Digitized Health Promotion: Personal Responsibility for Health in the Web 2.0 Era

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Abstract

The new apparatus of what is often termed 'digital health' (and also 'Health 2.0', 'Medicine 2.0', eHealth' or 'mHealth'), a conglomeration of new digital technologies addressed at delivering healthcare, preventive medicine and health promotion, has facilitated a focus on measuring and monitoring the functions and activities of lay people's bodies and encouraging self-care among patients with chronic diseases. It is upon this new approach to identifying and preventing ill health and disease that this working paper focuses. While the digital health approach to the body and health spans the arc from patient care to public health surveillance techniques, the discussion here largely is directed at the implications for the digital health 'revolution' in relation to the practice of health promotion; or what I refer to as 'digitized health promotion'. It is argued that despite concerted efforts on the part of those advocating for a less individualistic approach to health promotion since the 1970s and drawing attention to the social determinants of health, digital health technologies as they are advocated for promoting health represent a renewed focus on personal responsibility for health. In the discourses and practices of digitized health promotion, health risks have become increasingly individualized and viewed as manageable and controllable as long as lay people adopt the appropriate technologies to engage in self-monitoring and self-care. With the advent of the big data produced by digital technologies and the use of sophisticated algorithms to manipulate these data, it has become ever more convenient to focus attention on personal responsibility for health states. The digitalized health promotion phenomenon, therefore, operates as one dimension of the progressive withdrawal of the state in many developed countries from attempting to challenge the social and economic factors causing ill health and disease and efforts to promote social justice.

Introduction

Since the early years of the twenty-first century, governments in many countries have been faced with harsh economic challenges. One way in which they have sought to deal with these challenges is by introducing the use of the new digital technologies facilitated by Web 2.0 into the healthcare and public health arenas. The new apparatus of what is often termed 'digital health' (and also 'Health 2.0', 'Medicine 2.0', 'eHealth' or 'mHealth'), a conglomeration of new digital technologies addressed at delivering healthcare, preventive medicine and health promotion, has facilitated a focus on measuring and monitoring the functions and activities of lay people's bodies and encouraging self-care among patients with chronic diseases. Digital health technologies are becoming used across a range of contexts, including the following: telemedicine/telehealth, or using digital devices to monitor patients' health status and treatment remotely and to promote self-care; employing digital media and tools to track and respond to disease outbreaks; electronic medical records; and health promotion activities via such technologies as text messaging, gamification, self-tracking tools and health apps.

There are strong and clear overlaps of the discourses and practices of digital health initiatives in the healthcare arena with those in public health. Many of these initiatives as applied to health and disease focus on notions of the importance of members of the lay public 'engaging' in their own health care or preventive health endeavours. They represent digital technologies as offering the answers to significant fiscal and health-related problems. Discourses on digital health also emphasize the importance of the big data that are generated from digital technology use, representing this new type of data as offering the opportunity to improve most areas of healthcare and public health.

This working paper focuses in particular on the digital health phenomenon as it has been taken up in health promotion endeavours; or what I will refer to here as 'digitized health promotion'. The discussion sites digitalized health promotion as the latest stage in the trajectory of health promotion ideology and practice over the past four decades. I argue that over this period, the individualistic approach has been challenged and replaced by a focus on social justice and social epidemiology, which in turn has begun to be supplanted by a return to emphasizing personal responsibility for health as straitened economic circumstances and the possibilities generated by emergence of new technologies have converged to champion digitalized health promotion.

Health promotion: from individual responsibility to social determinants of health and back again

Public health and health promotion have always had to grapple with balancing the rights of the individual over those of the public: for example, in relation to legislation and public policy directed at such matters as quarantine, alcohol, cigarette smoking and

seat-belt wearing. Understandings of how people become ill and what they should do to avoid illness, disease and early death have fluctuated significantly over the past half-century. As part of a newly politicized approach to health and healthcare underpinned by Marxist and other political economy critiques of social inequalities and injustices, various movements and activist endeavours emerged in the 1970s in response to what was viewed as 'healthist' discourses: that is, those privileging good health over other priorities in life. Instead of what was positioned as a focus on personal responsibility for protecting and maintaining good health, advocates argued for redirecting attention at the social determinants of health: the social, cultural and economic underpinnings that influenced patterns of illness and disease across the community. Consumer health movements developed, seeing to challenge what was viewed as medical hegemony, or the medical profession's control over health knowledges and healthcare, and medicalization, the term used to describe the apparent encroachment of medicine into a growing number of spheres of everyday life (Lupton 1997, 2012c). What was termed 'the new public health' emerged as a means of focusing attention on the social structural causes of ill health and disease and engaging members of the community in participating in preventive health endeavours (Petersen and Lupton 1996).

In the 1970s, perspectives on health promotion and public health began to change in line with the new social movements that were highlighting social justice and inequality issues. Radical writers adopting a political economic critique were identifying the onus on individuals and the privileging of good health that was a central to health promotion activities. Robert Crawford (1977) referred to the 'victim-blaming' tendencies of health promotion and preventive medicine despite general awareness of the social and environmental determinants of disease in medicine. In later work Crawford (1980) commented on what he termed 'healthism', or the representation of good health as a priority, and the tendency in health promotion to expect individuals to adopt this priority and change their lifestyles accordingly. Writers in public health policy during this time were directing attention at identifying the social determinants of health, and attempting to develop policies that would move away from victim-blaming and healthism to a focus on improving the broader structural socioeconomic disadvantages that contributed to poor health outcomes (Raphael 2008, 2011). These included the Health for All by the Year 2000 Alma Alta Declaration by the World Health Organization in 1978, which called for social justice to be an integral part of public health policy and action (Baum 2008).

The term 'social epidemiology' began to be used in the early 1990s to denote research directed at the health of populations as opposed to the health of individuals. This change in focus highlighted the notion that social groups, taken as a whole, could be considered 'healthy' or 'unhealthy' as a result of social determinants of health. Social epidemiologists directed attention at the social and economic contexts in which defined groups lived. Unlike traditional epidemiology, which emerged from medical approaches to studying patterns, causes and effects of ill health and disease in populations, social epidemiology was strongly influenced by sociological, political science, social geographical and anthropological perspectives (Kawachi 2002, Krieger 2001, 2007).

While epidemiology focuses on risk factors such as infectious disease-causing agents or individual behaviours, such as tobacco or alcohol consumption, social epidemiology investigates such factors as geographical location, race and ethnicity, gender, sexual identity, living conditions, social discrimination, stress and income and their effects on health.

Central to the social epidemiology approach is the notion that the social and economic conditions in which people live are expressed materially in the corporeal body. As one of the foremost proponents of social epidemiology, Nancy Krieger, put it, social epidemiology addressed itself to 'illuminating intimate links between our bodies and the body politic' (2001: 693). From this perspective, the concepts of 'lifestyle' and 'risk' are broadened from the notion of the choices that individuals make in the conduct of their everyday lives to the conditions in which these choices are available (or not).

The social epidemiology perspective again drew on a political economy approach in critiquing mainstream approaches to health promotion. Also in the 1990s, other writers critiquing public health often adopted a Foucauldian governmentality perspective to highlight the ways in which health-related behaviours were positioned as part of the government of the self in neoliberal political contexts, thus drawing attention away from the role of state agencies in supporting health promotion and alleviating the reasons for people's ill health (Coveney 1998, Lupton 1995, 1999, Petersen and Lupton 1996). Into the 2000s, this perspective continues to constitute a dominant critique of public health and its role in configuring concepts of bodies, health and selves (Ayo 2011, Crawshaw 2012, 2013, Fullagar 2003, 2008, Gagnon *et al.* 2010). This critique has been particularly directed at the ways in which governments have sought to manage the 'obesity epidemic' by inciting individuals to view their body weight as subject to self-control and self-discipline (LeBesco 2011, Lupton 2012a, in press-b, Warin 2011, Wright and Gard 2005).

In the early years of the twenty-first century, influential organizations such as the World Health Organization have continued to champion a focus on social justice and alleviating social and economic inequalities in their policies on public health (Baum 2008). In the neoliberal political systems that currently dominate developed countries, however, and particularly in Anglophone countries such as the USA, the UK, Australian, New Zealand and Canada, the more reformist and politically activist approach of public health tends to be neglected for a focus on individuals' personal responsibility for managing their behaviours, regardless of their life circumstances (Ayo 2011, Raphael 2013). The role that governments are able to play in ameliorating the living conditions of those 'at risk' of ill health and disease tends to be diverted to funding social marketing campaigns exhorting people to change their behaviour (Crawshaw 2012, 2013, Gagnon *et al.* 2010, Goldberg 2012, Lupton 1995, in press-b, Raphael 2011) or seeking medical solutions to public health problems (Baum 2008). Health promotion programs have been subjected to cuts or downsizing in an economic context in which other public health approaches have been prioritized: particularly those that appear to offer short-term savings for governments (Sparks 2013).

While the rhetoric of public health policy has continually focused on the importance of identifying the social and economic determinants of health and alleviating those that are inequitable, in practice these inequalities have been little redressed (Raphael 2011, 2013). This has led to a paradoxical stance taken by many departments of health and those who work in them in developed countries, in which public acknowledgement of the strong link between socioeconomic disadvantage and ill health and disease is combined with a renewed emphasis on lifestyle change and a continued victim-blaming approach (Ayo 2011, Crawshaw 2013, Goldberg 2012, Lupton in press-b, Raphael 2013).

The rise of digital health technologies

In the context of the post-global financial crisis era and the austerity measures that have been introduced in many developed countries in response, the focus of governments on managing and governing health via the individual actions of their citizens has intensified even further (De Vogli 2011). It is into this space that the governmental apparatus of digital health has been generated. The twin incentives of 'better health outcomes' and 'lower health costs' (Dentzer 2013: 202) are driving the current enthusiasm for lay people to engage with digital technologies as part of taking responsibility for their health status and healthcare (Mort *et al.* 2009, Oudshoorn 2011), particularly in relation to increasingly ageing populations in developed countries (Mort *et al.* 2012).

Enthusiastic statements are constantly made in the medical and public health literature about the potential for the new digital technologies to 'engage' or 'activate' lay people to manage their own health and learn more about their bodies' functions and activities; or, as I have termed it, to become the ideal 'digitally engaged patient' (Lupton in press-a). In this literature, digital health technologies are positioned as contributing to lay people effectively becoming the 'managers' of their own health and healthcare (see, for example, Greene and Hibbard 2012). The terms 'disruptive' and 'destructive' are employed by some writers to suggest that a new paradigm of medical care, preventive medicine and health promotion is emerging as a result of digital health (see, for example, Swan 2012a, Topol 2012).

Contemporary digital devices such as smartphones, iPods and tablet computers now allow for ubiquitous computing and are increasingly connected to each other as part of the Internet of Things (Miorandi *et al.* 2012). These devices' portability and ability to connect to the internet almost anywhere and the opportunity to connect them wirelessly to technologies embedded with sensors that can constantly monitor bodily functions and activities, as well as their ability to converge with each other and readily exchange data and for sophisticated algorithms to be used to process and interpret the data that are collected, are all viewed as central dimensions of the digital health phenomenon (Swan 2009, 2012b). The affordances of Web 2.0 technologies mark a major departure from earlier Web 1.0 technologies such as websites that encouraged far less participation, largely conveying information to passive recipients. Users of the

newer digital technologies can contribute to or comment on blogs and online news items and upload data to social media sites such as Twitter, Facebook and Instagram. They are thus able to be both the consumers and the producers of digital content, as suggested in the word 'prosumption' that is now frequently used to describe this phenomenon of users' active engagement with digital media (Beer and Burrows 2010, Ritzer *et al.* 2012)

These mobile digital devices and related software and the Web 2.0 platforms to which they connect offer not only ready access to or provision of medical and health information on the internet but also new ways of monitoring and measuring the human body. They are able to produce detailed biometric data that may be collected by individuals and then easily shared with others. Thousands of health-related apps for mobile digital devices have been developed to assist users in tracking their bodily functions and activities. Due to the increasing trend of embedding tiny digital sensors and microprocessors into everyday objects that are then able to transmit the data they collect wirelessly to other digital devices, apps and platforms, increasingly greater amounts of data on many aspects of the human body's movements, geographical location and physical function may be collected and analysed (Swan 2012b). There are a range of digital products currently on the market that can be worn upon the body for self-tracking biometric data. Such body functions and indicators as blood glucose, body temperature, breathing rate, blood chemistry readings and even brain activity can all be monitored using portable wearable and internal sensors that have been embedded into devices that can be worn upon the body, woven into clothing or laminated onto ultrathin skin interfaces.

Wearable devices that are currently available include a rubber wristband, the Jawbone Up, which is fitted with tiny motion sensors which can track how much the user is walking and sleeping, working with an iPhone app to upload the data collected. Together with other technologies, the Up app can keep a record of meals eaten (using photographs of the food), calories burned and hours slept as well as physical activities completed, and the latter data can be graphed and compared with other users of the app for those who are competitive. The bracelet can be programmed to buzz silently at various periods throughout the day to remind its wearer to move. The developers of the device note that it uses algorithms to '[d]iscover hidden connections and patterns in your day-to-day activities' that will 'deliver insights that keep you moving forward' (*Up by Jawbone* 2013). Sports watches can be purchased which are worn during walking or running to record heart rate, time, distance, pace and calories burned, which data can then be uploaded to a computer. The Wakemate, another bracelet worn during sleep, uses sensors to monitor the wearer's sleep cycles and then chooses the best time to wake the wearer when they have entered a light sleep mode and provides detailed metrics on body movement during sleep to demonstrate how much deep, restful sleep was obtained.

Many of these apps and devices are used voluntarily by people as part of self-tracking their health, exercise and consumption habits (Lupton 2013d). However as part of digitized health promotion, digital health technologies are increasingly

championed in the health promotion and preventive medicine literature as offering unprecedented opportunities to reach target groups with tailored messages, to encourage members of these groups to engage in self-monitoring of their health-related behaviours and to both track individuals and collect mass data on these behaviours for use in monitoring populations. In the notion of 'personalized preventive medicine' the concepts of medicine and health promotion meet. The 'personalized' aspect of this approach focuses on collecting as much data as possible about individuals and their health states, everyday habits and the social and geographical environment in which they live: their 'personal health informatics' as one article puts it (Swan 2012a).

Many articles have recently appeared in the health promotional and preventive medicine literature discussing the possibilities of using digital technologies for health promotion (for example, Abroms *et al.* 2011, Kaplan and Stone 2013, Korda and Itani 2013, Lefebvre 2009, Stevens and Bryan 2012, Swan 2009, 2012a). Such strategies as tweeting or texting people with reminders to exercise, forgo smoking, wash their hands, limit their alcohol use, attend a screening test, immunize their children or practice safer sex and apps and designated Facebook pages related to specific public health campaigns or health behaviours have been proposed as ways of reaching target groups via mobile digital devices and social media platforms.

As such, digital technologies are presented as conduits for conveying health information that have the potential to far exceed the relatively blunt instrument of the social marketing campaign. What are sometimes described as 'digital interventions' are represented as far more specifically targeted and individualized, acting as proxy health coaches by offering motivation, support and feedback and reaching ever further into people's everyday lives (Chou *et al.* 2013, Cugelman 2012). Instead of the 'one-way' media traditionally used as part of social marketing health campaigns, such as advertisements and brochures, digital technologies such as social media are represented as facilitating 'engagement' of and fostering 'partnerships' with members of the public if used strategically (Coiera 2013). Writers in health promotion now frequently make reference to linking health-preventive strategies using digital health devices with encouraging members of targeted 'risk groups' to become responsible for promoting their own health.

Corporate organizations as well as government agencies have entered the digital health market. The American giant retailer chain Wal-Mart now provides interactive, self-service health kiosks, encouraging shoppers to check their eyesight, weight, body mass index and blood pressure and access health-related information (as well as showing advertisements for related products stocked by Wal-Mart which can be targeted to users based on their responses). In the UK, the National Health Service (NHS) has developed an initiative to fund libraries, community centres and pubs to act as 'digital health hubs'. These are designed to provide training and support for people to learn about accessing health and medical information online and use websites such as NHS Choices, which offers free health-related apps to download and information and advice on a range of conditions, online patient support communities and healthcare services. As the title of the website suggests, the focus is on supporting lay people to

make 'choices' about their health and healthcare, so as to 'put you in control of your healthcare' (*NHS Choices* 2013).

Digitizing the body

Medical technologies have increasingly played a role in how contemporary individuals experience and think about their bodies. Human bodies now interact with a vast number of technologies on a daily basis which are designed to change, extend or enhance their physical capacities and capabilities. In the era of digital health, these technologies are increasingly able to monitor and measure bodily capabilities, functions and behaviours and to produce data that may be used to construct concepts of health, illness, self-care and personal responsibility. Now that computers are wearable upon and can even be inserted into the body and are used as part of medical care and preventive health strategies, a new set of possibilities and limitations have been generated in relation to the ways that we think about and use these technologies.

Despite the representation of such technologies as inert, neutral objects participating in the collection of data in the interests of health promotion and medical self-care, from a critical sociological perspective such objects may be viewed as actively shaping the subjects/bodies of those who use them (Lupton 2012b, 2013b, 2013d, in press-a). Several writers in the sociology of science and technology have pointed out to the mythology of control that underpins discourses on technology in the medical and healthcare arenas. They highlight the messiness of technologies, their changing meanings, their situated functions in space and place, as well as their contribution to concepts of selfhood and the body. These scholars emphasize that technologies discipline and order bodies in certain ways, just as bodies discipline and order technologies. They are not politically neutral, but rather are implicated in a dense web of power relations (Casper and Morrison 2010, Haraway 1991, Mol 2002, Mort *et al.* 2009, Mort *et al.* 2012, Waldby 2000).

In the age of 'informational medicine' (Nettleton 2004), both the human body and medicine tend to be represented in terms of information processing and mechanical systems (Chrysanthou 2002, Haraway 1991, Lupton 2012c). Using medical and other technologies to peer inside the body is part of a mentality that assumes that more information about the body is always better. Testing and screening technologies offer the opportunity to look inside the body and identify health risks before they pose a serious threat. They have become increasingly used in preventive medicine as part of a wider move in medical care towards the use of technology (Coughlan 2006). Calculations of risk using these technologies appear to be scientific, and therefore reliable (Lupton 1995).

Writing before the advent of sensor-embedded wearable digital devices, Chrysanthou (2002: 470) commented on the 'fantasy of bodily perfection through information' that has become prominent in developed societies. He argued that the medicalized information society had generated a new form of embodiment that represented the body as transparent and as controllable and perfectible through the

gathering and judicious use of information. Chrysanthou referred to such technologies as self-screening and home-based diagnostic kits that are available at pharmacies or by mail order as examples of an increasing interest in self-monitoring for health purposes.

A mere decade later, digital technologies provide a bewildering array of devices by which the body can be visualized, documented, tested and monitored in ever-finer detail. The techno-utopianism that has pervaded medicine and healthcare has now given way to digital utopianism across a range of governmental and commercial enterprises. Lay people have been urged to use these technologies to 'digitize their bodies' in the interests of achieving better knowledge of what lies within (Topol 2012). Discourses on 'digitizing the body' as part of the project of self-monitoring take up the ideal of the transparent body. While people have been able to monitor and measure aspects of their bodies and selves using non-digital technologies for centuries, digital devices have facilitated the ever more detailed measurement and monitoring of the body and everyday life. As noted earlier, many self-tracking devices, particularly those that are wearable, such as adhesive skin patches, wristbands and headbands, allow for tracking of the body throughout the day (and night).

It is here that 'small data', or the conglomeration of data about themselves that people can bring together via interactions on and monitoring by digital devices, become represented as important. These small data are represented as providing unique insights into the self and the body (Heussner 2013), including identifying illness via biometrics and algorithms before the individual begins to feel ill. As one advocate of self-tracking bodily functions put it:

> An advantage of putting numbers of aspects of our bodies is that we don't always know what's going on. We don't feel certain things – like the early onset of illnesses, for example – but there are metrics and biomarkers that can tell us they're happening … I really do believe that the more mystery we can take out of understanding the body the better (Christensen 2013: no page number given).

There is a dualism here between knowing our bodies 'subjectively' from the inside, as in relying on self-awareness of one's physical wellbeing and state of health, and knowing them 'objectively' from the outside, as enacted by medical or digital monitoring technologies (Lupton 2012b, Mol and Law 2004). The implication of such statements is that the haptic sensations we feel from experiencing and living our bodies are no longer reliable or detailed enough to provide adequate knowledge of our health. We require digital technologies to perform a monitoring function that are bodies are unable to achieve alone.

Surveillant assemblages and self-monitoring

Digital surveillance technologies have proliferated in recent times. From the ubiquitous closed-circuit television camera to government agencies' databases, internet 'cookies' and shopping loyalty cards, such technologies allow the continual and routine collection

of data on such aspects as people's movements in public space, their use of government services and their purchasing and internet browsing habits (Best 2010, Lyon 2010, Ruppert 2012). Many of these surveillance technologies are 'top-down' and hidden, imposed upon the bodies they monitor often without their knowledge or consent. The development of digital devices with embedded sensors able to detect bodily functions and movements has contributed to an innovative approach to the surveillance of bodies that works from inside the body outwards. While surveillance cameras observe bodily movements in space, body sensor technologies surveill the body from the inside and transmit data to outside devices for interpretation and visualization. In so doing, the transparent body becomes a 'data double' (Elmer 2003) of the fleshly body, a collection of data that may be drawn from a variety of sources and reassembled in different ways to suit various purposes.

Drawing principally upon Foucault's work on biopolitics and the disciplinary and normalizing functions of the medical gaze, sociologists have written about the surveillance strategies that operate in the context of the clinic and the medical encounter (Armstrong 1995, Lupton 1997, 2012c). However the new practices of self-monitoring engendered by digital technologies go beyond the hierarchical panoptic approach developed in Foucauldian theories of disciplinary surveillance techniques in what has been termed a 'post-panoptic' society (Adams 2012). Technologies such as mobile self-tracking devices allow users to collect data on themselves in unprecedented quantities and unprecedented detail. The potential for self-monitoring offered by mobile digital devices therefore configures a different kind of surveillance that is voluntary rather than imposed, visible rather than hidden (Lupton 2012b, Rich and Miah 2009).

Rather than a small number of hidden observers watching and monitoring a large number of others, as the Foucauldian metaphor of the panopticon has it, the new digital technologies directed at promoting health often depend on individuals' turning the gaze upon themselves, and then inviting others to participate in their own surveillance by sharing the data (Lupton 2012b). This is a version of the synopticon model of surveillance, where instead of 'the few watching the many', the 'many are watching the few' (Doyle 2011). Indeed people interacting with each other on social media are watching each other, as more and more personal information is uploaded and shared on these sites and comments (or likes, or followers) are invited. It has been argued that participation in social media contributes to a 'confessional society' (Beer 2008) and a culture of sharing (John 2013), in which it is expected that intimate and mundane aspects of one's life are constantly shared with others, including those that may previously have been kept private.

Given the possibilities that are afforded by these technologies, it has been argued that the Deleuzian concept of 'surveillant assemblages' might be a better alternative to the panoptic gaze (Haggerty and Ericson 2000), as it acknowledges the mutually constitutive nature of selves/bodies/data/technologies, their constantly mutable form and the participatory nature of surveillance (Best 2010). In relation to digital health technologies, surveillant assemblages include those that are configured when people

use technologies to engage in self-care or self-monitoring practices that involve wearing or inserting digital devices upon their bodies. As part of the neoliberal requirements of lay person/patient 'engagement', these surveillant assemblages are ideally configured voluntarily, as lay people judge their participation in self-surveillance as being in their own best interests. They are seeking to monitor their own bodies as part of their own choices about how to achieve good health and physical fitness and make their own decisions about who will be given access to the information they collect via these devices.

Despite the rhetoric of participatory surveillance that tends to be expressed in discourses on digitized health promotion, users of digital devices do not always have full control over the data that are generated or indeed free choice about whether or not to use these technologies. There are moves in some sectors to employ digital devices in a more imposed manner. In the USA, for example, some insurance companies have started attempts to 'incentivize' clients who are designated as obese to lose weight by using sensor devices such as pedometers as part of 'wellness programs'. Such individuals are informed that unless they lose weight they face significant increase in their insurance premiums. One method to lose weight that they are offered is engagement in an online walking program, in which their daily steps are monitored by digital pedometers that upload data to a website monitored by the health insurance company. Not surprisingly, an evaluation of one such program found that while the financial 'incentive' did result in most people meeting the number of steps required to avoid higher payments, a significant proportion (one-third) of participants found the strategy coercive (Zulman *et al.* 2013).

As many employers fund health insurance in the US, workplace wellness programs have begun to be employed as a means of employers reducing their costs, some of which are mandatory. These programs also often use financial incentives or disincentives in their attempt to encourage employees to engage in health-promoting behaviours. Some companies have begun encouraging their employees to use mobile or wearable digital self-tracking devices to measure their sleep, diet and exercise habits and to upload these data to the company's website, as well as using other digital tracking to monitor employees' performance while working to measure worker productivity (Finley 2013). Some financially penalize those employees who have a high BMI or blood pressure or blood cholesterol levels that are deemed to be 'unhealthy' by the company. These actions have provoked questions about privacy and discrimination for employees who are identified as not 'responsible' enough in their preventive health efforts (Hendrix and Buck 2009, Mello and Rosenthal 2008).

Digitizing risk: the algorithm and big data

In discourses on digital health, much emphasis is placed on the role played by the big data accumulated from people's interactions with digital technologies in providing knowledge about healthcare services and providers. It is contended that, whether accumulated as by-products of people's use of websites or apps, entered as part of

electronic medical records or more deliberately produced as part of lay people's prosumption activities on social media sites, the reams of data that are generated across many thousands of users offer the potential for new ways of mobilizing health promotion (Coiera 2013, Murdoch and Detsky 2013, Swan 2012a).

Self-tracking digital devices produce data on everyday habits across their thousands of users when these data are uploaded to the associated websites. A growing number of patient experience and opinion platforms have been developed to 'crowdsource' data about medical treatments and infectious disease outbreaks (Lupton 2013a). In the growing digital data economy, companies have emerged that 'scrape' or harvest data from internet sites, including social media, for commercial purposes. This includes the data generated from self-tracking devices that are uploaded to the developer's website (Shahani 2012) and the comments that people make about their habits and health-related activities on social media sites (Lupton 2013a).

Big data and algorithms are now becoming central to digitized health promotion, both in gathering relevant data and generating predictive patterns. The terms 'infodemiology' and 'infoveillance' have become used in some quarters to describe the use of digital technologies to collect data about patterns of illness and disease from online sources such as social media and internet search engine terms. Various social media tools have been employed in public health efforts to disseminate information about health risks and disease outbreaks and to collect data on the incidence of illness and disease. For example, researchers have used Google to develop tracking systems for outbreaks of infectious diseases such as influenza by monitoring online queries and search terms (Pervaiz *et al.* 2012).

Digital calculations of risk are central to these efforts. In any attempt to educate the population about health as part of encouraging them to avoid certain ('unhealthy') behaviours and take up ('healthy') others, the concept of risk is employed. Certain groups are singled at as being 'at risk' and therefore requiring more intervention than other groups. Assessments of risk via quantitative methodologies have been an integral feature of public health strategies for decades. Populations are ranked and ordered using data from various datasets such as national and local health surveys, with certain 'risk groups' identified using this process. These risk groups are then targeted for special interventions in the attempt to persuade their members to change their behaviours to conform to expectations about preventive health and self-responsibility (Lupton 1995, Petersen and Lupton 1996).

The concepts of risk and 'at-risk groups' and the problematic of their calculation are also central to digitalized health promotion. In recent times, the big data sets generated from digital technologies have become a focal point for healthcare and public health authorities and policymakers. As noted earlier, such data sets, as well as the small data that are gathered from individuals using self-tracking digital devices to monitor their biometrics, are viewed as ways to calculate risk in ever-finer detail and to pinpoint health problems before they even begin to show physical signs. Calculations of risk are part of the apparatus and promise of digital devices and the algorithms used to

make sense of the data they produce. Digital technologies have become increasingly used as a tool for public health to identify 'at risk' individuals and groups.

Many apps and self-tracking digital devices are also directed at measuring bodily attributes and behaviours of their users and comparing these against a norm to generate risk calculations. For instance internet calculator sites have been instituted with online tools made available to members of the public to enter their own data and calculate their risk of developing diabetes or heart disease (Holmberg *et al.* 2012). Another example is the Ovuline (*Ovuline* 2013) digital platform and associated app for pregnant women . Members are encouraged to measure and monitor a wide range of bodily indicators and activities using a range of digital devices (exercise and sleep monitoring devices and digital scales, all of which can be purchased from the website) as well as entering other data into the database. Users are asked to upload the data they have collected using their devices or to manually enter data on their diet, exercise patterns, blood pressure, weight, mood, health state and sleep patterns. All of these data are combined to produce calculations (charts and an interactive timeline) that are used to advise on whether the pregnancy is conforming to norms in relation to diet and weight gain, to provide 'customized plans' to ensure that 'your unique pregnancy' is as healthy and normal as possible and to provide 'immediate alerts for health risks'.

In the data utopian discourse on the possibilities and potential of big data, metricisation and algorithmic calculation for healthcare, there is little room for acknowledgement that data themselves and the algorithms that interpret them and make predictions based on them are social actants rather than a neutral, objective source of knowledge. As a growing number of social analyses of digital data have pointed out in the face of all the glorification of these data in both the popular media and in expert forums, digital data, like any other source of information, whether 'big' or 'small', are social configurations that are partial, incomplete, and indeed, often inaccurate (Beer 2009, boyd and Crawford 2012, Cheney-Lippold 2011, Mort and Smith 2009, Ruppert 2011). Indeed, the technologies themselves that collect the data are not as seamless and precise as many discourses championing their use suggest. Just as telemedical technologies used for patient self-care and self-monitoring are sometimes unreliable and difficult to use (Mol 2009, Oudshoorn 2011), so too the types of self-tracking devices used for promoting health can be frustrating to use and variable in their efficacy and precision (Lupton 2013c, Van Remoortel *et al.* 2012).

Conclusion

Just as medical technologies have been promoted as the means by which healthcare costs may be reduced and service provision productivity increased, discourses of digitized health promotion position digital technologies as providing the obvious solutions to social and economic problems. Digitalized health promotion discourses hold out the promise of control not only over the vagaries of the body by engendering greater knowledge of what lies inside (Lupton in press-a), but also over the unruly

population, who are viewed as making ever-greater demands on the health system and the budgets of governments.

The current move towards the use of digital technologies brings with it significant implications for the practice of health promotion. Where once health promotion was a relatively low-tech endeavour, the new digital health technologies have introduced a diverse number of tools and devices that have significant implications for both health promotion professionals and the 'at risk' groups which they identify as requiring their interventions (Lupton 2012b, 2013d). Social marketing approaches attempting to change behaviour are complemented by methods that are able to reach into the most detailed and intimate aspects of people's bodies and relationships, monitoring and measuring them in many different dimensions. Where once lay people who had been targeted as part of 'at risk' groups for health promotion interventions could choose to ignore or discount the messages disseminated in health-related social marketing campaigns, they are now able to be reached individually via the digital devices that they carry or wear upon their bodies. Where once health promoters relied upon individuals' self-reports of their activities and behaviours, digital devices are able to surveill large numbers of people simultaneously at any hour of the day or night and report the data collected.

The algorithms configured via the use of digital media create new algorithmic assemblages as part of the operation of 'soft biopower' and 'soft biopolitics'. Through bringing together heterogeneous elements in new ways, ontological categories created by digitally-generated algorithms have a profound impact on how individuals view themselves and the world. They form new objects of knowledge and new bodies of information that exert a normalizing power, suggesting defined possibilities for action and relations with others (Cheney-Lippold 2011). When directions for behaviour emerge from an algorithm, the operations of power and surveillance are diffused and indirect. The digital device issues forth the directive or advice ('answer this question', 'take these medications', 'increase your physical activity', upload your data'). Just as telemedicine requires patients to discipline their bodies in certain ways to meet the demands of the technologies (Lupton in press-a, Oudshoorn 2011), so do the self-monitoring and self-knowledge imperatives of digitized health promotion expect members of their target groups to take on a set of obligations concerning obtaining and acting upon the data they generate

Digital health technologies as they are used for health promotion, therefore, represent another dimension of the government of the self that citizens in neoliberal political systems are incited to achieve. Digital health discourses assume that lay people are willing and able to take up the technologies they espouse. They privilege a rational, 'activated' consumer who privileges health over other priorities, who is familiar with and confident about using digital technologies and who is willing to take responsibility for self-care and preventive health efforts. The dominant discourse of digital health fails to acknowledge that the members of some social groups lack access to the new digital technologies (Baum *et al.* 2012, Frederico *et al.* 2012) or would rather not use them for a variety of reasons (Lupton in press-a, Nicolini 2007, Oudshoorn 2011). Just as some

patients using digital telemedical devices resent their intrusion into their everyday lives and domestic spaces (Lupton in press-a), so too the targets of digitized health promotion may respond with ambivalence, indifference or outright hostility to the directives issued forth from their devices.

Due to the assumption that digital technologies and the data they generate are objective and powerful tools leading to better self-knowledge and greater efficiency of health service and health promotion provision, little attention has been directed at the moral and ethical implications of these technologies. Yet, as I have shown, there is great potential for further entrenching socioeconomic disadvantage and failing to confront the underpinnings of this disadvantage when digitalized health promotion is embraced.

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