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Technology, work and eating behaviour

Tecnología, trabajo y comportamiento alimentario

Joe Pavelka
Department of Health and Physical Education, Mount Royal University, Canada

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Abstract

This paper applies a structural lens to exploring the cascading influence of technology on how we work and how it affects the structure of our day, including free time and our eating behaviours. Technology has always altered our eating behaviour by dictating work patterns, the structure of daily life and eating behaviour. Less consideration has been given to a broader speculation of the compounded impact of AI job disruption on patterns of daily life and eating behaviours. This paper draws upon what we know of AI machine learning's projected impacts on our patterns of daily life, with a focus on its potential impact on how we eat.
Keywords: work, technology disruption, daily life, eating behaviour

Resumen

Este trabajo aplica una perspectiva estructural para explorar la influencia en cascada de la tecnología sobre cómo trabajamos y cómo la tecnología afecta la estructura de nuestros días, incluyendo el tiempo libre y los comportamientos alimentarios. La tecnología desde siempre ha alterado nuestra conducta alimentaria dictando los patrones de trabajo, la estructura de la vida diaria y los comportamientos de alimentación. Se ha prestado menor atención a una especulación más amplia del impacto combinado de las alteraciones en los trabajos y empleos causadas por la inteligencia artificial (IA) sobre los patrones de la vida diaria y los comportamientos alimentarios. Este trabajo se basa en lo que sabemos sobre los impactos previstos del aprendizaje automático de la IA en los patrones de nuestra vida diaria, con un enfoque en su impacto potencial sobre la forma en la que comemos.
Palabras clave: trabajo, cambio tecnológico, vida diaria, comportamiento alimentario

4825 Mount Royal Gate SW. Calgary, Alberta, Canada T3E 6K6, jpavelka@mtroyal.ca

Introduction

In 2016 the Spanish government passed laws to curb the traditional *siesta*. Laws governing new working hours were introduced but in reality, the *siesta* experienced a slow death decades earlier with the rise of globalization (Mayo, 2016). This is true for most countries within thirty degrees of the equator including much of Latin America where the *siesta* lingers as a part of daily life. The mid-afternoon *siesta* was introduced to give workers a break from the heat of the day. Eating behaviour followed with a heavier mid-day meal then workers returned to their first or second job and then home at 7 or 8 pm for a smaller meal (Meadows, 2021). The day's work dictated overall patterns of daily life including eating behaviour. However, in Spain the typical household now involves both parents working and a longer commute making a mid-day return trip home impractical. Many are now involved in office work which needs to be synced with the rest of the world's work patterns (Mayo, 2016).

The *siesta* demonstrates the central role of paid work in dictating patterns of daily life, including eating behaviour. When the United States aimed to expand manufacturing in the scorched Sunbelt region following World War II, it did so with the help of the air conditioner. It kept factories and homes cool so people could work and live. People in the Sunbelt structured their days and eating differently from the *siesta*. The air conditioner demonstrates the role of technology in guiding work which guides the structure of the day which then guides eating behaviour. If we want to understand the future of eating behaviour, we need to understand how technology impacts work and our patterns of daily life.

The purpose of this paper is to explore the potential impact of artificial intelligence (AI) technology on eating behaviours as it affects our ways of living. Artificial intelligence presently impacts many aspects of eating from how we purchase and learn about food, to food production, supply chain and transportation. However, this paper applies a structural lens to exploring the cascading influence of technology on how we work and how it affects the structure of our day including free time and our eating behaviours. The basic argument is that technology has always altered our eating behaviour by dictating work patterns, the structure of daily life and eating behaviour. We know that work schedules impact eating behaviour (Escoto et al., 2012). Less consideration has been given to a broader speculation of the compounded impact of AI job disruption on patterns of daily life and eating behaviours. This paper draws upon what we know of AI machine learning's projected impacts on our patterns of daily life with a focus on its potential impact on how we eat.

Considerable speculation has been given to AI's eventual impact on work, health and wellness, surveillance and other dimensions of daily life. Much of it leans toward the dystopian and the erosion of humanness in the lived experience of daily life (Harari, 2018). There are sure to be numerous benefits from AI, but the broader cautions directed at the growing economic divide, and human dependence and agency require attention. The fourth technological revolution of AI as with past technological revolutions is predicated on trade-offs. Artificial intelligence proposes a relentless pursuit of optimization regardless of its application. Machine learning is a feature of AI that distinguishes it from previous technologies. It refers to algorithms, or codes created by humans with unprecedented ability to learn and develop on their own without human intervention. It poses enormous potential for change, benefit and disruption. The greatest concern is that we will lose our ability to be human in the face of optimized governance of daily life.

Technology, work, free time and eating behaviours

There are six commonly cited determinants of eating behaviour. They include biological factors such as hunger, appetite and taste; economic including cost and income; physical factors involving access, education skills and time; social such as class, culture and social context; psychological including mood, stress and guilt; and attitudes, beliefs and knowledge about food (Public Action Health Support Team, 2020). These determinants encompass a variety of factors, but eating behaviour is situated of the structure of the day. Individual time use data from 23 countries was examined to determine if there are common temporally sequenced patterns of daily life. Eight such clusters were identified and five are predicated on differentiated work schedules. They include paid standard, paid long, paid morning, shift morning and shift evening. In each case paid labour dominates the time allocation of the day. It suggests that people eat at fairly set periods throughout the day, but it does not address the pressure of varying schedules on what and how we eat (Vagini & Cornwell, 2018). For instance, literature supports that shift work impacts eating behaviour (Souza et al., 2018) as does working more than forty hours per week (Escoto et al., 2021). Busy lives tend to compromise healthy eating (Pelletier & Laska, 2012). Research is emerging of how the pandemic's disruption of work patterns altered eating behaviours for many people (Murphy et al., 2021). Literature also supports that stress emanating from work impacts what and how we eat (Nevanperä et al., 2012; Nishitani et al., 2009). Work plays an important role in daily life and our eating behaviours. The question concerning this paper is what determines the basic structures of work and how will this change with AI in the future?

Figure 1 presents the relationships among technology, work, free time, eating behaviour and the food industry. At the macro-level, technology changes the world by altering our means of production. This impacts the micro-level of daily life by affecting labour patterns which in turn affect the rest of our daily lives. Work is the primary organizing force of daily life for those who need to work, which is about 65% of the world's population (US Bureau of Statistics, 2020). Work also impacts the quantity and quality of our free time. When we have too little free time, eating behaviour is affected and when have too much free time and experience boredom it too alters eating behaviour (Moynihan et al., 2015). The food industry is not a focus of this paper, yet

it is important to acknowledge its role as an enabler of diverse and evolving eating behaviours from prepared foods and out-of-home dining to door-delivery food service.

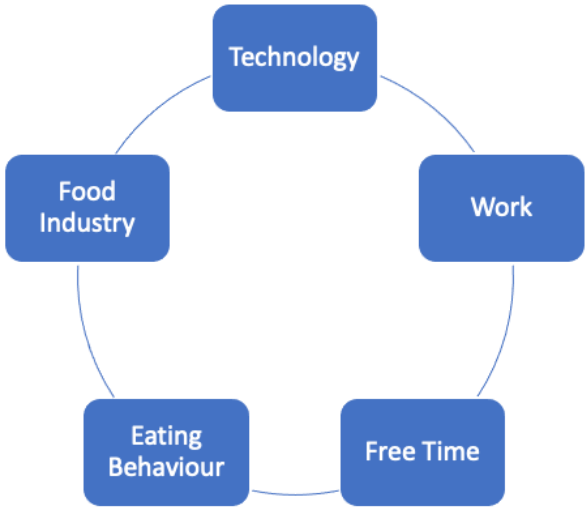

Figure 1. Relationships among technology, work, free time, eating behaviour and the food industry.

Much of the discussion of AI's impact on society is centered on job disruption. Research has suggested that just under half of existing jobs are under some threat of elimination by automation (Frey & Osbourne, 2013). Counter arguments regarding the job loss paradigm have emerged suggesting the rise of new jobs (Wilson et al., 2017). However, most agree that AI will disrupt work in significant ways requiring large parts of the population to wholly retrain, while others will be unemployed temporarily to permanently. New jobs will be created but how many and how quickly jobs will emerge is vague. As well competition for new jobs is less well understood (Halal et al., 2016). Some believe AI will erode the role of the human labour in the process of wealth creation making a 'job' as we know it less common or redundant (Harari, 2018). This has raised important questions about what it may mean to be human, but less attention has been given to its implications on daily life in which eating behaviour resides.

A 2018 Pew study reported views of just under a thousand experts, innovators, developers, business and policy leaders, and researchers associated with AI about its impact on society (Anderson & Raine,2018). Six in ten said they were hopeful that we would be better off by 2030, and smart systems in cities, farms, vehicles and buildings will save money and allow people to have more of a customized future. Most believe healthcare will experience the greatest benefit in diagnoses and treatment. AI presents the greatest benefit to downstream health care, while eating behaviour is situated at the upstream end with wellness and illness prevention. The same experts attach significant caveats to expected improvements and grave concerns to five areas including loss of human agency, loss of control over personal data, job disruption including job losses, loss of independence and mayhem connected to growing economic disparities.

Agency, dependence and eating behaviour

Daily life involves numerous trade-offs. The sense of being too busy encourages adoption of timesaving or convenience supports which may also have the effect of eroding human dependence. Accepting a higher paying job or a second job will likely increase financial resources, but it may erode one's agency over their day. It may result in longer commutes or the requirement to respond to emails and texts at home that hinder the pursuit of social, leisure and maintenance activities. In order to grasp the potential for the future relationship of technology, work and eating behaviours we need to revisit the ways this relationship has altered eating behaviour in the past.

It is often assumed the transition from nomadism to agrarian life brought such clear benefits that once it was discovered it was widely adopted. To the contrary, agriculture was difficult and it involved considerably more labour than nomadic life. Many theories consider why agriculture was adopted that range from the necessity of responding to drought and related disasters to opportunity such as the oasis theory (Weisdorf, 2005). However, it did result in a diet that was ten to hundred times richer in protein which yielded numerous benefits (Diamond, 1999). Neolithic people had time in their day to devote to the additional labour required of agriculture. The long period from the agricultural revolution to the first industrial revolution includes two important structural elements pertaining to eating behaviours. The first is warring to acquire land to support growing populations and slaves to provide labour and lessen the drudgery of work for citizens. The second is that daily life revolved around a task orientation whereby work was seamlessly interwoven into the day alongside socializing and maintenance responsibilities.

The first Industrial Revolution of 1760 to 1840 in Great Britain introduced structural changes and altered the pattern of daily life and eating behaviour. The shift from a task to a time orientation, separation of the work from home, and the extension of workplace values such as order and punctuality to the home. Edward P. Thompson's (1967) seminal work on the first Industrial Revolution characterized the task orientation in three ways. First, task orientation implies an imperative whereby the task must be done presently. Second, communities that abide by a task orientation demonstrate a lack of work-life demarcation. Third, to those unaccustomed to a task orientation way of life, it presents as an attitude of laziness. Despite the fact that they worked from dawn to dusk, the workday was less than today. It is estimated that during the Dark Ages people worked about 1,620 hours annually, compared to 1,949 for the average US worker in 1987. Estimates take into account that serfs lived and worked a task-oriented day that varied by season and punctuated with breaks for meals, socializing and rest (Schor, 1991). The task orientation way of life offered people considerable agency over their day; they were primarily beholden to the natural world.

Time orientation arose due to the convergence of the manufacturing function that required the timed coordination of numerous tasks and the clock. The 14th century invention of the clock facilitated synchronization of labour and introduced punctuality and order of the workplace and eventually the home. By the late 18th century, daily life in many industrial towns was governed by the clock. Church schools, favoured by proponents of the temperance movement, preached order, regularity and the habit of industry. The term ding-dong land refers to the daily orientation by the clock and the ringing of bells to get people to their place of work, half hour breaks, and curfew bells (Thompson, 1967). The manufacturing shop floor represented spatial separation of work and home thoroughly disrupting the seamless existence of task-oriented life which persisted in rural areas. By the 1840s, time orientation dictated the day's structure and meal consumption. Standard schedules of work and school and their spatial separation from home drove the middle class away from heavy mid-day lunches. Soon after, dinner migrated from mid-day to the end of the workday and eventually to 7 pm to allow men with a commute to return home. The dining room emerged in upper class homes as the place where meals should be consumed with punctuality and order (Cinotto, 2006). Around the same time people were given Saturday off in addition to Sunday partially in an effort to curb heavy 'day-off' drinking that would impede work on Mondays (Reid, 1996). Proper family meals were to occur during the Sunday day of rest or special holidays, otherwise they were not likely to occur because of busying schedules involving out of home by men, women and sometimes children (Cinotto, 2006).

Thompson (1967) makes the point that men employed in factories experienced a distinction between their employer's time and their own. The clock orientation devalued many social traditions. Companies hired monitors to calculate work time by subtracting time spent at taverns, alehouses, coffee houses, breakfast, dinner, playing, sleeping, smoking, singing, reading news history, quarrelling and contention amid disputes to anything foreign to company business or way of loitering. Workers organized to fight to decrease the workday from 15 to 10 hours, but they did not fight against the time orientation. By the 1820s the Industrial Revolution had created a way of life based on emergent work patterns. Thompson states that the first generation of factory workers were taught by their masters the importance of time; the next generation formed their own short[er] time committees in the ten-hour movement and the third generation struck for overtime. They had accepted the categories of their employers and that time is money (Thompson, 1967, p. 86). Technology changed processes of production and jobs; their day and eating behaviour followed.

During the early 20th century mealtimes migrated again. Breakfast became the calm meal of the day; lunch was lesser and generally restricted to women and children. The business lunch became the norm for men working downtown and restaurants catered to this growing market. As women joined the workforce in greater numbers by the 1920s restaurants catered to them as well. Women working out of the home meant that evening dinners were often rushed. More so for lower class families with unstable work schedules. This was met with disapproval by social reformers who dispatched college trained educators to teach lower- and middle-class women how to prepare food (Cinotto, 2006). It was important to bring the family together for evening meals if for no other reason than to keep youths off the streets and maintain civil peace.

For the working poor including African Americans and other marginalized groups, there was little hope in achieving calm family-oriented mealtimes. Economic conditions dictated multiple jobs for family members that would run throughout the day. Those who could, hosted boarders allowing women's work to remain in the home, but mealtimes catered to paying guests. In most cases homes of the lower class did not include an eating area so meals were taken in the kitchen or hallways (Cinotto, 2006). The demands of work clearly dictated eating behaviours of lower working-class families.

In 1930, the economist John Maynard Keynes projected that economic life in a hundred years' time would be good. His prediction was based on several decades of technological advancements that increased productivity and wages and decreased work time (Keynes, 1932). If this trend persisted it would create an environment where people's basic needs would be met with the possibility of a two- or three-day workweek. There would be ample time and money to ensure leisurely eating. However, since the first Industrial Revolution people have generally chosen increased purchasing power and work, over free time. By the early 1970s the term Leisure Society entered academic and popular discourse to describe the impending societal condition of little work with ample free time. A free time boon did not materialize. Decades later Anthony Veal (2011) carried out a rigorous review of the Leisure Society and determined that scholars at the time conflated the presence of a highly visible leisure economy as a sign that working hours had decreased. People were working just as much, if not more, but increased their spending and participation in the leisure economy giving the impression of more free time. Media extolled the business of leisure as an economic force reaching new monetary heights in the post war period. Life magazine reported in 1959 that leisure had become a *'A $40 billion bill just for fun'*. By the late 1950s Americans were spending more money on leisure than on new housing and automobiles combined (Coughlan, 1959).

Other technology-driven structural shifts in employment emerged. Automation shed jobs in agriculture and mining. Jobs migrated to the cities where decidedly different lifestyles emerged. Technology spawned specializations adding to the number of engineers, consultants, accountants, and other white-collar professions. The workday for blue collar workers was generally restricted by plant in operations. Their work hours were regulated, which is why they had to rely on unions to advocate for the whole. White collar workers could choose to work late or bring work home to create career and purchasing power advantage. An

increasing proportion of the population was moving from having someone else regulate their hours to having control over their own hours of work. However, the common underlying motive was to increase purchasing power. This resulted in a treadmill of increased daily stress and complexity of arrangements that relegated eating to a functional activity and encouraged the outsourcing of meal preparation.

The iconic TV dinner became popular in 1954 with Swanson's frozen meals. Dinner migrated to the living room in front of the television. TV dinners were more likely to be consumed in homes where the person responsible for meal preparation worked out of the home (Verlegh & Candel, 1999). The pace of life appeared to quicken and managing the household became increasingly complicated and stressful. A cause of increased stress was the rise of dual-earner families. Both parents working out of the home resulted in reduced time for household chores, more complex scheduling and a heightened value placed on life balance (Jacobs & Gerson, 2001). Another cause is the tension that arises when out-of-home work with its time orientation conflicts with childcare, meal preparation, and much of household labour which functions on task orientation (Vagini & Cornwell, 2001). Technology-driven timesaving devices including kitchen appliances flourished in the postwar era and drove people to spend more time at paid labour to purchase the technology to save time at home. Consumerism, even following the boom period of the 1960s did not slow. Households worked more and increased reliance on credit to maintain purchasing power (Ryan et al., 2010). Non-work hours already stressed by paid labour and longer commutes began filling evening up hours with sports and related programs providing strong competition for meal preparation and structured eating behaviours in non-work hours. The Sunday dinner became the last stand against a quickening pace of life (Cinotto, 2006). The past has taught us that the ideal structural conditions for healthy eating behaviour involves a pattern of daily life whereby paid work is present, stable, and as least stressful as possible.

The COVID-19 pandemic resulted in significant disruption of daily life for most people. Work disruption and its ripple effect throughout the rest of the day was a central trait of the pandemic. The unemployment rate peaked at extraordinary levels of 21.2% in the US (Falk, 2021), 9.4% in Canada (Statistics Canada, 2021) and 4.5% in Mexico (OECD, 2021). Just over seven in ten Americans shifted work to their home (Parker et al., 2020). People responded to the novel shelter-in-place orders by stockpiling food early on, which leveled off as the pandemic progressed. Initially grocery shopping focussed on healthy foods and later diverted to more comfort foods as people adjusted to their new conditions (Baker et al., 2020). Increased amounts of unstructured time resulted in boredom, loneliness and stress for many (Banerjee & Rai, 2020). Alcohol and cannabis sales rose dramatically (Pollard et al., 2020; Price, 2020). Families reported greater stress from the disruption of work and school schedules. Mothers took on the bulk of the responsibility to ensure continuity of children's learning while balancing their own work schedules (Dunatchik et al., 2021). Not surprisingly, home food delivery services increased dramatically (Sumagaysay, 2020). Pandemic disruptions highlighted structural responses to eating behaviours. People with less time scrambled for convenience options. Those with newfound free time entertained novel meal preparation including baking, while the general disruption which stress of too much work and too little work resulted in increased alcohol and cannabis consumption.

During the first agricultural revolution, food production consumed the bulk of the day; today 3% of the US labour force is dedicated to food production (Weisdorf, 2005). Eating was interwoven with work and social life. By the first industrial revolution eating became temporally and spatially separated from work, concurrent with a time orientation where eating and food preparation competed with all other non-work tasks in a shortened day that was beholden to work. In the past 250 years, technology increased productivity in food production and access while placing greater pressure for leisure expression and economy in non-work hours. Work is the constant that dominates while other priorities compete for time. Modern food production enables the minimizing of eating through fast food, prepared meals, door-delivery and so on. The 1960s, space age cartoon The Jetson's featured meals as a pill and a meal lasting no more than a minute. Eating was structurally reduced to a minimal amount of time, energy and thought. Since the mid-1960s, Americans have decreased consumption of food cooked at and time spent cooking (Smith et al., 2013). That coincides with the rise of the leisure economy and slight increases in time spent on paid labour (Veal, 2011). Since 1989 Americans, especially those who self-report as overweight, are report enjoying food and cooking less. The opposite is true for those who enjoy cooking. During the pandemic there were two diverging trends. One toward increased reliance on convenience supports and another on a resurgence of home cooking, including baking. The latter attached to those with more time (Murphy et al., 2020).

AI, faith and eating behavior

Roy Amara, the president of the Institute for the Future claimed that "we tend to overestimate the effect of a technology in the short term and underestimate it in the long term" (Vickers & Ziebarth, 2019, p. 4). That is the central concern surrounding AI given its novel capabilities and the heightened enthusiasm for rapid implementation following pandemic work and supply chain (Cooper, 2021). Concerns pertaining to AI implementation include job disruption and widening of the economic divide and erosion of human agency and dependence (Anderson et al., 2018). Fantastical predictions of job loss are not required to realize profound disruption that will impact all facets of life including eating behaviours. Mid-level estimates of job disruption include both temporary and permanent job loss, restructuring of job functions, job transitions and retraining, job devaluing, fewer high-quality jobs, more lower paying employment including the more gig work that involves holding multiple part-time lower paid jobs

with few if any (Aeppel, 2017). Optimism is center on the growth of new jobs. It is not clear that new jobs will replace the number of jobs lost and that existing workers will be suitable. Yuval Harari makes the point that it was not so much a leap to transition the farmer to the factory floor to make the tractors that replaced him, but it is a much greater leap to send the factory worker into AI (Harari, 2018).

Few if any experts predict that AI job disruption will result in less stress. The Pew research of experts predict it will advance the economic divide resulting in more of the population earning less with less to spend on food. Pressure to maintain a decent lifestyle means that people in lower income brackets will likely work more jobs and longer hours; similar to the consumer credit boom of the 1970s and 1980s when earning power stagnated but consumerism did not. Those whose expertise is in high demand will likely experience more job stability, agency over their day and access to a lifestyle that facilitates healthier eating. The infamous Silicon Valley employee cafeteria with free healthy food is intended to keep workers healthy and working long hours. Zuzanek (2017) in his review of work and free time in Canada concluded that automation would create a 'have and have not' society based on free time. History suggests that those with more free time are more likely to prepare and enjoy mealtimes. We freely give up control and dependence to technology for convenience which mitigates busy lives.

In general, food has a strong presence on the internet and social media. We go to it for advice (Ramachandran et al., 2018) and expression (Highfield & Leaver, 2016). Mobile technology adds to the spontaneity of searches and purchases. Machine learning algorithms use search data to further direct individual consumer choices and behaviour through pop-up ads and configuring searches. A concern is that with advances in data mining and connectivity of smart technologies related to the Internet of Things, our ability to make our own choices surrounding eating behaviour will be further given to algorithms. Algorithms are meant to optimize the product or service of the coder which means that those who rely on less healthy fast food will have those options more accessible, and those who subscribe to healthy eating will have those options more accessible as well. With the widening economic divide and further work disruption, convenient foods which are often less healthy may be further entrenched. This is where some faith is required. If predictive technologies can be made to veer toward the healthy either by the companies who guide them or directed by governments, eating behaviours may become healthier. The cost of convenient foods will also likely have to decrease, which may occur given the application of AI to food production (Dickerson, 2019).

Human dependence in eating behaviour generally involves our capacity to make independent decisions about the food we purchase, prepare and consume. Literature would suggest that many people are either disinterested or lacking capacity in meal preparation (Ferdman, 2015). The ever-evolving range of food and eating movements such as Mediterranean diet or the Slow Food Movement signal interest in capacity building surrounding food production and eating. A concern is that we will grow to trust algorithms more than we trust ourselves and surrender decision-making to algorithms that propose to know us better than we know ourselves (Harari, 2018). Additionally, as more advanced and connected smart systems appear that envelope an individual's eating, exercise, medical health, home, and finances with insurance providers or employers, the smart system may aggressively restrict or enhance behaviours such as restricting purchases of 'junk' foods. The aim would be for insurance companies, governments or employers to have healthier citizens and decrease health costs. It implies a dystopian surveillance presence, but it is nonetheless predicated on an admirable and defensible goal of decreasing health care costs.

Conclusion

Technology represents a one-way door that once entered does not facilitate a return to the past. It accentuates the imperative on discussion and awareness of potential impacts of AI. The purpose of this paper is to explore potential impacts of AI on work disruption and subsequent effects on eating behaviours. Informed speculation on how AI will impact this relationship includes near and long-term scenarios. Near term we can expect a reduction in easily bundled jobs and functions. Forced mobility, retraining and redundancy are a part of that scenario. It will involve a migration of work to lower value positions such as part time and gig work and a lesser migration to high value positions. Pandemic disruptions of global supply chains have accelerated the application of AI and robotics to decrease reliance on human labour. Fruit picking, meat processing and factory operations that require little education and often involve international work visas either shut down or were threatened to do so. These are more motivated than ever to replace human labour. The disruption and uncertainty of labour, especially for those with less education, is likely to result in stress and decreased purchasing power impacting eating behaviours.

Long-term scenarios are even less clear but if what we know is reasonably projected to the future, it will result in decreased demand for human labour. This will result in a modern-day bread and circuses scenario whereby many humans will need to rely on income acquired from other sources than paid labour. It will result in increased free time which can be positive or deeply destructive. A universal basic income is increasingly a part of public discourse. Experiments in income supports were a part of the pandemic response in many western countries, but most argue it is not economically feasible in the near term.

Eating is an essential part of the day that presently relies heavily on paid labour to provide structural elements that allow it to flourish. The future of paid labour is one of the most uncertain and discussed aspects of the fourth revolution. Agencies involved in promoting healthy eating behaviours have much to concern themselves with at present. However, there is little doubt that changing labour structures have and will continue to impact what and how we eat.

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