

Applied Behavioural Insights & Promotion of Healthy Eating

Working Paper



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Authors: Shahab Shahnazari, Stef Geiger and Joeri van den Steenhoven

Design: Terrie Chan

This working paper is part of our work on the future of health, and more specifically healthy eating and the prevention of chronic disease. The objective is to identify new opportunities for system change and building a healthier Canada. If you are interested in getting involved, please contact us via solutions-lab@marsdd.com.

This research has been supported by the Public Health Agency of Canada.

For more information, visit our website: solutions-lab.marsdd.com

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1 Promoting Healthy Eating Habits

The Challenge

The prevalence of unhealthy body weights and individuals categorized as overweight or obese has been steadily increasing across the developed world and has become a major cause of many chronic diseases.¹ Canada ranks among the top 10 OECD countries with the highest prevalence of obesity in both men and women (5th and 9th respectively)². A third of Canadian children aged 5-17 years old were categorized as either overweight or obese in 2011 (19.8% - overweight and 11.7% - obese).³



1/3

Canadian children
are **obese**

A typical body weights in youth as with adults can result from a number of natural or behavioural causes such as certain genetic deficiencies, dietary choices, physical activity levels and the individual's environment. If left untreated, overweight or obese children and youth have a greater risk of chronic conditions such as cardiovascular disease, diabetes, chronic respiratory disease, musculoskeletal, psychological and self-esteem issues.^{4,5,6,7} Overweight or obese children are also more likely to become obese adults and can experience more severe versions of the aforementioned chronic diseases in addition to others such as cancer.

Much work has been done to address the issue of obesity and unhealthy weights at the youth level, but these interventions have too often been point solutions to single settings that lack a cohesive strategy and vision for scaling across the region, province and nation. The root causes of unhealthy eating behaviour cannot be addressed through a single intervention and instead require a multi-faceted

1. Cecchini et al., Lancet (2010)

2. OECD Obesity Update 2014

3. Roberts et al., Results from the 2009-2011 Canadian Health Measures Survey

4. Freedman et al., Journal of Pediatrics (2007)

5. Whitlock et al., Pediatrics (2005)

6. Han et al., Lancet (2010)

7. Morrison et al., Journal of Affective Disorders (2015)

and multi-stakeholder approach that ensures cost-effectiveness, sustainability and stickiness. The typical pilot project must be replaced with new evidence-based approaches that bring communities together with other participants in order to co-create and test interventions that generate the buy-in necessary to ensure long-term sustainability through minimal resource inputs.

Why Intervene?

Individuals with one or multiple chronic diseases are usually the most frequent users of the healthcare system. A recent analysis showed that 1% of Ontario's population accounts for 34% of Ontario's health care expenditures and 5% account for 66%.⁸ This problem is expected to grow in the future. The Conference Board of Canada shows that the prevalence, direct and indirect costs of the top 10 chronic diseases and conditions all increased from 2000-2010, some dramatically. Diabetes has increased in prevalence by 74%, in direct health care cost by 135%, and 77% in indirect costs. Cardiovascular disease has increased in prevalence by 11%, direct health care cost 62% and indirect costs by 32%.⁹ The estimated economic burden of excess weight alone in Canada in 2012 was approximately \$19 billion (direct costs - \$5.4 billion and indirect costs -\$13.6 billion).¹⁰



At a time when public budgets are increasingly constrained and concerns exist around the long-term sustainability of our health care system, new approaches are required to prevent and reduce the frequency of chronic disease. Instead of treating chronic diseases alone, it is helpful to move upstream and intervene at earlier points along the chain of events that lead to the development of these diseases. Given that unhealthy eating is a strong driver of obesity, which is itself a top risk factor for chronic disease development; promotion of healthier eating habits has the potential to cause

8. Health System Performance & Research Network & Institute of Clinical Evaluative Sciences (2012)

9. Conference Board of Canada, "Health Matters: An Economic Perspective" (2013)

10. Krueger et al., Canadian Journal of Public Health (2014)

beneficial downstream effects including a reduction in both obesity levels and chronic disease. The key question then is, how best to change behaviours, attitudes and system patterns in order to promote healthier food choices by Canadians.

Taking Action

Influencing citizen behaviour and decision-making through some type of intervention in order to achieve positive outcomes has been utilized to varying degrees of success around the world. These strategies broadly fall into two categories: regulatory interventions and the more recent strategy of leveraging applied behavioural insights and human nature to promote a desired behaviour change.

1. Regulatory Interventions

Well-recognized regulatory levers available to policymakers have been the utilization of legal or financial means to induce shifts in citizen behaviour at municipal, regional or federal levels and has primarily focused on either reducing or eliminating the consumption of specific goods.

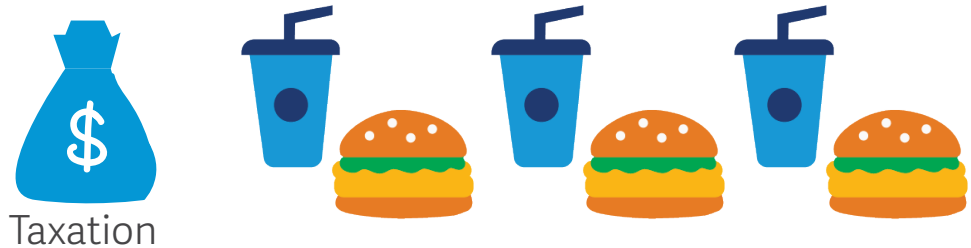
One common method utilized to reduce the consumption or use of unhealthy products has been the introduction of a tax. The objective of this type of intervention is to curb and reduce consumption of a product by artificially increasing its cost. The issue with an approach such as this is that since it is a one size fits all solution, it will have varying degrees of success and effect on the population on which it is applied. For example, tobacco taxation in Ontario was found to be an effective measure for reducing smoking among youth, young adults and individuals of lower socioeconomic strata. There has been less evidence of an impact on other population segments such as heavy smokers.¹¹ Clearly, initiatives need to be tailored for the needs and behaviours of particular target groups.

In the context of promoting healthy eating choices, taxation of unhealthy foods was first applied in Denmark in 2011. Targeting saturated fats, the Danish fat tax was not found to have a significant effect on reducing fat intake below recommended levels and was repealed 15 months after its introduction.¹² Mexico, recognized as one of the largest per capita consumers of soft drinks worldwide (estimated

11. Bader et al., Int J Environ Res Public Health (2011)

12. Jensen et al., Public Health Nutrition (2015)

at 163 liters per person per year)¹³ implemented an excise tax on sweetened sugar beverages in 2014. Unlike Denmark, Mexico's strategy resulted in a 6% reduction in soda consumption during the same year the tax was introduced, and has since been recognized as a global example of the benefits of this type of intervention.¹⁴



Mexico's excise tax on sweetened sugar beverages resulted in 6% reduction in soda consumption during the same year the tax was introduced.

Implementing restrictions and controls limiting the availability of certain products is another strategy that has been implemented by various levels of government in order to promote a healthier diet. In 2008, New York City phased out the use of artificial trans fat in all food service establishments including restaurants, caterers, mobile food-vending units, and mobile food commissaries. The policy was found to result in a 4.5% reduction in cardiovascular mortality rates.¹⁵ It has also been adopted by other US cities and is in the process of being adopted at the federal level with the US Food and Drug Administration setting a deadline of 2018 for the elimination of artificial trans fats from food in the US.

2. Applied Behavioural Insights

A more subtle form of promoting behaviour changes involves applying behavioural insights to solve a problem. This requires developing policy that leverages a deep understanding of how and why individuals make decisions, in order to create conditions under which individuals make choices that are better for themselves and others. Applied behavioural insights (ABI) combines the principles of economics and psychology to understand and influence decision-making processes.

Perhaps the most widely known application of behavioural insights is

13. Euromonitor International's Passport Global Market (2011)

14. Colchero et al., PLOS ONE (2015)

15. Restrepo et al., J Health Econ (2015)

“nudging.” Richard Thaler and Cass Sunstein’s book, [Nudge](#), is largely responsible for bringing behavioural insights to the forefront of global consciousness and policy-making. Published in 2008, Nudge used real-world examples of ABI from various studies and programs to illustrate how small, inexpensive changes to the contexts in which people make decisions can influence how they select an option, and that this minor change can have major impacts on outcomes.

In one study, the authors described an example on an election day where by simply asking an individual whether he or she intends to vote resulted in a 25% increase in that person’s likelihood to vote. In this case, merely being asked about voting intention served as a nudge to encourage individuals to vote.

In another example, a study explored the effectiveness of encouraging people to reduce their energy consumption by sending them a special bill detailing their energy use. A portion of the participants received invoices that included an image of a happy or sad face depending on the household’s energy use. The study showed that households receiving bills with the emotional cue of a sad face reduced their energy consumption significantly more than those who did not receive a sad face. Households who received a happy face on their bill were significantly more likely to keep their consumption down. The author’s examples highlight how an incredibly simple, small and potentially cost-free intervention can have a significant impact on people’s decision-making.



Participants receiving invoices that included happy or sad faces depending on their energy consumption significantly influenced their consumption behavior.

Partially in response to the promise of ABI, the Behavioural Insights Team (BIT) was formed in 2010 as part of the UK Cabinet Office (it has since become a separate entity). The BIT's objective is to improve policy outcomes while reducing government spending through the application of nudge theory. Since its inception, the BIT has implemented wide-ranging interventions, from tweaking of tax forms to helping individuals insulate their attics – all leading to savings of nearly half a billion dollars. Even more impressive is the fact that BIT was able to achieve these results with an annual budget of less than \$2 million¹⁶, a savings of \$100 for every dollar spent. Recognizing this impact, other governments including Canada and the US have followed suit and are at different stages of developing their own “Nudge Units”.

In contrast to more prescriptive methods, ABI does not limit people's freedom to choose. It is a friendly and potentially invisible method of encouraging individuals to make the choice by using human nature instead of rules and negative consequences. Applying strategies from behavioural economics to promote better social outcomes allows for policymakers to widen the scope of interventions available to them. In many cases, promoting a behavioural change can be more effective than legislation, advertising campaigns or subsidies, and often much cheaper.¹⁷

16. <http://www.theglobeandmail.com/news/politics/canada-studies-britains-nudge-unit-for-lessons-in-public-persuasion/article13541716>

17. Nudge: Improving Decisions About Health, Wealth and Happiness, Cass Sunstein and Richard Thaler

2 Applied Behavioural Insights & Policy Design

Compared to the typical regulatory or legislative approach, a behavioural science and behavioural economics method can be a much more cost-effective and less intrusive mechanism to encourage shifts in citizen behaviour. ABI can take on the form of interventions such as education or financial incentives as well as more subtle forms such as nudges that take advantage of social psychology to achieve the desired outcome.

The design of a government form, a restaurant menu, or the layout of a shelf of drinks in a grocery store is the result of a number of decisions made by the designer. The combination of these decisions in each item will result in or promote a number of outcomes whereas a different combination can result in alternate set of results. For example, the point at which an individual signs their name on a form can have an effect on how truthful they are when filling it out. The location of an item on a menu will impact how many people order it. Seemingly innocuous or unimportant design options can affect how an individual makes a decision. Through thoughtful design of the environments in which people make choices (i.e., the choice architecture), one can predispose or nudge individuals into making one decision or selection over another in order to affect a desired behavioural change.

A nudge is “any aspect of the choice architecture that alters people’s behaviour in a predictable way without forbidding any options or significantly changing their economic incentives”.¹⁸ Examples include:

- Moving the signature block to the beginning of an auto insurance form instead of the end leads customers to be more honest about their annual mileage (10% increase)¹⁹



18. Nudge: Improving Decisions About Health, Wealth and Happiness, Cass Sunstein and Richard Thaler
19. Shu et al., PNAS (2012)

- Making automatic enrolment into retirement plans the default option for employees raised participation rates from 61% to 83%.²⁰
- Linking people directly to a required form for tax payment instead of the page that included a link to the form increased payment rates by 20%.²¹

Behavioural Influences

The [UK Behavioural Insights Team's \(BIT\) MINDSPACE](#) mnemonic (summarized below), was developed to capture influences on an individual's behaviour and has been used as a checklist that complements the traditional policy-making approach by facilitating the incorporation of a behavioural component to the process.²² While not exhaustive, these 9 factors provide a summary of levers available to choice architects when attempting to design an intervention or policy aimed at shifting behavioural patterns.

More recently the UK BIT developed a simpler framework to follow for the creation of interventions that encourage a particular behaviour – [EAST](#).²³ The EAST methodology provides a straightforward approach to encouraging behaviours by making it “Easy, Attractive, Social, and Timely”. While the application of behaviour-based interventions is a complex and nuanced process, the EAST framework simplifies this complexity and is aimed at providing practitioners and designers with a simplified toolset and starting point for the creation and testing of interventions.

20. EAST – Four simple ways to apply behavioural insights (The Behavioural Insights Team – UK)

21. EAST – Four simple ways to apply behavioural insights (The Behavioural Insights Team – UK)

22. MINDSPACE – Influencing behaviour through public policy, Dolan et al.

23. EAST – Four simple ways to apply behavioural insights, Service et al.

M

Messenger

Our receptiveness to a message is highly dependent on who the messenger is. More likely to act on information provided by a messenger that is similar to ourselves demographically and behaviourally, has similar views, or who we recognize to be an authority.

I

Incentives

The timing and value of an incentive will change how effective it is in motivating behaviour. Additionally, people's responses to incentives can be affected by cognitive biases that influence their decisions (e.g., studies have shown that people undervalue payoffs that do not occur in the immediate future).

N

Norms

Our behaviour is heavily influenced by social and cultural norms. We are more likely to behave in a way that mirrors how we believe others are likely to act.

D

Defaults

We are more likely to choose the default option when provided with a number of variables/choices (e.g., majority of individuals use the default settings on smartphones even through some of the non-default options may serve them better).

S

Salience

When making decisions, we devote the majority of our focus on the information that appears to or which we perceive to be the most relevant or novel.

P

Priming

Our behaviour can be influenced by events that have happened beforehand. Small, seemingly innocuous subconscious cues can make us respond differently when faced with a decision.

A

Affect

Our emotional state impacts how we make decisions. We think less rationally when in particular moods or while experiencing certain emotions – this can lead to poor decisions.

C

Commitment

We are more likely to fulfill obligations that we have committed to. Publicly committing to something or even writing the commitment down makes us more likely to follow through.

E

Ego

We tend to engage in behaviours that reinforce a consistent self-image. By engaging in behaviours (that are not consistent with our self-image) frequently enough, we can actually modify our self-image to reinforce these behaviours.

E

A

S

T

Easy

Any intervention that makes engaging in certain behaviours easier can have a significant impact. The UK BIT has shown that making the desired option the default, reducing friction or even simplifying language can result in a significant increase in the desired behaviour.

Attractive

Individuals are more likely to do something when it draws their attention. This ties back to the concept of salience – people are more responsive to novel stimuli. This category encompasses how appealing the outcome is for the behaviour. The UK BIT highlights that there are alternatives to financial incentives to entice people, such as implied scarcity of a product or service, appealing to our subconscious need to maintain a positive self-image, or gamification (using characteristics such as challenges, rewards and competitions in non-game contexts).

Attractive

Interventions that leverage social influences can be very effective. Individuals tend to be influenced by social norms, so being told that most people engage in a particular behaviour makes it more likely that they will engage in that behaviour. Getting individuals to publically commit to a goal also makes it much more likely that they will see it through. On a broader level, if there is a social aspect to the desired behaviour, even if individuals merely discuss it with others, the people in their network are more likely to engage in the behaviour as well.

Timely

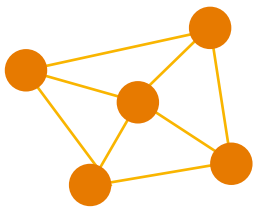
People can be more receptive to the idea of changing their behaviours at specific points in their lives, different times of the year, or when they're engaged in a particular activity. For example, people are more likely to resolve to exercise near the end and beginning of a calendar year. Interventions designed to encourage increased exercise may be more effective when timed around this time. Additionally, and as mentioned earlier, individuals tend to focus more on short-term consequences and over-discount events further off in the future. By leveraging this insight, interventions that emphasize immediate rewards or make future rewards more tangible can often be more effective than those that don't.

Creating & testing behaviour-based interventions

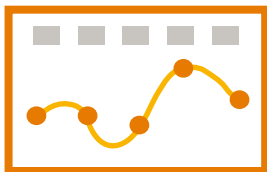
The EAST framework provides a set of recommended principles to follow when designing a behaviour-based intervention, the UK BIT has also devised a methodology to apply when creating, testing, and adapting an intervention based on these insights.²⁶



1. Define the outcome: Select the behaviour to be changed and how changes in this behaviour can be reliably quantified. For each metric associated with this shift, a method and process for measurement should also be chosen prior to testing. Each metric should also have a set target or goal that will, when aggregated, allow for confident determination of success or failure. Determination of feasibility as a long-term solution will be tied largely to the cost of the intervention as well as the expected economic value of the benefits. Finally, thought must be given to the timeline of the behavioural change, as there will in many cases, be a range of timelines for impact to occur.

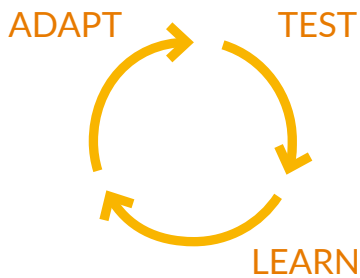


2. Understand the context: It is important to examine and understand the system and process from the perspective of the user and the administrator. Since even the smallest detail can influence behaviour, understanding the context is critical to identifying areas that can or should be modified. Through interviews, shadowing or even role-playing, insights, perspectives and potential solutions can be identified that can have the necessary impact while minimizing any negative downstream impacts.



3. Build your intervention: Once the context and process is understood, the next step is to identify the point(s) at which an intervention can occur. Depending on the nature of the system and the decision being made, it can be helpful to create a representative journey map that highlights decision-making points where an intervention would be most effective. Once a point is identified, a number of interventions can be designed and iteratively evaluated in order to select the one most suitable for wider-scale evaluation.

26. EAST – Four simple ways to apply behavioural insights, Service et al.



4. Test, learn, and adapt: To determine if the selected intervention is effective, it must be initially tested and refined using real individuals in smaller-scale real-world scenarios. One method used by the UK BIT and others has been to test multiple versions of the same intervention with different groups of participants in order to control for different demographic influences. A baseline control group is also included that doesn't experience the intervention and allows for assessment of the effectiveness of the intervention. Smaller-scale experimentation allows for multiple iterative cycles each building on lessons learned from previous rounds. Once effectiveness has been shown at smaller-scales, the next step can typically be further experimentation with larger groups or real-world implementation.

As a cyclical process, the first three steps may not always have to be followed in a linear fashion. The process of building and small-scale testing of an intervention may lead to the identification of new considerations of the context or desired outcome, as such the process of developing an intervention can be quite iterative and cyclical. The BIT's success and impact has been due in part to their ability to create interventions based on a deep understanding of the system they are working with, while also scientifically verifying their effectiveness.

Concerns with ABI

While the use of ABI as a component of policy-making is growing in popularity, a number of concerns have come to the forefront including: reproducibility of results in the real world (i.e., outside of test phase), the magnitude of the effects, and the ethical aspects of influencing behaviour.

The results obtained in a controlled experimental environment may not always translate to the real world. As with many types of experiments, testing of an intervention in a smaller-scale can be affected by any number of biases (e.g., expectation bias of evaluator). When combined with a limited and/or non-representative sample population, the outcomes may be quite different from those resulting from the application of the same intervention in the real world. In order to minimize this possibility, units such as the UK BIT have to the extent possible, run trials in association with the government so that

interventions can be tested in real situations with real users.

A second issue that can be associated with ABI interventions concerns the effect of the intervention itself and the cost benefit ratio of implementation vs. maintaining status quo. The smaller the effect, the more difficult it is to observe and measure its effectiveness in the real world. While many behavioural interventions can have very small effects, it is important to put this into context. If, for example, an intervention results in a small 2% increase in fee payments by the population and the total amount of fees paid every year is \$100 million, the resulting \$2 million increase can be quite significant. At the same time, taking into account the relative low cost of an ABI intervention, an intervention can, when compared to a small effect still be viable to implement.

One of the principal concerns rising from the use of ABI to affect behaviour change is that it is unethical for governments to influence their citizen's behaviour. This position ignores the fact that unlike laws and other regulatory vehicles imposed by the government, ABI interventions preserve freedom of choice. It may also be worth recognizing that encouraging specific behaviours through subconscious means is not a new strategy (e.g., marketing and advertising). What is new, is using this toolset for policy-making as opposed to consumerism with the difference being that marketers use these tactics to encourage individuals to buy products and services while policy-makers are interested in using them to encourage behaviours that benefit the individual and society.

MaRS Solutions Lab believes that ABI has the potential to be a powerful tool in bringing about systems change. The concept of selecting the smallest intervention with the largest impact is one of the core elements of our methodology, and ABI embodies this approach. Nevertheless, despite its promise, it remains important to acknowledge and account for the limitations and pitfalls of ABI. Between ethical controversy, difficulty in measuring impact, and the nascent and rapidly evolving nature of the field, ABI is not a magic bullet, but rather one of a number of tools available to systems change agents. MaRS Solutions Lab views ABI as one of any number of levers, but nonetheless one that can have an impact many times larger than its actual cost.

3 Promoting Healthy Eating Using Applied Behavioural Insights

Behavioural insights can be applied in any number of fields ranging from financial planning (e.g., increasing contribution to pensions) to reducing teenage pregnancies. One of MSL's primary challenges relates to tackling the 'future of health', the primary goal of which is to reduce the incidence of chronic disease in Canadians – which negatively impacts quality of life and shortens life expectancy. It is also a massive burden on the health care system and results in billions of dollars of lost productivity every year.

While the Canadian health system is effective at treating patients, the long-term sustainability of the system depends on the ability to prevent individuals from getting sick in the first place. For example, a considerable portion of chronic diseases such as Type II diabetes is caused by preventable factors such as inactivity and poor diet. Due to this, MSL has identified the prevention of chronic diseases resulting from preventable factors such as diet as a priority. MSL's periodic table of systems change²⁷ encourages the development of the smallest interventions that affect the greatest change and has led us to focus on creating and encouraging healthier eating habits at home, at school and in the retail environment.

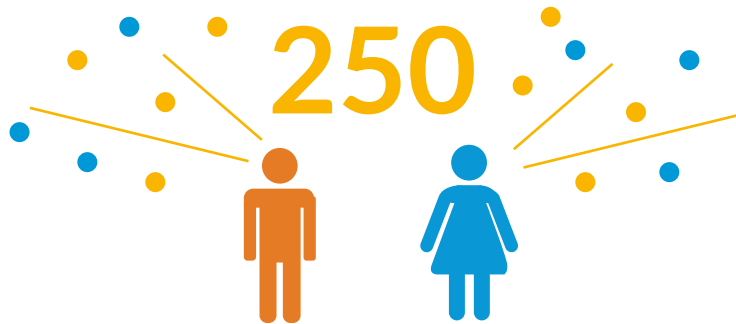
Why Use ABI?

An individual can make as many as 250 food decisions on an average day, the vast majority of which are made without any conscious thought.²⁸ This "mindless eating" is seldom due to hunger, but rather influenced by our social situation, the portions we are given, as well as marketing tactics and convenience. Individuals eat considerably more when in social situations than they would otherwise. We also tend to finish off what we've been served regardless of how unreasonable the portion is. These subconscious factors and others such as the ease of access to high calorie convenience foods can in part explain

27. www.marsdd.com/systems-change/mars-solutions-lab/mars-solutions-lab-approach

28. Dr. Brian Wansink

the relatively high prevalence of obesity in Canada and the US. Since so many of a person's eating decisions are made subconsciously, encouraging better decisions might also benefit by leveraging less conscious means (e.g., nudging people to make smarter food purchasing decisions). If an individual is influenced by subconscious cues to eat, it may be reasonable that they can also be influenced to make better choices using a subconscious approach as well.



An individual can make as many as 250 food decisions on an average day.

While exploratory in nature, others have already begun leveraging behavioural insights to promote healthier eating habits. Academic researchers, private corporations and governments, recognizing the potential of ABI to promote healthy eating have begun experimenting, and while still a relatively nascent field of study, have made a number of interesting findings.

Google, which provides free food to its employees in company cafeterias, observed that its staff was both eating too much and making unhealthy choices. Instead of enforcing rules or limiting their employees' freedom to choose, Google opted to implement several behavioural interventions:

- The bins holding candy such as M&Ms were changed from clear to opaque. This intervention, which reduced the saliency of the candy inside the bin reduced how much was eaten by 9%.
- Food order in a buffet line impacts the type and amount of food put on a plate. Individuals typically take the first items they encounter at a much higher frequency.²⁹ Taking advantage of this, Google moved the salad to the front of the cafeteria buffet, increasing the consumption of healthier salad options.
- Putting up a sign informing employees that bigger plates mean

29. Wansink et al., PLOS ONE (2013)

bigger portions, resulted in a 50% increase in the use of small plates (the assumption being that this led to a proportionate reduction in portion size).

- Foods were tagged with a colour indicating which category it belonged to in the Harvard nutritional pyramid.
- Desserts offered were limited to three-bite portions.
- Drink fridges were rearranged so that bottled water was positioned at eye level and unhealthy beverages such as sodas were moved to the bottom shelves and were therefore less visible. This intervention resulted in a 47% increase in water intake and a reduction in calories consumed by 7%.

Leveraging ABI to Promote Healthy Eating

Google's experiments highlight the impact that simple behaviour-based interventions can have on the food decisions made by individuals. Academic research into these areas has identified interventions that work and attempt to explain the underlying behaviour they tap into to generate the given outcome. The following 3 sections provide examples of behaviour-based interventions in three different settings that researchers have found to have a positive impact on food decisions made by individuals.

1. In the cafeteria

Dr. Brian Wansink's research for the Cornell Food and Brand Lab has included a number of studies conducted in cafeteria settings. These studies offer fascinating insights into how people make eating decisions, and in many cases make it clear how and where to apply behavioural insights. Dr. Wansink and his colleagues founded the Cornell Center for Behavioral Economics in Child Nutrition Programs³⁰, which led to the creation of the Smarter Lunchrooms Movement, an initiative tasked with the development of behavioural interventions for school lunchrooms. Testing a number of cafeteria interventions^{31,32,33,34} the team was able to show that by:

30. ben.cornell.edu

31. Hanks et al., Journal of Public Health (2012)

32. Wansink et al., Preventative Medicine (2012)

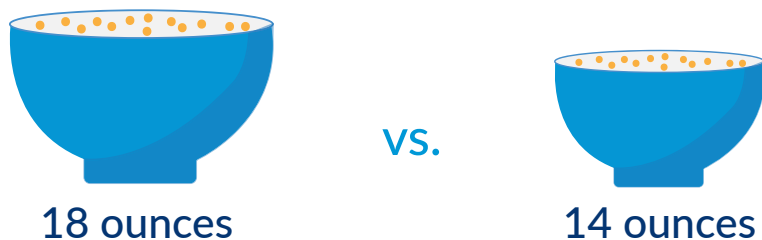
33. Hanks et al., Agricultural and Resource Economics Review (2012)

34. Wansink et al., Public Health Nutrition (2013)

- Using more interesting and descriptive names for healthy foods can increase their sales by 27%.



-
- Providing choices for vegetables (e.g., carrots and celery), instead of just one option (e.g., just carrots), increased the likelihood that students will eat vegetables.
 - Having cafeteria workers explicitly ask students if they want a salad can increase salad sales by over 30%.
 - Moving the salad bar to a more prominent location near the checkout can lead to a threefold increase in salad sales.
 - Displaying fruit in a bowl and thereby making it more attractive and accessible resulted in a doubling of fruit sales.
 - Encouraging the use of trays can lead to healthier choices being made. Students not using trays were found to take 21% less salad but consumed the same amount of dessert. When lacking trays, the limited plate space resulted in students eliminating healthy foods first in order to fit more unhealthy items.
 - Decreasing the size of a cereal bowl from 18 to 14 ounces was found to reduce cereal serving size by 24%.



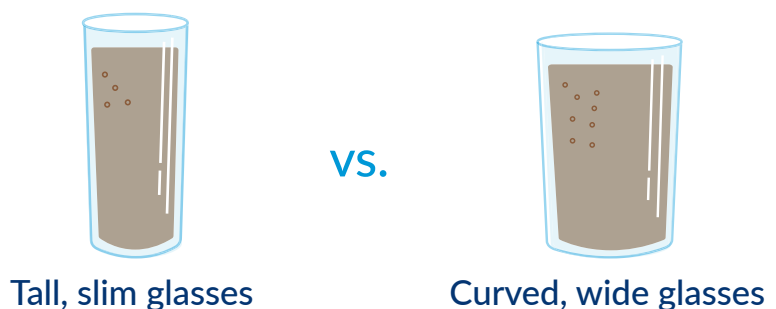
- Implementing an express line exclusively for students who buy healthy items was found to significantly increase sales of healthy food.

While the above is a sampling of interventions the Cornell Center for Behavioral Economics in Child Nutrition Programs tested in school cafeterias, the potential for application in other similar venues such as catered events and restaurant buffets also exists.

2. At home

A large number of decisions that result in what is eaten at home is determined by the food that is purchased and brought into the home. Decisions and associated interventions within the home are therefore more limited towards reducing consumption through portion control and include:

- Use smaller plates. It has been shown that shifting from a 30cm plate to a 25cm plate reduced caloric intake by 22%. This principle of smaller bowls resulting in smaller servings has been applied to all types of dishes. Research has shown that reducing the size of a serving bowl can reduce consumption by 71%.³⁵
- Using tall, slim, straight glasses as opposed to glasses that are curved or wide can reduce how much juice or soda is consumed.



- Use regular dinner spoons instead of sauce spoons (e.g., when serving pasta sauce, a smaller spoon can result in ladling less sauce on pasta).
- Keeping unhealthy foods out of sight and in opaque containers. Individuals are wired to respond to the mere smell or sight of

35. Van Kleef et al., Journal of Nutrition Education and Behavior (2012)

appetizing foods. Keeping food items such as chips out of plain sight, make it less likely that they will be selected as a snack.

Dr. Brian Wansink’s work in this area has also identified that within each household, there is typically only one individual that makes decisions on what food is purchased in a home. This “nutritional gatekeeper” is on average responsible for over 70% of food decisions and creates a highly effective target for healthy eating interventions.³⁶

3. Retail environments

Perhaps one of the most effective places to promote healthier eating decisions is the primary location at which we make a significant number of our food decisions – where we purchase it. Retail environments are intentionally and meticulously designed to encourage the purchase of certain products. What if similar tactics were implemented but aimed at nudging customers to buy more healthy foods?

Recently, in-store food rating systems have been introduced in countries such as the US, Canada, the UK, and Australia. In Canada and the US, these rating systems typically use stars to indicate the healthiness of a product while the UK and Australia use a red, amber, green traffic light system. Both methods have proven effective in encouraging healthier choices when purchasing groceries. A study of the impact of a Northeastern US supermarket chain’s star-based nutritional rating system found a 1.39% increase in the purchase of products rated at least one star or more in the two years following the introduction of the rating system.³⁷ It should be noted that the 1.39% increase translated to approximately 2.9 million more items with at least one star being purchased on a monthly basis.



36. Wansink, Journal of the American Dietetic Association (2006)

37. Sutherland et al., American Journal of Clinical Nutrition (2010)

Retail stores food rating systems have been introduced to indicate healthiness of a product

Another study examined the effect of providing shoppers in a grocery store with shopping carts that had been partitioned with tape. A sign on the cart explained that one partition was for healthy foods (e.g., fruits and vegetables), while another section was for all other foods. The experiment showed that shoppers using the partitioned carts purchased more than twice the fruits and vegetables than shoppers using regular carts.³⁸ While it is unclear whether the intervention's effectiveness was due to increased salience, social factors, or combination of the two, it is clear that that even a relatively minor modification to the shopping environment can have a positive effect on behaviour.

Researchers in Denmark were able to reduce littering in the streets of Copenhagen by 46% by placing footprint paths leading to trashcans.³⁹ Using a similar strategy, another group of researchers placed green footprints on the floor of a campus store for 3 weeks, making a path from the entrance to the location of fresh fruit inside. Researchers were able to show that by making the selection of the healthier option easier and helping the customer find the fruit, they were able to increase fruit sales in the shop by 99.6%.⁴⁰ Given its efficacy in two distinct areas, the footprint nudge has the potential to be applied in other areas such as cafeterias and buffets.

38. Wansink et al., Partitioned Shopping Carts: Assortment Allocation Cues that Increase Fruit and Vegetable Purchases

39. Hansen, PG., Roskilde University (2011)

40. Hansen, PG

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Applying ABI to the Canadian context

Given the examples provided above, what becomes clear is that while ABI and its application to healthy eating is a nascent but growing field, the rapidly expanding body of evidence highlights the potential applications and impact simple interventions based on behavioural insights can have.

MaRS Solutions Lab's (MSL) challenge for this project is how can we make healthy eating the easy choice for children and youth in order to attain a 20% reduction in unhealthy eating and a 20% improvement in healthy weights by 2020 in the communities we will be working in. Since healthy eating problems are predominantly behavioural in nature, MSL believes that using an ABI strategy will be a particularly appealing method that can deliver impactful results while consuming minimal resources. But what is the best mechanism through which to apply an ABI-led approach in order to address this problem in Canada?

Defining the Problem

To affect change, we must experiment with potential interventions. This involves careful consideration of which interventions to pursue, the design of robust experiments to measure impact, and evaluation of whether the intervention can and should be implemented at a larger scale. But before steps can be taken to address the problem, it must first be properly defined and the points of intervention identified.

MSL's objective is to reduce obesity by encouraging healthy eating, but what would be a positive outcome, in other words, how do you define healthy eating? MSL's vision of healthy eating for Canadians is at least 5 servings of fruit and vegetables a day, greater consumption of whole grains, reduced intake of salt, sugar, saturated and trans fats as well as an overall reduction in calories consumed.

Selecting interventions

MSL believes that where possible, it is preferable to work with interventions that have already been tested and validated before attempting to create novel ones. While certain situations and environments may demand the design on new interventions, many instances can be addressed effectively and efficiently through the use of interventions already in place or previously tested in other jurisdictions.

The most effective solutions are those that have been created with people rather than for them. Individuals must be engaged directly in order to develop an understanding of the context within which they make food decisions. Insight can be gained through interviewing youth, parents, school administrators, teachers and other stakeholders with this knowledge used to inform the selection of interventions or creation of new ones. Working directly with stakeholders can surface issues that hadn't been considered and incorporate learnings not previously accounted for.

Using a methodology adapted from IDEO, MSL proposes the use of a three-lens approach to the selection or design of interventions. Using desirability, feasibility, and viability as principal selection criteria, and adding a fourth of our own (impact), MSL has developed a non-exhaustive matrix of potential interventions (refer to Appendix A). This list represents a simplification of the challenges that revolve around implementation of interventions and is meant to be a framework to guide discussion.

● DESIRABILITY

- Evaluation of how appealing an intervention in terms of its ability to hit a behavioural sweet spot
- Incorporates the magnitude of the effect, and whether the intervention has been tested in a properly controlled experiment

● FEASIBILITY

- Assessment of how realistic the running of an experiment test of an intervention would be and how easily impact associated with the test could be measured

● VIABILITY

- How well can an intervention be implemented and scale more widely?
- How sustainable is the intervention?

● IMPACT

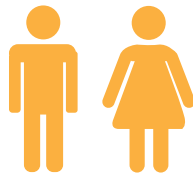
- What is the potential impact of the intervention?
- What change can it bring about?

Testing interventions

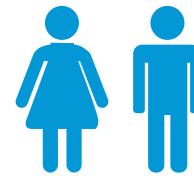
1. How to intervene

Effective experimental design requires interventions to be tested with a randomized group of participants and compared to a baseline control group. Randomization is used to ensure that any observed effects are attributable to the intervention rather than an underlying bias or common quality within the group being tested. The control group functions to provide a non-intervention baseline result against which measurements and outcomes from the experimental group can be compared. Results of an experiment run without a control group cannot be confidently attributed to the tested intervention, it is therefore critical to have an associated randomized group of participants that do not experience the intervention to be tested.

Randomized Group of Participants



Baseline Control Group



Effective experimental design requires interventions to be tested with these two groups and observe effects attributable to the intervention

Selection of experimental groups depends upon the intervention to be tested, the environment as well as the resources available. One method involves randomly splitting a group of participants into an intervention group (or multiple intervention groups if testing different versions of an intervention) and a control group - running both through the experiment simultaneously. This format is optimal when it is easy to isolate groups from one another or when the experiment requires a longer timeframe to complete.

Another method involves using the same group of participants in both control and intervention groups but separated by time. An initial group of participants would be observed for a set period of time, establishing a baseline. The intervention to be tested would then be introduced to the same group, which would be observed for any resulting behavioural

changes. This methodology is best suited for situations where the experimental groups cannot be isolated, or when the experiment can be conducted relatively quickly (e.g., intervention in a school cafeteria).

While it is important to strive for robust experimental control and design, the reality is that a balance must be struck. Unlike a highly controllable laboratory setting, experimentation in the real world requires compromises to be made that account for time and resource limitations that can impact experiment duration, number of runs, and mechanisms used to measure outcome. This should not however, diminish the validity or importance of the work. At MSL, our priority is to run well-designed experiments that allow for confident association of outcomes to tested interventions.

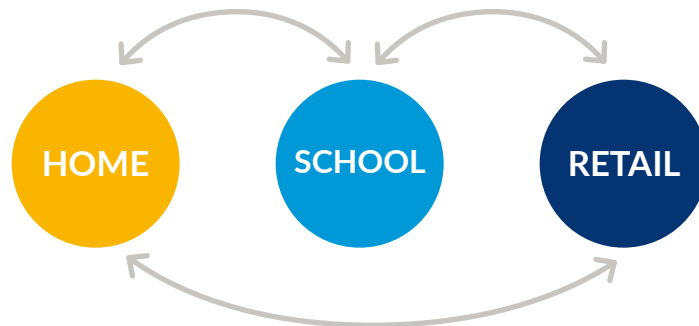
One of the more challenging aspects of encouraging healthy eating is that the outcome (e.g., reduction in prevalence of chronic disease) may not be visible or measureable for months or even years post-intervention. Proxy or indirect outcomes that are correlated to the ultimate outcome must therefore be identified. For example, does the intervention succeed in getting individuals to buy or eat more fruits and vegetables, eat more appropriately sized servings, or have participants lost weight over the course of the intervention. Healthier food choices and reduced caloric intake has been well-documented to result in enhanced weight loss and in this example could be used as a proxy for reduction in downstream frequency of developing a chronic disease.

There are many methods by which an observer can measure outcomes of an intervention. The most reliable method would be to observe and track every participant's eating habits. Given the resources required and invasiveness associated with this method, other processes may have to be relied upon. Regular (weekly or biweekly) measurement of weight or body mass index could be used, but this would be limited to experiments of sufficiently long duration. In retail environments, tracking of food decisions becomes easier as checkout results in the generation of an itemized list of purchases that can be inputted and tracked longitudinally. Retailers can also track sales at larger group-levels (e.g., district-wide).

Self-reporting has been commonly used in many settings, but issues with its validity have been well-documented. Individuals can over or underestimate, forget, or be dishonest when self-reporting. Despite these concerns, self-reporting may be the most viable method of measurement where direct measurement can be difficult or not possible (e.g., the family home).

2. Where to intervene

Through research and engagement with stakeholders, we have identified the optimal points of intervention to be: school, home, and retail environments (e.g., grocery store or restaurants). In the school environment, we've identified the priority to be getting youth to make better decisions when buying food and when bringing snacks and meals from home. In the home, our goal is to encourage the selection of healthier meals, portions, and snacking habits. In the retail environment, our objective is to enable individuals to make the better choice and purchase more healthy items such as fruits, vegetables and whole grains.



Identifying the point of intervention is important, but it should be remembered that all three are connected. Eating decisions at school are influenced by what students bring for meals from home, and the foods available at home is influenced by purchases made in retail environments. Therefore, instead of a number of point/pilot interventions that inherently lack a cohesive and integrated approach and scaling strategy, MSL proposes testing multiple interventions within the same population simultaneously using a living lab method. Imagine an experiment where interventions co-designed with the community, are introduced and tested in school cafeterias, retail environments and homes for months and years. Community members would be exposed to multiple interventions and have the opportunity to be directly involved in the design <-> feedback <-> redesign process.

Complex issues such as the promotion of healthy eating behaviour requires a multi-stakeholder approach that brings governments, corporations, non-governmental organizations, foundations, academia and the community together to address a common challenge. The MSL

living labs approach integrates these diverse perspectives (especially that of the community) and applies it in an open and iterative manner towards the co-creation and experimentation of behaviour-based interventions. The value of this approach for our partners and collaborators can be described as follows:

Develop solutions with society

In the lab we convene stakeholders from different parts of society and develop solutions together. The lab acts as a neutral common ground and creative space. Solutions that come out of the lab are to be implemented and funded by all stakeholders.

Understand the problem from a citizen/user perspective

Many social problems are often defined from an institutional perspective. The lab takes a different view. Using tools from design thinking we try to gain a deep understanding of the problem from a citizen or user perspective by studying people's experience and analyzing the numbers.

Offer opportunities to experiment and learn

An important value of the lab is experimenting and learning on a small scale to test what works before we make expensive large-scale mistakes. But also because such complex problems can only be fully understood when you are actually trying to solve them.

Working towards scale and sustainability

The lab offers a process to deliberately work towards scale to create system change rather than one-off projects. This means building receptor networks in society to create capacity to implement new solutions. It implies focusing on solutions that can become sustainable without prolonged support from governments or foundations. And it requires developing policies and practices for solutions to scale.

Have a long-term view

Solving social challenges and creating system change does not happen quickly. It requires time, stamina and commitment by all partners and collaborators. It may take years and multiple interventions before progress can be claimed, and it often does. While many institutions need to focus on the short term, the lab takes a long-term view. We are committed to solving the challenge, however long it takes and whatever solutions are needed.

Better social outcomes at lower cost

Innovation is about discovering better ways of doing things. For social challenges, the result of innovation should be better social outcomes

at lower cost. Solutions that are developed in the lab may require investments, but in the long-term need to result in cost savings to society.

3. Using Toronto as a living lab

MSL proposes the initial establishment of 3 living labs based in communities and neighbourhoods in and around the Greater Toronto Area (GTA). The GTA, as the most populous metropolitan area in Canada, provides the necessary diversity of culture and socioeconomic mix that allows interventions designed and tested there to be applicable and relevant in other parts of Canada and the globe (test locally but scale globally). The value of these living labs is twofold:

1. Provides the primary vehicle through which behavioural interventions can be developed in partnership with and tested in communities and will enable PHAC and MSL to achieve strategic goals around reduction of chronic disease resulting from unhealthy eating habits.
2. Will create a long-term and sustainable utility that can act as a global destination where public, private and non-profit participants from international jurisdictions can come to explore, co-create, learn and test their own interventions.

At MSL, we understand that tackling complex problems such as unhealthy eating habits, obesity and chronic disease are rarely solved by a single solution. This more holistic and integrated lab approach has the potential to create a bridge between policymakers and those impacted by policy, while at the same time developing solutions, creating support systems and building capacity for change to improve the lives of people and strengthen the resilience of communities. While changing individual behaviour can be difficult, experimenting with new and innovative strategies such as ABI and applying them via novel approaches like living labs has the potential to affect the desired change.

Appendix A

Intervention	Setting	Desirability		Feasibility		Viability
		Evidence of Effectiveness	Magnitude of Effectiveness	Ease of Experimenting	Ease of Measurement	Scalability
Healthy choice convenience line	Cafeteria/Restaurant	3	?	2	3	2
Salad bar at beginning of buffet line	Cafeteria/Restaurant	?	?	2	3	4
Salad bar made more prominent	Cafeteria/Restaurant	3	5	2	3	4
Interesting and descriptive food names	Cafeteria/Restaurant	3	2	4	3	5
Option of small serving dishes with portion size reminder	Cafeteria/Restaurant	3	4	2	5	4
Foods tagged with food guide colour codes	Cafeteria/Restaurant	?	?	5	3	4
Bite-size dessert portions	Cafeteria/Restaurant	?	?	2	4	3
Offering multiple healthy options	Cafeteria/Restaurant	3	3	4	3	4
Displaying fruit more attractively	Cafeteria	3	5	4	3	5
Encouraging use of trays	Cafeteria	3	2	2	3	3
Smaller plates	Home	3	2	1	1	1
Keep less healthy foods out of sight	Home	?	?	1	1	2
Health rating system (stars etc.)	Retail/Restaurant	4	1	1	2	1
Preferential shelf placement	Retail/Cafeteria	3	4	5	5	4
Shopping cart partitions	Retail	3	5	2	3	1
Footprint path	Retail	5	3	4	4	4

