs) for mitochondrial support[106] • High Intensity Interval Training (HIIT)[107] • Fasted training • Muscle maintenance and growth[108]

SYSTEM FOCUS	SELF-RECOGNITION / EVALUATION	GUIDED SELF-EVALUATION	PRACTITIONEREVALUATION	POTENTIAL INTERVENTION(S)

5. Immune system function and inflammatory status 	• Frequent infections
	• Prolonged recovery time
	• Feeling tired all the time
	• Feeling 'under par'
	• Muscle and joint aches and pains
		• Evaluate symptom changes brought about by:
		  • Limiting alcohol consumption
		  • attempting to stop (or reducing) smoking
		  • reducing exposure to toxins e.g. household chemicals and toxic personal care products
			• Detailed case history
			• Functional testing e.g. immune markers (SIgA, neutrophils, IL-6, TNFα, IFNγ etc.), hsCRP, endocrine (full thyroid panel), LPS, intestinal permeability, vitamin and mineral status[109]
			• Questionnaires to assess need for emotional/stress support[110]
				• Vitamin D supplementation[111]
				• Anti-inflammatory nutritional protocol
				• Weight management and time restricted feeding
				• Supplementation with n-3 fatty acids,[112] botanicals/herbs

6. Oxidative stress status 	• Feeling tired all the time • Lack of energy • Lack of motivation for physical activity • Immune challenged	• Complete questionnaires to determine environmental chemical exposure • Assess sleep patterns, stress levels	• Low-penetration epigenetic testing to assess capacity to counteract free radicals[113] • Use of questionnaires to determine toxic exposures e.g. environmental, household, personal care products[114] • Test for oxidised (ox-) LDL[115] and advanced glycation end-products (AGE)[116] • DNA/RNA oxidative damage assays • Measure activity of antioxidant enzymes e.g. glutathione (GSH), superoxide dismutase (SOD), catalase[117]	• Low refined carb (sugar), higher fat, diverse plant-based nutritional diet[118] • High intake of polyphenols (foods/beverages, supplements, etc) • Weight management[119] • Mindfulness practice • Targeted antioxidant food/botanical/herbal supplements, herbal teas[120]

SYSTEM FOCUS	SELF-RECOGNITION / EVALUATION	GUIDED SELF-EVALUATION	PRACTITIONEREVALUATION	POTENTIAL INTERVENTION(S)
7. Neuroendocrine system function 	• Hormonal imbalance e.g. menstrual irregularities, mood swings, post-menopausal • Poor stress tolerance • Pervasive tiredness • Lack of energy and motivation • Skin problems • Weight gain / loss • Heart rate variability (HRV)[121]	• Perceived/self-reported stress or resilience questionnaires (e.g., Brief Resilience Scale)[122] • Environmental toxin questionnaires (e.g. IFM toxin exposure)[123] • Heart rate variability (HRV)[96]	• SNPs such as GSK3B, FKBP5, OXTR, AKT1, COMT, DRD (2, 3, 4), OPRM1, BDNF, 1A HTR1A, SLC6A4, MTHFR, MTR[124] • Thorough case history • Holistic symptom mapping • Functional testing e.g. organic acids, blood spot (hormones), saliva testing (adrenal hormones), full thyroid screen (incl. rT3)[125] • Heart rate variability (HRV)[96] • Neurotransmitter testing	• Personalised nutritional and lifestyle protocol based on test results • Optimise gut function[126] • Stress management protocol e.g. heart rate variability, mindfulness, physical activity, hobbies • Multi-modality CAM (Complementary and Alternative Medicine) collaborative approach e.g hypnotherapy, massage • Botanical/herbal supplements and herbal teas
8. Circulatory system function 	• Family history • Poor diet and lifestyle choices (obesity, MetS, T2 diabetes, VAT) • Cold hands and feet • Need for weight management • High stress/pressured job • Sleep apnoea • Anxiety (e.g. over future health)	• Blood pressure meter • Body composition scales • Wearable tech e.g. Garmin, Fitbit • Heart rate variability (HRV)[96]	• APOE, MTHFR, ACE, PPARγ and PAI-1 gene expression, SNPs for SOD, GPx • Familial history • Assess top risk factors: hypertension, obesity (VAT), diabetes, smoking, dislipidaemia • Functional testing e.g. fat handling, lipid fractions/particle sizes, oxidation levels (ox VLDL), hsCRP, homocysteine, fibrinogen, creatinine, vits and mins status, sex hormones • Height to weight ratio[127] • Visual and somatic assessment of patient	• Personalised nutritional, movement (regain insulin sensitivity) and lifestyle intervention protocol • Reduced alcohol intake • Stop smoking • Increased MUFA intake (e.g. extra virgin olive oil) • High dose n-3 PUFA supplementation • Enhanced plant-based diet (8-10 servings/day)[128] • Exercise and stress-reduction protocol • Healthy weight management • Establish and maintain glycaemic control • Food/botanical/herbal supplementation

SYSTEM FOCUS	SELF-RECOGNITION / EVALUATION	GUIDED SELF-EVALUATION	PRACTITIONEREVALUATION	POTENTIAL INTERVENTION(S)
9. Toxic burden and biotransformation 	• Skin rashes and discomfort • Feeling tired and run down • Unexplained weight gain, brain fog or nerve tremors • Worse after alcohol, chemical exposure • Frequent headaches and/or nausea • Breathing difficulties, asthma • Sensitivity to environmental chemicals	• Monitoring a symptom diary and evaluating it against hazards and exposure • Evaluation of home, occupational and other potential environmental chemical hazards • Environmental toxin and exposure questionnaires[123]	• Low-penetration epigenetic testing to assess biotransformation capacity (detox and methylation SNPs)[129] • Functional testing e.g. liver enzymes, organic acids, blood chemistry, GSH, heavy metals, thyroid panel • Detailed case history taking and holistic symptom mapping - link with mitochondrial dysfunction, oxidative stress, neuroendocrine and immune system in particular	• Dietary protocol for biotransformation support • Forest 'bathing'[130] • Optimise gastrointestinal function • Compensate for genetic SNPs (vulnerability) in detoxification pathways with food and food/botanical/herbal supplements, herbal teas[131] • Remove identified toxin triggers from home
10. Structural integrity status 	• Ability to readily climb a flight of stairs without pain, fatigue or excessive oxygen debt (as part of SF-36 questionnaire)[132] • Tracking fat, lean muscle and bone mass on body composition scales[133] • Susceptibility to bone fractures, bruising and/or skin ruptures	• Circulating vitamin D status. Target: 100-150 nmol/L (40-60 ng/ml) 25(OH)D[134] • Nutrient status and assimilation (protein, vitamins, minerals) • Standing long-jump (SLJ) and isometric handgrip dynamometry for assessment of lower and upper body muscular fitness[135] • Sarcopenia questionnaires (e.g. FRAIL and SARC-F)[136]	• Bone mass density scan (dual-energy X-ray absorptiometry [DXA])[137] • Bone strength assessment with quantitative computed tomography (CT)[138] • Bone resorption assessment (via pyridinium crosslinks in urine)[139] • Hormonal (parathyroid) changes linked to insufficient supply of minerals (Ca, Mg, inorganic phosphate), vitamins (D, K) and protein[140] • Biomarkers of joint tissue turnover (i.e. ECM fragments), cytokines and chemokines[141] • Skin barrier function assessment[142] • Functional movement screening[143,144]	• Correction of deficiencies in nutritional status (e.g., protein, micronutrients)[145] • Supplementation with protein and branched chain amino acids (leucine, isoleucine, valine)[146] • Optimise gut and microbiome function[147,148] • Adequate and regular physical activity, including weight bearing activity[149] and flexibility practices (e.g. yoga,[150] pilates)[151] • Strength and conditioning training[152] • Avoid skin damaging UV or chemical exposure[153] • Interventions by musculo-skeletal health professionals

SYSTEM FOCUS	SELF-RECOGNITION / EVALUATION	GUIDED SELF-EVALUATION	PRACTITIONEREVALUATION	POTENTIAL INTERVENTION(S)
11. Psychological and cognitive function 	• Isolation and lack of community • Concern about body weight • Body dysmorphia • Long-term stress • Early-life trauma • Trauma, incl. PTSD • Lack of support system	• Increasing knowledge and awareness through reading and education (PAP) • Wearable tech e.g. heart rate variability monitor • Use of apps e.g. stress check, heart rate, sleep monitor	• Listening to patient's story • Assessing states of emotional flatness e.g. Pemberton Happiness Index questionnaire[154] • Quality of life assessment e.g. QOLS[155] • Warwick-Edinburgh Mental Wellbeing Scale[156] • Assessing gastrointestinal function re gut/brain connection • Functional testing for micronutrient deficiencies and hormonal imbalance[109]	• Relevant, appropriate and individualised nutritional and lifestyle interventions • Mindfulness protocol for stress reduction and self-empowerment[157] • Heart rate variability[158] • Practical, individualised, coping strategies e.g. pursuit of hobbies, joining clubs/groups • Multi-modality individual-selected CAM therapies • Targeted food/botanical/ herbal supplements
12. Psychosoclal-emotional health status 	• Depression and anxiety • Early life trauma • Estranged from one or both parents • Lack of familial support / feuds • Feeling of being out of synch with life • Relationship difficulties • Tired and lacking energy • Disordered sleep patterns • Poor stress tolerance • Sense of loss of direction and/or purpose • Heart Rate Variability (HRV)[106]	• Increasing knowledge and awareness through reading and education (PAP • Wearable tech e.g. heart rate variability monitor; • Use of apps e.g. stress check; sleep monitor; heart rate; mindfulness • Ryff's Psychological Wellbeing Scales (PWB)[159] • Meaning/purpose in life questionnaires[160]	• Listening to the patient's story[161] • Determine patient's chronotype[162] • Waist to height ratio and body composition • Assess low grade inflammatory markers • Assess sleep hygiene, sleep patterns, sleep apnoea (social jet lag)[ibid] • Assess diurnal cortisol and melatonin (hormonal assessment) • Assess emotional flatness e.g. Pemberton Happiness Index questionnaire • Quality of life assessment e.g. QOLS[163] • Warwick-Edinburgh Mental Wellbeing Scale[164]	• Relevant, individualised nutritional and lifestyle interventions • Healthy weight management (social jet lag correlates with obesity and metabolically-mediated chronic disease)[145] • Restore insulin sensitivity with diet and movement • Support late chronotypes • Improve sleep hygiene • Mindfulness protocols • Practical, individualised, coping strategies e.g. pursuit of hobbies, joining clubs/groups[165] • Multi-modality individual-selected CAM therapies • Targeted food/botanical supplements[166]

3.4 Options for interpreting health data from the ecological terrain

Health data relating to each of the domains of the ecological terrain may be either qualitative or quantitative. They may be self-reported, derived from wearable technologies (e.g. Heart Rate Variability [HRV]) or from biomedical testing. In all cases, it is possible to establish ranges of function that can be broadly categorised into 3 levels: optimal, sub-optimal and elevated-risk.

For example, in relation to one biomarker for glycaemic control, glycated haemoglobin (HbA1c), the ranges might be as follows: optimal, HbA1c values <58 mmol/mol (<7.5%); suboptimal, HbA1c values of 58-75 mmol/mol (7.5-9.0%), and high-risk, with HbA1c values >75 mmol/mol (>9.0%), as determined by Mochizuki et al. (2017).

In order to allow for the development of a consensus approach, agreement over which measures or markers of each domain are to be selected for trialling is proposed to occur through trans-disciplinary working groups. Proposals concerning both the formation of working groups and the conduct of demonstration trials in various settings are detailed in the **Recommendations** of this position paper **(Section 7.4, p. 120)**.

However, preliminary work with individual cases and multiple, primarily quantitative, biomarkers and assessment methods conducted by the *ANH-Intl Science Unit* shows the importance of visual representation of the ecological terrain. For example, **Figure 10** reveals changes in recorded responses over a three month period for a 53-year-old, caucasian female.

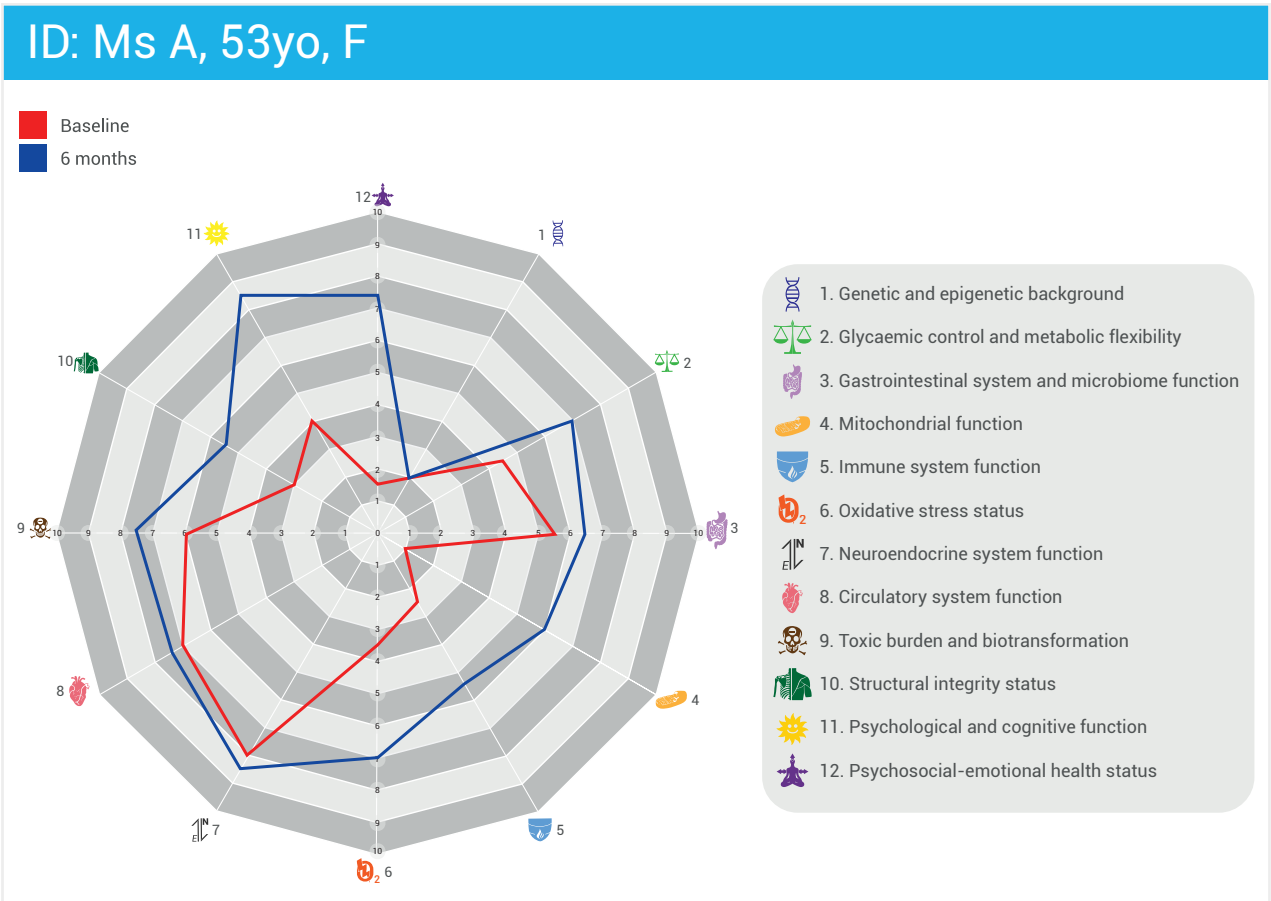


Figure 10. Radar chart presentation of results (baseline and after 6 months) following evaluation of the 12 domains of the ecological terrain of a 53yo female.

Highly informative and motivational health data that is able to positively influence behaviour can be gathered from a variety of commercially available devices and wearable technologies. Additionally, biomedical testing as offered by suitably qualified and experienced health professionals can offer reliable data on health status of multiple systems.

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SECTION 4

THE HEALTH SYSTEM

"Globally, the policy and research communities have heatedly debated health system reforms. Health systems have been dissected, analyzed, evaluated and compared. However, there is no common and consistent answer to the question what is a health system? The term 'health system' has been defined differently for different purposes"[1]

- William C. Hsiao, Professor of Economics, Harvard TH Chan School of Public Health, Boston, MA, USA

4. THE HEALTH SYSTEM

4.1 Definitions

Professor William Hsiao, internationally recognised for his work on health care financing and social insurance, raises the very important question of how a health system should be defined. He goes on to suggest that for policy and research purposes it is most useful to conceptualise a health system ***"as a set of relationships in which the structural components (means) and their interactions are associated and connected to the goals the system desires to achieve (ends)."***

Hsiao identified three common goals of health systems, these being health status, financial risk protection and public/consumer satisfaction[1]. The author discusses how equity in the achievement of these goals may (or may not) be achieved. He goes on to elaborate the various means that are typically used to achieve these goals, including public and private financing, regulation and persuasion. Hsiao argues that the private sector and government (and we would add non-profits, charities and citizens as a grassroots force) are another powerful means of achieving health system goals. They may influence people's beliefs, expectations, lifestyles and preferences through advertising, education and information dissemination.

In short, Hsiao, writing at the same time as Derek Wanless (**Section 1.2, p. 11**), provides a useful backdrop for the consideration of the sustainability of any 'health system'. We suggest that common perceptions of the 'healthcare system' that are usually restricted to the established medical system of people, institutions, structures and resources that deliver goods and services to the public is too limiting. These established medical systems, including the UK's NHS, are in fact 'healthcare delivery systems'. Their primary function is to deliver healthcare goods and services to the public. Such perceptions ignore the public, the health and wellbeing of which is ostensibly the healthcare system's raison d'être. They also ignore the myriad of interactions each individual has with their environment that impact health and wellbeing.

We propose therefore that a broader definition of a health system is required if sustainability and health optimisation are to be prioritised over disease management. A progressive health and care system that includes the prioritisation of health optimisation, choice and satisfaction of individual needs, would therefore not be limited to institutionally-delivered or corporate-delivered healthcare goods and services.

As a consequence, in the context of this position paper, the 'health system' is interpreted as the societal and environmental system with which an individual interacts, deliberately or unwittingly, that influences his or her ecological terrain. These interactions may have beneficial, neutral or adverse effects on health or resilience. They include the four key components of the Meikirch model (**Fig. 5, p. 28**), namely the demands of life, the individual, society and environment, as well as the 10 resultant complex interactions.

The health system can be interpreted at various levels of magnitude, including at the individual, community, local, regional or national level (**Fig. 11, p. 70**). At the national level, the health system still places the individual, not the clinics, hospitals and associated institutions, people and resources, at its core.

The 'health system' is interpreted as the societal and environmental system with which an individual interacts, deliberately or unwittingly, that influences his or her ecological terrain. These interactions may have beneficial, neutral or adverse effects on health or resilience.

4.2 The structure and organisation of health systems

As the burden on institutionalised and corporate healthcare services increases, it appears increasingly likely that the health needs of individuals will not be able to be met without dramatic changes to how healthcare is both received and delivered. These changes will need to include much greater levels of public engagement and responsibility for health. The current biomedical model of institutionalised healthcare has meant that responsibility for health has effectively been delegated to GP clinics and hospitals that deliver goods and services. Nutrition, that represents a human's most intimate interaction with the environment, has been outsourced to registered dietitians. Physical activity has been outsourced to gyms and fitness centres, while stress-related behavioural problems have been outsourced to registered psychologists and social workers. Within the existing model of a healthcare delivery system, the individual has been relegated to a disempowered and almost passive participant in the system.

Within a collaborative, participatory and sustainable system, health professionals do not act autocratically in their selection, recommendation or delivery of interventions. They act instead as guides, taking fully into account patient's needs and individual circumstances, while considering the best available and relevant evidence. In the process, the individual is able to engage in a multi-factorial programme of health optimisation that will generally include support for behavioural, lifestyle and dietary change, as well as appropriate and clinically-validated interventions, that may be delivered by a health professional or through self-care. Ongoing monitoring of the individual's health status, usually across multiple domains or zones of health (Section 3.2), is an important component and allows for modification of the programme over time to ensure optimum outcomes, both in the short- and long-term.

In the present system, healthcare delivery tends to be delivered too late in the disease cycle. The public tends not to access the health system until clinical symptoms of one or more diseases are manifest. There is little emphasis on disease prevention and almost none on health creation or optimisation. Pathogenesis of single diseases and often comorbidities are frequently advanced before any external support is sought. This delay in access to healthcare services or support greatly complicates the resolution of health. Additionally, the advice offered and treatments provided or recommended may not be optimal for a given individual, and generally do not adequately address upstream causes of health problems (Section 2.1, p. 17).

When considering health systems in a broader context, it is therefore necessary to think well

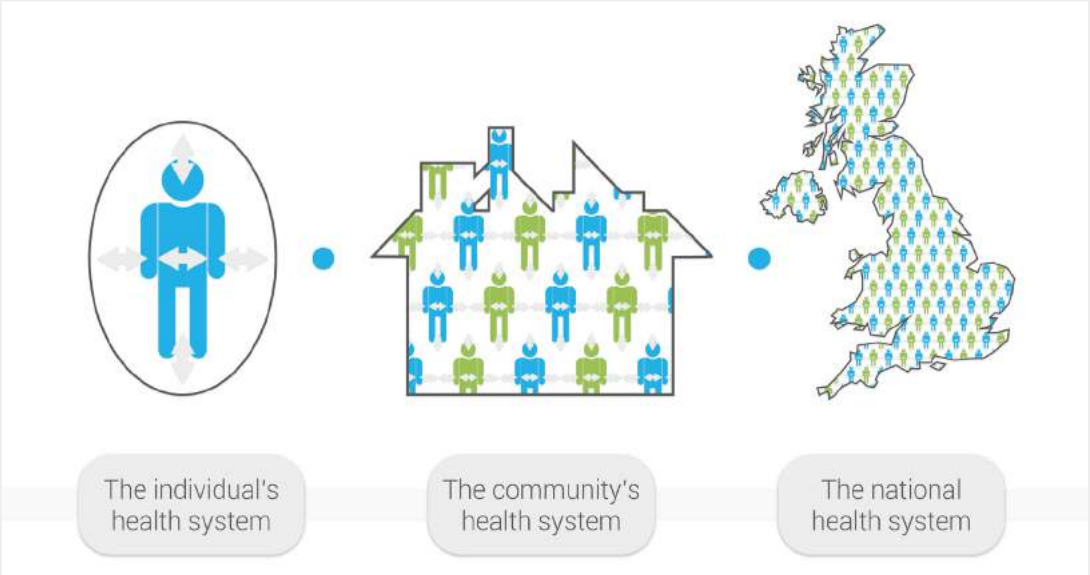


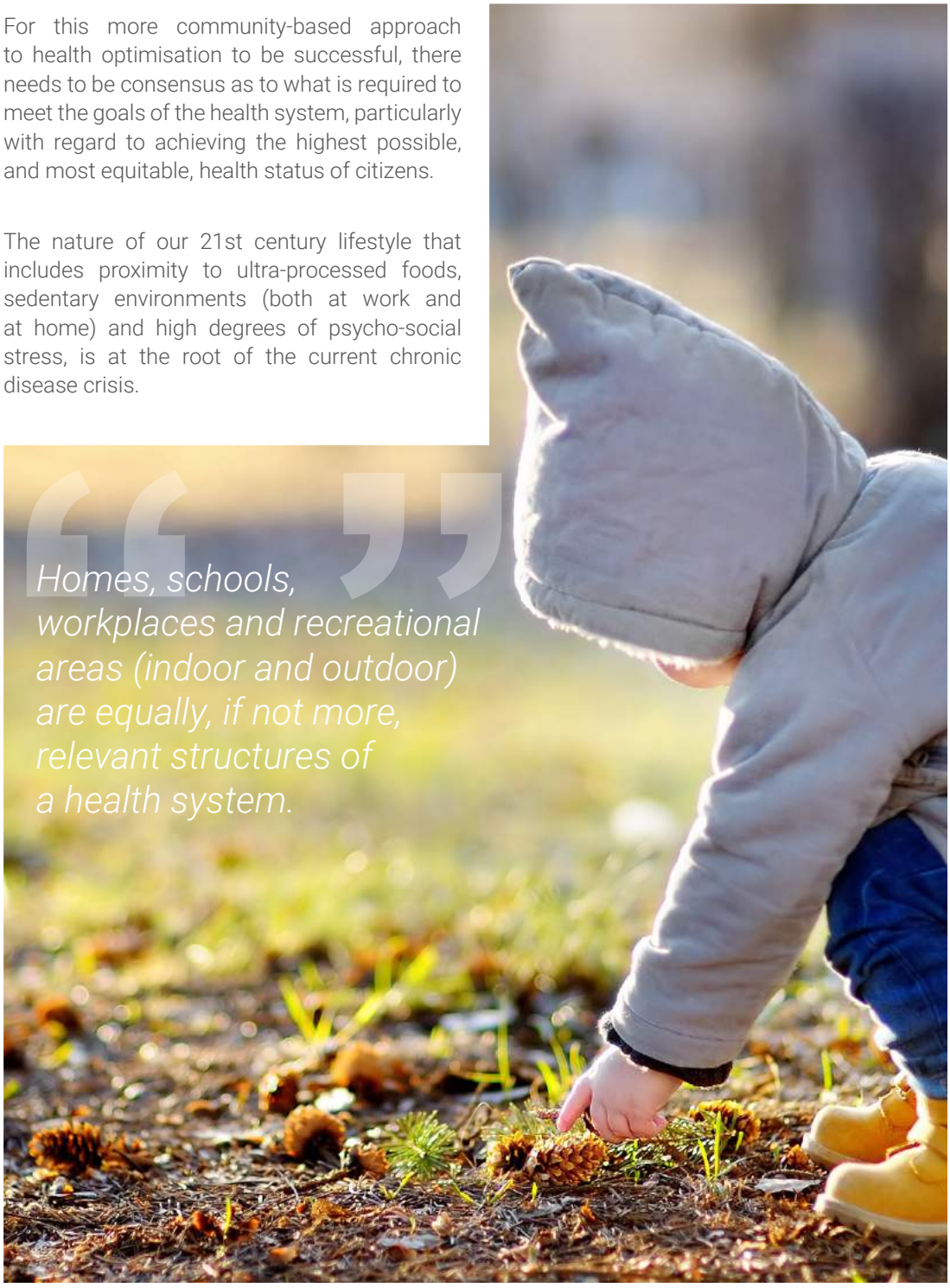
Figure 11. Three different levels of magnitude of health systems.

beyond the established physical structures of healthcare, namely clinics, surgeries and hospitals. Homes, schools, workplaces and recreational areas (indoor and outdoor) are equally, if not more, relevant structures of a health system. In such systems, registered health professionals are not the only individuals with the capacity to act as guides. Health coaches, complementary and alternative medicine (CAM) professionals, fitness professionals, counsellors, health store staff, community workers and school teachers are other groups that can uphold this function, especially if all are cognisant of a unified model that defines health and resilience.

> *The current biomedical model of institutionalised healthcare has meant that responsibility for health has effectively been delegated to GP clinics and hospitals that deliver goods and services.*

For this more community-based approach to health optimisation to be successful, there needs to be consensus as to what is required to meet the goals of the health system, particularly with regard to achieving the highest possible, and most equitable, health status of citizens.

The nature of our 21st century lifestyle that includes proximity to ultra-processed foods, sedentary environments (both at work and at home) and high degrees of psycho-social stress, is at the root of the current chronic disease crisis.



4.3 Individuals should be at the centre of any health system

A McKinsey report published[2] in 2010 emphasised the need for citizens to take control of their care and avoid the wrong types of treatment. An extract from the report reads as follows:

> *"….the increasing prevalence of largely preventable chronic conditions and the suboptimal use of health care resources—are strongly influenced by the behavioral choices consumers make. For example, obesity, which is largely preventable, significantly raises the risk of diabetes, heart disease, stroke, and some cancers. And because most health systems have not encouraged patients to take appropriate control of their care, consumers often seek the wrong type of treatment for many conditions. Misuse of the health care system only intensifies the cost burden imposed by the increased prevalence of chronic illness."*

It therefore behoves the UK government, the healthcare delivery sector, other health and fitness professionals, as well as civil society, to co-create a much broader-based health system at the national level. Any new system must be both relevant to the needs of individuals and genuinely sustainable.

This requires not only a more unified understanding of health and its optimisation, but also a degree of consensus among health professionals, government, healthcare institutions and the public. Given the intricate interrelationships between different systems, a whole-body approach is required; one that focuses on multiple elements of the individual's biological, familial and social system (Section 3.1, p. 37), not just limited parts of it.

Every effort must be made to facilitate circumstances in which citizens can have greater autonomy over, as well as take greater responsibility for, their health. To avoid messaging that is conflicting and confusing to the public, approaches should be agreed by consensus. The development of relevant and coherent public health messaging that is both well-received by the diverse sub-populations of the UK and that delivers positive outcomes, could go a long way to averting an otherwise inevitable future catastrophe caused by excess demand for health and social care services.

In a February 2017 BBC interview,[3] president of the Royal College of General Practitioners (RCGP), Dr Helen Stokes-Lampard, said:

> *"We have the shortest consultations in Europe. It is a crazy situation….They want to push more care out of hospitals, but we do not have the resources or infrastructure in the community to cope….."The typical patient has a range of multiple conditions. They can have diabetes and heart disease and some moderate depression. Patients can be on 10 medicines. You can't possibly provide good care in 10 minutes to these sort of patients….We will need to provide more complex care…That takes time - longer than the 10 minutes we get now. I really worry what will happen."*

The burden of chronic disease, including the expected doubling of numbers of people requiring 24-hour care,[4] creates major challenges over the planning of resources and associated funding required for the care of future ageing populations.[5]

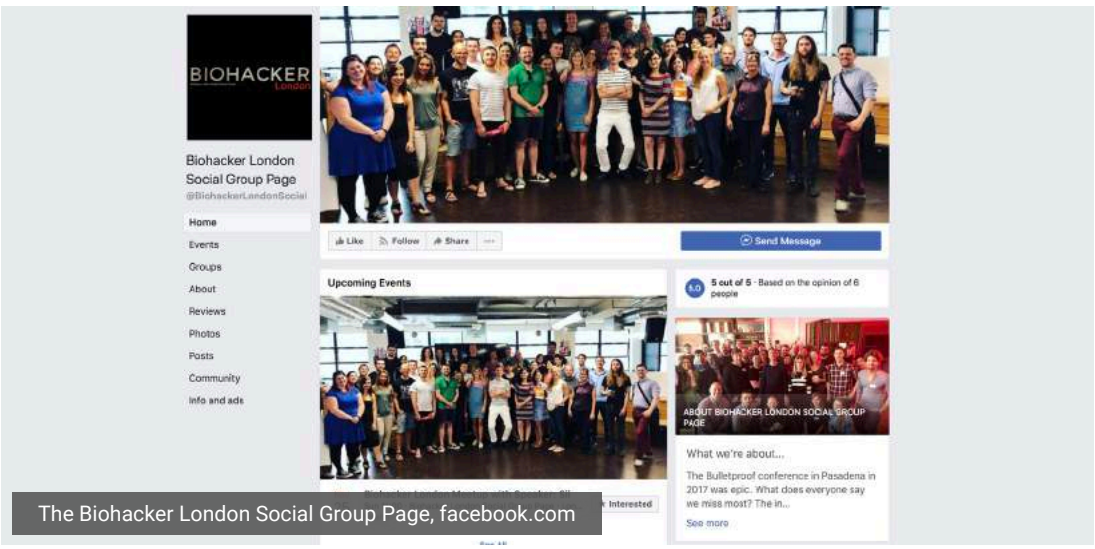
The 2014 GP Patient survey revealed:[6]

- 92.5% were confident in managing their own health
- 54% had one or more long standing health conditions
- 63.7% with long-term conditions said they received enough support from local services or organisations in the previous six months to help them manage their condition, a decrease of 0.3 percentage points since December 2013 and 0.4 percentage points since December 2012.
- 17.4% stated their activities were limited due to recent illness or injury
- 93.5% said they did not have a written care plan (3.3% said they didn't know).

Citizens' interest in modifying behaviour, diets and lifestyles to optimise health, often informed by data or technology of some kind, is reflected in the rapid expansion of the 'biohacker' movement. The growth of this movement could also be seen as recognition that GPs and other mainstream health professionals have, with limited exceptions, very little background training in, or capacity to deliver or recommend, interventions that optimise heath.

Biohackers increasingly relate to being viewed as 'health optimisers' or 'DIY biotechnologists'. They typically focus not on disease treatment or even prevention, but rather on non-pharmaceutical interventions that improve peak performance and mental capacity, while reducing the degenerative effects of ageing and stress. Most 'hacks' are essentially natural and low cost. The evidence that fuels wider adoption typically derives from real-world experiences and data sharing through social networks, rather than on expensive clinical trials that often do not reflect the complexities of the many variables associated with real life.

The 'biohacker' movement, with its original roots in Silicon Valley, is led by a diverse range of aspirational health and technology experts, doctors and influencers, including Dave Asprey (Bulletproof® founder), Ellen Jorgensen PhD (molecular biologist, co-founder of Genspace), Ben Greenfield (fitness professional), Rhonda Patrick PhD (biomedical scientist), Stephan Guyenet PhD (neuroscientist and obesity researcher), Dominic D'Agostino PhD (neuroscientist) and Dr Peter Attia (integrative physician).



The Biohacker London Social Group Page, facebook.com

4.4 Economic and ecological determinants of health systems

Sustainability can be considered within both economic and ecological contexts. Each discipline deals with the allocation of resources, but each has its own distinct system of rules (e.g., laws, theories). Moreover, specific resources are valued very differently in economics and ecology. The increasing failure of healthcare systems (Section 1.1, p. 9) can be defined in both economic and ecological terms (especially when considering humans as a key component of any ecological assessment). Yet in deconstructions aimed at identifying likely causes, it is generally ecological principles that have been most ignored.[7]

In every other area of human endeavour where sustainability has been applied because of concerns over limited resources or excessive ecological damage, ecological considerations have been brought to the fore. Examples of industries to which sustainability principles have been applied successfully include agriculture, forestry, energy, construction and tourism.

One of the common links between all the sustainable sectors of these diverse industries is recognition that inputs, such as energy, materials, transport or human resources, must be reduced. High input systems, at some point, are inevitably at greater risk of failing economically or ecologically.

Any attempt to make health systems sustainable for future generations will require application of an ecological (or ecosystem) perspective. This is because human health remains, regardless of the intervention of technology, heavily dependent on ecological interactions between a single species, Homo sapiens, and its internal and external worlds.

Robert Verkerk PhD (lead author of the current position paper) previously defined[8] sustainable healthcare, in a wider, social, economic and ecological context, as follows:

> *"A complex system of interacting approaches to the restoration, management and optimisation of human health that have an ecological base, that are environmentally, economically and socially viable indefinitely, that work harmoniously both with the human body and the non-human environment, and which do not result in unfair or disproportionate impacts on any significant contributory element of the healthcare system."*

Cole and colleagues suggested using an ecosystem perspective,[9] an approach the current authors consider to be a prerequisite to assessing the requirements for a sustainable health system. The authors proposed three distinct frames through which human health can be viewed. Such approaches, state the authors, typically reflect the perspective of 'health promotion practitioners' and they can and should inform policy.

The three frames are:

- Environmental hazards and burden of illness
- Ecosystem conditions and human well-being
- Environmental and social justice, along with human core values

It is from this broader ecosystem perspective of community-based health systems, and the application of the Meikirch model (Section 2.4) to the individual's health, that we propose ten hallmarks (Section 5) that help to define a sustainable health system.

The current burdens on healthcare systems, including the NHS, are not sustainable.

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4 Kingston A, Comas-Herrera A, Jagger C. Forecasting the care needs of the older population in England over the next 20 years: estimates from the Population Ageing and Care Simulation (PACSim) modelling study. *Lancet Public Health*. In press. Published online August 30, 2018 [*http://dx.doi.org/10.1016/ S2468-2667(18)30118-X*]

5 Kingston A, Wohland P, Wittenberg R, et al. Is late-life dependency increasing or not? A comparison of the Cognitive Function and Ageing Studies (CFAS). *Lancet*. 2017; 390(10103): 1676-1684.

6 NHS England GP Care Plan 2014, published 98 January 2015: *https://www.england.nhs.uk/statistics/2015/01/08/gp-patient-survey-2014/* [last accessed 18 March 2018].

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8 Verkerk, R. Can the failing Western medical paradigm be shifted using the principle of sustainability. *ACNEM Journal 2009*; 28(3): 4-10

9 Cole DC, Eyles J, Gibson BL, Ross N. Links between humans and ecosystems: the implications of framing for health promotion strategies. *Health Promotion International 1999*; 14(1): 65–72.

SECTION 5

THE 10 HALLMARKS OF HEALTH SYSTEM SUSTAINABILITY

Science & Research

Science Supporting Metabolic-Based Therapies

Ketogenic Diet and Metabolic Therapies (Book)

Cancer as a Metabolic Disease (Article; FREE)

Cancer as a Metabolic Disease (Book)

Body, Data / Analytics, Experiments

BULLETPROOF DIET AND INTERMITTENT FASTING – MY 30-DAY RESULTS

VIEW POST

MARK'S DAILY APPLE

The MDA Ultimate Guide to the Keto Diet: How You Can Use Keto To Achieve Greater Health and Enhance Well-Being

WIM HOF METHOD

LEARN EVERYTHING YOU NEED TO KNOW ABOUT THE WIM HOF METHOD

BENGREENFIELDFITNESS

BIOHACKING

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The art of biohacking can have an enormous impact on how you look, feel, think, perform, and really every aspect of self-improvement. Put simply, biohacking is manipulating your biology through the use of proper nutrition, supplements, specialized training tactics and gear, self-quantification for measuring improvements, and more – all in the interest of being your best self. So take a deep-dive into my biohacking articles and learn all of the tips, tricks, and biohacks developed by the world's leading experts in health and fitness. You'll find recommendations for blood testing, supplements, food timing, specialized diets, advanced training methods, using sauna and cold thermogenesis, detox protocols, reducing EMF exposure, and much more!

Why I Eat Tapeworms & Whipworms Every Two Weeks: The Fascinating World ... rapy.

Burn Fat, Fix Your Brain, and Live Longer

A Beginner's Guide to Biohacking

Stephan J. Guyenet, PhD

The science of body weight and health

HOME THE HUNGRY BRAIN IDEAL WEIGHT PROGRAM RESOURCES

About Stephan

NERD SAFARI PODCAST RESEARCH REPORTS AMA ABOUT

Welcome to a blog I'd like to read

The rapid growth of the 'biohacking' and health optimisation movement is driven by positive experiences, linked to self-quantification, self-experimentation and use of analytic and measurement technology. Members of this community may be almost entirely reliant on self-care and non-pharmaceutical approaches.

5. THE 10 HALLMARKS OF HEALTH SYSTEM SUSTAINABILITY

Ten hallmarks have been identified as being characteristic of health systems that are likely to be sustainable in the long-term, whether at the community, regional or national level. These hallmarks are summarised in **Figure 12** (**p. 80**) and described further in the proceeding sub-sections (**5.1, p. 81 to 5.10, p. 94**).

Reduced pharmaceutical dependency

Upstream focus and health optimisation

Non-pharmaceutical health care approaches

Routine evaluation or screening

Economic and environmental sustainability

Biological and genetic potential

Person-centred health care

Empowered self-care

Fully informed consent for medical interventions

Participatory and collaborative health systems

Figure 12. The 10 hallmarks of a sustainable health system

5.1 Reduced pharmaceutical dependency

Goal: Minimise reliance on pharmacological agents for chronic conditions and address polypharmacy by safe, multi-modality deprescription practices

It is critically important that reliance on pharmaceuticals is reduced as far as possible. This is in part because a sustainable health system is one in which the emphasis is on upstream, preventative approaches (i.e., 'personally acquired potential' (PAP) for health) that are not best addressed by use of pharmaceutical drugs. Pharmaceuticals are costly, they tend to address symptoms rather than causes of disease, they may be prescribed unnecessarily or erroneously and the use of many is associated with debilitating side effects.[1] Excessive use of some pharmaceuticals may also contribute to serious adverse environmental effects.[2,3] A recent, comprehensive research study by the Universities of Sheffield and York, commissioned by the Department of Health, estimated that prescribing errors directly cause around 700 deaths and may contribute to up to 22,000 deaths each year in the UK. About 237 million drug prescription errors are estimated to be made by UK doctors, nurses and pharmacists annually, with 3 out of every 4 of these causing harm to patients. The cost of these errors is estimated to be around £1.6 billion pa.[ibid]

Deprescribing is defined by NICE[4] as:

> *"the process of discontinuing or reducing the dose of medicines, supervised by a healthcare professional, with the aim of managing polypharmacy and improving outcomes. Deprescribing requires careful counselling and shared decision-making with patients, and is considered part of routine clinical care."*

There is a growing body of clinicians and patients alike, along with a mounting body of evidence of benefits, that safe deprescribing strategies for patients can be used to dramatically reduce polypharmacy.[5,6]

In many cases, deprescribing could be undertaken more successfully where non-pharmaceutical, multi-factorial (e.g. dietary, lifestyle/physical activity, psychological/emotional) interventions are applied alongside, in order to help support specific aspects of an individual's health. This cannot happen until GPs and pharmacists are more formally trained in nutritional, lifestyle, functional or other relevant forms of integrative medicine, or are adequately supported by practitioners or coaches who are themselves appropriately trained.

Community-based health systems (clinical practices) should prioritise 'conversion' from pharmaceutical reliance to non-reliance while also aiming to reduce costs and improve outcomes and quality of life.

"

Pharmaceuticals are costly, they tend to address symptoms rather than causes of disease, they may be prescribed unnecessarily or erroneously and the use of many is associated with debilitating side effects.

5.2 Non-pharmaceutical health care approaches

Goal: Prioritise non-pharmaceutical, multi-factorial approaches where possible, including therapeutic diets, modified lifestyles and appropriate movement/physical activity

As discussed in **Sections 2.2 (p. 19)** and **2.4 (p. 24)**, the primary disease burden is caused by preventable diseases that are fostered by inappropriate diets and lifestyles. The scale of the task involved in encouraging the general public to engage in healthier diets and lifestyles, particularly among disadvantaged socio-economic groups, cannot be underestimated. However, the absence of effective advice from NHS sources that is both consistent and subject to expert consensus acts as a major impediment to the resolution of widespread metabolic dysfunction (Section 2.2) in older adults.

For example, there is as yet little consensus over which dietary and lifestyle approaches are more suitable for obesity and type 2 diabetes treatment. Two recent trials are widely perceived to represent polarised viewpoints and entirely different mechanisms. One involved severe caloric restriction (DiRECT),[7] and the other, low carbohydrate diets (Virta Health).[8] However, both yielded comparable results and were superior to any trial of anti-diabetic medication. The results of these trials demonstrate that more than one approach can be used with positive outcomes that exceed the current standard of care. They also suggest the need for a forum (see **Section 7, Recommendations, p. 113**) in which scientists, clinicians and patients with different backgrounds and experiences can engage with a common aim of agreeing on a diversity of effective approaches, suitable to different social and cultural groups.

Given the complexity of interrelationships between different body systems, any approach needs to be multi-factorial and address multiple systems simultaneously. The 12 facets of an individual's biological, emotional and behavioural terrain, as considered in **Section 3.1** (the human ecological terrain), provide a standard system of assessment.

To help facilitate both self-care and guided care, it is essential that consensus is achieved among experts and authorities over the types and nature of multi-factorial, non-pharmaceutical approaches aimed at preventing (or treating) key burdensome diseases (most notably obesity and type 2 diabetes). Such a consensus will avoid conflict and resultant public confusion or apathy.

It is for this reason that the present document is the result of a consultation process with a diverse array of allied health professions in the field of integrated medicine; lifestyle medicine; nutrition and various branches of complementary and alternative medicine (CAM).

Among the key areas of intervention to be agreed by consensus are individualised approaches to:

- Relaxation/stress transformation
- Nutrition - including food composition, food preparation and meal frequency
- Movement/physical activity
- Sleep quality and quantity

It is serendipitous that Dr Rangan Chatterjee, a British GP with one of the highest public profiles in this field, given his two BBC One series of Doctor in the House, has recently published a book on these 4 areas. The book is entitled ***The 4 Pillar Plan: How to Relax, Eat, Move and Sleep our Way to a Longer, Healthier Life*** (2017, Penguin).[9] Penguin Life will be publishing Dr Chatterjee's second book, ***The Stress Solution: The 4 Steps to Reset Your Body, Mind, Relationships and Purpose***, at the end of 2018.[10]

The approaches to reducing or preventing disease risk through modified lifestyle, as presented in these books, may serve as useful starting and reference points for the public and health authorities alike. Given the profile of Dr Chatterjee and the associated high level of public interest in his message, as well as the importance of establishing a greater level of consensus, the Department of Health, Public Health England and other health authorities in the UK should engage closely with the content and recommendations in books such as these and consider endorsing them.

5.3 Economic and environmental sustainability

Goal: Sustainability, in fiscal, economic, effectiveness and environmental terms

Sustainability is critical to the capacity of health systems to support the health of future generations. It is clear not only that the NHS is struggling to meet the health (sickness) needs of the UK population but that the present biomedical model, as applied throughout the Western, and increasingly other parts of the world, is failing.

Appleby and the King's Fund have undertaken extensive work evaluating NHS sustainability in both fiscal and economic terms. But given that the King's Fund's remit is heavily economic, there are numerous areas of consideration that have not been included, especially when a broader definition of a health system is used, as proposed here (Section 4.1, p. 69 and Section 4.4, p. 74).

Both fiscal and economic issues of sustainability resolve rapidly if the public is able to successfully prevent a significant proportion of preventable chronic disease. Interventions, whether delivered through self-care or guided by a practitioner, must by necessity be multi-factorial and/or multi-modality, given the diverse and multi-factorial nature of the causes of chronic diseases. Unfortunately, approaches that evaluate real-world effectiveness and compare them to standard treatment protocols have yet to be prioritised in the UK. These approaches include Comparative Effectiveness Research (CER) which has received greater acceptance as a means of determining approaches to clinical practice in other countries, including Germany, Australia and the US.[11,12]

Central to any notion of sustainability in any health system is the key objective of preventing disease (i.e. health creation, opitmisation or promotion) as early as possible in an individual's life. Given that most current burdens are preventable and the result of inappropriate diets and lifestyles, considerable effort needs to be expended in facilitating the modification of diets and behaviours prior to the clinical manifestation of these diseases (Section 5.6, p. 89). Wanless recognised the need for effective public health measures, including primary and secondary prevention and chronic disease management, *"to reduce pressure in the longer term."*[13] Wanless also stated: *"There are potentially large gains to be made by refocusing the health service towards the promotion of good health and the prevention of illness."*[ibid]

The challenge, however, is that public health measures have to-date had surprisingly little impact on outcomes at a national level. However, for lifestyle, personalised medicine and functional medicine practitioners, the reasons for the failure of these approaches are clear; the advice being offered is generally far from optimal.

Sustainable human development will occur only when the majority of humans are able to lead fulfilled and meaningful lives, in robust health, in ways that do not lead to the irreversible degradation of the natural environment on which all life on Earth ultimately depends. Such an ecosystem perspective (Section 3.3) needs to be applied to the evaluation of the sustainability of UK health systems, both within and outside the established healthcare delivery system that embodies the NHS.

Presently such an approach is lacking in the UK and needs to be prioritised if the goal to achieve health system sustainability is to be widely supported.

Sustainable human development will occur only when the majority of humans are able to lead fulfilled and meaningful lives, in robust health, in ways that do not lead to the irreversible degradation of the natural environment on which all life on Earth ultimately depends.

5.4 Person-centred health care

Goal: Whole-person-centred approach that encourages the individual to be in the driving seat of his or her health and caters for the individual's needs, capacities and context

The NHS Constitution for England supports the concept of a patient-centred approach. Principle 4 states (2015 revision) that ***"The patient will be at the heart of everything the NHS does."*** However, the very premise that a citizen is a 'patient' suggests that the focus is primarily on diseased individuals, many of these also suffering from comorbidities. Wanless himself fully recognised the need for ***"refocusing the health service towards the promotion of good health and the prevention of illness."***[ibid] But, as we have previously stated, there is little consensus among health authorities, biomedical scientists and healthcare professionals over what constitutes health promotion or disease prevention.

Entwistle and Watt (2013) emphasise that there is often ambiguity associated with the meaning of person-centred care and its synonyms, and suggest that most interpretations are either too disease-centred or system- or staff-centred.[14] The Health Foundation provides useful clarification:[15]

> ***"Person-centred care supports people to develop the knowledge, skills and confidence they need to more effectively manage and make informed decisions about their own health and health care. It is coordinated and tailored to the needs of the individual. And, crucially, it ensures that people are always treated with dignity, compassion and respect."***

While the Health Foundation is collaborating with the NHS in fostering and training health workers to work more closely together in shared decision-making, self management support and care planning, these approaches are more relevant to those with long-term conditions (LTCs). Training tends to be limited to NHS staff, notably community matrons, re-ablement teams, specialist nurses supporting those with LTCs, interface services, and primary and secondary care teams.[16]

One of very few studies to determine the value of a person-centred approach revealed, in relation to patients with LTCs and associated chronic pain, that ***"attention to [an individual's] personal situation"*** and ***"an orientation to what matters to them in life"*** were valued most.[17]

There is clearly a long way for the health system to go in relation to delivering person-centred care, especially in primary care and community care. In primary care, it appears that the limited consultation times available for GPs and their patients is a major obstacle to improved individual-centred care that takes into account the individual's situation, demands, needs and capacities.

Collaborative and participatory approaches, involving trans-disciplinary teams including health coaches,[18] as well as group visits (shared medical appointments),[19] are important ways of improving whole-person-centred care.

> *"The patient will be at the heart of everything the NHS does."*
>
> *- The NHS Constitution*

5.5 Fully informed consent for medical interventions

Goal: Fully informed consent over all medical interventions

The principle of informed consent is an important part of medical ethics and is governed by UK and international human rights law.[20] Specifically, as noted by NHS Choices,[ibid] ***"the person must be given all of the information in terms of what the treatment involves, including the benefits and risks, whether there are reasonable alternative treatments, and what will happen if treatment doesn't go ahead"***.

Additionally, as of October 2005, the UK became a signatory, along with 192 other countries, of the Universal Declaration on Bioethics and Human Rights[21] which offers an explicit guideline for properly informed consent, as per Article 6, with further context being provided by Articles 3 to 5, as follows:

Article 3

Human dignity and human rights

1. Human dignity, human rights and fundamental freedoms are to be fully respected.
2. The interests and welfare of the individual should have priority over the sole interest of science or society.

Article 4

Benefit and harm

In applying and advancing scientific knowledge, medical practice and associated technologies, direct and indirect benefits to patients, research participants and other affected individuals should be maximized and any possible harm to such individuals should be minimized.

Article 5

Autonomy and individual responsibility

The autonomy of persons to make decisions, while taking responsibility for those decisions and respecting the autonomy of others, is to be respected. For persons who are not capable of exercising autonomy, special measures are to be taken to protect their rights and interests.

Article 6

Consent

1. Any preventive, diagnostic and therapeutic medical intervention is only to be carried out with the prior, free and informed consent of the person concerned, based on adequate information. The consent should, where appropriate, be express and may be withdrawn by the person concerned at any time and for any reason without disadvantage or prejudice.
2. Scientific research should only be carried out with the prior, free, express and informed consent of the person concerned. The information should be adequate, provided in a comprehensible form and should include modalities for withdrawal of consent. Consent may be withdrawn by the person concerned at any time and for any reason without any disadvantage or prejudice. Exceptions to this principle should be made only in accordance with ethical and legal standards adopted by States, consistent with the principles and provisions set out in this Declaration, in particular in Article 27, and international human rights law.
3. In appropriate cases of research carried out on a group of persons or a community, additional agreement of the legal representatives of the group or community concerned may be sought. In no case should a collective community agreement or the consent of a community leader or other authority substitute for an individual's informed consent.

In primary care and public health, in the UK and elsewhere, the predominant biomedical model has led to an erosion of individual/patient autonomy. Professor Miguel Kottow, from the University of Chile, stated in his 2004 paper entitled ***"The battering of informed consent"*** published in the Journal of Medical Ethics:[22]

> *"It has been argued that patient care is best served by a limited form of paternalism because the doctor is better qualified to take critical decisions than the patient, who is distracted by illness. The revival of paternalism is unwarranted on two grounds: firstly, because prejudging that the sick are not fully autonomous is a biased and unsubstantial view; secondly, because the technical knowledge of healthcare professionals does not include the ethical qualifications and prerogative to decide for others."*

It is clear that in many facets of healthcare delivery, both in the NHS and in the private sector, Kottow's 'paternalism' is rife. Equally, the legal and ethical principle of informed consent is frequently flouted. Examples include the common prescription of statin drugs for 'raised' cholesterol, or sulfonylurea or other anti-diabetic drugs for type 2 diabetes when there are well established dietary and lifestyle approaches that have been demonstrated to yield comparable or often better outcomes e.g., DASH diet and physical activity for hypertension,[23] non-pharmacologic weight loss programmes for obesity and type 2 diabetes remission, [7,24] and low carbohydrate diets for type 2 diabetes remission.[25]

Another important breach of the legal requirement for informed consent relates to communications about risks, benefits and alternate options for medical interventions delivered directly by healthcare staff. This includes physiotherapy or other physical therapies, psychological or psychiatric therapies and vaccinations.

The legal and ethical requirements and fundamental human right for informed consent means it is incumbent on the healthcare delivery service responsible for delivering medical interventions to provide the person (customer, patient, parent or guardian) all the relevant information on risks, benefits and alternate approaches, based on the best available evidence. This must be provided in ample time to allow an informed decision to be made prior to the planned intervention.

In primary care and public health, in the UK and elsewhere, the predominant biomedical model has led to an erosion of individual/ patient autonomy.

5.6 Upstream focus and health optimisation

Goal: Focus on prevention and upstream potential causes of disease(s), as early as possible in an individual's life

The bulk of effort in established healthcare delivery systems is on disease management, not prevention or health optimisation. Targeting prevention requires an entirely different approach to one that has adapted to treat the symptoms of downstream diseases, the current primary focus of mainstream healthcare systems. This means that effective effort aimed at health promotion or creation must be expended within communities, in workplaces, in schools and in homes, outside of the NHS or private healthcare establishments (**Fig. 13**).

Drs Garry Egger and John Dixon from Southern Cross University and the Baker IDI Heart and Diabetes Institute in Australia, respectively, provide a useful framework from which to evaluate chronic disease determinants.[26] The authors suggest that evaluation of risk factors and markers of disease are often somewhat too downstream to be effective and that, for the purpose of prevention, proximal ('downstream' or 'cause'), medial ('midstream' or 'causes of causes') and distal ('upstream' or 'causes of causes of causes') should be evaluated so that lifestyle and dietary modifications can be made suitably early in the disease cycle.

The authors go on to present information that is of particular value for health professionals and their patients or clients. It tabulates multi-factorial lifestyle and environmental determinants of chronic diseases (referred to as ***"anthropogens"***). It also indicates, with supporting references to peer-reviewed journals, those factors that both increase or decrease risk, as well as ones that act as moderators.

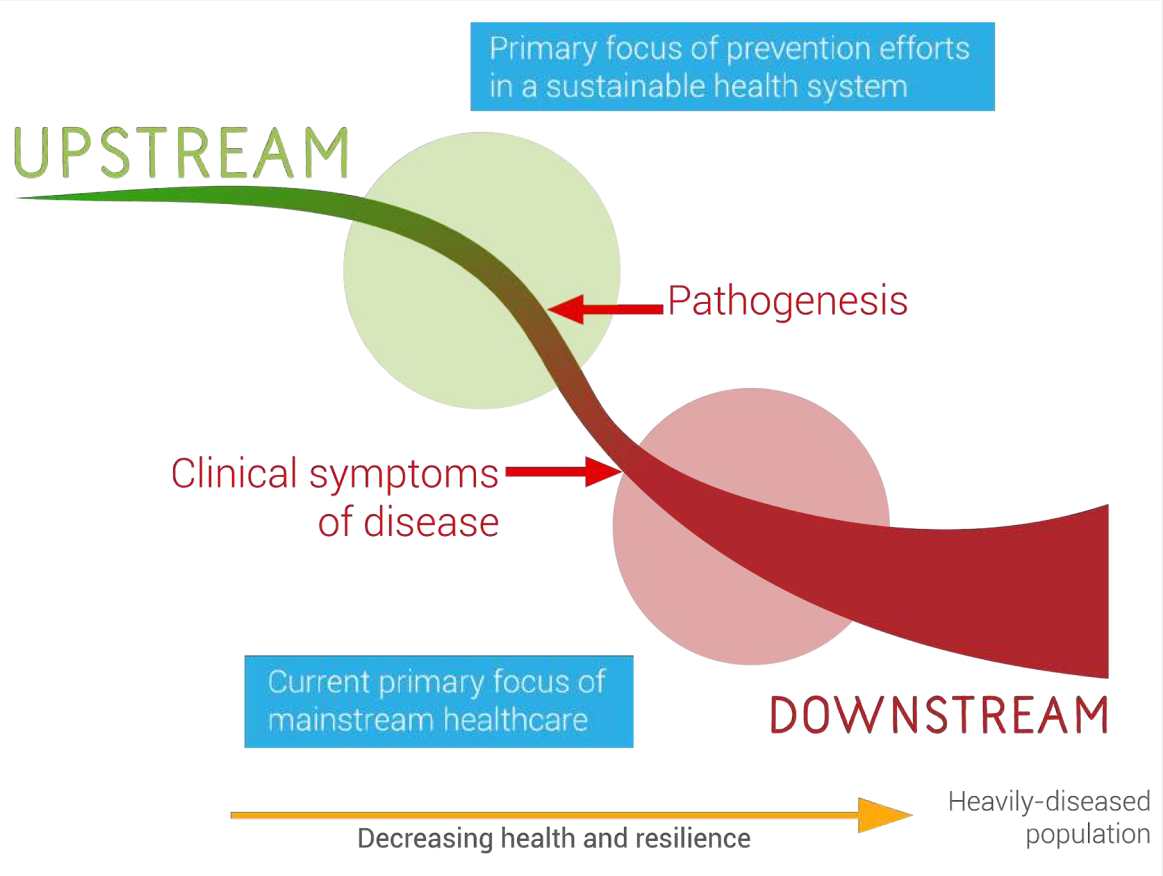
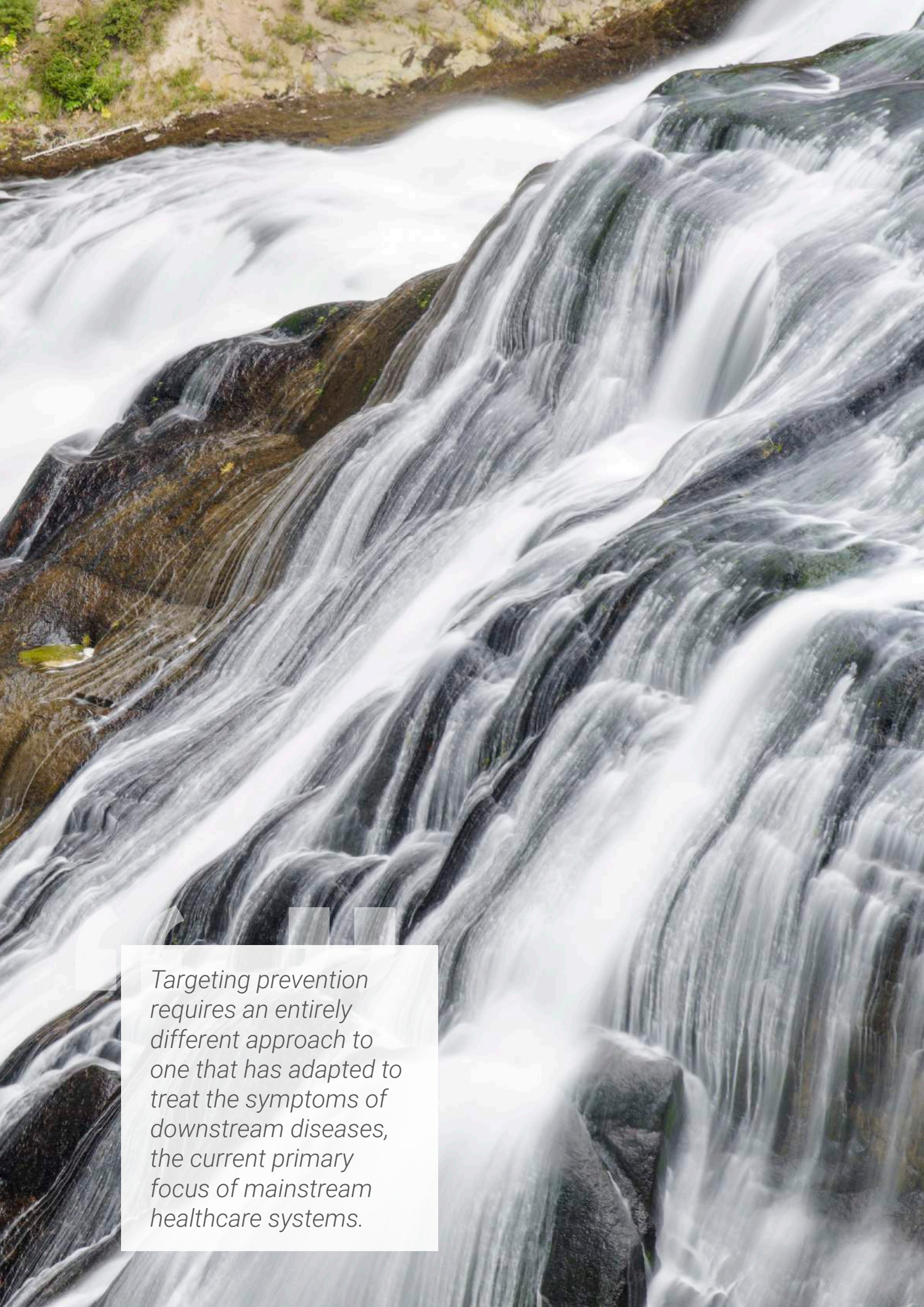


Figure 13. Schematic of disease cycle for chronic, non-communicable diseases, showing primary focus of mainstream healthcare on downstream effects, and the requirements of a sustainable health system where the primary focus is applied upstream in an effort to promote and create health (and prevent future disease) prior to the manifestation of clinical symptoms of chronic diseases.



Targeting prevention requires an entirely different approach to one that has adapted to treat the symptoms of downstream diseases, the current primary focus of mainstream healthcare systems.

5.7 Routine evaluation or screening

Goal: Routine health evaluation, monitoring or screening, allowing determination of health and resilience status, prediction of disease risk and early diagnosis of disease

Primary care has now become so symptom, disease and treatment focused that there is a general failure to examine, from a more holistic perspective, the multiple, interrelated body systems of the patient (e.g. gastrointestinal system, alongside inflammatory, oxidative stress, immunological and neuroendocrinological status). Additionally, there is generally insufficient available time in a consultation to allow the GP to sufficiently appreciate the individual's needs, concerns and life demands.

A sustainable health system should encourage regular health monitoring, involving both qualitative and quantitative methods, of apparently healthy populations for a range of disease risk factors, as well as distal, medial and proximal determinants of chronic disease (Section 5.6).

Such monitoring could be operated by nursing or dedicated public health staff in NHS primary care clinics. It would not necessitate input from GPs until measured data outside of agreed normal ranges were found and triage or specific interventions were deemed necessary.

It is important that a range of key measures are agreed by consensus for such non-invasive assessments, and that some candidate measures be considered in the generalised examples provided in Table 2 (p. 52). Key functional markers include body composition assessment (e.g. skinfold test or body impedance analysis), glycosylated haemoglobin (Hb1Ac), high sensitivity C-Reactive Protein (hs-CRP), heart rate variability (HRV) and, for women only, breast thermography and cervical screening.

5.8 Biological and genetic potential

Goal: Personalised to optimise biological and genetic potential, taking into account life's demands, environment and any comorbidities

Whether an individual is engaged in self-care, guided self-care or has received interventions recommended or delivered by a healthcare professional, it is of key importance that both non-pharmaceutical and any necessary pharmaceutical interventions are individualised as far as it is possible or feasible. Within a sustainable system, the priority has to be for non-pharmaceutical approaches (Section 5.2) that are matched both to the individual's genetic and biological potential, as well as his/her needs and specific demands.

With relatively few exceptions, NICE guidance on prescribing does not involve much personalisation, although, increasingly, genetic (pharmacogenomic) testing is able to help tailor drugs where significant toxicities or resistance are likely, notably oncologics.

The emerging disciplines of functional medicine, personalised medicine, lifestyle medicine and 4P medicine, as well as the majority of CAM modalities, all work to individualise the approach, taking into account factors such as the individual's history, background, needs, demands of life and context.

5.9 Empowered self-care

Goal: Empowered self-care including access to products and services required to maintain optimum health and resilience

Among the greatest limitations to empowered self-care are: a) access to reliable information that is relevant to the individual, his or her circumstances and biologically given potential (BGP); b) access to the required products and services, and; c) affordability.

In the UK, this tends to mean lower socio-economic groups are more reliant on the limited services offered by the NHS, and are less likely to source private services associated with nutrition, lifestyle or CAM therapies.

In the US, data from the National Health Interview Survey (NHIS) showed that 86% of CAM users elected to use CAM. Of these, 51% used wellness services, whereas 35% used wellness combined with standard treatment. As demonstrated in numerous other studies, socio-economics may lead to inequalities in health status, wellness users being significantly more likely to be older, more educated, in better health, and engaged in multiple healthy behaviours.[27]

The application of EU regulations and directives, the latter via transposed statutory instruments, has been a significant factor limiting the availability of therapeutically valuable food supplements to UK consumers, including vitamins and minerals,[28] and botanicals.[29] Additionally, the imposition of restrictions on thousands of health claims based on the scientific challenges associated with the EU health claims regime, including scientific assessment of causal relationships by the European Food Safety Authority (EFSA), has substantially limited the ability of companies to communicate healthy messaging to consumers. The resulting ***"me too"*** or zero claims environment means that citizens are less, rather than more, able to differentiate between products of differing health or nutritional value.

Many EU laws have disproportionate effects that act as an obstacle to fundamental freedoms, such as choice in healthcare. Amongst the limitations on freedom of expression, or access to products, services and information, the EU laws on natural products have had the following effects:

- The EU legal requirement for applicants (companies) to establish a causal relationship between consumption of a food and a benefit in a healthy population prior to a health claim being made in commercial products has resulted in the rejection of 2,059 health claims. All of these health claims are now deemed non-authorised and therefore illegal EU-wide. Only 261 authorised health claims have been permitted, most for vitamins and minerals at 15% more of the Nutrient Reference Value per daily serving. Included in the rejected, non-authorised health claims are all health claims for all 9 essential amino acids, all probiotics and prebiotics, glucosamine (sulphate and hydrochloride), coenzyme Q10, 5-hydroxytryptophan (5HTP), *Rhodiola rosea*, *Saccharomyces cerevisiae var. boulardii*, Acerola cherry, acetyl carnitine, alpha-lipoic acid, anthocyanidins, apple cider vinegar, green tea (and flavonoids contained), broccoli, cherries (including anthocyanin-rich tart cherries) and numerous more[30]

- Inflexible guidance on health claims applications under Regulation 13(5) of the EU Regulation 1924/2006 (on health and nutrition claims), has meant that, to-date, only 6 claims have been authorised EU-wide. A disconcerting 116 applications have been rejected (i.e. 93.5% failure rate)[31]

- EU health claims have been applied, as a result of a Court of Justice of the European Union (CJEU) ruling (Case C-19/15), to communications by health professionals, so limiting their capacity to offer nutritional advice about specific commercial products[32]

- The definition of an EU medicinal product has such broad scope that it affects any product that is not ***"clearly"*** a food, food supplement, cosmetic or medical device. This definition has provided UK regulators with the capacity to arbitrarily remove any product that ***"corrects, modifies or restores"*** physiological functions and ***"exerts a pharmacological, immunological or metabolic action."***[33] The definition includes all therapeutically useful foods and food supplements

- Such legally disproportionate and scientifically irrational limitations on the public's access to products, as well as commercial communications about health benefits (using scientifically substantiated information based on plausible science), provide major obstacles to effective self-care

- Sustainable health systems require balanced, reliable, information, access to a diverse range of products that have health and therapeutic benefits that are not classified, or at risk of being classified, as medicines. They also require open, proportionately-regulated communication channels between companies, educators, health professionals and citizens.

> *Many EU laws have disproportionate effects that act as an obstacle to fundamental freedoms, such as choice in healthcare.*

5.10 Participatory and collaborative health systems

Goal: Informed guidance from health and fitness professionals and healthy therapeutic partnerships and collaborations

A central part of evolving community-based health and resilience support networks is to develop trans-disciplinary collaborations within a participatory framework.

GP surgeries can play a key role as centres for education and learning to inspire modified behaviours that help prevent disease (**Sections 5.2**, and **5.6**). However, in order to facilitate the personally acquired potential (PAP) of individuals, it is important that the needs of citizens are met, that appropriate expertise and support (e.g., coaching) is readily available, and that practice-level engagement is actively encouraged.[34]

Given that a sustainable health system includes engagement by healthy, as well as diseased, individuals, the public needs access to health and fitness professionals with diverse backgrounds. However, all health professionals need to be cognisant of common goals relevant to the individual, such as those mapped in the ecological terrain (**Section 3**, **pp. 35** to **58**).

The process whereby non-statutorily regulated health professions (e.g. medical herbalism) have been marginalised by the NHS is not compatible with a sustainable health system. Neither is it appropriate to prevent access to modalities (e.g. homeopathy) that have considerable public support,[35] are cost effective and, contrary to certain claims, have been deemed to demonstrate benefit beyond placebo.[36,37]

There is increasing evidence, especially from Australia,[38] showing that group visits or shared medical appointments (SMAs)[39] are a useful adjunct to helping patients with their management of chronic diseases. They are defined as:

> *"…consecutive individual medical visits carried out in a supportive group setting of similar patients where all can listen, interact, and learn."*

They involve a doctor (GP or specialist) consulting patients sequentially amongst a group of peers, with similar problems who can interact throughout the consultation, under the guidance and direction of a trained facilitator (usually a practice nurse or other allied health professional).[40]

SMAs greatly assist developing strong health professional/patient relationships, benefit from peer support and overcome a significant part of the time limitations associated with 1:1 consultations.[41]

A sustainable health system is one which includes the participation of a diverse range of health and fitness professionals in a collaborative community setting, including in local GP surgeries. SMAs have great potential for use in the UK, and could be supported by nutritional and lifestyle practitioners, health coaches and a diverse range of CAM therapists. Equally, collaborative and participatory health and wellness support may occur in integrative medicine practices and in non-medical, community settings.

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SECTION 6

IMPEDIMENTS TO HEALTH SYSTEM SUSTAINABILITY IN THE UK

6. IMPEDIMENTS TO HEALTH SYSTEM SUSTAINABILITY IN THE UK

There are currently significant impediments to establishing fully-scaled, person-centred sustainable health systems in the UK. Some of these are disproportionate and appear to have developed over time, not as a means of protecting or enhancing the public's health, but rather to protect specific business interests.

EU pharmaceutical law (EC Directive 2001/83/EC, as amended) that applies in the UK has supremacy over any therapeutic product, including foods, ingredients in foods, or food supplements that correct, modify or restore physiological functions and exert a pharmacological, immunological or metabolic action (see also Section 6.5.1, p. 106).

EU medicines law was originally adopted in the UK following the thalidomide disaster of the mid-1960s.[1] The UK, and the UK authority on medicines, the Medicines and Healthcare products Regulatory Agency (MHRA), has been one of the most important architects of EU pharmaceutical law and has collaborated closely with the European Medicines Agency (EMA) in granting marketing authorisations (licences) to UK, European, US and other companies over the last few decades from their respective London bases. (The EMA and its staff will have been relocated to Amsterdam from January 2019).

Unless ***"clearly"*** proven to be a food, food supplement, cosmetic or medical device (Recital 7, Directive 2001/83/EC, as amended), EU pharmaceutical law ensures that all other products fall within the drug category, the latter being very broad in its definition and scope.[2] In practice, this means that based on presentation or function, products historically sold as foods, food supplements or cosmetics, may be arbitrarily classified as unlicensed medicines by national authorities, including the MHRA, following case by case assessment.

Other impediments include insufficient agreement on the most effective strategies to manage health, uncertainty in the science, insufficient funding or affordability for private services, and the existence of a nationalised service in the form of the NHS that aims to deliver health and social care services equitably to all citizens of the UK.

The following sections summarise six of the major groups of impediment.

6.1 Political

There is yet to be the political will from a government or a major opposition party in the UK to support the development of sustainable health systems.

The Green Party manifesto for health, by contrast, closely follows the principles of sustainability laid out in this paper and indeed, the Alliance for Natural Health International has had input in the development of the manifesto.

Among the values and principles set out in its manifesto, the Green Party states:[3]

> *"Ill health exists at many levels: a diseased organ within a stressed person, a sick individual within an uncaring society, or a sick society within an overstrained and collapsing ecosystem. To achieve improved individual, social and environmental health, effective interventions at all levels are needed. Current theory and practice place too much emphasis on interventions at the biochemical and individual levels, too little on the social and ecological. Achieving better health requires a balanced, integrated and holistic understanding and approach."*

There has been similar reticence among major political parties to consider radical change in other industry sectors. Ironically, the EU's support for the precautionary principle and its identification of the UK as one of 5 EU countries failing to meet EU pollution standards for nitrogen dioxide has provided a trigger for the Conservative government to eliminate petrol and diesel engined cars by 2040.[4]

However, the mounting health and care crisis faced as a result of the predicted burden of chronic diseases is not something that can be fixed by incremental changes to a failing healthcare delivery system. One that has yet to effectively prevent or develop cures for the majority of the diseases that contribute to its burden.

Despite concerted attempts by certain media, commentators, skeptics and others to denigrate complementary, alternative, or related, natural (non-pharmaceutically-based) approaches to health care and wellness, these approaches continue to be strongly supported by the public. In a comprehensive study, published in 2013, of 5 databases containing peer-reviewed literature published between 2000 and 2011, it was found that between 26% and 41% of the UK population use complementary and alternative medicine (CAM) at least once a year.[5] Additionally, an Ipsos MORI poll of 23 countries found that Britons were the most concerned about the future of their healthcare services for themselves and their families.[6]

One of the purposes of this paper is to provide a common framework for health system sustainability that makes full use of all relevant health and fitness professionals, both within and outside the NHS. The net result would be a lower disease burden, better care and better outcomes.

But before such changes can occur, there is need for cross-party political will, acceptance by the medical mainstream, as well as grassroots support.

6.2 Economic/financial

The King's Fund and others have assembled copious data over recent years that confirm the precarious fiscal and economic state of the NHS. Simon Stevens, head of NHS England, has warned that the NHS can no longer do what is asked of it and the lack of funding increases in 2018-19 could result in ***"services retrenching and retreating, waiting lists growing, and staffing levels falling."*** [7]

However, there remains high levels of public and political support for the NHS, widely regarded as the 'jewel in Britain's social welfare crown'. Among the reasons is the accessibility to a diverse range of taxpayer-funded healthcare services. A comparison of the unmet need for medical examinations among EU countries emphasises the extremely high levels of healthcare accessibility in the UK compared with most other European countries (**Fig. 14**). This is linked to the absence of financial barriers to access.

Any attempt to increase utilisation of non-NHS services that require private funding may act disproportionately on those from lower socio-economic groups, creating social inequalities, one of the very principles the NHS was established in 1948 to avoid.

There is an urgent need for a detailed economic assessment of a sustainable health system operating along the lines of the principles proposed in the present paper. Such an approach should include assessment of the broader macroeconomic benefits linked to changes in health status of the population,[8] including instigating more effective, person-centred, community-based disease prevention measures that occur largely outside the established healthcare system.

The absence of financial or other in-kind incentives to help motivate healthy behaviours is a further limitation of the existing NHS-managed healthcare delivery system. Charging for GP visits has been explored multiple times, and even a nominal fee, such as £10 per visit, would be expected to raise £3.5 to 4.5 billion. However, there have been concerns that charges may lead more people, especially those who need healthcare support most — the poor and the elderly — to avoid seeking care.[9]

By contrast, the €60 fee for GP visits in Ireland has encouraged higher levels of self-care and has boosted demand for health foods in Irish health stores (Irish Association of Health Stores, pers. comm.).The lack of a similar appetite for such a measure in the UK is likely linked to the widespread desire to protect one of the founding principles of the NHS, namely equity in healthcare. Therefore, rather than pursuing barriers and 'sticks', it may be more beneficial to look for incentives and 'carrots'.

Given the extraordinary cost of metabolic diseases such as obesity and type 2 diabetes, these costing the UK in excess of £50 billion annually, tax deductions or other incentives could be provided for those who do not draw on NHS services.

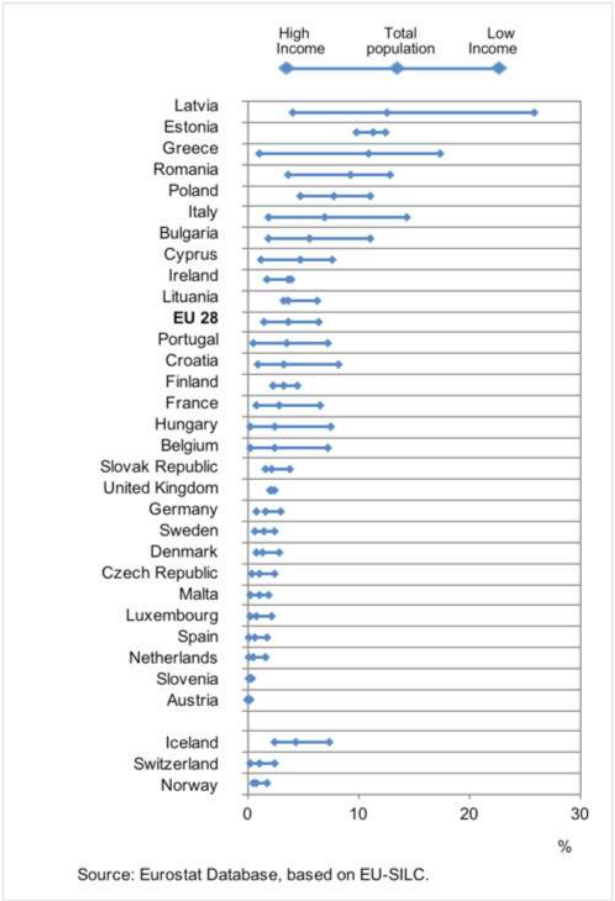

Figure 14. Unmet need for medical examination for financial, geographic or waiting times reasons, by income quintile, 2014.

6.3 Scientific

The scientific impediments to creating political, medical, academic and public consensus over a full-scale approach to managing and improving the health and resilience of the UK population in a manner that is sustainable are both complex and substantial. Many are associated with the current and limiting model of evidence-based medicine (EBM)[10] that has ruled decision-making in healthcare in recent times. Most clinical decisions made in accordance with NICE guidance are the result of purported evidence of efficacy from randomised controlled trials (RCTs), that frequently do not represent effects (benefits or harms) in the real world.[11]

Systematic reviews and meta-analyses are viewed as the most persuasive evidence, however publication bias and selective outcome reporting represent major threats to their validity.[12]

Among the numerous limitations of commonly applied scientific methods to healthcare are:

- Publication bias
- Investigator bias
- 33 other forms of possible bias[13]
- Conflicts of interest
- Selective outcomes
- Typical limitation to mono-therapeutic approaches, despite extensive evidence that multi-factorial approaches are required for effective treatment of complex, chronic conditions and comorbidities
- Evaluation of average outcomes in average populations, and avoidance of consideration of best outcomes from best practice among specific population groups ('the best practitioner effect')
- Inadequate comparison of multi-modality best practice approaches against standard treatments, as is typical in Comparative Effectiveness Research (CER)[14]
- Ignoring key influences in health outcomes, including placebo effect, Hawthorne effect, psycho-social factors, therapist-patient relationship, concomitant treatments (including non-pharmaceutical effects, e.g. diet, physical activity, relaxation, sleep)
- Absence of 'big data' to explore associations between long-term health status and resilience to patterns of healthy behaviours, including diets minimising ultra-processed foods, pollution and xenobiotic (including pharmaceutical) exposure minimisation, empowered self-care, and stress transformation practices. However a collaborative project, led scientifically by the Alliance for Natural Health International is under way specifically to explore such associations[15]
- Measurement, predominantly of efficacy, as opposed to effectiveness[16]

- Insufficient emphasis on pragmatic trials of likely best case, multi-factorial interventions
- Insufficient focus on non-pharmaceutical interventions, and comparisons of risk and benefits with standard care
- Insufficient focus on long-term benefits (health status, economic, social) of disease prevention or health promotion/creation strategies
- Insufficient consideration of the totality of costs and benefits in cost/benefit assessments, and the complexities associated with comparing each, given their different 'currencies' (with the exception of quality of life, or disability adjusted life year studies, and similar)
- Attributing insufficient value to clinical experience and clinical outcome evaluation, especially in the case of multi-factorial treatment approaches including modified diets, lifestyles and any concomitant non-pharmaceutical treatments

The net effect of the limitations of the prevailing scientific methods are so profound as to make them of limited value. The practice of using existing EBM approaches to exclude non-pharmaceutical (including CAM) modalities that have been shown to be associated with positive outcomes, simply because typical standards of EBM have not been met, can be viewed as myopic at least, if not protectionist.

6.4 Structural

There are extensive challenges to ensuring the adequacy of structures to facilitate sustainable health systems scaled to the national level. One of the biggest is the continued reliance on 1:1 consultations in primary care as the main interface between the public and healthcare professionals. Not only are GPs and other NHS staff working in primary care not suitably trained to evaluate upstream factors that modify risk of, or trigger or mediate, chronic diseases, there is inadequate time available to provide the necessary support.

The ***Healthier You: NHS Diabetes Prevention Programme*** (NHS DPP)[17] which provides online support for behaviour change among those identified as high risk for type 2 diabetes is a start. But it is sub-optimal and does not include sufficient coaching or peer-to-peer support. Most GP surgeries would need to make significant structural and educational changes to become community centres based around a collaborative and participatory approach, as proposed in this position paper.

While the NHS predominantly supports pharmaceutical and surgical interventions, based on the application of NICE guidance, a broad range of non-pharmaceutically-based health professionals are excluded and must be paid for privately by citizens. Such exclusions exacerbate health inequalities. Other structural barriers to chronic disease prevention and management include time restraints, ineffective counselling and interventions, and lack of support in identifying obstacles.[18]

Community centres, schools and GP surgeries represent important physical venues in which support could be provided to help citizens develop their personally acquired potential (PAP). However, it is clear that this will not happen on a large scale until there is broad consensus for such an approach - and this will require widespread political, as well as community, support.

Critical to this process is demonstration and subsequent communication and dissemination of results. This is exactly the model that has been used to create a degree of momentum for group visits (shared medical appointments or SMAs).

Not only are GPs and other NHS staff working in primary care not suitably trained to evaluate upstream factors that modify risk of, or trigger or mediate, chronic diseases, there is inadequate time available to provide the necessary support.

6.5 Legal/regulatory/policy

It is clear that regulations affecting the natural health sector represent a major barrier to the development of a sustainable health system. This is the result of specific laws and statutes, most originating in the EU. Other challenges include the lack of statutory recognition of a wide range of health professional groups typically viewed as being part of the complementary and alternative medicine (CAM) sector.

Thomson Reuters has determined that 52,741 laws have been introduced in the UK as a result of EU legislation since 1990, while parliamentary research estimated that 13.2% of UK primary and secondary legislation enacted between 1993 and 2004 was EU-related.[19] However, it must be recognised that not only have UK authorities (e.g., MHRA) been closely involved in the development of EU laws, especially those relating to pharmaceuticals, the UK has also been characterised as a 'gold-plater' of EU law. This reflects the tendency of UK authorities to either go beyond the minimum requirements of prescribed laws, or interpret laws including legal uncertainty in the most restrictive manner possible.[20]

The following subsections address key challenges to health system sustainability in the UK that emanate from continued implementation of EU laws, as well as UK statutes or policies.

6.5.1 Barriers created by EU laws

The following are six key areas of EU law that currently limit fundamental rights and freedoms of UK citizens and businesses seeking to enhance the sustainability of health systems using food, food ingredients, botanicals and other natural measures.

1. **EU pharmaceutical law**[21] that prevents therapeutic foods and food ingredients from being sold for risk of being categorised as unlicensed medicines, including insufficient legal exclusion for foods and food supplements (note European court rulings relating to exclusion in Recital 7 and 'rule of doubt' in Article 2(2)). Cemented by the Court of Justice of the European Union (CJEU), case law gives the MHRA powers to arbitrarily classify any product as medicinal, especially where there is evidence or claims of effectiveness. The broad definition and scope of EU pharmaceutical law prevents wider use of 'food as medicine' and especially food supplements for therapeutic use. There is overwhelming need to re-define new-to-nature pharmaceutical products in ways that do not cause natural substances, with which humans have co-evolved alongside over millions of years, from being classified as drugs, thus requiring cost prohibitive pre-market authorisation. EU pharmaceutical law also fails to recognise the difference between substances that are used to treat or prevent disease by exerting a direct pharmacological action on a specific target organ, receptor or tissue, as against ones that facilitate the body's in-built self-healing (homeostatic) mechanisms.

2. **EU Food Supplements Directive**[22] allows only authorised forms of vitamins and minerals to be used, which currently excludes over 300 forms widely used in the US and other parts of the world, given the scientific challenge and cost burden in applying for authorisation. The Directive includes a requirement to harmonise vitamin and mineral maximum and permitted levels (Article 5). Faced with pressure from many quarters including the scientific challenges implicit in agreeing levels,[23] the European Commission has indicated that it has no current plan to implement this measure. The MHRA applies the broad EU definition of a medicinal product to food supplements that are regarded as 'borderline products' and has issued final determinations (i.e., notices of a ban in the absence of medicinal licencing) for numerous food supplements containing botanicals and other substances, including black cohosh, St John's wort, milk thistle, agnus castus, echinacea, N-acetyl-carnosine and high dose coenzyme Q10.[24]

3. **EU Traditional Herbal Medicinal Products Directive**[25] the scope of which is limited to traditional herbal medicines intended for use by the public for minor ailments and with no supervision by a medical practitioner. It requires evidence of 30 years of safe use, including 15 years within the EU. Pharmaceutical-based stability requirements rule out many fully natural, multi-herb formulations and exclude combinations with non-herbal substances. Most of the products registered under this directive are viewed as having insufficient efficacy by leading herbal medicine practitioners and experts. The legally defined and technical requirements (e.g. stability testing) provide very substantial obstacles for authorisation of authentic herbal products from non-European traditions under the scheme. Accordingly, no traditional herbal product from the long-standing traditions of Ayurveda or traditional Chinese medicine (TCM) have so far been authorised.

4. **EU Nutrition and Health Claims Regulation.**[26] While the Regulation was born out of a policy measure to help reduce obesity, being part of the EU obesity strategy launched in 2007[27] to prevent false, misleading and ambiguous claims and authorise scientifically valid claims, the Regulation has failed in multiple areas. This includes banning (non-authorised health claims) over 2,000 previously used health claims from commercial usage, many of which are scientifically justified. However, these claims were 'non-authorised' following negative assessments by the European Food Safety Authority (EFSA), given that many of their original applications by food business operators did not meet the narrow criteria developed by EFSA for the Article 13(1) (general function) health claims evaluation process. Moreover, while the intention of Article 13(5) was to provide a conduit for authorisation of additional health claims based on emerging science, to-date only 6 have been approved and EFSA's rejection rate presently exceeds 93%. Guidance provided by EFSA for health claim substantiation requires that human studies are conducted on healthy populations. Such studies are generally too costly for the vast majority of small to medium-sized enterprises, which is the sector most responsible for innovation in the healthy foods/supplements market. In 2016, the Court of Justice of the EU ruled that commercial communications from food business operators addressed to health professionals had to comply with the Regulation,[28] effectively preventing 'B2B' product training of health professionals. Overall, this Regulation has served to provide significant commercial censorship over the ability of businesses to communicate the benefits of health foods and supplements to the public. It has simultaneously created a 'me too' or zero claims environment for commercial health claims. This makes it harder, not easier as originally intended, for the public to discriminate between healthy and less healthy foods in the marketplace.

5. **EU Novel Food Regulation**[29] provides a pre-market authorisation requirement (i.e., a barrier, especially to SMEs) for a wide range of innovative or non-EU sourced natural products that may be regarded as not having had a significant history of consumption in the UK. The regulation includes food or ingredients produced from, or isolated from, plants, microorganisms or fungi that are new to the EU market, traditional foods eaten elsewhere in the world or foods produced from new processes. The 'novel food' definition is exceptionally broad and is protectionist, acting disproportionately on products with histories of use outside of the EU. This latter obstacle inherent in the base Regulation passed in 1997 was somewhat lessened by the introduction of a simplified route (included in the 2015 Regulation) to authorisation for products that have 25 years' continuous use by a significant number of people in a country outside the EU. However, traditional foods from third-world countries without a continuous history of use, or ones in which continuous use cannot readily be proven, are still impacted. Furthermore, the Regulation impacts innovative products produced using novel processes that 'fall foul' of the broad definition. This includes food or ingredients resulting from a production process not used for food production within the EU before this 1997 date, which gives rise to significant changes in the composition or structure of a food, affecting its nutritional value or metabolism in the body.

6. **EU GMO Regulation**[30] on the traceability and labelling of genetically modified (GM) organisms requires mandatory labelling of GM foods and animal feeds. While the Regulation has resulted in a high level of citizen (consumer) rejection of GM foods intended for human consumption, farmers have not rejected GM-containing feed. In fact, over 85% of compounded animal feed across the EU is estimated to contain GMOs.[31] This high proportion of GM feed is likely related to the absence of any mandatory requirement for labelling of animal-derived products sourced from animals fed with GM feed. A 'safeguard clause' is written into EU law (Article 23 of Directive 2001/18/EC) to allow individual EU Member States to restrict (or ban) cultivation of GM crops in their respective territories even following EU authorisation. Member States may also apply emergency measures (Article 34 of Regulation (EC) No 1829/2003) where adequate data on environmental and health risks are available. . The scientific framework for evaluating the long-term environmental and human health safety of GMOs is inadequate and has led to the EU authorisation of more than 50 GM crops. There are inadequate measures in place to guard against GM transgenic flow (cross pollenation) into non-target plants and organisms, including into organic crops. There is also insufficient consideration given to the overall impact of GM crop technologies on human health and the environment, especially when combined with the use of glyphosate-based herbicides.

6.5.2 UK specific regulatory or policy measures

There is a strong tendency for NHS-related health and care services to marginalise, or more commonly entirely ignore, health professionals that work outside the statutorily regulated professions. This is despite many thousands of these professions being regulated by recognised bodies (Table 3).

Regulated CAM professionals outnumber practicing GPs in the UK by 215% (only 42,453 active GPs were found to be practicing in the UK as of March 2016).[32]

Additionally, given the burden caused by cancer, the Cancer Act 1939 prevents health professionals, other than registered medical practitioners, nurses and pharmacists, from issuing any advertisement about their services. The law therefore effectively limits the provision of such services that are widely demanded by the public.

Table 3. Partial list of UK health professional registers (including number of registrants) that are deemed by UK authorities as outside the EU definition of 'authorised health care professional' (Article 5(1), Directive 2001/83/EC, as amended).

Registering Body	No of Registrants
The Register of Exercise Professionals (REPs)	21,000
The General Regulatory Council for Complementary Therapies (GRCCT)	18,769
Federation of Holistic Therapists (FHT)†	15,000
Pharmaceutical Services Negotiating Committee (PSNC)	11,699
Complementary & Natural Healthcare Council (CNHC)†	6,632
General Osteopathic Council (GOC)*	5,301
British Acupuncture Council (BAC)†	5,000
General Chiropractic Council (GCC)*	3,254
Society of Homeopaths (SOH)†	1,000
British Homeopathic Association (BHA)	850
British Acupuncture Federation (BAF)	800
The Association of Traditional Chinese Medicine (ATCM)	720
Alliance of Registered Homeopaths (ARH)	600
General Naturopathic Council (GNC)	500
National Institute of Medical Herbalists (NIMH)	450
Register of Chinese Herbal Medicines (RCHM)	441
Homeopathic Medical Association (HMA)	200
College of Practitioners of Phytotherapy (CPP)	176
Ayurvedic Professionals Association (APA)	155
Naturopathic Nutrition Association (NNA)	150
General Council & Register of Naturopaths (GCRN)	134
Association of Master Herbalists (AMH)	91
British Association Accredited Ayurvedic Practitioners (BAAAP)	60
Grand Total	**92,982**

* Professional Standards Authority (PSA) approved registering body.
† PSA accredited approved register.

6.6 Professional and educational barriers

There are severe limitations to the scope and availability of relevant education to statutorily regulated health professionals in the UK given the lack of emphasis on whole body, person-centred care. Not only this, public education aimed at health creation, health optimisation or disease prevention is often not only inadequate but also does not reflect the latest advances in nutrition and lifestyle medicine.

Many GPs lack relevant knowledge or experience to deal with complex conditions and comorbidities, especially using non-pharmaceutical approaches. In addition, they can have difficulty in effectively motivating patients to alter lifestyle behaviours.[33]

The medical curriculum, internationally, contains an often unspoken powerful bias towards pharmaceutical interventions and against non-pharmaceutical ones.[34,35] Medical students, for example, typically do not receive training that facilitates behaviour changes that would improve outcomes for those with obesity, type 2 diabetes and related conditions.[36]

Additionally, medical doctors working either within the NHS or privately, face fitness to practice tribunals at the General Medical Council (GMC), including the risk of being struck off the medical register, by supporting non-standard treatment approaches. Complaints made to the GMC over Dr Sarah Myhill's practice are a good case in point. While Dr Myhill has been able to preserve her license to practice, it is clear that few other medical doctors would be capable or prepared to withstand such challenges.[37]

There is an urgent need for both consensus and a diversification of training curricula, not only for statutorily recognised health professionals, but also for other registered health professionals and health coaches.

6.7 Social, cultural and attitudinal barriers

A joined-up, sustainable health system in which the majority of the population maintains high levels of health and resilience through most of their lives — having acquired the necessary skills and knowledge to optimise their biological potential — may seem like an almost impossible objective. However, a major attitudinal shift would likely occur if the public was to become aware of a fundamental shift in how healthcare should be addressed and become less reliant on NHS-delivered healthcare.

One of the greatest impediments to encouraging change is the provision of a viable alternative. When the only alternatives are ones that need to be paid for privately, and that are often labelled by mainstream medicine aficionados as 'quack medicine' because the approaches do not conform with NICE-approved standard care, it is not surprising that uptake is limited and inequitable.

There is an urgent need for collaborative demonstration studies that seek to deliver improved outcomes, both in terms of health promotion or disease management. These should be relevant to a wide range of socio-economic groups and cultures. Such study designs require that a diverse range of clinical and research interests are represented on the study teams, including those who specialise in nutritional, lifestyle and other forms of person-centred medicine and healthcare. Such collaborations have yet to occur or be prioritised.

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SECTION 7
RECOMMENDATIONS

7. RECOMMENDATIONS

7.1 Radical change is required

The growing burden of preventable chronic conditions and comorbidities, along with ageing populations, lack of efficacy of standard care and intense pressure on government to curb healthcare spending, contribute to the urgent need for alternate models of care. Such models need to be not only effective at reducing the disease burden, they must also be sustainable. They require that considerably more emphasis is placed on reducing/eliminating upstream drivers of future disease.

Tinkering around the edges of the plethora of issues contributing to rising rates of preventable disease will not resolve the underlying sustainability challenges facing mainstream healthcare and delivery. While community pharmacy potentially provides an important 'stepping stone' between self-care and primary care, pharmacy faces its own challenges. These include the squeeze on healthcare budgets, intensifying competition, transformation of the supply chain, emergence of new alternative (online) channels, and high levels of demand for convenience and relevant expertise.[1,2]

There is widespread recognition that a multi-factorial approach to regenerative health and wellbeing is needed, but there is as yet little consensus over which combinations of factors are most likely to yield the best outcomes in specific population groups. Stampfer and colleagues published findings in the New England Journal of Medicine in 2000, based on evaluation of over 84,000 women in the Nurses health Study. The results revealed that 82% of coronary events were caused by lack of adherence to a low-risk behavioural pattern involving diet, exercise and abstinence from smoking.[3] Yet, 18 years on, there is still no consensus on what constitutes a healthy diet,[4,5] or how to motivate the public to becoming more active.[6]

Nor is there consensus over how individuals or health professionals should monitor health status and resilience prior to the manifestation of clinical symptoms of disease. For example, lipoprotein subfraction concentrations and oxidation state are not routinely measured by NHS GPs in those with a higher heart disease risk profile despite good evidence of its usefulness.[7,8]

NICE guidance on non-pharmaceutical, disease prevention approaches is also, in general, too non-specific and does not tackle underlying problems such as the endocrine dysregulation of appetite, energy use and energy storage (see Section 2.2, p. 19).

Further complicating decision-making for the lay-public is the effect of conflicting, scientifically unsupported or uninformed advice given by different influencers. These may include the mainstream medical profession, integrative medicine practitioners, government authorities and the many online health and lifestyle 'experts', including 'Dr Google'. A not uncommon result is public intransigence.

7.2 Position paper 'endgame'

Aims 8 and 9 of this position paper (**Section 1.1**, **p. 9**) outline its role as the basis for evaluating the effectiveness, feasibility and sustainability of health systems that focus on multi-factorial self-care and guided care using the ecological and sustainability principles discussed in preceding sections.

The position paper is already a limited consensus position, endorsed by a wide range of health professional bodies whose practitioners operate largely outside — although far from exclusively — the NHS (see **Acknowledgments** and **Endorsements**, **pp. V - IX**).

These associations and health professionals, the latter outnumbering NHS primary care physicians by more than two to one, work primarily in private practice. They are unencumbered by the limitations of funding cuts, General Medical Council (GMC) tribunals or NICE guidance and the viability of their clinical businesses is dependent on patient or client satisfaction and perceived value.

Unfortunately, in the past, there has not been sufficient concerted effort to track health trajectories among such populations using standardised methods. However, the Hawthorn Health Collaboration has been established to redress this information gap, and is presently in beta-testing with its smartphone-based Go Hawthorn app.[9] The app aims to accrue 'big data' from large numbers among diverse populations, allowing the evaluation of positive (but also neutral and negative) outcomes associated with specific patterns of behaviour, lifestyle and health choice. The collaboration includes the insurance broker Balens Ltd, the Alliance for Natural Health International, three UK universities (Warwick, Westminster and Exeter), the Integrative Medicine group at the Kansas University Medical Centre and TNO (Toegepast Natuurwetenschappelijk Onderzoek) in the Netherlands.

The focus of this position paper is not to provide a prescriptive approach for interventions that might significantly diminish the yet-to-be-resolved preventable disease and comorbidity burden. Instead, the aim is to propose the basis for a universal approach ('language') applicable to an upstream model that includes the evaluation of whole body, multi-system health and resilience through an ecological lens. The position paper also proposes a number of criteria (hallmarks) that, together, support the sustainability of health systems.

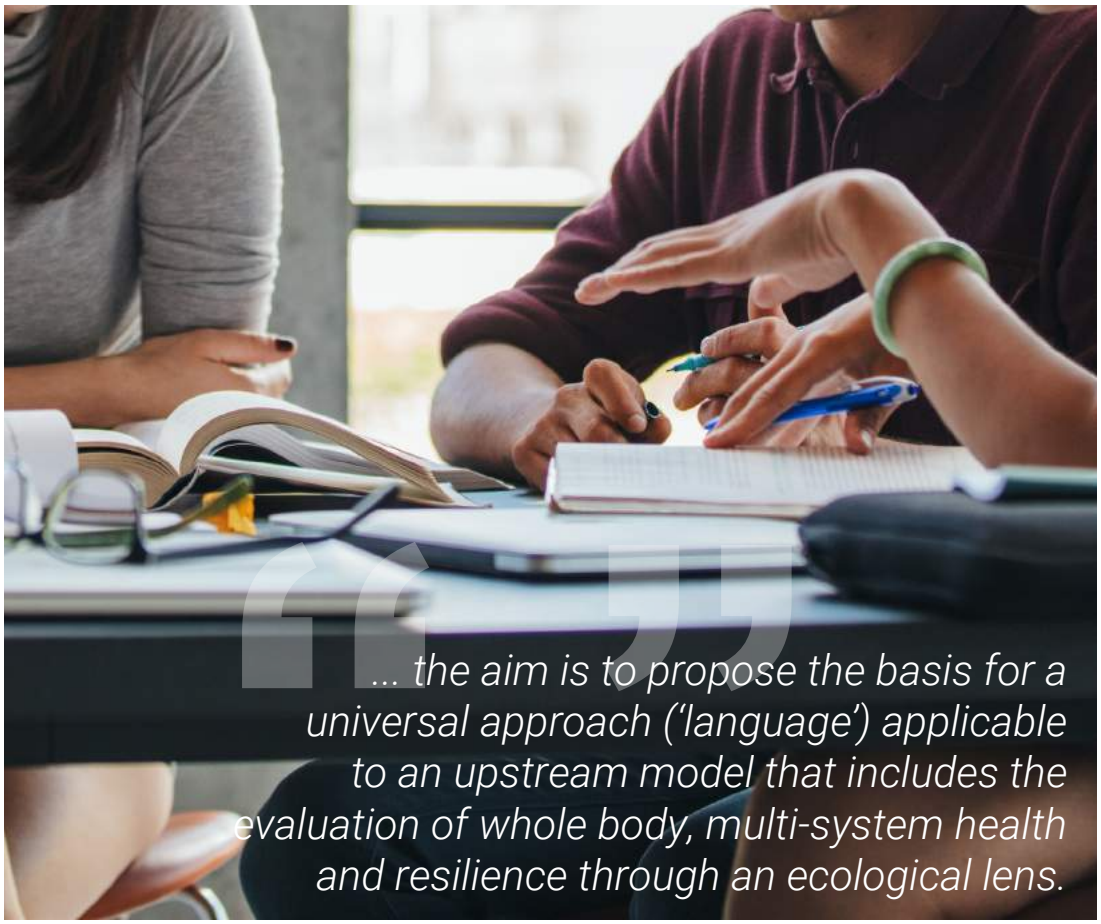
The principle end-game of the position paper is for its use as a basis for agreeing, through consensus, standardised methodologies for evaluating multi-factorial, multi-modality, person-centred, upstream healthcare in a variety of settings. Instead of evaluating average effects from average practitioners, the aim will be to determine best practice and the 'best practitioner effect'. This effect can be defined as identifying practitioners who work collaboratively with their patients or clients, helping them to implement highly effective multi-factorial health optimisation strategies.

All evaluation should involve high levels of individual engagement, and will include differing levels of practitioner or health professional engagement or guidance.

The five settings that are proposed for pilot evaluation are:

1. NHS primary care clinics that already incorporate dietary and lifestyle support for their patients
2. Community pharmacies or health stores engaged in public health education
3. Private integrative medicine clinics including at least one medical doctor
4. Integrative Complementary and Alternative Medicine (CAM) clinics, and
5. Non-clinically based community health management via non-medically-qualified health and lifestyle coaches.

In order to ensure standardised evaluation across these diverse settings, funding will be required to support demonstration (pilot) trial management, clinical direction and biomedical testing.



7.3 Pre-requisites to positive change

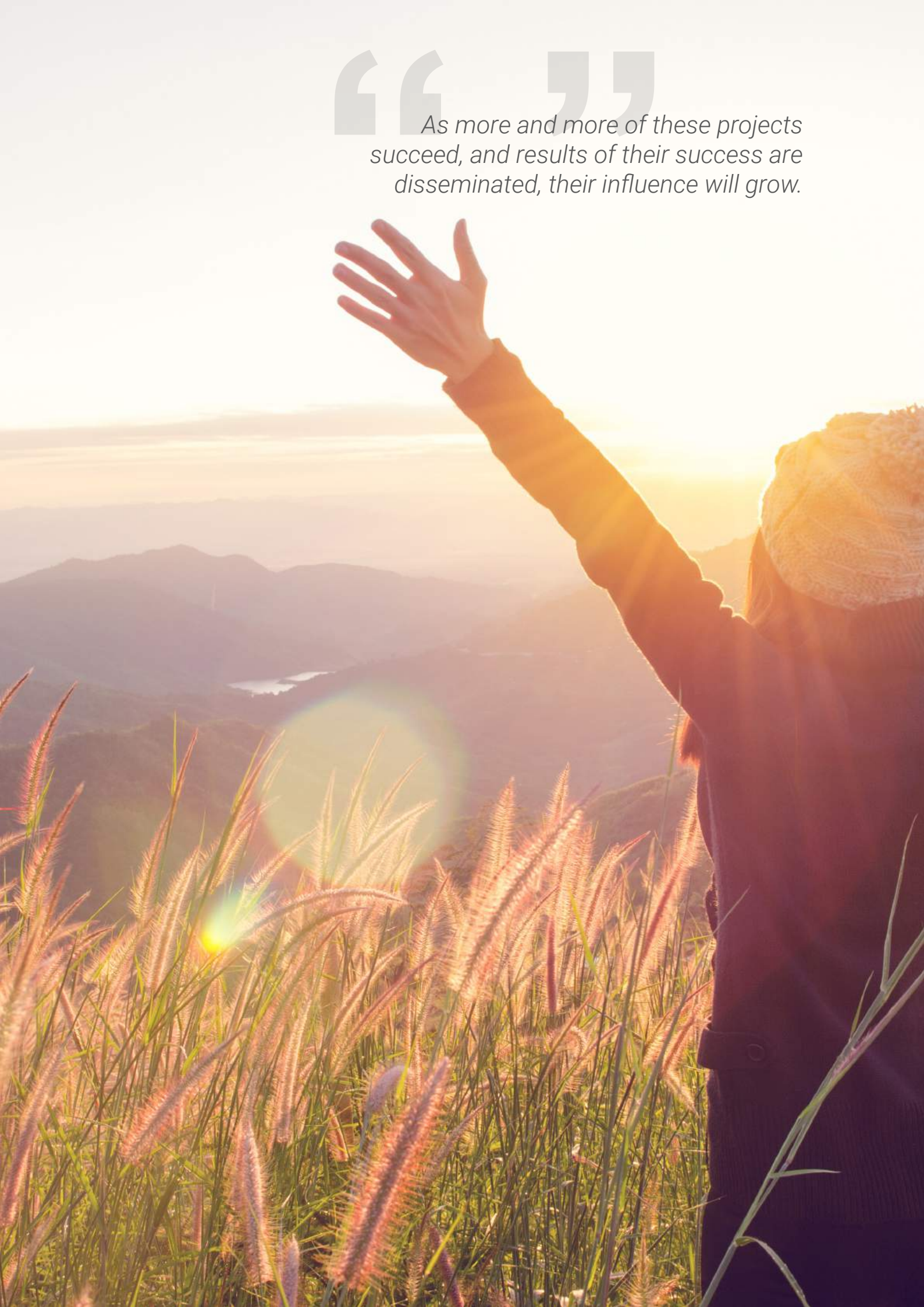
There are a limited number of pre-requisites for developing sustainable health systems, and it is essential that effort is expended to remedy each in advance of tackling other impediments, such as structural, regulatory, policy, professional or other barriers (Section 6).

The following pre-requisites are considered essential:

- Population-wide recognition that prevention is better than cure, and an understanding of the common risk factors, triggers and mediators of preventable chronic diseases
- Population-wide recognition that the most important domain for healthcare is outside the established healthcare delivery system, and includes homes, schools and workplaces
- Consensus over the best combinations of strategies for different population groups
- Relevant knowledge and skills
- Motivation, desire and 'incentivisation'
- Availability of relevant products and services
- Affordability across all socio-economic groups
- Sufficient available time for all concerned
- Individual engagement and empowerment
- Removal of regulatory restrictions that prevent access to appropriate products and services
- Familial, peer, workplace and community support for lifestyle change

It should also be appreciated that, aside from any new initiatives, there are multiple initiatives and demonstration projects already ongoing, both within and outside the NHS, that are dealing with different aspects of the challenge. This is particularly the case in relation to behavioural and lifestyle change as a means of reducing type 2 diabetes and obesity incidence.[10,11]

As more and more of these projects succeed, and results of their success are disseminated, their influence will grow. But given the confluence of the increasing burden and the incapacity of the health system in its present form to deliver dramatically better outcomes, a more catalytic approach is urgently required.



As more and more of these projects succeed, and results of their success are disseminated, their influence will grow.

7.4 Proposed working groups

We have identified five distinct areas of focus, consensus from which will inform the evaluation methods and metrics for the proposed pilot trials. These focus areas are summarised in **Figure 15**.

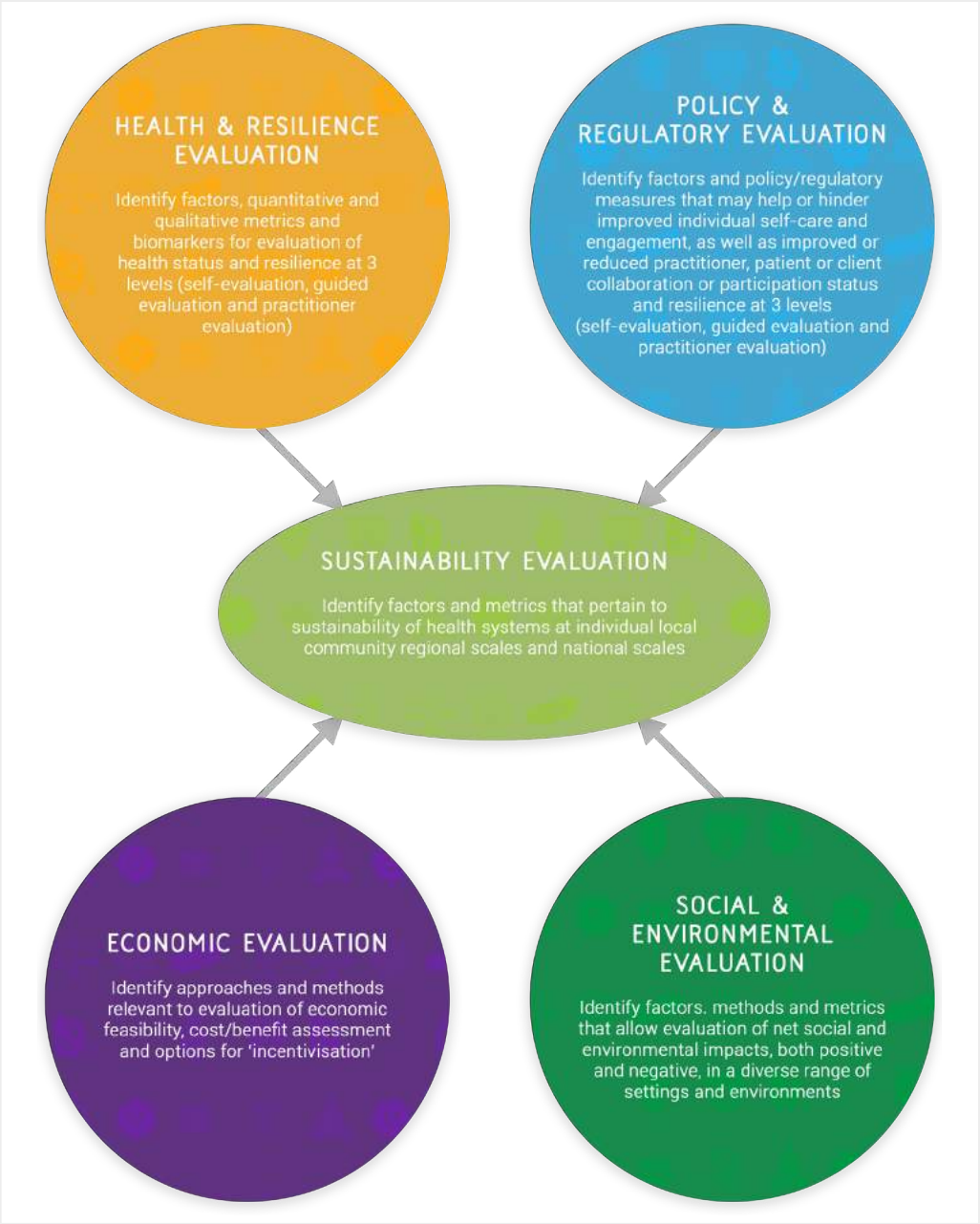


Figure 15. Five proposed focus areas for trans-disciplinary working groups.

In order to ensure independence and transparency, the working groups should be convened and mediated by an independent body, but should include participants from a diverse range of interests and backgrounds. These should include NHS England/Scotland/Wales/Northern Ireland, Public Health England, NICE, academia, CAM associations and experts, as well as relevant commercial interests.

The focus areas for each of the four proposed working groups, along with specific items for priority consideration are given in Table 4.

Table 4. Priority items for consideration in each of the four proposed working groups

Health & Resilience Working Group	Relevant section
• Agreeing key markers for multi-system health and resilience	2.4
• Metabolic disease mechanisms	2.2
• Shared upstream and downstream determinants for common, preventable chronic disease comorbidities, with specific focus on type 2 diabetes, obesity, heart disease, environmentally-related cancers and Alzheimer's disease	5.4
• Practice-based evidence assessment of effectiveness of interventions in modifying chronic disease risk	5.4
• Practice-based evidence review of CAM modalities and their application	5.4
• Development of practice-based evidence through evaluation of the best, as opposed to average, clinical outcomes ('best practitioner effect')	6.3
• Application of Comparative Effectiveness Research (CER)	6.3
• Use of 'big data' to explore associations between healthy behaviours in the real world	6.3
• Assessment methodologies for self-care and practitioner-guided care for the 12 facets of the human terrain	5
• Deprescribing practices alongside non-pharmaceutical interventions	5.1
• Markers for outcome studies of multi-factor interventions and behavioural changes	5.4 6.3
• Group visits and SMAs	5.4
• Therapeutic synergy of multi-factor interventions	6.3
• Review of health professions' training curricula	6.6
• Substantive revision of NICE guidelines relating to non-pharmaceutical interventions	5.2

Policy & Regulatory Working Group	Relevant section
• Characteristics and goals of sustainable health systems	5
• Scope of practice barriers for registered or accredited health professionals	6.6
• Building trans-disciplinary collaborative teams with NHS and private health professionals	2.4 3.1 4.2 5.10
• Evaluation of regulatory constraints	6.5
• Brexit opportunities and challenges	6.5.2
• UK and EU laws that are compatible and incompatible with health system sustainability	6.5.1
• Parliamentary engagement	6.1
• Informed consent	5.5

Economics Working Group	Relevant section
• Fiscal and economic sustainability analysis	4.4 5.3
• Modelling different health system scenarios with varied levels of self-care and health professional guidance in terms of economic feasibility, value and sustainability	4.4 5.3
• Determination of criteria and methodologies for assessing net costs and benefits	4.4 5.3 5.10
• Cost-effectiveness Analysis (CEA) methods and thresholds	6.2
• Evaluation of opportunity costs	(2.1 - 2.3)
• Willingness-to-pay (WTP) analysis	(2.1 - 2.3)
• Possible financial and other incentive/ motivation ('incentivisation') schemes	7.2

Social & Environmental Working Group	Relevant section
• Maximising the human resource	4.4
• Community empowerment programmes	2.4 3.3 7.2
• Social, cultural and attitudinal barriers to healthy behaviours	6.7
• Public-awareness raising of successful community projects	7.2
• Public health and community messaging to encourage upstream engagement in health and self-care, with the aim of increasing its adoption outside clinical settings, such as in homes, schools, and the workplace	4.2 5.6 7.2

The main purpose of the working groups will be an output in the form of a consensus report including each group's deliberations, findings and conclusions. This report will in turn provide an agreed blueprint for moving forward both practically, in terms of sustainability, and politically. The main objective of the consensus report will be to inform the establishment, with the necessary political and financial support, of several (at least 12) demonstration projects within local communities in which agreed outcomes (health, economic, environmental, social) are measured over at least a 12 month period. Assuming success of the demonstrations, such validation will be essential to gaining the broad-based support needed for further roll-out.

7.5 Concluding remarks

Incremental changes to the way we, as a society, manage our health are likely to be insufficient to cope with the relentless increase in the burden of chronic and autoimmune diseases. While the NHS has persisted and expanded hugely over its 70 years of existence, its viability is now threatened. Transformative and systemic changes in how we as humans manage our health are now needed as a matter of urgency. This includes transitioning from a more mechanistic model of healthcare delivery to a trans-disciplinary, adaptive, emergent and holistic model of health care that is based on living, dynamic and ecological systems.

This position paper represents a consensus position from a diverse range of associations and health professionals that have long been at the coal-face of dealing with those parts of the healthcare 'equation' that are not adequately addressed by the NHS.

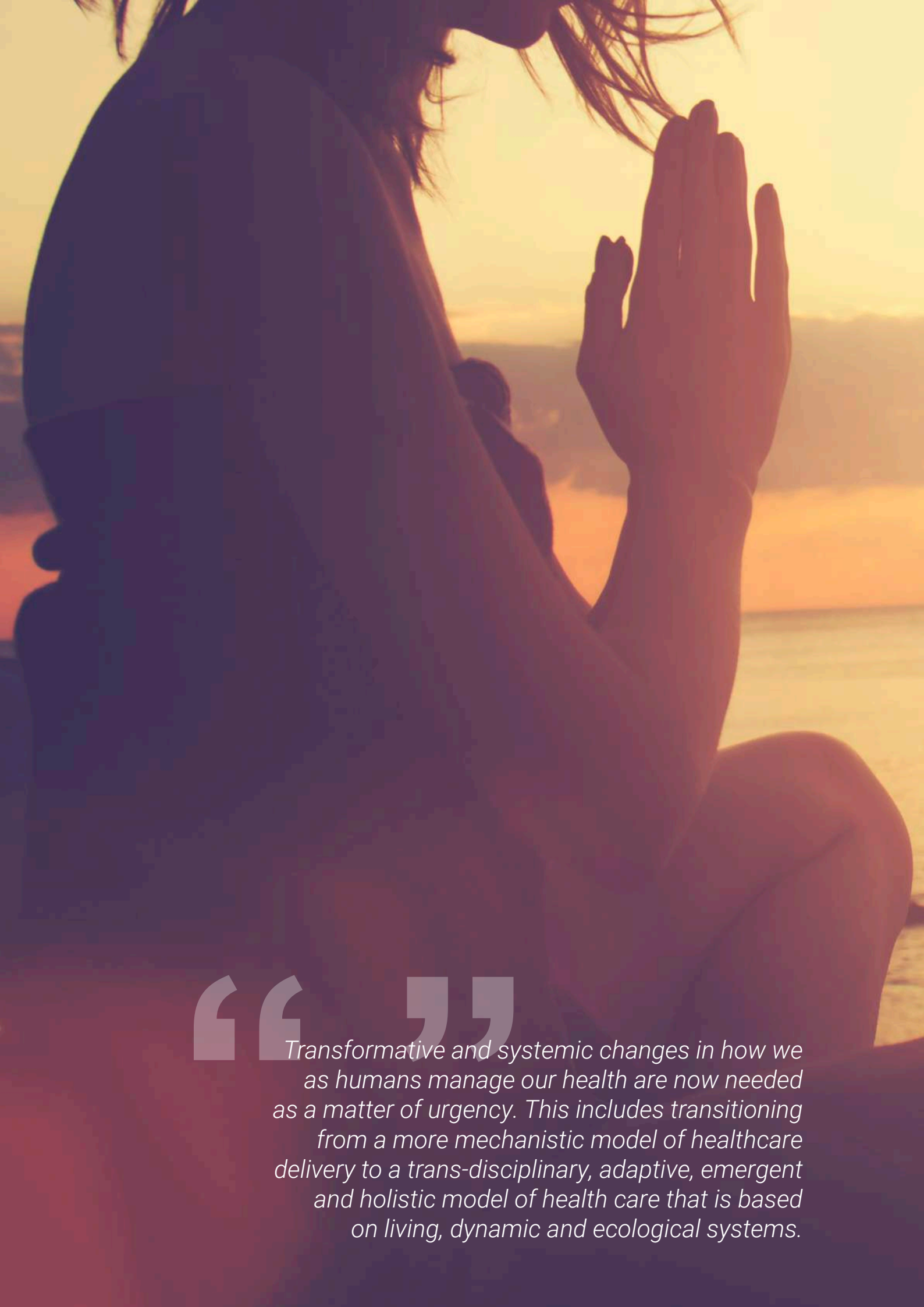
These health professionals interface directly with the public and outnumber GPs in the UK by around two to one. Despite providing services that aim to directly benefit the public, these health professionals remain marginalised by the mainstream healthcare system and the NHS. There are complex reasons for this, including differences in perception over the relative effectiveness of different healthcare approaches, their privately funded nature and the influence of vested interests that seek to maintain a disease-centric, pharmaceutically-reliant healthcare delivery system.[12]

The position paper offers an approach that incorporates a universal 'language' for the assessment of health status and resilience. This language is based on the innate biology, sociobiology and ecology of human beings and their related social systems. Using these ecological and sustainability principles, the approach is fully inclusive, being accessible to all health and fitness professionals, regardless of modality. It is equally able to be interpreted by the lay public, putting the individual at the very heart of a multi-factorial system that seeks to find balance among multiple systems within the body.

To-date, ecological and sustainability principles have been applied successfully to address major challenges facing the energy, construction and agricultural sectors.

Given the sheer and ever-growing scale of the preventable disease burden and the unsustainable nature of the NHS and mainstream healthcare delivery systems, action must be taken without delay. Never has there been a more important time to apply and evaluate the enduring principle of sustainability, as viewed through an ecological lens, to the ways in which we manage our health.

We owe it to future generations to act now - before it is too late.



Transformative and systemic changes in how we as humans manage our health are now needed as a matter of urgency. This includes transitioning from a more mechanistic model of healthcare delivery to a trans-disciplinary, adaptive, emergent and holistic model of health care that is based on living, dynamic and ecological systems.

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