Journal of Health Communication
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/uhcm20

Communicating Health Through Health Footprints

Oliver Harrison [a], Cother Hajat [a], Cary Cooper [b], Gustavo Averbuj [c] & Peter Anderson [d]

[a] Health Authority, Abu Dhabi, United Arab Emirates

[b] University of Lancaster, Lancaster, United Kingdom

[c] Ketchum Argentina, Buenos Aires, Argentina

[d] Institute of Health and Society, Newcastle University, Newcastle upon Tyne, United Kingdom

Available online: 14 Sep 2011

To cite this article: Oliver Harrison, Cother Hajat, Cary Cooper, Gustavo Averbuj & Peter Anderson (2011): Communicating Health Through Health Footprints, Journal of Health Communication, 16:sup2, 158-174

To link to this article: http://dx.doi.org/10.1080/10810730.2011.596608

Journal of Health Communication, 16:158–174, 2011

ISSN: 1081-0730 print/1087-0415 online
DOI: 10.1080/10810730.2011.596608

Routledge
Taylor & Francis Group

Communicating Health Through Health Footprints

OLIVER HARRISON AND COTHER HAJAT

Health Authority, Abu Dhabi, United Arab Emirates

CARY COOPER

University of Lancaster, Lancaster, United Kingdom

GUSTAVO AVERBUJ

Ketchum Argentina, Buenos Aires, Argentina

PETER ANDERSON

Institute of Health and Society, Newcastle University,
Newcastle upon Tyne, United Kingdom

The depth and scale of challenges posed by noncommunicable diseases such as diabetes mellitus and cardiovascular disease are now well known and clearly documented. Reducing the 4 key risk factors has been shown to reduce premature mortality and morbidity by 70% globally. The authors consider how affirmative action can be driven to reduce these risk factors through Health Footprints, targeted interventions within specific domains of consumption, on the basis of an assessment of the negative health effect of specific choices, with the goal of driving healthy choices and improving health. In this article, the authors propose a methodology that ties together insight from public health, behavioral economics, marketing, and health communication. They offer 3 specific examples for affirmative action: a Pigovian tax on unhealthy foods, group-level interventions on the basis of sharing key health data, and personalized prevention tailored to specific individuals. In addition, they discuss the approach to implementation, including the role of an apex coordinating organization in setting standards for data and ethics, and evaluation of the effect of interventions to drive continuous improvement.

The opinions expressed and the data communicated in this article are those of the authors only and do not necessarily reflect the views of the World Economic Forum or of all the members of the Global Agenda Council on Non-Communicable Diseases.

The authors thank the members of the World Economic Forum Global Agenda Council for Chronic Diseases and Wellbeing for providing a platform for discussing the concepts developed in this article. In particular, the authors acknowledge the leadership of the Chairmen from 2009–2010 (Prof. Cary Cooper) and 2010–2011 (Dr. Mirta Roses Periago) and the support provided by the World Economic Forum representative, Eva Jané-Llopis. In addition, the authors acknowledge the support of Prof. Paul Dolan from the London School of Economics who provided significant support for this article on economics and behavioral economics.

Address correspondence to Oliver Harrison, Director of Public Health and Policy, Health Authority, P.O. Box 5674, Abu Dhabi, United Arab Emirates. E-mail: oharrison@haad.ae

The depth and scale of challenges posed by noncommunicable diseases (NCDs) such as diabetes mellitus and cardiovascular disease are now well known and clearly documented (Fuster & Kelly, 2010; World Health Organization, 2008). The global burden of NCDs is rising rapidly, placing them near the top of the global risk landscape in terms of likelihood and severity (World Economic Forum, 2010). After many years of lobbying by global health organizations including the International Diabetes Federation, the World Health Organization, the World Heart Federation, and the U.S. Institute of Medicine and National Heart Lung and Blood Institute, the U.N. General Assembly has voted in favor of holding a U.N. High Level Meeting on NCDs in September 2011 (United Nations). The U.N. meeting is an important opportunity to set out a clear framework for action to address the global NCD burden, and now is the time to propose effective approaches to be considered.

There is widespread agreement on the importance of effective communication for driving action in NCDs; examples include the 2008 paper "Grand Challenges in Non-Communicable Disease (Daar et al., 2007), the WHO 2008–2013 Action Plan for the Global Strategy for the Prevention and Control of Non-communicable Diseases (World Health Organization, 2008) and the 2010 Institute of Medicine report, "Promoting Cardiovascular Disease in the Developing World" (Institute of Medicine, 2010). Here, we discuss Health Footprints as a mechanism for the effective communication of health, and more specifically the health effect of choices. We propose that Health Footprints can help encourage healthy choices and discourage unhealthy choices, and thus help address the NCD burden.

A wide range of NCDs are caused by just four risk factors (Chow et al., 2009; Fuster & Kelly, 2010; World Health Organization, 2008):

- poor diet
- physical inactivity
- tobacco smoking
- alcohol consumption (as described by Anderson, Bitarello, Baumberg, Jarl, & Stuckler, this issue).

Reducing these four risk factors has been shown to reduce premature mortality and morbidity by 70% globally (World Health Organization, 2009). In a 2004 report, the U.K. Department of Health concluded that "at the population level, substantial health losses are attributable to lifestyle and significant gains in health could be achieved by relatively small changes in the choices people make" (Department of Health, United Kingdom, 2004). However, addressing these risk factors to achieve a reduction in cardiovascular disease burden has to date been challenging with only a handful of examples of effective population-level effect; the 35-year results from North Karelia, Finland, being among the best documented (Vartianen et al., 2010).

In this article, we consider how affirmative action can be driven through Health Footprints. We define Health Footprints as targeted interventions within specific domains of consumption, on the basis of an assessment of the negative health effect of specific choices, with the goal of driving healthy choices and improving health.

In our model, Health Footprints are targeted at specific behaviors (e.g., the consumption of specific goods and services), on the basis of a rigorous quantification of the negative health effect of unhealthy choices within specific domains. Health Footprints may be titrated through feedback from the market of their effect to actively steer health-related choices. For the purposes of this article, we focus on examples related to obesity and tobacco consumption, but the Health Footprints approach

could be applied to other disease areas such as mental illness (e.g., alcohol and drug use disorders).

Health Footprints Methodology

Five Key Tenets

Our approach to Health Footprints is based on five key tenets:

1. Industry Incentives Are Misaligned With Health
For much of the 20th century, the food and beverage industry was focused on delivering calories at a low cost to global markets. The rush to produce and distribute cheap calories, including the price cost and the time cost, was a great success but has probably contributed to global obesity:

> From 1980 to 2000 . . . the relative price of food fell by 14%. Interestingly, from 1960 through 1980, when the prevalence of obesity did not change, food prices actually rose. Moreover, the relative prices of [less healthy foods, which typically include highly processed foods with high quantities of federally subsidised added sugars and added fats] decreased since the early 1980s, compared with [healthier foods]. For example, between 1985 and 2000, the price of fresh fruits and vegetables, fish, and dairy products increased by 118%, 77%, and 56% respectively, whereas sugar and sweets, fats and oils, and carbonated beverages increased at lower rates −46%, 35% and 20% respectively (Finkelstein, Ruhm, & Kosa, 2005).

Not only has industry succeeded in delivering cheap and readily available calories, but today a huge variety of products compete for market share on the basis of relative attractiveness to consumers. With their revenues driven by volume, manufacturing, distribution, and sales, companies seek to drive the consumption of their products and services. In so doing, they use two key tools. First, companies have developed idealized offerings that act as super-stimuli capable of driving higher consumption (Lenoir, Serre, Cantin, & Ahmed, 2007). For example, food and beverage manufacturers produce products that generate intense activity in the reward centers of the brain whether as a byproduct of producing the products that sell the most, or increasingly through sophisticated processes of design; such foods are typically high-calorie, high-fat foods with specific taste and textural characteristics. Parents know that chocolate does not require marketing to children: It sells itself. Products with high calories for nutrition[1] (HCFN) tend to sell better than do those with low calories for nutrition (LCFN) and often generate higher profit margins in part because they are more attractive to consumers (driving sales volume).

Second, companies use marketing techniques to optimize perceived utility, positioning their offerings carefully to minimize perceived effort/disutility, and maximize

[1]"Calories for Nutrients (CFN) provides an index of how many calories are required to obtain an additional 1% of the recommended daily values of 13 key nutrients. Low scores correspond to relatively healthy items, as fewer calories are needed to obtain key nutrients; high scores indicate less healthy items, as more calories are needed to obtain these nutrients." Epstein LH, Dearing KK, Roba LG and Finkelstein E (2010). *The Influence of Taxes and Subsidies on Energy Purchased in an Experimental Purchasing Study*. Psychological Science; published online February 5, 2010.

perceived benefit/utility. To maximize its own utility (profits), industry manipulates consumer perception and thus manages the perception of utility. Unfortunately, such super-stimulus offerings may not be healthy, and this can create a misalignment of industry and public health incentives. Furthermore, in seeking higher profits, industry has optimized the blend of ingredients for lower cost and longer shelf life spawning an increase in the use of unhealthy alternatives such as high-fructose corn syrup and trans fats. In addition, companies heavily invest in supply chains and product placement in stores to improve accessibility, helping limit the time cost of consumption for their products. In effect, this means that switching consumption to other products will increase the time cost, so that utility tradeoffs must be made by the consumer (that is, less time to spend doing other things).

The increase in the availability of such unhealthy products represents the misalignment of industry incentives with health. Yet, we believe that we should think of industry as simply a part of a wider economic system; economic enterprises including manufacturers, distributors, and shops respond rapidly to changes in economic incentives. Health Footprints act by shifting the relative profitability of products; in this way, Health Footprints have the potential to incentivize industry itself to help drive healthier choices, such as by developing, manufacturing, distributing, and marketing healthier products and services.

2. Consumer Choices Are Driven by Utility Functions and Are Based on Perceived Value and Attention

The General Utility Model (GU model) is a widely used model of decision making and a central tenet of microeconomics. For an individual consumer, the GU model states that their decisions about purchasing and consuming products and services will be based on the "consumption bundle" that maximizes their utility function; in turn, this is based on the perception of available options, and for each option, the effort required (or disutility incurred) and the benefit (utility) obtained. Put simply, the GU model states that individuals will choose the available option that maximizes their utility given external constraints (Mas-Coleill, Whinston, & Green, 1996). The complex heuristics underlying GU model decision making appear to be hardwired in the human brain and may be an evolutionary adaptation to quickly weighing up options in a complex and demanding world (Robson, 2001). In particular, there are adaptations related to managing attention, which requires significant processing by the cerebral cortex and is a limited resource. Put simply, many decisions are made on autopilot, by automatic systems; on the basis of simple underlying heuristics, such decisions are irrational and prone to bias.

Although there are contradictory examples, typically increasing the economic cost will reduce demand. For example, in a study a 12% increase in the cost of Coca-Cola was found to result in a 14.6% decrease in purchases (Brownell & Frieden, 2009). Alongside assessing the relative economic value of present options, consumers apply a discount factor to future value; such discount factors are often very high and applied inconsistently (Thaler, 1981). Moreover, perception is prone to cognitive biases such as recall bias (for example, remembering a grandparent who smoked into their 90s and concluding that smoking is not harmful in one's family; Epstein, Dearing, Roba, & Finkelstein, 2010).

Although imperfect, we use the GU model to understand consumerism related to health outcomes, particularly the consumption of food and beverage, exercise, tobacco, and alcohol. In particular, we use the principle of perceived value of options

to understand how choices are made, and thus how they may be influenced. We propose a model of directed feedback, Health Footprints, which channel the negative externalities of unhealthy choices through the GU model, rebalancing the perceived value of such choices with a view to making healthy choices more likely and unhealthy choices less likely.

3. Symbolic Value Makes an Important Contribution

In the GU model, value is subjective rather than objective, and perceived value varies between consumers. Moreover, total value is the sum of two sets of factors:

- physical value: perceived benefit directly from the components of a product or service
- symbolic value: perceived additional benefit of the whole product or service (beyond the physical value of its components)

The total perceived value of the product or service is the sum of the physical and the symbolic value. In economic decision making, the product or service is consumed (that is, exchanged for money) if the total price is lower than the total perceived value. Symbolic value is profoundly influenced by culture, context, and psychological drives such as associations with desired attributes including tobacco, freedom, alcohol, and sociability (Corneo & Jeanne, 2005); it is probably assessed by the limbic system rather than the cerebral cortex (Sanfey, Loewenstein, McClure, & Cohen, 2006).

Consumption may be driven by either decreasing cost or increasing perceived value, either by increasing the physical value (e.g., serving a larger portion of an alcoholic drink) or by increasing symbolic value such as by associating product or service with a desired attribute (e.g., creating an association between consumption of an alcoholic drink and sociability).

Building on this tenet, Health Footprints may influence consumer choice through price and/or perceived value. In turn, perceived value may be influenced through factors that are physical and/or symbolic (culture, context, and psychological drives).

4. Context Can Help Drive Choices by Framing Utility

Evidence suggests that human behavior is highly susceptible to changes in the context in which choices are made:

> It turns out that the environmental effects on behavior are a lot stronger than most people expect.[2]

For example, it has been demonstrated that size of plates has an influence on the amount one eats (unrelated to hunger; Diliberti, Bordi, Conklin, Roe, & Rolls, 2004). Hippocrates, writing 2,500 years ago, advised anyone coming to a new city to enquire whether it was likely to be a healthy or unhealthy place to live, depending on its geography and the behavior of its inhabitants:

> As a general rule, the constitutions and the habits of a people follow the nature of the land where they live.[3]

[2]Kahneman D. *Two big things happening in psychology today*. 2008.

[3]Hippocrates, Hippocratic writings. Edited, with introduction by GER Lloyd. Harmondsworth (Penguin), 1978, 168.

The value of options within a utility function can therefore be adapted without changing the available options or the true economic value of the options. Example techniques include setting the default option (e.g., portion size, or opt-in vs. opt-out) and placing fresh fruit and vegetables in a grocery store at eye level or near the entrance. In their book *Nudge*, Richard Thaler and Cass Sunstein (2008) termed such techniques *choice architecture*.

5. The Health Sector Typically Has a Limited Role in Communicating Health Choices
In reality, people have always sought health information from a range of sources. Health professionals are just one such source, and are steadily becoming less important as new sources of information become more prevalent (e.g., the Internet, the lay media). Furthermore, it appears that people are increasingly seeking health information from peers (Eysenbach, Powell, Englesakis, Rizo, & Stern, 2004). In addition, the health sector represents just one of many routes to improving health. For example, an individual with high cholesterol may choose between lifestyle changes (improved diet and increasing physical exercise), taking allopathic medication (e.g., a statin), and a variety of alternative or complementary therapies. These are different options that are difficult to compare.

We suggest that effective Health Footprints will need to communicate health across a range of domains, particularly those related closely with nutrition, physical activity, and the consumption of alcohol and tobacco. Moreover, Health Footprints must be adapted over time to be effective tools for driving the health-related behavior of real consumers, not simply for transferring information to them.

In the context of these five tenets, healthy choices cannot simply be driven by the transfer of information to consumers by health care workers alone. Such interventions alone ignore the reality of how health-related decisions are made by consumers; that is, through processes that are unconscious, effortless, associative, and fast. Real consumer choices have an emphasis on symbolic and physical value, and respond to (marketing) cues from an industry whose incentives are often misaligned with health. We suggest, however, that within this construct consumers are still responding rationally to the options presented to them even if these decisions appear irrational from a public health perspective.

Health professionals are in the business of protecting and improving health; it is natural, therefore, for them to view consumer choices through the lens of health, as healthy and unhealthy choices. We believe that health professionals must be careful to avoid viewing unhealthy choices as simply the wrong choices made by ill-informed consumers. Despite the frustrations it causes for health professionals, we believe it is important to recognize that consumers perceive value from unhealthy choices. Health is not the only factor involved in making health-related decisions. Consumers live diverse and complex lives within which the perception of future health status may typically be only be a small factor and a limited driver of present choices (Bradford & Dolan, 2010). See Table 1 for an example.

Approaches for Communication Through Health Footprints

Health Footprints are intended to bring the health consequences of a particular decision to the individual *at the point of decision*, thus helping drive perceived

Table 1. "Why do physicians smoke?"

• In the GU model framework, individuals choose between the available options on the basis of relative value, so it is important to recognize that unhealthy choices carry value for that individual. Having established the habit, a smoking physician will become addicted to nicotine. He or she may well associate the absence of smoking with the emergence of unpleasant withdrawal symptoms (an aversive stimulus), and thus associate smoking with the absence of the aversive stimulus (thus, net value). Moreover, the physician may attribute strong symbolic value to cigarettes; for example, he or she may associate smoking with freedom, youth, and liberation (the tobacco industry, of course, drives this through marketing). Tobacco consumption therefore carries value and the behavior will perpetuate (despite the awareness of the negative health effect).

value for consumers in accordance with the GU model. We propose approaches on the basis of the influences on choice identified in *Mindspace*, a report commissioned by the U.K. Cabinet Office from the Institute for Government (Dolan, Hallsworth, Halpern, King, & Vlaev, 2010). Such approaches may be deployed in isolation or combined in bundles; these are shown in Table 2.

Three Potential Models of Health Footprint

We illustrate with three potential models of Health Footprint.

Example 1: A Broad-Based Pigovian Tax on Specific Foods

As previously described, between 1980 and 2000 there was a marked fall in the price of food, particularly those that are HCFN (Finkelstein, Ruhm, & Kosa, 2005). In responding to the opening of global markets, and government policies focused on preventing hunger and reducing the cost of food, industry developed calorie-dense products and efficient supply chains. At the same time, the prevalence of obesity has increased, and it is accepted that this increase is in part caused by a reduction in the economic cost of calories (Finkelstein, Ruhm, & Kosa). The U.S. Centers for Disease Control and Prevention estimated the 2008 health care costs (direct and indirect) of obesity to be approximately US$147 billion, with substantial further societal costs (Finkelstein, Trogdon, Cohen, & Dietz, 2009). These costs to society reflect the effect of excessive nutrition (and thus consumer choices made within the nutrition markets) upon markets external to nutrition markets. These are termed *externalities*.[4]

A simple way to feedback such externalities to the market is through direct taxation along the supply chain such as a levy on shops selling specific unhealthy products; an example is the program due to be implemented in certain towns in the

[4]According to the OECD, *externalities* refers to situations when the effect of production or consumption of goods and services imposes costs or benefits on others which are not reflected in the prices charged for the goods and services being provided (see http://stats.oecd.org/glossary/detail.asp?ID=3215).

Table 2. Influences on consumer choice and possible approaches to driving healthy choices

Influence	Description	Approach
Messenger	We are heavily influenced by who communicates information	Use trusted messengers, including non–health sector (e.g., peer-to-peer, popular media)
Incentives	Our responses to incentives are shaped by predictable mental shortcuts, such as strongly avoiding losses	Provide targeted financial incentives based on real consumer behaviors
Norms	We are strongly influenced by what others do	Create group-level interventions to focus on norms within social networks
Defaults	We go with the flow of preset options	Set defaults through policy interventions, for example, on portion size and the location of products within stores
Salience	Our attention is drawn to what is novel and seems relevant to us	Use point-of-decision prompts to make health relevant during consumption; continually innovate to deliver novel messaging to address consumer adaptation
Priming	Out acts are often influenced by subconscious cues	Collect longitudinal data on effectiveness to help identify subconscious cues
Affect	Our emotional associations can powerfully shape our actions	Use suitable emotive messaging in Health Footprints
Commitments	We seek to be consistent with our public promises, and reciprocate acts	Consider use of explicit commitments made to peers
Ego	We act in ways that make us feel better about ourselves	Develop mechanisms to congratulate success

United Kingdom starting in 2012.[5] Another possibility is a Pigovian tax[6] on specific HCFN foods; such a tax is structured to reduce the consumption of HCFN foods by including in the consumer price the pro rata societal costs of obesity (that is, the negative externalities of the food and beverage market).

[5]See http://www.financenews.co.ukfnews/fat-tax-could-sting-the-uk-as-early-as-2012.

[6]According to Wikipedia, a Pigovian tax (also called a Pigouvian tax) is a tax levied on a market activity that generates negative externalities. The tax is intended to correct the market outcome. In the presence of negative externalities, the social cost of a market activity is not covered by the private cost of the activity. In such a case, the market outcome is not efficient and may lead to over-consumption of the product. A Pigovian tax equal to the negative externality is thought to correct the market outcome back to efficiency (see http://en.wikipedia.org/wiki/Pigovian_tax.).

It has been shown (in real markets) that there is considerable price elasticity of demand; that is, that increases in the price of unhealthy goods results in a decrease in the volume of consumption. Furthermore, it has been shown in an experimental setting for food and beverages that taxes on HCFN (unhealthy) goods are more effective than are subsidies for LCFN (healthy) goods; for a fixed total level of consumer spend, subsidies actually increase calories consumed because the surplus produced from the subsidies is spent on HCFN goods (Epstein et al., 2010). By contrast, taxing HCFN food had the dual benefit of increasing consumption of LCFN food and decreasing the consumption of HCFN food; this result would need to be tested in real markets.

To be effective, such a Pigovian tax would need to be carefully designed and implemented, particularly in light of a highly complex network of government taxes and subsidies in food and beverage production. With reference to the creation of a similar model of carbon tax (Metcalf & Weisbach, 2009), particular considerations would include the setting of tax rates, initial enactment and implementation, ensuring the broadest possible tax base (to prevent consumer switching from taxed to untaxed HCFN goods, and the proper consideration of international trade (in light, for example, of the World Trade Organisation's General Agreement on Tariffs and Trade, which permits trade restrictions if they are needed to protect "human, animal, or plant life or health"[7]). One option, to help ensure a broad national tax base (covering a wide range of goods) and possible international coverage, would be to apply the tax to specific raw materials used in the manufacture of unhealthy (HCFN) foods; this might include, for example, palm oil or refined sugar. A key benefit of such a broad-based tax is that it delivers behavior change incentives to individual consumers and to all consumers across the market, helping to change the societal norms related to consumption. This, in turn, changes the context for individual consumption and thus helps to prevent relapse.

A common criticism of Pigovian taxes for unhealthy products is that such taxes are regressive, that is, the highest tax burden is on low-income individuals who tend to spend a higher share of total income on such products than do high-income individuals. A recent review of the real effect of tobacco taxation, however, suggests that such taxes are, in fact, progressive because price elasticity is higher in low-income individuals (i.e., there is a greater reduction in demand from higher prices) and the overall utility of individuals actually benefits from greater help in controlling excessive consumption of the product (Gruber & Koszegi, 2008).

It would be critical to create transparent mechanisms for tracking the effect of the tax on the consumption of specific products, total calories, and rates of obesity to help ensure continuous improvement in effect over time. In addition, such a tax should be applied steadily to allow industry time to reformulate its products, avoiding industry resistance and engaging industry in marketing healthier goods.

With regards to the Mindspace framework mentioned earlier, a Pigovian tax would create a steady consumer incentive to adopt healthy choices. Acting over time, the tax would steer industry toward the development and marketing of healthy products and services; in turn, industry would deploy marketing to drive consumption of healthier choices, reinforcing the consumer effects, and acting through the other

[7]World Trade Organisation's General Agreement on Tariffs and Trade, Article XX (see http://www.gatt.org)

approaches. We agree that a similar approach may be applied to limit the effect of other NCD risk factors such as the consumption of alcohol, as Anderson and colleagues describe in this issue.

Example 2: Group-Level Health Interventions

There is a strong emerging evidence base that health-related behaviors (and their phenotypic consequences) are socially communicated. Examples include both tobacco smoking (Christakis & Fowler, 2008) and obesity (Christakis & Fowler, 2007); for example, with regards to obesity:

> A person's chances of becoming obese increased by 57% (95% confidence interval [CI], 6 to 123) if he or she had a friend who became obese in a given interval. Among pairs of adult siblings, if one sibling became obese, the chance that the other would become obese increased by 40% (95% CI, 21 to 60). If one spouse became obese, the likelihood that the other spouse would become obese increased by 37% (95% CI, 7 to 73; Christakis & Fowler, 2007).

As described in this issue by Martin-Moreno, Apfel, Alfonso-Sanchez, Galea, and Jakab (2011):

> Both physical and mental health are strongly influenced by social forces . . . both healthy and unhealthy behaviours spread contagiously in large social groups.

The implication of social networks in etiology suggests their potential role in mediating effective intervention. We propose Health Footprints, which aggregates individual health data for the individuals within specific groups (e.g., families, friends) and helps drive collective action such as changing the norms of social eating. With regards to the Mindspace framework mentioned earlier, such interventions would enlist social networks as messengers, helping to set norms and create local feedback from social contacts that would influence affect and ego. Such group-level programs may also work for local governments, schools, or employers. As examples, we propose two models of group-level intervention: (a) the voluntary sharing of specific health data by individuals across social networks, and (b) the aggregation of data within defined groups with benchmarking between such groups.

Fowler and Christakis have suggested that social acceptance may be the medium of transmission of unhealthy states such as smoking (Christakis & Fowler, 2008) and obesity (Christakis & Fowler, 2007). Given that individuals tend to wish good health for their social contacts (Post, 2007), such acceptance of unhealthy states and behaviors may be rooted in a lack of understanding, or the relative discounting of the utility domains related to health compared with others, perhaps related to social bonding (Bradford & Dolan, 2010). In this case, strengthening the availability of relevant health information may help focus attention on the negative health effects of such unhealthy states and help prompt changes in the underlying behaviors (Ratzan & Gilhooly, 2010). We propose that individuals could opt into sharing specific health data, such as their weight, with specific social contacts including a spouse or a friend. The regular sharing of such data would help focus the attention of both the individual and the contact on the health-related behavior (and its negative consequences).

Information technology applications such as Facebook and mobile technologies could facilitate such data sharing.

Aggregating data within defined groups and benchmarking between such groups helps influence group norms, and form a foundation for collective action. For example, the Wisconsin County Health Rankings were developed by the University of Wisconsin Population Health Institute (using a model developed by the United Health Foundation) using preexisting county-level data, and were found to stimulate public discourse about a range of determinants of health (Peppard, Kindig, Danger, Javaag, & Remington, 2008).

Building on this model, we propose that specific health data (such as the prevalence of smoking, or obesity) could be systematically aggregated across a range of amenable groups (e.g., employers) or defined geographic areas (e.g., cities or local government boundaries). Such groups should be defined according to an organizational level with responsibility for action on health, that is, the reporting should be coterminous with the level responsibility.

Benchmarking rates between such groups would reveal differences and prompt individuals within the groups, and decision makers. As with the Wisconsin County Health Rankings, the appropriate framing of such differences and how they evolve over time, such as in an annual public league table, could act as a significant drive for affirmative action. Another application of this concept would be a Quadruple Bottom Line for companies requiring the inclusion of data on the health of their employees in their annual reports.

Example 3: Personalized Prevention

Individuals vary in health status, consumption of goods, and preferred source of health information and media channel, and in response to different forms of health messaging. Putting this together, the ideal strategy is *personalized prevention*. Such an individual Health Footprint would integrate the available personal data on phenotype, genotype, and behavior and deliver personalized interventions to drive healthy behaviors. Systems with broad data access and personalized behavioral interventions would require careful ethical consideration and informed consent. As described earlier, much health-related behavior is driven by perceived utility unrelated to health, that is, individuals do not spend all their time attending to health and will consume products because of taste, or unconscious (e.g., social) cues. The principle underlying personalized prevention would be that individuals would seize moments of rational health decision making to opt into enduring programs that provide prompts and cues to drive health-related decision making between rational moments, that is when they are not attending to health. For example, an individual may make a rational decision to quit smoking and opt into a program that includes targeted text-message prompts from his or her cell phone and briefing his or her social contacts to help avoid relapse. An example is QuiText, an Australian service that aims to help smokers through the stages of quitting smoking through a text-message support program.[8]

A range of web-based health data integration systems are already available, such as Microsoft Health Vault,[9] Google Health,[10] and Patients Know Best.[11] Such

[8]See http://www.quitext.com/Default.aspx.
[9]See http://www.healthvault.com/personal/index.aspx.
[10]See http://www.google.com/health.
[11]See http://www.patientsknowbest.com.

systems are capable of driving a range of consumer applications, which can be personalized to deliver health effect. In turn, these web-based systems can be linked with portable devices, including cell phones, which are rapidly becoming ubiquitous worldwide (there were 4.6 billion subscriptions worldwide by the end of 2009 with high penetration rates even in the developing world; Heeks, 2008). There are some good examples of how cell phone text messaging can be used to collect health data and drive health programs, such as DataDyne's EpiSurveyor, an innovative, free web-based and cell phone–based application for data collection in international development and global health.[12] Today, such web-based health data systems integrated with cell phones offer a unique opportunity to scale up a global program of personalized intervention.

Such programs of personalized health intervention can deploy a range of the Mindspace approaches shown in Table 2; these approaches may build on the underlying open-source system architecture much as apps are developed for modern mobile devices. Furthermore, through the longitudinal tracking of both the approaches tried, and the consumer's health data (e.g., weight), the system can optimize the mix of approaches over time. Such programs could act as diverse fieldwork, collecting high-quality, real-world evidence to provide new insights and drive continuous improvement. A comprehensive program featuring this approach (called "Weqaya," which is Arabic for "protection") is already underway in Abu Dhabi in response to a high burden of cardiovascular risk, particularly diabetes (Hajat & Harrison, 2010).

Key Considerations

In summary, the process begins by using the evidence base to assess the health-related behaviors to be changed, understanding the factors involved in decision making by consumers and targeting specific interventions to steer those factors; this iterative approach is shown in Figure 1.

Adapting consumer decisions affects the demand function and induces changes to supply by sales, distribution and manufacturing industry. Furthermore, understanding the factors involved in industry decision making (e.g., supply costs, retail prices) permits the development of specific interventions to drive industry and the supply side. A combination of demand- and supply-side interventions may be synergistic, leading to faster and more profound change. To be effective, we suggest that Health Footprints should have four characteristics. First, they should be based on a rigorous analysis of the health effect of specific behaviors, or products and services. Second, Health Footprints must be proportionate; that is, the strength of their influence on reality perception must be driven by the predicted level of health effect caused by a specific product or service, ideally recognizing vulnerable groups. Third, they should be channeled to the consumer in a manner that maximizes their effectiveness, such as at the point of decision and directly affecting the net utility perception of the options. Fourth, the effect of Health Footprints should be evaluated empirically and the continuously optimized through iteration to achieve effect against clear and specific targets. Such evaluation should be monist, enabling the unified comparison of the effect of a diverse range of approaches.

[12]See http://www.datadyne.org.

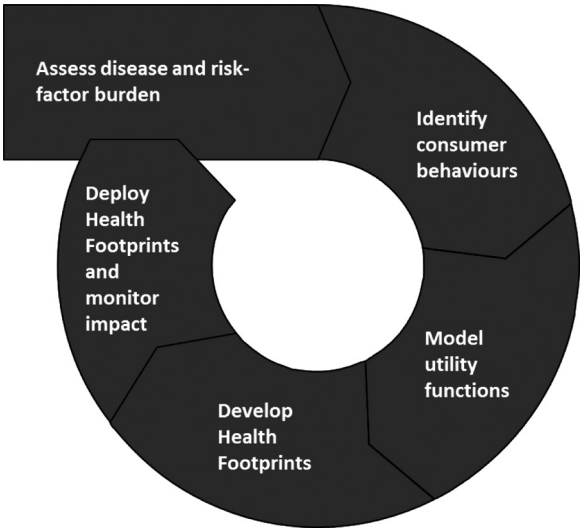

Figure 1. Schematic diagram of the process for developing and continuously improving Health Footprints.

Apex Coordination

Elsewhere in this issue, Nishtar and Jané-Llopis describe a role for apex coordinating body in the coordination of local, national and multinational efforts to address the burden of NCDs (Nishtar & Jané-Llopis, 2011); they describe an organization that

> [has] a mutli-sectoral construct, a scope beyond the health sector and grounding within health systems . . . [that is engaged with] policy coordination, normative guidance and pooling technical resources . . . [bringing]] together agencies in a framework that can allow them to retain their independence but gain from being in 'collaboration' . . . [sharing] information, [giving] better visibility to all parties, and an affirmation of a strategic role in a wider landscape of institutional actors.

Building on their definition, we see a central role of apex coordination that can enable benchmarking and cross-learning in Health Footprints. We support the identification of an apex coordinating organization (or the de novo creation of such an organization) tasked with would oversee the standardized assessment of disease and risk-factor burden, building on a range of currently available tools such as those shown in Table 3.

Furthermore, the apex coordinating organization could set standards for data related to Health Footprints, as with the World Wide Web Consortium established in 1996 to maintain standards for the Internet.[13] Furthermore, the organization could maintain an ethical code related to Health Footprints building on conventions such as the U.S. Health Insurance Portability and Accountability Act,[14] the

[13]See http://en.wikipedia.org/wiki/World_Wide_Web_Consortium.
[14]See http://en.wikipedia.org/wiki/Hipaa.

Table 3. Example tools for disease and risk factor burden assessment

Number	Name	Level	Owner
1	Global Burden of Disease	• Population	World Health Organization
2	Millennium Development Goals	• Population	United Nations
3	Stiglitz-Sen-Fitoussi Report	• Population	International Commission on Measurement of Economic Performance and Social Progress
4	Chronic Disease Model	• Population	National Institute for Public Health and the Environment of the Netherlands
5	Global Competitiveness Index	• Population • Group	World Economic Forum
6	Wellness App	• Group (employer)	World Economic Forum Wellness Alliance for Workplace Health

Caldicott Principles,[15] the Helsinki Accords,[16] and the Nuremburg Code.[17] Last, the organization will collate data on effectiveness and help disseminate best practice.

Regularly published data will help display the health and well-being of populations, helping drive better solutions for sustainable health and development, and helping position health and well-being as central and crucial to human, business, and social capital development. Combined with cost modeling at population level, they help iteratively remind government of the current and projected economic burden of chronic diseases (which threatens to crowd out essential monies for other critical global issues), and ensure that the true value that people place on good health and well-being is fully recognized.

In addition, countries and groups will develop their own local program data. Such local data will be self-reported by a municipality or community, a business, a producer or service provider and an individual. Local programs will be flexible with Health Footprints developed in partnership with stakeholders to ensure endorsement and buy-in. Monitoring and evaluation will include process as well as outcome indicators; these will be relevant across a range of sectors, levels and sizes, including large businesses and small and medium enterprises. Where necessary, selective and periodic auditing of data will ensure the integrity of local results, particularly where there is a significant reputational or financial effect of performance.

With a clear incentive to drive national and local change, countries and groups will find innovative ways to determine the negative effect of products and industries. Following the example of cities that took a lead in food labeling (such as New York),

[15]See http://en.wikipedia.org/wiki/Caldicott_principles#Caldicott_principles.
[16]See http://en.wikipedia.org/wiki/Helsinki_Accords.
[17]See http://en.wikipedia.org/wiki/Nuremberg_Code.

they will impose specific Health Footprints, on products and industries that harm health.

Government, private sector, and civil sector entities should collaborate to implement the framework; local adaptation will help ensure effect, while harmonization will help facilitate benchmarking and iterative learning. The World Health Organization might be well-positioned to play such an apex coordinating role.

Ethics

In more naïve forms, behavior change is a common strand of human history. In different ways, the emergence of economic systems, the social effect of the Industrial Revolution, the emergence of Psychology as a scientific discipline, and the effect of mass media have progressively increased the capacity for directed behavior change. Now, faced with global challenges such as climate change and obesity, and with ubiquitous computing and mobile communications, we stand on the verge of delivering more powerful behavior change, what we might term *directed adaptation*. While such programs offer the potential to improve health and well-being, and to help tackle vast and urgent challenges, the ethics of behavior intervention need to be discussed in detail and clear rules agreed.

Reliable behavior change has potential for misuse, across commercial marketing and politics. In addition, countries, groups, and individuals will have different preferences, and careful consideration must be given to program design, including whether consumers opt-in to or opt-out from a program. The apex coordinating organization should convene a suitable group to agree and periodically review such ethical rules for Health Footprints.

Conclusions and Next Steps

We believe that Health Footprints represent a model for integrating the evidence on burden of disease and insights about the drivers of consumer behavior to generate practical tools for affirmative action on NCDs. By channeling the evidence of health into consumer decision making, Health Footprints offer a flexible framework that addresses the root of the NCD epidemic—the everyday assessments of utility by consumers.

Apex coordination and continuous improvement will create an ever-strengthening toolkit of Health Footprints. In turn, effective Health Footprints will drive the demand for healthier products and services in key markets (e.g., food, beverage), creating an industry incentive to innovate to promote well-being; a practical example today is the effect of standard health labeling on the food and beverage industry. Acting over time, such market forces will be powerful drivers of change. Early adopters in key industries will capitalize on the opportunities and accelerate innovation.

Ultimately national governments are best able to drive scalable change, because they can deploy the full range of approaches shown in Table 2. Certain countries will take a lead in the development of Health Footprints while others will be more cautious. An early innovator in this space is Abu Dhabi in the United Arab Emirates, which is already driving a program called Weqaya.

To date, the Abu Dhabi Weqaya program has screened around 95% of adult Emiratis for cardiovascular risk, and provided a personal health report to each.

An online portal (www.weqaya.ae) allows consumers to view their health status, and it provides personalized health advice, including nutrition, exercise, and tobacco cessation. In line with the Health Footprint principles described in this article, in 2011 Weqaya will incorporate mobile devices, helping strengthen point of decision prompts for consumers; in addition, a range of policy-level and economic interventions will strengthen the feedback to consumers of the health effect of their choices. In Abu Dhabi, discussions have already begun with industry to drive supply-side innovation (healthier products and services) in parallel with the demand-side effect of the Weqaya program; these are both early examples of Health Footprints.

With the catalytic effect of effective apex coordination, programs such as those in Abu Dhabi could provide a template for affirmative action on NCDs in other countries.

References

Anderson, P., Amaral-Sadabini, Baumberg, B., Jarl, J., & Stuckler, D. (2011). Communicating alcohol narratives: Creating a healthier relationship with alcohol. *Journal of Health Communication*, *16*(S2), 27–36.

Bradford, W. D., & Dolan, P. (2010). Getting used to it: The adaptive global utility model. *Journal of Health Economics*, *29*, 811–820.

Brownell, K. D., & Frieden, T. R. (2009). Ounces of prevention—The public policy case for taxes on sugared beverages. *New England Journal of Medicine*, *260*, 1–4.

Chow, C. K., Lock, K., Teo, K., Subramanian, S. V., McKee, M., & Yusuf, S. (2009). Environmental and societal influences acting on cardiovascular risk factors and disease at a population level: A review. *International Journal of Epidemiology*, *38*, 1595–1498.

Christakis, N. A., & Fowler, J. H. (2007). The spread of obesity in a large social network over 32 years. *New England Journal of Medicine*, *357*, 370–379.

Christakis, N. A., & Fowler, J. H. (2008). The collective dynamics of smoking in a large social network. *New England Journal of Medicine*, *358*, 2249–2258.

Corneo, G., & Jeanne, O. (2005). *A theory of symbolic values, with an application to economic development*. Retrieved June 6, 2011, from http://www.socialpolitik.de/tagungshps/2005/Papers/Corneo.pdf

Daar, A. S., Singer, P. A., Persad, D. L., Pramming, S. K., Matthews, D. R., Beaglehole, R., et al. (2007). Grand challenges in non-communicable disease. *Nature*, *22*, 494–496.

Department of Health, United Kingdom. (2004). *Choosing health: Making healthy choices easier*. London: Author.

Diliberti, N., Bordi, P. L., Conklin, M. T., Roe, S. L., & Rolls, B. J. (2004). Increased portion size leads to increased energy intake in a restaurant meal. *Obesity Research*, *12*, 562–568.

Dolan, P., Hallsworth, M., Halpern, D., King, D., & Vlaev, I. (2010). *Mindspace: Influencing behaviour through public policy*. London: UK Cabinet Office: Institute for Government. Retrieved June 6, 2011, from http://www.instituteforgovernment.org.uk/content/133/mindspace-influencing-behaviour-through-public-policy

Epstein, L. H., Dearing, K. K., Roba, L. G., & Finkelstein, E. (2010). The influence of taxes and subsidies on energy purchased in an experimental purchasing study. *Psychological Science*, *21*, 406–414.

Eysenbach, G., Powell, J., Englesakis, M., Rizo, C., & Stern, A. (2004). Health related virtual communities and electronic support groups: Systematic review of the effects of online peer to peer interactions. *BMJ*, *328*, 1166–1171.

Finkelstein, E. A., Ruhm, C. J., & Kosa, M. K. (2005). Economic causes and consequences of obesity. *Annual Review of Public Health*, *26*, 239–257.

Finkelstein, E. A., Trogdon, J. G., Cohen, J. W., & Dietz, W. (2009). Annual medical spending attributable to obesity: Payer-and service-specific estimates. *Health Affairs*, *28*, w822–w831.

Fuster, V., & Kelly, B. (Eds.), (2010). *Promoting cardiovascular health in the developing world: A critical challenge to achieving global health*. Washington, DC: Institute of Medicine. Retrieved June 6, 2011, from http://www.nap.edu/catalog/12815.html

Gruber, J., & Koszegi, B. (2008). *A modern economic view of tobacco taxation*. Paris: International Union Against Tuberculosis and Lung Disease.

Hajat, C., & Harrison, O. (2010). The Abu Dhabi Cardiovascular Program: The continuation of Framingham. *Progress in Cardiovascular Diseases*, *53*, 28–38.

Heeks, R. (2008). ICT4D 2.0: The next phase of applying ICT for international development. *IEEE Computer*, *41*(6), 26–33.

Lenoir, M., Serre, F., Cantin, L., & Ahmed, S. H. (2007). Intense sweetness surpasses cocaine reward. *PLoS ONE*, *2*, e698.

Martin-Moreno, J. M., Apfel, F., Alfonso-Sanchez, J. L., Galea, G., & Jakab, Z. (2011). The social nature of chronic noncommunicable diseases (NCDs) and how to tackle them through communication technology, training, and outreach. *Journal of Health Communication*, *16*(S2), 94–106.

Mas-Coleill, A., Whinston, M. D., & Green, J. R. (1996). *Microeconomic theory*. New York: Oxford University Press.

Metcalf, G. E., & Weisbach, D. (2009). The design of a carbon tax. *Harvard Environmental Law Review*, *33*, 500–556.

Nishtar, S., & Jané-Llopis, E. (2011). A global coordinating platform for noncommunicable diseases. *Journal of Health Communication*, *16*(S2), 201–205.

Peppard, P. E., Kindig, D. A., Dranger, E., Jovaag, A., & Remington, P. L. (2008). Ranking community health status to stimulate discussion of local public health issues: The Wisconsin County health rankings. *American Journal of Public Health*, *98*, 209–212.

Post, S. G. (Ed.), (2007). *Altruism and health: Perspectives from empirical research*. New York: Oxford University Press.

Ratzan, S., & Gilhooly, D. (2010). *Innovative use of mobile phones and related information technologies.* Background Paper for the Global Strategy for Women's and Children's Health: Investing in Our Common Future, United Nations, New York, NY, July.

Robson, A. J. (2001). The biological basis of economic behavior. *Journal of Economic Literature*, *39*, 11–33.

Sanfey, A. G., Loewenstein, G., McClure, S. M., & Cohen, J. D. (2006). Neuroeconomics: Cross-currents in research on decision-making. *Trends in Cognitive Sciences*, *10*, 108–116.

Thaler, R. (1981). Some empirical evidence on dynamic inconsistency. *Economics Letters*, *8*, 201–201.

Thaler, R., & Sunstein, C. (2008). *Nudge: Improving decisions about health, wealth and happiness*. New Haven, CT: Yale University Press.

United Nations. (2010, April). *United Nations General Assembly Resolution A/RES/64/265 on the Prevention and Control of Noncommunicable Diseases contained in document A/64/L.52*. Retrieved June 6, 2010, from http://www.un.org/ga/search/view_doc.asp?symbol=A%2F64%2FL.52&Submit=Search&Lang=E

Vartiainen, E., Laatikainen, T., Peltonen, M., Juolevi, A., Männistö, S., Sundvall, J., et al. (2010). Thirty-five-year trends in cardiovascular risk factors in Finland. *International Journal of Epidemiology*, *39*, 504–518.

World Economic Forum. (2010). *Global Risks 2010*. Geneva, Switzerland: Author.

World Health Organization. (2008). *2008–2013 Action Plan for the Global Strategy for the Prevention and Control of Noncommunicable Diseases*. Geneva, Switzerland: Author.

World Health Organization. (2009). *Global health risks: Mortality and burden of disease attributable to selected major risks*. Geneva, Switzerland: Author. Retrieved from http://www.who.int/healthinfo/global_burden_disease/GlobalHealthRisks_report_full.pdf