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Working Paper 21-051

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Impact-Weighted Accounts Project Research Report

Abstract

We apply the product impact measurement framework of the Impact-Weighted Accounts Initiative (IWAI) in two competitor companies within the consumer-packaged goods industry. We design a methodology that allows us to calculate monetary impact estimates on customer health, access and affordability of products and recyclability, among other factors. Our results indicate substantial differences in the impact that competitors have through their products. These differences demonstrate how impact measures reflect business strategy choices and informs decision-making on industry-specific areas, including food reformulation and product placement.

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1. Introduction

Although significant progress has been made in the environmental and social metrics disclosed by companies and prescribed by reporting standards, these mostly pertain to a company's operations and are still not embedded in financial statements. In contrast to employment or environmental impacts from operations, product impacts, which refer to the impacts that occur from usage of a product once a company has transferred control of the good or service, tend to be highly idiosyncratic limiting the ability to generalize and scale such measurements. As such, for companies that do measure product impact, impact evaluation is highly specific, limiting comparability and scalability. Moreover, the number of companies that have managed to measure product impact in monetary terms is even more limited.

In prior work, we designed a framework in which product impacts can be measured and monetized in a systematic and repeatable methodology across industries and have provided a sample application to the automobile manufacturing industry to address these issues.[i] Within any industry, the framework can be applied using a set of standard principles, industry assumptions and public data to estimate product impacts across the following seven dimensions.

FIGURE 1

Product Impact Framework Dimensions

Reach		**Dimensions of Customer Usage**			**Env Use**	**End of Life**
Quantity	Duration	Access	Quality	Optionality	Pollutants & efficiency	Recyclability
The magnitude of individuals reached	Length of time the product can be used, particularly for durables	Accessibility of product through pricing and efforts to provide for the underserved	Quality of product through health, safety, effectiveness, and inherent need or goodness	Ability to choose an alternative product with full information and free will	All pollutants and efficiencies enabled through customer usage	Projected product volume recycled at end of product life

In this paper we apply the framework to two competitor companies in the consumer-packaged foods space. We then discuss potential data points and data sources for monetization and detail the decisions behind assumptions made. Finally, we provide examples of insights specific to the consumer-packaged foods space that can be derived from impact-weighted financial accounts and their analysis. In our prior work, we discuss the broader need and implications of impact-weighted financial accounts.[ii] The application of the product impact framework to the consumer-packaged foods space demonstrates feasibility and actionability, while also providing guidance on the nuances and decision-making of applying the framework to other similar industries. The impacts derived demonstrate the potential for product impact measurement to inform strategic decision-making. We see our results as a first step, rather than a definitive answer, towards more systematic measurement of product impact in monetary terms that can then be reflected in financial statements with the purpose of creating impact-weighed financial accounts.

2. Application of the product impact framework

We apply the product impact framework of the Impact-Weighted Accounts Initiative within the consumer-packaged foods industry to ensure the framework is feasible, scalable, and comparable in the space. Through a detailed analysis of two competitor companies, we provide a cohesive example that examines the impacts of packaged foods across the seven product impact dimensions of the framework to uncover nuances of the framework application in estimating monetary values. The companies will be referred to as Companies A and B given the purpose of this exercise is to examine feasibility and is not to assess the performance of individual companies. We do note that the data is from two of the largest global packaged food manufacturers.

2.1 Data collection process

This application is based on publicly available data from company disclosures and industry-wide assumptions informed by regulatory bodies and established research firms. These examples use existing data and metrics with the goal of incorporating publicly available data rather than making a judgement of materiality.

Self-disclosed company datapoints reflect information found in the company's disclosures from 2018 such as the Form 10-K or annual sustainability reports which often disclose Sustainability Accounting Standards Board (SASB) and Global Reporting Initiative (GRI) metrics. Because these disclosed metrics are often input metrics rather than impact metrics, this dataset is supplemented with metrics from industry research firms and regulatory bodies, including Nielsen and the United States Department of Agriculture. This allows us to translate these inputs into estimated impacts.

Product categories and pricing data comes from the Nielsen Homescan Panel which tracks purchases of over 40,000 US households by UPC code with associated pricing, method of payment, and volume sold. Nutritional information comes from the United States Department of Agriculture Food Data Central database which provides nutrient content by product UPC code for over 250,000 branded products. Industry-wide assumptions on product pricing, nutrition associated health outcomes, and associated costs for various health outcomes come from the Nielsen Consumer Panel, health outcome specific non-profit organizations such as the American Heart Association, and meta-analyses of nutrition and health-focused studies. Given the methodology determines monetary impacts, the industry wide assumptions inevitably rely on some market-determined price and valuations.

3. Consumer packaged foods manufacturing application of the product impact framework

3.1 Overall impacts estimated

TABLE 1

Product Impacts of Company A and B

						Dimensions of Customer Usage								
				Reach		Access		Quality				Optionality	Env Use	End of Life
Company	Revenue	Positive Product Impact	Negative Product Impact	Quantity		Affordability	Underserved	Health & Safety	Positive Effectiveness Impact	Negative Effectiveness Impact	Need	Information, Addiction, or Monopoly	Emissions	Recyclability
				Revenue (%) by category:										
				Cereal	36.4%									
				Breakfast	18.3%									
A	$13.5bn	$2.0bn	-$3.2bn	Crackers	14.9%	$1,323m	$3m	-$341m	$655m	-$2,215m	-	-	-$470m	-$153m
				Snacks	11.2%									
				Breakfast (frozen)	10.9%									
				Ready to serve	4.1%									
				Yogurt	37.9%									
				Ice cream	15.8%									
				Snacks	12.2%									
B	$15.7bn	$3.2bn	-$1.1bn	Cereal	8.8%	$3,079m	$73m	-$61m	$464m	-$792m	-	-	-$150m	-$49m
				Produce	7.2%									
				Vegetables (frozen)	6.6%									
				Breakfast	2.4%									

For the consumer packaged foods industry, the affordability dimension captures pricing below industry average of different product categories, estimates of food stamp sales proxy for underserved impact, recalls are monetized in the health and safety dimension, the nutritional profile of products are captured in the effectiveness dimension, sales of staple foods are reflected in the basic need dimension, emissions from cooking and storage are captured in environmental usage, and the emissions from waste are captured in the end of life recyclability dimension. The following sections dive into the details, assumptions, and decisions behind these estimated impacts.

3.2 Reach

TABLE 2

Implied Product Category Sales of Company A and B

Data						
		A		B		
10K	Revenue	$13.5bn		$15.7bn		
Nielsen	Sales by product category	Cereal	36.4%	Yogurt	37.9%	
		Breakfast	18.3%	Ice cream	15.8%	
		Crackers	14.9%	Snacks	12.2%	
		Snacks	11.2%	Cereal	8.8%	
		Brkfst (frzn)	10.9%	Produce	7.2%	
		Rdy to serve	4.1%	Veg (frozen)	6.6%	
				Breakfast	2.4%	

Estimation				
	A		B	
Revenue	$13.5bn		$15.7bn	
	x			
% category	2.4% to 37.9%			
	=			
Category revenue	Cereal	$4.9bn	Yogurt	$6.0bn
	Breakfast	$2.5bn	Ice cream	$2.5bn
	Crackers	$2.0bn	Snacks	$1.9bn
	Snacks	$1.5bn	Cereal	$1.4bn
	Brkfst (frzn)	$1.5bn	Produce	$1.1bn
	Rdy to serve	$0.6bn	Veg (frozen)	$1.0bn
			Breakfast	$0.4bn

*Note: Product categories and percentages are based on Nielsen rather than company defined categories. Also, only product categories that represent over 2% of sales are displayed

3.2.A The customer

The goal of the reach category is to identify the number of individuals reached by the company. For consumer-packaged foods, we identify the customer as the end consumer rather than the retailer because the consumer is the one using the product. Furthermore, this decision is supported by the fact that manufacturers market their products to the end consumer rather than the retailer.

3.2.B Categorization of products

Given the vast number of products that consumer packaged food manufacturers sell, it would be unwieldy to report on and quantify the impact at the Universal Product Code (UPC) level. Instead, there needs to be a taxonomy of products according to a generally accepted set of categories. Looking at company disclosures for guidance, we found that although companies do categorize their revenue into certain product lines, the level of granularity and product categories differs across companies. Rather than using company-provided product categories, we use the groupings provided by a reputable and established consumer packaged foods data provider to ensure comprehensive comparability. In this example, we use the Nielsen Product Groups, but other data providers that track consumer and retailer behavior, such as IRI, could also have product groupings of relevance.

3.2.C Unit of measurement

To determine the appropriate unit for reporting consumer packaged foods sales in reach, we considered unit volume, revenue, calories, and servings. We use monetary revenue as the unit of measurement given it can be translated to implied calories, implied servings, or implied nutrients sold as required for monetization in the other dimensions.

3.2.D The impact estimate

Since companies do not report revenue by Nielsen Product Group, we extrapolate the percentage of sales by product group and manufacturer from the Nielsen HomeScan panel to company A and B’s reported revenue for demonstrative purposes. Companies that perform this analysis could report actual revenue by Nielsen Product Group or another widely accepted taxonomy.

3.3 Access - Affordability

TABLE 3

Product Category Affordability of Company A and B

Data					
Company datapoints		**A**		**B**	
Nielsen, USDA	Avg company price per calorie	Cereal	$0.0023	Yogurt	$0.0069
		Breakfast	$0.0019	Ice cream	$0.0073
		Crackers	$0.0019	Snacks	$0.0056
		Snacks	$0.0025	Cereal	$0.0020
		Brkfst (frzn)	$0.0033	Produce	$0.0035
		Rdy to serve	$0.0093	Veg (frozen)	$0.0102
				Breakfast	$0.0063
Industry assumptions					
Nielsen, USDA	Avg industry price per calorie	Breakfast	$0.0026	Produce	$0.0053
		Brkfst (frzn)	$0.0039	Rdy to serve	$0.0062
		Cereal	$0.0019	Snacks	$0.0027
		Crackers	$0.0019	Veg (frozen)	$0.0045
		Ice cream	$0.0027	Yogurt	$0.0098

Estimation		
	A	**B**
Snacks revenue	$1.5bn	$1.9bn
	÷	
Snack price per calorie	$0.0025	$0.0056
	=	
Implied snack calories sold	601.7bn	340.9bn
	x	
(Industry snack price	$0.0027	
	-	
Snack price per calorie)	$0.0025	$0.0056
	=	
Snack affordability impact	**$88.1m**	**-**
Affordability impact	**$1,323m**	**$3,079m**

*Note: Slight differences in affordability impact and calculation methodology are due to rounding.

3.3.A Product affordability in consumer-packaged foods

To calculate affordability, we compare the average pricing within each product category for both companies to the overall industry average price. We choose to use average price per calorie over other price metrics, which include price per unit, price per serving, or price per ounce. Tying price back to calories allows us to directly estimate the impact of pricing on accessibility since every individual must consume a certain number of calories to survive.

3.3.B Pricing per calorie data

Since companies do not publicly report price per calorie, we rely on pricing information from the Nielsen Homescan Panel and caloric information from USDA FoodData Central database. We merge calories per 100g of each product to every purchase made in the Nielsen panel on UPC code. We individually create a brand identifier for each manufacturer which allows us to sum the total number of calories sold and associated cost for each manufacturer and product category. We repeat this estimate for each product category across manufacturer to get to an industry-wide assumption on the average product category price per calorie.

3.3.C The impact estimate

We use the average price per calorie and estimated product category revenue to determine the number of calories sold within each product category. We then estimate the price differential from the industry average pricing within each product category to identify product categories in which the company provides a more affordable product than the industry. For the more affordable categories, we multiply the calories sold against the price differential to estimate the affordability impact. In Table 3, we show an example calculation for a single product category for company A and B. Repeating and summing this calculation for the other more affordable categories measures the total affordability impact. For Company A, the categories included in the total affordability impact are snacks, breakfast, and frozen breakfast. For Company B, the categories included in the total affordability impact are yogurt and produce. A packaged foods manufacturer looking to estimate their own affordability impact could use actual calories sold and internal price per calorie for each product category.

Since price per calorie affordability is volume-based, it is possible for companies to seem more affordable than they are in practice if they sell in bulk. A company that sells bulk-sized products will likely have lower than average price per calorie while remaining inaccessible to certain consumers who cannot afford to pay the higher lump sum price. Given this is an issue that persists for all volume-based comparisons, the internal company comparison should be based on the highest internal price per calorie across different packaging sizes, if there is significant variance in price between different sizes.

3.4 Access – Underserved

TABLE 4

Underserved Accessibility of Company A and B

Data			
Company datapoints		**A**	**B**
Company marketing	Total products	1,800	
Company WIC guide	WIC products	13	
CSR report	% WIC products	0.7%	16%
Nielsen	% WIC purchases	1.07%	1.02%
Industry assumptions			
USDA	Annual meal cost per person	$491.52	
NAIC	Food assistance health savings	$1,400	

Estimation		
	A	**B**
Revenue	$13.5bn	$15.7bn
	x	
% of WIC products	0.72%	16%
	x	
% food stamp purchases	1.07%	1.02%
	÷	
Meal cost per person	$491.52	
	x	
Health savings	$1,400	
Underserved impact	**$2.99m**	**$72.89m**

3.4.A The underserved consumer

In the consumer-packaged foods space, we estimate the underserved impact by identifying the food insecure customers[1] reached across all markets. We use estimates of supplemental nutrition assistance program[2] sales to identify consumers who are food insecure. We believe the sales from this program can identify products that address hunger in a nutritious and efficient manner. Although food stamp programs tend to be common in the United States over other geographies, we make the simplifying assumption that the rate of purchases by the food insecure is consistent globally given data constraints. We recognize this fails to capture the fact that different countries might exhibit different poverty rates, government support programs and eating habits. For manufacturers that believe this estimate excludes a significant part of their impact to reducing food insecurity in emerging markets, this estimate can be supplemented to include the sales of staple products in emerging markets. The intent is to capture sales of staple foods, such as flour or grains rather than premium ice creams.

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[1] As defined by the Food and Agriculture Organization of the United Nations, food insecurity is "a situation that exists when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and an active and healthy life".

[2] In the United States, households making less than 130% of the poverty line in gross monthly income given household size are eligible for the Supplemental Nutrition Assistance Program. This program provides an average monthly benefit of $448 for a household of 4 to be used at retail food stores for purchase of fruits and vegetables; meat, poultry, and fish; dairy products; breads and cereals; and other foods such as snack foods and non-alcoholic beverages.

3.4.B Food stamp data

To identify the revenue that is coming from food stamp programs, we use a mix of company self-reporting on qualified products and Nielsen data on purchase methodology. For company A, the identification of assistance qualified products is limited to confirmed cereals qualifying for the Special Supplemental Nutrition Assistance Program for Women, Infants, and Children (WIC)[3], which likely underestimates the full extent of products that meet food sustenance requirements. On the other hand, company B discloses the actual percent of their products that are WIC-qualified. We then use Nielsen data to identify the percent of sales that are paid for using a supplemental food assistance program since WIC-qualified products are not necessarily only purchased by WIC households. Given data availability, we are limited to estimating supplemental food assistance sales only through the WIC program using a representative sample. A company performing this analysis could use actual revenue from all food stamp programs.

3.4.C The impact estimate

We divide the revenue from food stamp programs by industry assumptions on annual per person meal cost to identify the number of food insecure individuals reached. We then multiply the number of food insecure individuals reached with the averted health costs associated with food stamp program access[iii] to estimate the underserved impact.

[3] As described by the United States Department of Agriculture, "The Special Supplemental Nutrition Program for Women, Children, and Infants provides federal grants to states for supplemental foods, health care referrals, and nutrition education for low-income pregnant, breastfeeding, and non-breastfeeding postpartum women, and to infants and children up to age five who are found to be at nutritional risk".

3.5 Quality – Health and Safety

TABLE 5

Recall Impact of Company A and B

Data			
Company datapoints		**A**	**B**
FDA	Recalls conducted	1	2
FDA	Product recalled	Cereal	Cereal Snackbar
FDA	Unit volume	Box (15.3 or 23 oz)	14-box case (14.1, 19 oz) 1 bar
FDA	Units recalled	1,145,030	16,308 735
Industry assumptions			
	Consumption of recalled product (per person)	229.28	1
USDA	Salmonella cost	$3,568	

Estimation		
	A	**B**
Cereal unit volume	19.15	231.7
	x	
Cereal units recalled	1,145,030	16,308
	=	
Volume recalled (ounces)	21,927,325	3,778,564
	÷	
Per person consumption	229.28	
	x	
Health savings	$3,568	
	=	
Cereal recall impact	**-$341.23m**	**-$58.80m**
Recall impact	**-$341.23m**	**-$61.42m**

3.5.A Packaged foods health and safety

In the consumer-packaged foods space, it is necessary to make the distinction between the healthiness and the health and safety of a product. In the health and safety dimension, we look at whether there have been any breaches of health and safety related to the product rather than the inherent healthiness of the product, which is instead captured in the effectiveness dimension. For consumer-packaged goods, the health and safety breaches can be examined by looking at product recalls. Although a high volume of recalls is usually indicative of a manufacturer that has produced many products of questionable quality, high recall volume could also be the result of a manufacturer that is very conscious of the health and safety of their product and therefore is voluntarily and preemptively recalling products. For demonstrative purposes, this example does not distinguish between mandatory and voluntary recalls when estimating the health and safety impact given all three recalls were voluntary. A manufacturer estimating its own impact could exclude voluntarily issued recall volumes from their analysis.

3.5.B Data on product recalls

Consumer packaged foods manufacturers that disclose metrics on food safety in their corporate sustainability reports per SASB metric CN0103-09[4] tend to share only the number of recalls issued without the associated product volume. Therefore, we use Food & Drug Administration recall data[iv] to identify the associated products and product volumes for each issued recall. This allows us to estimate actual units recalled[5] which can then be tied back to consumption. Since FDA and SASB both do not specify the associated food-borne illness with each recall, we assume that all recalled product would be associated with salmonella for demonstrative purposes. Any manufacturer conducting this analysis should identify the actual associated food-borne illness and look at the USDA ERS database on foodborne illnesses to collect the relevant estimate.

3.5.C The impact estimate

Using company A's and B's cereal recall as an example, we determine the average ounces of product per unit of sales. For company A, this is the simple average of the two box sizes and for company B, the simple average is multiplied by the 14 boxes in each case. We then multiply ounces per unit of sales by total units recalled to estimate the total volume recalled in ounces. To approximate the number of consumers exposed to recalled cereal, we then divide the recalled volume by an industry assumption on a reasonable per person cereal consumption level. Finally, we calculate the cereal recall impact by multiplying the number of individuals affected by the recall with the per person cost for a food-borne illness. For the total recall impact, we repeat this calculation for all recalls. For demonstrative purposes, we display recall impact from mandatory and voluntary recalls. Manufacturers estimating their own recall impact could use the actual sales volume and associated food-borne illness for only mandatory issued recalls to estimate the number of customers affected.

[4] SASB Metric CN103-09 is a food safety accounting metric on "number of recalls issued, total amount of food product recalled".

3.6 Quality – Effectiveness

TABLE 6

Effectiveness Impact of Company A and B

Data			
Company datapoints		**A**	**B**
Nielsen & USDA	Fiber sold (g)	65.7bn	32.5bn
	Sodium sold (mg)	7,321bn	2,494bn
	Trans fat sold (g)	3.03m	515.63m
	Sugar sold (g)	27.2bn	9.3bn
	Whole grains sold (g)	0.7bn	73.0bn
Industry assumptions			
NCBI	Fiber on reduced CHD risk[v]	15.5%	
USDA	Annualized DV of fiber (g) [vi] [6]	9,125	
BMJ	Sodium on CVD risk increase[vii]	17%	
PLoS Med[viii]	Excess sodium consumed (%)[7]	32%	
	Individual excess consumed (mg)	401,500	
PLoS Med[ix]	Grains on reduced CHD risk	6.0%	
	Annual assoc. consumption	18,250	
New England Journal of Medicine [x]	Trans fat on CHD risk increase	23.0%	
	Annual assoc. consumption[8]	1,866	
Harvard Health Publ	Sugar on CVD risk[xi]	38%	
UCSF	Excess sugar consumed (%)[xii]	56%	
American Heart Association[xiii]	Prevalence of CHD[9]	5.23%	
	Medical cost of CHD	$5,297.62	
	Indirect cost of CHD	$5,892.86	
	Prevalence of CVD[10]	41.50%	
	Medical cost of CVD	$3,096.40	
	Indirect cost of CVD	$2,307.69	

Estimation		
	A	**B**
Fiber sold	65.7bn	32.5bn
	÷	
Annualized DV of fiber	9,125	
	=	
Individuals reached	7,202,447	3,564,941
	x	
Fiber on reduced CHD risk	15.5%	
	x	
Prevalence of CHD	5.2%	
	x	
CHD costs	$11,190.48	
	=	
Fiber impact	**$653m**	**$323m**
Sodium sold	7,321bn	2,494bn
	x	
Excess sodium sold (%)	32.4%	
	÷	
Annual excess consumption	401,500	
	=	
Individuals reached	5,899,031	2,009,797
	x	
Sodium on increased risk	10.0%	
	x	
Prevalence of CVD	41.5%	
	x	
CVD costs	$5,404.09	
	=	
Sodium impact	**-$1,323m**	**-$451m**
Effectiveness impact	**-$1,561m**	**-$328m**

[6] Estimated based on the daily recommended value of fiber at 25g multiplied by 365 to scale to an annual value

[7] Estimated based on the excess sodium consumed as a percent of daily sodium consumed, where the recommended limit for sodium consumption is 2,300 mg and the average daily sodium consumption is 3,400 mg

[8] Annual associated trans fat consumption estimated based on 2% of annual caloric intake with 2,300 daily caloric intake and 9 calories per gram of fat

[9] The industry assumption for prevalence of CHD in these estimates are US based. Companies with sales in non-US geographies where the prevalence for CHD is significantly different may choose to use a more representative prevalence rate.

[10] Similarly, the industry assumption for prevalence of CVD in these estimates are US based. Companies with sales in non-US geographies where the prevalence for CVD is significantly different may choose to use a more representative prevalence rate.

3.6.A Packaged foods effectiveness

As mentioned in the previous section, the effectiveness of a packaged food product can be estimated through its nutrient value. Although consumers do purchase packaged foods for other reasons independent of nutrient value, such as convenience of pre-made meals or enjoyment from eating a chocolate bar, these additional qualities are secondary to the most basic goal of packaged food provision and consumption, which fundamentally boils down to nutrition. We capture this by looking at nutrients that have clear and consistent established relationships with health outcomes. Current research indicates that trans fat[11], added sugar[12], sodium[13], whole grains[14], and fiber[15] have clear associations with the relative risk for cardiovascular and coronary heart disease. We recognize that the associations between nutrition and health outcomes are not limited to these five nutrients and two diseases. Where medical research identifies clear associations for additional nutrients and health outcomes, companies can use this methodology to estimate the impact of those nutrients as well. Care in selecting additional nutrients is needed to ensure the overall effectiveness estimate is not falsely skewed positive from the addition of only positive nutrients. To provide an example of an additional nutrient that companies could choose to monetize, we will also describe the methodology that could be used for companies looking to include calcium in impact estimate section, Section 3.6.C.

3.6.B Data on product nutrient content and associated health outcomes

Given the differences in how packaged food manufacturers discuss and report nutritional information, we use Nielsen and USDA data to consistently estimate the amount of fiber, sodium, trans fat, and added sugar sold by manufacturer. For each product purchased in the Nielsen panel, we merge the associated nutritional facts from the USDA data using UPC code to determine the nutrient volume associated with each purchase given the servings sold. We then sum to estimate

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[11] According to the American Heart Association, "artificial trans fat, or trans fatty acids, are fats created in an industrial process that adds hydrogen to liquid vegetable oils to make them more solid. The primary dietary source for trans fat in processed foods is "partially hydrogenated oils".

[12] According to the Center for Disease Control, "Added sugars are sugars and syrups that are added to foods or beverages when they are processed or prepared. Naturally occurring sugars such as those in fruit or milk are not added sugars".

[13] According to the American Heart Association, "Salt and sodium are often used interchangeably, but they're not exactly the same thing. Sodium is a mineral that occurs naturally in foods or is added during manufacturing or both. Table salt is a combination of sodium and chloride. By weight, it's about 40 percent sodium and 60 percent chloride".

[14] According to the Whole Grains Council, "A grain is considered to be a whole grain as long as all three original parts — the bran, germ, and endosperm — are still present in the same proportions as when the grain was growing in the fields".

[15] According to the Nutrition Source at the Harvard T.H. Chan School of Public Health, "Fiber is a type of carbohydrate that the body can't digest. Though most carbohydrates are broken down into sugar molecules, fiber cannot be broken down into sugar molecules, and instead it passes through the body undigested. Fiber helps regulate the body's use of sugars, helping to keep hunger and blood sugar in check".

the total volume of nutrients sold by Company A and B in the Nielsen panel and scale given the revenue represented by the Nielsen data with total revenue to extrapolate the full nutrient volume sold. In doing so, we assume the nutritional profile in the Nielsen panel is representative of the manufacturers' total nutrient sales and that all sold products are consumed.

Since whole grains are excluded from the USDA dataset, we estimate the whole grains sold using various company statements. Company A reports that a certain number of their brands contain a creditable ounce of whole grains per serving and Company B reports that all their cereal brands contain at least eight grams of whole grains. Combining these statements with average price per serving and total revenue, we can estimate the total amount of whole grains sold by both companies. A company estimating their own effectiveness impact should use actual nutrient volumes sold.

To determine the associated relative health risks with each nutrient, we use meta-analyses in medical literature to identify established relative risk associations. We then use cost estimates from the American Heart Association to estimate the associated health and productivity costs with cardiovascular and coronary heart disease.

We note that the medical literature on recommended nutrient consumption, relative health risks, and other nutrition and health-based estimates can change over time. These examples demonstrate estimates based on the latest guidance from widely accepted government departments and organizations. Although there may be a lag from contemporary literature, we find that the widely accepted guidance is updated on a regular cadence. For example, the Dietary Guidelines by the United States Department of Agriculture is updated every five years. Therefore, to ensure the assumptions used are current and consistent, the nutritional assumptions made in this example should be updated to reflect the latest provided guidance by these broader government and non-profit organizations.

3.6.C The impact estimate

We calculate the impact of fiber sold by estimating the health impact on the individuals reached. First, we divide Company A and B's total fiber sold by an estimate of recommended annual individual consumption[16] to estimate the equivalent individuals reached. We then calculate the impact from reducing the risk of coronary heart disease for these individuals by multiplying the number of individuals reached by the change in risk, prevalence, and associated costs. In the full effectiveness calculation, we also apply this methodology to whole grains and trans fat in the appendix, given the health outcome associations for these nutrients are independent of any consumption limits.

On the other hand, the sodium and added sugar have clear risk associations when consumed above a certain limit. Therefore, we provide an example of estimating sodium impacts to demonstrate how the limits on consumption can influence the calculation. As with fiber, we identify the amount of sodium sold by each manufacturer. We then multiply this by the excess sodium consumed to identify excess sodium sold. Dividing by the excess per person consumption, we can approximate the number of individuals reached and apply the prevalence, risk association, and costs to calculate the total sodium impact. To estimate the total effectiveness impact, we repeat the limit calculation for added sugar in the appendix and sum the impacts for all five nutrients.

We recognize different approaches can exist for the limit calculation with sodium and added sugar. For example, rather than estimating excess sodium from the total sodium sold, it is also possible to only include excess sodium from products where the sodium per calorie content is higher than the recommended level. While this product-level methodology aligns with the scope of manufacturer control, the total sum calculation aligns more with consumer behavior as it captures all sodium contributing to excess consumption.

For companies looking to include other nutrients, we describe the methodology for a sample nutrient, calcium. First, we determine if calcium is associated with any health outcomes. Second, we determine if calcium has any consumption limits. Having identified that calcium is associated with a decrease in osteoporosis and does not have any consumption limits, we choose to apply the methodology used for fiber, whole grains, and trans fat. Following that methodology companies can divide the amount of sodium sold by the annualized daily value of calcium consumption, 401.5 grams[xiv], to estimate the equivalent individuals reached. The number of individuals can then be multiplied by the prevalence (10.3%[xv]), change in risk (65%[xvi]), and

[16] In this example, we use the recommended daily consumption from the New England Journal of Medicine which reflects the latest guidance from the 2015-2020 USDA Dietary Guidelines to estimate annual individual consumption. As newer guidance is released, the annual estimate should also be updated to reflect the latest information.

associated medical and productivity costs for osteoporosis ($15,343[xvii]) to estimate the impact of calcium sold.

3.7 Quality – Basic Need

3.7.A Basic needs met by packaged foods

Packaged food manufacturers have a basic need impact when they sell staple food products. Although we tend to use elasticity to identify products that meet a basic need, food products are one of the exceptions given there exists highly inelastic food products that do not meet a basic need. For example, demand for ice cream or sodas is often inelastic, but ice cream and sodas are not a basic need. Therefore, we use staple foods to determine whether the product sold meets a basic need. We reference the list of Nielsen product categories against the USDA food pyramid to identify the following categories as clearly staples: baby food, bread and baked goods, eggs, flour, fresh meat, fresh produce, and pasta. Since Companies A and B do not have significant sales in these categories, they have no basic need impact. Although there are other categories that could potentially qualify as staples, such as cereals and yogurt, we limit the estimate to the minimally processed staple products for conservatism. This list of staple products could be refined going forward as more companies apply this methodology and identify additional categories or products that are basic staples for consumption.

3.7.B The impact estimate

For companies that do have significant sales in a staple category, the impact estimate could divide revenue from staple sales by the annual meal cost per person to identify the number of individuals reached. The number of individuals reached should then be multiplied by a monetization coefficient on the per person averted cost of hunger. Currently, we have identified $491.52 as the annual cost of meals for a single individual from data on supplemental food assistance programs. Similarly, we have identified $13.41 as the monetization coefficient on the individual cost to end world hunger based on the 820 million individuals that are food insecure globally[xviii] and the $11 billion cost to ending world hunger[xix]. We multiply the averted food insecurity cost against all individuals reached by a staple food, regardless of their food security status, given our goal is to monetarily proxy for the inherent goodness or basic need provided by a company that sells a staple food. As with the other dimensions, these industry assumptions should be refined and updated as more relevant and accurate figures become available.

3.8 Optionality

Given Company A and B do not operate in a monopoly, do not sell addictive products, and have not provided false marketing or false information about their products, they both have no impact under the optionality dimension. This assumes that although products with high sugar or high fat are habit forming, they are not truly addictive. This is likely to be the case for most packaged food manufacturers.

3.9 Environmental Usage Emissions

TABLE 7

Environmental Usage Impact of Company A and B

Data				Estimation		
Company datapoints		**A**	**B**		**A**	**B**
CSR	Scope 3 emissions from goods			Emissions from usage	4,123,600	1,316,000
	CO_2 emissions (home cooking)	2,783,430	888,300		x	
	CO_2 emissions (home storage)	1,340,170	427,700	Cost per ton of carbon	$114	
					=	
Industry assumptions				**Emissions impact**	**-$470m**	**-$150m**
IWAI	Cost per metric ton of carbon[xx]	$114				

The environmental usage impact of packaged food manufacturers captures the equivalence of emissions generated by use of the product, which includes cooking and storage of the product. While both Company A and B disclose some level of Scope 3 emissions from purchased goods and services, Company A reports aggregate emissions while Company B details the percentage of emissions from transportation, cooking, storage, and end of life treatment. To provide a more reasonable estimate for Company A given the aggregate estimate would likely include emissions beyond cooking and storage and therefore overstate the environmental usage impact, we apply the percentage emissions from Company B allocated to home cooking and storage relative to all Scope 3 emissions for demonstrative purposes. Ultimately, a company conducting this analysis could identify all emissions from home cooking and storage and use the cost per metric ton of carbon to identify the total emissions impact.

3.10 End of Life Recyclability Impact

TABLE 8

End of Life Recyclability Impact of Company A and B

Data				Estimation		
Company datapoints		**A**	**B**		**A**	**B**
CSR	Scope 3 emissions from goods	1,340,170	427,700	Emissions from end of life	1,340,170	427,700
					x	
Industry assumptions				Cost per ton of carbon	$114	
IWAI	Cost per metric ton of carbon	$114			=	
				End of life impact	**-$152.8m**	**-$48.8m**

As with the previous section, we apply the approximated or disclosed emissions from the end of life treatment of packaged foods and the cost of carbon to estimate the recyclability impact. Since Company A provided an aggregate total for emissions, we again use the percentage of emissions from end of life treatment from Company B to monetize the end of life treatment in this dimension. Given the definition of Scope 3 emissions, the end of life recyclability impact includes the impact from food waste.

4. Value of impact-weighted financial statement analysis

This application of the product framework to consumer-packaged foods manufacturers not only indicates feasibility of estimating monetary product impacts within this industry, but also demonstrates the potential value of impact-weighted financial statement analysis. For example, with packaged foods, a company's strategic focus on prioritizing health and nutrition could be captured by product effectiveness impacts for a single company over time. By providing a view of nutrient volumes sold, the effectiveness impacts can demonstrate trends and decisions around food reformulation, retail placement, and even consumer behavior, such as the growing trends towards health and wellness, plant-based eating and clean label foods. We expect that most packaged foods companies have experienced a reduction in negative impact from trans fat in recent years, a reflection of changing consumer preferences, legislation, and food reformulation. Noting that the premise of food reformulation is about improving the nutritional content of a product without compromising on taste, the effectiveness impacts over time for multiple companies could provide useful insights for industry leaders and internal strategic decision-making.

Another potential analysis could compare the product impacts of different companies. Within a single industry, one can identify differences in how the two companies approach different product attributes. For example, our analysis suggests that while Company A is more affordable than Company B, Company B tends to formulate healthier products. Analyzing each dimension allows for a deeper understanding of the business strategies employed by each company.

Finally, the impact-weighted financial statement analysis indicates which dimensions are most material to product impact creation. In the consumer-packaged foods industry, the impact is driven mostly by dimensions that influence the quality of the product, most specifically, the effectiveness dimension. This suggests that the variance in company performance on product impact in consumer-packaged foods is most dependent on the nutritional profile of the product.

4.1 Application of impact-weighted financial statement analysis

To provide a comprehensive example of the information enabled by impact-weighted financial statement analysis, we generated product impact estimates for other companies within the consumer-packaged foods industry. These estimates allow us to identify competitive dimensions of product impact within consumer-packaged foods, company strategy and product impact performance over time, and overall industry leaders and laggards.

The dataset consists of product impact estimates for 13 leading global consumer-packaged food manufacturers in 2018 that are publicly traded and cross-listed in the US to ensure data availability. Given the industry assumptions used for monetizing product impact remain constant throughout the industry, the product estimates are calculated by applying the industry-wide assumptions to the respective company-specific data points as demonstrated with Companies A and B. For comparability, we examine the product estimates scaled by EBITDA and revenue.

For the affordability dimension, company-specific data on sales in each product category and industry assumptions of the respective price per calorie and price per category come from Nielsen. The product categories defined by Nielsen are used to maintain consistency across all companies. Only product categories that make up at least 2% of a company’s sales are included in the affordability estimate. For the underserved dimension, we collect company-specific data on WIC qualified product sales and sales to WIC households from company reporting and Nielsen. Where companies do not report their WIC sales, we apply the New York State WIC food list. We use WIC sales as a proxy in identifying sales to underserved customers. We note that WIC is an American federal assistance program.

For the health and safety dimension, company-specific data on recalls are from the U.S. Food and Drug Administration (FDA) rather than company reporting for consistency of methodology. We include both mandatory and voluntary firm-initiated recalls to ensure a complete estimate of impact. The cost assumption applied to a recall depends on the reason for recall as indicated by the FDA. We scale the recall impact by the Class I, II, and III recall classification to account for the risk of harm occurring. Assumptions are applied as used in the example with Companies A and B.

For the effectiveness dimension, nutrient sales data for whole grain, fiber, sodium, trans fat, sugar and calcium come from Nielsen and the U.S. Department of Agriculture (USDA). We apply the same industry assumptions as provided in the Companies A and B examples. For the basic need dimension, the companies included in our dataset do not have sales in any of the staple food product categories. Therefore, no basic need impact is recorded for these companies.

For the environmental usage dimension, emissions data comes from company reporting or, when unavailable, from the Carbon Disclosure Project. When Scope 3 emissions are reported as a whole rather than in its components, we note that the environmental usage dimension estimates are based on an assumption that 40% of Scope 3 emissions are from home cooking and storage. For the end of life dimension, similar to the environmental usage dimension, emissions data is collected from company reporting or the Carbon Disclosure Project. We note that in cases where end of life emissions are not explicitly reported, estimates are based on an assumption that 13% of Scope 3 emissions are due to end of life treatment.

TABLE 9

Product Impact of Consumer-Packaged Foods Companies

	Impact Scaled by EBITDA			Impact Scaled by Revenue		
Impact	N	Average	SD	N	Average	SD
Affordability Impact	13	34.34%	0.30	13	7.06%	0.06
Underserved Impact	13	0.90%	0.01	13	0.18%	0.00
Health and Safety Impact	13	-44.36%	0.65	13	-10.19%	0.34
Effectiveness Impact	11	-79.96%	0.47	11	-16.85%	0.12
Whole Grain Impact	5	0.87%	0.02	5	0.18%	0.00
Fiber Impact	12	11.73%	0.07	12	2.25%	0.01
Sodium Impact	13	-43.29%	0.30	13	-8.34%	0.05
Trans Fat Impact	8	-0.83%	0.01	8	-0.19%	0.00
Added Sugar Impact	10	-55.47%	0.58	10	-12.30%	0.14
Environmental Usage Impact	10	-11.15%	0.12	10	-2.53%	0.03
End of Life Treatment Impact	10	-3.51%	0.04	10	-0.86%	0.01
Overall Product Impact	11	-103.05%	0.89	11	-21.80%	0.21

Table 9 shows summary statistics for all impact variables. The number of observations varies across the variables as for some companies we are missing information necessary to calculate the impact estimates. Examining the average impact scaled by EBITDA and revenue indicates that the effectiveness dimension is a significant driver of product impact. Within the effectiveness dimension, sodium, added sugar, and fiber are the nutrients driving the effectiveness impact. Affordability and health and safety are also dimensions that drive the overall product impact. The large standard deviation of the health and safety impact indicates that health and safety issues contribute significantly to the overall product impact of some, but not all packaged foods companies.

FIGURE 2

Distribution of Overall Product Impact Estimates Scaled by EBITDA

Figure 2 shows the distribution of total product impact in the sample showing significant variation. The distribution exhibits a negative mean and a negative skew suggesting that the firms in our sample overall deliver more negative product impact.

4.2 Hypotheses explaining negative product impact estimates

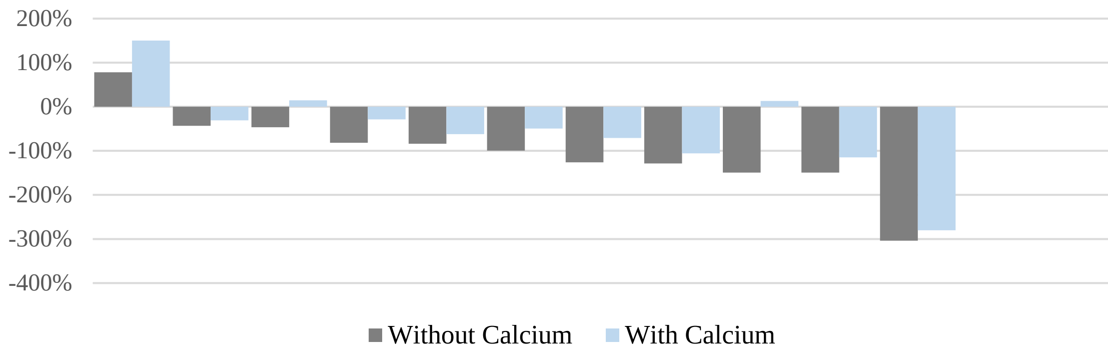
There are four hypotheses that can explain why we are observing generally negative product impact within the packaged foods industry. The first hypothesis is the *baseline case* in which the negative product impact estimated is consistent with and captures the impact of the industry. The second hypothesis is the *scope bias case* in which some positive impacts created by the packaged foods industry have not yet been estimated and included in the total product impact. The third hypothesis is the *measurement bias case* in which the benefits or costs are rightly scoped but incorrectly estimated, in this case benefits are underestimated and costs overestimated. Finally, the fourth hypothesis is *sample selection bias* in which the companies selected in our sample are unrepresentative of the full industry, in this case product impact laggards.

While the *baseline case* hypothesis aligns with concerns voiced by public health experts regarding nutrition[xxi], we also note that *scope bias* and *sample selection bias* may be influencing the extent of the negative product impact within the packaged foods industry. In this dataset, the effectiveness impact of packaged foods companies are estimated through five nutrients: fiber, whole grains, sodium, added sugar, and trans fat. As the *scope bias case* indicates, the inclusion of other beneficial nutrients in this estimate could lead to a more positive overall product impact. Similarly, the inclusion of other harmful nutrients in this estimate could lead to a more negative overall product impact. We examine the marketing materials of packaged foods companies to identify commonly mentioned nutrients that might be leading to *scope bias*. The two nutrients mentioned by multiple packaged foods companies are calcium and protein. We choose to examine how calcium influences the effectiveness impacts given the risk association between calcium and osteoporosis.[xxii] Figure 3 shows how the distribution of overall product impact estimates could shift with the inclusion of calcium in the effectiveness estimate.

FIGURE 3

Distribution of Overall Product Impact Estimates Scaled by EBITDA

(With and Without Calcium)



The overall product impact estimates without calcium are shown in gray. To the left of each overall product impact estimate without calcium is that company's respective overall product impact estimate with calcium included. By including calcium in the overall product impact estimate, the distribution of product impact estimates has become less negative with three companies now displaying positive product impact. The inclusion of calcium does not uniformly improve overall product impact estimates, with companies selling predominantly breakfast foods and dairy products demonstrating the most marked changes. While *scope bias* may be skewing the overall product impact estimates negative, it is important to note that there needs to be conservatism and care in selecting nutrients for inclusion in the effectiveness dimension to avoid a false view of the industry. For comparability, we focus this dataset on the five nutrients commonly found in packaged foods. Companies conducting their own impact-weighted accounts may find it informative to include additional nutrients as we have demonstrated with calcium.

Finally, the *sample selection bias* could skew the overall product impact estimates negative if the companies in this dataset are unrepresentative of the industry. This dataset consists of thirteen of the largest global packaged food conglomerates. It is possible that the product impact of packaged food conglomerates is unrepresentative of smaller independent packaged foods companies.

4.3 Discussion of insights enabled by impact-weighted financial statement analysis

We examine the distribution of product impact estimates to identify dimensions of product impact that are most competitive within packaged foods.

Figure 4

Affordability Impact Estimates

(Scaled by EBITDA)

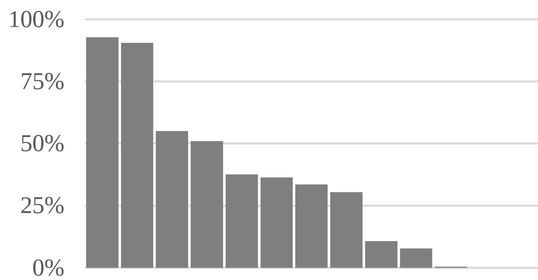


Figure 5

Underserved Impact Estimates

(Scaled by EBITDA)

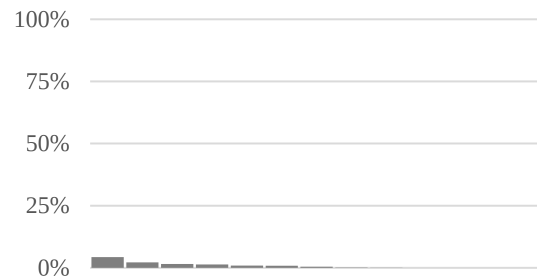


Figure 6

Health and Safety Impact Estimates

(Scaled by EBITDA)

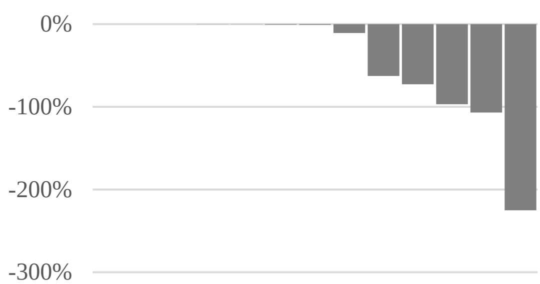


Figure 7

Effectiveness Impact Estimates

(Scaled by EBITDA)

Figure 8

Environmental Usage Estimates

(Scaled by EBITDA)

Figure 9

End of Life Impact Estimates

(Scaled by EBITDA)

Comparing the distribution of product impact by dimension provides information on which dimensions are drivers of product impact within consumer-packaged foods and how the dimensions influence overall product impact numbers. The magnitude of the effectiveness and affordability dimensions suggests that these two dimensions are key drivers of product impact in consumer-packaged foods. The variation of effectiveness and affordability impacts also highlights that these dimensions are key points of differentiation within this industry. This suggests that the overall nutritional content and cost per calorie of a packaged food are key differentiators in this industry.

The health and safety impact estimates are characterized by negative magnitudes with extreme outliers. The outliers in the health and safety dimension indicate that the dimension is a key driver of impact for companies with a large recall but not for others. The two companies with the most negative health and safety impact had either a significant volume of recalls or a severe health outcome associated with their recall.

The environmental usage, end of life and underserved impact dimensions are characterized by much smaller overall magnitudes and smaller variation. The smaller magnitude of the underserved impact dimension can potentially be explained by lack of granular data on food stamp and emerging market staple sales, preventing identification of which customers are truly underserved. The smaller magnitude of the end of life dimension can potentially be explained by lack of non-emissions related packaging and waste treatment data. While the impact in these dimensions may be understated, the significant difference in magnitude indicates that these dimensions have less influence on a packaged food company's product impact performance.

5. Conclusion

Although interest in ESG measurement continues to grow significantly, product impact has been difficult to systematically measure given the idiosyncratic nature of the impacts and the tendency to view products in broad categorizations of simply good and bad. The creation of a product impact framework allows for a systematic methodology that can be applied to different companies across a wide range of industries. This enables transparency, comparability, and scalability within product impact reporting. The identified standard dimensions on which product impact can be measured are rooted in existing measurement efforts, allowing data that is publicly available to be leveraged.

To ensure applicability, determine feasibility, and identify nuances within each dimension of product impact, we examine applications of the framework to company pairs across each GICS sector. In this paper, we provide a sample application to the consumer-packaged foods industry. We use publicly disclosed data and industry-wide assumptions to derive monetary estimates of a product's reach, accessibility, quality, optionality, environmental use emissions and end of life recyclability. While publicly disclosed data can provide meaningful insights, use of internal company data can further enable precision and support internal decision-making. This example also highlights the need for ongoing discussion and refinement of industry-accepted assumptions as contemporary literature leads to changing guidance over time.

This paper is one within the series of applications of the framework across each GICS sector, covering consumer packaged foods manufacturers in the consumer staples sector. Ultimately, the aspiration is to develop and provide a framework that enables more informed decisions which account for the many impacts created by products.

A. Appendix: Effectiveness Estimate for Whole Grains, Added Sugar and Trans Fat

Data

Company datapoints		**A**	**B**
Nielsen & USDA	Fiber sold (g)	65.7bn	32.5bn
	Sodium sold (mg)	7,321bn	2,494bn
	Trans fat sold (g)	3.0m	515.6m
	Sugar sold (g)	27.2bn	9.3bn
	Whole grains sold (g)	0.7bn	73.0bn

Industry assumptions		
NCBI	Fiber on reduced CHD risk	15.5%
USDA	Annualized DV of fiber (g)	9,125
BMJ	Sodium on CVD risk increase	17%
PLoS Med	Excess sodium consumed (%)	32%
	Individual excess consumed (mg)	401,500
PLoS Med	Grains on reduced CHD risk	6.0%
	Annual assoc. consumption	18,250
Harvard School of Public Health	Trans fat on CHD risk increase	23.0%
	Annual assoc. consumption	1,866
Harvard Health Publ	Sugar on CVD risk	38%
UCSF	Excess sugar consumed (%)	56%
	Individual excess consumed (mg)	1446860%
American Heart Association	Prevalence of CHD	5.23%
	Medical cost of CHD	$5,297.62
	Indirect cost of CHD	$5,892.86
	Prevalence of CVD	41.50%
	Medical cost of CVD	$3,096.40
	Indirect cost of CVD	$2,307.69

Estimation

	A	**B**
Whole grains sold	715,488,000	72,955,896,645
	÷	
Annualized DV of grains	18,250	
	=	
Individuals reached	39,205	3,997,583
	x	
Grains on CHD risk	6.0%	
	x	
Prevalence of CHD	5.2%	
	x	
CHD costs	$11,190.48	
	=	
Whole grains impact	**$1,376,705**	**$140m**
Added sugar sold	27,183,839,440	9,265,585,300
	x	
Excess sugar sold (%)	55.7%	
	÷	
Annual excess consumption	14,469	
	=	
Individuals reached	1,046,897	356,834
	x	
Sugar on increased risk	38.0%	
	x	
Prevalence of CVD	41.5%	
	x	
CVD costs	$5,404.09	
Sodium impact	**-$892m**	**-$304m**
Trans fat sold	3,029,740	515,626,935
	÷	
Consumption for risk	1,866	
	=	
Individuals reached	1,624	276,393
	x	
Trans fat on CHD risk	23.0%	
	x	
Prevalence of CHD	5.2%	
	x	
CHD costs	$11,190.48	
Trans fat impact	**-$218,613**	**-$37m**

Resources

[i] George Serafeim and Katie Trinh. "A Framework for Product Impact-Weighted Accounts", Harvard Business School. Accessed July 6, 2020.
[ii] George Serafeim, T. Robert Zochowski, and Jen Downing. "Impact-Weighted Financial Accounts: The Missing Piece for an Impact Economy", Harvard Business School. Accessed October 6, 2020.
[iii] Mozaffarian, Dariush. "Food is Medicine: Why Healthier Eating Should be a Priority for Health Care Providers, Insurers and Government", National Association of Insurance Commissioners & The Center for Insurance Policy and Research. Published December 2018. Accessed July 2020.
[iv] "Compliance Dashboards > Recalls". US Food & Drug Administration Data Dashboard. https://datadashboard.fda.gov/ora/cd/recalls.htm. Accessed July 2020
[v] McRae, Marc. "Dietary Fiber is Beneficial for the Prevention of Cardiovascular Disease: An Umbrella Review of Meta-analyses." *J Chiopr Med.* Published October 2017. Accessed August 2020.
[vi] "Dietary Guidelines for Americans 2015-2020". US Department of Health and Human Services and US Department of Agriculture. 8th Edition. Published December 2015. Accessed August 2020.
[vii] Strazzullo, Pasquale et al. "Salt intake, stroke, and cardiovascular disease: meta-analysis of prospective studies." *BMJ (Clinical research ed.)* Published November 2009. Accessed August 2020.
[viii] Pearson-Stuttard, Jonathan et al. "Estimating the health and economic effects of the proposed US Food and Drug Administration voluntary sodium reformulation: Microsimulation cost-effectiveness analysis." *PLoS medicine*. Published Apr. 2018. Accessed August 2020.
[ix] Lee Yujin et al. "Cost-effectiveness of financial incentives for improving diet and health through Medicare and Medicaid: A microsimulation study." *PLOS Medicine* Published March 2019. Accessed August 2020.
[x] Mozaffarian, Dariush et al. "Trans Fatty Acids and Cardiovascular Disease". *The New England Journal of Medicine.* Published April 2006. Accessed August 2020.
[xi] "The Sweet Danger of Sugar". *Harvard Health Publishing Harvard Medical School.* Updated November 2019. Accessed August 2020.
[xii] "How Much is Too Much? The Growing Concern Over Too Much Added Sugar In Our Diets". *UCSF Sugar Science.* Accessed August 2020.
[xiii] "Cardiovascular Disease: A Costly Burden for America", American Heart Association. Published 2017. Accessed August 2020.
[xiv] "Dietary Guidelines for Americans 2015-2020". US Department of Health and Human Services and US Department of Agriculture. 8th Edition. Published December 2015. Accessed August 2020.
[xv] Wright, Nicole et al. "The Recent Prevalence of Osteoporosis and Low Bone Mass in the United States Based on Bone Mineral Density at the Femoral Neck or Lumbar Spine". *J Bone Miner Res.* Published 2014. Accessed September 2020.
[xvi] Sunyecz, John. "The use of calcium and vitamin D in the management of osteoporosis." *Therapeutics and Clinical Risk Management.* Published August 2008. Accessed September 2020.
[xvii] Pike et al. "Direct and Indirect Costs of Non-Vertebral Fracture Patients with Osteoporosis in the US. *PharmacoEconomics.* Published September 2012. Accessed September 2020.
[xviii] "Transforming Food Systems for Affordable Healthy Diets". *Food and Agriculture Organization of the United Nations.* Published 2019. Accessed August 2020.
[xix] "Ending world hunger is within reach: Study finds it will cost only USD 11 billion more a year". *International Institute for Sustainable Development.* Published October 2016. Accessed August 2020.
[xx] David Freiberg, DG Park, George Serafeim and T. Robert Zochowski. "Corporate Environmental Impact: Measurement, Data and Information", Harvard Business School. Accessed August 2020.
[xxi] "Processed Foods and Health". *The Nutrition Source | Harvard T.H. Chan School of Public Health.* Accessed November 2020.
[xxii] John A. Sunyecz. "The use of calcium and vitamin D in the management of osteoporosis." *Therapeutics and Clinical Risk Management.* Published August 2008.