

**SUPERIOR COURT OF THE DISTRICT OF COLUMBIA
Civil Division**

THE PRAXIS PROJECT, et al.,)	
)	Case No. 2017 CA 004801 B
Plaintiffs,)	
)	Honorable Judge Elizabeth C. Wingo
v.)	
)	
THE COCA-COLA COMPANY, et al.,)	Next Event: Motion Hearing
)	March 15, 2018 at 11:00 a.m.
Defendants.)	

**COCA-COLA’S MOTION TO DISMISS
PURSUANT TO SUPER. CT. R. 12(B)(6) AND 12(B)(1)**

Defendant The Coca-Cola Company (“Coca-Cola”), by and through the undersigned, hereby moves this Court, pursuant to Rules 12(b)(6) and 12(b)(1) of the Superior Court Rules of Civil Procedure, to dismiss Plaintiffs’ Complaint in its entirety and with prejudice.

In support of the instant Motion, Coca-Cola respectfully refers this Court to the Memorandum of Law and Points of Authorities filed herewith.

ORAL HEARING REQUESTED

Pursuant to Rule 12-I(h) of the Superior Court Rules of Civil Procedure, Coca-Cola respectfully requests an oral hearing on this motion.

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Dated: October 23, 2017

Respectfully submitted,

Steven A. Zalesin (pro hac vice)
Travis J. Tu (pro hac vice)
Jane M. Metcalf (pro hac vice forthcoming)
PATTERSON BELKNAP WEBB & TYLER LLP
1133 Avenue of the Americas
New York, New York 10036
(212) 336-2000 (telephone)
(212) 336-2111 (facsimile)
E-mail: sazalesin@pbwt.com
tjtu@pbwt.com
jmetcalf@pbwt.com

/s/ Anthony T. Pierce

Anthony T. Pierce (D.C. Bar No. 415263)
Stanley E. Woodward Jr. (D.C. Bar No. 997320)
Melissa D. Chastang (D.C. Bar No. 1028815)
AKIN GUMP STRAUSS HAUER & FELD LLP
1333 New Hampshire Avenue, N.W.
Washington, D.C. 20036
(202) 887-4000 (telephone)
(202) 887-4288 (facsimile)
E-mail: apierce@akingump.com
sewoodward@akingump.com
mchastang@akingump.com

Counsel for Defendant The Coca-Cola Company

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Steven A. Zalesin (pro hac vice)
Travis J. Tu (pro hac vice)
Jane M. Metcalf (pro hac vice pending)
PATTERSON BELKNAP WEBB & TYLER LLP
1133 Avenue of the Americas
New York, New York 10036
(212) 336-2000 (telephone)

Anthony T. Pierce (D.C. Bar No. 415263)
Stanley E. Woodward Jr. (D.C. Bar No. 997320)
Melissa D. Chastang (D.C. Bar No. 1028815)
AKIN GUMP STRAUSS HAUER & FELD LLP
1333 New Hampshire Avenue, N.W.
Washington, D.C. 20036
(202) 887-4000 (telephone)

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PRELIMINARY STATEMENT

This case involves an improper attempt to inhibit debate on disputed issues of science and public policy, and to silence views that differ from Plaintiffs' own.

The Coca-Cola Company ("Coca-Cola") and its co-defendant The American Beverage Association ("ABA") believe that obesity and related conditions are best addressed through comprehensive lifestyle changes, such as moderating total caloric intake from all foods and beverages (including beverages sweetened with sugar) and increasing physical activity. Coca-Cola has expressed this view in public discourse, including in media interviews and at scientific symposia. It has also run advertisements that encourage reduced caloric intake and increased physical activity, and has sponsored exercise-focused events for youth throughout the United States. Coca-Cola is not alone in its belief that an effective approach to weight management must account for a range of factors, as opposed to blaming any one food or beverage. The U.S. Food and Drug Administration ("FDA") has similarly concluded that "sugar-sweetened beverages are no more likely to cause weight gain in adults than any other source of energy."

Plaintiffs have a different perspective. They believe that sugar-sweetened beverages ("SSBs") are "uniquely" to blame for obesity in this country, and that Coca-Cola has deceived consumers by questioning this supposedly "growing scientific consensus." According to Plaintiffs, Coca-Cola has violated the District of Columbia Consumer Protection Procedures Act, D.C. Code § 28-3901 *et seq.* ("CPPA"), by discussing its opinions in public fora; by running advertisements with such innocuous tips as "If you eat and drink more calories than you burn off, you'll gain weight"; and even by sponsoring physical activity opportunities for youth. This is so, Plaintiffs assert, not because Coca-Cola has made any false statements of fact, but because Coca-Cola's actions "switch the focus" from Plaintiffs' own views about the causes of obesity.

Plaintiffs are not government regulators, public health officials, or even consumers of SSBs. Plaintiff The Praxis Project (“Praxis”) is a nonprofit organization whose stated mission is to “build healthier communities.” Plaintiffs William H. Lamar IV and Delman L. Coates provide “pastoral care” to congregants grappling with obesity and related conditions. In these capacities, Plaintiffs have espoused their belief in a “unique” link between SSBs and obesity. But their efforts would be more successful, Plaintiffs allege, if they were not “drowned out” by Coca-Cola’s speech on the issue. Plaintiffs thus ask the Court to grant them a monopoly on the conversation and enjoin Coca-Cola from making *any* statement—whether of fact or opinion, and whether true or false—that contravenes their scientific position or ideology.

Plaintiffs’ extraordinary request rests on a faulty premise. Contrary to their allegations, there is no “scientific consensus” that SSBs are uniquely to blame for obesity. The studies cited in the complaint acknowledge that the relationship between SSBs and obesity is a subject of ongoing debate. Just last month, the Ninth Circuit reached the same conclusion in striking down a city ordinance that would have required SSB advertisements to include a warning that they “contribute to” obesity. The court concluded that the warning was “at a minimum, controversial” and that it was “deceptive” to present this viewpoint as settled fact. Accordingly, manufacturers’ right *not* to disseminate that view was protected by the First Amendment. Likewise here, the First Amendment guarantees Coca-Cola the right to express its scientific opinion, and bars Plaintiffs’ demand that it be compelled to take their side of the controversy.

Plaintiffs’ complaint also suffers from other fatal defects. Their naked assertion that Coca-Cola’s constitutionally-protected speech has “hampered” their agenda does not give them standing to sue in this Court. And in several respects, their allegations are insufficient to state a claim under the CPPA. The complaint should be dismissed for failure to state a claim.

BACKGROUND

A. The Coca-Cola Company

Coca-Cola has sold its flagship soft drink, Coke, since 1886, making it one of the “oldest and most iconic” companies in the United States. (Compl. ¶ 78) A key element of Coca-Cola’s success has been its ability to adapt to changing consumer demands. Thus, in recent decades, Coca-Cola has introduced numerous product innovations to address consumers’ increased concern with weight management. For example, it has voluntarily added prominent disclosures of the calorie content for each product; expanded its low- and no-calorie options; and introduced new pack types to facilitate smaller serving sizes. *See* Exs. 1-2.

Coca-Cola also takes seriously its social responsibility to help consumers make informed choices. It agrees that the prevalence of obesity and related conditions, including cardiovascular disease and type 2 diabetes, is an issue of public concern, and that SSBs, like all calorie-containing foods, may contribute to those conditions when consumed to excess or combined with a sedentary lifestyle. Coca-Cola has run national advertisements emphasizing the importance of caloric moderation and physical activity. These ads inform consumers, for example, that a 12-ounce can of Coke contains 140 calories, that all calories “count” (“including Coca-Cola”), and that weight maintenance requires balancing caloric intake and exercise. *See* Exs. 1-4.

The prevalence of obesity among U.S. children has also prompted Coca-Cola to ramp up its support of youth athletic activities. In conjunction with local charities, Coca-Cola provides opportunities for children to participate in flag football and other sports. (Compl. ¶¶ 122-125) Coca-Cola has also undertaken voluntary initiatives to help parents set appropriate limits on their children’s caloric intake. Among other measures, the company has withdrawn its SSBs from elementary and middle schools and refrained from placing ads in media targeted at children

under age 12. *See* Exs. 1-2; Compl. ¶ 139 n.98.

As all of these actions reflect, Coca-Cola believes that the best way to combat obesity and related conditions is not by scapegoating any one food or beverage, but by informing and empowering consumers to ensure that, on the whole, their “calories in” do not exceed their “calories out.” This view is not idiosyncratic. FDA stated in 2014 that, while consumers need to manage intake of added sugars, “sugar-sweetened beverages[] are no more likely to cause weight gain in adults than any other source of energy,” and that “maintaining an appropriate calorie balance and increasing physical activity . . . are key recommendations to help combat” obesity and related conditions. 79 Fed. Reg. 11880, 11903-04 (Mar. 3, 2014).¹ And in 2016, it rejected a suggestion to require products with added sugars to bear “warning labels,” concluding instead that “some added sugars can be included as part of a healthy dietary pattern.” 81 Fed. Reg. 33742, 33829 (May 27, 2016).

Consistent with these pronouncements, the Ninth Circuit recently enjoined a legislative effort to present the “disputed policy views” that Plaintiffs espouse as scientific fact. *American Bev. Ass’n v. City and County of San Francisco*, 2017 U.S. App. LEXIS 18150, at *24 (9th Cir. Sept. 19, 2017). The court ruled that a San Francisco ordinance that would have required ads for SSBs to disclose that they “contribute[] to obesity [and] diabetes” was contrary to scientific evidence that SSBs do *not* have these effects when consumed “as part of a diet that balances caloric intake with energy output.” *Id.* at *21. This important omission, the court held, rendered the warning “deceptive in light of the current state of research.” *Id.* at *22.

¹ In reaching this conclusion, FDA considered evidence submitted by the Center for Science in the Public Interest, Plaintiffs’ counsel here, but found the evidence “failed to show a direct association between added sugars consumption and heart disease risk.” *Id.* at 11904.

B. Plaintiffs and Their Complaint

Although their claims are predicated on alleged deception of consumers, Plaintiffs do not claim that they are consumers of Coca-Cola products, or that they were themselves deceived. Rather, motivated by their general interest in obesity and related conditions, Plaintiffs seek to bar Coca-Cola from making statements about weight management that contradict, or even “switch the focus” from, Plaintiffs’ views on those issues. (Compl. ¶ 4)

According to the complaint, Praxis is a California-based nonprofit organization that strives to “build healthier communities.” (Compl. ¶ 23) Reverends Lamar and Coates are pastors in the District of Columbia and Maryland, respectively, who have provided spiritual guidance to individuals affected by obesity and related conditions. (Compl. ¶¶ 19, 21, 148, 153)

Plaintiffs disagree with Coca-Cola’s opinion that these problems should be addressed through comprehensive lifestyle changes. They dismiss “lack of caloric balance and exercise” as a mere distraction. (Compl. ¶ 69) Rather, they assert that SSBs are “the key driver of,” and “unique dietary contributors to,” obesity and related conditions. (Compl. ¶¶ 4, 58) By Plaintiffs’ reckoning, Coca-Cola’s refusal to embrace this perspective amounts to a “campaign of deception.” (Compl. ¶ 72)

Plaintiffs point to a number of studies that purportedly establish their viewpoint as “scientific consensus.” (Compl. ¶¶ 36, 49 n.18, 59 n.27) But in reality, the reasons for obesity are hotly disputed within the scientific community. The articles Plaintiffs cite acknowledge as much, noting that “[t]he role of [SSBs] in promoting obesity is controversial”² and “[t]he effect

² Ex. 5 (Cara B. Ebbeling et al., *Effects of Decreasing Sugar-Sweetened Beverage Consumption on Body Weight in Adolescents: A Randomized Controlled Pilot Study*, 117 PEDIATRICS 673, 673 (2006) (cited in Compl. ¶ 50)).

on health of a high intake of sugars [is] . . . subject to scientific and public debate.”³ These publications also recognize the limited utility of any effort to pinpoint a discrete “cause” of obesity, “a complex, systemic, multi-causal problem.”⁴

Plaintiffs nevertheless seek to hold Coca-Cola liable for all instances in which it has contradicted their view—not only in consumer advertising, but also in settings traditionally dedicated to open public discourse, such as media interviews and scientific conferences. Although they describe their complaint as an attack on “misleading advertising” (Compl. ¶ 1), Plaintiffs focus primarily on four statements by Coca-Cola scientists and executives in non-commercial (and non-advertising) settings, made outside the statute of limitations and/or geographical reach of the CPPA, and taken grossly out of context:

- Plaintiffs object to a 2013 statement by Dr. Rhona Applebaum, Coca-Cola’s then-Chief Science and Health Officer, that Coke is “safe, it hydrates, it’s enjoyable.” (Compl. ¶ 131) Dr. Applebaum made this statement during a one-hour speech at a symposium sponsored by the Canadian Obesity Network, during which she also said that consuming SSBs as part of a healthy lifestyle was “about the how much, and how often. We’re not expecting all your hydration needs to come from Coca-Cola. Lord knows that’s not balance, variety and moderation.” Exs. 9, 10 at 4:21-24.
- They take issue with a 1998 statement to a Brazilian newspaper that “Coca-Cola is an excellent complement to the habits of a healthy life,” which was attributed to then-CEO Douglas Ivester. (Compl. ¶ 76) In the same article, Mr. Ivester is quoted as having cautioned that “[n]aturally, people need to exercise and follow a balanced diet” in order to maintain a healthy lifestyle. Ex. 8.
- They cite various statements by Coca-Cola executive Katie Bayne to *USA Today* in 2012, including that “our drinks offer . . . hydration” and “[t]here is no scientific evidence that connects sugary beverages to obesity.” (Compl. ¶¶ 75, 130) Ms. Bayne gave the interview to provide Coca-Cola’s perspective on a proposal to ban certain SSB sales in New York City. In the same interview, she noted that “[o]besity

³ Ex. 6 (Anne Raben et al., *Increased Postprandial Glycaemia, Insulinemia, and Lipidemia After 10 Weeks’ Sucrose-Rich Diet Compared to an Artificially Sweetened Diet: A Randomized Controlled Trial*, 55 FOOD & NUTRITION RES. 5961, at p. 1 (2011) (cited at Compl. ¶ 50 n.19)).

⁴ Ex. 7 (MCKINSEY GLOB. INST., OVERCOMING OBESITY: AN INITIAL ECONOMIC ANALYSIS, at iv (2014) (cited at Compl. ¶ 59 n.27)).

is a critical health challenge” and emphasized the necessity that “calories in balance with the calories out.” Ex. 11.

- They claim that Coca-Cola CEO James Quincey has “joined the campaign of deception” by stating, in a 2013 interview with CNN, that “[a] calorie is a calorie.”⁵ (Compl. ¶ 77) Mr. Quincey made this remark when reporters sought Coca-Cola’s view on whether its SSBs were more likely than other foods or beverages to contribute to obesity. Exs. 12, 13 at 4:23-5:13.

Plaintiffs also seek to hold Coca-Cola responsible for statements made by third parties.

They claim that Coca-Cola “surreptitiously” funded the work of two now-defunct organizations, the Global Energy Balance Network and European Hydration Institute, whose theories about obesity aligned with its own. (Compl. ¶¶ 78-94) But they do not cite any instance in which Coca-Cola has denied funding those entities; to the contrary, they point to occasions on which Coca-Cola executives publicly acknowledged it. (Compl. ¶ 85) Similarly, although they claim that Coca-Cola “paid a network of health professionals and blogger-dietitians” to misrepresent “the state of the science” vis-à-vis SSBs, they identify no actual misrepresentations originating from that “network” and concede that Coca-Cola publicly acknowledged its sponsorship of dietitians’ work.⁶ (Compl. ¶¶ 92, 94) Finally, they suggest that Coca-Cola is to blame for various public statements by the ABA, a trade organization of which Coca-Cola is a member, that dispute Plaintiffs’ SSB-focused views on obesity. (Compl. ¶¶ 95-107)

⁵ Plaintiffs apparently misinterpret this statement to mean that all calories have equivalent nutritional value. Coca-Cola does not assert that proposition. A calorie from, *e.g.*, milk provides nutrients that a calorie from an SSB generally does not. But every calorie has the same energy value, and calories consumed from all sources must be taken into consideration in balancing energy intake and output. *See, e.g.*, Walter Willett et al., *Eat, Drink & Be Healthy: The Harvard Medical School Guide to Healthy Eating*, p. 44 (“[L]ike a kiss or a rose, a calorie is a calorie”).

⁶ Plaintiffs identify just one statement published by a news source allegedly sponsored by Coca-Cola. In full, the statement read: “Select portion-controlled versions of your favorites, like Coca-Cola mini cans, packs of almonds, or pre-portioned desserts for a meal.” *See* Ex. 14. In their complaint, Plaintiffs describe the article as “suggest[ing] that a soda could be a healthy snack, ‘like . . . packs of almonds.’” (Compl. ¶ 92)

Plaintiffs' claims are also based, to a lesser extent, on Coca-Cola's advertising. Plaintiffs do not claim that Coca-Cola's ads misrepresented the characteristics of its products or made other factually incorrect statements. To the contrary, they acknowledge that Coca-Cola has voluntarily publicized the need to exercise and limit caloric intake. According to Plaintiffs, however, these ads are part of the "campaign of deception" because they "switch the focus" from Plaintiffs' theory that SSBs are the main enemy in the fight against obesity. (Compl. ¶¶ 4, 37, 113-15) To the extent they quote the ads, Plaintiffs do so in selective and misleading fashion, attributing to them, for example, the message that "light exercise . . . can[] offset . . . drinking SSBs routinely." (Compl. ¶ 109) In reality, the only statements Plaintiffs marshal to support their claim of "false, deceptive, and misleading advertising" (Compl. ¶ 1) are these:

- "Spend a day on the couch? Go for something less. Just finished an afternoon of Frisbee? Maybe you've earned a little more. Balance what you eat and drink with what you do." See Compl. ¶ 115; Exs. 15-16 ("Mixify").⁷
- "Beating obesity will take action from all of us, based on one simple, common-sense fact: all calories count, no matter where they come from, including Coca-Cola and everything else with calories. And if you eat and drink more calories than you burn off, you'll gain weight." See Compl. ¶ 116; Exs. 1-2 ("Coming Together").
- "A 12 oz Coke = 140 calories. There are many ways to burn those calories through EXTRA physical activity and have fun while doing so." (Compl. ¶ 113; Compl. Illustration 1)) ("Be OK") The television ad then depicts a series of physical activities, separated by "plus" signs, that could collectively burn 140 calories. While Plaintiffs ridicule the inclusion of "75 seconds of laughing" among the activities, the ad also depicts more strenuous undertakings, such as dancing for 10 minutes and walking for 25. The ad concludes with the prominent statement "Calories burned may vary. For more on energy balance, visit Coke.com/140," as well as an image of Coke Zero alongside the statement "CALORIES OPTIONAL." See Compl. ¶ 113; Exs. 3-4.

Plaintiffs also take issue with Coca-Cola's links on its website to resources explaining

⁷ Plaintiffs manipulate this quote to read "Maybe you've earned a little more *soda*." (Compl. ¶ 115 (emphasis added)) But the voice-over does not mention "soda," and the ad's clear message is that consumers should monitor the total mix of their physical activity, food intake, and beverage consumption.

that “all liquids, including milk, fruit juices, sports drinks, watery foods, and even beverages such as soft drinks, coffee and tea can play a role in meeting individual hydration needs.” *See* Compl. ¶ 133; Ex. 17. Once again, Plaintiffs object to this statement not because it is false, but because it may distract consumers from the “health consequences” Plaintiffs attribute to SSB consumption. (Compl. ¶¶ 132, 137)

Plaintiffs finally assert that Coca-Cola has “target[ed] children with its advertising,” despite its corporate policy of advertising only to individuals age 12 and older. (Compl. ¶ 139, 139 n.98) They do not, however, point to any specific ad that is so targeted, alleging only that Coca-Cola places advertisements in media such as “billboards, buses, trains, magazines, newspapers, Twitter, and BuzzFeed” where it is possible for children to see them. (Compl. ¶ 140) Incredibly, they also take Coca-Cola to task for *sponsoring youth physical activity opportunities*, claiming that these acts of corporate citizenship “draw attention away” from approaches to combating obesity that Plaintiffs consider more meritorious. (Compl. ¶¶ 120-21)

Plaintiffs have publicized and promoted their views by sharing them with congregants and “attempting to educate the public.” (Compl. ¶¶ 148, 153, 160) But these efforts have been “hamper[ed],” they allege, by Coca-Cola’s participation in public debate. (Compl. ¶¶ 150, 155, 166) This is the only injury Plaintiffs purport to have suffered. They do not claim to have consumed SSBs, and their only purchases of Coca-Cola SSBs were allegedly made shortly before this lawsuit was filed, for the sole purpose of “test[ing] and evaluat[ing]” the products’ characteristics in some unspecified manner. (Compl. ¶¶ 18, 35, 151, 156, 167)

Claiming a right to pursue their agenda without the interference of opposing viewpoints, Plaintiffs ask this Court to endorse their beliefs as “scientific consensus” and prohibit Coca-Cola from making any public statement that contradicts or “switch[es] the focus” from those theories.

(Compl. ¶¶ 4, 36) They urge the Court to declare Coca-Cola’s conduct “unlawful,” enjoin Coca-Cola from disseminating its views, and require Coca-Cola to “fund a corrective public education campaign” that peddles the orthodoxies of Plaintiffs’ choosing. (Prayer for Relief ¶¶ B-D)

ARGUMENT

On a Super. Ct. Civ. R. 12(b)(6) motion to dismiss, courts in this District apply “the pleading standard articulated by the Supreme Court in *Bell Atl. Corp. v. Twombly*, 550 U.S. 544 (2007) and *Ashcroft v. Iqbal*, 556 U.S. 662 (2009).” *Poola v. Howard Univ.*, 147 A.3d 267, 276 (D.C. 2016). To withstand dismissal, “a complaint must contain sufficient factual matter . . . to state a claim to relief that is plausible on its face.” *Iqbal*, 556 U.S. at 678 (internal quotation marks omitted). Although the court must credit all well-pleaded factual allegations in the complaint, it need not “accept as true a legal conclusion couched as a factual allegation.”⁸ *Id.*

On a motion to dismiss for lack of standing pursuant to Super. Ct. Civ. R. 12(b)(1), courts generally apply a similar analysis, “consider[ing] the allegations in the complaint as true” and “treat[ing] the motion as one filed under Rule 12(b)(6).” *Matthews v. Automated Bus. Sys. & Servs., Inc.*, 558 A.2d 1175, 1179 n.7 (D.C. 1989); *but see Grayson v. AT&T Corp.*, 15 A.3d 219, 232 (D.C. 2011) (permitting courts to look beyond facial allegations and dismiss complaint if standing “does not adequately appear from all materials of record”).

Here, Plaintiffs’ complaint must be dismissed for three independent reasons. First, the challenged statements are protected by the First Amendment. Second, because they do not claim

⁸ This Court may also properly consider documents external to the complaint on a motion to dismiss if they are “referred to in the complaint and [are] central to plaintiff’s claim.” *Drake v. McNair*, 993 A.2d 607, 616 (D.C. 2010) (internal quotation marks omitted). Because Coca-Cola’s public statements and advertisements are extensively “referred to in the complaint” and form the basis of Plaintiffs’ claim, Coca-Cola respectfully requests that this Court consider these materials in their entirety, rather than relying on Plaintiffs’ selective and misleading quotations. All documents are attached as exhibits to this Motion and identified in the accompanying Index of Exhibits.

to have suffered monetary, physical, or other cognizable injury as a result of Coca-Cola's actions, Plaintiffs do not have standing to sue in this Court. And third, the conduct they dispute is in any event not actionable under the CPPA.

I. COCA-COLA'S STATEMENTS ARE PROTECTED BY THE FIRST AMENDMENT

Plaintiffs' complaint is a naked attempt to suppress speech on an issue of public concern. Their claims are thus barred by the First Amendment.

Although Plaintiffs purport to ground their claims in Coca-Cola's "advertising" (*see* Compl. ¶¶ 1, 13, 18), the vast majority of the disputed statements are not advertising at all. Most were made in non-commercial contexts, and enjoy robust First Amendment protection. And the few challenged statements that arguably qualify as commercial speech are nonetheless protected because their factual accuracy is not in dispute.

A. Coca-Cola's Participation in Scientific and Public Health Debate

Plaintiffs seek to eliminate perspectives other than their own from the national conversation about nutrition, obesity, and health. This is improper under the First Amendment, which "protects scientific expression and debate just as it protects political and artistic expression." *Bd. of Trustees of Leland Stanford Junior Univ. v. Sullivan*, 773 F. Supp. 472, 474 (D.D.C. 1991). Courts have consistently rejected efforts, whether through legislative action or private suit, to endow a particular scientific viewpoint with the force of law.

One such effort, as noted above, involved the very matter at issue here. In *American Bev. Ass'n*, 2017 U.S. App. LEXIS 18150, at *21, the City of San Francisco argued that an ordinance mandating that ads for SSBs warn that they "contribute to" obesity reflected a "clear scientific consensus." The Ninth Circuit disagreed, concluding that there remains an active "debate over whether [SSBs] pose unique health risks," with considerable support for the view that they do

not. *Id.* at *23. Indeed, the prescribed warning not only was “controversial,” but “deceptive” in that it presented a disputed scientific viewpoint as settled fact. *Id.* at *21-22. The court thus held that the plaintiff’s First Amendment challenge to the ordinance was likely to succeed.

The bedrock principle that participation in scientific debate cannot be suppressed applies equally to corporations whose statements on such issues are challenged as “false advertising.” In *ONY, Inc. v. Cornerstone Therapeutics, Inc.*, 720 F.3d 490, 494 (2d Cir. 2013), for instance, the court upheld the dismissal of a manufacturer’s unfair-competition claim concerning a competitor’s statements in a journal article, which allegedly disregarded known “contradictory authority” and contained “incorrect statements of fact.” *Id.* at 494, 495. The court rejected the plaintiff’s attempt to cast a bona fide scientific disagreement as false advertising, reasoning that the First Amendment prohibits courts from adjudicating the truth of “statements about contested and contestable scientific hypotheses.” *Id.* at 497; *see also Am. Sch. of Magnetic Healing v. McAnnulty*, 187 U.S. 94, 104-05 (1902) (defendant’s statements not actionable where relevant science was “still in an empirical stage” such that “intelligent people may and indeed do differ”); *United States v. Harkonen*, 510 F. App’x 633, 637 (9th Cir. 2013) (“engaging in a genuine scientific debate” is, “by definition, not fraudulent”); *Underwager v. Salter*, 22 F.3d 730, 736 (7th Cir. 1994) (“Scientific controversies must be settled by the methods of science rather than by the methods of litigation”); *McMillan v. Togus Reg’l Office, Dep’t of VA*, 294 F. Supp. 2d 305, 316-17 (E.D.N.Y. 2003), *aff’d*, 120 F. App’x 849 (2d Cir. 2005) (dismissing claims based on alleged distortion of safety data and noting that “[a]ny unnecessary intervention by the courts in the complex debate . . . [of] modern science can only distort and confuse.”). Simply put, the First Amendment prohibits courts from acting as referees in scientific debate.

Yet Plaintiffs ask this Court to do just that, granting State imprimatur to their views and

prohibiting Coca-Cola from questioning or contradicting them. For example, Plaintiffs seek to hold Coca-Cola liable for a statement by its chief scientific officer, made at a Canadian symposium on obesity, that Coke is “safe, it hydrates, it’s enjoyable” (Compl. ¶ 131). They similarly attack a statement by Coca-Cola’s CEO, made in response to a reporter’s question about SSBs and obesity-related diseases, that “[a] calorie is a calorie” (Compl. ¶ 77; *see also id.* ¶¶ 75, 130 (challenging media statement by Coca-Cola executive concerning lack of “scientific evidence” connecting SSBs to obesity)). In each instance, Plaintiffs label as “false advertising” statements that express Coca-Cola’s “conclusions . . . on subjects about which there is legitimate ongoing scientific disagreement.” *ONY*, 720 F.3d at 498. This is precisely the type of “intervention by the courts in the complex debate . . . [of] modern science” that the First Amendment prohibits. *McMillan*, 294 F. Supp. 2d at 317.

B. Coca-Cola’s Statements to the Media

Several of the disputed statements are privileged under the First Amendment for additional reasons. As set forth in Coca-Cola’s accompanying Special Motion to Dismiss pursuant to the D.C. Anti-SLAPP Act, D.C. Code § 16-5501 *et seq.*, many were made in the context of Coca-Cola’s efforts to forestall governmental initiatives to restrict the sale of SSBs. Such petitioning activities are entitled to absolute protection. But even if they were not made for the purpose of influencing legislators or regulators, many of the challenged statements were directed *at the media*, and concern issues of public importance. Such comments to the press are entitled to near-unfettered First Amendment protection.

Statements to the media enjoy the robust protections generally afforded to non-commercial speech. The differentiation of commercial from non-commercial speech “rests heavily on the common-sense distinction between speech proposing a commercial transaction

and other varieties of speech.” *Zauderer v. Office of Disciplinary Counsel of Sup. Ct.*, 471 U.S. 626, 638 (1985) (internal quotation marks omitted). Speech qualifies as “commercial” if it “does no more than propose a commercial transaction.” *Nat’l Ass’n of Mfrs. v. SEC*, 800 F.3d 518, 523 n.12 (D.C. Cir. 2015) (quoting *Bolger v. Youngs Drug Prods. Corp.*, 463 U.S. 60, 66 (1983)). By contrast, a company’s statements “discuss[ing] controversial issues of public policy,” including those in which the company has a financial stake, are non-commercial. *Consol. Edison Co. v. Public Serv. Comm’n*, 447 U.S. 530, 544 (1980) (utility’s flyers espousing expanded use of nuclear power was non-commercial speech).

The distinction matters. Though all content-based restrictions on speech are subject to “heightened judicial scrutiny,” *Sorrell v. IMS Health Inc.*, 564 U.S. 552, 570 (2011), they are “presumptively invalid” when imposed on non-commercial speech. *R.A.V. v. St. Paul*, 505 U.S. 377, 382 (1992). This rule applies whenever the speech does more than propose a transaction. Even commercial speech that is “inextricably intertwined with . . . otherwise fully protected speech” is subject to the “test for fully protected expression” rather than the “more deferential commercial speech principles.” *Riley v. Nat’l Fed’n of Blind*, 487 U.S. 781, 782 (1988).

Consistent with these principles, the First Amendment protects speech by business entities that “contribut[es] to reporters’ discussion of an issue of public importance”—even when that speech also serves the speaker’s commercial interests. *Boule v. Hutton*, 328 F.3d 84, 91 (2d Cir. 2003). In *Boule*, for example, the court held that the defendant art dealer’s remarks to the art press, which “were disseminated . . . to the relevant [art] consumers” and “promoted [its] commercial interests” by casting doubt on the authenticity of its competitors’ collections, were nonetheless entitled to “full protection under the First Amendment” because of the public interest in “fraud in the art market.” *Id*; see also *Sorrell*, 564 U.S. at 567 (“While the burdened speech

results from an economic motive, so too does a great deal of vital expression.”). Similarly, in *Farah v. Esquire Magazine, Inc.*, 863 F. Supp. 2d 29, 40-41 (D.D.C. 2012), aff’d, 736 F.3d 528 (D.C. Cir. 2013), the court dismissed a Lanham Act challenge to a magazine’s statements impugning a competitor’s journalistic integrity, finding them to be constitutionally protected “satirical speech on a matter of public interest.” And in *Delux Cab v. Uber Techs., Inc.*, 2017 U.S. Dist. LEXIS 57494, at *16-17 (S.D. Cal. Apr. 13, 2017), statements “made by Uber representatives to journalists” regarding the safety of Uber were protected because they were “inextricably intertwined with the reporters’ coverage of a matter of public concern, i.e., whether Uber is safe for riders.” *Id.* at *17 (emphasis added) (internal quotation marks omitted). Thus, even a company’s comments about its own products enjoy robust First Amendment protection when made to the press, rather than in a product advertisement.

This principle dooms Plaintiffs’ bid to hold Coca-Cola liable for its media statements regarding obesity-related conditions. None of these statements “propose[s] a commercial transaction”: they are not advertisements, do not reference the purchase of Coca-Cola products, and are not directed at prospective Coca-Cola consumers. *Nat’l Ass’n of Mfrs.*, 800 F.3d at 523 n.12. Instead, each informs the press of Coca-Cola’s views on “an issue of public importance.” *Boule*, 328 F.3d at 91. *See* Compl. ¶¶ 75-77, 130-31; *see also supra* at 6. Accordingly, they are entitled to “full protection under the First Amendment.” *Boule*, 328 F.3d at 91.

C. Coca-Cola’s “Balance” Advertising

Despite their repeated references to “false, deceptive, and misleading advertising,” Plaintiffs do not challenge any of Coca-Cola’s traditional product advertising. Instead they limit their complaint to ads that discuss the calorie content of Coca-Cola products and recommend a balanced approach to weight management. Specifically, Plaintiffs take issue with the following

advertising statements: (1) a 12-ounce can of Coke contains 140 calories; (2) a person who maintains an active lifestyle may consume more calories without gaining weight than a person with a sedentary lifestyle; (3) all calories contribute to weight gain irrespective of source; (4) the activities depicted in the “Be OK” ad can, in the aggregate, burn 140 calories; and (5) soft drinks are hydrating. See Compl. ¶¶ 113-116, 133; Exs. 1-4, 15-17. Plaintiffs *do not dispute the factual accuracy* of any of these statements. Rather, they assert that the statements may lead to erroneous conclusions, e.g., “that [consumers] *can or will* ‘balance’ routine consumption of [SSBs] through casual exercise,” “that kids who do some exercise *should* drink even more [SSBs],” and “that consumers *w[ill]* ‘be ok’ if [SSB] consumption [is] coupled with various light activities.” (Compl. ¶¶ 108, 113, 115) (emphases added).

Plaintiffs’ concern that truthful representations in Coca-Cola’s ads will result in bad decisions by consumers is not a valid basis for suppressing those statements. “Truthful advertising related to lawful activities is entitled to the protections of the First Amendment.” *In re R.M.J.*, 455 U.S. 191, 203 (1982). Accordingly, the government may not “prevent the dissemination of truthful commercial information in order to prevent members of the public from making bad decisions,” *Thompson v. W. States Med. Ctr.*, 535 U.S. 357, 374 (2002), or “to tilt public debate in a preferred direction,” *Sorrell*, 564 U.S. at 578-79. The same reasoning applies here, and requires dismissal of Plaintiffs’ claims.

Plaintiffs’ entire lawsuit is a constitutionally-impermissible attempt to suppress protected speech.⁹ The complaint should be dismissed for this reason alone.

⁹ Plaintiffs’ prayer for injunctive relief underscores this point. They ask the Court to impose “an overly broad prior restraint upon speech,” *Gold v. Maurer*, 2017 U.S. Dist. LEXIS 65687, at *18-19 (D.D.C. May 1, 2017) (internal quotation marks omitted), and to “require [Coca-Cola] to carry [a] message. . . expressly contrary to [its] views,” *Pacific Gas & Electric Co. v. Public Utilities Comm’n*, 475 U.S. 1, 15 n.12 (1986). Neither is permitted by the First Amendment.

II. PLAINTIFFS LACK STANDING TO SUE

Even if Coca-Cola's statements were not protected by the First Amendment, the statements caused Plaintiffs no injury-in-fact. Plaintiffs thus lack standing to sue in this Court.

Plaintiffs do not allege that Coca-Cola's conduct caused them to make purchases under false pretenses, to suffer ill health effects, or even to entertain any misconceptions about Coca-Cola products. Instead, they premise their CPPA claim on their mere "expos[ure] to [Coca-Cola's] false and deceptive advertising"; on their voluntarily expenditure of resources to disseminate beliefs contrary to Coca-Cola's; and on their decision to purchase Coca-Cola SSBs in order to "test and evaluate their characteristics." (Compl. ¶¶ 18, 35, 37, 147, 151, 156, 167) None of these constitutes an "injury-in-fact" sufficient to confer standing.

A. Mere Exposure to Unlawful Conduct Does Not Establish Injury-In-Fact

Although "Congress created the District of Columbia court system under Article I of the Constitution," the courts of the District have, since their inception, applied "the constitutional standing requirement embodied in Article III" of the U.S. Constitution and "followed Supreme Court developments in constitutional standing jurisprudence." *Grayson v. AT&T Corp.*, 15 A.3d 219, 224, 233 (D.C. 2011). Only a plaintiff who has suffered "injury-in-fact"—*i.e.*, "a distinct and palpable injury to himself" that is "fairly traceable to the defendant's unlawful conduct and likely to be redressed by the requested relief"—has standing to sue. *Grayson*, 15 A.3d at 235 (internal quotation marks omitted).

This requires the plaintiff to identify some injury beyond the sheer fact of an alleged statutory violation. "[A] plaintiff [does not] automatically satisfy[y] the injury-in-fact requirement whenever a statute grants a person a statutory right and purports to authorize that person to sue to vindicate that right." *Spokeo, Inc. v. Robins*, 136 S. Ct. 1540, 1549 (2016). In

Spokeo, the Supreme Court concluded that it was not enough for the plaintiff to allege that a search engine company had listed inaccurate information about his education, family status, and economic status in violation of the Fair Credit Reporting Act. He also had to show that the inaccuracies had “cause[d] [him] harm or present[ed] a[] material risk of harm.” *Id.* at 1550.

Plaintiffs’ claim that they have been “exposed to Defendants’ false and deceptive advertising,” thus “depriving them of their statutory right . . . to truthful information,” is likewise insufficient. (Compl. ¶¶ 36, 145) The D.C. Court of Appeals rejected this precise theory of “injury” in *Grayson*, 15 A.3d at 246-47, in which a plaintiff alleged that a telecommunications company had engaged in deceptive practices, but did not himself claim to have been deceived. The court found the plaintiff’s “mere interest in the alleged unlawfulness of [a company’s] business practices” insufficient to satisfy “our long-enduring legal principles governing constitutional standing.” *Id.* at 243.¹⁰ Although, at that time, a since-deleted CPPA provision authorized suit by any plaintiff “for the interests . . . of the general public,” the court declined to read even this broad provision as overturning its “long-enduring principles” of standing, absent a “clear expression” from the D.C. Council that it intended that result. *Id.* at 244, 248.

In 2012, the D.C. Council amended the CPPA to, *inter alia*, remove the provision relied upon in *Grayson*—but it explicitly retained the injury-in-fact requirement that the Court of Appeals had applied. The Council recognized that D.C. courts have long required injury-in-fact “as a prudential matter,” and explained that the amendments’ purpose was to “provide the courts with a variety of ways to consider standing options” while still requiring plaintiffs to “satisfy the

¹⁰ Another plaintiff had standing to sue for “invasion of his statutory legal rights created by the CPPA,” *Grayson*, 15 A.3d at 248-49. But that plaintiff alleged that the defendant’s misrepresentations had caused him to purchase a product under false pretenses. Accordingly, the court found, he had adequately “allege[d] personal injury to himself.” *Id.* at 249.

prudential standing principles” historically applied by D.C. courts. *See* D.C. Code § 28-3901(c); Report on Bill 19-0581, the Consumer Protection Amendment Act of 2012 (“Committee Report”) at 2. Accordingly, both District and federal courts applying the post-2012 CPPA have continued to demand a showing of injury-in-fact beyond mere exposure to fraudulent and deceptive marketing claims. In *Hancock v. Urban Outfitters, Inc.*, 830 F.3d 511, 514 (D.C. Cir. 2016), for instance, the D.C. Circuit held that the plaintiffs’ claim that they had been exposed to a CPPA violation when the defendant retailer collected their zip codes under false pretenses “d[id] not get out of the starting gate.” *Id.* at 512-13, 514. Rather, because “some statutory violations can result in no harm,” the plaintiffs’ exposure to “a bare violation of the requirements of D.C. law” did not confer standing. *Id.* at 514 (internal quotation marks omitted). Some other “cognizable injury”—such as “invasion of privacy, increased risk of fraud or identity theft, or pecuniary or emotional injury”—was required. *Id.* at 515.

Other courts have reached the same conclusion. *See Hemby*, 2014-CA-000190 (D.C. Super. Jan. 22, 2015) (Ex. 19) (claim that plaintiff was “deprived of the right to truthful information” insufficient to confer standing absent allegations “that he purchased the product in reliance on [the allegedly] deceptive marketing”); *cf. Zuckman v. Monster Bev. Corp.*, 2016 D.C. Super. LEXIS 10, at *5 (D.C. Super. Aug. 12, 2016) (consumer had standing based on misrepresentation of beverage’s health risks because he suffered “risk of harm from consuming [the beverages]” and “would not have purchased them” absent the misrepresentations); *Organic Consumers Ass’n v. General Mills, Inc.*, 2017 D.C. Super. LEXIS 4, at *5 (D.C. Super. July 6, 2017) (noting that 2012 CPPA amendments do not “absolve[] [plaintiffs] of Article III’s

constitutional standing requirement.”).¹¹

Here too, Plaintiffs’ claim that they were injured through “exposure” to the allegedly offending conduct “does not get out of the starting gate.” *Hancock*, 830 F.3d at 514. Absent some explanation of how the disputed statements palpably injured them—for example, by inducing them to purchase SSBs under false pretenses—all they have alleged is “a bare violation . . . of D.C. law.” *Id.* at 514. If that were enough to confer standing, the D.C. courts would be open to anyone with a “mere interest in the alleged unlawfulness of [a defendant’s] business practices,” *Grayson*, 15 A.3d at 247—precisely the result that has been repeatedly rejected. Plaintiffs’ allegation that they have been exposed to false statements by Coca-Cola does not give them standing to sue in this Court.

B. Plaintiffs’ Voluntary Use of Resources to Disseminate Their Views Does Not Constitute Injury-In-Fact

Plaintiffs next attempt to manufacture injury by claiming that Coca-Cola’s participation in the national conversation about obesity-related diseases has forced them to devote more effort to disseminating their opposing viewpoint than would have been necessary had Coca-Cola kept quiet. Not only is this theory of injury barred by the First Amendment, *see supra* at 11-15, it is also insufficient to show injury-in-fact for any of the three Plaintiffs.

1. Praxis

Praxis alleges that Coca-Cola has “undermined” its “mission to build healthier communities” (Compl. ¶ 23) Because of Coca-Cola’s participation in the debate about SSBs, Praxis claims, it has been forced to “take[] concrete steps” to promote its contrary view

¹¹ The contrary suggestion that “deprivation of a statutory right to be free from improper trade practices under the CPPA” is sufficient for standing, *see Nat’l Consumers League v. Bimbo Bakeries USA*, 2015 D.C. Super. LEXIS 5, at *8 (D.C. Super. Apr. 2, 2015), is incorrect. Mere “deprivation of a statutory right” is exactly what the Supreme Court in *Spokeo*, and the D.C. Circuit in *Hancock*, found *insufficient* for that purpose.

(Compl. ¶¶ 160-162), and these efforts have required it to “divert resources” from other unspecified “important public health . . . initiatives.” (Compl. ¶ 165)

Praxis’s assertion that it could more efficiently propagate its views regarding SSBs if only Coca-Cola’s contrary perspective were silenced does not establish injury-in-fact. To establish Article III standing, an organization, like an individual, must show a “concrete and demonstrable injury to [its] activities.” *American Legal Foundation v. FCC*, 808 F.2d 84, 91 (D.C. Cir. 1987) (internal quotation marks omitted). Simply alleging “a setback to [the organization’s] abstract social interests” is not sufficient.” *Id.*

Praxis cannot solve its standing problem by repackaging the frustration of its “abstract social interests” as a “diversion” of the resources it devotes to them. *Id.* at 92; *see also* Compl. ¶ 165. “Were an association able to gain standing merely by choosing to fight a policy that is contrary to its mission, the courthouse door would be open to all associations.” *Long Term Care Pharm. Alliance v. UnitedHealth Group, Inc.*, 498 F. Supp. 2d 187, 192 (D.D.C. 2007). In *Food & Water Watch, Inc. v. Vilsack*, 808 F.3d 905, 920 (D.C. Cir. 2015), for instance, the D.C. Circuit found that a nonprofit organization whose “primary purpose[.]” was “to educate the public about . . . safe, wholesome food” lacked standing to challenge USDA regulations that, it claimed, would compromise the safety of poultry products, confuse consumers, and force the organization to “increase the resources that it spends on educating the general public” about the limitations of USDA certification. *Id.* The D.C. Circuit concluded that these assertions did not establish that “the organization’s activities ha[d] been perceptibly impaired in any way,” and amounted to “nothing more than an abstract injury to its interests that is insufficient to support standing.” *Id.* at 921; *Int’l Acad. of Oral Med. & Toxicology v. FDA*, 195 F. Supp. 3d 243, 258 (D.D.C. 2016) (organization’s “spending of money to further [its] advocacy mission . . . does not

by itself constitute an injury to the organization sufficient to create standing”). Praxis’s resource diversion claim is essentially identical to, and every bit as “abstract” as, the injuries alleged in these cases. *Food & Water Watch*, 808 F.3d at 921.¹²

The 2012 CPPA amendments, which provide a private right of action to both “nonprofit organizations” and “public interest organizations” under defined circumstances, do not alter this analysis. *See* D.C. Code § 28-3905(k)(1)(C)-(D). As set forth above, even plaintiffs who otherwise satisfy the CPPA statutory criteria lack standing in the absence of an injury-in-fact. This is made explicit in subparagraph (C), the provision establishing a right of action for nonprofit organizations. That clause specifies that such an organization may bring a claim in either of two circumstances: (i) “on behalf of itself or any of its members, or [(ii)] on any such behalf **and** on behalf of the general public.” D.C. Code § 28-3905(k)(1)(C) (emphasis added). In other words, only an organization with standing to sue “on behalf of itself or any of its members” may assert an additional claim “on behalf of the general public.” Because Praxis lacks standing to sue “on behalf of itself,” and does not claim to sue on behalf of its members, it also lacks standing to sue “on behalf of the general public.” (Compl. ¶ 35)

Subparagraph (D), which affords a right of action to certain “public interest organization[s],” is similarly of no help to Praxis. D.C. Code § 28-3905(k)(1)(D). Not only is that subparagraph, like the CPPA as a whole, subject to the antecedent injury-in-fact requirements of Article III, but by its terms it does not redress “diversion” of an organization’s resources. Rather, it provides that an organization may sue “*on behalf of the interests of a consumer or a class of consumers*”—but only if “the consumer or class could bring” an action

¹² *Animal Legal Def. Fund v. Hormel Foods Corp.*, 2017 D.C. Super LEXIS 9, (D.C. Super. Sept. 20, 2017), which found allegations of “divert[ed] organizational resources” sufficient to establish standing, *see id.* at *9, did not address these precedents and is squarely at odds with them.

under the statute independently. D.C. Code § 28-3905(k)(1)(D)(i) (emphasis added). Here, Praxis does not purport to sue “on behalf of the interest of a consumer or class of consumers”; it sues only on behalf of “[itself] and the general public.” (Compl. ¶ 35) Praxis has thus failed to satisfy the requirements necessary to assert a claim under Section 28-3905(k)(1)(C) or (D).

2. Pastors Lamar and Coates

The pastors present an even more farfetched theory of injury: that Coca-Cola’s statements about SSBs and weight management have prompted them to spend more time counseling congregants on issues relating to obesity and related conditions than they otherwise would have. The individual plaintiffs thus claim that Coca-Cola has “inhibit[ed] their ability to provide counsel or pastoral care.” (Compl. ¶¶ 147-50)

This theory of standing is a non-starter. A mere claim to have devoted “time and money” to combating the perceived social effects of a defendant’s conduct does not confer standing on an individual any more than it does on an organization. *See Food & Water Watch*, 808 F.3d at 918-19 (finding individual plaintiffs’ expenditure of “increased cost[s]” on seeking out safe poultry insufficient to confer standing). Indeed, in holding that an organization’s “special interest” in an issue is insufficient to confer standing, the Supreme Court has reasoned that a contrary conclusion would make it “difficult to perceive why any individual citizen with the same bona fide special interest would not also be entitled to do so.” *Sierra Club v. Morton*, 405 U.S. 727, 739-40 (1972); *see also Grayson*, 15 A.3d at 247 (plaintiff’s “mere interest” in the disputed business practices does not confer standing).

Moreover, even if “pastoral injury” were theoretically cognizable, it would not confer standing here because of its exceedingly remote relationship to the challenged conduct. Only an injury that “fairly can be traced to the challenged action of the defendant” and is “likely to be

redressed by a favorable decision” —as opposed to injury “result[ing] from the independent action of some third party not before the court”—can confer Article III standing. *Simon v. E. Ky. Welfare Rights Org.*, 426 U.S. 26, 38, 41-42 (1976). Here, the individual Plaintiffs’ theory of injury hinges on multiple “independent actions” by numerous third parties. In order for the pastors’ claimed injury to manifest, consumers not before the Court would have to: (1) view Coca-Cola’s statements, most of which were made in non-advertising settings, about SSBs and health; (2) form the belief, contrary to many conflicting statements, that no link exists between SSBs and obesity-related conditions; (3) consume Coca-Cola SSBs “routinely” (Compl. ¶¶ 149, 154); (4) develop obesity-related conditions; (5) seek pastoral care from one of the individual Plaintiffs for those conditions; and (6) persist, contrary to Plaintiffs’ urging, in their purportedly misguided beliefs about SSBs and obesity. Even if this improbable sequence of events occurred, the resulting injury would be so attenuated it could not be “fairly . . . traced” to Coca-Cola’s alleged misconduct. *Id.*

Finally, the individual Plaintiffs’ claim “on behalf of the general public” (Compl. ¶ 35) does not provide an independent basis for standing. Individuals, like nonprofit organizations, may sue on the public’s behalf only if they are also suing on their own behalf, *i.e.*, if they have individual standing. D.C. Code § 28-3905(k)(1)(B). Pastors Lamar and Coates do not.

C. Plaintiffs Cannot Establish “Tester” Standing

Unable to advance any cogent theory of injury, Plaintiffs claim that they nonetheless have standing because, shortly before filing this action, they each “purchased several [SSBs] sold by Coca-Cola” in order “to test and evaluate their characteristics.” (Compl. ¶¶ 151-52, 156-57, 167) Plaintiffs vaguely reference their intention to test the products’ “sugar content[,] potential effects on blood sugar levels[,] and Defendants’ representation that a calorie of Coke is

equivalent nutritionally to a calorie of any other food.” (Compl. ¶¶ 20, 22, 26) They do not, however, allege that any such testing has actually occurred.

Plaintiffs’ oblique references to “testing” cannot salvage their claim. Standing is available only to “testers” who investigate and disprove representations about the “tested” product. The Supreme Court recognized this form of standing in *Havens Realty Corp. v. Coleman*, 455 U.S. 363, 374 (1982), in which an African-American plaintiff inquired about the defendant’s housing vacancies to determine whether she would receive truthful information. When, instead, she was falsely told that no apartments were available, she suffered a cognizable injury. *Id.* at 373-74. By contrast, a white “tester” who made the same inquiry and was given accurate information lacked standing because the testing had not rendered him the “victim of a discriminatory misrepresentation.” *Id.* at 375.

A “tester” plaintiff thus gains standing only when “testing” uncovers a misrepresentation. Article III does not permit parties to “manufacture standing merely by inflicting harm on themselves” or to “secure a lower standard for . . . standing simply by making an expenditure.” *Clapper v. Amnesty Int’l USA*, 568 U.S. 398, 416 (2013). Accordingly, “the mere expense of testing” a product does not “constitute[] ‘injury in fact’” absent a finding that the product has been falsely represented. *Fair Employment Council v. BMC Mktg. Corp.*, 28 F.3d 1268, 1276 (D.C. Cir. 1994). The D.C. Council recognized this limitation in the CPPA legislative history, explaining that the statute’s “tester” provision confers a right of action on plaintiffs who “purchase[] products . . . with the intent of determining whether those products or services are what they claim to be,” and who then uncover a misrepresentation. *See* Committee Report at 5.

That is not what happened here. Plaintiffs have not identified any representation about Coca-Cola products that they actually tested, let alone found to be false. They therefore lack

standing as “testers.”

III. PLAINTIFFS HAVE NOT STATED A CLAIM UNDER THE CPPA

Not only does the complaint run afoul of the Constitution’s free-speech protections and injury-in-fact requirements, it also fails to state a claim under the CPPA. Many of the disputed statements fall outside the statute’s limitations period, geographical scope, or both. Plaintiffs do not identify any statement that is false or “misleading” under the CPPA, or otherwise violates its provisions. Coca-Cola cannot be held liable under the CPPA for statements by the ABA and other non-merchants. And Plaintiffs’ allegations about “advertising to minors” do not state a viable claim for relief.

A. Many of the Challenged Statements Are Time-Barred or Beyond the CPPA’s Geographic Reach

CPPA claims are subject to the residual three-year statute of limitations set forth in D.C. Code § 12.301(8). *See Murray v. Wells Fargo Home Mortg.*, 953 A.2d 308, 323 (D.C. 2008). A CPPA claim accrues when the plaintiff either has “actual notice” of the offending conduct, or when a “reasonabl[e] . . . investigation, if conducted, would have led to actual notice.” *Silvious v. Snapple Bev. Corp.*, 793 F. Supp. 2d 414, 417 (D.D.C. 2011). In this case, because Plaintiffs claim that the “scientific research” had unmasked Coca-Cola’s “deception” by 2012 at the latest (Compl. ¶ 66), they cannot challenge any statements made prior to July 2014—three years before they filed their complaint. This precludes *all* claims based on Coca-Cola’s statements to the media and at scientific conferences, as well as their claims based on Coca-Cola’s “Be OK” and “Coming Together” ads. (Compl. ¶¶ 75-77, 114, 109 n.75, 116 n.82, 130-31)

Many of the disputed statements are also beyond the geographic reach of the CPPA, which was enacted to “protect *local consumers* from improper and fraudulent trade practices.” *Williams v. The Purdue Pharma Co.*, 297 F. Supp. 2d 171, 174 (D.D.C. 2003) (emphasis added).

A statement is not actionable if it was neither made nor “received in the District.” *Dahlgren v. Audiovox Comm'ns Corp.*, 2012 D.C. Super LEXIS 13, at *40-41 (D.C. Super. Mar. 15, 2012). This limitation bars Plaintiffs’ attempt to hold Coca-Cola liable for statements it made in Brazil, Canada, the United Kingdom, and New York—none of which they claim to have “received in the District.” *Id.*; see also Compl. ¶¶ 75, 76, 77 n.40, 131 n.94.

B. Plaintiffs Have Identified No Statement by Coca-Cola that Is Objectively Misleading or Otherwise Actionable Under the CPPA

To the extent it is not otherwise barred, Plaintiffs’ CPPA claim fails because it does not allege any actionable misrepresentation. The statute proscribes only statements or omissions that are false or have a “tendency to mislead.” D.C. Code § 28-3904(e)-(f-1). “[A]n accurate statement . . . generally would not be actionable under [the CPPA].” *Saucier v. Countrywide Home Loans*, 64 A.3d 428, 442 (D.D.C. 2013) Here, Plaintiffs do not allege that the disputed statements are factually untrue; their beef is that Coca-Cola’s speech tends to “drown[] out” Plaintiffs’ contrary views. (Compl. ¶ 37) Plaintiffs’ desire to have their message heard over others does not mean that Coca-Cola’s statements have a “tendency to mislead.”

Plaintiffs also cannot claim that, by expressing its view on a disputed issue of science, Coca-Cola has made statements that are facially false or misleading to reasonable consumers. “[W]hen litigants concede that some reasonable and duly qualified scientific experts agree with a disputed scientific proposition, [] the litigants are barred from also arguing that the proposition is ‘literally false.’” See *Nat’l Consumers League v. Gerber Prods.*, 2015 D.C. Super LEXIS 10, at *23 (D.C. Super. Aug. 5, 2015) (citing *In re GNC Corp.*, 789 F.3d 505 (4th Cir. 2015)). And it is *Plaintiffs’* scientific position—not Coca-Cola’s—that has been found to be “misleading” when

presented as settled fact. *American Bev. Ass'n*, 2017 U.S. App. LEXIS 18150, at *22.¹³

C. Certain Statements Plaintiffs Challenge Are Outside the Scope of the CPPA, Which Governs Only Consumer-Merchant Transactions

Another deficiency of Plaintiffs' CPPA claim is that only a handful of the statements it attacks—those found in Coca-Cola's advertising—even arguably implicate the “consumer-merchant relationship[]” that the CPPA governs. *Sundberg v. TTR Realty, LLC*, 109 A.3d 1123, 1129 (D.C. 2015) (internal quotation marks and citation omitted). The CPPA “does not cover all consumer transactions, and instead only covers trade practices arising out of consumer-merchant relationships,” where a “merchant” is defined as one who “in the ordinary course of business sells or supplies consumer goods or services.” *Id.* at 1129.

This dooms Plaintiffs' attempt to premise a CPPA claim on anything other than Coca-Cola's advertising and sale of its own products. Neither Coca-Cola's public discussion of scientific issues nor its sponsorship of youth recreational activities implicates “consumer transaction[s]” or the “consumer-merchant relationship[].” *Id.* (internal quotation marks omitted).

Furthermore, Plaintiffs cannot base their CPPA claim on the statements of the ABA, the Global Energy Balance Network, or the European Hydration Institute—none of which qualify as “merchants.” *See Dahlgren v. Audiovox Commc'ns Corp.*, 2010 D.C. Super. LEXIS 9, at *42-*43 (D.C. Super. 2010) (rejecting CPPA claims arising from trade association's promotion of

¹³ The complaint makes cursory reference to several other provisions of the CPPA, all of which are inapposite. *See* Compl. ¶ 176(a)-(e). Because Plaintiffs do not allege any misrepresentations about the calorie or nutrient content of Coca-Cola products, they cannot show that Coca-Cola represented its goods as having “a source, sponsorship, approval, certification, accessories, characteristics, ingredients, uses, benefits, or quantities that they do not have”; that it falsely represented that its goods were “of particular standard, quality, grade, style, or model”; or that it “advertise[d] or offer[ed] goods or services without the intent to sell them . . . as advertised or offered.” D.C. Code § 28-3904(a), (d), (h).

cell phones because association was “not alleged to have manufactured or sold any cell phones.”). Even if these entities’ activities were actionable under the CPPA, their actions could not be imputed to Coca-Cola. The CPPA imposes liability only for trade practices in which a defendant directly participates. “[T]he offending party . . . must have actually made a misrepresentation of material fact directly to the plaintiff.” *Parr v. Ebrahimian*, 2013 U.S. Dist. LEXIS 188865, *20-21 (D.D.C. Mar. 26, 2013); see also *Armstrong v. Accrediting Council for Continuing Educ.*, 832 F. Supp. 419, 425 (D.D.C. 2013) (“[N]o provision of the CPPA creates a cause of action for aider-and-abettor liability.”). Coca-Cola thus cannot be liable for the conduct of nonprofit organizations, which falls outside the scope of the statute in any event, simply because it allegedly provided them with funding.

D. Plaintiffs’ Vague Allegations of “Advertising to Minors” Do Not State a Claim for Relief

Plaintiffs’ thin assertion that Coca-Cola “target[ed] children” in its advertising cannot salvage their pleading. (Compl. ¶ 139) The complaint sets forth no facts to show that Coca-Cola actually “target[ed]” children; it alleges only that placement of ads in media such as “billboards” and “magazines” made it possible for minors to view them. (Compl. ¶ 140) In fact, the only concrete statement they attribute to Coca-Cola on this topic is its announcement of a corporate policy *against* advertising to children. (Compl. ¶ 139 n.98)

Plaintiffs’ vague accusations of “targeting minors” cannot state a CPPA claim for at least three reasons. First, these allegations “do not permit the court to infer more than the mere possibility of misconduct,” and thus fail to satisfy the applicable pleading standards. *Iqbal*, 556 U.S. at 679. Second, running ads in general media that might appeal to children is not an “improper trade practice” under the CPPA even where it is *unlawful* for minors to purchase the product in question. See *Hakki v. Zima*, 2006 D.C. Super. LEXIS 10, at *8 (D.C. Super. 2006)

(finding alcohol advertisements that “may . . . appeal to persons under 21” permissible under the CPPA). And finally, the First Amendment bars Plaintiffs’ broad-based attack on all advertising, irrespective of content, with the potential to interest children. *Sorrell*, 564 U.S. at 554. Plaintiffs’ “advertising-to-minors” allegations thus do not state a viable claim under the CPPA.¹⁴

CONCLUSION

Plaintiffs think SSBs are uniquely to blame for the problems of obesity and related conditions, and that Coca-Cola should be prohibited from expressing any contrary view. This Court need not determine whether Plaintiffs are right about the first premise to reject the second. The fact that there is scientific disagreement and public controversy over the societal problem of obesity is reason enough to hold that Plaintiffs’ effort to suppress Coca-Cola’s speech on the issue is constitutionally impermissible. Even if their claims were not barred by the First Amendment, Plaintiffs have no standing to pursue them, and their complaint fails to set forth a viable claim for relief under the CPPA. The complaint should be dismissed with prejudice.

¹⁴ Though they take Coca-Cola to task for using its name and trademark when sponsoring youth physical activity opportunities, Plaintiffs do not, and cannot, allege that these acts of community service constitute “advertising” under the CPPA.

Dated: October 23, 2017

Respectfully submitted,

/s/ Steven A. Zalesin

Steven A. Zalesin (pro hac vice)
Travis J. Tu (pro hac vice)
Jane M. Metcalf (pro hac vice forthcoming)
PATTERSON BELKNAP WEBB & TYLER LLP
1133 Avenue of the Americas
New York, New York 10036
(212) 336-2000 (telephone)
(212) 336-2111 (facsimile)
E-mail: sazalesin@pbwt.com
tjtu@pbwt.com
jmetcalf@pbwt.com

Anthony T. Pierce (D.C. Bar No. 415263)
Stanley E. Woodward Jr. (D.C. Bar No. 997320)
Melissa D. Chastang (D.C. Bar No. 1028815)
AKIN GUMP STRAUSS HAUER & FELD LLP
1333 New Hampshire Avenue, N.W.
Washington, D.C. 20036
(202) 887-4000 (telephone)
(202) 887-4288 (facsimile)
E-mail: apierce@akingump.com
sewoodward@akingump.com
mchastang@akingump.com

Counsel for Defendant The Coca-Cola Company

SUPERIOR COURT OF THE DISTRICT OF COLUMBIA
Civil Division

THE PRAXIS PROJECT, et al.,)	
)	Case No. 2017 CA 004801 B
Plaintiffs,)	
)	
v.)	Honorable Judge Elizabeth C. Wingo
)	
THE COCA-COLA COMPANY, et al.,)	Next Event: Motion Hearing
)	March 15, 2018 at 11:00 a.m.
Defendants.)	
)	

DEFENDANT COCA-COLA'S RULE 12-I(a) CERTIFICATION

Pursuant to Rule 12-I(a) of the Superior Court Rules of Procedure, the undersigned certifies that the parties conferred on the relief requested in the underlying motion and Plaintiffs do not consent to such relief.

[SIGNATURE BLOCK ON NEXT PAGE]

Respectfully submitted,

Steven A. Zalesin (pro hac vice)
Travis J. Tu (pro hac vice)
Jane M. Metcalf (pro hac vice forthcoming)
PATTERSON BELKNAP WEBB & TYLER LLP
1133 Avenue of the Americas
New York, New York 10036
(212) 336-2000 (telephone)
(212) 336-2111 (facsimile)
E-mail: sazalesin@pbwt.com
tjtu@pbwt.com
jmetcalf@pbwt.com

/s/ Anthony T. Pierce

Anthony T. Pierce (D.C. Bar No. 415263)
Stanley E. Woodward Jr. (D.C. Bar No. 997320)
Melissa D. Chastang (D.C. Bar No. 1028815)
AKIN GUMP STRAUSS HAUER & FELD LLP
1333 New Hampshire Avenue, N.W.
Washington, D.C. 20036
(202) 887-4000 (telephone)
(202) 887-4288 (facsimile)
E-mail: apierce@akingump.com
sewoodward@akingump.com
mchastang@akingump.com

Counsel for Defendant The Coca-Cola Company

SUPERIOR COURT OF THE DISTRICT OF COLUMBIA
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[PROPOSED] ORDER

Upon review of Defendant Coca-Cola’s Motion to Dismiss pursuant to Rules 12(b)(6) and 12(b)(1) of the Superior Court Rules of Civil Procedure, and good cause being shown, it is hereby:

ORDERED that the Motion is **GRANTED**; and it is further:

ORDERED that Plaintiffs’ Complaint is dismissed with prejudice.

SO ORDERED.

Honorable Judge Elizabeth C. Wingo
(signed in chambers)

Copies via CaseFileXpress:

Maia Caplan, Esq.
George Chipev, Esq.
Michael Bern, Esq.
Kevin Chambers, Esq.
Kathryn Ruemmler, Esq.
Richard Bress, Esq.
Anthony Pierce, Esq.
Stanley Woodward Jr., Esq.
Melissa Chastang, Esq.

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)	
)	

CERTIFICATE OF SERVICE

On October 23, 2017, the undersigned hereby certifies that a true and correct copy of the foregoing Memorandum of Law in Support Of Coca-Cola's Motion to Dismiss Pursuant to Super. Ct. R. 12(B)(6) and 12(B)(1) was electronically served via the CaseFileXpress system on:

Richard P. Bress
LATHAM & WATKINS LLP
555 Eleventh Street, NW
Suite 1000
Washington, D.C. 20004
(212) 637-2200 (telephone)
(212) 637-2201 (facsimile)
E-mail:rick.bress@lw.com

Counsel for Defendant American Beverage Association

Maia Caplan
Matthew Simon
CENTER FOR SCIENCE IN THE PUBLIC INTEREST
1220 L Street, NW
Suite 300
Washington, DC 20005
(202) 777-8381 (telephone)
E-mail:mkats@cspi.net
msimon@cspinet.org

Andrew Rainer
Mark Gottlieb
THE PUBLIC HEALTH ADVOCACY INSTITUTE
360 Huntington Avenue
Suite 117 CU
Boston, MA 02115
(617) 373-2026 (telephone)
E-mail: arainer@phaionline.org
mark@phaionline.org

Daniel B. Edelman
KATZ MARSHALL & BANKS, LLP
1718 Connecticut Ave., NW
Sixth Floor
Washington, DC 20009
(202) 299-1140 (telephone)
E-mail: edelman@kmblegal.com

Michael R. Reese
George V. Granade
Carlos F. Ramirez
REESE LLP
100 W. 93rd St.
16th Floor
New York, NY 10025
(212) 643-0500 (telephone)
E-mail: mreese@reesellp.com
ggranade@reesellp.com
cramirez@reesellp.com

Counsel for Plaintiffs William H. Lamar IV, Delman L. Coates, and the Praxis Project

/s/ Anthony T. Pierce
Anthony T. Pierce (D.C. Bar No. 415263)
AKIN GUMP STRAUSS HAUER & FELD LLP
1333 New Hampshire Avenue, N.W.
Washington, DC 20036
(202) 887-4000 (telephone)
(202) 887-4288 (facsimile)
E-mail: apierce@akingump.com

Counsel for Defendant The Coca-Cola Company

**SUPERIOR COURT OF THE DISTRICT OF COLUMBIA
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)	Case No. 2017 CA 004801 B
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THE COCA-COLA COMPANY, et al.,)	
)	
Defendants.)	

**INDEX OF EXHIBITS TO COCA-COLA'S MOTION TO DISMISS PURSUANT TO
SUPER. CT. R. 12(B)(6) AND 12(B)(1)**

- Exhibit 1.** Video of “Coming Together” Advertisement, *available at* <https://goo.gl/BpjxqP> (cited in Compl. ¶ 116) (hard copy filed pursuant to Super. Ct. R. 5(d)(6)(B)).

- Exhibit 2.** Storyboard for “Coming Together” Advertisement (cited in Compl. ¶ 116).

- Exhibit 3.** Video of “Be OK” Advertisement, *available at* <https://goo.gl/l2e520> (cited in Compl. ¶¶ 109, 113) (hard copy filed pursuant to Super. Ct. R. 5(d)(6)(B)).

- Exhibit 4.** Storyboard for “Be OK” Advertisement (cited in Compl. ¶¶ 109, 113).

- Exhibit 5.** Cara B. Ebbeling et al., *Effects of Decreasing Sugar-Sweetened Beverage Consumption on Body Weight in Adolescents: A Randomized Controlled Pilot Study*, 117 PEDIATRICS 673 (2006) (cited in Compl. ¶ 50).

- Exhibit 6.** Anne Raben et al., *Increased Postprandial Glycaemia, Insulinemia, and Lipidemia After 10 Weeks’ Sucrose-Rich Diet Compared to an Artificially Sweetened Diet: A Randomized Controlled Trial*, 55 FOOD & NUTRITION RES. 5961 (2011) (cited in Compl. ¶ 50).

- Exhibit 7.** MCKINSEY GLOB. INST., OVERCOMING OBESITY: AN INITIAL ECONOMIC ANALYSIS (2014) (cited in Compl. ¶ 59 n.27).

- Exhibit 8.** *The Unhappy Truth about Soda*, CTR. FOR SCI. IN THE PUB. INTEREST, <http://www.therealbears.org> (cited in Compl. ¶ 76), and CONSTANCE L. HAYS, THE REAL THING: TRUTH AND POWER AT THE COCA-COLA COMPANY (2005) (excerpt).

- Exhibit 9.** Video of Dr. Rhona Applebaum’s Remarks at the Canadian Obesity Network’s 2013 Symposium (May 29, 2013), *retrieved from* <https://goo.gl/I1SK6M> (cited in Compl. ¶ 131) (hard copy filed pursuant to Super. Ct. R. 5(d)(6)(B)).
- Exhibit 10.** Transcription of Dr. Rhona Applebaum’s Remarks at the Canadian Obesity Network’s 2013 Symposium (May 29, 2013) (cited in Compl. ¶ 131).
- Exhibit 11.** Bruce Horovitz, *Executive Answers Questions about Sugary Drinks*, USA TODAY (June 7, 2012) (cited in Compl. ¶ 75).
- Exhibit 12.** Video of CNN Interview by Richard Quest with James Quincey (May 9, 2013), *available at* <https://goo.gl/dw6RHp> (cited in Compl. ¶ 77) (hard copy filed pursuant to Super. Ct. R. 5(d)(6)(B)).
- Exhibit 13.** Transcription of CNN Interview by Richard Quest with James Quincey (May 9, 2013) (cited in Compl. ¶ 77).
- Exhibit 14.** Candice Choi, *Coca-Cola Teams up with Nutritionists to Push Coke as Healthy Treat*, FOOD MANUFACTURING (Mar. 16, 2015) (cited in Compl. ¶ 92).
- Exhibit 15.** Video of “Mixify” Advertisement, *retrieved from* <https://goo.gl/8azpWA> (cited in Compl. ¶ 115) (hard copy filed pursuant to Super. Ct. R. 5(d)(6)(B)).
- Exhibit 16.** Storyboard for “Mixify” Advertisement (cited in Compl. ¶ 115).
- Exhibit 17.** INT’L FOOD INFO. COUNCIL FOUND., HYDRATION: DOES IT ALWAYS HAVE TO BE WATER? (2011) (cited in Compl. ¶ 133).
- Exhibit 18.** *Hemby v. Biotab Nutraceuticals, Inc.*, 2014-CA-000190 (D.C. Super. Sept. 10, 2014)
- Exhibit 19.** *Hemby v. Biotab Nutraceuticals Inc.*, 2014-CA-000190 (D.C. Super. Jan. 22, 2015)

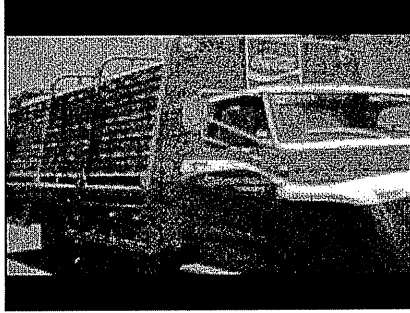
Exhibit 1

**Hard Copy Filed Pursuant
to Super. Ct. R. 5(d)(6)(B)**

Exhibit 2



(Music)
VOICE OVER: For over a 125 years we've been bringing people together.



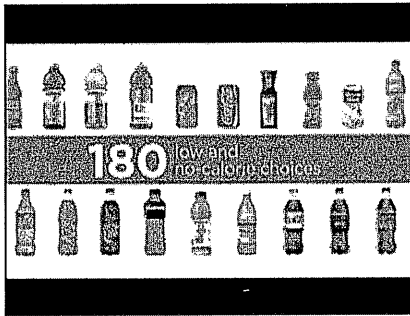
Today we'd like people to come together on something that concerns all of us, Obesity.



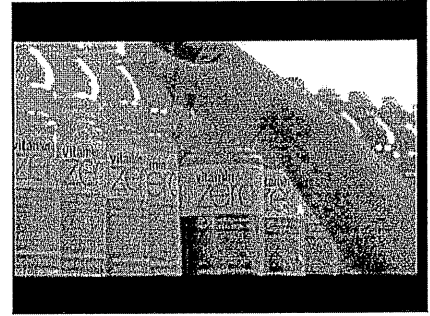
The long term health of our families and the country's is at stake and as the nation's leading...



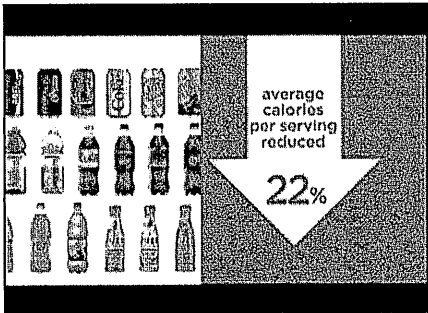
beverage company we can play an important role. Across our portfolio of more than 650 beverages...



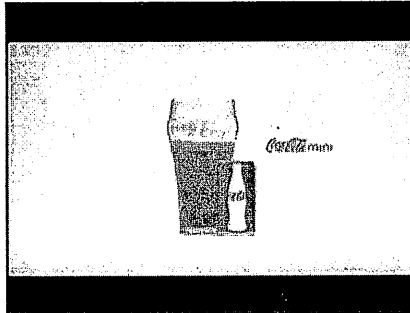
we now offer over a 180 low and no calorie choices...



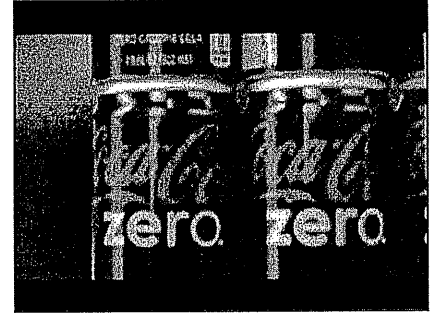
and most of our full calorie beverages now have low or no calorie versions.



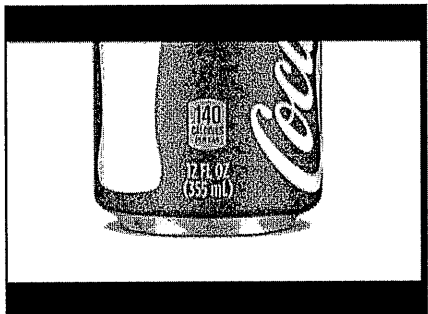
Over the last 15 years this has helped reduced the average calories per serving across our industry products in the U.S. by about 22%.



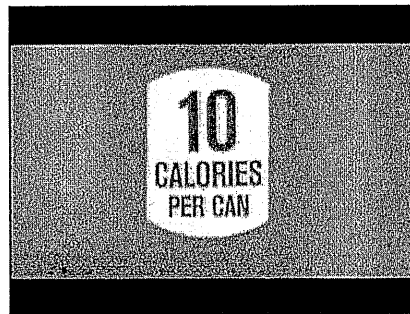
We've created smaller portion controlled sizes for our most popular drinks and will have them in about 90% of the country by the end of this year.



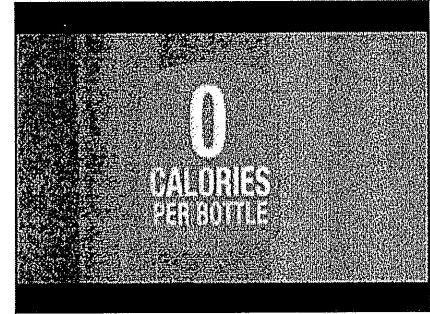
We've added the calorie content of all our beverages on the front to help make it even easier for people to make informed decisions.



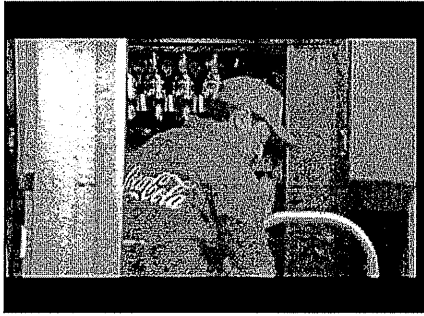
For elementary, middle and high schools our industry has voluntarily...



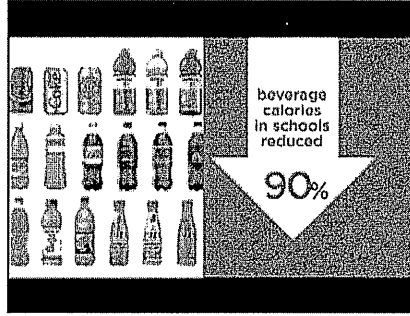
changed its offerings to primarily water...



juices and low and no calorie options.



(Music)
VOICE OVER: This has helped reduced the calories from...



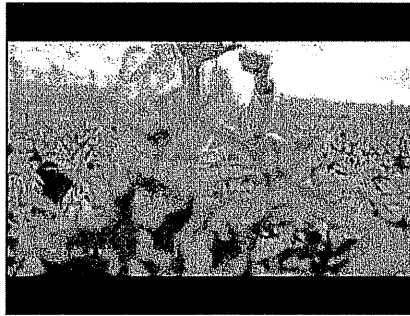
our industries beverages in those schools by 90% since 2004.



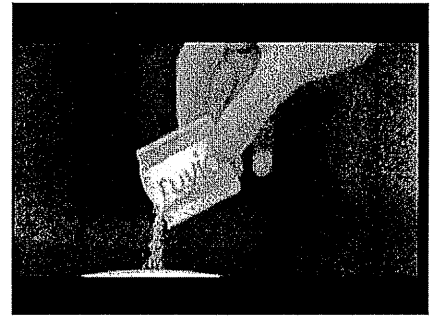
We support programs like the Boys and Girls Clubs of America...



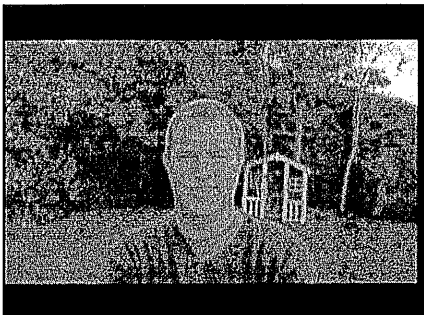
that enable young people to get active and start healthy habits early.



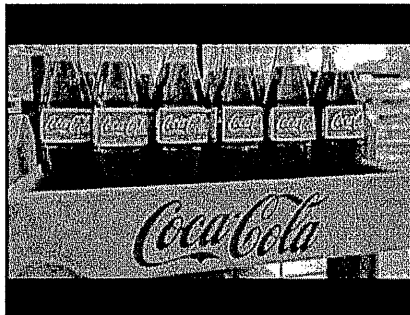
Leading is also about new thinking which is why we will continue to work with scientists and nutritionists...



on innovative things like zero calorie all natural sweeteners.



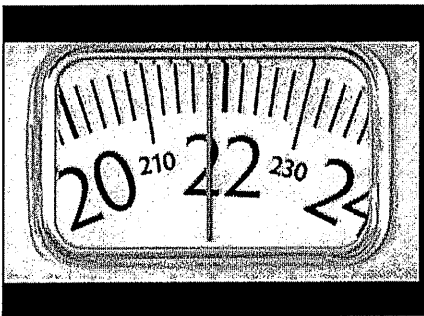
But beating obesity will take action from all of us based on one simple common sense fact.



All calories count no matter where they come from including Coca-Cola and everything else with calories.



And if you eat and drink more calories than you burn off you'll gain weight.



The well-being of our families and communities concerns everyone.



Finding a solution will take continued effort from all of us. But at Coca-Cola we know that when people come together...



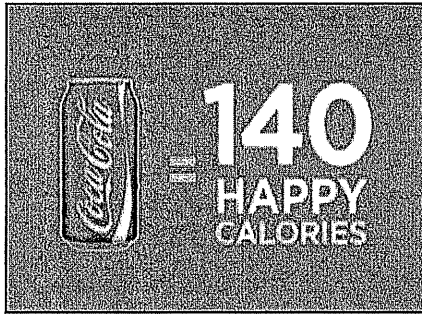
we can make a real difference. To learn more visit coke.com/comingtogether.
(Fade Out)

Text: coke.com/comingtogether

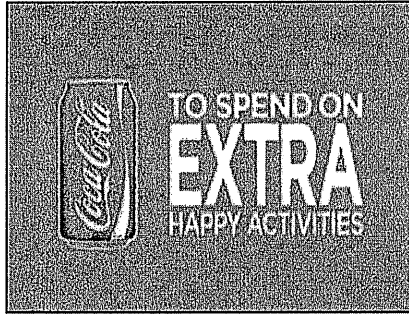
Exhibit 3

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to Super. Ct. R. 5(d)(6)(B)**

Exhibit 4



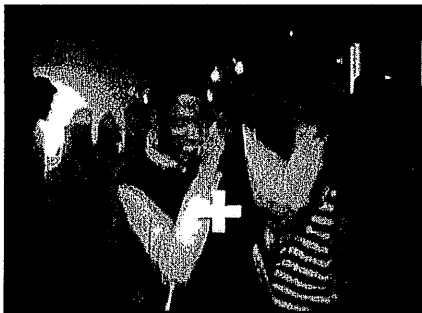
(Music)



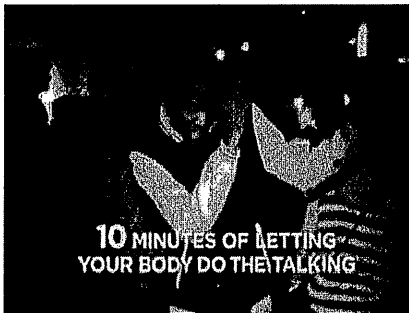
SONG: *I just wanna be okay. Be okay...*



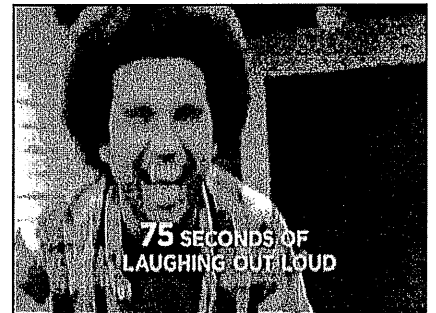
(Woman running with dog)



(Man dancing)



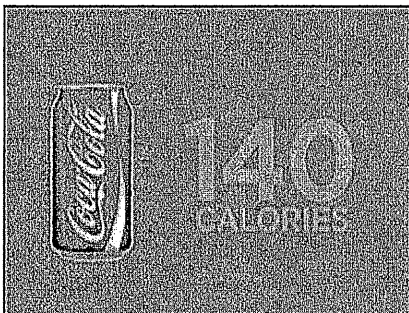
(Man dancing and text shown on screen)



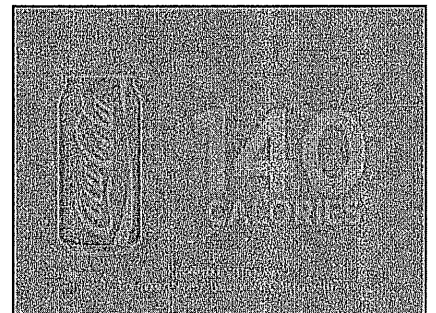
(Man laughing)



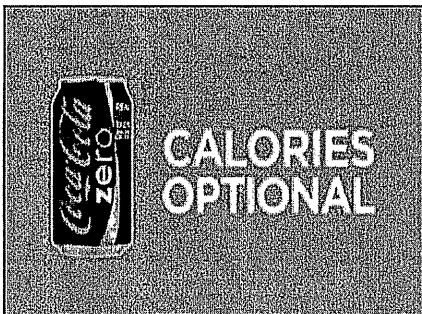
(Man dancing at a bowling alley)



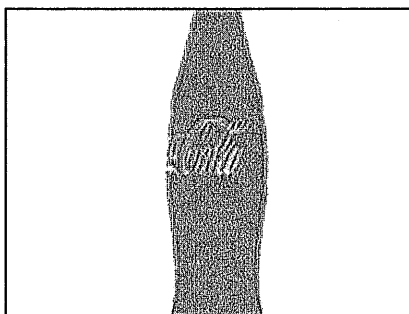
SONG: *I just wanna know today...*



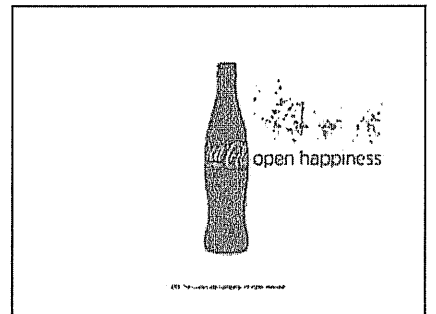
know today, know today.



Now that maybe...



I can be okay.



(Fade Out)

Text: (Illegible).

Text: (Illegible) The Coca-Cola Company. All rights reserved.

Exhibit 5

Effects of Decreasing Sugar-Sweetened Beverage Consumption on Body Weight in Adolescents: A Randomized, Controlled Pilot Study

Cara B. Ebbeling, PhD^a, Henry A. Feldman, PhD^{a,b}, Stavroula K. Osganian, MD, ScD^{a,b}, Virginia R. Chomitz, PhD^c, Sheila J. Ellenbogen, MBA^a, David S. Ludwig, MD, PhD^a

From the ^aDivision of Endocrinology, Department of Medicine, and ^bClinical Research Program, Children's Hospital Boston, Boston, Massachusetts; and ^cInstitute for Community Health, Cambridge, Massachusetts

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ABSTRACT

OBJECTIVE. The role of sugar-sweetened beverages (SSBs) in promoting obesity is controversial. Observational data link SSB consumption with excessive weight gain; however, randomized, controlled trials are lacking and necessary to resolve the debate. We conducted a pilot study to examine the effect of decreasing SSB consumption on body weight.

METHODS. We randomly assigned 103 adolescents aged 13 to 18 years who regularly consumed SSBs to intervention and control groups. The intervention, 25 weeks in duration, relied largely on home deliveries of noncaloric beverages to displace SSBs and thereby decrease consumption. Change in SSB consumption was the main process measure, and change in body mass index (BMI) was the primary end point.

RESULTS. All of the randomly assigned subjects completed the study. Consumption of SSBs decreased by 82% in the intervention group and did not change in the control group. Change in BMI, adjusted for gender and age, was 0.07 ± 0.14 kg/m² (mean \pm SE) for the intervention group and 0.21 ± 0.15 kg/m² for the control group. The net difference, -0.14 ± 0.21 kg/m², was not significant overall. However, baseline BMI was a significant effect modifier. Among the subjects in the upper baseline-BMI tertile, BMI change differed significantly between the intervention (-0.63 ± 0.23 kg/m²) and control ($+0.12 \pm 0.26$ kg/m²) groups, a net effect of -0.75 ± 0.34 kg/m². The interaction between weight change and baseline BMI was not attributable to baseline consumption of SSBs.

CONCLUSIONS. A simple environmental intervention almost completely eliminated SSB consumption in a diverse group of adolescents. The beneficial effect on body weight of reducing SSB consumption increased with increasing baseline body weight, offering additional support for American Academy of Pediatrics guidelines to limit SSB consumption.

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Key Words

beverages, adolescent obesity, weight loss, body mass index, diet

Abbreviations

SSB—sugar-sweetened beverage
E_{SSB}—energy intake from sugar-sweetened beverages
MET—metabolic

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Address correspondence to David S. Ludwig, MD, PhD, Department of Medicine, Children's Hospital, 300 Longwood Ave, Boston, MA 02115. E-mail: david.ludwig@childrens.harvard.edu

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A RAPID INCREASE in the consumption of sugar-sweetened beverages (SSBs) among adolescents in the United States¹ has occurred concomitantly with the escalating pediatric obesity epidemic,² raising the possibility of a causal relationship. Soft drinks are readily available in homes, fast food and other restaurants, vending machines, and school cafeterias.³ Moreover, the soft drink industry uses aggressive advertising campaigns directed toward young consumers.^{4,5} Based on data from a nationally representative sample of youth, a remarkable 73% of adolescent boys and 62% of adolescent girls consume carbonated soft drinks on any given day, of which the vast majority contain sugar rather than non-nutritive sweeteners.³ Those who consume soft drinks obtain 10% to 11% of their total energy intake from these beverages.³ Not surprisingly, soft drinks are the leading source of added sugars in the diets of adolescents.⁶

The role of SSBs in promoting obesity has been debated extensively in recent years. The American Academy of Pediatrics^{7,8} and the current *Dietary Guidelines for Americans*⁹ advocate reducing SSB consumption as a weight-control strategy based on available prospective data from cohort studies.¹⁰⁻¹² However, the American Beverage Association argues that available evidence for a causal relationship between soft drink consumption and obesity is inadequate to justify a change in their marketing practices.¹³ A recent executive summary put forth by food and nutrition scientists also contends that there is no convincing evidence linking obesity with intake of high-fructose corn syrup,¹⁴ the primary sweetener and major source of calories in soft drinks.¹⁵ Although prospective data linking SSB consumption with excessive weight gain are compelling,¹⁰⁻¹² randomized, controlled trials are undeniably lacking and necessary to evaluate causality.

In the only pediatric trial to date, James et al¹⁶ reported a significant decrease in the incidence of obesity after 1 year among 7- to 11-year-old children who received an intervention to decrease carbonated beverages compared with a control group. However, change in mean body mass index (BMI) did not differ between groups, possibly because of methodological issues. The intervention consisted of only 4 school-based educational sessions aimed at reducing consumption of all carbonated beverages containing either sugar or non-nutritive sweeteners. Moreover, baseline SSB consumption was very low in this young cohort (ie, ~1 glass every 3 days), leaving minimal opportunity for the intervention to have a significant impact on beverage intake and, ultimately, BMI. The decrease in consumption of all carbonated beverages for the intervention group was only 150 mL over 3 days, with no significant change in SSB consumption. These issues highlight a need for trials of more powerful interventions with youth who frequently consume SSBs.

Environmental variables, such as ready availability of SSBs, often seem to undermine educational and behavioral strategies that focus largely on personal responsibility for making healthful choices based on expert recommendations.¹⁷ The purpose of this randomized, controlled pilot study was to test the hypothesis that a simple environmental intervention will significantly decrease SSB consumption and BMI among adolescents. We further hypothesized that the effects will be greatest in the heaviest adolescents; for this reason, we stratified the cohort by baseline-BMI status. Although access to soft drinks from many sources has increased over the last 2 decades, adolescents still obtain nearly 50% of their beverages at home.³ Thus, we implemented a novel intervention that relied on delivery of noncaloric beverages to the homes of adolescents, in combination with telephone-administered behavioral counseling, to displace SSBs and thereby decrease consumption.

METHODS

Subjects

We enrolled 103 adolescents (47 males and 56 females), aged 13 to 18 years, who reported consuming at least 1 serving (ie, 360 mL or 12 fl oz) per day of SSB (ie, soft drinks, juice drinks containing <100% juice, punches, lemonades, iced teas, and sports drinks). Each subject lived predominantly in 1 household (ie, no more than 1 weekend every 2 weeks in a secondary household). We excluded those who were currently dieting for the purpose of weight loss or taking prescription medications that might affect body weight. We also did not enroll those who reported smoking at least 1 cigarette in the past week or were diagnosed as having a major medical illness or eating disorder. To decrease the likelihood of enrolling individuals with eating disorders or undernutrition, we excluded those with a BMI below the 25th percentile.¹⁸ During telephone conversations with parents, we collected demographic data including gender, race and ethnicity, date of birth, total annual household income, and street address. Recruitment and screening of subjects were conducted in collaboration with a local high school that provided mailing lists and space for obtaining measurements. Packets containing an invitation letter and informed consent and assent documents were sent to parents of all students enrolled at the school. Parents were instructed to contact staff members by telephone, if interested, to obtain more information about the study protocol. The study director supervised the evaluation of eligibility criteria and enrollment.

The study protocol was approved by the institutional review board at Children's Hospital Boston. Written informed consent and assent were obtained from parents and subjects, respectively. Eligible subjects were entered sequentially onto a list of random group assignments

prepared in advance by the study statistician, stratified by gender and BMI (<85th percentile for gender and age, ≥85th percentile).¹⁸ The sequence of random assignments was permuted within stratum in blocks of 2, 4, and 6. To avoid any bias in the enrollment procedure, personnel conducting recruitment were masked to sequence. All of the subjects assigned to a group were available for follow-up measurements (Fig 1), and there were no serious adverse events or adverse effects among adolescents in the intervention group. Each subject received a \$100 gift certificate to a local shopping mall at the end of the study. The study, known as Beverages and Student Health (BASH), was conducted during the 2003–2004 academic year.

Intervention

The intervention group received weekly home deliveries of noncaloric beverages for 25 weeks. The target number of individual beverage servings (ie, 360 mL or 12 fl oz per referent serving) delivered to each home was based on household size: 4 servings per day for the subject and 2 servings per day for each additional member of the household. This extra allotment was provided to avoid competition between the subject and family members for the beverages. We distributed an order form to each household for selecting beverage preferences from a wide variety of options (eg, bottled water and “diet” beverages including soft drinks, iced teas, lemonades, and punches). The beverage order form listed options in units, based on manufacturer packaging. The units contained bundles of 4 to 6 cans or bottles, with volumes ranging from 300 to 720 mL (10–24 fl oz) per can or bottle. The target number of delivered servings, specified above, was approximately equal to 5 units per week for the subject and 3 units per week for each additional member of the household. A regional supermarket delivery service filled the orders and delivered the beverages,

with research staff coordinating and monitoring the process.

We instructed subjects to drink the noncaloric beverages delivered to their homes and not to buy or drink SSBs. In addition, we offered advice on how to choose noncaloric beverages when not at home. Written instructions regarding beverage consumption were mailed to subjects at the beginning of the intervention period. We also contacted each household by telephone during the first week of the intervention to speak with the subject and a parent. This telephone contact provided an opportunity to reinforce instructions, answer questions, and address concerns. Thereafter, we contacted each subject by telephone on a monthly basis throughout the intervention period to assess satisfaction with beverage choices and deliveries, discuss beverage consumption, and provide motivational counseling. Beverage orders were revised on request to increase the likelihood that subjects would drink the delivered products. On a monthly basis, we also mailed refrigerator magnets to subjects, with each magnet conveying a message under the theme of “Think Before You Drink.” The messages provided data-based information with regard to the possible effects of SSBs in promoting excess energy intake,¹¹ weight gain,¹⁰ tooth decay,¹⁹ and hunger.²⁰ An additional message cautioned subjects to beware of misleading beverage labels and advertisements.

We asked subjects in the control group to continue their usual beverage consumption habits throughout the 25-week intervention period. They received weekly home deliveries of noncaloric beverages for 4 weeks after completion of follow-up measurements, as a benefit for having participated in the study.

Primary End Point

The change in BMI from baseline to follow-up was the primary end point. Weight and height were measured by using an electronic scale (model TBF-300A; Tanita, Arlington Heights, IL) and stadiometer (model PE-AIM-101; Perspective Enterprises, Portage, MI), respectively. Subjects removed shoes and heavy outerwear before weight measurements. We measured height in duplicate, with the subject stepping away from the stadiometer between measurements. BMI was calculated as total mass (kilograms) divided by height (meters) squared.

Dietary and Physical Activity Recall Interviews

Two 24-hour dietary and physical activity recall interviews were conducted over the telephone at baseline and another 2 at the end of the intervention period. Telephone calls were unannounced so that the subject did not know the exact dates of the interviews in advance. The interviewer was masked to group assignment.

Dietary intake was assessed by a multiple-pass method using the Nutrition Data System for Research

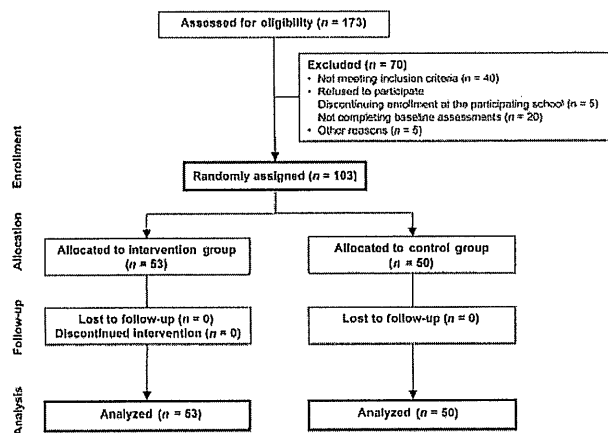


FIGURE 1
Flow of subjects through each stage of the trial.

Software (NDS-R 4.06; Nutrition Coordinating Center, University of Minnesota, Minneapolis, MN). We prompted the subject to list in sequence the foods and beverages consumed during the previous day, identify omissions in the initial list, and then provide details (eg, portion sizes and brand names) concerning each reported item. Intake was reviewed and confirmed at the end of each recall. Energy intake from SSBs (EI_{SSB}) was the variable of primary interest for this report. We also quantified the volumetric consumption of all noncaloric beverages.

Immediately after the dietary recall portion of the interview, we prompted the subject to recall physical activity and inactivity, including sleep, using a protocol modeled after validated methodology.^{21,22} The subject was asked to recall the activity performed most during respective 15-minute time blocks throughout the preceding day (12:00 AM to 11:59 PM) and then to rate the relative intensity of each reported activity as light, moderate, hard, or very hard.²² A metabolic equivalent (MET level) was assigned to each activity to calculate a physical activity factor (kilocalories/kilogram per hour). As points of reference, resting has a MET level of 1.0, and brisk walking has a level of 5.0.²³ In addition to conducting the 24-hour physical activity recall interview, we asked subjects to estimate the usual number of hours per day spent watching television, using a computer (for purposes other than doing homework), and playing video games.

Before the first telephone interview, we held in-person group training sessions focusing on how to estimate food and beverage portion sizes and how to describe the intensity of physical activity. Teaching aids included food models, measuring cups and spoons, common kitchen items (ie, plates, bowls, cups, and glasses), and familiar packaging (ie, beverage containers and snack food wrappers). In addition, we presented cartoons illustrating examples of physical activities performed at varying intensity levels. Each subject practiced recalling dietary intake and physical activity during the training session.

Process Evaluation

To obtain additional process data for informing the design of a future large-scale trial, we administered questionnaires at the end of the study. Using 10-cm visual analog scales with appropriate verbal anchors, subjects responded to a series of questions regarding adherence to instructions, beverage delivery logistics, and overall enjoyment of participation.

Statistical Methods

The study was designed to provide 80% power to detect an effect size of 0.51 (mean change \div SD of change), using a 5% type I error rate. Historical data on intersubject variability and intrasubject correlation of BMI in children, drawn from the American Academy of Pediatrics'

Child and Adolescent Trial for Cardiovascular Health (CATCH) study,²⁴ indicated that our detectable effect size corresponded with a 3.1% mean change in BMI. Posthoc power calculations, taking into account the attained sample size ($n = 103$) and precision of the overall net difference between the intervention and control groups, indicated that the detectable effect in practice was 0.57 kg/m² or 2.2% of mean baseline BMI.

We compared baseline demographic, anthropometric, and behavioral characteristics between the intervention and control groups by Student's *t* test for continuous measures and Fisher's exact test for discrete variables. The primary analysis was conducted by multiple linear regression with individual BMI change as the dependent variable, group as an indicator independent variable, and gender and age as obligatory covariates. The influence of covariates was tested by adding them to the regression model, both singly and in combination. Effect modification by baseline BMI was evaluated by adding a group \times baseline BMI interaction term to the primary analytic model. To quantify the net effect of the intervention among the heaviest adolescents, we categorized subjects using baseline-BMI tertiles as cut points in a secondary model of effect modification. We used $P < .05$ as a criterion for statistical significance of covariates and effect modifiers. Computations were performed with SAS software (SAS Institute, Inc, Cary, NC).

RESULTS

Baseline Measures

Baseline subject characteristics are presented in Table 1. There were no significant group differences between intervention and control subjects in demographics (gender, race, ethnicity, age, household income, and household size) or anthropometrics (weight, height, and BMI). Likewise, the groups did not differ in baseline levels of daily EI_{SSB} , noncaloric beverage intake, physical activity, television viewing, or total media time (Table 2).

Process Measures

We completed all of the 6 possible monthly telephone contacts with 83.0% of the subjects in the intervention group (44 of 53 subjects), for an average of 5.8 ± 0.6 (mean \pm SD) counseling calls per subject. Problems with beverage deliveries were reported during only 1.3% of the completed telephone contacts (4 of 306 contacts). As shown in Table 2, EI_{SSB} decreased by 82% for the intervention group ($P < .0001$) and did not change for the control group. There were no changes in physical activity, television viewing, or total media time for either group. Questionnaire data are presented in Table 3 and suggest a high level of self-reported compliance.

Outcome Measures

Change in BMI, adjusted for gender and age, was 0.07 ± 0.14 kg/m² (mean \pm SE) for the intervention group and

TABLE 1 Baseline Characteristics of Subjects in the Intervention and Control Groups

Characteristic	n (%) or Mean ± SD		P ^a
	Intervention	Control	
No. of subjects	53 (100)	50 (100)	
Gender			
Male	24 (45)	23 (46)	1.0 ^b
Female	29 (55)	27 (54)	
Race			
White	18 (34)	19 (38)	.69
Nonwhite	35 (66)	31 (62)	
Ethnicity			
Hispanic	11 (21)	7 (14)	.44
Non-Hispanic	42 (79)	43 (86)	
Age, y	16.0 ± 1.1	15.8 ± 1.1	.37
Weight, kg	72.1 ± 20.5	69.6 ± 19.2	.53
Height, cm	167 ± 9	167 ± 9	.88
BMI, kg/m ²	25.7 ± 6.3	24.9 ± 5.7	.51
Weight status			
BMI <85th percentile	28 (53)	29 (58)	.69 ^b
BMI ≥85th percentile	25 (47)	21 (42)	
Household income ^c			
<\$30 000	19 (38)	20 (41)	.97
\$30 000 to \$59 999	16 (32)	14 (29)	
≥\$60 000	15 (30)	15 (31)	
Residing in subsidized housing	10 (19)	7 (14)	.60
Household size (family members)	3.1 ± 1.1	3.2 ± 1.1	.96

^a Comparing intervention and control groups by Student's *t* test (continuous measures) or Fisher's exact test (discrete variables).

^b Balanced by stratified randomization.

^c Three nonrespondents in the intervention and 1 in the control group.

0.21 ± 0.15 kg/m² for the control group. The net difference, -0.14 ± 0.21 kg/m², was not significant overall but varied considerably over the range of baseline BMI (Fig 2). As an effect modifier in regression analysis, baseline BMI was significant at *P* = .016. The trend in weight loss (Fig 2) was an additional BMI decrease of 0.08 kg/m² for every 1 kg/m² at baseline in the intervention group (Fig 2A), compared with a negligible trend in the control group (Fig 2B). The intervention effect was significant for baseline BMI >30 kg/m² (Fig 2C) in the primary analysis. Moreover, among the subjects in the upper baseline-BMI tertile (BMI ≥ 25.6 kg/m²), BMI change differed markedly between the intervention (-0.63 ± 0.23 kg/m²) and control (+0.12 ± 0.26 kg/m²) groups, a net effect of -0.75 ± 0.34 kg/m² (*P* = .03), whereas no significant group difference was seen for the subjects in the middle and lower tertiles (*P* = .04 for interaction).

Adjusting the analysis for the demographic and behavioral covariates listed in Tables 1 and 2, either singly or in combination, did not change the results. Among the covariates, only baseline EI_{SSB} exerted an independent effect on the trial end point, amounting to an additional 0.14 kg/m² decrease in BMI per 420 kJ (100 kcal) per day consumed. However, baseline EI_{SSB} was not a significant effect modifier (*P* > .75) and did not attenuate the effect modification of baseline BMI, which

TABLE 2 Daily EI_{SSB}, Physical Activity, Television Viewing, and Total Media Time in the Intervention and Control Groups

Variable	Mean ± SD		P ^a
	Intervention	Control	
No. of subjects	53	50	
EI _{SSB} , kJ ^b			
Baseline	1466 ± 781	1596 ± 1109	.50
Change	-1201 ± 836 ^c	-185 ± 945	<.0001
Noncaloric beverage intake, mL			
Baseline	254 ± 304	170 ± 245	.12
Change	396 ± 493 ^c	78 ± 523	.002
Physical activity, MET level			
Baseline	1.74 ± 0.35	1.63 ± 0.23	.08
Change	-0.12 ± 0.37	-0.03 ± 0.32	.18
Television viewing, h			
Baseline	2.17 ± 1.36	2.62 ± 1.75	.14
Change	0.05 ± 1.56	-0.19 ± 1.85	.47
Total media time, h ^d			
Baseline	4.57 ± 2.42	5.28 ± 3.38	.22
Change	-0.50 ± 2.56	-0.31 ± 3.33	.75

^a From Student's *t* test comparing intervention and control groups.

^b To convert kilojoules to kilocalories, divide by 4.2.

^c Significant change from baseline, *P* < .0001.

^d Sum of time spent watching television, using a computer (for purposes other than doing homework), and playing video games.

remained statistically significant at *P* = .028 when adjusted for baseline EI_{SSB}.

DISCUSSION

Public health interventions to prevent and treat overweight in children have generally taken a comprehensive approach, targeting multiple behaviors believed to promote positive energy balance.^{17,25} Conceptually, such an approach could be more efficacious than an intervention focused on just 1 behavior. However, most comprehensive programs have not had a substantial effect on body weight despite some success in promoting behavior change,¹⁷ perhaps because the behaviors targeted in these interventions are not key determinants of body weight, or because the selected educational and behavioral strategies lack sufficient intensity. In the present study, we focused specifically on SSB consumption, a single dietary behavior that may have a particularly large impact on body weight in adolescents. Moreover, we used a novel environmental intervention, in combination with telephone-administered behavioral counseling, to penetrate homes and thereby foster behavior change.

We found that decreasing SSB consumption had a beneficial effect on body weight that was strongly linked with baseline BMI. Net BMI change was -0.75 ± 0.34 kg/m² in the intervention compared with the control group among subjects in the upper baseline-BMI tertile; BMI changes did not differ significantly between groups among subjects with lower baseline body weight. Moreover, the effect was greater among the subjects who drank more SSBs at baseline, presumably because of

TABLE 3. Adherence to Instructions, Beverage Delivery Logistics, and Overall Enjoyment of Participation

Question	Descriptor Range ^a	Mean ± SD
Intervention group (n = 53)		
How well did you follow the study instructions to drink the BASH beverages delivered to your home?	Not at all (0) to very well (10)	8.4 ± 1.7
How well did you follow the study instructions to not buy or drink sugar-sweetened beverages?	Not at all (0) to very well (10)	8.1 ± 2.1
How was the number of beverages that you received each week?	Too few (0) to too many (10)	6.4 ± 1.9
How was the frequency (1 time per wk) of beverage deliveries?	Not often enough (0) to too often (10)	5.4 ± 1.5
Did you enjoy participating in the BASH study?	Not at all (0) to very much (10)	8.6 ± 1.9
Control group (n = 50)		
How well did you follow the study instructions to continue your usual beverage habits until June 2004?	Not at all (0) to very well (10)	8.1 ± 1.9
Are you enjoying the BASH study? ^b	Not at all (0) to very much (10)	7.6 ± 1.9

BASH indicates Beverage and Student Health study.

^a On 10-cm visual analog scale.

^b Present tense; control group had not yet received beverage deliveries (provided as a benefit after completion of the study) when the questionnaire was administered.

greater displacement of SSBs by noncaloric beverages. We observed that BMI decreased by -0.14 kg/m^2 for every 420 kJ (100 kcal) per day from SSBs at baseline. Because each 360-mL (12-fl oz) serving of SSB contains $\sim 630 \text{ kJ}$ (150 kcal), and total SSB consumption was reduced by 82% in the intervention group, we calculate that BMI decreased on average by 0.26 kg/m^2 for every serving per day of SSB that was displaced ($[0.14 \text{ kg/m}^2 \text{ per } 420 \text{ kJ per day from SSBs}] \times [630 \text{ kJ per serving}] \div [82\% \text{ reduction in SSB consumption}]$). For comparative purposes, a prospective observational study found that BMI increased by 0.24 kg/m^2 for every additional serving of SSB consumed per day.¹⁰ The results of our pilot study were not materially affected by gender, race or ethnicity, age, household income, household size, physical activity, or television viewing.

Several previous studies provide a physiological basis for interpreting these findings. Sugar seems to be less satiating when provided in liquid compared with solid form, thus contributing to incomplete energy compensation.²⁶⁻³¹ For example, DiMiglio and Mattes²⁷ observed exact energy compensation under free-living conditions when ingested sugar was obtained from jelly beans but not when an equal amount of sugar was obtained from a beverage. Moreover, St-Onge et al³¹ found that a beverage containing only sugar was less satiating than one with mixed nutrients, while controlling for energy content and volume. The sugary beverage also had an attenuated thermogenic effect, indicating less nutrient oxidation and greater energy storage. Taken together, these studies suggest that both the physical (liquid versus solid) and chemical (exclusively sugar versus mixed nutrient) characteristics of SSBs have an adverse effect on short-term energy intake and metabolism. Decreasing SSB consumption may elicit adaptations, involving satiety and thermogenesis, that facilitate long-term weight control.

The greater impact of the intervention among the heaviest adolescents is particularly striking. Although published data indicate that overweight adolescents obtain a larger percentage of their total energy intake from soft drinks than their lean peers,³² the greater weight loss with increasing baseline BMI in the present study was

not simply because of a greater decrease in energy intake from SSBs. Perhaps some individuals are inherently more susceptible than others to the adverse effects of SSBs on body weight. If so, these individuals would be more likely to become overweight in an environment characterized by high levels of SSB consumption; similarly, they would also tend to lose more weight with reduction in consumption. In any event, the mechanisms underlying susceptibility remain speculative and likely involve complex interactions among genetic predispositions, psychological factors, and environmental stimuli.³³

Our data are consistent with previous studies. In a 1-year retrospective cohort study, Welsh et al³⁴ noted that preschool children who were overweight or at risk of overweight were ~ 2 times more likely to remain or become overweight if they consumed SSBs. There was no significant association between SSB consumption and weight gain in children who were not at risk. In an intervention study, Tordoff and Alleva³⁵ reported that provision of 4 servings per day of noncaloric beverages caused a decrease in body weight over 3 weeks, relative to a control period, in adults who were overweight on average. Similarly, Raben et al³⁶ noted that obese subjects lost weight when given supplements containing nonnutritive sweeteners primarily in the form of beverages for 10 weeks, whereas those who were given sucrose primarily in the form of soft drinks gained weight.

Pediatricians and parents often express concern regarding the possible adverse health effects of nonnutritive sweeteners, such as aspartame or sucralose, in many noncaloric beverages. However, these sweeteners have been approved by the US Food and Drug Administration and are considered safe for children.³⁷ In this pilot study, we provided a wide range of noncaloric beverage options, including varieties containing nonnutritive sweeteners, to maximize the likelihood that the adolescents would identify products that satisfied their preferences and thereby displace SSBs with the products delivered to their homes. Nevertheless, we encouraged the subjects to order only bottled water if they or their parents had any safety concerns regarding nonnutritive sweeteners. It seems prudent for pediatricians to take a similar ap-

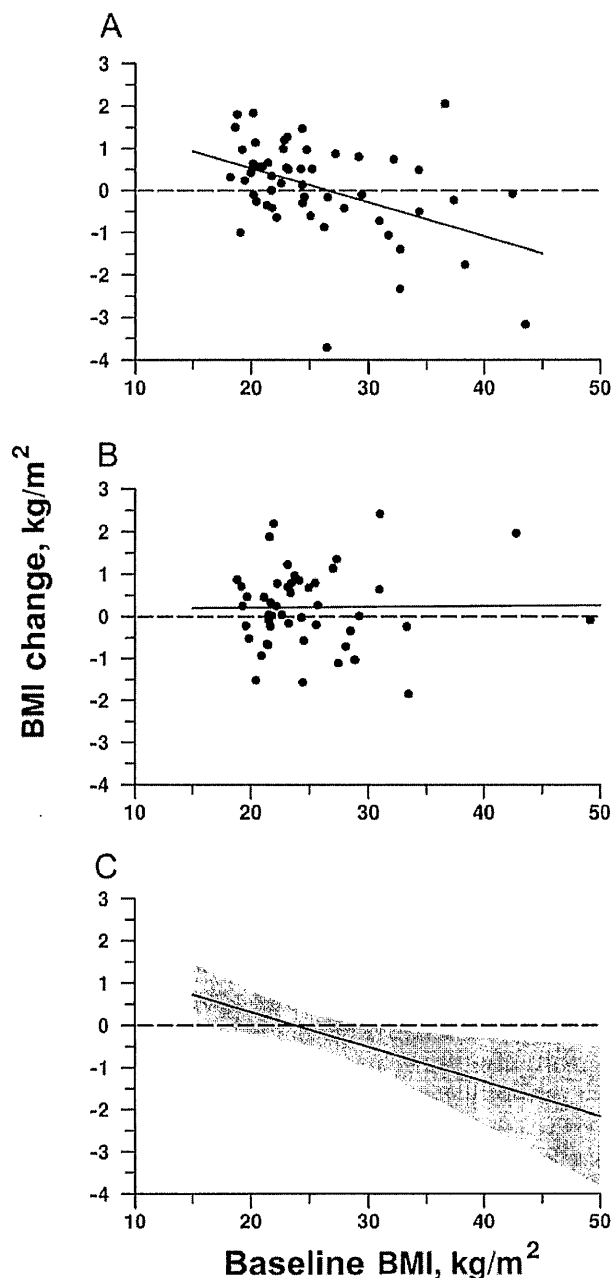


FIGURE 2
 BMI trends over 25 weeks for the intervention (A, slope = -0.081 kg/m²; $P = .0005$) and control (B, slope = 0.002 kg/m²; $P = .95$) groups as a function of baseline BMI. The intervention effect was significant, as shown by 95% confidence band on difference between study groups (C) for baseline BMI > 30 kg/m².

proach when counseling families to remove SSBs from their homes and self-select noncaloric beverages from available options as a weight-control strategy.

The strengths of this study include a novel intervention, a demographically diverse sample, and a 100% completion rate among randomly assigned subjects. An environmental intervention is particularly attractive for adolescents who often desire increasing autonomy, resist

adult authority, express ambivalence regarding dietary change and, thus, may not respond to conventional nutrition education and behavioral counseling.^{38,39} Based on process data, the intervention had the anticipated effect in significantly decreasing SSB consumption, and subjects seemed to enjoy participation in the study. Moreover, the diversity and high retention rate of the study cohort enhance the generalizability of the results. Limitations of the study include a relatively small sample size and short intervention period. Reliance on self-report for dietary assessment and process evaluation is another limitation, as in all studies of free-living subjects. Finally, we did not stage pubertal status. Although puberty could be an effect modifier, randomization likely precluded any systematic bias associated with this variable.

In the context of a research study, we used an expensive environmental intervention to evaluate the efficacy of decreasing SSB consumption as a weight-control strategy. However, it should be relatively simple to translate this intervention into a pragmatic public health approach. For example, schools could make noncaloric beverages available to students by purchasing large quantities at low costs. Assuming a unit price of 10¢, an intervention designed to provide 2 servings of noncaloric beverages per day (more than the amount associated with a BMI decrease of 0.75 kg/m² among the heaviest adolescents in our study) would cost approximately \$35 per student over 25 weeks. This cost would compare favorably with that of other weight-loss interventions for adolescents.

CONCLUSIONS

Decreasing the consumption of SSBs seems to be a promising strategy for the prevention and treatment of overweight adolescents. Large-scale trials are needed to evaluate the effects of this strategy over the long term, focusing specifically on the heaviest adolescents. Pending completion of such trials, this study offers additional support for American Academy of Pediatrics guidelines that recommend limiting SSB consumption.^{7,8} Pediatricians and public health professionals are well-positioned to publicize and implement these guidelines.

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Exhibit 6

Increased postprandial glycaemia, insulinemia, and lipidemia after 10 weeks' sucrose-rich diet compared to an artificially sweetened diet: a randomised controlled trial

Anne Raben^{1*}, Bente K. Møller¹, Anne Flint², Tatjana H. Vasilaras³, A. Christina Møller¹, Jens Juul Holst⁴ and Arne Astrup¹

¹Department of Human Nutrition, Faculty of LIFE sciences, University of Copenhagen, DK; ²Novo Nordisk A/S, Søborg, DK; ³Center for Health Promotion and Disease Prevention, The Danish National Board of Health, DK; ⁴Department of Medical Physiology, University of Copenhagen, DK

Abstract

Background: The importance of exchanging sucrose for artificial sweeteners on risk factors for developing diabetes and cardiovascular diseases is not yet clear.

Objective: To investigate the effects of a diet high in sucrose versus a diet high in artificial sweeteners on fasting and postprandial metabolic profiles after 10 weeks.

Design: Healthy overweight subjects were randomised to consume drinks and foods sweetened with either sucrose (~2 g/kg body weight) ($n = 12$) or artificial sweeteners ($n = 11$) as supplements to their usual diet. Supplements were similar on the two diets and consisted of beverages (~80 weight%) and solid foods (yoghurts, marmalade, ice cream, stewed fruits). The rest of the diet was free of choice and ad libitum. Before (week 0) and after the intervention (week 10) fasting blood samples were drawn and in week 10, postprandial blood was sampled during an 8-hour meal test (breakfast and lunch).

Results: After 10 weeks postprandial glucose, insulin, lactate, triglyceride, leptin, glucagon, and GLP-1 were all significantly higher in the sucrose compared with the sweetener group. After adjusting for differences in body weight changes and fasting values (week 10), postprandial glucose, lactate, insulin, GIP, and GLP-1 were significantly higher and after further adjusting for differences in energy and sucrose intake, postprandial lactate, insulin, GIP, and GLP-1 levels were still significantly higher on the sucrose-rich diet.

Conclusion: A sucrose-rich diet consumed for 10 weeks resulted in significant elevations of postprandial glycaemia, insulinemia, and lipidemia compared to a diet rich in artificial sweeteners in slightly overweight healthy subjects.

Keywords: *glucose; insulin; leptin; triacylglycerol; NEFA; GLP-1; GIP; meal test; overweight*

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The effect on health of a high intake of sugars (fructose, sucrose, high-fructose corn syrup) is still subject to scientific and public debate. Currently, a high intake of dietary sucrose and fructose coincides with the worldwide pandemic of obesity, type-2 diabetes, and cardiovascular diseases, and this has increased the concerns about the possible adverse effects of excessive sugar consumption (1, 2).

In general, it is recommended to limit the intake of added sugars to below 10 E% primarily to ensure an adequate intake of micronutrients (3, 4), which can be problematic in population groups with relatively small energy requirements (children and elderly) (5, 6). However, several other problems may arise from a large consumption of sugars. Firstly, a relatively large consumption of sugars, especially in the form of liquid sugar,

has been shown to result in increased energy intake and body weight. This has been explained by subjects being unable to compensate properly for the energy and thus consuming excess amounts of energy when sugars are consumed as soft drinks (7–9). Secondly, large cohort studies have linked a high intake of sugar-sweetened beverages to an increased risk of developing type-2 diabetes (10–12) and both human and animal intervention studies have demonstrated decreased insulin sensitivity after consumption of a high-sucrose diet (13–16). Thirdly, recent studies have linked sucrose and fructose intake to the development of lipid dysregulation, visceral adiposity, hypertension, inflammation, and clinical coronary heart disease (16–18). In order to avoid excessive intake of calories and the ensuing health hazards, it would therefore seem prudent to exchange sucrose for a non-calorie containing alternative such as artificial sweeteners. Due to the scarcity of publications in this area, the actual efficiency of this practice in the longer term is, however, still unclear. The aim of the present study was to investigate the effects of sucrose versus artificial sweeteners on the fasting and postprandial metabolic profiles after 10 weeks' intervention in slightly overweight subjects.

Subjects and methods

Experimental design

The study was designed as a 10 week parallel intervention study with two groups randomised to receive supplemental drinks and foods containing either sucrose or artificial sweeteners. Subjects consumed these as part of their daily food intake and collected the supplements at the Department of Human Nutrition every week. Subjects were not informed about the true purpose of the study, but were all told that they would receive supplements containing artificial sweeteners. The study comprised a main group of 41 subjects and a representative subgroup of 23 subjects. The present paper reports data from the subgroup. Data on the main group have been reported previously (8, 19). In this sub-study additional measurements of fasting and postprandial metabolic profiles were performed on a total of 23 subjects (19 women and 4 men).

Fasting blood was sampled in week 0 and 10 and postprandial blood sampled during an 8-hour meal test in week 10 (day 70). Height, waist-to-hip ratio, sagittal height, and blood pressure were measured in week 0. Measures of body weight and composition were conducted in week 0, 2, 4, 6, 8, and 10. The subjects spend the day and night before the blood sampling days in a respiratory chamber (data not included here). In the morning (9 AM) body weight and waist-to-hip ratio were measured after voiding. After 10 min of resting in a supine position blood pressure, body composition, and sagittal height were measured. A venflon catheter was

inserted in an antecubital arm vein and after another 10 min fasting blood samples were drawn. On the meal test day (week 10), subjects subsequently received breakfast (10 AM) and lunch (2 PM) at the Department. The breakfast and lunch were precise reproductions of what the subjects consumed the previous day, where they could eat ad libitum from menus selected in the respiratory chamber. The supplemental foods were eaten at breakfast and the supplemental beverages both at breakfast and lunch. Subjects were asked to use a maximum of 20 min to eat the meals. After the meals, subjects were allowed to move quietly around, read, and watch television. Postprandial blood samples were drawn at 30, 45, 60, 120, 180, 240 (just before lunch), 270, 285, 300, 360, 420, and 480 min after breakfast. Subjects rested in a supine position 10 min before each blood sampling.

Subjects

The inclusion criteria were: 20–50 years of age, overweight (BMI of 25–30 kg/m² or >10% overweight according to weight and height tables (20), healthy, not dieting, and for women not pregnant or lactating. The two study groups, the sucrose group (*n* = 12) and the sweetener group (*n* = 11) were well matched at baseline regarding gender, anthropometric measures, blood pressure, and physical activity (Table 1). The study was approved by the Municipal Ethical Committee of Copenhagen and Frederiksberg as being in accordance with the Helsinki II Declaration. All subjects gave written informed consent after the experimental procedures had been explained to them orally and in writing.

Table 1. Characteristics of subjects at baseline (week 0)¹

	Sucrose group (<i>n</i> = 12)	Sweetener group (<i>n</i> = 11)
Age (years)	35.3 ± 2.8	35.5 ± 3.6
Body weight (kg)	84.5 ± 2.4	80.1 ± 2.9
Height (cm)	171.8 ± 2.0	170.5 ± 2.2
BMI (kg/m ²)	28.7 ± 0.7	27.6 ± 0.8
Fat mass (kg)	31.2 ± 1.1	27.5 ± 1.4
Fat mass (%)	36.9 ± 0.9	34.4 ± 1.4
Fat-free mass (kg)	53.3 ± 1.7	52.6 ± 2.4
Fat-free mass (%)	63.1 ± 0.9	65.6 ± 1.4
Waist-to-hip ratio	0.78 ± 0.02	0.79 ± 0.03
Sagittal height (cm)	20.8 ± 0.7	20.4 ± 0.7
Systolic BP (mmHg)	119.5 ± 4.0	116.6 ± 1.9
Diastolic BP (mmHg)	72.6 ± 3.6	72.0 ± 2.7
Physical activity (h/wk)	8.7 ± 2.5	12.1 ± 2.8
Physical activity level ²	2.9 ± 0.3	3.1 ± 0.2

¹Mean ± SEM. BP: blood pressure. No significant differences between groups (unpaired *t*-test).

²Self-reported, rated from 1 to 5, with 1 = low and 5 = high.

Experimental diets

Diets have been described in detail before (8). In brief, subjects in the sucrose group were instructed to consume an amount of sucrose corresponding to about 2 g sucrose/kg body weight and similar amounts of artificially sweetened beverages and foods were given to the sweetener group. For an 80 kg person with an energy intake of 12 MJ/d this meant 23% of energy from sucrose. The beverages accounted for about 80% and solid foods for about 20% by weight of the supplements. The beverages consisted of soft drinks (Coca Cola, Fanta, and Sprite – all from Coca Cola Tapperierne A/S, Fredericia, Denmark) and flavoured fruit juices (orange, raspberry, 'sport', and mixed). The caps were changed and all labels were removed to hinder subjects from guessing which drinks were 'light'. The solid foods consisted of yoghurt (strawberry, Peach Alexander, and cherry for the sucrose group or strawberry-rhubarb, Peach Melba, and forest berries for the sweetener group), jam (orange, raspberry, and black currant), ice cream (strawberry, pistachio, and vanilla), and canned fruits (apricots, prunes, and apples). Except for the yoghurts the types of beverages and foods in the two groups were matched. Because some of the artificially sweetened products were fat-reduced, the sweetener group was given additional butter or corn oil to make the fat intake in the groups as similar as possible. Besides the experimental diet, subjects were allowed to freely consume their habitual diet throughout the intervention period.

Food intake was measured by 7 day dietary records at week 0, 5, and 10. Digital food scales with an accuracy of 1 g were used (Soehnle 8020 and 8009; Soehnle-Waagen GmbH & Co, Murrhardt, Germany). The computer database of foods from the National Food Agency of Denmark (Dankost 2.0) was used to calculate the energy and nutrient intakes (21). On the meal test day the breakfast contained different types of bread, butter, cheese, fruit juice, cereals, and milk. The lunch consisted of different types of bread, butter, cheese, vegetables, sandwich spread with meat and fish, eggs, and milk. The supplemental foods were consumed at breakfast and the supplemental beverages both at breakfast and lunch.

Anthropometry and blood pressure

Body weight was measured to the nearest 0.1 kg with a digital scale (Seca model 708; Seca Mess und Wiegetechnik, Vogel & Halke GmbH & Co, Hamburg, Germany). Body composition was estimated with the bioelectrical impedance method using an Animeter (HTS-Engineering Inc, Odense, Denmark). Fat mass (FM) and fat-free mass (FFM) were calculated as described previously (22). Height was measured to the nearest 0.5 cm before intervention using a wall-monitored stadiometer. Waist and hip circumferences were measured with a tape measure. Sagittal height was measured in the supine

position to the nearest 0.5 cm. Blood pressure was also measured in the supine position after 10 min of rest with an automatically inflating cuff (UA-743, A&D Company Ltd, Tokyo).

Laboratory analyses

Blood drawn fasting and postprandially was analysed for concentrations of glucose, lactate, insulin, non-esterified fatty acids (NEFA), triacylglycerol (TAG), total cholesterol, high density lipoprotein (HDL), glucagon, glucose-dependent insulinotropic polypeptide (GIP), glucagon-like peptide-1 (GLP-1), and leptin. Blood was sampled without stasis through an indwelling catheter into iced syringes. Within 30 min, samples were centrifuged for 10 min at 3000 $\times g$ and 4°C, and the supernatant fluid was stored at –80 or –20°C until analysed.

Blood for determination of plasma glucose and lactate was collected in fluoride-EDTA prepared tubes (Vacurette; Greiner labortechnik; Kremsmoenster, Austria) and was analysed by standard end-point enzymatic methods (MPR3 Gluco-Quant Glucose/HK and MPR3 Hexokinase/G&P-DH test kits; Boehringer Mannheim GmbH Diagnostica, Copenhagen) (23, 24).

Blood for insulin analysis was sampled in dry tubes. Determination of serum insulin was done with an enzyme-linked immunosorbent assay using a non-competitive sandwich assay (25) with a DAKO RIA insulin kit (DAKO A/S, Glostrup, Denmark). The NEFA concentration in plasma was measured by enzymatic quantitative colorimetric method (Wako NEFA test kit, NEFA C, ACS-ACOP method; Wako Chemicals GmbH, Germany). Concentration of serum TAG was analysed by an enzymatic endpoint method (Test-Combination Triacylglycerol (GPO-PAP) kit; Boehringer Mannheim GmbH Diagnostica, Copenhagen) (26). Cholesterol and HDL serum concentrations were measured using the enzymatic colorimetric Monotest Cholesterol High Performance CHOD-PAP method (Boehringer Mannheim GmbH Diagnostica, Copenhagen) and the HDL-Cholesterol precipitant method (supplementary pack to the Monotest Cholesterol High Performance CHOD-PAP method, Boehringer Mannheim GmbH Diagnostica, Copenhagen).

The GIP, GLP-1, and glucagon concentrations in plasma were all measured after extraction of plasma with 70% ethanol (vol/vol, final concentration). For the GIP radioimmunoassay (27) we used the C-terminally directed antiserum R 65, which cross-reacts fully with human GIP. Human GIP and 125-I human GIP (70 MBq/nmol) were used for standards and tracer. The plasma concentrations of GLP-1 were measured (28) against standards of synthetic GLP-1 7-36amide using antiserum code no. 89390. The glucagon radioimmunoassay (29) was directed against the C-terminus of the glucagon molecule (antibody code no. 4305). Leptin was

analysed using radio-immunoassay and an Automatic Gamma Counter (DRG Human Leptin RIA Kit (RIA-1624) 1272 Clinigamma LKB Wallac Four 1½ Detectors).

Statistical analyses

All results are given as means \pm SEM. All statistical analyses were performed in SAS version 8 (SAS Institute, Cary, NC). Estimates of insulin resistance and pancreatic β -cell function, introduced as a Homeostasis Model Assessment (HOMA) by Matthews et al. (30) were used as indices of insulin resistance:

HOMA-R (relative insulin resistance) = glucose
(mmol/l) \times insulin (μ U/l)/22.5.

HOMA- β (β -cell function) = $20 \times$ insulin(μ U/ml)/
glucose (mmol/l) - 3.5.

The Incremental areas under the curves (iAUC) was calculated for all postprandial blood measures separately for each subject as the difference between the integrated area of the response curve and the rectangular area above or below fasting concentrations. Differences between groups in subject characteristics, daily energy intake and macronutrient composition at baseline (week 0) were analysed using Student's unpaired *t*-tests.

The average daily energy and macronutrient intakes (from food dairies, week 0, 5, and 10) and the body weight and body composition of the sucrose and the sweetener group were analysed using repeated measurements analyses (PROC MIXED in SAS) testing the effect of group (diet), time (week), and group \times time interaction. Baseline value was used as a cofactor in analyses of body weight and body composition.

Differences in fasting concentration of blood parameters, HOMA-R, HOMA- β between groups were analysed using Student's unpaired *t*-test. Changes from week 0 to 10 between groups were analysed using covariance test first with baseline value as a cofactor and subsequently also with changes in body weight as a cofactor (PROC GLM in SAS). Differences between groups in energy and macronutrient intakes at the meal test day (breakfast, lunch, and breakfast+lunch) and sensory evaluation of the meals were analysed using Student's unpaired *t*-tests.

Repeated measurements analyses (PROC MIXED in SAS) over time during the meal test day were used for analyses of postprandial blood parameters. The effects of group, time (min) and group \times time were tested with and without changes in body weight, fasting value (week 10), and energy and sucrose intake on the test day (week 10) as cofactors in the analyses. For all repeated measurement analyses, the model was reduced when the group \times time interaction was insignificant and Tukey-Kramers adjusted post hoc tests were applied where appropriate.

The iAUC were analysed using analyses of variance (ANOVA) (PROC GLM in SAS) with group as a factor. The level of significance was $P < 0.05$.

Results

Changes during the 10 week intervention were as follows.

Dietary intake

In week 0 the groups were well matched with regard to energy and macronutrient intake (Table 2). During the intervention, energy and macronutrient intake did not change in the sweetener group. However, in the sucrose group the intake of sucrose increased by 161% and of carbohydrate by 31% from week 0 to 10 and in week 10, energy intake was 32% higher compared with the sweetener group ($p < 0.01$). The amount (gram) of consumed protein, dietary fibre, total fat or alcohol did not differ between groups at any time, but energy density increased significantly on the sucrose compared with the sweetener diet ($p < 0.01$). A similar dietary pattern was evident on the meal test day in week 10 (Table 3).

Body weight and body composition

Analysis on body weight during the intervention showed a significant group \times week effect ($P = 0.03$) with a body weight increase in the sucrose group (by 1.4 ± 0.6 kg in week 10) compared with the sweetener group (-1.5 ± 0.6 kg in week 10). When analysing FM and lean body mass (in kg and percentage), no significant differences were found between groups (data not shown).

Fasting blood concentrations

Fasting concentrations of blood parameters and HOMA-R and HOMA- β are shown in Table 4 (p -values for changes are corrected for fasting values in week 0). In week 0 fasting concentrations between groups were not significantly different, except for a higher GLP-1 in the sucrose group ($P < 0.001$). Changes from week 0 to 10 showed an increase in fasting concentrations of insulin ($P < 0.05$), GIP ($p < 0.05$), and leptin ($P < 0.001$) in the sucrose group compared with the sweetener group. There was also a tendency towards a difference in HOMA-R ($p = 0.051$) and HOMA- β , $p = 0.06$). When change in body weight was also used as cofactor in the analyses, all differences between groups became non-significant. In week 10 total fasting TAG was significantly higher in the sucrose group ($P < 0.05$), but the changes from week 0 to 10 were not different between groups.

Postprandial blood concentrations

For all postprandial parameters, there was a significant effect of time ($P < 0.0001$).

Glucose, insulin, and lactate

The responses over time on the meal test day and the iAUC for glucose, insulin, and lactate are shown in Fig. 1. Postprandial glucose response was significantly higher, especially after breakfast, in the sucrose group compared with the sweetener group (group, $p < 0.01$). Also the iAUCs were significantly different with a slightly negative area in the sweetener group compared with a positive area in the sucrose group ($p < 0.05$).

The insulin response was significantly higher in the sucrose group compared with the sweetener group, again most markedly after breakfast (group \times time effect, $p < 0.05$), but the difference in iAUC's did not reach significance ($p = 0.06$). Also for lactate a significant group \times time effect was seen ($P < 0.0001$), due to a larger

lactate concentration in the sucrose group compared with the sweetener group. The iAUC was significantly higher in the sucrose group ($P < 0.01$).

Including fasting value and change in body weight as cofactors in the above repeated measurements analyses did not change the findings. The HOMA indices for iAUC of glucose and insulin were not significantly different, although a tendency was observed for the HOMA-R index (480×10^3 in the sucrose versus -50×10^3 in the sweetener group, $p = 0.065$).

NEFA, TAG, and leptin

The postprandial responses for NEFA, TAG, and leptin are shown in Fig. 2. There were no significant differences between groups in the postprandial NEFA response. For

Table 2. Average daily energy and macronutrient intakes in the sucrose and sweetener groups at baseline (week 0) and during the intervention (week 5 and week 10)¹

		Week 0	Week 5	Week 10	P (ANOVA)		
					Group \times time	Group	Time
Energy (kJ/d)	Sucrose	10219 \pm 886	10984 \pm 855 ³	11759 \pm 866 ⁴	NS	0.02	NS
	Sweetener	9378 \pm 597	8630 \pm 708	8909 \pm 337			
Carbohydrate (g/d)	Sucrose	294 \pm 33 ^a	383 \pm 29 ^{b,5}	386 \pm 24 ^{b,5}	0.0033	<0.001	NS
	Sweetener	258 \pm 14	232 \pm 20	245 \pm 9			
Carbohydrate (E%) ²	Sucrose	48 \pm 2 ^a	60 \pm 1 ^{b,5}	56 \pm 1 ^{b,5}	<0.001	<0.001	<0.001
	Sweetener	48 \pm 2	46 \pm 2	47 \pm 2			
Sucrose (g/d)	Sucrose	69 \pm 22 ^a	189 \pm 14 ^{b,5}	180 \pm 7 ^{b,5}	<0.001	<0.001	<0.001
	Sweetener	50 \pm 8	23 \pm 4	27 \pm 5			
Sucrose (E%)	Sucrose	10 \pm 2 ^a	30 \pm 1 ^{b,5}	27 \pm 1 ^{b,5}	<0.001	<0.001	<0.001
	Sweetener	9 \pm 1	4 \pm 1	5 \pm 1			
Dietary fibre (g/d)	Sucrose	20 \pm 2	21 \pm 2	20 \pm 2	NS	NS	NS
	Sweetener	19 \pm 2	21 \pm 2	22 \pm 2			
Fat (g/d)	Sucrose	91 \pm 7	80 \pm 8	90 \pm 8	NS	NS	NS
	Sweetener	86 \pm 10	78 \pm 9	77 \pm 6			
Fat (E%)	Sucrose	35 \pm 1 ^a	28 \pm 1 ^b	29 \pm 1 ^{ab}	0.02	NS	0.01
	Sweetener	34 \pm 2	34 \pm 2	32 \pm 2			
Protein (g/d)	Sucrose	84 \pm 6	74 \pm 7	79 \pm 6	NS	NS	NS
	Sweetener	78 \pm 4	74 \pm 5	78 \pm 4			
Protein (E%)	Sucrose	14 \pm 1 ^a	11 \pm 0 ^{b,5}	11 \pm 0 ^{b,5}	<0.001	0.003	0.01
	Sweetener	15 \pm 1	15 \pm 1	15 \pm 1			
Alcohol (g/d)	Sucrose	12 \pm 2	9 \pm 2	18 \pm 5	NS	NS	NS
	Sweetener	13 \pm 2	16 \pm 5	19 \pm 4			
Alcohol (E%)	Sucrose	4 \pm 1	3 \pm 1 ³	4 \pm 1	NS	NS	NS
	Sweetener	4 \pm 1	6 \pm 1	6 \pm 1			
Weight of food (g/d)	Sucrose	3098 \pm 296	3750 \pm 278	3727 \pm 318	NS	NS	0.009
	Sweetener	3374 \pm 287	3614 \pm 213	3840 \pm 226			
Energy density (kJ/g)	Sucrose	3.4 \pm 0.2	3.0 \pm 0.1	3.2 \pm 0.2 ⁴	NS	0.03	<0.001
	Sweetener	3.0 \pm 0.3	2.4 \pm 0.2	2.4 \pm 0.1			

¹Mean \pm SEM. At week 0 and 10, $n = 12$ in the sucrose group and $n = 11$ in the sweetener group. At week 5 $n = 11$ in both groups. Values in the same row with different superscript letters are significantly different (repeated measurements over weeks), $P < 0.05$.

²E%, percentage of energy.

³⁻⁵Significant difference between the sucrose and sweetener groups (ANOVA): ³ $P < 0.05$, ⁴ $P < 0.01$, ⁵ $P < 0.001$.

TAG there was a significantly higher postprandial concentration in the sucrose compared with the sweetener group (group, $p < 0.05$). The group difference became insignificant after entering the change in body weight and fasting concentrations as cofactors. Accordingly, there was no significant difference between groups in iAUC.

Postprandial leptin response was significantly greater in the sucrose compared with the sweetener group, both without and with fasting concentration as a cofactor (group, $P < 0.001$ and $p < 0.05$, respectively). Further inclusion of changes in body weight as a cofactor made the differences non-significant ($p = 0.09$). The iAUCs were not different between groups.

Glucagon, GIP, and GLP-1

The postprandial responses for glucagon, GIP, and GLP-1 are shown in Fig. 3. Postprandial glucagon concentrations were significantly higher in the sucrose group than in the sweetener group (group effect, $p < 0.05$), but the iAUCs were not different. No significant differences between groups in any aspect of the GIP response were found. However, when including fasting value and changes in body weight as cofactors, there was a significant group effect ($p < 0.01$).

The GLP-1 concentrations were significantly greater in the sucrose group than in the sweetener group, both without and with fasting concentration and changes in body weight as a cofactor (group effect, $P < 0.0001$ and $P < 0.001$, respectively). The iAUCs were not significantly different between diets.

When using fasting value, changes in body weight, energy, and sucrose intake on the test day as cofactors in the repeated measurements analyses, the differences in lactate (group \times time, $p < 0.0001$), insulin (group \times time, $p < 0.05$), GIP ($p < 0.01$), and GLP-1 (group, $p < 0.001$) were significant.

Discussion

The major findings in the present study were that 10 weeks intake of a diet rich in sucrose resulted in higher postprandial concentrations of most measured blood parameters – glucose, insulin, lactate, TAG, leptin, glucagon, and GLP-1 – in healthy, overweight subjects compared to a diet rich in non-caloric artificial sweeteners. After adjusting for differences in fasting values, changes in body weight, energy, and sucrose intake in week 10, the differences were significant for lactate, insulin, GIP, and GLP-1.

Table 3. Average energy and macronutrient intakes in the sucrose and sweetener groups at breakfast and lunch on the meal test day in week 10 of the intervention¹

		Breakfast	Lunch	Breakfast+lunch
Energy (kJ)	Sucrose	4264 \pm 415	4531 \pm 575	8796 \pm 920
	Sweetener	3021 \pm 438	3651 \pm 413	6672 \pm 759
Carbohydrate (g)	Sucrose	184 \pm 20 ²	126 \pm 21	311 \pm 36 ²
	Sweetener	113 \pm 22	84 \pm 7	197 \pm 27
Carbohydrate (E%)	Sucrose	73 \pm 3 ²	47 \pm 3	60 \pm 2 ²
	Sweetener	61 \pm 4	40 \pm 2	51 \pm 3
Sucrose (g)	Sucrose	91 \pm 13 ⁴	49 \pm 14 ³	140 \pm 22 ⁴
	Sweetener	10 \pm 7	0 \pm 0	10 \pm 7
Sucrose (E%)	Sucrose	35 \pm 3 ⁴	18 \pm 3 ⁴	26 \pm 3 ⁴
	Sweetener	3 \pm 2	0 \pm 0	2 \pm 1
Dietary fibre (g)	Sucrose	7 \pm 1	13 \pm 1	20 \pm 2
	Sweetener	8 \pm 1	15 \pm 1	22 \pm 2
Fat (g)	Sucrose	21 \pm 4	44 \pm 6	65 \pm 9
	Sweetener	17 \pm 3	39 \pm 7	56 \pm 10
Fat (E%)	Sucrose	18 \pm 2	37 \pm 3	28 \pm 2
	Sweetener	22 \pm 3	39 \pm 3	30 \pm 3
Protein (g)	Sucrose	31 \pm 3	38 \pm 6	69 \pm 8
	Sweetener	30 \pm 3	36 \pm 4	66 \pm 7
Protein (E%)	Sucrose	13 \pm 1 ³	14 \pm 1	13 \pm 1 ³
	Sweetener	19 \pm 2	17 \pm 1	18 \pm 1
Energy density (kJ/g)	Sucrose	3.5 \pm 0.2 ³	3.6 \pm 0.3	3.5 \pm 0.2
	Sweetener	2.7 \pm 0.2	3.6 \pm 0.4	3.1 \pm 0.2

¹Mean \pm SEM. E%, percentage of energy. $n = 12$ in the sucrose group and $n = 11$ in the sweetener group.

²⁻⁴Significant difference between the sucrose and sweetener groups (Student's unpaired t -test): ² $P < 0.05$, ³ $P < 0.01$, ⁴ $P < 0.001$.

Table 4. Fasting plasma or serum concentrations of blood parameters, HOMA-R and HOMA-β in week 0 and week 10, and changes between week 0 and week 10 of the intervention¹

		Week 0	Week 10	Change ²
Glucose (mmol/l)	Sucrose	4.68 ± 0.11	4.92 ± 0.12	0.24 ± 0.09
	Sweetener	4.78 ± 0.08	4.87 ± 0.13	0.09 ± 0.15
Insulin (pmol/l)	Sucrose	41.8 ± 5.3	53.6 ± 7.9	11.8 ± 4.9 ³
	Sweetener	37.0 ± 5.3	35.8 ± 4.8	-1.2 ± 3.2
Lactate (mmol/l)	Sucrose	1.09 ± 0.14	1.11 ± 0.13	0.02 ± 0.08
	Sweetener	0.83 ± 0.05	0.89 ± 0.12	0.06 ± 0.10
NEFA (μmol/l)	Sucrose	595 ± 44	532 ± 35	-63 ± 33
	Sweetener	535 ± 53	524 ± 69	-10 ± 80
TAG (mmol/l)	Sucrose	1.48 ± 0.18	1.75 ± 0.24 ³	0.27 ± 0.12
	Sweetener	1.07 ± 0.12	1.01 ± 0.14	-0.05 ± 0.17
Total cholesterol (mmol/l)	Sucrose	5.20 ± 0.30	5.07 ± 0.29	-0.13 ± 0.19
	Sweetener	5.28 ± 0.32	5.26 ± 0.36	-0.02 ± 0.17
HDL-cholesterol (mmol/l)	Sucrose	1.31 ± 0.06	1.34 ± 0.07	0.03 ± 0.06
	Sweetener	1.47 ± 0.12	1.47 ± 0.13	0.00 ± 0.05
Glucagon (pmol/l)	Sucrose	3.2 ± 0.4	4.0 ± 0.5	0.8 ± 0.4
	Sweetener	2.9 ± 0.4	3.2 ± 0.4	0.4 ± 0.6
GIP (pmol/l)	Sucrose	8.8 ± 2.2	9.8 ± 1.7 ³	1.0 ± 2.0 ³
	Sweetener	7.6 ± 1.9	5.1 ± 1.3	-2.5 ± 2.2
GLP-1 (pmol/l)	Sucrose	13.3 ± 0.9 ⁵	13.8 ± 0.7 ⁵	0.4 ± 0.5
	Sweetener	8.0 ± 0.6	9.4 ± 0.7	1.4 ± 0.8
Leptin (ng/ml)	Sucrose	19.8 ± 2.2	26.9 ± 2.2 ⁴	7.1 ± 1.7 ⁴
	Sweetener	16.1 ± 3.4	15.1 ± 2.5	-1.0 ± 2.1
HOMA-R	Sucrose	1.46 ± 0.20	1.96 ± 0.29	0.50 ± 0.18
	Sweetener	1.32 ± 0.21	1.32 ± 0.2	0.00 ± 0.15
HOMA-β	Sucrose	26.0 ± 3.6	32.9 ± 5.5	6.9 ± 3.5
	Sweetener	22.1 ± 3.4	20.7 ± 3.0	-1.4 ± 1.8

¹Mean ± SEM. N = 12 in the sucrose group and n = 11 in sweetener group. Sucrose: sucrose group, Sweetener: sweetener group, NEFA: non-esterified fatty acids, TAG: triacylglycerol, GIP: glucose-dependent insulinotropic polypeptide, GLP-1: glucagon-like peptide-1.

²Change is calculated as week 10 minus week 0. An ANOVA was performed with week 0 value as covariate.

³⁻⁵Significant difference between sucrose and sweetener groups (ANOVA). ³P < 0.05, ⁴P < 0.01, ⁵P < 0.001.

A relatively large amount of sucrose, (~28 E% or 185 g/d) was consumed in the sucrose group, mainly in the form of liquid sugar (~80 weight%). The ensuing increase in total energy intake and body weight on that diet compared with the sweetener diet has been discussed before (8). Since changes in body weight can influence the measured blood parameters, adjustments in the statistical analyses were done in the present study to correct for this. In this way the influence of the diets per se on the blood parameters could be estimated. Still, in the real world the values not adjusted for changes in body weight will be the interesting ones, since these reflect the actual health status of the person in question. The statistical corrections are, therefore, mainly done in order to distinguish between the effects of changes in body weight and the effect of the dietary composition per se on blood concentrations.

Sucrose consists of 50:50 glucose and fructose that undergo different metabolic pathways after absorption

from the small intestine. The higher postprandial glucose response on the sucrose-rich diet can be explained by the large amount of available glucose from both sucrose and starch on this diet. The rise in glucose can on the other hand partly explain the large increase in postprandial insulin levels on this diet. Part of the insulin increase may, however, have been induced by the higher postprandial GLP-1 responses in the sucrose group compared to the sweetener group. It can be speculated that the constantly high energy intake in the sucrose group throughout the intervention has facilitated the secretion of GLP-1 by increasing the responsiveness to macronutrients in the small intestine (31). However, after adjusting for differences in energy and sucrose intake on the meal test day, both insulin and GLP-1 concentrations remained significantly higher in the sucrose group. Thus, other factors may have played a role. The fact that GIP became significantly higher on the sucrose diet after adjusting for differences in fasting values, changes in body weight,

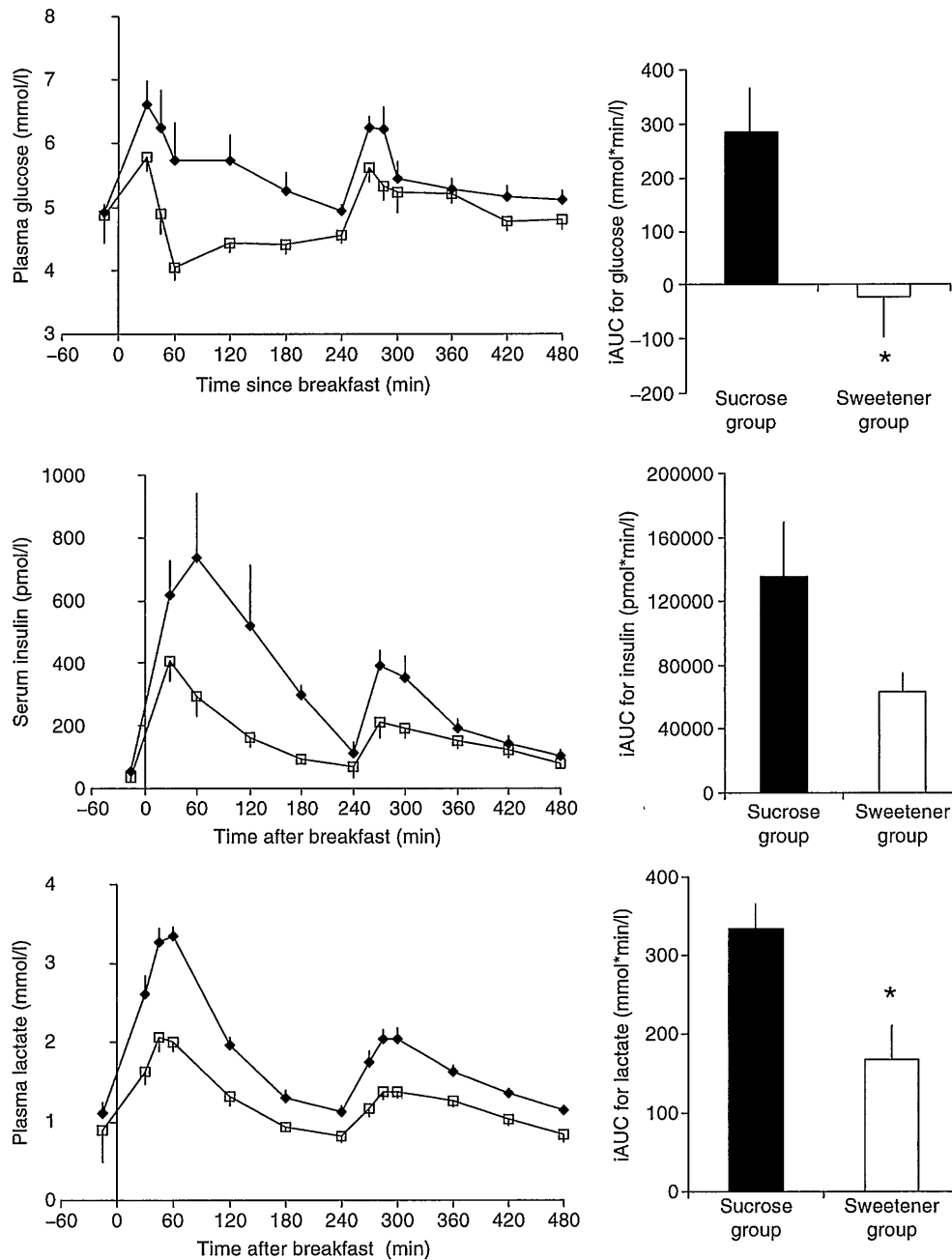


Fig. 1. Mean (\pm SEM) plasma glucose, serum insulin, and plasma lactate concentrations and incremental areas under the curves (iAUC) for a meal test day (week 10) in two groups who received supplementation containing either sucrose (\blacklozenge), $n = 12$ or artificial sweeteners (\square), $n = 11$ for 10 weeks in addition to their habitual diet. Postprandial responses were tested by repeated measurement analysis. For all curves, the time effect was significant ($P < 0.0001$). For glucose there was a significant group difference ($p < 0.01$), and a difference in iAUC ($p < 0.05$). For postprandial insulin there was a group \times time effect ($p < 0.05$), whereas the iAUC did not differ (group, $p = 0.06$). For lactate there was a significant group \times time effect ($P < 0.0001$) and a difference in iAUC ($P < 0.01$).

sucrose, and energy intake also indicates that other factors played a role in the release of GIP on that diet compared with the sweetener diet.

From the fasting results in our study, there was a tendency that the sucrose-rich diet lead to reduced insulin sensitivity after 10 week. This tendency disappeared,

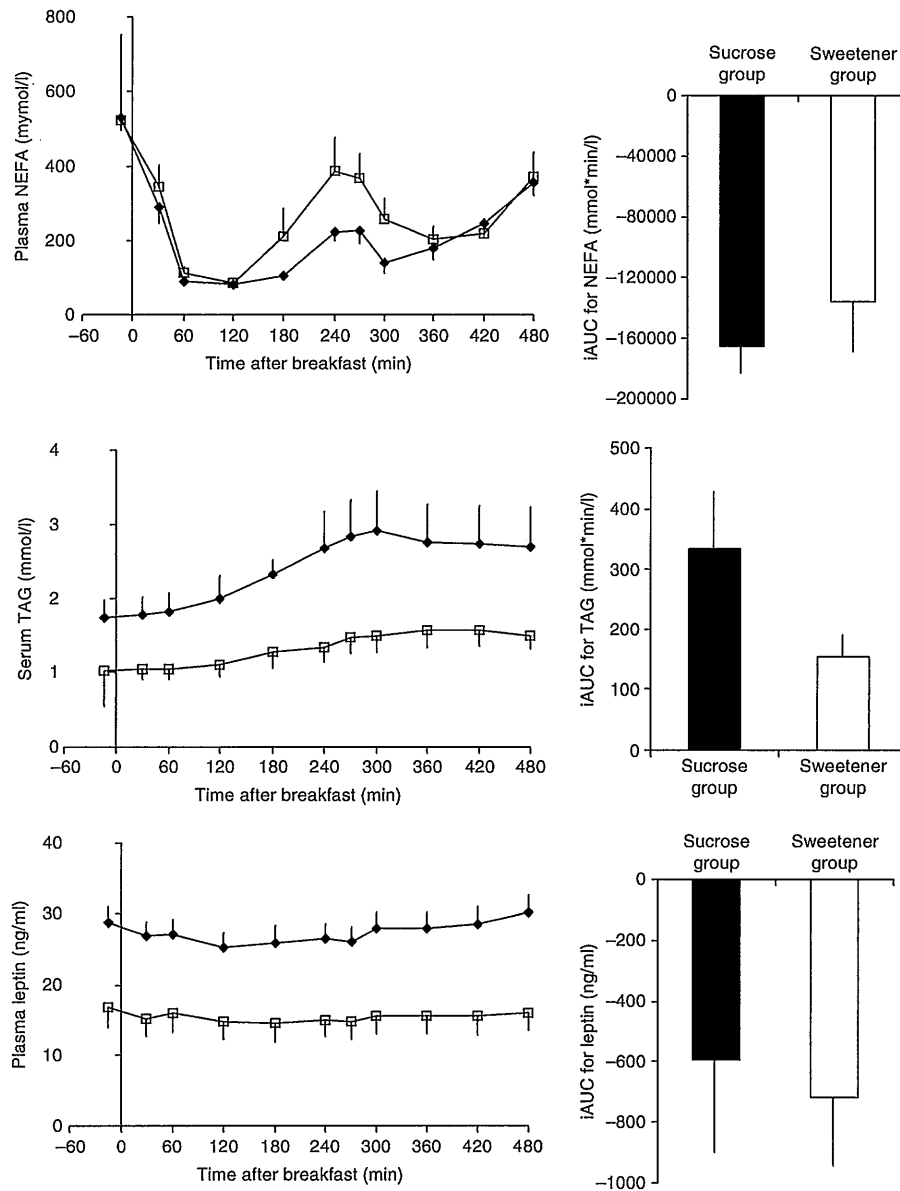


Fig. 2. Mean (\pm SEM) plasma non-esterified fatty acids (NEFA), serum triacylglycerol (TAG), and plasma leptin concentrations and incremental areas under the curves (iAUC) for a meal test day (week 10) in two groups who received supplementation containing either sucrose (\blacklozenge), $n=12$ or artificial sweeteners (\square), $n=11$ for 10 weeks in addition to their habitual diet. Postprandial responses were tested by repeated measurement analysis. For all curves, the time effect was significant ($P < 0.001$). For NEFA no significant differences were seen. For postprandial TAG and leptin, there were significant group differences ($p < 0.05$ and $p < 0.001$, respectively), but the iAUCs were not different.

however, after adjusting for changes in body weight. In some previous studies, no differences in insulin sensitivity were found when subjects were exposed to sucrose or starch for up to 24 days (15, 32–34). In contrast, a recent study of 10 weeks duration showed a decrease in insulin sensitivity after consumption of fructose-sweetened compared with glucose-sweetened beverages corresponding to

25 E% (16). In our study, large significant postprandial differences in glucose and insulin concentrations were observed, and fasting and iAUC HOMA-R index tended to be different too. These data together with the data in the study by Stanhope et al. (16) suggest that consumption of a sucrose- or fructose-rich diet for an extended period of time (e.g. 10 weeks) produces a less beneficial

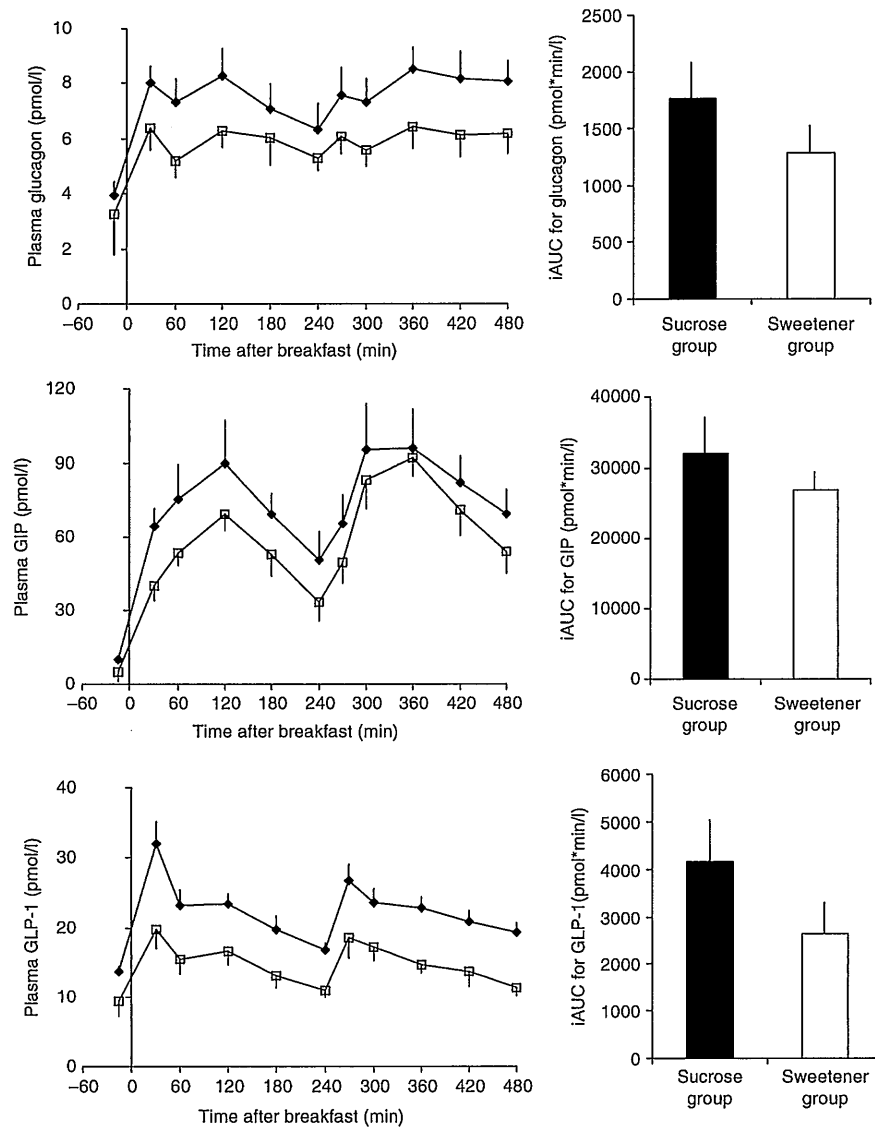


Fig. 3. Mean (\pm SEM) plasma glucagon, glucose-dependent insulinotropic polypeptide (GIP), and glucagon-like peptide-1 (GLP-1) concentrations and incremental areas under the curves (iAUC) for a meal test day (week 10) in two groups who received supplementation containing either sucrose (\blacklozenge , $n=12$) or artificial sweeteners (\square , $n=11$) for 10 weeks in addition to their habitual diet. Postprandial responses were tested by repeated measurement analysis. For all curves, the time effect was significant ($P < 0.0001$). No differences were seen for GIP. For postprandial glucagon and GLP-1, there were significant group differences ($p < 0.05$ and $P < .0001$, respectively), but no differences in iAUC.

glycaemic and insulinemic response and a risk of developing insulin resistance compared with a diet sweetened with non-caloric sweeteners or glucose. However, it is likely that changes in body weight can explain part of these findings.

We observed a large increase in lactate concentrations on the sucrose diet compared with the sweetener diet. This can probably be explained by the metabolic fate of the fructose moiety from the sucrose molecule. Thus, fructose present in the portal blood is efficiently

extracted by the liver and metabolised to fructose-1-phosphate under the action of the enzyme fructokinase, which is highly specific for fructose (35). Fructose-1-phosphate is further metabolised to triose-phosphate that subsequently can be converted into lactate and released into the systemic circulation (35). In accordance with this, postprandial lactate was shown to be elevated both after short- and longer-term consumption of a sucrose-rich compared with a starch-rich diet (32, 33).

A number of studies have been published in the past decade on the effects of fructose or high-fructose corn syrup on measures of lipidemia. In vitro data indicate that lactate is a main lipogenic precursor after fructose administration and that the activation of pyruvate dehydrogenase is a major regulatory step in this process. At the same time, fructose inhibits hepatic lipid oxidation, thus favouring fatty acid re-esterification and very low density lipoprotein (VLDL)-triglycerid synthesis (35). Due to the fructose moiety, sucrose may therefore affect concentrations of TAG by increasing hepatic TAG synthesis and VLDL production (36, 37).

Although total fasting TAG was higher in our study after 10 weeks on the sucrose diet, the changes from week 0 to 10 were not significantly different between groups ($p = .07$). Furthermore, changes in fasting cholesterol concentrations did also not differ between diets. Similarly, fasting TAG and cholesterol concentrations did not differ after 6 months on a low-fat, high-sucrose diet compared with a low-fat, high-starch ad libitum diets in the CARMEN study, in which 398 obese men and women participated (38). It is important to note, however, that in contrast to the present study, subjects in the CARMEN study consumed less energy and lost body weight on the sucrose-rich diet compared with a more fat-rich control diet – probably due to the sucrose-rich diet consisting mostly of solid foods and not of drinks as in the present study.

In the present study, postprandial TAG responses were significantly higher on the sucrose diet compared with the sweetener diet. These results are in accordance with previous studies, where diurnal TAG levels were found to be higher after sucrose, measured after 1–24 days intake, compared with either starch or glucose (32–34). Furthermore, a recent study showed that consuming fructose-sweetened beverages for 10 weeks increased 23-hour postprandial triglyceride AUC and hepatic de novo lipogenesis as well as visceral adiposity compared with glucose-sweetened beverages (16). Since sustained elevation of plasma TAG has been proposed to be an independent risk factor for cardiovascular diseases (39, 40) and since the diurnal TAG response was consistently higher on the sucrose diet in the present study, it can be speculated that this diet would lead to an increased risk of these diseases in the long-term compared with a diet sweetened with non-caloric sweeteners.

Not many studies have compared sucrose with artificial sweeteners after longer-term consumption. One earlier cross-over study looked at the effect of an intake of 45 g sucrose (9 E%) compared with an equivalent sweetening amount of aspartame for 6 weeks in 9 subjects with NIDDM (41). Here no effect of the added sucrose was observed with regard to fasting triglycerides, total or HDL-cholesterol, glucose and HbA1c, 2-hour postprandial glycaemia, and insulinemia or insulin sensitivity as

measured by the euglycemic clamp. The lack of differences in that study could, however, be due to the fairly small sucrose challenge compared with both our study (27 E%) and the recent study by Stanhope et al. (16), where fructose amounted to 25 E%.

We found both increased fasting and postprandial leptin concentrations in the sucrose compared with the sweetener group after 10 weeks' intervention. The differences in fasting values disappeared, however, after adjusting for changes in body weight. This would correspond to the fact that a higher leptin concentration is an indicator of higher fat deposits. Overall, however, diurnal leptin concentrations were about twice as high on the sucrose-rich diet compared with the sweetener diet. This could be due to the prolonged increase in insulin concentration, since hyperinsulinemia has been found to stimulate leptin release (42). We have previously observed increased postprandial leptin levels after only 14 days' ad libitum sucrose-rich versus starch-rich diet in normal weight subjects. This finding was also explained by greater postprandial insulin peaks on the sucrose-rich diet (43).

In conclusion, a sucrose-rich diet consumed for 10 weeks resulted in significant elevations of postprandial glycaemia, insulinemia, and lipidemia compared to a diet rich in artificial sweeteners in slightly overweight healthy subjects. However, more studies and of longer duration are needed to substantiate these findings.

Conflict of interest and funding

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AR was responsible for the study protocol. THV, ACM, and AR were responsible for conducting the trial and for data collection. JJH was responsible for analyses of blood parameters. BKM was responsible for the data analysis and drafted the first script with supervision from AFL, AA, and AR. All authors contributed to the interpretation of the results and the final version of the manuscript.

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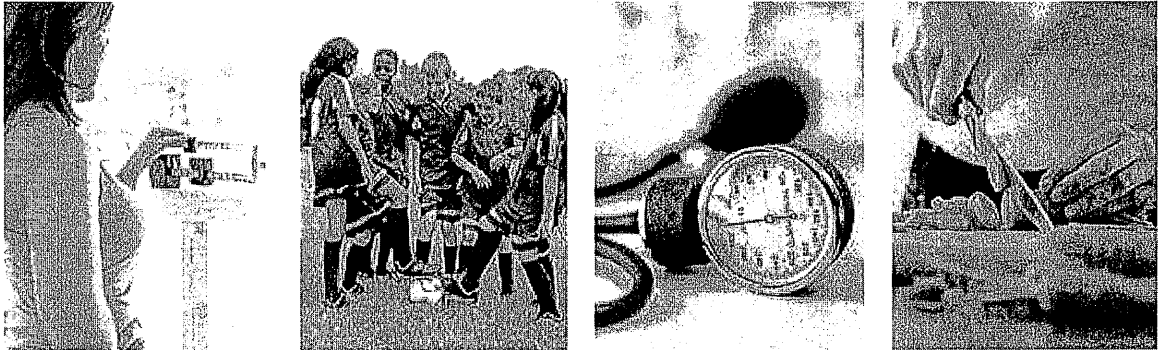
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***Anne Raben**

Department of Human Nutrition
Faculty of LIFE sciences,
University of Copenhagen
Rolighedsvej 30
1958 Frederiksberg C
Denmark
Email: ara@kvl.dk

Exhibit 7

McKinsey Global Institute



November 2014

Overcoming obesity: An initial economic analysis

Discussion paper

The McKinsey Global Institute

The McKinsey Global Institute (MGI), the business and economics research arm of McKinsey & Company, was established in 1990 to develop a deeper understanding of the evolving global economy. Our goal is to provide leaders in the commercial, public, and social sectors with the facts and insights on which to base management and policy decisions.

MGI research combines the disciplines of economics and management, employing the analytical tools of economics with the insights of business leaders. Our "micro-to-macro" methodology examines microeconomic industry trends to better understand the broad macroeconomic forces affecting business strategy and public policy. MGI's indepth reports have covered more than 20 countries and 30 industries. Current research focuses on six themes: productivity and growth; natural resources; labor markets; the evolution of global financial markets; the economic impact of technology and innovation; and urbanization. Recent reports have assessed job creation, resource productivity, cities of the future, the economic impact of the Internet, and the future of manufacturing.

MGI is led by McKinsey & Company directors Richard Dobbs, James Manyika, and Jonathan Woetzel. Michael Chui, Susan Lund, and Jaana Remes serve as MGI partners. Project teams are led by a group of senior fellows and include consultants from McKinsey & Company's offices around the world. These teams draw on McKinsey & Company's global network of partners and industry and management experts. In addition, leading economists, including Nobel laureates, act as research advisers.

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McKinsey Global Institute

November 2014

Overcoming obesity: An initial economic analysis

Discussion paper

Richard Dobbs
Corinne Sawers
Fraser Thompson
James Manyika
Jonathan Woetzel
Peter Child
Sorcha McKenna
Angela Spatharou



Preface

The world has made huge advances in containing infectious diseases, but that progress is being partially offset by a sharp rise in the incidence of heart and lung disease, diabetes, lifestyle-related cancers, and other non-communicable diseases. One of the major drivers of the increase in these diseases is the rising prevalence of obesity.

Obesity is a complex, systemic, multi-causal problem, rooted in the sedentary nature of modern post-industrial life, more widely available and more affordable food, a change in the nature and mix of diets, psychological stimuli such as stress and epigenetic triggers, and potentially even physiological disruption to the gut microbiome. There is considerable ongoing academic research into the scale and causes of the rapidly rising obesity epidemic. Researchers are digging deep into specific questions and analyzing potential solutions. However, there is a lack of integrated analysis of the holistic program that would be needed to reverse rising obesity, and what it would take to start to deliver such a program.

This discussion paper seeks to start to close this gap. We set out to learn as much as possible from existing research and build on it with our own understanding of micro- and behavioral economics, and McKinsey's experience and research across sectors, including consumer-facing, public, and health-care sectors. Our aim then has been to step back and attempt to develop a perspective on what might be the building blocks of a societal response that could overcome rising obesity. As with all MGI research, this has not been funded by any company, government, or external organization but by the partners of McKinsey.

In this discussion paper, the McKinsey Global Institute has cataloged a comprehensive list of interventions that are being used or piloted somewhere in the world by central and local governments, employers, schools, health-care systems, food retailers, manufacturers, and foodservice providers. We have identified 74 interventions and

developed an initial assessment of their cost-effectiveness and the potential scale of their impact if they were applied at a national level. As a start, we have tested this for the United Kingdom, an example of a developed economy in which the prevalence of obesity is rising. In doing this, we have relied on the evidence of the impact of these interventions when applied somewhere in the world. We have not independently verified the analysis of each intervention or the third-party research, an important caveat that we return to in this paper's discussion of the quality of the evidence in this complex area.

We explore the key questions about what action is going to be required to abate obesity, and we discuss some of the major barriers to that action for different sectors of society. We identify priority intervention areas that could form part of an effective response to turn the obesity trajectory, and we suggest approaches that could help to get that program off the ground. We have a particular focus on behavioral interventions that can improve nutrition and physical activity. We do not directly address clinical questions such as the role of different nutrients or genetics, leaving those to the scientists. Moreover, because this research focuses on obesity, we capture only the health benefits delivered by physical activity and other interventions that change body mass index (BMI). However, we acknowledge that BMI changes give only a partial picture of the full health benefits of physical activity.

Almost everyone reading this discussion paper will disagree with some parts of it, partly because of the polarized nature of the debate on obesity but arguably more because obesity is a complex, systemic issue with no simple solution. This means that analysis on the potential impact of an intervention is valid from some perspectives, but limited from others. We regard this discussion paper as an initial contribution and thought-starter on what it is likely to take to address rising obesity. Our hope is that this analysis will be built on in the future as the collective knowledge base, and therefore the ability to respond to this crisis, is expanded.

This analysis was led by Richard Dobbs, a McKinsey and MGI director based in London; Peter Child, a McKinsey director based in London specializing in consumer goods; Sorcha McKenna, a McKinsey partner in Dublin specializing in consumer goods and health care; Robin Nuttall, a partner in McKinsey's Strategy Practice in London; James Manyika, a McKinsey and MGI director based in San Francisco; Angela Spatharou, a McKinsey partner specializing in health care in Mexico City; Fraser Thompson, a MGI senior fellow based in Singapore; and Jonathan Woetzel, a McKinsey and MGI director based in Shanghai. Corinne Sawers, a McKinsey consultant in London, led the project team, which comprised Simon Alfano, Alexia Cesar, Kate Forster, Sumeet Jha, Sakshi Mor, Ainhoa Manterola Solans, and Alison Underwood.

We would like to thank the panel of academic advisers to this discussion paper, whose diversity of expertise reflects the multifaceted nature of the issue, and who have provided invaluable advice, guidance, and pressure test: Dr. William H. Dietz, director, Strategies to Overcome and Prevent Obesity Alliance, Milken Institute School of Public Health, George Washington University; Kevin D. Hall, senior investigator, Laboratory of Biological Modeling, Integrative Physiology Section, National Institute of Diabetes and Digestive and Kidney Diseases; Philip James, president of the International Association for the Study of Obesity and projects director of the World Public Health Nutrition Association; Susan Jebb, professor of diet and population health, University of Oxford; Tim Lobstein, director of policy and programmes, International Association for the Study of Obesity; Professor David Russell-Jones, consultant endocrinologist; Boyd Swinburn, Alfred Deakin Professor of Population Health and director of the World Health Organization Collaborating Centre for Obesity Prevention at Deakin University in Melbourne; and Lennert Veerman, senior research fellow in the School of Population Health, University of Queensland.

Among the many other people whose input was so vital for this paper are Tatiana Andreyeva, Rudd Centre for Food Policy and Obesity, Yale University; Jan Barendregt, associate professor in epidemiological modeling, School of Population Health, University of Queensland; Tom Blake, Sprout Wellness Solutions; Bryan Bollinger, New York University School of Business; Sir Peter Bottomley, UK member of Parliament for

Worthing West; Baroness Virginia Bottomley, Nettlestone; Karen Campbell, Deakin University; Frank Chaloupka, University of Illinois at Chicago; Michel Chauliac, Ministry of Health and Sport, France; Rachel Craig, Health Survey for England, United Kingdom; Steven Cummins, London School of Hygiene and Tropical Medicine; Antoine de Saint-Affrique, Unilever; Ravi Dhar, Yale School of Management; Peter Dolan, ChildObesity180; Dustin Duncan, New York University Langone Medical Center; Brian Elbel, New York University Langone Medical Center; Charlotte Evans, University of Leeds; Peter Freedman, managing director, The Consumer Goods Forum; Simone French, University of Minnesota; Alan Garber, Harvard University; Fiona Geaney, University College Cork; Moria Golan, Hebrew University of Jerusalem; David Halpern, UK Government Behavioural Insights Team; Lisa Harnack, University of Minnesota; Corinna Hawkes, World Cancer Research Fund; Katy Hunter, Transport for London; Stephen Jan, University of Sydney Medical School; Martyn Jones, Morrisons; David Just, Cornell University Center for Behavioral Economics; Scott Kahan, Johns Hopkins and George Washington universities; Ariane Kehlbacher, University of Reading; David Lee, Department for Environment, Food, and Rural Affairs, United Kingdom; George Loewenstein, Carnegie Mellon University and London School of Economics; Carlos Monteiro, University of São Paulo; Mike Rayner, Nuffield Department of Population Health, University of Oxford; Christina Roberto, Harvard School of Public Health; Kim Roberts, HENRY; Tom Robinson, Stanford University School of Medicine; Barbara Rolls, Pennsylvania State University; Mary Rudolf, Bar Ilan Medical School, Tzfat; Harry Rutter, London School of Hygiene and Tropical Medicine; Rick Sadler, University of Western Ontario, Canada; Jim Sallis, University of California, San Diego; Lucy Saunders, Greater London Authority; Andrew Scaife, Department for Environment, Food and Rural Affairs, United Kingdom; Peter Scarborough, Nuffield Department of Population Health, University of Oxford; Marlene Schwartz, Rudd Centre for Food Policy and Obesity, Yale University; David Scott, Morrisons; Sinne Smed, University of Copenhagen; Peter Speyer, Institute for Health Metrics and Evaluation; Christiane Stock, University of Southern Denmark; Claire Tardy, Euromonitor; Richard Tiffin, University of Reading; Helen Walters, Greater London Authority; and Y. Claire Wang, Columbia University.

We also wish to thank academic advisers to MGI, namely Martin Baily, senior fellow in the Economic Studies Program and Bernard L. Schwartz Chair in Economic Policy Development at the Brookings Institution; Richard Cooper, Maurits C. Boas Professor of International Economics at Harvard University; and Nobel laureate Michael Spence, William R. Berkley Professor in Economics and Business at New York University.

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We are grateful for all of the input we have received, but the final discussion paper is ours and any errors are our own. This paper contributes to MGI's mission to help business and policy leaders understand the forces transforming the global economy, identify strategic locations, and prepare for the next wave of growth. As with all MGI research, this work is independent and has not been commissioned or sponsored in any way by any business, government, or other institution, although it has benefited from the input and collaborations that we have mentioned. We welcome your emailed comments on the research at obesity@mckinsey.com.

Richard Dobbs

Director, McKinsey Global Institute
London

James Manyika

Director, McKinsey Global Institute
San Francisco

Jonathan Woetzel

Director, McKinsey Global Institute
Shanghai

November 2014



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IN BRIEF

Overcoming obesity: An initial economic analysis

Obesity is now a critical global issue, requiring a comprehensive intervention strategy rolled out at scale. More than 2.1 billion people—nearly 30 percent of the global population—are overweight or obese. That's nearly two and a half times the number who are undernourished. Obesity, which should be preventable, is now responsible for about 5 percent of all deaths worldwide. If its prevalence continues on its current trajectory, almost half of the world's adult population will be overweight or obese by 2030. This preliminary paper aims to start a global discussion on the components of a successful societal response. Among our main findings are:

- Based on existing evidence, any single intervention is likely to have only a small overall impact on its own. A systemic, sustained portfolio of initiatives, delivered at scale, is needed to address the health burden. Almost all the identified interventions are cost-effective for society—savings on health-care costs and higher productivity could outweigh the direct investment required to deliver the intervention when assessed over the full lifetime of target population. In the United Kingdom, such a program could reverse rising obesity, saving about \$1.2 billion a year for the National Health Service (NHS).
- Education and personal responsibility are critical elements of any program to reduce obesity, but not sufficient on their own. Additional interventions are needed that rely less on conscious choices by individuals and more on changes to the environment and societal norms. Such interventions “reset the defaults” to make healthy behaviors easier. They include reducing default portion sizes, changing marketing practices, and restructuring urban and education environments to facilitate physical activity.
- No individual sectors in society, whether they are governments, retailers, consumer-goods companies, restaurants, employers, media organizations, educators, health-care providers, or individuals, can address obesity on their own. Capturing the full potential impact requires engagement from as many sectors as possible. Successful precedents suggest that a combination of top-down corporate and government interventions with bottom-up community-led ones is required to change public-health outcomes. Moreover, some kind of coordination is likely to be required to capture potentially high-impact industry interventions, given that there are market share risks facing any first mover.
- Implementing an obesity abatement program at the required scale will not be easy. We see three important elements to consider: (1) deploy as many interventions as possible at scale and delivered effectively by the full range of sectors in society; (2) understand how to align incentives and build cooperation; and (3) do not focus unduly on prioritizing interventions because this can hamper constructive action.
- The evidence base on the clinical and behavioral interventions to reduce obesity is far from complete, and ongoing investment in research is imperative. However, in many cases this is proving a barrier to action. It need not be so. We should experiment with solutions and try them out rather than waiting for perfect proof of what works, especially in the many areas where interventions are low risk. We have enough knowledge to be taking more action than we currently are.

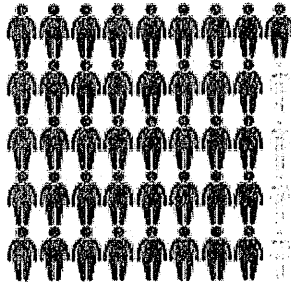
MGI has initially assessed the elements of a potential program for the United Kingdom, but we believe our findings are broadly applicable around the world. This discussion paper is intended as an initial contribution and thought starter on what it is likely to take to address rising obesity. Our hope is that this analysis will be built on in the future as the collective knowledge base, and therefore the ability to respond to this crisis, is expanded.

Addressing rising global obesity...

(5% of all deaths each year)

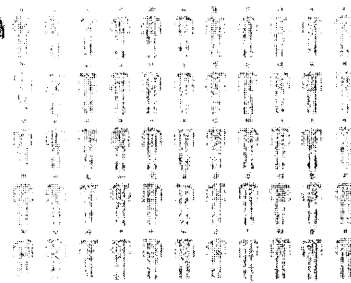
Today:

30%¹

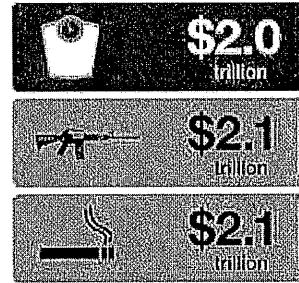


In 2030:

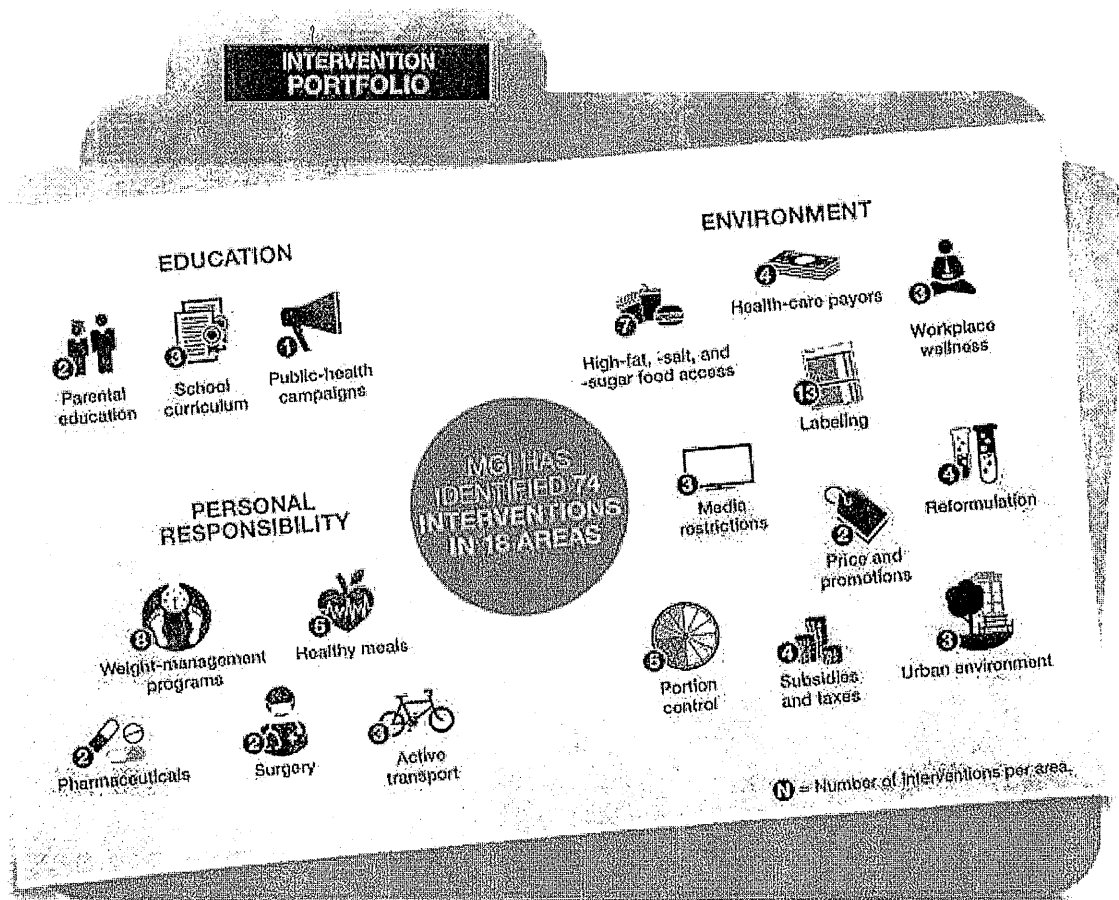
41%²



Obesity has roughly the same economic impact as smoking or armed conflict



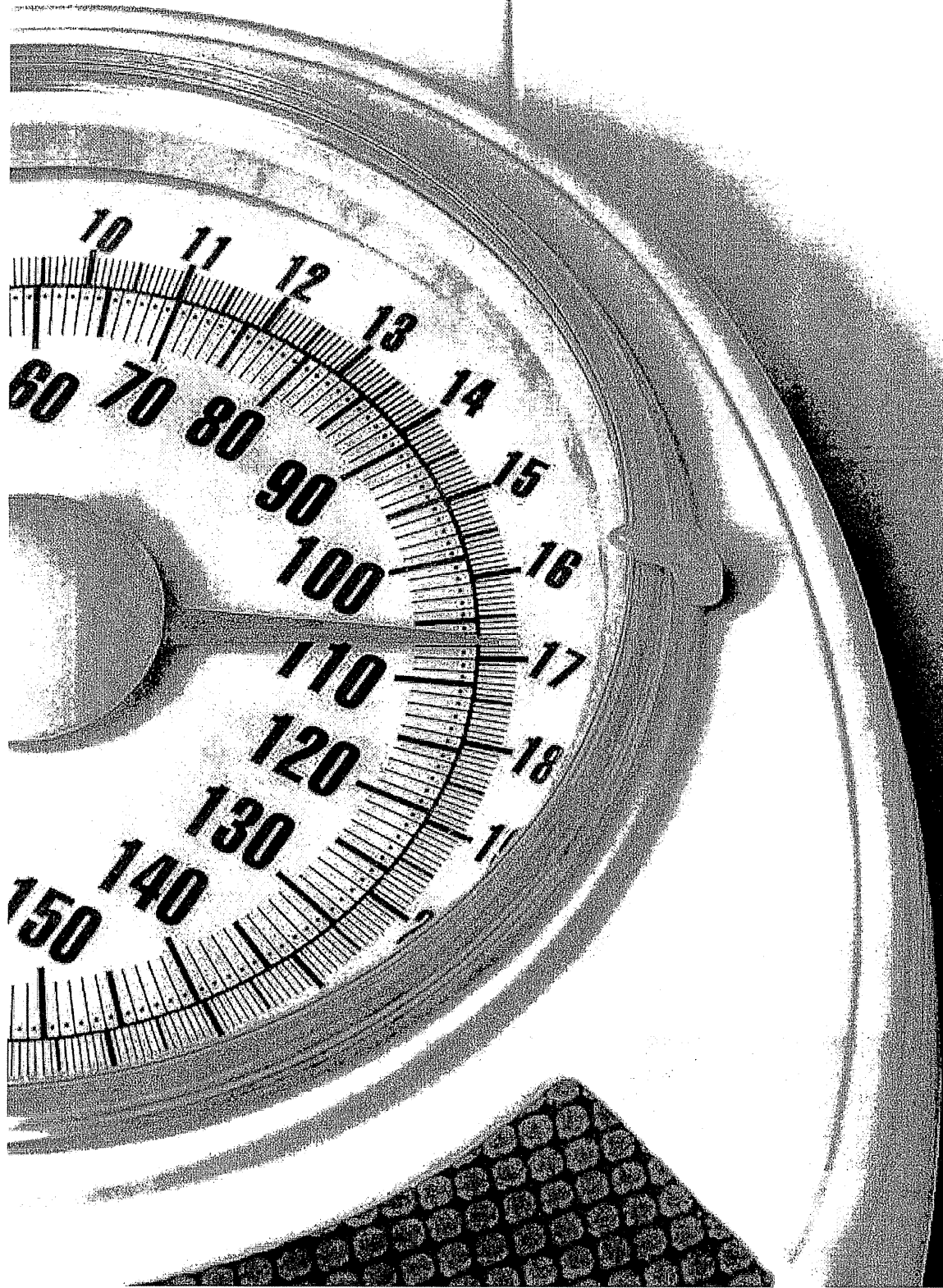
...will require a sustained portfolio of interventions delivered by a range of different sectors.



UK case study findings:

- 44 interventions bring 20% of overweight/obese Britons back to a normal weight.
- A range of sectors are required to deliver impact.
- All interventions are cost-effective for society.
- A portfolio of interventions could deliver £26bn benefit.

¹ combines prevalence of obese and overweight; ² based on regional historical trends; combines prevalence of obese and overweight



Executive summary

Almost everyone reading this discussion paper will disagree with some parts of it. That is because much of the global debate on obesity has become polarized and sometimes deeply antagonistic. But, even more importantly, disagreement about the way forward reflects the fact that obesity is a complex, systemic issue with no single or simple solution, and the fact that there is currently a lack of integrated assessments of those potential solutions. All of this is getting in the way of addressing rising obesity. This research tries to overcome hurdles by offering an independent view on the components of a potential strategy.

A strategy of sufficient scale is needed as obesity is now reaching crisis proportions. More than 2.1 billion people—close to 30 percent of the global population—today are overweight or obese.¹ That's nearly an estimated two and a half times the number of people in the world—adults and children—who are undernourished. And the obesity problem is getting worse, and rapidly. If the growth rate in the prevalence of obesity continues on its current trajectory, almost half of the world's adult population is projected to be overweight or obese by 2030.

This has huge personal, social, and economic costs. Obesity is responsible for around 5 percent of all global deaths.² The global economic impact from obesity is roughly \$2.0 trillion, or 2.8 percent of global GDP, roughly equivalent to the global impact from smoking or armed violence, war, and terrorism (Exhibit E1).

The toll of obesity on health-care systems alone is between 2 and 7 percent of all health-care spending in developed economies. That does not include the large cost of treating associated diseases, which takes the health-care cost toll up to 20 percent by some estimates. There is growing evidence, too, that the productivity of employees is being undermined by obesity, compromising the competitiveness of companies.

There has been a plethora of research projects on the scale of the problem and on individual interventions designed to address obesity. However, to date, there has been limited systematic cataloguing of possible interventions, or analysis of their relative cost-effectiveness and potential impact. Perhaps most importantly, there is a need for more holistic assessments of what an integrated strategy for overcoming obesity would look like. Our research draws on analysis of the impact of existing interventions, along with discussions with policy advisers, population-health academics, and industry representatives, to begin filling that gap. In developing the research, we have received thoughtful input from academics, policy makers, and businesses from many sectors.

1 Under World Health Organization standards, overweight is defined as having a body mass index over 25. Obese is defined as having a body mass index over 30. Body mass index is mass divided by height squared.

2 The World Health Organization estimates that 2.8 million global deaths a year are attributable to high BMI on a base of 59 million total global deaths per year.

Exhibit E1**Obesity is one of the top three global social burdens generated by human beings**

Estimated annual global direct economic impact and investment to mitigate selected global burdens, 2012¹
GDP, \$ trillion

Selected global social burdens		Share of global GDP %	Historical trend ²
Smoking	2.1	2.9	▲
Armed violence, war, and terrorism ³	2.1	2.8	▲
Obesity	2.0	2.8	▲
Alcoholism	1.4	2.0	▶
Illiteracy ⁴	1.3	1.7	▼
Climate change	1.0	1.3	▲
Outdoor air pollution	0.9	1.3	▶
Drug use ⁵	0.7	1.0	▲
Road accidents	0.7	1.0	▲
Workplace risks	0.4	0.6	▲
Household air pollution	0.4	0.5	▲
Child and maternal undernutrition	0.3	0.5	▼
Unsafe sex ⁶	0.3	0.4	▶
Poor water and sanitation ⁷	0.1	0.1	▼

1 Based on 2010 disability-adjusted life years (DALY) data from the Global Burden of Disease database and 2012 economic indicators from the World Bank; excluding associated revenue or taxes; including lost productivity due to disability and death, direct cost, e.g., for health care, and direct investment to mitigate; GDP data on purchasing power parity basis.

2 Based on historical development between 1990 and 2010 of total global DALYs lost (Global Burden of Disease).

3 Includes military budget.

4 Includes functional illiteracy.

5 Includes associated crime and imprisonment.

6 Includes sexually transmitted diseases. Excludes unwanted pregnancies.

7 Excludes lost time to access clean water source.

SOURCE: Literature review; World Health Organization Global Burden of Disease database; McKinsey Global Institute analysis

The McKinsey Global Institute (MGI) has studied 74 interventions to address obesity in 18 areas that are being discussed or piloted somewhere around the world (see Table E1 at the end of this executive summary). We conducted a meta-analysis of research available. Of the 74 interventions, we were able to gather sufficient evidence to estimate what might be the potential cost and impact of 44 interventions. On the basis of this analysis, we have developed a perspective on what it might take to start to reverse rising obesity prevalence in a developed market.

As a starting point for our research on this issue, we have assessed what might be needed in a potential program for the United Kingdom. In the near future, as part of ongoing research on this topic, we intend to present similar analyses for emerging markets, potentially starting with China and Mexico. We expect the potential scale and impact of the interventions to look different in emerging markets than in the United Kingdom. However, we expect our findings to be broadly applicable around the world.

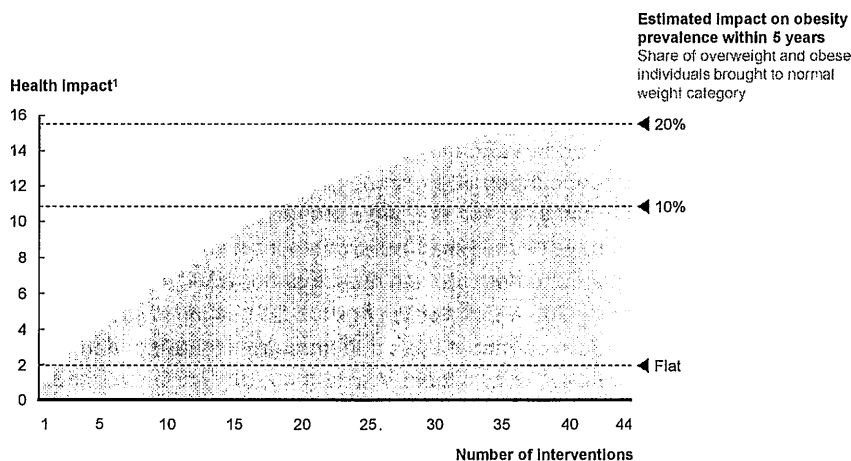
We must stress that our analysis is by no means complete. We see our work on a potential program to address obesity as the equivalent of the 16th-century maps used by navigators. On those maps, some islands were missing and some continents were misshapen, but they were still helpful to the sailors of that era. We are sure that we have missed some interventions and have over- or underestimated the impact of others. But we hope that our work, like 16th-century maps, is a useful guide and a starting point to be built on in years to come as we and others develop this analysis and gradually compile a more comprehensive evidence base on this topic. We have focused on understanding what it takes to address obesity by changing individuals' energy balance through adjustments in consumption or physical activity. However, we have not addressed some important questions that require considerable further research. These questions include the role of different nutrients in affecting satiety hormones and metabolism, and antibiotic disruption of the gut microbiome. As more clarity develops on these research areas, it is to be hoped that important insights about which interventions are likely to work and how to integrate them into a program to tackle obesity will emerge.

Some of our initial findings are:

- **No single solution creates sufficient impact to reverse obesity: only a comprehensive, systemic program of multiple interventions is likely to be effective.** Our analysis suggests that any single intervention is likely to have only a small impact at the aggregate level. Our research suggests that an ambitious, comprehensive, and sustained portfolio of initiatives by national and local governments, retailers, consumer-goods companies, restaurants, employers, media organizations, educators, health-care providers, and individuals is likely to be necessary to support broad behavioral change. These levers must address different population segments and deploy different mechanisms for impact. If the United Kingdom were to deploy all the interventions that we have been able to size at reasonable scale, the research finds that it could reverse rising obesity and bring about 20 percent of overweight and obese individuals—or roughly the population of Austria—back into the normal weight category within five to ten years (Exhibit E2). This would have an estimated economic benefit of around \$25 billion a year, including a saving of about \$1.2 billion a year for the UK NHS.

Exhibit E2

MGI quantified the maximum potential of 60 percent of the interventions identified, which together could bring 20 percent of overweight and obese individuals into a normal weight category



¹ Impact is captured as million DALYs saved over full lifetime of 2014 UK population, taking into account health benefits accrued later in life.

SOURCE: Literature review; expert interviews; McKinsey Global Institute analysis

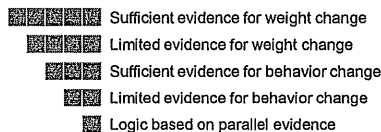
- **Almost all of the interventions we analyzed are highly cost-effective from the viewpoint of society.** “Cost-effective from the viewpoint of society” means that the health-care costs and productivity savings that accrue from reducing obesity outweigh the direct investment required to deliver the intervention when assessed over the full lifetime of the target population (Exhibit E3).³ Our analysis does not demonstrate the financial cost-benefit profile of the interventions to a specific entity such as a school, an employer, a retailer, or a food manufacturer. Nonetheless, in terms of the financial “bang for buck” that comes from delivering a positive impact on health, all interventions are attractive.
- **Education and encouraging personal responsibility are necessary but not sufficient—restructuring the context that shapes physical activity and nutritional behavior is a vital part of any obesity program.** Education and personal responsibility are critical elements of any program to reduce obesity, but they are not enough on their own. Our research suggests that additional interventions need to be in the mix that rely less on conscious choices by individuals and individual responsibility and more on changes to the environment and societal norms. These interventions reset the default and make healthy behavior easier and more normal, thereby relying less on individual willpower. Examples include reducing portion sizes of packaged foods and fast food, changing marketing practices, and changing physical activity curricula in schools. Such interventions rely less on individual willpower to go against the grain, making healthy lifestyles easier to achieve.

³ We assess cost-effectiveness based on World Health Organization definitions: investing less than one times per capita GDP to save a disability-adjusted life year (DALY) is highly cost-effective, investing one to three times per capita GDP is cost-effective, and more than three times per capita GDP is not cost-effective.

Exhibit E3

There is considerable scope to have high impact on obesity in a cost-effective way

Cost-effectiveness and impact of obesity levers, United Kingdom



Intervention group ¹	Estimated impact across full population Thousand DALYs saved	Estimated average cost per DALY ² \$ per DALY saved	Strength of evidence rating ³
Portion control	2,126	400	Sufficient evidence for weight change
Reformulation	1,709	2,600	Limited evidence for weight change
High calorie food/beverage availability	1,137	200	Sufficient evidence for behavior change
Weight-management programs	967	1,300	Sufficient evidence for behavior change
Parental education	962	2,000	Limited evidence for behavior change
School curriculum	888	600	Limited evidence for behavior change
Healthy meals	868	14,000	Logic based on parallel evidence
Surgery	615	10,000	Sufficient evidence for behavior change
Labeling	575	2,000	Limited evidence for behavior change
Price promotions	561	200	Logic based on parallel evidence
Pharmaceuticals	430	5,600	Sufficient evidence for behavior change
Media restrictions	401	50	Limited evidence for behavior change
10% tax on high-sugar/high-fat products ⁴	203	1,800	Logic based on parallel evidence
Workplace wellness	139	2,700	Sufficient evidence for behavior change
Active transport ⁵	67	31,000	Logic based on parallel evidence
Public-health campaigns	49	200	Logic based on parallel evidence

1 Includes only non-overlapping levers in each category. Where two levers overlapped, such as plain and engaging labeling or gastric banding and bariatric surgery, the higher-impact lever was chosen.
 2 Impact and cost over lifetime of 2014 population; uses UK-specific cost-effectiveness calculated using GDP and World Health Organization methodology.
 3 Based on the evidence rating system of the Oxford Centre for Evidence-Based Medicine.
 4 All intervention impact modeling was subject to scalable assumptions on potential reach. Tax levers are also subject to scalability of levy incurred. In this case, MGI modeled a 10 percent tax on a set of high-sugar and high-fat food categories, based on empirical precedents and size of levy often studied. It is scalable, and impact would increase close to directly with increase in levy.
 5 Impact assessed here is only from reduced body mass index (BMI), not full health benefits of some interventions (e.g., cardiovascular health, mental health). For example, active transport health benefits are higher when all of these benefits are taken into account.
 NOTE: We do not include health-care payors because this is a less relevant intervention in the United Kingdom context. There are insufficient data to quantify urban-environment interventions.
 SOURCE: Literature review; expert interviews; McKinsey Global Institute analysis

- **Capturing the full potential impact is likely to require commitment from government, employers, educators, retailers, restaurants, and food and beverage manufacturers, and a combination of top-down corporate and government interventions and bottom-up community-based ones.** Our obesity abatement analysis and empirical examples of successful packages of interventions suggest that improvements in public health only result from a comprehensive package of interventions delivered by a wide range of societal sectors including a critical “community-owned” element. Delivering such a package requires engagement from all relevant societal sectors. Moreover, some kind of coordination is likely to be required to capture potentially high-impact industry interventions. Any single company that opts for a particular intervention unilaterally runs the risk of harming its competitive position; unanimous action avoids that risk. In some cases, however, coordination among industry players may be illegal under antitrust constraints. New forms

of cross-industry collaboration and support from government have the best chance of overcoming these challenges.

Implementing an obesity abatement program of the scale required will not be easy. A challenge of this magnitude requires an ambitious set of solutions—and the diffuse range of the many sectors of society relevant to this issue makes it even harder to achieve progress. We need to improve our ability to motivate action across such a diverse set of sectors. We believe that research and trial and error in how to deliver a cross-societal response is as important as research in the specific intervention areas discussed in this paper. We see four imperatives if progress is to be made:

- 1. As many interventions as possible must be delivered to have significant impact.** A holistic approach by the public, private, and third sectors is the best way forward. A program that succeeds in reversing obesity prevalence is likely to require as many interventions as possible to be deployed at scale and with high-quality delivery, our research finds. Deploying a comprehensive set of interventions would need the full set of societal sectors we have identified—local and national government, health-care payors and providers, schools, employers, food and beverage manufacturers, retailers, restaurants, and food-service providers—to play a role. Coordination will be crucial. Today, government efforts to tackle the obesity issue seem too fragmented to be effective. In the United Kingdom, 15 central government departments; all local authorities with responsibility for health, education, and local planning; 16 EU directorates-general; and a wide range of nongovernmental organizations all have a significant impact on the major intervention areas that we have identified.
- 2. Understanding how to align incentives and build cooperation is critical to success.** Some attempts to overcome obesity failed because they did not align with the incentives of the required participants. An example of this was the attempt by Michael Bloomberg to ban supersize beverages when he was mayor of New York. This change was blocked in the courts after extensive lobbying and legal action by the soft drink and retail industries. Other initiatives such as EPODE, which originated in France, and the Healthy Weight Commitment Foundation in the United States are leading the way in delivering integrated responses to the issue. If society is to succeed in tackling obesity, it will be necessary to find ways to build on such initiatives, to overcome misaligned incentives, and to coordinate action across a diverse set of societal sectors. The same is true of many of the public-health and environmental challenges facing us in the 21st century. In the case of regulation to reduce the incidence of smoking, it was not possible to align incentives; in the case of obesity, we believe that it might be possible.
- 3. Government, health-care systems, and private and social-sector organizations and entities should not focus overly on prioritizing interventions because this could hamper constructive action.** As we have said, only a holistic, broad, and multipronged approach can be successful in reversing the obesity crisis. Interventions in the hands of all relevant societal sectors need to be deployed. Prioritization based on potential impact, cost-effectiveness, and feasibility is always important when making investment decisions. However, in the case of obesity, focusing unduly on priority interventions could be unhelpful given the need for a holistic response. A

search for the “best” interventions or a single solution could delay action and displace responsibility. Given the seriousness of the obesity issue, the aim should be to do as much as possible as soon as possible.

- 4. While investment in research should continue, society should also engage in trial and error.** Given the scale of the obesity crisis and its economic impact, investment in research, innovation, and experimentation is relatively low. For instance, the United Kingdom invests less than \$1 billion a year in prevention activities such as weight-management programs and public-health campaigns. To put that in perspective, that is only about 1 percent of the social cost of obesity in the United Kingdom. More investment is required, especially in understanding the effectiveness of intervention measures when they are applied as part of a comprehensive program. But society should also be prepared to experiment with possible interventions. In many intervention areas, impact data from high-quality, randomized control trials are not possible to gather. So, rather than waiting for such data, the relevant sectors of society should be pragmatic with a bias toward action, especially where the risks of intervening are low, using trial and error to flesh out their understanding of potential solutions.

□ □ □

The science on obesity and research into how to reverse this growing health burden is by no means complete. Society needs to know more about this complex systemic issue and its causes in order to mount a genuine, sustained, and aggressive challenge. This discussion paper is just a start. We intend to continue to try to capture an even greater range of interventions and update our data with the latest efforts on the ground and research as it is completed. Moreover, we hope that this analysis will help prompt further debate, and most critically, further action.

We reiterate, this analysis is just a 16th-century map, and it will benefit from continued input, research, and debate. We invite contributions to our ongoing research. In particular, we would like to hear about other possible interventions, better and updated data on the impact of interventions, and further insights about overcoming the major barriers to delivering high impact in a large-scale, integrated response. We also welcome challenge and input on our analysis and approach. Please send any comments to obesity@mckinsey.com.

In Chapter 1 of this discussion paper, we survey current worldwide trends in obesity and the diseases linked to it, such as type 2 diabetes. In Chapter 2, we discuss 18 groups of obesity interventions, under which we have classified 44 selected interventions, and introduce our obesity abatement cost-effectiveness analysis and some of its major findings. Finally, in Chapter 3, we review some of the elements of how society might mount a response to obesity, and what it is going to take to deliver it.

Table E1
74 interventions across 18 groups

Highlighted interventions were assessed for potential scaled impact and cost-effectiveness. Those not assessed either did not have sufficient quality data or were not relevant in the context of the United Kingdom (our pilot geography for this analysis)

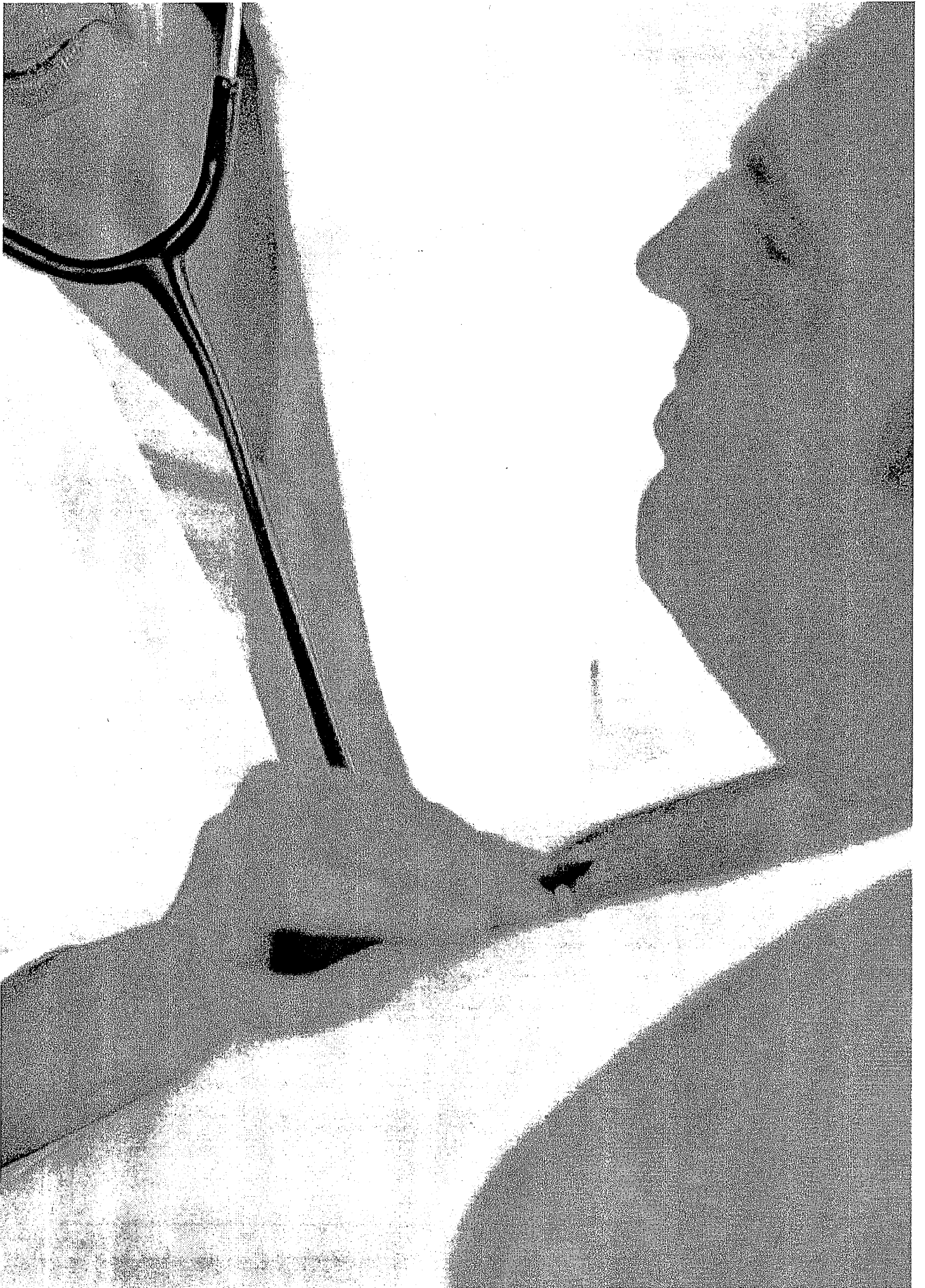
1 Active transport	Urban redesign: walking	Government authorities redesign urban planning to facilitate and encourage walking
	Urban redesign: cycling	Government authorities redesign urban planning to facilitate and encourage cycling
	Disincentivize driving	Government authorities redesign tariffs, pedestrianization, and parking laws, and improve the quality of public transport
2 Health-care payors	Payor material incentive: general	Health-care payors provide material incentives for better health outcomes such as reduced payments
	Payor material incentive: facilitative	Health-care payors provide material incentives that facilitate healthy behavior (e.g., free gym membership or subsidized healthy food)
	Payor personal tracking and measurement support	Health-care payors provide personal tracking and measurement technical support for healthy behavior and improved health outcomes
	Parental diet and exercise education	Health-care payors provide parental education
3 Healthy meals	Free compulsory school meals for all	Government provides free compulsory school meals and improves health quality
	Subsidized compulsory school meals for all	Government subsidizes compulsory school meals and improves health quality
	Free healthy meals in the workplace	Employers provide free healthy meals
	Supermarket targeted promotions	Grocery retailers promote healthy eating through campaigns and recipes
	Lower-calorie options in the workplace	Employers introduce healthy options in canteens but do not remove existing options
4 High-calorie food and drink availability	Supermarket layout: space	Grocery retailers allocate greater share of space to healthier products and categories
	Supermarket layout: prominence	Grocery retailers allocate greater prominence (aisle ends, checkout counters, store entry) to healthier products
	Reduced access to high-calorie food in schools: regulated	Government bans vending machines and snack shops in schools
	Reduced access to high-calorie food in schools: self-regulated	Schools voluntarily ban vending machines and snack shops
	Reduced access to high-calorie food in the workplace	Employers remove vending machines and easy access to high-calorie foods
	School canteen layout	Schools place healthier canteen areas (e.g., vegetables, fruit, and salad) more prominently
	Workplace canteen layout	Employers place healthier canteen areas (e.g., vegetables, fruit, and salad) more prominently
5 Labeling	Calorie/nutrition "plain" labeling on package: regulated	Government mandates nutritional labeling on all packaged foods
	Calorie/nutrition "plain" labeling on package: self-regulated	Industry self-regulates nutritional labeling on all packaged foods
	Calorie/nutrition "engaging" labeling on package: regulated	Government mandates front-of-pack "engaging" format nutritional information (e.g., traffic-light labels) on all packaged foods
	Calorie/nutrition "engaging" labeling on package: self-regulated	Industry self-regulates front-of-pack and "engaging" format nutritional information (e.g., traffic-light labels) on all packaged foods
	Portion-size "engaging" labeling on package: regulated	Government mandates "engaging" portions information on each package in a clearly communicated way
	Portion-size "engaging" labeling on package: self-regulated	Industry self-regulates "engaging" portions information on the front of the package in a clearly communicated way
	Nutrition labeling in restaurants: regulated	Government mandates labeling on menus and shelf choices in fast-food restaurants
	Nutrition labeling in restaurants: self-regulated	Fast-food restaurants label menus and make shelf choices
	Nutrition "plain" labeling: workplace	Employers provide workplace canteen nutritional labeling
	Nutrition "engaging" labeling: workplace	Employers provide "engaging" workplace canteen nutritional labeling (e.g., traffic-light labels)
	Aggregate meal calorie labeling: workplace	Employers provide aggregated nutritional content and traffic-light labels at checkout
	Aggregate meal calorie labeling: restaurants	Fast-food restaurants provide aggregated nutritional content and traffic-light labels at checkout
Aggregate basket calorie labeling: retailers	Retailers provide traffic-light rating of basket contents at checkout	
6 Media restrictions	Media restriction on high-calorie food advertising on all supports: regulated	Government restricts advertising of high-calorie foods on all advertising supports
	Media restriction on high-calorie advertising on TV: regulated	Government restricts advertising of high-calorie foods on TV from 6 a.m. to 9 p.m.
	Media restriction: self-regulated	Food and beverage industry voluntary restricts high-calorie food advertising (e.g., to children)
7 Parental education	Parental education: pre-schoolchildren	Government authorities provide educational program (e.g., 12-week course) to parents of pre-schoolchildren covering nutrition and parental feeding styles, and providing opportunities for physical activity
	Parental education: schoolchildren	Government authorities provide educational program (e.g., 12-week course) to parents of schoolchildren covering nutrition and parental feeding styles, and providing opportunities for physical activity
8 Pharmaceuticals	Over-the-counter pharmaceuticals	Provision of non-prescription weight-loss drugs
	Prescription pharmaceuticals	Medical prescription of weight-loss drugs

Table E1 (continued)

74 interventions across 18 groups

Highlighted interventions were assessed for potential scaled impact and cost-effectiveness. Those not assessed either did not have sufficient quality data or were not relevant in the context of the United Kingdom (our pilot geography for this analysis)

9: Portion control	Reduced portion size	Food producers reduce average portion sizes
	Reduced portion size: restaurants	Restaurants reduce average portion size of meals and snacks
	Reduced portion size: workplace	Employers reduce average portion size of foods in workplace canteens
	Reduced portion size: reduce portions of high-calorie beverages	Beverage producers reduce average portion sizes of high-calorie beverages
	Eliminate "supersize" items from menus and product ranges	Remove extra-large single-serve portions from packaged food ranges and restaurant menus
10: Price promotions	Price promotion reconfiguration: regulated	Retailers and producers restrict promotional activity (e.g., two-for-one) of high-calorie food and beverages
	Price promotion reconfiguration: voluntary	Food producers/retailers voluntarily increase price of high-calorie food and beverages
11: Public health campaigns	Comprehensive public health campaign	Government launches public health campaign promoting healthy habits across various media (e.g., TV, radio, out-of-home advertising)
12: Reformulation	New "better for you" products	Introducing new product ranges with improved nutritional profile, and advertised as such
	Stealth product reformulation: food	Food producers deliver small, incremental changes to formulation of food products (e.g., reduction in sugar) that consumers do not notice
	Stealth product reformulation: beverages	Beverage producers deliver small, incremental reduction in the caloric content of beverages that consumers do not notice
	Stealth product reformulation: restaurants	Fast-food retailers deliver small, incremental changes in the formulation of food products that consumers do not notice
13: School curriculum	School temporary diet and exercise programs	Schools provide short-term intensive nutritional education or exercise programs
	School curriculum mandates physical activity: regulated	Schools mandate or increase the amount of physical activity in the curriculum
	School curriculum includes nutritional health education: regulated	Schools include or increase the amount of nutritional health education
14: Subsidies, taxes and prices	Relative price increase: regulated	Government introduces a tax in order to drive price increases on certain types of food or nutrient
	Relative price increase: reduced agricultural subsidy	Government reduces subsidies on certain food commodities that drive prices (e.g., processed foods such as corn, sugar, and palm oil)
	Relative price decrease on fresh produce and staple foods: increased agricultural subsidy	Government subsidizes fresh food such as fruit and vegetables
	Relative price decrease on fresh produce and staple foods: personal subsidies	Government provides personal subsidies (e.g., food stamps for low-income individuals for sole use on certain healthy food types)
15: Surgery	Bariatric surgery: gastric banding	Provision of gastric banding surgery
	Bariatric surgery: gastric bypass	Provision of gastric bypass surgery
16: Urban environment	School physical exercise facilities	Government authorities/schools invest in higher-quality physical exercise facilities
	Improved community sports facilities and programs	Government authorities increase access to community sports facilities and programs
	Supermarket availability	Retailers increase presence in areas with poor access to grocery stores
17: Weight management programs	Personal technology and wearables to support healthy eating and physical activity: cross-platform	Health systems/employers provide personal technology platforms and wearable technology to support goal setting, tracking, and measuring of key behavior and health outcomes
	Health system individual counseling	Health system provides a short-term (e.g., 12-week) one-to-one counseling program on nutrition and how to change dietary and physical activity behavior
	Health system group counseling	Health system provides a short-term (e.g., 12-week) group counseling program on nutrition and how to change dietary and physical activity behavior
	Physical activities on prescription	Health system prescribes physical activities and provides free gym membership or other facilitative measures
	Commercial weight management programs	Commercial provision of weight management programs (e.g., Weight Watchers) that include group counseling, goal setting, and community support
	Short-term, intensive weight management programs: adults	Health care system or commercial market provides short-term (e.g., two- to six-week) residential "boot camp" providing nutritional education and physical activity to adults
	Short-term, intensive weight management programs: children	Health care system or commercial market provides short-term (e.g., two- to six-week) residential "boot camp" providing nutritional education and physical activity to children
	Weight management around childbirth	Health care system provides weight management advice as part of pre- and postnatal care
18: Workplace wellness	Workplace team challenge incentive schemes	Employers provide team challenge activities to encourage physical activity and improved key health indicators
	Workplace individual challenge incentive schemes	Employers provide individual challenge activities to encourage physical activity and improved key health indicators
	Employer material (financial) incentive	Employers provide material incentives for improved key health indicators (e.g., discounts on insurance premiums, gym membership, prizes)



1. The obesity crisis

Obesity is a major global economic problem caused by a multitude of factors (see Box 1, "The complex causes of obesity"). Today obesity is jostling with armed conflict and smoking in terms of having the greatest human-generated global economic impact. Obesity imposes significant costs on health-care systems; around the world, 2 to 7 percent of all health-care spending relates to measures to prevent and treat this condition, with up to 20 percent of all health-care spending attributable to obesity, through related diseases such as type 2 diabetes and heart disease. These health-care costs place a burden on government finances. Furthermore, overall economic productivity and employers are both affected by impaired productivity.

The global economic impact of obesity is increasing. The prevalence of obesity is still rising in developed economies, and now, as emerging markets become richer, they, too, are experiencing rising prevalence. The evidence suggests that the economic and societal impact of obesity is deep and lasting. It may entrench social inequalities between generations; obesity in parents appears to increase the risk of obesity in their children through both physiological and behavioral mechanisms. An additional implication is that, even if the current rise in prevalence can be reversed, the damaging health implications and economic costs the world is experiencing today could persist well into the future.

If the prevalence of obesity continues its current trajectory, almost half of the world's adult population could be overweight or obese by 2030.⁴

4 T. Kelly et al., "Global burden of obesity in 2005 and projections to 2030," *International Journal of Obesity*, volume 32, number 9, September 2008.

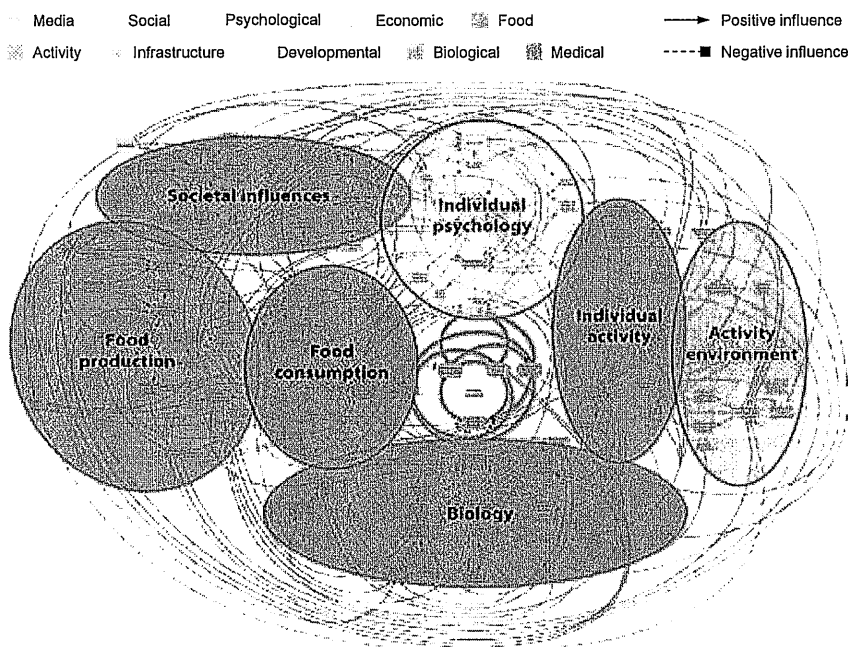
Box 1. The complex causes of obesity

The root causes of rising obesity are highly complex, spanning evolutionary, biological, psychological, sociological, economic, and institutional factors. The UK government Foresight research on obesity identified more than 100 variables that directly or indirectly affect obesity outcomes (Exhibit 1).

Exhibit 1

Academics have emphasized that obesity is a systemic problem: causes are complex, manifold, and interdependent

Obesity causal map



SOURCE: B. Butland et al., *Foresight: Tackling obesities—future choices*, UK Government Office for Science, project report, 2nd ed., October 2007.

Because of centuries of food insecurity, human beings have evolved with a biological ability to cope with food scarcity rather than abundance. The human body seeks out energy-dense foods and tries to conserve energy as fat. Hormones that regulate hunger and satiety encourage people to seek extra food when food is scarce but do not seem to have the ability to prevent over-consumption or encourage extra calorie burning when food is abundant.

Modern life makes fewer physical demands on many people, who lead less active lifestyles as technology replaces the need for physical labor. With many jobs now sedentary, exercise is a conscious and optional

choice. As an illustration of the change, in 1969 about 40 percent of US schoolchildren walked or rode their bikes to school; by 2001, only 13 percent did.¹ Over the past 50 years, it has been estimated that a reduction in occupation-related physical activity in the United States has reduced the daily net energy balance by 100 calories per person, a significant share of the overall change in the energy balance during this period.²

Mass urbanization in many regions—the global urban population is growing by 65 million a year, the equivalent of adding seven new cities the size of Chicago every 12 months—is boosting incomes but reinforcing a less physical lifestyle.³ One Chinese study found that urbanization reduces daily energy expenditure by 300 to 400 calories, and traveling to work by car or bus reduces it by a further 200 calories.⁴

Human beings also have a psychological relationship with food that goes beyond a need for basic sustenance. Many of us use food as a reward or to relieve stress, or have a compulsive relationship with certain types of food. There is a correlation between obesity and high rates of some mental health conditions, including depression.

1 Noreen C. McDonald, "Active transportation to school: Trends among US schoolchildren, 1969–2001," *American Journal of Preventative Medicine*, volume 32, issue 6, June 2007.

2 T. S. Church et al., "Trends over 5 decades in US occupation-related physical activity and their associations with obesity," *PLoS ONE*, volume 6, number 5, 2011.

3 For more on urbanization, see, for example, *Urban world: Mapping the economic power of cities*, McKinsey Global Institute, March 2011.

4 W. P. James, "The fundamental drivers of the obesity epidemic," *Obesity Reviews*, volume 9, supplement 1, March 2008.

Box 1. The complex causes of obesity (continued)

People are highly influenced by social norms and subtle social cues in their eating habits and their attitude toward weight. For instance, if they dine with other people who eat more, they eat more themselves; likewise, those who dine with people who eat less, eat less themselves. One study has shown that 35 percent more calories are consumed when having dinner with a friend than when eating alone, and 96 percent more if dining in a group of seven people.⁵ Another study has shown that a person is 57 percent more likely to become obese if a friend has also become obese—evidence of social normalization of the condition.⁶

Food has become much more affordable over the past 60 years. In the United States, the share of average household income spent on food fell from 42 percent in 1900 to 30 percent in 1950 and to 13.5 percent in 2003.⁷ This is beneficial in welfare terms, reducing rates of undernutrition and freeing up disposable income.

Many of these factors underline the importance of the environmental context as a driver of obesity prevalence. A helpful lens for examining how the environment affects prevalence is looking at expatriate populations, transplanted from one context to another. For example, British expats who have settled in Abu Dhabi have diabetes prevalence rates of 18 percent, compared with a baseline prevalence of 8 percent in the United Kingdom. Physical environment is one factor, but it is likely that sociocultural variables are also relevant. Various studies suggest a correlation between Hispanic immigrants' obesity rate and the length of their stay in the United States and the depth of their cultural assimilation.⁸

Some experts are questioning whether the net energy balance—that people are eating too much and exercising too little—is the appropriate lens to examine root causes. There is growing interest in the role that different nutrients such as carbohydrates, proteins, and fats play in our metabolism and in hormones that regulate satiety and hunger. Many leading scientists support the view that refined carbohydrates promote weight gain and inhibit weight loss.⁹ The science to date on this is inconclusive, and we do not include it in the assessment here without further evidence. However, it is an important area for further research and could refocus the design of obesity interventions. Similarly, there is increasing interest in the role of the microbiome—our intestinal bacteria ecosystem. Scientific evidence from controlled trials suggests that individuals whose bodies contain a greater diversity of bacterial species are less prone to high body mass index (BMI) and less likely to gain weight.¹⁰ This also is too inconclusive for us to include at this stage.

Some commentators take the causal complexity illustrated in Exhibit 1 as a pre-determined defeat. They say, "If the causes are so complex, where do we begin?" However, we do have a good understanding of the proximate causes, even if the background causes are complex. We know that over the past 50 years, individuals' daily energy balance equation has changed; physical activity has declined, and energy consumption has increased. Even though there are important outstanding questions about diet composition, gut microbiome, and epigenetics, we are not walking blind with no sense of what to address. However, interventions to increase physical activity, reduce energy consumption, and address diet composition cannot just seek to reverse the historical trends that have left the population where it is today. For example, we cannot, nor would we wish to, reverse the invention of the Internet or the industrialization of agriculture. We need to assess what interventions make sense and are feasible in 2014.

5 Brian Wansink, *Mindless eating: Why we eat more than we think*, Bantam-Dell, 2006.

6 Nicholas A. Christakis and James H. Fowler, "The spread of obesity in a large social network over 32 years," *New England Journal of Medicine*, volume 357, number 4, July 2007.

7 *100 years of US consumer spending data for the nation, New York City, and Boston*, US Department of Labor, report number 991, May 2006.

8 D. A. Himmelgreen et al., "The longer you stay, the bigger you get: Length of time in the US and language are associated with obesity in Puerto Rican women," *American Journal of Physical Anthropology*, volume 125, number 1, 2004.

9 B. J. Brehm et al., "The role of energy expenditure in the differential weight loss in obese women on low-fat and low-carbohydrate diets," *Journal of Clinical Endocrinology and Metabolism*, volume 90, number 3, March 2005.

10 Herbert Tilg and Arthur Kaser, "Gut microbiome, obesity and metabolic dysfunction," *Journal of Clinical Investigation*, volume 121, number 6, June 2011.

THE PREVALENCE OF OBESITY IS HIGH AND GROWING AS GLOBAL PROSPERITY INCREASES

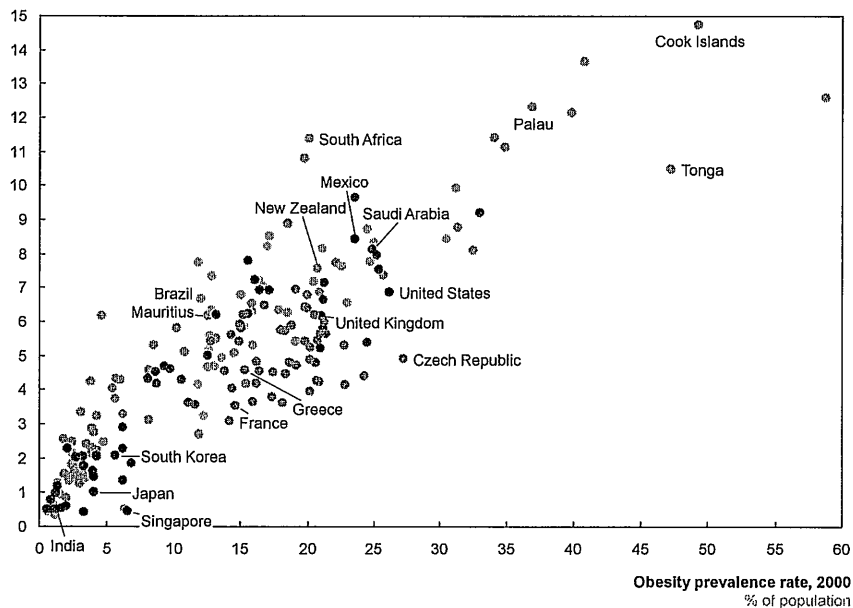
Nearly one-third of the global population today is overweight or obese—that's more than 2.1 billion people.⁵ Putting that into perspective, this is nearly two and a half times the 840 million people estimated to be undernourished. No country reduced its obesity prevalence between 2000 and 2013. During this period, prevalence grew by 0.5 percentage points or more a year in 130 of the 196 countries for which the Organisation for Economic Co-operation and Development (OECD) documents obesity prevalence data. Prevalence growth has momentum; countries with high prevalence in 2000 have continued to see the highest prevalence growth rates since then (Exhibit 2). There does not seem to be convergence to a stable obesity prevalence rate internationally. Recent data suggest a plateauing of prevalence in some developed markets, such as Italy, the United Kingdom, and the United States, while Australia, France, Switzerland, and other advanced economies experience continued growth.⁶

Exhibit 2

Obesity prevalence growth has momentum: countries with the highest prevalence in 2000 have experienced the most growth in prevalence since
Obesity prevalence across all countries, 2000 levels vs. 2000–08 growth

• Oceania and Australasia • Africa • South and Central America • Asia • North America • Europe

Obesity prevalence growth, 2000–08
Percentage-point change



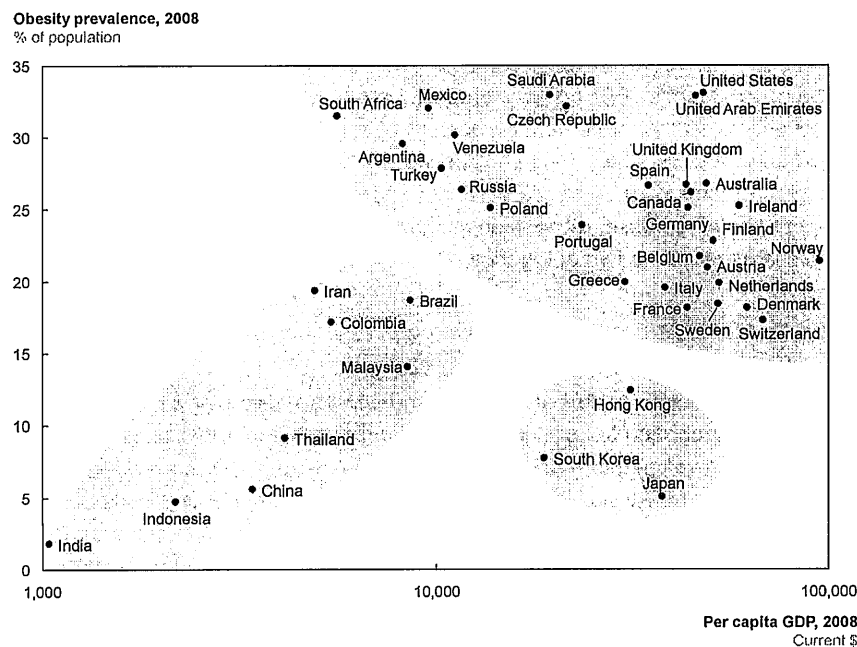
SOURCE: OECD statistics; McKinsey Global Institute analysis

⁵ Marie Ng et al., "Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: A systematic analysis for the Global Burden of Disease Study 2013," *The Lancet*, volume 384, issue 9945, August 2014. Overweight and obese people are defined as those with a body mass index of 25 or over, and 30 or over, respectively. The BMI is the individual's weight divided by the square of his or her height. Values are expressed in units of kilograms per meter squared.

⁶ *Obesity update*, Organisation for Economic Co-operation and Development, June 2014.

Overall obesity prevalence does appear to be correlated with a country's wealth (Exhibit 3). It is striking how few countries escape the pattern. Among G-20 nations with per capita GDP exceeding \$8,000, only Japan and South Korea have prevalence rates lower than 16 percent. The majority of G-20 countries have rates of more than 20 percent.⁷ Looking at children specifically, the prevalence of obesity ranges between 5 and 20 percent.

Exhibit 3
With a few exceptions—up to a certain income threshold—obesity prevalence rises with income



SOURCE: OECD statistics; World Bank GDP statistics; McKinsey Global Institute analysis

China, Indonesia, and India currently have lower obesity prevalence rates than advanced economies. However, as rapid industrialization and urbanization boost incomes, the prevalence rates in these fast-growing emerging economies are rising quickly.⁸ In India and China, the prevalence of obesity in cities is three to four times the rate in rural areas, reflecting higher incomes in urban areas and therefore higher levels of nutrition and food consumption and often less active labor. The prevalence of obese and overweight people rose at 1.2 percent a year in Chinese adult males between 1985 and 2004 and 1 percent a year in adult females.⁹

7 The G-20 members are Argentina, Australia, Brazil, Canada, China, European Union, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, South Korea, Turkey, the United Kingdom, and the United States.

8 For a discussion of the link between rising prosperity and industrialization and urbanization, see MGI's series of reports on urbanization at www.mckinsey.com/insights/mgi/research/urbanization.

9 Barry M. Popkin, "Will China's nutrition transition overwhelm its health care system and slow economic growth?" *Health Affairs*, volume 27, number 4, 2008.

This is a pattern we observe across emerging markets. Many of these countries experienced a rise in prevalence of one percentage point a year between 2000 and 2008. Today, many countries have prevalence rates of 20 percent or even 30 percent and now have well-entrenched rising trends. A report from the Overseas Development Institute found that obesity and overweight rates in North Africa, Latin America, and the Middle East were on a par with Europe at 10 to 30 percent obesity in adults and at 30 to 70 percent overweight. Other regions, including South Asia and East Asia, are catching up with advanced economies in obesity prevalence.¹⁰

All G-20 countries are experiencing year-on-year growth in prevalence of 0.5 to 1.5 percentage points. In the United Kingdom, for instance, more than 80 percent of the population aged 21 to 60 could be obese or overweight by 2030, according to the government's 2007 Foresight report.¹¹ Breaking this down by gender, the report estimated that more than 60 percent of men and 50 percent of women would be obese. By 2050, the report estimated, one-quarter of children in the United Kingdom could be obese. These projections largely reflect overweight people becoming obese, rather than a significant absolute rise in the number of people in either of the two categories.

THE ECONOMIC IMPACT OF OBESITY IS IN LINE WITH THAT OF SMOKING AND ARMED VIOLENCE

The global economic impact of obesity is roughly \$2.0 trillion, or 2.8 percent of global GDP, according to our analysis, which reflects the fact that obesity places a burden on developed and developing economies alike.¹² This is equivalent to the GDP of Italy or Russia. Obesity today has the same impact on the global economy as armed conflict, and only a shade less than smoking. These three are far and away the largest global economic impact areas driven by human behavior (Exhibit 4).

We assessed the current impact to society of 14 major problems that are caused by humans—that is, those that are the result of human decisions, are amplified by human or societal behavior, or depend on societal, legal, or infrastructural environments created by humans. This analysis therefore excludes diseases such as malaria but includes the impact of diseases such as heart disease and type 2 diabetes whose prevalence lifestyle choices or other human decisions can drive. Our estimate of the global economic toll of obesity includes the cost of lost economic productivity through the loss of productive life years, direct costs to health-care systems, and the investment required to mitigate the impact of obesity. Of the three sources of cost that we assessed, lost productivity is the most significant in our analysis, accounting for nearly 70 percent of the total global cost of obesity. Some critics may argue that lost productivity should not be included, as it does not generate a direct cost. However, we believe that,

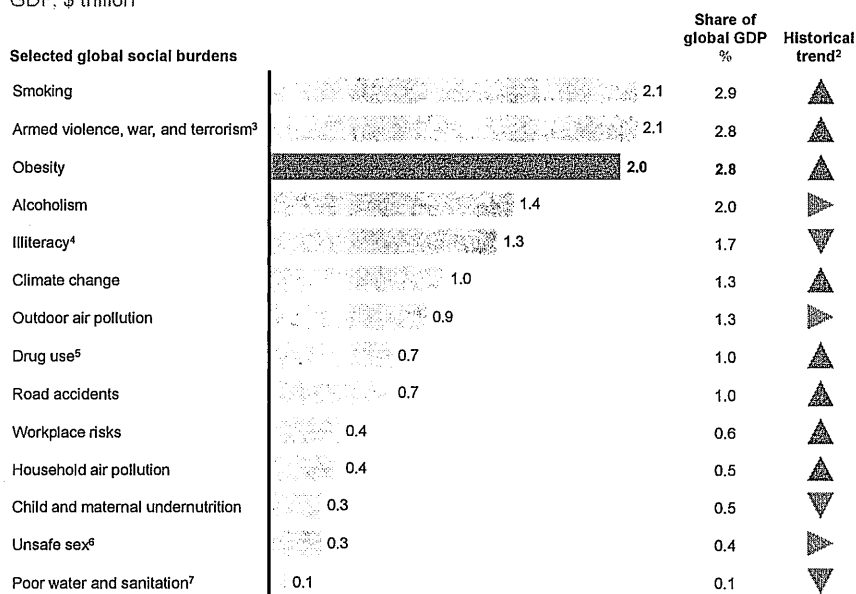
10 Sharada Keats and Steve Wiggins, *Future diets: Implications for agriculture and food prices*, Overseas Development Institute, January 2014.

11 B. Butland et al., *Foresight: Tackling obesity—future choices*, UK Government Office for Science, project report, 2nd ed., October 2007.

12 Our analysis assessed the cost of three elements in 2012 dollars at purchasing power parity (PPP): the loss of productive life, direct health-care costs, and investment to mitigate the cost. Loss of productive life is based on Global Burden of Disease assessment of disability-adjusted life years lost attributable to different risk factors. These DALYs are given economic value by GDP per capita for different countries. This is a purely economic lens; it does not suggest that all of the reasons for investing to mitigate should be tied to the economic cost.

while not a direct cost to society, it should be included because it has a negative economic impact. In addition, it should be noted that our estimates are based on the current cost of these burdens. This means that burdens such as climate change and obesity, which result in a higher future cost, are ranked lower than if we had conducted these analyses on a net present value basis.

Exhibit 4
Obesity is one of the top three global social burdens generated by human beings
Estimated annual global direct economic impact and investment to mitigate selected global burdens, 2012¹
GDP, \$ trillion



1 Based on 2010 disability-adjusted life years (DALY) data from the Global Burden of Disease database and 2012 economic indicators from the World Bank; excluding associated revenue or taxes; including lost productivity due to disability and death, direct cost, e.g., for health care, and direct investment to mitigate; GDP data on purchasing power parity basis.

2 Based on historical development between 1990 and 2010 of total global DALYs lost (Global Burden of Disease).

3 Includes military budget.

4 Includes functional illiteracy.

5 Includes associated crime and imprisonment.

6 Includes sexually transmitted diseases. Excludes unwanted pregnancies.

7 Excludes lost time to access clean water source.

SOURCE: Literature review; World Health Organization Global Burden of Disease database; McKinsey Global Institute analysis

The severity of the economic burden of obesity varies among countries (Exhibit 5).

Exhibit 5
Relative ranking of major social burdens by country

	France	Japan	Indonesia	China	Nigeria	Brazil	Morocco	South Africa	Mexico	United States	United Kingdom
Smoking	1	2	3	4	11	5	4	7	5	3	1
Obesity	2	3	8	9	13	3	2	4	1	2	2
Armed violence, war, and terrorism	3	6	9	3	7	1	7	3	4	4	3
Alcoholism	4	4	10	6	5	2	11	8	3	5	5
Illiteracy	5	5	7	8	10	7	7	9	6	4	4
Climate change	6	7	2	4	4	4	3	6	2	8	8
Outdoor air pollution	7	5	6	1	9	12	8	12	8	7	7
Road accidents	8	9	5	7	3	6	9	10	7	9	9
Drug use	9	8	12	11	14	8	6	8	9	6	6
Workplace risks	10	10	11	10	12	9	10	13	11	10	10
Unsafe sex	11	13	13	13	2	11	12	1	13	11	12
Child and maternal undernutrition	12	11	3	12	1	10	5	5	10	13	11
Poor water and sanitation	13	12	14	14	8	14	14	14	14	12	13
Household air pollution	14	14	4	5	6	13	13	11	12	14	14

SOURCE: Literature review, World Health Organization Global Burden of Disease database; McKinsey Global Institute analysis

In most developed economies, obesity ranks among the top three human-generated economic burdens. In the United Kingdom, for instance, obesity has the second-largest impact after smoking, generating an economic loss of more than \$70 billion a year in 2012, or 3.0 percent of GDP (Exhibit 6).

In the United States, armed conflict (and especially spending on the military) has the highest social and economic impact, and obesity is second; obesity generated an impact in the United States of \$663 billion a year in 2012, or 4.1 percent of GDP. In both countries, the prevalence and associated cost of obesity are growing, albeit less steeply than in recent decades and in comparison with many emerging markets.

The economic toll of obesity varies more widely in emerging markets. In Mexico, obesity is the largest social impact at 2.5 percent of GDP. We observe comparable burdens in Morocco at 2.8 percent of GDP, in South Africa at 3.0 percent of GDP, and in Brazil at 2.4 percent of GDP. But in other emerging markets obesity is—as of now—a much less significant economic burden. In Nigeria, for instance, obesity's impact on the economy is 0.7 percent of GDP,

ranking as the 13th-largest economic burden; in Indonesia, it has a 1.0 percent impact, ranking eighth; and in China, the figure is 1.1 percent, ranking ninth.

Exhibit 6
Obesity is the second-largest human-generated impact on the United Kingdom
Selected social issues, United Kingdom, 2012¹

Selected global social issues	Annual economic impact GDP at current dollars, \$ billion	Share of UK GDP %
Smoking	90	3.6
Obesity	73	3.0
Armed violence, war, and terrorism ²	67	2.5
Illiteracy ³	49	2.0
Alcoholism	44	1.8
Drug use ⁴	35	1.4
Outdoor air pollution	28	1.1
Climate change	23	0.9
Road accidents	14	0.6
Workplace risks	14	0.6
Child and maternal undernutrition	3	0.1
Unsafe sex ⁵	2	0.1
Poor water and sanitation ⁶	1	0.0

¹ Based on 2010 DALY data from the World Bank Global Burden of Disease database and 2012 economic indicators; excluding associated revenue or taxes, including lost productivity due to disability and death, direct cost (such as for health care), and direct investment to mitigate; GDP data on purchasing power parity basis.

² Includes military budget.

³ Includes functional illiteracy.

⁴ Includes associated crime and imprisonment.

⁵ Includes sexually transmitted diseases. Excludes unwanted pregnancies.

⁶ Excludes lost time to access clean water source.

SOURCE: Literature review; McKinsey Global Institute analysis

We now discuss each of the three categories of economic impact imposed by obesity.

The health burden of obesity constrains economic productivity and can increase business costs

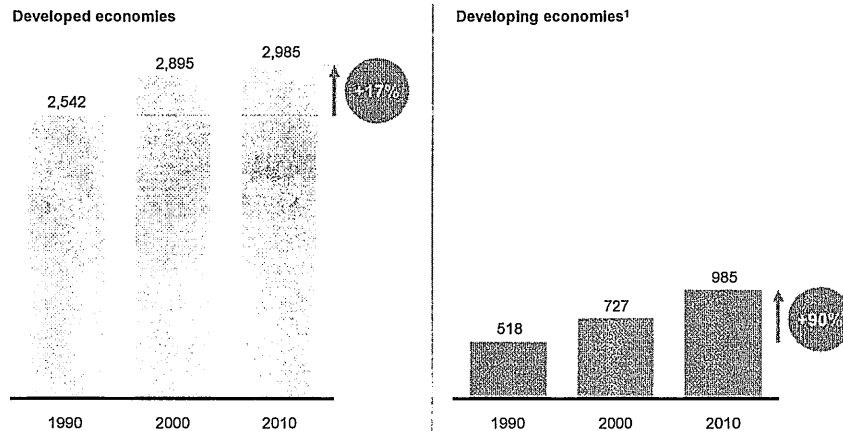
We assessed the productivity lost due to obesity using the standard measurement of disability-adjusted life years, or DALYs, which measure the number of years that are lost or rendered economically unproductive due to disease.¹³ Of the DALYs lost to obesity across the world, around 71 percent are due to premature mortality and 29 percent to disability that has prevented individuals from making their full economic contribution.

The number of DALYs lost to obesity today is three times as high in developed economies as it is in emerging markets. However, that gap is narrowing. The rise in the number of DALYs per 100,000 people lost because of obesity slowed in developed economies between 1990 and 2010 but soared by 90 percent in emerging economies (Exhibit 7).

¹³ Our analysis using DALYs measures the opportunity cost to an economy; we have not measured the broader losses to human well-being associated with lost productivity. We also note that the value of a DALY is tied to per capita GDP and for this reason, our analysis tends to amplify the cost to developed economies, where per capita GDP is higher, and tends to under-record the burden of cost in emerging markets.

Exhibit 7**From 1990 to 2010, growth in obesity-related lost DALYs slowed in developed economies but almost doubled in developing economies**

Obesity health burden
DALYs lost per 100,000 people



¹ Definition of developing economies based on World Bank categorization of low- and middle-income countries, with per capita gross national income of less than \$12,615.

SOURCE: World Health Organization Global Burden of Disease database; McKinsey Global Institute analysis

The productivity loss from the rising prevalence of obesity has jumped from 1990 to 2010 in some emerging markets. In Indonesia, for instance, the number of DALYs lost per 100,000 people due to obesity has risen from 184 in 1990 to 885 in 2010, a jump of nearly 400 percent. In South Africa, DALYs lost to obesity totaled 1,577 in 1990 and 2,659 in 2010, an increase of 69 percent.

The 29 percent “disability” burden affects employers through lost employee productivity and health-care costs. Employees with particularly high BMI can be less productive in the workplace due to the range of health problems that obesity can cause, including, for example, arthritis, fatigue, breathlessness, lack of concentration, and depression.¹⁴ There is also a relationship between obesity and absenteeism from work for health reasons, including frequent medical checkups.¹⁵

In the United Kingdom, for instance, we estimate that the total impact on employers is \$7 billion. Of this, \$5 billion, or more than two-thirds, comes from decreased productivity in the workplace rather than outright absenteeism. In the United Kingdom, higher health-insurance premiums are not a major issue for employers because of the central role of public health through the NHS. By contrast, in the United States higher insurance premiums could contribute as much as \$7.7 billion of our \$18.9 billion to \$21.9 billion overall estimate of the cost of obesity to employers.¹⁶

¹⁴ Eric A. Finkelstein et al., “The costs of obesity in the workplace,” *Journal of Occupational and Environmental Medicine*, volume 52, number 10, October 2010.

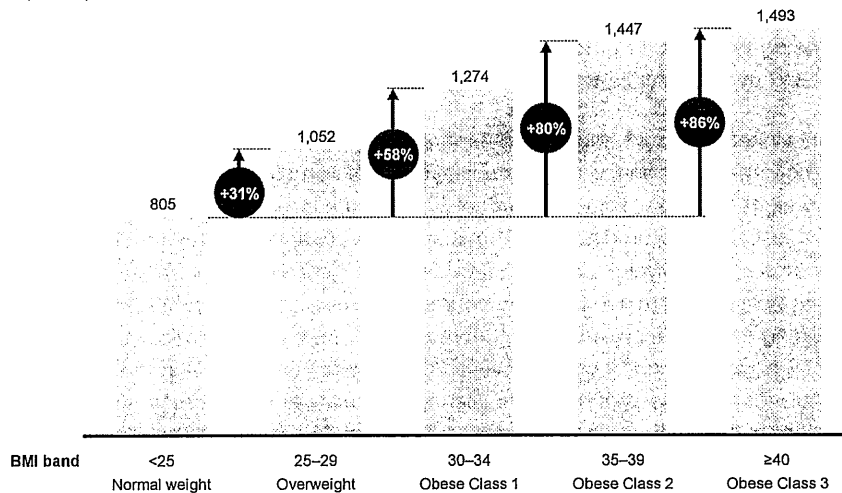
¹⁵ L. A. Tucker and G. M. Friedman, “Obesity and absenteeism: An epidemiologic study of 10,825 employed adults,” *American Journal of Health Promotion*, volume 12, number 3, January–February 1998; J. Cawley, J. A. Rizzo, and K. Haas, “Occupation-specific absenteeism costs associated with obesity and morbid obesity,” *Journal of Occupational and Environmental Medicine*, volume 49, number 12, December 2007.

¹⁶ Ross A. Hammond and Ruth Levine, *The economic impact of obesity in the United States*, Economic Studies Program, Brookings Institution, August 2010.

Obesity drives between 2 and 7 percent of global health-care spending

Previous McKinsey analysis on health-care spending in the OECD group of countries has found that, without reform, health-care spending could grow by 50 to 100 percent between 2007 and 2040. In the United Kingdom alone, the research found that health-care spending could account for 11 to 14 percent of GDP by 2040.¹⁷ Separately, the World Health Organization (WHO) estimates that high BMI drives between 2 and 7 percent of global health-care spending.¹⁸ We observe this correlation clearly in the United Kingdom (Exhibit 8).

Exhibit 8
Associated medical costs rise as BMI increases
UK medical costs by BMI group, 2012¹
£ per capita



¹ Includes primary care, general practitioner prescriptions, hospitalization, accident and emergency, and outpatient care. 2003 values taken from Tigbe et al. (2013) adjusted using 2012/13 Fédération Internationale de Médecine du Sport and Health Examination Survey data on per capita UK costs in each category.

SOURCE: W. W. Tigbe, A. H. Briggs, and M. E. J. Lean, "A patient-centred approach to estimate total annual healthcare cost by body mass index in the UK Counterweight programme," *International Journal of Obesity*, August 2013; Fédération Internationale de Médecine du Sport and Health Examination Survey, 2012/13; McKinsey Global Institute analysis

The research found four major drivers of increased spending: an aging population, an explosion of so-called lifestyle diseases, a rise in public expectations, and a lack of value-consciousness among health-care consumers.¹⁹ We cannot address aging populations or rising public expectations of health-care provision. However, we can tackle a lack of consciousness about value among citizens and a lack of efficiency within health-care systems, as well as the burden of lifestyle diseases of which obesity is a major driver. Obesity contributes to cardiovascular disease, type 2 diabetes, and some cancers such as kidney, bowel, and breast. Mitigating or reversing the obesity crisis is a critical element of any strategy for achieving sustainable provision of health care and managing public budgets.

¹⁷ *Sustainable health systems: Visions, strategies, critical uncertainties and scenarios*, World Economic Forum in collaboration with McKinsey & Company, January 2013.

¹⁸ *Ibid.*

¹⁹ *Ibid.*

Today, one in 12 of the global adult population has type 2 diabetes, which is at least partly driven by obesity (see Box 2, “Obesity and diabetes”). In addition, a large number of people suffer from “impaired glucose intolerance,” a pre-diabetes condition that usually leads to the disease unless significant lifestyle changes are made.

Type 2 diabetes is both preventable and reversible with lifestyle changes. A US study found that a 7 percent weight loss accompanied by moderate physical activity decreased the number of new diabetes cases by 58 percent among the high-risk population.²⁰ In the United States, the direct cost of obesity to the health-care system is estimated to be between \$147 billion and \$190 billion a year—or about 7 percent of total annual health-care spending.²¹ Per capita medical spending is 24 percent higher for obese individuals than for those who are not obese. Some estimates put the future cost to US health care from obesity as high as \$344 billion by 2018, or approximately 20 percent of total health-care spending that year. To put the figure into context, this cost would be greater than the GDP of South Africa today.

In the United Kingdom, the government currently spends about £6 billion (\$9.6 billion) a year on the direct medical costs of conditions related to being overweight or obese. That is 5 percent of the entire budget of the NHS. It spends a further £10 billion on diabetes. The cost of obesity and diabetes to the health-care system is equivalent to the United Kingdom’s combined “protection” budget for the police and fire services, law courts, and prisons; 40 percent of total spending on education; and about 35 percent of the country’s defense budget. The £6 billion cost has increased since 2007, when it was £4 billion to £5 billion. On current projections of rising prevalence of obesity and overweight conditions, the cost to the NHS could increase from between £6 billion and £8 billion in 2015 to between £10 billion and £12 billion in 2030.

The investment to mitigate obesity today accounts for a small share of the overall cost of obesity

Only a small share of the overall cost of obesity comes from investment to mitigate or prevent it, compared with other health- or non-health-related burdens. We estimate that the global investment to prevent obesity is about \$5 billion, or only 0.25 percent of the total economic impact of obesity. In comparison, investment in prevention of traffic accidents accounts for about 1.2 percent of the overall cost of such accidents. Instead, obesity spending is weighted toward treatment. For example, the United Kingdom’s largest prevention outlay is £11 million a year through the Change4Life campaign. This is equivalent to only 0.18 percent of what the NHS spends on obesity- and overweight-related conditions. Part of the reason for this is that the effectiveness of preventive approaches is difficult to assess.

20 The Diabetes Prevention Program Research Group, “The Diabetes Prevention Program (DPP): Description of lifestyle intervention,” *Diabetes Care*, volume 25, number 12, December 2002.

21 Eric A. Finkelstein et al., “Annual medical spending attributable to obesity: Payer- and service-specific estimates,” *Health Affairs*, volume 28, number 5, July 2009; John Cawley and Chad Meyerhoefer, “The medical care costs of obesity: An instrumental variables approach,” *Journal of Health Economics*, volume 31, issue 1, January 2012.

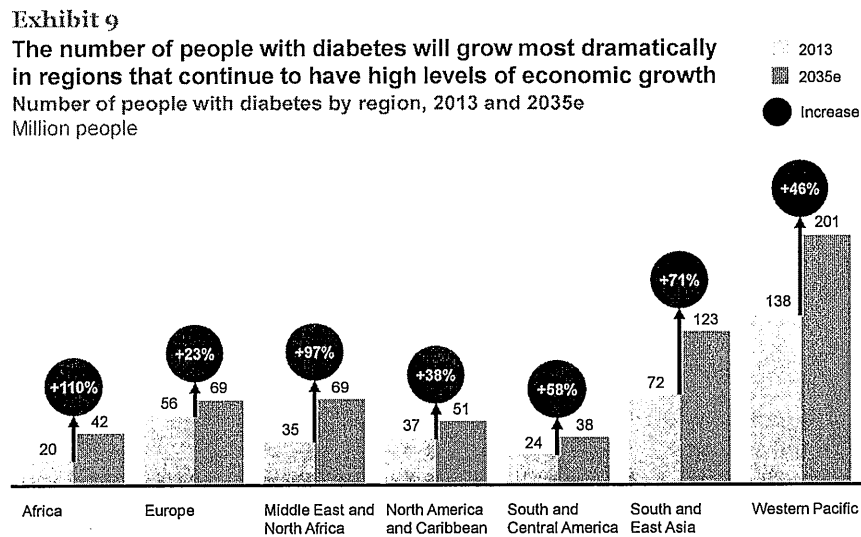
Box 2. Obesity and diabetes

Type 2 diabetes, a metabolic disorder characterized by resistance to insulin that results in chronically high blood sugar in the body, is one of the major health-care costs of obesity. Left untreated, the condition can result in severe complications, including heart disease; stroke, blindness, kidney failure, and poor blood flow to limbs that can lead to sores and amputations. The prevalence of type 2 diabetes has soared in tandem with obesity—prevalence rates from 30 million diagnosed cases worldwide in 1985 to about 382 million today. By 2035, almost 600 million people could be affected by the disease, according to the International Diabetes Federation. An additional 316 million people globally have “pre-diabetes,” or impaired glucose tolerance. These individuals do not have evident symptoms and therefore are not usually diagnosed; however, 40 percent of them progress to fully fledged diabetes within five to ten years.¹

In the past, diabetes tended to be a disease largely of older people in developed economies. But its demographics are changing rapidly—diabetes today is afflicting younger populations, and its spread is more global. Diabetes is increasingly common in young adults, adolescents, and even children. Type 2 accounted for less than 3 percent of all diabetes cases in adolescents in 1990, but that share had risen to 45 percent in 2005.² Insulin resistance progresses faster in young people than older people, and they also suffer earlier and more acute co-morbidities of kidney failure, blindness, and heart disease. Many young people are already suffering kidney disease and high blood pressure on diagnosis.³

About 80 percent of the growth in prevalence projected between now and 2035 is expected to be in developing economies, reflecting rapid economic growth, rising incomes, and the adoption of Western lifestyles (Exhibit 9).⁴ The MENA (Middle East and North Africa) region and the rest of Africa are projected to experience around a doubling of the number of people with diabetes in this period. Minority and indigenous populations have a higher risk of type 2 diabetes than white Caucasians, the hypothesis being that this is partly driven by different genetic racial susceptibilities. Other factors may also play a role, including socioeconomic disparities and access to health care.

The burden on health-care systems is already high and rising. It has been estimated that diabetes accounts for 12 percent of global health-care costs at between \$376 billion and \$672 billion.⁵ In the United Kingdom, the NHS spends 10 percent of its total budget on treating diabetes, 80 percent of which we can attribute to treating the complications of unmanaged diabetes. These are costs that could be reduced with better management through changes in lifestyle.



SOURCE: International Diabetes Federation; McKinsey Global Institute analysis

1 P. Zimmet, K. G. Alberti, and J. Shaw, “Global and societal implications of the diabetes epidemic,” *Nature*, volume 414, December 13, 2001.
 2 O. Pinhas-Hamiel and P. Zeitler, “The global spread of type 2 diabetes mellitus in children and adolescents,” *Journal of Pediatrics*, volume 146, 2005.
 3 Ibid.
 4 S. Wild et al., “Global prevalence of diabetes: Estimates for the year 2000 and projections for 2030,” *Diabetes Care*, volume 27, number 5, May 2004.
 5 P. Zhang et al., “Global healthcare expenditure on diabetes for 2010 and 2030,” *Diabetes Research and Clinical Practice*, volume 87, number 3, March 2010.

OBESITY AND SOCIOECONOMIC DISADVANTAGE MAY BE MUTUALLY REINFORCING

Developed economies have a clear inverse correlation between income levels and the prevalence of obesity, particularly in the case of women and children. Put simply, lower-income groups tend to have higher obesity prevalence. And it seems likely that causation works both ways. Across a range of developed markets, this inverse relationship is most acute for women (see Box 3, “Gender disparity”).

A study conducted by the US Centers for Disease Control and Prevention found that obesity prevalence is generally similar at all income levels for men in the United States (around 30 percent), while for women it was 42 percent at low-income levels vs. 29 percent at high-income levels.²² In Australia the relationship holds across genders, with obesity prevalence ten percentile points higher for adults in the most disadvantaged quintile vs. the least disadvantaged one.²³ In several other countries, it has been observed that obesity prevalence for women ranges from 1.6 (United States) to 18.4 (South Korea) times as high at the lower end of the education spectrum as it is for those at the upper end. This relative index of inequality is lower on average for men.

The same pattern appears in the United Kingdom.²⁴ The inverse relationship holds for different measures of socioeconomic status, including household income, the occupational status of the parent, educational achievement, and a score of area deprivation. The prevalence of obesity is almost double among women with unskilled occupations (35.2 percent) than among professional women (18.2 percent).²⁵ In the case of British children, the prevalence of obesity is almost 50 percent as high among boys in the lowest household income quintile as for those in the highest household income quintile; for girls, the prevalence is more than 50 percent as high.²⁶ Children in the bottom decile of most deprived areas are twice as likely to be obese as children in the decile of least deprived areas (Exhibit 10).²⁷ The UK Health Survey for England did not find a relationship between household income and obesity for men. However, the survey did find that among men with a higher level of educational attainment, the prevalence of obesity is lower.²⁸

22 Cynthia L. Ogden et al., *Obesity and socioeconomic status in adults in the United States, 2005–2008*, National Center for Health Statistics data brief number 50, December 2010.

23 Australian Institute of Health and Welfare, *Who is overweight?* AIHW analysis of the 2007–08 National Health Survey, 2013.

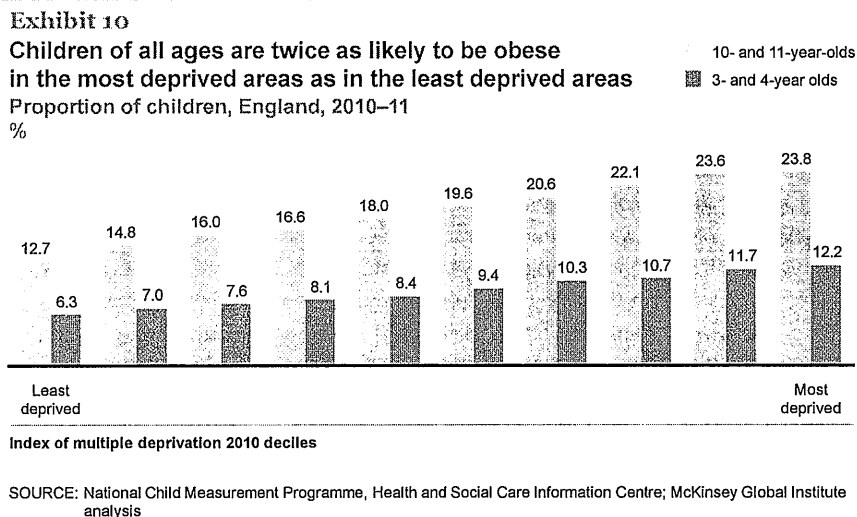
24 *Adult obesity and socioeconomic status*, National Obesity Observatory Data Factsheet, September 2012.

25 *Ibid.*

26 S. Bridges and J. Thompson, “Children’s BMI, overweight and obesity,” in *Health survey for England—2010, respiratory health*, R. Craig and J. Mindell, eds., Health and Social Care Information Centre, December 2011.

27 *Socio and economic inequalities in diet and physical activity*, National Obesity Observatory, November 2013.

28 *Adult obesity and socioeconomic status*, National Obesity Observatory Data Factsheet, October 2010.



Given that obesity has a higher incidence among disadvantaged households, it also imposes a disproportionate burden on these already disadvantaged households in terms of higher health-care costs and reduced welfare. This entrenchment of inequalities operates both within countries and at the international level. In emerging economies where public-health provision is nascent, these health-care costs fall directly on households. In addition, there is some evidence that epigenetic factors may disproportionately increase the burden of obesity in emerging markets (see Box 4, “The thrifty phenotype”).

Moreover, it seems that obesity can be passed from generation to generation. There is evidence that obesity risk is tied to parental BMI through both physiological and behavioral mechanisms. Studies find that a mother with a high BMI is a significant predictor of obesity in her children when they grow to adulthood because fetuses develop a compromised metabolism and a resistance to insulin.²⁹ However, other sociocultural factors and genetic predisposition drive the onset of obesity, too.³⁰ For instance, eating habits that confound adult eating patterns are typically passed along by parents in early life.³¹

29 J. Eriksson et al., “Size at birth, childhood growth and obesity in adult life,” *International Journal of Obesity*, volume 25, number 5, June 2001; R. Huxley et al., “Ethnic comparisons of the cross-sectional relationships between measures of body size with diabetes and hypertension,” *Obesity Reviews*, volume 9, supplement 1, March 2008; L. C. Fernald and L. M. Neufeld, “Overweight with concurrent stunting in very young children from rural Mexico: Prevalence and associated factors,” *European Journal of Clinical Nutrition*, volume 61, number 5, May 2007; Elizabeth W. Kimani-Murage et al., “The prevalence of stunting, overweight and obesity, and metabolic disease risk in rural South African children,” *BMC Public Health*, volume 10, number 1, March 2010.

30 R. Huxley et al., “Ethnic comparisons of the cross-sectional relationships between measures of body size with diabetes and hypertension,” *Obesity Reviews*, volume 9, supplement 1, March 2008; Obesity in Asia Collaboration, “Waist circumference thresholds provide an accurate and widely applicable method for the discrimination of diabetes,” *Diabetes Care*, volume 30, number 12, December 2007.

31 Jennifer S. Savage, Jennifer Orlet Fisher, and Leann L. Birch, “Parental influence on eating behavior: Conception to adolescence,” *Journal of Law, Medicine, and Ethics*, volume 35, issue 1, March 2007.

Box 3. Gender disparity

The prevalence of obesity (and overweight) is higher in women than men in the majority of countries, and, with a few exceptions, including the United Kingdom among developed economies, this effect is exaggerated in the countries with the highest overall obesity prevalence (Exhibit 11). The gender disparity is the result of a complex interplay of social, cultural, and biological factors that vary by socioeconomic groups within each country.¹ In Egypt, for instance, there is a 24 percentage-point difference—male prevalence of obesity is 21 percent vs. female prevalence of 45 percent. Eleven of the top 20 countries for prevalence have a gender gap of ten percentage points or more.² There is higher prevalence among females in 168 of the 196 countries for which OECD data are available. The 28 countries where there is no gender gap tend to have low overall prevalence and high GDP, and the prevalence in males is less than three percentage points greater than in females.

Higher prevalence in women implies that they carry more of the burden of obesity, including reduced life expectancy, greater risk of obesity-related disease, and increased medical costs. There is some evidence that higher prevalence has an impact on women's social mobility because of the link between obesity and educational attainment and income. One American study showed that obese teenage girls were less likely to enroll in college than girls in their age group who are not obese; this did not hold true for teenage boys. Enrollment by girls in high schools that had relatively few obese teenagers was also lower, suggesting that self-perception and confidence play a role.³ Research has also shown that obese women earn less than those who are not obese and that this income penalty continues throughout their careers. Men are not as disadvantaged as women in this respect.⁴

In countries with a large obesity gender gap, careful thought needs to be given about how best to intervene, particularly in countries where effective mitigation may require overcoming strong social and cultural barriers.⁵

1 L. D. Howe, R. Patel, and B. Galobardes, "Tipping the balance: Wider waistlines in men but wider inequalities in women," *International Journal of Epidemiology*, volume 39, number 2, April 2010.

2 We count the Pacific Islands and Caribbean Islands as one country each. The Pacific Islands comprise Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Kiribati, Marshall Islands, Nauru, Palau, Samoa, Solomon Islands, and Tonga. The Caribbean Islands comprise Bahamas, Barbados, Netherlands Antilles, Puerto Rico, and Saint Kitts and Nevis.

3 Robert Crosnoe, "Gender, obesity, and education," *Sociology of Education*, volume 80, number 3, July 2007.

4 Katherine Mason, "The unequal weight of discrimination: Gender, body size, and income inequality," *Social Problems*, volume 59, number 3, August 2012.

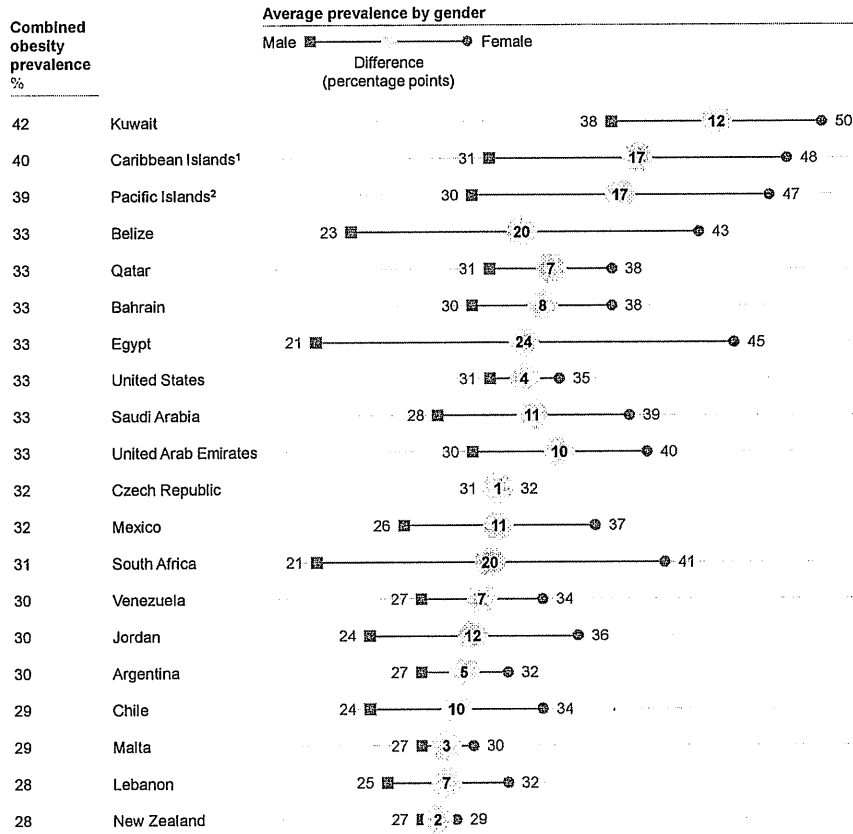
5 *Ibid.* L. D. Howe, R. Patel, and B. Galobardes, "Tipping the balance," April 2010.

Box 3. Gender disparity (continued)

Exhibit 11

**The prevalence of obesity is consistently higher in women than in men—
with a gap of up to 24 percentage points**

Male and female obesity prevalence for top 20 countries with highest prevalence, 2008
% of population



¹ Comprising Bahamas, Barbados, Netherlands Antilles, Puerto Rico, and Saint Kitts and Nevis.

² Comprising Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Kiribati, Marshall Islands, Nauru, Palau, Samoa, Solomon Islands, and Tonga.

SOURCE: OECD statistics; McKinsey Global Institute analysis

Box 4. The thrifty phenotype

There is some evidence that the nutritional condition of one generation is a significant variable affecting the BMI of subsequent generations. Research finds that epigenetic variations—a change in gene expression due to environmental factors—explain some of this and may contribute to the growing prevalence rates of major lifestyle diseases such as obesity, diabetes, and heart disease.¹ Two important relationships are being researched. One links recent undernutrition to a high propensity to metabolic disorders and high BMI in future generations; the other links obesity in parents to a higher propensity in their children, controlling for other confounding variables.

The Barker Theory—or the “thrifty phenotype hypothesis”—finds that fetal undernutrition during pregnancy is a risk factor for increasing mortality rates from a range of diseases and for becoming obese in later life.² The likelihood of developing type 2 diabetes increases in undernourished newborns.³ In-uterus undernutrition might inhibit sufficient fetal insulin production to ensure that enough of the scarce sugar is made available for the development of the brain. When sugar intake rises, children born to undernourished mothers are not able to produce the amount of insulin required to manage increased sugar levels in the body. The Barker Theory suggests that in countries where food was scarce but is now more plentiful—as incomes rise—obesity rates explode disproportionately compared to the rates in countries with no recent history of food scarcity, controlling for other major factors, such as economic development.

The Republic of Nauru, a Micronesian island, provides an apt case study. Until the mid-20th century, the island had a history of repeated food shortages and starvation. Once islanders left food poverty behind them, obesity and type 2 diabetes prevalence rates soared to among the highest worldwide; in 2010, 94 percent of men and 93 percent of women were overweight, and approximately 71 percent of the population was obese.⁴ The International Diabetes Federation identifies 31 percent of Nauruans as diabetic; in the 56- to 65-year-old age group, the share is 45 percent. The impact of these high obesity and diabetes rates has major consequences. These high prevalence rates are due to a range of factors: sedentary lifestyle, lack of arable land and reliance on highly processed food, and lack of health education. Some studies suggest that “epigenetic programming” of gene activity to protect from scarcity of nutrition also may be relevant.⁵

If this epigenetic programming is a driver of the exploding obesity prevalence in countries undergoing a major “nutritional transition”—which includes most rapidly developing middle-income countries in Asia, Latin America, the Middle East, and Africa—it raises serious concerns. The obesity and diabetes burden faced by these regions is likely to be disproportionately high, and in many cases, their health-care systems will not be sufficiently developed or accessible to mount an adequate response.

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- 1 Reinhard Stöger, “The thrifty epigenotype: An acquired and heritable predisposition for obesity and diabetes?” *Bioessays*, volume 30, number 2, February 2008.
 - 2 D. J. P. Barker, “The origins of the developmental origins theory,” *Journal of Internal Medicine*, volume 261, number 5, May 2007.
 - 3 J. G. Eriksson et al., “Early adiposity rebound in childhood and risk of type 2 diabetes in adult life,” *Diabetologia*, volume 46, number 2, February 2003; George J. Dover, “The Barker hypothesis: How pediatricians will diagnose and prevent common adult-onset diseases,” *Transactions of the American Clinical and Climatological Association*, volume 120, January 2009.
 - 4 *Nauru country health information profile 2011*, statistical annex, World Health Organization.
 - 5 *Ibid.* Reinhard Stöger, “The thrifty epigenotype,” February 2008.

□ □ □

It is no exaggeration to say that across the globe, obesity and its associated medical conditions have reached crisis proportions. Left unchecked, rising prevalence is very likely to have an even more significant economic impact than it does today—putting pressure on employers and the productivity of their companies and on health-care systems, and on the public purse. The question is how best to combat it. In Chapter 2, we discuss 18 major groups of interventions that have been deployed somewhere in the world—a menu of options to consider in the intensifying fight against obesity.



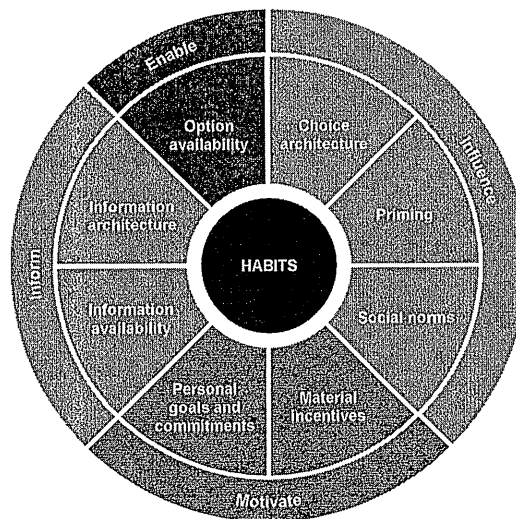
2. Tackling obesity

Obesity is the result of a multitude of factors, and therefore no single solution is likely to be effective in tackling it. A range of interventions that encourage and empower individuals to make the required behavioral changes will be necessary. These interventions need to be systematic, not only aiming for an immediate impact on the net energy balance but also making sure that change is sustained. A comprehensive portfolio of interventions is also required to target the different needs and responsiveness of various population segments. Governments, health-care systems, employers, retailers, consumer-goods companies, and consumers themselves all need to play their part.

To map out the range of solutions available to society to change its collective behavior and reduce obesity, we have developed a framework that classifies interventions to tackle obesity. The framework draws on the most recent health-related behavioral-change theory and insights from behavioral economics. The framework comprises four types of mechanism: mechanisms that inform, enable, motivate, and influence (Exhibit 12).

Exhibit 12

MGI has developed a framework to disaggregate mechanisms for population behavioral change



SOURCE: Expert interviews; McKinsey Global Institute analysis

The “inform” segment includes whether information is made available and how it is communicated. Information availability tests whether appropriate information is provided to relevant populations to stimulate behavioral change. One example would be a doctor advising a patient to lose weight in order to reduce the risk of a heart attack. Another example is whether nutritional information is included on food labels. Information architecture describes where and how information is presented. So, for instance, a doctor does not just issue a general warning but

details how the risk of having a heart attack decreases with every pound lost. Food labels are color-coded so that they are more easily understood.

The “enable” segment assesses the extent to which options to change behavior are available. Examples include giving individuals access to green spaces or a gym to facilitate exercise, or introducing healthy options in a canteen.

The “motivate” segment explores the main methods for encouraging people to consciously change their behavior, such as by setting personal goals or making commitments (exercising, losing weight). These goals or commitments can be aided by, for instance, exercise-tracking wristbands. The other major motivational mechanism is the use of material incentives, including financial incentives, to lose weight or exercise more. Financial incentives can be direct. For instance, the government of Abu Dhabi rewards participants in a weight-loss challenge with a gram of gold for each kilogram lost. Or they can be indirect, as in employers or insurers reducing health-care premiums.

“Influence” is the final segment, covering the major means for stimulating different behavior—whether or not individuals are fully aware of their behavioral change. Of these, choice architecture reflects how choices are presented and includes the importance of standards or defaults. Examples of using choice architecture to change diet or exercise behavior are making portion sizes of unhealthy food smaller and changing the relative pricing of different food products. Priming covers exposure to a particular stimulus or cue that affects perception, judgment, and decisions about consumption, such as cartoon characters promoting fruit and vegetables to children, or pictures associated with health in supermarkets.³² The final influencing mechanisms relate to the effect of social norms on individuals’ behavior, which can arise from a wide range of interventions that change attitudes.

To shed light on how the framework may help in the fight against obesity, we looked at other attempts to change the behavior of entire populations to ascertain how the different mechanisms have worked in practice (see Box 5, “The lessons from efforts to change behavior”). The analysis has also considered two types of intervention that do not rely as much on behavioral change, and which are targeted at small segments of highly obese people: pharmaceuticals and surgery.

MGI HAS IDENTIFIED 74 INTERVENTIONS TO TACKLE OBESITY THAT FALL INTO 18 GROUPS

We set out to develop a comprehensive catalog of interventions that could be used to reduce obesity. Working in conjunction with policy advisers, population-health academics, and individuals from companies, and drawing on an extensive review of research, we have identified 74 intervention levers that are being discussed or piloted around the world. The 74 intervention levers fall broadly into 18 groups (Exhibit 13).³³

32 The Healthy Choices Pilot, launched in a Morrisons supermarket in Salford, United Kingdom, increased fresh fruit sales by 20 percentage points through the introduction of “Let’s shop healthier” signage and pictures of health-care professionals. The cartoon “Popeye” reportedly increased spinach sales in the 1930s in the United States by 33 percent. Market dynamics have evolved considerably, but children today are likely to be just as responsive to the eating habits of their cartoon heroes.

33 For a detailed assessment of documented impact, examples, and feasibility constraints of each intervention area, please contact obesity@mckinsey.com for back-up materials.

Exhibit 13
Intervention groups and descriptions

	<p>1. Active transport Facilitating and encouraging walking, cycling, and public transport, which engender more physical activity</p>		<p>10. Price promotions Restricting promotional activity in high-calorie impulse foods to decrease consumption</p>
	<p>2. Health-care payors Providing incentives or support to encourage healthy behavior. These can include general financial incentives, such as premium rebates or reward points, or more targeted facilitating incentives such as free gym membership. Payors can also deliver other interventions such as parental and weight-management programs</p>		<p>11. Public-health campaigns Delivering a public-health campaign through multiple media outlets to promote healthy eating and physical activity habits</p>
	<p>3. Healthy meals Improving the health quality of meals in controlled settings such as schools and workplaces</p>		<p>12. Reformulation Incrementally reducing calories in food products to drive subconscious reduction in consumption</p>
	<p>4. High-calorie food and drink availability Reducing the ready availability of high-calorie foods to help control impulse consumption, including removing vending machines from schools and workplaces, high-calorie foods from supermarket checkouts, and fast-food retailers from locations outside schools</p>		<p>13. School curriculum Introducing additional hours of physical education and healthy nutrition in school curricula to encourage healthier habits</p>
	<p>6. Labeling Providing calorie and other nutritional labeling so that consumers can understand the content of their food. Labels can be plain text or “engaging”—an easy-to-interpret assessment of the health of the product (e.g., traffic lights)</p>		<p>14. Subsidies, taxes, and prices Changing agricultural policy or regulatory policy to adjust consumer prices and the supply of select food and/or beverage categories</p>
	<p>6. Media restrictions Restricting high-calorie food advertising to reduce exposure to marketing that is proven to promote consumption</p>	<p>(not behavioral)</p>	<p>15. Surgery Scaling up delivery of bariatric surgery to reduce stomach capacity and deliver immediate change in food consumption</p>
	<p>7. Parental education Empowering and educating parents to promote a healthier lifestyle for their children through regular parental guidance sessions</p>		<p>16. Urban environment Making changes to physical activity and food access to facilitate and encourage healthy habits, such as increasing the walkability of cities and green space, and improving access to grocery stores</p>
<p>(not behavioral)</p>	<p>8. Pharmaceuticals Intervening with drugs to reverse obesity rapidly in cases where it is creating immediate health risks</p>		<p>17. Weight-management programs Educating and empowering individuals to change key weight behavior through counseling, physical activity programs, and education</p>
	<p>9. Portion control Encouraging appropriate consumption through incremental (i.e., 1 to 5 percent) reductions in portion sizes and designing packaging to better delineate portion size to help consumers moderate their consumption</p>		<p>18. Workplace wellness Offering programs and engaging employees to encourage healthy behavior, for example through financial and non-financial incentives, team competitions, and the provision of education and self-management tools such as personal tracking devices</p>

Box 5. The lessons from efforts to change behavior

Having developed the behavioral-change framework, we tested it against existing examples of major behavioral-change campaigns over the past few decades. Specifically, we have examined campaigns to improve road safety in the United Kingdom since the 1960s, Australia's campaign to reduce the prevalence of skin cancer that took off in the 1980s, and a campaign against drug abuse in the United States that began in the 1980s. This exercise shed some light on how the different mechanisms have been used to date, their relative importance or potential impact, and success factors for effective behavioral change. We highlight findings on each of the four types of behavioral-change mechanism in the framework: inform, enable, motivate, and influence.

Inform: The impact of information availability can be enhanced by thoughtful information architecture. All public-health campaigns inform the public about the risks of certain behavior, whether that is taking recreational drugs, driving while drunk, not using seat belts, or not wearing sunscreen. Although the information itself is important, the evolution of public-health campaigns suggests that for maximum impact, the information needs to be delivered effectively. The experience of the campaigns that we have analyzed suggests that successful behavioral change relies on a number of elements. It is crucial to identify what information is likely to influence different groups. In all the case studies we looked at, young people, particularly males, are less amenable than other groups to warnings about risky behavior. In addition, changing behavior requires a real understanding of what has an impact on attitudes. For instance, initial "drink driving" advertisements in the United Kingdom focused on the risk of injury or death, but focus groups suggested that this message did not seem to resonate with 17- to 24-year-old males, the biggest offenders. The UK Department for Transport tested members of this group for what really motivated them and concluded that they were more fearful of getting caught drunk driving, having an accident, and being prosecuted. Subsequent ads highlighted the impact of a criminal record on future career prospects, and this significantly raised the response rate in that demographic group, leading to court convictions for drunk or drugged driving of young males falling 41 percent from 2003 to 2010.

The theory of best-practice communications suggests that a memorable message or slogan is also important. The very successful Australian sun protection campaign employed a memorable message. The campaign phrase "Slip Slop Slap" (slip on a shirt, slop on sunscreen, slap on a hat), with its use of alliteration and monosyllables, is short and memorable. The medium of the message can also help to target unresponsive groups. The UK drink-driving campaign was primarily channeled through Radio 1, the main pop-radio station for young people. The right timing is also important. One leg of Unilever's hand-sanitation campaign in India was held during Kumbh Mela, an annual pilgrimage when millions of Hindus gather in the same place. Unilever stamped 2.5 million pieces of roti (Indian flatbread) provided to pilgrims with the phrase, "Did you wash your hands with Lifebuoy?" How, where, and when information is communicated are important dimensions in the effectiveness of the messaging.

Enable: Making change easy through option availability and choice architecture (influence) is critical. For individuals who want to tackle being overweight and even for those who do not particularly care about their weight, making behavior change easy will improve outcomes. The Department for Transport in the United Kingdom encouraged the improved availability of non-alcoholic drinks in British pubs to make it easier to not drink while out with friends. In some areas of the United Kingdom, the NHS posts free chlamydia tests (urine sample pots with prepaid envelopes to send for testing) for 14- to 24-year-olds to make it easier for young people to get tested. Conversely, making bad behavior more difficult is highly effective. The ban on smoking indoors in many countries is a compelling example.

Box 5. The lessons from efforts to change behavior (continued)

Motivate: Personal goals and commitments and material incentives are important but have more variable success rates than other behavioral-change programs. Programs based solely on setting personal goals and commitments have a mixed record of success. One example of such a program is Drug Abuse Resistance Education, or DARE, a high-profile US education campaign in place since 1984 in which 26 million American children and ten million children in other countries have participated. Children are taught about drug abuse over the course of ten weeks in a program facilitated by their schools and led by police officers, and they commit to a pledge to take a stand against drug abuse. However, education and commitment alone were not enough. In 2001, the US surgeon general removed federal funding from the program because he judged it to be ineffective. In 2003, the US Government Accountability Office concluded that the program generated a boomerang effect: those who participated in DARE proceeded to have above-average rates of drug use. This finding was given traction by a University of Indiana study that found that students completing the program had higher rates of hallucinogenic drug use than those who had not taken part. More successful programs that rely on personal commitments, such as Weight Watchers, make other behavioral-change mechanisms such as leveraging social norms central to their efforts. On material incentives or disincentives, tobacco taxes in the United Kingdom have grown steadily since first introduced and now account for about 80 percent of the recommended retail price. These taxes have likely contributed to a steady decline in smoking over the past 30 years, particularly deterring teenagers from starting to smoke.¹ The price disincentive was delivered alongside comprehensive and aggressive public-health and school curriculum education campaigns. Research shows that, in the United Kingdom and the United States, changes in social norms were at least as important as shifting behavior.²

Influence: Addressing social norms together is a powerful change mechanism.

Campaigns that deploy both these mechanisms are motivated by the hypothesis that they are likely to be more effective in changing public behavior than education alone. The United Kingdom aimed to stigmatize drunk drivers as recklessly risking the lives of others. An Australian campaign to discourage speeding implied that men who speed lacked virility, which proved a highly effective message. Endorsement by celebrities is a powerful way to shift social norms. A campaign led by Esther Rantzen, a well-known television presenter in the United Kingdom, stimulated public concern over child car seats that led to Parliament's making the seats mandatory. Stop-smoking campaigns stigmatized smoking in the presence of children and helped to make smoking less socially acceptable.

1 Pearl Bader, David Boisclair, and Roberta Ferrence, "Effects of tobacco taxation and pricing on smoking behavior in high risk populations: A knowledge synthesis," *International Journal of Environmental Research and Public Health*, volume 8, number 11, November 2011.

2 Kevin Callison and Robert Kaestner, *Do higher tobacco taxes reduce adult smoking? New evidence of the effect of recent cigarette tax increases in adult smoking*, NBER working paper number 18326, August 2012.

MGI HAS ASSESSED THE POTENTIAL IMPACT AND COST-EFFECTIVENESS OF A SUBSET OF INTERVENTIONS

While there have been research projects and pilots on individual interventions to address obesity, there has been little systematic attempt to analyze the relative potential cost-effectiveness and impact of a set of interventions if they are applied at the population level. To begin to address this gap, MGI has posed the question, "What is the full possible solution set out there, and what could be achieved in the near future if all relevant societal sectors properly engage and interventions are scaled up?" We analyzed the potential impact at a population level of those interventions for which we have been able to gather sufficient evidence of their impact from pilots and research projects around the world. We have been able to gather information relevant to 44 of the 74 interventions that we have identified in total, which appear in 16 of the 18 intervention areas. We have used this analysis to assess what a program to reverse rising obesity might look like.

The impact of an intervention is likely to be different in different countries due to distinct structural, behavioral, and cultural baselines. We have illustrated the potential scale of impact and cost-effectiveness of the individual interventions in a developed economy by looking at the United Kingdom. We are developing a similar projection for a developing economy through studies for Mexico or China. Both countries have high current and projected obesity prevalence. While there are likely to be differences between countries, we believe that the United Kingdom, Mexico, and China pilots are directionally correct for the impact and cost-effectiveness of interventions in other developed and developing economies.

Our research is based on an extensive review of more than 500 research studies from around the world. Although we pressure-tested each of these studies for quality of design, comprehensiveness and relevance, this discussion paper does not act as independent verification for each and every one, but rather an attempt to generalize for their findings. From these we have extrapolated the potential impact of various measures if they were to be adopted in the United Kingdom. We have conducted considerable pressure testing of our assessment of the existing evidence with a wide range of academics and experts on obesity. Our approach to interpreting existing data and the potential to scale up impact has been conservative.

However, we should stress that the science of addressing obesity is relatively young, and, due to limitations in the available data, the analysis presented here should be regarded as only an initial attempt to determine the potential impact and cost-effectiveness of a subset of potential interventions. The conclusions we draw on an integrated response to obesity should be viewed as the equivalent of a 16th-century map of the world; some islands may be missing and the shapes of continents may be somewhat skewed, but it is directionally correct. Our program undoubtedly misses some interventions and over- or underestimates the impact of other interventions. However, over the next few years, we intend to develop our analysis of the impact of different obesity intervention areas.

Some of the 74 interventions that we have identified do not yet lend themselves to a sufficiently robust assessment of their impact on obesity. These include building more parks to facilitate physical activity, making urban centers pedestrian-friendly to encourage active transport, or providing improved access to grocery stores to facilitate balanced diets. Such interventions have a long-term, diffuse impact that is hard to measure in a controlled study. This does not mean that they are due any less consideration.

Furthermore, some interventions, including drugs such as liraglutide and food-stamp programs that subsidize healthy foods and restrict unhealthy foods, are only now being tested for the first time.³⁴ For these reasons, this analysis is both an early and incomplete perspective on the range of potential solutions.

The main findings that emerge from our analysis are:

- **High impact is affordable from the perspective of society.** Our analysis suggests that 95 percent of interventions measured are highly cost-effective.³⁵ If the United Kingdom were to deploy all the interventions we were able to analyze, it could reverse rising obesity and bring roughly 20 percent of overweight and obese individuals back into the normal weight category within five to ten years. This would reduce the number of obese and overweight people in the United Kingdom by roughly the population of Austria.
- **However, reversing the health burden requires a multipronged approach—no single intervention can offer a solution.** Deploying as many interventions as possible of those we have identified would likely create considerable long-term synergies by raising awareness of the issue.
- **Education and personal responsibility are important to deliver this impact but, in themselves, are not enough.** To reverse the growing obesity burden, interventions are required that change society-wide norms and the environment that individuals face when making choices on eating, drinking, and engaging in physical activity.
- **Different interventions target different population segments, and some have long-term, slow-burn impact.** Even if some interventions have a low impact in the short term, they are still an important part of the solution.
- **Effective action to tackle obesity requires a renewed focus on coordination.** It is particularly important if we are to capture the high potential impact that food and beverage manufacturers, retailers, food-service providers, and restaurants could have on the problem.³⁶

34 Researchers at the University of Minnesota are conducting trials on two strategies for improving the nutritional quality of the diets of participants in food-benefit programs, considering the impact of different incentives and restrictions, namely bonus refunds for each dollar spent on fruit and vegetables, and restrictions on the purchase of high-calorie processed goods using benefit dollars.

35 According to World Health Organization measures of cost-effectiveness, spending below one times per capita GDP per DALY saved is very cost-effective, investment of one to three times per capita GDP per DALY saved is cost-effective, and spending of above three times per capita GDP is not cost-effective.

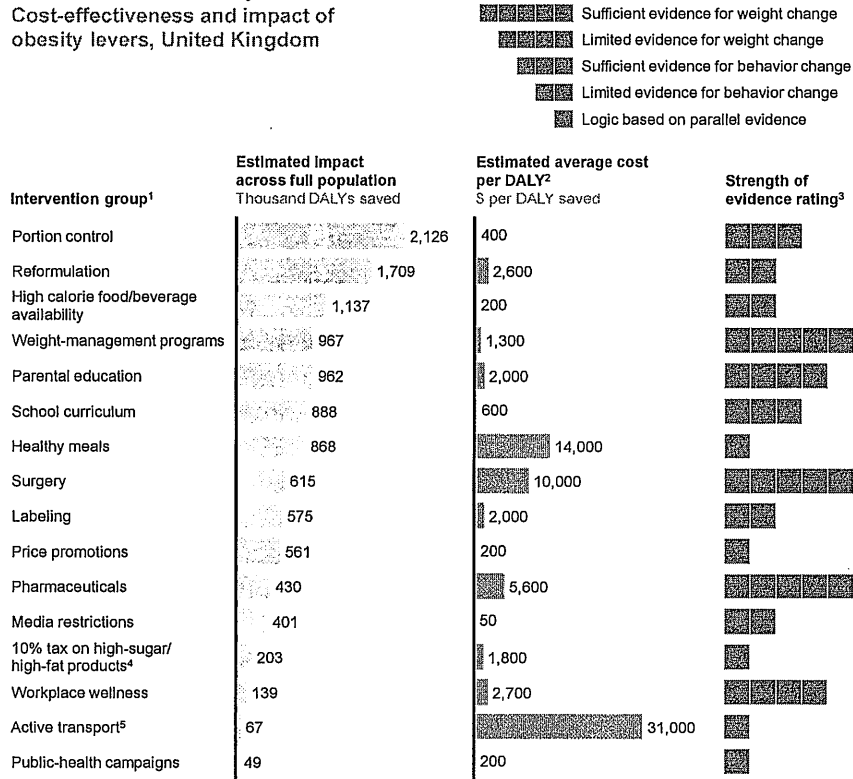
36 In the food and beverage industry, we include manufacturers, retailers, and foodservice providers.

AN OBESITY ABATEMENT PROGRAM

Our analysis suggests that a number of interventions have particularly high immediate impact at a low cost to society. The fact that a large number of effective interventions could be deployed cost-effectively suggests that the multipronged response necessary to mitigate rising obesity-prevalence rates is indeed possible and economically attractive.

We hope that this analysis can be used to help understand the nature of the response required, as well as start to build a fact base that can serve as an ongoing—and evolving—tool to help policy makers, the private sector, and individuals estimate the potential impact and cost-effectiveness of different interventions (see Exhibit 14 and Box 6, “MGI’s analysis of the effectiveness of obesity interventions”).

Exhibit 14
There is considerable scope to have high impact on obesity in a cost-effective way
 Cost-effectiveness and impact of obesity levers, United Kingdom



1 Includes only non-overlapping levers in each category. Where two levers overlapped, such as plain and engaging labeling or gastric banding and bariatric surgery, the higher-impact lever was chosen.
 2 Impact and cost over lifetime of 2014 population; uses UK-specific cost-effectiveness calculated using GDP and World Health Organization methodology.
 3 Based on the evidence rating system of the Oxford Centre for Evidence-Based Medicine.
 4 All intervention impact modeling was subject to scalable assumptions on potential reach. Tax levers are also subject to scalability of levy incurred. In this case, MGI modeled a 10 percent tax on a set of high-sugar and high-fat food categories, based on empirical precedents and size of levy often studied. It is scalable, and impact would increase close to directly with increase in levy.
 5 Impact assessed here is only from reduced body mass index (BMI), not full health benefits of some interventions (e.g., cardiovascular health, mental health). For example, active transport health benefits are higher when all of these benefits are taken into account.

NOTE: We do not include health-care payors because this is a less relevant intervention in the United Kingdom context. There are insufficient data to quantify urban-environment interventions.

SOURCE: Literature review, expert interviews; McKinsey Global Institute analysis

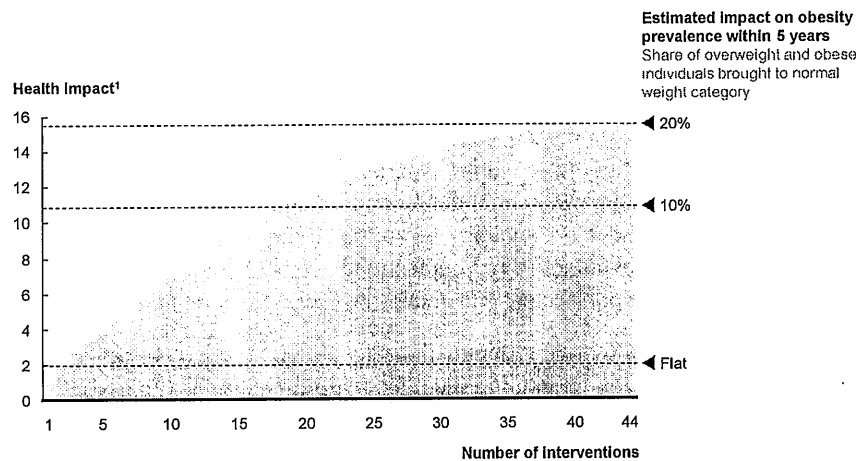
Our decision to quantify just 44 of the 74 measures we have identified should not be taken as a judgment on whether other interventions might or might not be effective. Just because we cannot estimate the potential impact of some of the others to robust standards does not mean they do not have considerable impact. Policy makers and other sectors of society should consider all 74 interventions—and any others that we have not identified—as opportunities for innovation. Our list of 74 interventions should be seen as a starting point in a broad effort to achieve a significant step change in individual behavior and the food and beverage and physical activity environment necessary to reverse the rising prevalence of obesity. It is also important to understand the underlying assumptions that we have made; depending on which assumptions we use, the impact can vary. We took an initial cut to help engender a good dialogue that we hope will continue.

HIGH IMPACT IS ACHIEVABLE AT LOW COST TO SOCIETY

Significant impact on obesity prevalence should be possible at a low cost, according to our analysis. In our UK analysis, we find that 95 percent of the 44 interventions included are highly cost-effective from the point of view of society under WHO definitions. Moreover, many of the less cost-effective interventions have other important benefits beyond a reduction in obesity that are not captured here. For example, subsidizing school meals has been shown to improve exam results; investing in urban cycling improves cardiovascular and mental health and reduces carbon emissions.

Our UK pilot analysis indicates that deploying all 44 interventions that we were able to assess could reverse the rising trajectory of obesity and return roughly 20 percent of overweight and obese individuals to the normal weight category (Exhibit 15). This is approximately equivalent to the entire population of Austria of 8.5 million people. The impact could be even greater with effective deployment of other interventions that we have not yet been able to analyze or that are still under development, such as pharmaceuticals in their early research stages.

Exhibit 15
MGI quantified the maximum potential of 60 percent of the interventions identified, which together could bring 20 percent of overweight and obese individuals into a normal weight category



¹ Impact is captured as million DALYs saved over full lifetime of 2014 UK population, taking into account health benefits accrued later in life.

SOURCE: Literature review; expert interviews; McKinsey Global Institute analysis

Box 6. MGI's analysis of the effectiveness of obesity interventions

MGI has assessed the relative impact and likely cost to deploy interventions to abate obesity. These deployment costs can then be compared with the value that comes from reducing obesity, including, for instance, reduced health-care costs and higher productivity.

In this analysis, we assessed both interventions to address existing cases of obesity and structural measures to prevent new cases. Our initial analysis is for the United Kingdom, using the 44 interventions for which we were able to gather sufficient data. These interventions are highlighted in the full table in the executive summary. While the scale and cost of interventions are likely to vary in different geographies, the methodology that underlies the UK analysis can be applied to overcoming obesity in other countries and to other obesity intervention areas. Where interventions could either be regulated by government or “self-regulated” by the food and beverage industry, schools, employers, or health-care systems, we have assessed both regulated and self-regulated options only where there is a precedent of government regulation.

In this abatement analysis, we assessed the impact of each intervention on a single cohort—the UK population in 2014. For each intervention, we reviewed the evidence of sustained impact on weight, energy consumption, or physical activity, taking into account patterns in weight regain or evidence on compensation and substitution behavior. We also assessed a best-case scenario of feasible interventions that could be rolled out across the population of the United Kingdom and assumed best-practice delivery of each intervention. We project the impact on health over a full lifetime compared with a baseline of the state of each individual's health if the intervention had not been deployed. This approach ensures that we capture the full preventive effect of many interventions whose impact is not realized until later in life. We measure the impact of each intervention using DALYs—disability-adjusted life years—saved. DALYs capture the burden of poor health by measuring years of life lost and years of life impaired by a disease condition. In the case of interventions that include an increase in physical activity, such as various weight-management programs, community-sports programs, school interventions, and workplace wellness, we capture the health benefits that are associated with a reduced BMI. This is only a partial picture of the full health benefits delivered by physical activity, which include cardiovascular and mental health improvements. Therefore, this assessment does not capture the full potential return on investment of physical activity as a source of health improvement.

For each intervention, we estimate the cost-effectiveness of deploying it in terms of thousands of dollars spent per DALY saved. Cost-effectiveness is derived from the average, rather than the marginal, cost of delivering each intervention. We include only the direct cost of deployment and exclude secondary economic impacts such as reduced revenue to a manufacturer or increased tax revenue that are salient from the perspective of a specific sector in society but not from a “societal” lens.

These costs can then be compared with the benefits of a reduction in DALYs, including savings accruing to health-care systems and employers. Our societal lens uses a neutral “value of a DALY” metric, which does not apply to any single sector of society, to assess which interventions emerge as societally cost-effective. This accounts for the approximate societal economic benefit of a DALY saved.

Box 6. MGI's analysis of the effectiveness of obesity interventions (continued)

To assess the cost-effectiveness of interventions, we have applied the World Health Organization's cost-effectiveness brackets for DALYs. The WHO defines an intervention that costs less than one times per capita GDP per DALY saved as highly cost-effective. On the same basis, any cost that is one to three times per capita GDP is considered cost-effective, and any cost above three times per capita GDP is not cost-effective. In the UK context, less than £22,500 (\$30,000) per DALY is very cost-effective; £22,500 to £67,500 per DALY is cost-effective; and any intervention costing more than £67,500 per DALY is not cost-effective.

It is critical to note that some interventions assessed—such as taxation and changing pricing and promotion practices—are scalar and can be deployed at lower or higher levels. Our analysis is based on what is standardly assessed or recommended in academic literature. Potential impact is tied to size of a levy or price change.

There is high variability in the quality of the assessment of obesity interventions to date. While it is clearly not possible to achieve double-blind trials of behavioral interventions, we do believe that more rigor is needed on this in the future. To highlight the quality of the evidence to date, we have developed a categorization of the strength of evidence of each intervention based on the Oxford Centre for Evidence-Based Medicine 2011 Levels of Evidence system. This categorization picks up the quality of the evidence and also whether the evidence covers changes in energy in/energy out or goes further and reflects changes in weight.

Our classification categories are (from high to low):

- **Level 5:** Sufficient evidence of effectiveness on weight. Based on systematic review of randomized trials on **weight change**.
- **Level 4:** Limited evidence of effectiveness on weight. Based on observational study or cohort/follow-up study on **weight change**.
- **Level 3:** Sufficient evidence of effectiveness on change in consumption or physical activity. Developed physiological model of weight change based on a review of randomized trials on **change in consumption or physical activity levels**.
- **Level 2:** Limited evidence of effectiveness on change in consumption or physical activity. Developed physiological model of weight change based on at least one randomized trial or observational study on **change in consumption or physical activity levels**.
- **Level 1:** Logic based on parallel or indirect evidence. **No direct evidence for change in weight or change in consumption or physical activity levels.**

Based on this analysis, the highest-impact intervention area is portion control, and this might have the advantage of being profitable as there is a saving in ingredients. Reformulation of fast food and processed foods is the second-highest-impact intervention type, but here some costs are involved. Many of the other highest-impact intervention areas—parental education, introducing healthy meals in schools and workplaces, changes in the school curriculum to include more physical exercise—are also highly cost-effective.

We find that some high-impact intervention areas have not received much public attention. Intensive parental-education schemes are not widely deployed or discussed but show considerable potential for improving childhood obesity rates. Reconfiguring price promotions, for instance, which involves reducing retail promotion (such as offers of three for the price of two) of nutritionally poor foods and investing it in promoting healthier foods is an intervention that few are discussing. Another effective intervention that has received relatively little attention in the United Kingdom is introducing calorie labeling in fast-food restaurants, coffee shops, and other eating environments away from home. In the United States, such labeling has encouraged producers and retailers to make their products healthier or reduce portion size.³⁷

While the context of every country is different, our findings for the United Kingdom are, we believe, indicative of the impact that could be achieved in other developed economies. Indeed, we believe that our UK estimates of impact are conservative for two reasons. First, we have interpreted the existing evidence on impact and reach using conservative assumptions. Second, and importantly, we measure only the medium-term impact—after compensation and weight regain are taken into account—of the 44 interventions across 16 intervention areas. Yet, particularly if interventions are simultaneous, in the long term there are likely to be some synergies that reinforce behavioral change. For instance, if a country were to intervene through hands-on nutritional and physical activity education in schools, an end to easy access to high-calorie foods and beverages in schools, and a public-health campaign associating healthy eating and active living with popular cultural icons for children such as celebrities or cartoon characters, this could help to support a broad cultural shift in the way children view nutrition and physical activity. We have seen a similar shift in attitudes in relation to smoking and drunk driving that has a multiplier effect. Such a shift in regard to food would potentially have a larger impact on children's health than our assessment of these three individual interventions.

NO SINGLE INTERVENTION CAN REVERSE THE OBESITY BURDEN—A MULTIPRONGED APPROACH IS REQUIRED

Our assessment finds that the single highest-impact intervention area is reducing the size of portions in packaged foods, fast-food restaurants, and canteens. This saves more than two million DALYs over the lifetime of the 2014 population, about 4 percent of the total disease burden attributable to high BMI. However, even deploying the intervention with maximum impact, we achieve only this relatively modest reduction in the overall burden of obesity. Significant impact requires as many interventions as possible to be deployed by as wide as possible a range of

³⁷ Barbara Bruemmer et al., "Energy, saturated fat, and sodium were lower in entrées at chain restaurants at 18 months compared with 6 months following the implementation of mandatory menu labeling regulation in King County, Washington," *Journal of the Academy of Nutrition and Dietetics*, volume 112, number 8, August 2012.

sectors of society—particularly if the aim is to shift cultural norms around eating and physical activity habits.

An additional reason that a comprehensive portfolio of interventions is required is the desirability of addressing all relevant segments of the population. High-income older women have different behavioral change triggers than low-income young men. To influence the diet of three-year-olds, there is only one route—through their parents. For those people who are already struggling with high BMI, subconscious interventions or changes to societal norms are very unlikely to reverse their condition. Targeted interventions are needed, even if they are not the most cost-effective. As we have discussed, prevention is both easier and less costly than targeted later-stage intervention, but prevention does not help those who are already at the extreme end of the BMI spectrum. For most of these individuals, intensive, and less cost-effective, interventions that induce a change in behavior, such as education and motivational tools, need to be supplemented by subconscious, structural changes.³⁸

CHANGES TO SOCIETAL NORMS AND SUBCONSCIOUS MECHANISMS ARE CRITICAL TO SUPPORT LONG-TERM BEHAVIORAL CHANGE

From our analysis, we see a clear pattern in the types of interventions that can have significant impact on obesity as well as those that are likely to have less impact or have impact of only short duration. In general, we find that the interventions likely to have the most lasting effects are those that rely less on the volition of citizens and more on changes in their external environment, such as reducing portion sizes, reconfiguring promotional practices, or increasing compulsory exercise in schools.

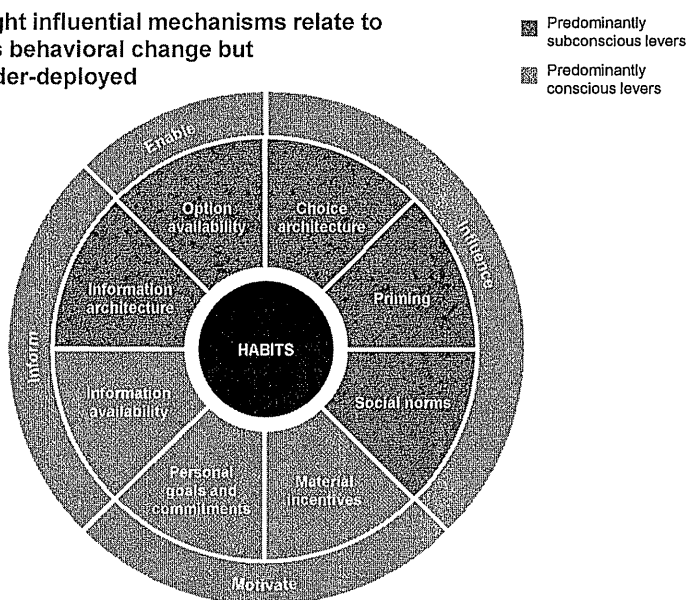
We have allocated our interventions to curb obesity into two groups: “conscious” mechanisms, which individuals participate in or engage with, and “subconscious” mechanisms, which alter the environment facing the consumer, maybe in ways that might not even be detectable (Exhibit 16).

Conscious approaches include educating individuals and motivating them through explicit goal setting and material incentives, such as monetary rewards. The segments that are most associated with conscious behavioral change are information availability, personal goals and commitments, and material incentives. Subconscious mechanisms can include changes in available options (changing school canteen provisions, for example) and shifts in social norms that shape behavior. The segments that drive subconscious behavioral change include information architecture (variation in how information is presented), option availability, and three forms of influence: choice architecture (variation in how choices are presented), priming (exposure to a specific stimuli), and social norms.

³⁸ Our model takes into account the full demographic profile of the population affected by the deployment of interventions in the analysis. It is sensitive to the fact that bariatric surgery applies only to people with a BMI of 35-plus but that some food and beverage industry interventions affect most of the population.

Exhibit 16

Five out of eight influential mechanisms relate to subconscious behavioral change but tend to be under-deployed



SOURCE: Expert interviews; McKinsey Global Institute analysis

Society to date has disproportionately focused on conscious mechanisms such as education and personal responsibility

So far, society's approach to addressing obesity has focused heavily on conscious mechanisms: ensuring information availability through labeling practices and public-health campaigns, weight-management plans with explicit goal setting, and material incentives in workplace wellness schemes. These are critical elements in a comprehensive program of behavioral change. However, based on existing evidence, they have not proved effective enough to slow or reverse the progression of the obesity crisis. Part of the reason for this is lack of scale, but based on our analysis, interventions are also needed to make behavioral change easier.

Why are conscious mechanisms by themselves often not enough? Human nature is to blame. Human beings have amazing power to rationalize and selectively interpret their own behavior—and, too often, they also have inadequate willpower. When individuals consciously try to change net energy balance by reducing caloric intake and raising activity levels, they consistently fail.

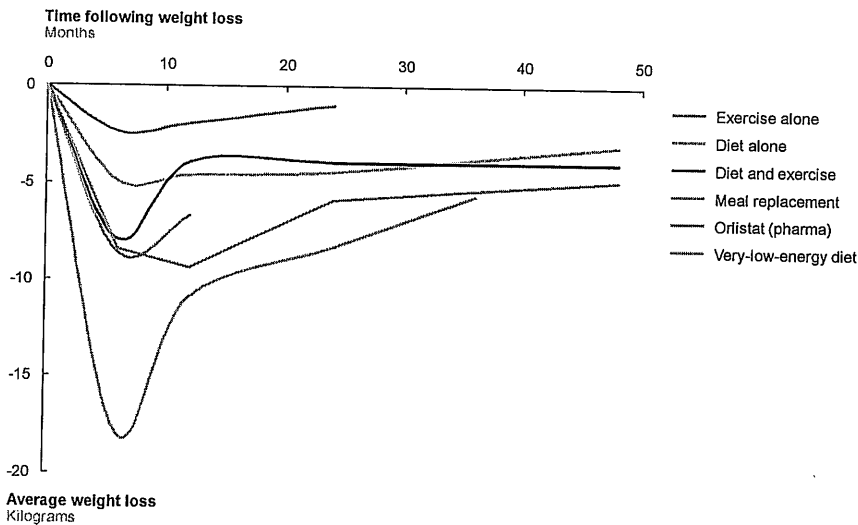
Moreover, brain power is no match for lack of willpower. Intellectually, people grasp the messages of public-health campaigns that seed an understanding of the issue and make clear the desired behavior. But these programs have low conversion rates—the number of people who then make the choice to change behavior. Moreover, of the small proportion of the population who turn thought into action, a significantly smaller share is likely to succeed. Willpower is a notoriously limited resource, and as a result individuals have a poor record of changing their own habits, particularly in the face of an environmental and cultural context that makes that change harder.

Conscious efforts by individuals do have an impact—but often this impact reverses in the long term. Participants in weight-management programs, dietary counseling, and drug treatment, as well as bariatric surgery patients, all achieve good weight loss in the first six months. But even in the case of surgery, initial success is typically followed by a slow, creeping regain of the weight lost. Individuals often end up at the same weight they were before the interventions (Exhibit 17).

Exhibit 17

Traditional targeted interventions struggle to sustain their impact, with weight regain ranging from 30 to 70 percent of the original loss

Average weight loss according to different strategies—a meta-study of clinical trials



SOURCE: Marion Franz et al., "Weight-loss outcomes: A systematic review and meta-analysis of weight-loss clinical trials with a minimum 1-year follow-up," *Journal of the American Dietetic Association*, volume 107, number 10, October 2007; D. Foxcroft, "Orlistat for the treatment of obesity: Cost utility model," *Obesity Reviews*, volume 6, number 4, November 2005; O. O'Meara et al., "A rapid and systematic review of the clinical effectiveness and cost-effectiveness of orlistat in the management of obesity," *Health Technology Assessment*, volume 5, number 18, February 2001; J. Torgerson et al., "XENical in the prevention of diabetes in obese subjects (XENDOS) study: A randomized study of orlistat as an adjunct to lifestyle changes for the prevention of type 2 diabetes in obese patients," *Diabetes Care*, volume 27, number 1, January 2004; McKinsey Global Institute analysis

These late-stage interventions often fail because they are fighting a losing battle with a powerful pair of forces: the body's desire to secure high-energy foods, honed after centuries of evolution, and the modern environment, where cheap, high-calorie food is readily available and work and lifestyles require little physical exertion. The individual's desire to change—no matter how intense—is overwhelmed by these forces. One specialist in childhood obesity describes the challenge of today's children to maintain a healthy weight as like the plight of the mythological Sisyphus pushing his rock up a hill, only to have it slip back to the bottom, over and over again. So, in addition to conscious mechanisms—educating the child to make healthy choices—the effort to control obesity requires changing the environment that shapes behavior relating to nutrition and physical activity, which serves to lighten the mass of Sisyphus's stone as it is pushed uphill.

Subconscious mechanisms change the physical activity and food and drink environments, and are therefore more likely to change behavior

Subconscious mechanisms serve to reset the default in order to make healthy behaviors easier and more natural. The advantage of subconscious mechanisms for behavioral change is that they do not rely on an individual's deciding to change. By removing the need for willpower from the equation, subconscious interventions have a greater chance of succeeding. They also can have wider impact than interventions that target an individual's behavior: a reformulation of fast food to reduce fat and sugar reaches all regular fast-food eaters, while a healthy menu option is likely to be considered by only a small minority.

Perhaps not surprisingly, the subconscious mechanisms in our behavioral-change framework map to interventions seem likely to have the greatest impact in our preliminary analysis. Most of the interventions in the food and beverage environment are driven by subconscious mechanisms such as limiting access to high-calorie foods, reducing portion sizes, reformulating foods to decrease sugar and fat content, and reducing promotional activity in expandable categories. Other interventions that rely on subconscious mechanisms include structural changes that determine physical activity levels, such as urban redesign that forces people out of their cars and mandating physical activity in school curricula.

These subconscious interventions all rely on fundamental principles of behavioral economics. Research in this field has shown that most people accept the default option, are highly susceptible to “anchors” or suggestions of what norms are—such as, for instance, accepting an offer of a supersized portion—and follow social norms and behavior. The most striking outcome of the obesity abatement analysis is that classical targeted interventions such as education, weight-management programs, surgery, and pharmaceuticals do not have as much impact as changing the defaults in the food and beverage environment.

Subconscious interventions not only have greater impact than conscious ones; they are also more cost-effective (Exhibit 18).

We should note that the two subconscious interventions that do not deliver high impact and cost-effectiveness—active transport and healthy meals—nevertheless deliver considerable benefits that do not relate specifically to weight, including improved mental and cardiovascular health, and they mitigate social inequality.

In addition to employing the most effective ideas from behavioral economics, subconscious interventions share three important traits:

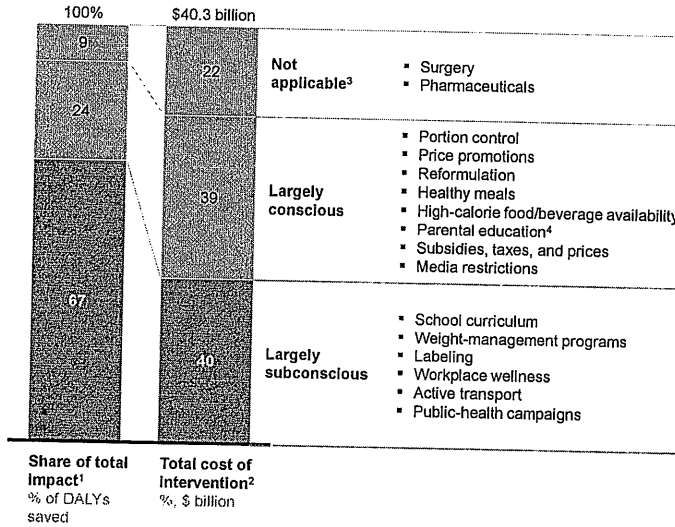
- **Structural.** Subconscious mechanisms tend to be structural in nature—they change the rules or the environment. This can mean literal changes in the physical environment, such as closing off parts of a city to vehicular traffic. Or it can mean expanding or restricting choices—changing school canteen provisions or redefining the standard size of a coffee shop muffin.
- **Far-reaching.** By their nature, structural interventions tend to apply to a very wide population. For example, changes to school curricula apply to all schoolchildren. Changes to a food producer's marketing practices have potential impact across consumer media and marketing channels. As a result, the per capita cost of subconscious interventions is far lower than that of conscious interventions targeted at individuals.

- Permanent.** Structural changes tend to be long lasting. If school meals are made healthier or supermarkets and suppliers reduce the intensity of their promotions of certain categories, these changes remain in place unless policy alters. The new status quo soon becomes the norm—consumers tend to quickly forget the old status quo and may be less likely to question new arrangements.

Exhibit 18

The highest-impact levers do not rely on individual willpower to change, but restructure the choices in our environment

Impact and cost of obesity interventions, by behavioral-change mechanism, United Kingdom, full lifetime 2014 population



NOTE: We do not include health-care payors because this intervention is not relevant in the United Kingdom context. There were insufficient data to quantify urban-environment interventions. Numbers may not sum due to rounding.
 SOURCE: Literature review; expert interviews; McKinsey Global Institute analysis

INVESTING IN LOWER-IMPACT AND LESS COST-EFFECTIVE INTERVENTIONS IS STILL WORTHWHILE

Given the overall high cost-effectiveness of the set we examined, even lower-impact and less cost-effective interventions should be considered. Some of the interventions we have analyzed are low cost but low impact in the short term. Nevertheless, they are important because they play a role in educating the population and helping to engineer a gentle shift in attitudes and behavior—although we acknowledge that this is difficult to quantify. For instance, our analysis finds that public-health campaigns to promote physical activity and healthy eating have a low impact but they help to create broad understanding that a balanced diet and active life are important and not necessarily easily achieved. This insight, in itself, is not usually sufficient to change behavior but is still an important baseline ingredient in any effort to create a cultural shift. Introducing high-quality nutritional education and increasing the amount of physical activity in national school curricula are other lower-impact types of intervention. Nevertheless, it should not be dismissed because these efforts could help to shift attitudes among the young.

Similarly, parental education is not an intervention with the best value for money but it is critical in helping to shift the way future generations think about food and exercise. There may be low-cost ways of shifting social norms that have not yet been explored. Today, parental interventions tend to identify high-risk families and deliver intensive counseling on nutrition, feeding habits, and parenting habits to support appropriate nutrition and physical activity behavior in children. But there could be different models for intervening in this way. For example, it could become part of the core task of midwives and pediatricians to give new parents nutritional guidance and counseling. Pediatricians in Italy already do this. In the United Kingdom and elsewhere, monthly child benefit payments could be accompanied by practical and detailed nutritional guidance and meal ideas. Society should experiment as much as possible with new ways of delivering the message on food and exercise, and it should monitor and measure the impact.

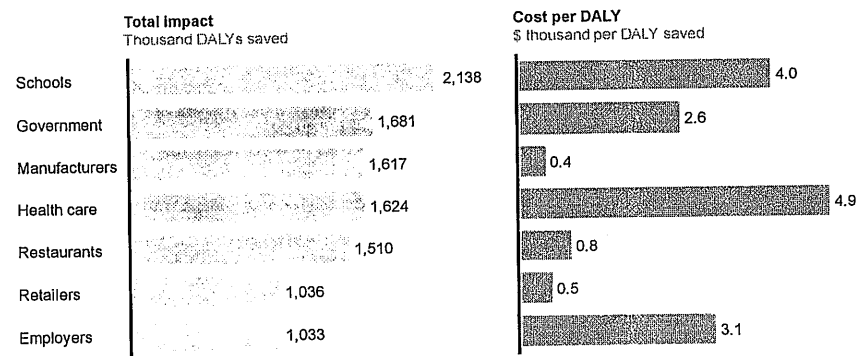
New collaborations are needed within the food and beverage industry and between industry and government

A successful program to abate obesity will require collaboration and deep engagement across all groups in deploying the wide range of intervention areas that we have identified (Exhibit 19). All of the societal sectors identified—government, schools, health-care providers, food and beverage manufacturers, retailers, and fast-food retailers—can make a contribution.

Exhibit 19

Impact is spread fairly evenly across all relevant stakeholders

Cost-effectiveness and impact of obesity levers, United Kingdom¹



¹ Cost and impact assessed over lifetime of 2014 UK population. Uses UK-specific cost-effectiveness calculated using GDP and World Health Organization methodology. Some food and beverage industry impact could be captured through government (regulation). In the food and beverage industry, we include manufacturers, food retailers, restaurants, and food-service providers.

SOURCE: Literature review; expert interviews; McKinsey Global Institute analysis

To make a positive contribution to tackling obesity, food and beverage manufacturers, retailers, food-service providers, and restaurants will need to deploy a wide range of interventions including portion control, reformulation, adapting price promotion and marketing practices, and introducing best-in-class labeling. Interventions could rely on industry participants using their world-class expertise in marketing and sales to nudge consumers toward healthier choices, or to invest in a healthier portfolio mix.

There is no straightforward and simple road map for delivering industry levers. Some could be delivered through industry self-regulation or government

regulation. Others will require a clear pull from consumers, creating the opportunity for companies to gain a competitive advantage.

There may be a prisoner's dilemma inhibiting many industry interventions in which a first mover in, say, reformulating products faces risk to market share, but in which no one company bears a great deal of risk if the whole industry moves together. All major players in a competitive industry acting in concert is no small feat—but not impossible.

In some cases, the industry cannot intervene without help from government. Consider, for instance, a reconfiguration in promotional activity away from higher-calorie food products to lower-calorie ones. This reconfiguration works only if all players in the industry agree to take action. If only voluntary agreements are in place, there is a risk that one or more players could depart from the agreement. An additional problem is that the industry could be in breach of competition law if it were to act in concert on this type of intervention; it would need protection from antitrust authorities. The depth of the challenge of collective action in the industry—to the point where sometimes collective action is even illegal—needs to be better addressed. We further explore these barriers to action in Chapter 3.

The UK government offers an example of an attempt to engage the food and beverage industry more broadly. Its Responsibility Deal invites players to commit to certain pledges, including on labeling practices and reformulation. The Responsibility Deal has secured impressive commitments from a range of manufacturers, retailers, food-service providers, and restaurants, and has made considerable progress on delivering progress on reformulation, labeling, and marketing practices. However, because it is voluntary, a number of players in the industry have not signed up for the commitments, creating frustration among “leaders,” and failing fully to shift defaults in the food and beverage environment. A more ambitious approach is required to secure a fully coordinated industry response. This may require regulation or standardization to level the playing field for industry. The challenge ahead is to identify where there is willingness to act and to facilitate collective action, while recognizing that any food and beverage industry action will ever be only part of the solution. A major cultural shift is necessary, and achieving such a shift will require comprehensive and ambitious education, engagement by the mass media, and sufficient provision of health care to provide the tools and knowledge that people need to remain healthy in the context of modern sedentary lifestyles and plentiful food supply.

□ □ □

In a field as complex and wide-ranging as tackling obesity, where there are substantial limits to the research that has been undertaken, we believe that our analysis of the cost-benefit economics of a wide range of interventions can help policy makers and the industry to plot a path toward effective action. The MGI obesity abatement analysis suggests that interventions are, by and large, highly cost-effective, but it also makes it clear that any small subset of initiatives will not be enough to reverse rising obesity. Rather, a wide range of societal sectors needs to deploy as wide as possible a range of interventions. There needs to be new collaboration and cooperation within the food and beverage industry and between the industry and government to push the boundaries on what is currently being delivered. In our final chapter, we discuss how the analysis underpinning the program could help to bring forward the agenda to tackle obesity.



3. Moving toward action

The severity of the global obesity crisis—and its economic and social costs—is beyond doubt. But our survey of interventions around the world that are already being used or piloted suggests that there are plenty of ways to tackle this issue.

Our preliminary obesity abatement analysis for the United Kingdom contains a great deal of encouraging news. Most of the interventions that we have reviewed are cost-effective at a societal level and could potentially have a high impact. This discussion paper suggests that disparate, small-scale interventions that have been tried somewhere could be sufficient to reverse rising obesity if they are scaled up and delivered effectively. No single type of intervention—or any single sector of society—will be able to rein in the rising prevalence of obesity. However, as large as possible a set of interventions deployed by all relevant sectors has the potential to break that trend.

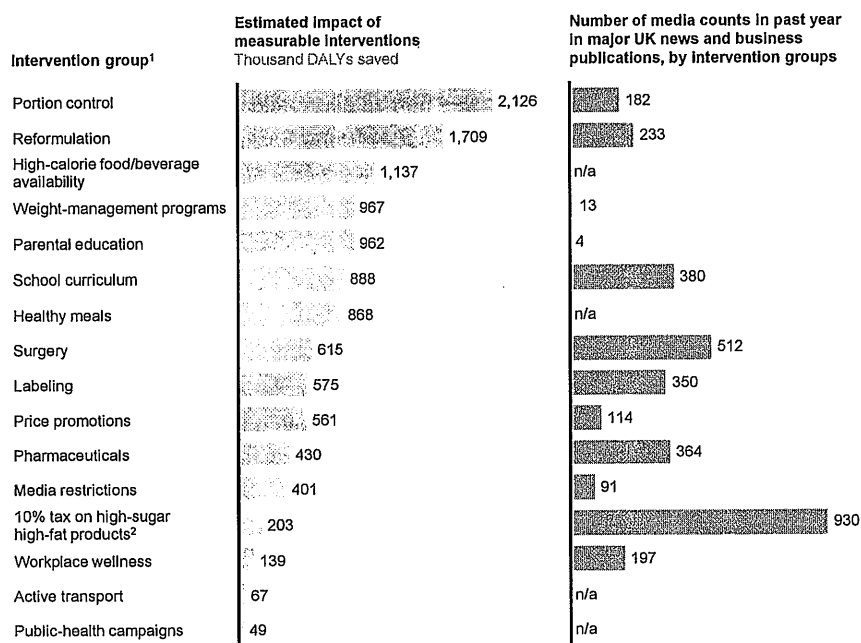
This is not to argue that the effort will be easy. For a large number of interventions to be used in concert, more cooperation within and between the public and private sectors than we have observed so far is likely to be necessary. We also believe that, if the relevant sectors of society are to move toward action quickly, they cannot focus too heavily on debating which interventions should be prioritized and they should be prepared to engage in trial and error to reach an understanding of which approaches are likely to be most effective. We see the last piece of the jigsaw puzzle being more investment in obesity prevention and in research.

SUCCESS REQUIRES AS MANY INTERVENTIONS AS POSSIBLE BY A FULL RANGE OF PRIVATE AND PUBLIC SECTORS OF SOCIETY

The current debate on addressing obesity still tends to revolve around the search for a single killer intervention. Commentators also tend to focus on a particular societal group—whether educators or the food and beverage industry—as holding the key to solving the problem. This approach will not be sufficient for two reasons. First, the debate tends not to focus on the initiatives that our analysis would suggest could have the most impact (Exhibit 20). Second, and most critically, as we discussed in Chapter 2, a successful program to tackle the rising prevalence of obesity is likely to require as many interventions as possible to be deployed by the full range of sectors of society—at a large scale and with highly effective delivery.

Exhibit 20**Some high-impact intervention areas are receiving less media and public focus**

Impact and media count of intervention groups, United Kingdom



1 At 50 years since deployment; uses UK-specific cost-effectiveness calculated using GDP and World Health Organization methodology; includes only non-overlapping levers for each cluster. Where levers overlapped, the higher-impact lever was chosen; excludes clusters that are difficult to complete media searches for: healthy meals, active transport, high-calorie food and beverage availability, and public-health campaigns.

2 All intervention impact modeling was subject to scalable assumptions on potential reach. Tax levers are also subject to scalability of levy incurred. In this case, we have modeled a 10 percent tax on a set of high-sugar and high-fat food categories, based on empirical precedents and size of levy often studied. It is scalable, and impact would increase close to directly with increase in levy.

SOURCE: Literature review; expert interviews; McKinsey Global Institute analysis

Today, government efforts to tackle the obesity issue seem too fragmented to be effective. In the United Kingdom, 15 central government departments; all local authorities with responsibility for health, education, and local planning; 16 EU directorates-general; and a wide range of nongovernmental organizations all have a significant impact on the major intervention areas that we have identified (Exhibit 21).

Exhibit 21

16 EU directorates-general and 15 UK central government departments have an impact on UK obesity intervention and prevention levers

EU directorates-general

- Agriculture and Rural Development
- Budget
- Climate Action
- Communication
- Communications Networks
- Competition
- Economic and Financial Affairs
- Education and Culture
- Employment, Social Affairs and Inclusion
- Energy
- Enlargement
- Enterprise and Industry
- Environment
- EuropeAid
- Eurostat
- Health and Consumers
- Home Office
- Humanitarian Aid and Civil Protection
- Human Resources and Security
- Informatics
- Internal Market and Services
- Interpretation
- Joint Research Centre
- Justice
- Maritime Affairs and Fisheries
- Mobility and Transport
- Regional Policy
- Research and Innovation
- Secretariat-General
- Service for Foreign Policy Instruments
- Taxation and Customs Union
- Trade
- Translation

UK central government, ministerial departments

- Cabinet Office
- Department for Business, Innovation and Skills
- Department for Communities and Local Government
- Department for Culture, Media and Sport
- Department for Education
- Department for Environment, Food and Rural Affairs
- Department for International Development
- Department for Transport
- Department for Work and Pensions
- Department of Energy and Climate Change
- Department for Health
- Foreign & Commonwealth Office
- Home Office
- HM Treasury
- Ministry of Defence
- Ministry of Justice
- Northern Ireland Office
- Scotland Office
- Wales Office

SOURCE: www.gov.uk; European Commission; McKinsey Global Institute analysis

There are examples around the world of effective action that is mitigating or reversing obesity prevalence rates for pockets of the population. These programs always involve the coordination of multiple groups, and always deploy a combination of top-down interventions with bottom-up grass-roots activity led by the community. Examples include the Healthy Weight Commitment Foundation in the United States; EPODE's community public-private partnership approach, which originated in France and is being replicated around the world; and the Singapore government's "1 million kg Challenge" (see Box 7, "Integrated efforts to respond to obesity: Healthy Weight Commitment Foundation and EPODE"). These cases show that no single intervention is enough and that genuine change will require all societal sectors to act in concert. They also suggest that some of the biggest food and beverage industry interventions will require coordination across this highly competitive and fragmented industry or between industry and government. Among the crucial first steps that could be taken is galvanizing momentum to scale up these examples of successful public-private partnerships that engage all sectors of society and balance community and centralized levers.

Box 7. Integrated efforts to respond to obesity: Healthy Weight Commitment Foundation and EPODE

Our analysis suggests that an integrated effort will be necessary to change public-health outcomes related to high BMI. The evidence from efforts already under way suggests that such an integrated approach will require commitments to action from a wide range of organizations across industry, and the public and social sectors. Two of the most prominent efforts to tackle obesity through a multistakeholder response, both of which have displayed an impressive understanding about how to align incentives and deliver concrete change, are the Healthy Weight Commitment Foundation and EPODE. Each of these examples combines top-down interventions by government and large corporate players, with bottom-up interventions by grass-roots organizations in local communities. Both are needed. The former have the influence to deploy wide-reaching changes to the environment by, for instance, setting consistent standards in urban planning, school curricula, and food and beverage industry practices. This means that interventions can be designed, led, and delivered in the context of local communities, schools, and families—the heart of where behavioral change occurs.

The Healthy Weight Commitment Foundation.

The foundation was founded in 2009 and since then has established a partnership of more than 250 non-profit organizations and businesses in order to promote healthy eating and increased physical activity to schools, families, and community organizations in the United States. In this time, it has succeeded in garnering commitments from food and beverage industry players that have resulted in the removal of 6.4 trillion calories per year from the US marketplace. It has also delivered more than \$1 million in grants and prizes to school and community organizations for community-led initiatives such as investing in school vegetable gardens and Girl Scout cooking classes. The foundation partnered with Discovery Education to step-change quality of and access to education products to promote nutrition, physical activity, and energy-balance knowledge and behavior changes in schools. Discovery Education designed an evidence-based, flexible, open-

source curriculum with modules and tools that could be used in a wide variety of courses. This curriculum is now available in more than half of US elementary and preschools. The Healthy Weight Commitment Foundation has said, "Aligned incentives and powerful partnerships were critical to our success."¹

EPODE. *Ensemble, Prévenons l'Obésité des Enfants*, or "Together, Let's Prevent Childhood Obesity," started in France in 2003. It is a community-based approach that targets childhood obesity from multiple angles, including by making changes in the child's environment—schools and homes—to encourage and enable the adoption of healthy lifestyles.² The EPODE approach and principles are now being shared worldwide through the EPODE International and European networks. By 2015, the international network aims to bring its work to more than 400 million people worldwide.³ The distinctiveness of the EPODE approach lies in its operating at the local level by involving multiple stakeholders and holding them accountable for concrete goals. Municipal health services are involved, as are many other departments: communication, education, sports, social affairs, community life, and community planning.⁴ As it has grown, EPODE has enlisted the support of food and beverage companies such as Nestlé and Coca-Cola.⁵ One of EPODE's main goals is to modify local community norms about physical activity and healthy eating by increasing availability of after-school sports clubs, improving walkability of towns, and upgrading school meal nutrition.⁶ These structural changes are accompanied by local media campaigns on healthy living themes. The campaigns include related activities led by leisure centers, local businesses, schools, and other local groups and sectors.⁷

1 *Working together to change the outlook of a generation: Five-year anniversary report*, Healthy Weight Commitment Foundation, 2014.

2 EPODE European Network website.

3 *Ibid.*

4 J.-M. Borys et al., "EPODE approach for childhood obesity prevention: Methods, progress and international development," *Obesity Reviews*, volume 13, number 4, April 2012.

5 EPODE European Network website.

6 *Ibid.* J.-M. Borys et al., "EPODE approach for childhood obesity prevention," April 2012.

7 *Ibid.*

If a multipronged approach is to be successful, a forum that brings together all relevant societal sectors including industry representatives, local health-care providers, representatives of business, economics, health, and innovation and skills ministries, and academics could be a useful approach. Such a forum could not only be a space in which representatives from these sectors can discuss these complex issues, but also facilitate commitments to action. Any such forum would need the resources and legislative powers necessary to play an effective coordinating role. One inspiration might be the London Organising Committee for the Olympic Games and the Olympic Delivery Authority. Both were established in 2005 after London won the bid to host the 2012 Olympic Games, and they coordinated the spending of nearly £9 billion.

The appropriate approach to obesity will almost certainly vary from country to country depending on the nature of the local challenges. For example, some emerging markets will need greater focus on the development of urban infrastructure and environments given the rapid development of cities and the concentration of obesity in urban areas; public-health services may be a second-order priority. In the United Kingdom, by contrast, public health is arguably the key focus, and therefore leadership from health, health economics, or behavioral economics backgrounds is likely to play a central role. In all geographies, engagement with the food and beverage industry is likely to be critical, although the specific challenges will vary from country to country; for example, some countries' food retail is informal and highly fragmented, which will have an impact on how an anti-obesity drive would have to be formulated to be effective. While acknowledging the need to calibrate any obesity program to the specific context of each country, it is still clear that representation from the food and beverage industry, health and education authorities, local authorities, and civil society at the local and national levels will be necessary to deliver on the highest-priority intervention areas.

At the international level, some highly effective organizations are already developing research, garnering commitments and alignment from a wide range of societal sectors, and sharing best practices. They include the World Obesity Federation, the Non-Communicable Disease Alliance, the WHO Commission on Ending Childhood Obesity, and EPODE International Network. However, there is scope to be even more ambitious and consider developing a global entity that can facilitate the transfer of knowledge about tackling obesity and galvanize the momentum needed to replicate existing successes around the world. The fight to reverse the rising prevalence of obesity—and to tackle non-communicable diseases more broadly—would likely be more effective if there were to be an international body with the status and responsibilities of the Intergovernmental Panel on Climate Change in the case of climate change, the World Trade Organization in the case of trade, or the International Monetary Fund in the case of financial markets. Such a forum could reside within an existing global entity, such as the WHO or the World Bank, or there may need to be an entirely new entity.

UNDERSTANDING HOW TO ALIGN INCENTIVES AND DEVELOP NEW FORMS OF COOPERATION IS IMPORTANT

A lack of incentive to take action—and therefore inertia in decision making—has proved to be a major barrier to mitigating obesity. Its burden does not fully affect those who are central to making the interventions—such as educators, employers, and the food and beverage industry—but with health departments. Even where there are incentives to act, these societal sectors may not fully understand or acknowledge them. Many employers may not understand the extent to which the productivity of their employees is being compromised by obesity. Many food and beverage industry players may not recognize the longer-term value at risk to their financials and brand strength. In general, there is more work to be done to understand the specific value at risk due to the obesity health burden.

In many cases, societal sectors have recognized an incentive to act but face considerable challenges in coordinating the action they take. As we have suggested, for some interventions to be feasible and effective, many sectors of society need to act in concert. This is almost certainly the case in the food and beverage industry where, in some instances, unilateral interventions to tackle obesity may put income at risk. The consumer packaged goods and retail industries are intensely competitive, and collaboration is hard (and in some cases illegal). Even if a particular intervention is neutral for the bottom line or is highly attractive, companies are caught in a prisoner's dilemma—taking unilateral action that may put market share at risk would undermine companies' obligations to their shareholders. There is evidence that current commitments are not being followed through by all players, and that some in the industry may therefore need government help in a more concerted approach.

There are many factors that make this hard. In some cases, there is a lack of understanding about which interventions are likely to be most effective in tackling obesity. For instance, many schools approach the issue by introducing nutritional education. That is a useful contribution, but the impact is highly dependent on how such education is delivered. Where it has proved successful, it has been practical and sustained, has involved parents, and, where possible, has deployed popular role models as advocates. Moreover, nutritional education depends on the successful deployment of other interventions such as removing vending machines and snack shops from schools.

Gaps in current research compound inertia and tend to produce a bias toward interventions that are easily measurable but do not necessarily have the highest impact. Obesity is governed by a complex system that is not fully understood. Many interventions can have unintended consequences and side effects that are challenging to measure (see Box 8, "Methodological challenges in obesity research").

Lack of public acceptance has often weakened the mandate for change and hindered decision making. In some cases, entrenched consumer behavior may be difficult to overcome. Consumers may, for instance, continue to choose a high-calorie product out of habit despite having full information about the potential negative consequences for their health. Behavioral nudges to persuade consumers to change—such as marketing, priming an individual to associate a

product with a celebrity, or encouraging consumers to choose smaller portions by replacing larger ones—have all proved effective. But tone is important (including in the media). A moral tone that consumers may find patronizing is not helpful.

Finally, there may be insufficient political will to overcome reluctance to change, whether in the private sector or among consumers. In some cases, regulation may be necessary to level the playing field in relevant industries—through labeling, for instance. In other cases, government may find that it needs to deregulate or facilitate coordination on industry interventions such as reducing promotional activity. Central and local governments are best positioned to facilitate and encourage schools and local communities to take a leading role in abating obesity, but this may require both resources and political prioritization, neither of which may be in place.

Box 8. Methodological challenges in obesity research

The health-care and public-health sectors have typically relied on evidence from randomized, controlled studies to aid policy decisions.¹ Given the complex systemic nature of the obesity topic, it is much more difficult to run studies or measure population-level change robustly enough to provide such scientific quality of data. Take installing pavements in an urban setting to help encourage walking—it is very difficult to create a double-blind control group for this intervention. It is also difficult to independently measure what individuals eat throughout their days, without very expensive live-in studies. In such cases, decision making can be informed only by rational assumptions. Moreover, many environmental interventions have only small, long-term direct effects or an indirect impact, as is the case with labeling.

Studies on labeling have had mixed results. Nevertheless, there is consensus that labeling has a small, direct effect on some groups of people—an impact that is not usually detectable in studies that pick up only those changes that are between 50 and 100 calories. Reformulation, a direct effect of labeling, may lag behind implementation of a regulatory change because of the investment required. However, as we have discussed, labeling also has indirect signaling effects. So while research into labeling may suggest that this intervention is only marginally attractive, an assumption-based cost-effectiveness estimate suggests the opposite. These methodological challenges suggest that, if an intervention is perceived to have more benefits than harm, there may be a case for a bias toward implementation.

1 A. J. Fischer et al., “The appraisal of public health interventions: An overview,” *Journal of Public Health*, volume 35, number 4, December 2013.

FOCUSING TOO MUCH ON PRIORITIZING INTERVENTIONS CAN STAND IN THE WAY OF ACTION

The political capital and resources to deliver change that can help the fight against obesity—including time, money, and effort—are necessarily finite. For this reason, good sense suggests that it is worth prioritizing interventions based on their potential impact, cost-effectiveness, and feasibility. However, focusing too heavily on which interventions should be the highest priority can delay constructive action and even allow some sectors of society to pass the buck when what is needed is the deployment of as many interventions as possible by the full range of those sectors.

SOCIETY SHOULD TAKE A “JUST START” APPROACH TO OBESITY INTERVENTIONS, WHILE STEPPING UP INVESTMENT IN RESEARCH

Investment in obesity prevention and mitigation is relatively low given the scale of the problem. For instance, the United Kingdom invests less than \$1 billion a year in prevention activities such as weight-management programs and public-health campaigns. To put that in perspective, that is only about 1 percent of the social cost of obesity in the United Kingdom. Given the high return on effective prevention, more aggressive investment in prevention measures would be worthwhile.

At the same time, it is worth considering stepping up investment in what is, to date, limited research into obesity. Global investment in obesity research is not insignificant at an estimated \$4 billion a year. This is 0.2 percent of the social cost of obesity that we assessed in Chapter 1. However, this amount pales in comparison to the estimated future economic burden facing society. And it is important to use research to motivate action. We believe three important elements should be considered:

- **Be aware of the limits of scientific research methods in the context of obesity.** Obesity is a highly complex system of countless interacting variables. Research to understand relationships among these variables is important, but in many prevention and intervention areas such as intervening on urban infrastructure, we cannot assess the impact with the full rigor of randomized-control trials. In such cases, society should still pursue interventions but also use other criteria to inform decision making, such as risk assessment, other benefits, and cost to deliver.
- **Develop improved data collection.** There is a strong case for improving the collection of data on intervention areas in order to expand research capabilities and cover some existing blind spots. We picked up evidence of considerable variation in the quality of execution of different interventions across all types of societal sectors. Improved data gathering would help to further refine perspectives on best practices. Over time, more sophisticated abilities to measure impact in complex behavioral systems may develop. But, in the meantime, there are areas where efforts to track and measure more of the many interventions being deployed around the world can be stepped up. Some type of forum to provide tools and guidance for tracking and measuring would support this.
- **Engage in more trial and error on low-risk interventions.** Obesity is not a topic that lends itself to perfect evidence, and therefore efforts to tackle this issue shouldn't necessarily depend on the usual strictures of evidence-based medicine. To ease any bottlenecks to action, where the cost and risk of delivering an intervention are low, the bias should be in favor of deployment rather than waiting for perfect evidence. Examples of low-risk, low-cost interventions include restricting high-calorie food access in schools, mandating consistent labeling practices, and introducing nutritional counseling as part of prenatal care.

□ □ □

This research is just the start of an attempt to develop a holistic perspective on what it may take to reverse the growing health burden imposed by obesity. The science on obesity and research into how to reverse the rising health burden is by no means complete, and learning more about this complex issue and its causes is clearly vital if the global community is to mount a genuine, sustained, and aggressive challenge.

We intend to continue to try to develop our knowledge on an even greater range of obesity programs and update our data with the very latest efforts on the ground and research as it is completed. We invite contributions to our ongoing research. In particular, we would like to hear about other possible interventions, better and updated data on the impact of interventions, and further insights about overcoming the major barriers to delivering high impact in a large-scale, integrated response. We also welcome challenge and input on our analysis and approach. Please send any comments to obesity@mckinsey.com.

There is huge scope to rein in the rising trend of obesity across the world—and to do so in a cost-effective way. Above all, boldness is imperative. Nothing else will mitigate the huge and rising human, social, and economic costs of this crisis.



Appendix

1. Social-cost analysis

The goal of the McKinsey Global Institute analysis of social costs is to provide an understanding of the economic impact of selected human-generated burdens on society.

Selection of social-cost categories

We selected the evaluated social costs using one of the following criteria:

- Involvement of direct human decision making (for example, alcohol or tobacco consumption)
- Amplification through human and societal behavior (for example, climate change)
- Dependency on the societal and legal environment and infrastructure shaped by humans (for example, illiteracy, road accidents)

We believe that we have identified the major costs that meet one of these criteria but acknowledge that our analysis may not be comprehensive.

QUANTIFYING THE COSTS

The purpose of quantifying social costs is not to help public-policy makers to prioritize among them but to provide a directionally correct fact base on the size of the different categories that can aid our understanding of them. There are a number of caveats with this analysis. Necessarily, we have had to make some subjective judgments on, for instance, the value of productive life years saved. In addition, we came up against a lack of robust data in some cases (for example, estimating the costs of illiteracy). The analysis also considers only current social costs, and not the expected future costs. In some cases, such as climate change and obesity, this could represent a significant underestimate of the total costs.

We included three major sources of economic cost:

- **Loss of productivity** attributable to loss of life or impaired life quality. We estimate this using the Global Burden of Disease assessment of annual disability-adjusted life years lost attributable to each risk factor using data denominated in 2010 pound sterling.³⁹ We quantified the economic value of the disability-adjusted life years lost by valuing each DALY using national per capita GDP data sourced from the World Bank. This approach overweights the cost of lost DALYs in developed markets because their per capita GDP tend to be higher than those of emerging markets. For this reason, we emphasize that

39 Institute for Health Metrics and Evaluation, Global Burden of Disease 2010 database.

our analysis uses a purely economic lens and does not take into account all relevant reasons for investing in each one.

- **Direct costs** associated with each cost category. Direct health-care costs largely dominate total direct costs across countries. However, in some countries there is a wider group of relevant direct costs (for example, drunk-driving costs in the case of alcoholism). Country-level data were not available in some countries. In these cases, we allocated the global cost of the category (for example, high BMI, smoking, water, and sanitation) based on the share of DALYs in global DALYs weighted by per capita GDP relative to global GDP.
- **Direct investment** for the remediation, adaptation, and prevention of the specific social-cost category (for example, diet counseling, public-health programs, greenhouse-gas adaptation investment). This was based on various research initiatives, detailed by social cost below.

We did not include consumer spending, such as on tobacco or alcohol, in each category.

DETAILS BY TYPE OF SOCIAL COST

Alcoholism. Productivity losses based on DALYs lost to alcohol are expressed in 2010 pound sterling. We use Rehm et al. (2009) to estimate the cost of global health care and law enforcement.⁴⁰ We use Baumberg (2006) to estimate the cost of criminal damage, drunk driving, and unemployment related to alcoholism.⁴¹

Armed violence, war, and terrorism. We base productivity losses on DALYs lost to assault by firearm, sharp object, and other means, and collective and armed violence in 2010 pound sterling. For investment in remediation and prevention, we include global military expenditure, using a 2013 report from the Stockholm International Peace Institute.⁴² We estimated the direct health-care cost of war using the Geneva Declaration report on the global burden of armed violence.⁴³

We estimated DALYs lost to terrorism by looking at the lives lost to terrorism as a share of all lives lost to total armed violence, and then extrapolated proportional to DALYs. We calculate the DALYs lost to total armed violence using DALYS lost (in 2010 pound sterling) because of assault by firearm, sharp object, and other means, and collective and armed violence. Investment in prevention of terrorism is based on an estimate by the North Atlantic Treaty Organization.⁴⁴

Child and maternal undernutrition. We calculate productivity losses based on DALYs lost due to child and maternal undernutrition in 2010 pound sterling. Our estimate of the investment used to mitigate obesity uses data from the

40 Jürgen Rehm et al., "Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders," *The Lancet*, volume 373, number 9682, June 2009.

41 Ben Baumberg, "The global economic burden of alcohol: A review and some suggestions," *Drug and Alcohol Review*, volume 25, number 6, November 2006.

42 "Military expenditure" in *SIPRI Yearbook 2013: Armaments, disarmament, and international security*, Stockholm International Peace Research Institute, 2013.

43 *Global burden of armed violence*, Geneva Declaration Secretariat, 2008.

44 Bjorn Lomborg, "Is counterterrorism good value for money?" *NATO Review*, April 2008.

World Food Program on food aid and the G-8 L'Aquila Accord 2009 budget for agricultural aid.⁴⁵

Climate change. We calculate productivity losses based on estimated DALYs attributable to climate change in 2000 (that is, famine, vector-borne diseases, and waterborne diseases) using the World Health Organization's report *Climate change and human health: Risks and responses*. We then scaled up to 2012 using an estimate of an increase in deaths attributable to climate change in that time frame from the DARA Climate Vulnerability Monitor for 2012.⁴⁶

For the cost of adapting to climate change, we used World Bank estimates of the cost between 2010 and 2050 of adapting to a world temperature that is 2 degrees Celsius warmer than pre-industrial levels by 2050. The World Bank estimate of the cost is between \$70 billion and \$100 billion a year. Adaptation costs are the only outlier in our methodology because the figure we use does not reflect actual 2012 spending.

We base our estimate of the economic impact of climate change on the DARA assessment of the 2010 economic impact of environmental disasters, habitat change, and industry stress. Our analysis does not include the health impact used by DARA, which is largely captured in our figure for the number of DALYs lost.

Drug use. We estimate productivity losses by assessing the DALYs lost that are attributable to drug-use disorders in 2010 pound sterling. We used the United Nations Office on Drugs and Crime *World drug report* for 2012 and 2013 to estimate the direct health-care costs of drug-related crime and imprisonment.⁴⁷

Indoor air pollution. We estimate productivity losses by estimating the DALYs lost that are attributable to household air pollution. To estimate the direct health-care costs of household air pollution, we used DARA's international assessment, which assumes that about 50 percent of the DALYs lost are attributable to indoor air pollution and the other 50 percent to outdoor air pollution.

Illiteracy. We include only productivity costs, for which we use the World Literacy Foundation report *The economic and social cost of illiteracy*.⁴⁸

Obesity. We estimate productivity losses by assessing the DALYs lost that are attributable to high BMI. For direct health-care costs, we use World Health Organization estimates. Our estimate of the investment devoted to mitigating obesity comes from our analysis of the research budgets government investment in prevention programs, and commercial weight-management markets.

Outdoor air pollution. We base productivity losses based on an assessment of DALYs lost that are attributable to ambient ozone pollution and ambient

45 Lidia Cabral and John Howell, *Measuring aid to agriculture and food security*, Overseas Development Institute, ODI briefing paper number 72, February 2012.

46 A. J. McMichael et al., *Climate change and human health: Risks and responses*, World Health Organization, 2003; *Climate vulnerability monitor: A guide to the cold calculus of a hot planet*, 2nd ed., DARA and the Climate Vulnerable Forum, 2012.

47 *World drug report 2013*, United Nations Office on Drug and Crime, May 2013.

48 *The economic and social cost of illiteracy: A snapshot of illiteracy in a global context*, final report, World Literacy Foundation, April 2012.

particulate-matter pollution in 2010 pound sterling. We estimate investment in mitigation using the United Nations sustainable development financing report.⁴⁹

Poor water and sanitation. We estimate productivity losses by assessing the DALYs lost that can be attributed to poor water and sanitation in 2010 pound sterling. We estimate direct health-care costs using WHO estimates.⁵⁰ We assess government and international aid spending to mitigate poor water and sanitation using the United Nations' global analysis and assessment of sanitation and drinking water.⁵¹

Road accidents. To estimate productivity losses here, we assess DALYs lost that can be attributed to injury on the roads expressed in 2010 pound sterling. We use WHO estimates in our assessment of the investment to mitigate.⁵²

Smoking. We estimate productivity losses based on DALYs lost attributable to tobacco use in 2010 pound sterling, tying the value to per capita GDP in each country. We base direct medical costs on *The tobacco atlas*, fourth edition (2012).⁵³ Our estimate of investment in smoking cessation is based on a literature review of a subset of public-health systems.

Workplace risks. We assess the productivity lost in the workplace by assessing DALYs lost that can be attributed to occupational risks in 2010 pound sterling. There are no data on investment to mitigate these risks of the health-care cost, so we assumed that these costs are low and therefore not a significant omission.

Unsafe sex. We estimate productivity losses based on DALYs lost attributable to HIV and other sexually transmitted diseases in 2010 pound sterling, tying the value to per capita GDP by country. We base our estimated of direct medical costs and investment in prevention on estimates from the WHO, UNAIDS, and AVERT.

49 *Chapter 1: Financing for sustainable development: Review of global investment requirement estimates*, UN System Task Team Working Group on "Financing for sustainable development," background paper, October 2013.

50 *Global costs and benefits of drinking-water supply and sanitation interventions to reach the MDG target and universal coverage*, World Health Organization, May 2012.

51 *UN-Water global analysis and assessment of sanitation and drinking-water: The challenge of extending and sustaining services*, World Health Organization and UN Water Report, April 2012.

52 G. Jacobs, A. Aeron-Thomas, and A. Astrop, *Estimating global road fatalities*, Transport Research Laboratory and Department for International Development, TRL report number 445, 2000.

53 Michael Eriksen, Judith Mackay, and Hana Ross, *The tobacco atlas*, fourth edition, American Cancer Society and World Lung Foundation, 2012.

2. MGI Obesity Abatement analysis

INTERVENTION SET

Criteria for global intervention sets

We conducted a literature review and expert interviews to identify as wide as possible a range of interventions that fulfilled the following criteria:

- The interventions have been tried somewhere in the world even if they do not have the explicit goal of reducing obesity prevalence; we do not include blue-sky thinking.
- There is evidence that the intervention has an impact on obesity in at least some settings or segments of the population.

Regulated vs. unregulated

Many interventions could be deployed in a self-regulated or regulated version. We considered the regulated version only when it had been enacted or strongly considered by a legislative body. The Australian Responsible Children's Marketing Initiative is an example of industry self-regulated media restrictions on promoting unhealthy food to children. In the United Kingdom, the government banned advertising of high-fat, high-salt, and high-sugar products during children's television airtime. We considered both regulated and self-regulated versions in the analysis. For interventions such as these, the regulated version tends to have greater reach and impact than the self-regulated version.

Interventions assessed in the UK abatement analysis

For each intervention, we conducted a literature review and interviews to assess if it is relevant and feasible in the UK context (even if there are some barriers to implementation) and whether the data are of sufficient quality to be able to robustly model impact and cost-effectiveness. We quantified only those interventions that fulfilled both criteria.

ASSESSING HEALTH GAIN

Metric for impact: DALYs

We assessed the health impact of obesity intervention and prevention levers using disability-adjusted life years, the standard international health metric to assess the health burden or health saving. A DALY can be conceived of as a year of healthy life. It captures two elements: years of life lost and years of life whose quality is impaired. The WHO's Global Burden of Disease project uses DALYs.⁵⁴ DALYs are also the standard metric in other cost-effectiveness analyses on obesity interventions and other public-health investments, facilitating comparison and contextualization.⁵⁵

54 Global Burden of Disease database, World Health Organization, 2010.

55 Examples include ACE (Assessing Cost Effectiveness), led by Boyd Swinburn, Marjory Moodie, and Robert Carter, and the OECD "Fit not fat" study, led by Franco Sassi, Michele Cecchini, and Marion Devaux.

Scope and timescale

For each intervention, we assessed the lifetime health impact on the entire UK population in 2014. We identified which interventions affected which population segments and then followed the health impact through the entire lifespan of members of each segment. This approach captures the full impact of interventions targeting children and young people that is not realized until later in life as the obesity-related disease burden is greatest between the ages of 40 and 50.

Methodology for assessing impact

All the interventions that we assessed either change the net energy intake—food and beverage consumption—or net calorie expenditure through physical activity. Assessing DALYs saved by an intervention at the population level requires an understanding of its impact on the net energy intake for each age group and for different BMI segments of the population. We then translate this impact on the net energy intake into the BMI change for each population segment and then the BMI change into DALYs saved.

In the case of some classic obesity interventions such as weight-management programs, bariatric surgery, and pharmaceuticals, the body of evidence captures impact in terms of the average BMI/weight change rather than net energy intake, and therefore it is not necessary to convert the calorie change into BMI. In these cases, we assessed the change in BMI on the evidence available five years after the intervention or applied a discount factor on weight change recorded immediately after the intervention to ensure that we included regained weight subsequent to that intervention.

Net energy change to BMI

We developed a deterministic model based on Kevin Hall's system of physiological mathematical modeling to simulate body weight over the course of five years when subjected to an energy imbalance.⁵⁶ This dynamic assessment of body weight change—steady state as well as transient—at any time (t) in this period requires us to estimate a change in the extracellular fluids (ECF) and the gain or loss of fat mass (FM) and fat-free mass (FFM). The relationships between these and their intermediaries are given below:

$$\text{Equation 1} \quad \text{BW}_t = \text{FFM}_t + \text{FM}_t + \text{ECF}_t$$

$$\text{Equation 2} \quad \frac{d(\text{FM})}{dx} = f(\text{P}, \text{E}_i, \text{TEF}, \text{EE}, \text{C}_i, \text{G})$$

$$\text{Equation 3} \quad \frac{d(\text{FFM})}{dx} = f(1-\text{P}, \text{E}_i, \text{TEF}, \text{EE}, \text{C})$$

$$\text{Equation 4} \quad \frac{d(\text{ECF})}{dx} = f(\text{N}_{ai}, \text{CI})$$

$$\text{Equation 5} \quad \text{TEF} = f(\text{E}_i, \text{C}_i, \text{G})$$

$$\text{Equation 6} \quad \text{EE} = f(\text{E}_i, \text{C}_i, \text{P})$$

$$\text{Equation 7} \quad \frac{d(\text{G})}{dx} = f(\text{G}, \text{C}_i)$$

⁵⁶ Kevin D. Hall, "Modeling metabolic adaptations and energy regulation in humans," *The Annual Review of Nutrition*, volume 32, August 2012; Kevin D. Hall et al., "Quantification of the effect of energy imbalance on bodyweight," *The Lancet*, volume 378, number 9793, August 2011; Carson C. Chow and Kevin D. Hall, "The dynamics of human body weight change," *PLoS Computational Biology*, volume 10, number 1371, March 2008.

where P = P ratio; TEF = adaptive thermogenesis; C = carbohydrate intake; G = glycogen level; E = energy intake; EE = energy expenditure; and Na1 = sodium intake level.

Solving this system of mixed equations leads us to the body weight at any instant t . These equations involve 25 different physiological and biochemical constants.

The inputs to this model include the following initial physiological parameters: gender, body weight, age, height, and change in calorie intake. This Excel-based model uses the Runge-Kutta order 4 algorithm for solving the differential equations. When tested against the original Web-based simulator developed by Kevin Hall and his team, our model produces results with accuracy to the third decimal place.

BMI change to DALYs saved

For each population segment in an age group by BMI matrix, we compared the baseline BMI trajectory to the post-intervention BMI trajectory.

Baseline years of life lost (YLL)

To estimate baseline YLLs, we calculated deaths per population segment (that is, male and female by age cohort) based on disease-specific mortality rates by age group for the following diseases whose incidence is related to high BMI: kidney cancer, breast cancer, endometrial cancer, diabetes, ischaemic, hypertensive heart disease, arthritis, stroke, and colorectal cancer. We calculated the percentage of deaths attributable to each BMI point by using relative risk ratios. We assessed what proportion of these deaths could be attributable to obesity by taking the incremental relative risk due to a BMI over 22—the level at which the relative risk for these diseases starts to increase—and holding all other variables constant.

We calculated total YLLs attributable to high BMI from the percentage of deaths per population segment (that is, age bracket by BMI point) due to obesity and multiplied by the remaining life expectancy.

For baseline population data, we segmented age and BMI from the United Kingdom's NHS census. We smoothed five-point BMI brackets to estimate point-by-point distribution. UK disease prevalence rates come from a proprietary McKinsey patient database. Overall mortality rates come from the United Kingdom's National Statistics data. We took disease-specific mortality rates from the WHO's western EU regional rates. Disability weights came from Global Burden of Disease data. These data are granular in taking account of the severity of disease. For instance, the data differentiate severities of cancer, namely "diagnosis and primary therapy" to "terminal with no medication." They also categorize by the prevalence of certain "disabling" factors such as diabetic symptoms (for example, diabetic foot, kidney disease, liver cirrhosis, or incontinence). We calculated a weighted-average overall disability weight for each disease using estimates of the distribution of severity of each disease in the UK population.

Baseline years of life disabled (YLD)

We calculated disability years by examining the number of people in a population segment, disease prevalence by age times disability weight times percent of disability attributable to obesity.

A disability weight is a weighting factor that reflects the severity of the disease in terms of its impact on the quality of life on a scale from zero (perfect health) to 1 (death).

We calculated weighted-average disability weights using WHO disability weight data, adjusting for UK population-specific estimates on the prevalence of different symptoms. As in our calculation of YLLs, we calculated the percentage of disability caused by each disease that is attributable to obesity through relative risk factors.

Population-wide BMI distribution shift

We calculated a new population-wide BMI distribution by reallocating people who shift from one category of BMI to new BMI brackets. To do this, we assumed constant distribution of BMI within a BMI point (for example, the number of people with a BMI of 21.1 is the same as the number of people with a BMI of 21.8).

If the shift is less than 1, the relevant percentage of the population is distributed between original and new BMI points. For example, if 50 percent of the population reduces its BMI by 0.5 points, 25 percent of that population shifts to the next BMI category down. If the shift is greater than 1 BMI point, we distributed the population between the initial BMI point, the BMI point rounded up, and the BMI point rounded down of the new BMI point. So if 50 percent of the population shifts from a BMI of 27 to a BMI of 22.5, 25 percent of the initial population will shift to a BMI of 22 and 25 percent will have a BMI of 23, while 50 percent will stay at a BMI of 27.

DALYs saved

We recalculated the fraction of DALYs attributable to obesity using the methodology for baseline DALYs that we have described with a new population BMI distribution. The difference between baseline DALYs and post-intervention DALYs gives us the number of DALYs saved by each intervention.

Strength of evidence

We have developed a system for categorizing the strength of evidence on each intervention based on the Oxford Centre for Evidence-Based Medicine 2011 Levels of Evidence system. We included further detail on quality of evidence, and whether evidence was for change in energy in/energy out or change in weight (see Box A1, "Strength of evidence analysis").

We constructed the estimated impact of each intervention on the net energy balance or overall change in BMI largely from peer-reviewed studies, supplementing these extensively with expert interviews and pressure testing. We included more than 400 studies, of which about 75 percent were peer reviewed. Details of the full set of studies are found in the bibliography.

Box A1. Strength of evidence analysis

- **Level 5:** Sufficient evidence of effectiveness on weight. Based on systematic review of randomized trials on **weight change**.
- **Level 4:** Limited evidence of effectiveness on weight. Based on observational study or cohort/ follow-up study on **weight change**.
- **Level 3:** Sufficient evidence of effectiveness on change in consumption or physical activity. Developed physiological model of weight change based on a review of randomized trials on **change in consumption or physical activity levels**.
- **Level 2:** Limited evidence of effectiveness on change in consumption or physical activity. Developed physiological model of weight change based on at least one randomized trial or observational study on **change in consumption or physical activity levels**.
- **Level 1:** Logic based on parallel or indirect evidence. **No direct evidence for change in weight or change in consumption or physical activity levels**.

ASSESSING COST

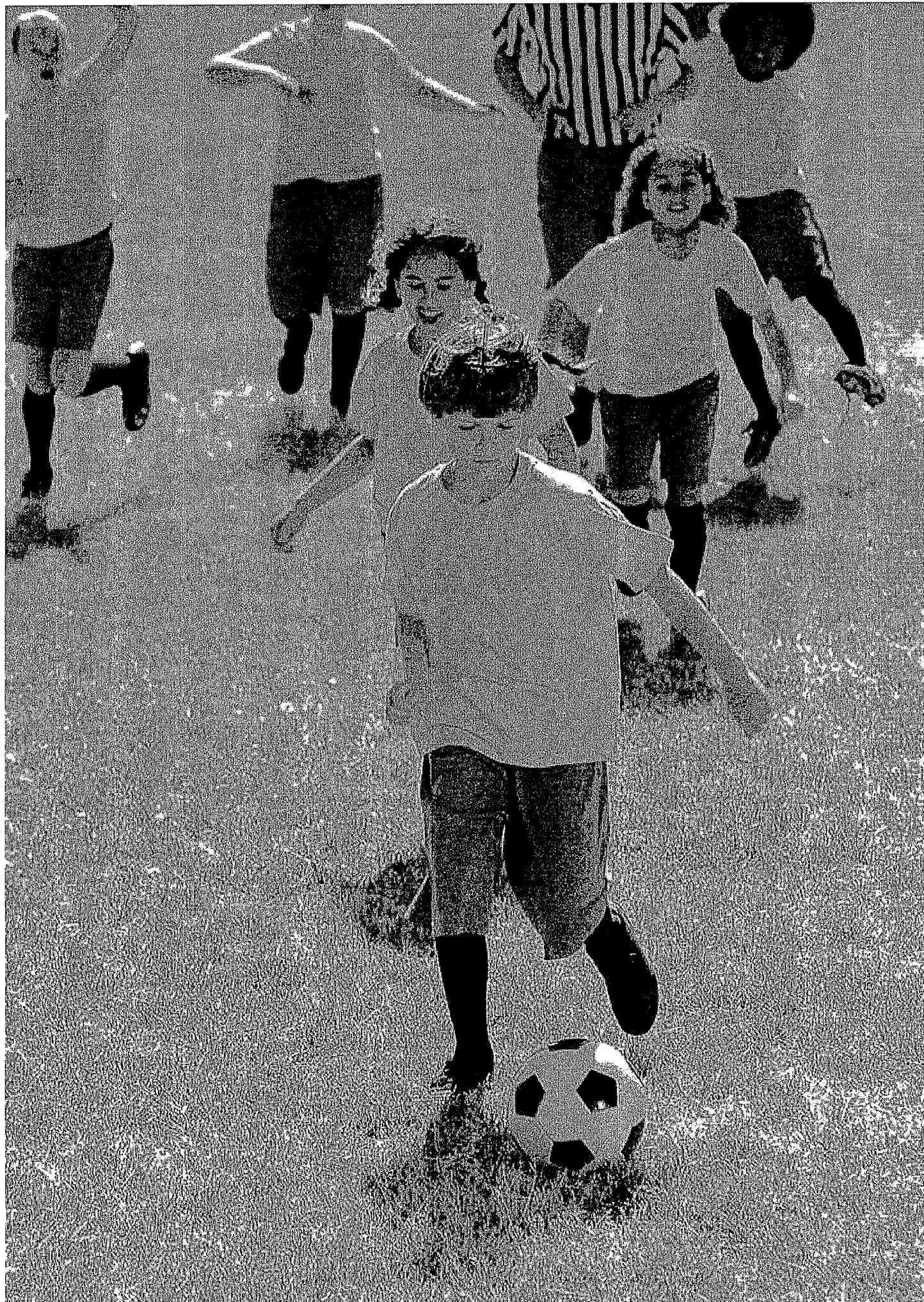
We based cost data on the actual estimated costs of delivering interventions where they were available, including subsidized school meals, parental interventions, bariatric surgery, and urban cycling schemes. We based our assessments of the cost of other interventions on external research and industry interviews.

We have included the cost of deploying each intervention in the cost function only as a contrast to other analyses that include health-care savings and, in some cases, productivity savings. Our reasoning was that we wanted, as much as possible, to take a purely societal view of the cost-benefit economics of interventions against obesity. In one sense, health-care savings are savings to society but they also accrue directly to governments or health-care systems. In order to take a societal perspective on the cost-benefit economics, we used World Health Organization brackets for cost-effective investment ratios to save a DALY. The WHO defines an intervention that costs less than one times per capita GDP per DALY as highly cost-effective, an intervention of one to three times per capita per DALY as a cost-effective investment, and an intervention costing more than three times per capita GDP per DALY saved as not cost-effective.⁵⁷

Given that we are assessing each intervention for its cost and impact across a single cross-sectional population cohort, in the case of one-off interventions (for example, weight-management programs and bariatric surgery), we assess only the cost for delivery. For ongoing interventions that produce a permanent change in environment, we assessed the up-front cost for delivering change and 30 years of ongoing costs with a cumulative net present value discount rate of minus 3 percent a year.⁵⁸ We assume that the change will be maintained over the full lifetime of the cohorts, but consider it most likely that, by 30 years, the ongoing costs would have been absorbed into business as usual, or technological advances would have rendered them much lower than we currently estimate. Most of the cost incurred is up-front rather than ongoing.

⁵⁷ *Cost-effectiveness thresholds*, World Health Organization, Cost effectiveness and strategic planning (WHO-CHOICE).

⁵⁸ M. R. Gold et al., *Estimating costs in cost-effectiveness analysis: Cost-effectiveness in health and medicine*, Oxford University Press, 1996.



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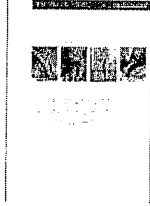
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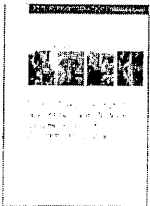
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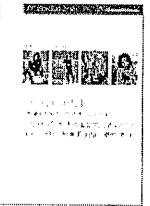
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Exhibit 8

WATCH

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THE TRUTH

THE UNHAPPY TRUTH ABOUT SODA

It wasn't so bad when soft drinks were the occasional treat.
But now sugary drinks are the number one source of calories in the American diet.

With one third of America overweight and another third obese, it's a wonder
anyone is still swallowing what the soda companies are selling.

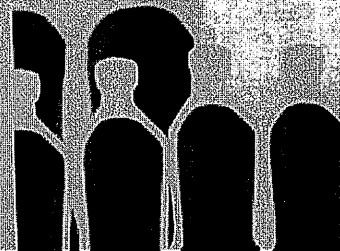
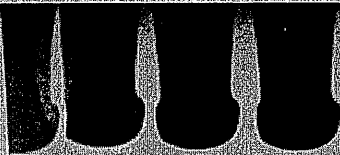
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the film

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About half of men with diabetes will experience erectile dysfunction.

THE TRUTH

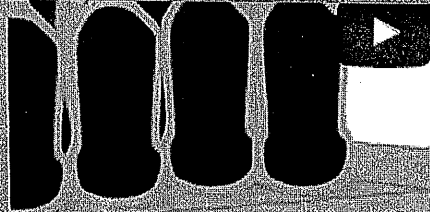
The Real Bears



VIEWS



WATCH SHARE THE TRUTH



SHARE HELP THE REAL BEARS TELL THEIR STORY

Big soda companies have billions of dollars to tell their story, but we have each other. Oh—and we have the truth. Help The Real Bears spread the truth about soda by sharing the film.

Facebook it. Tweet it. Pin it. Google+ it. Email the link to your friends and relatives. Show it at school. Sit down and watch it with your whole family. Host a movie night and watch it before the main feature. Talk about The Real Bears on your YouTube show. Embed it on your website or blog. Have at it. You are the messenger.

Sharing is the only means we have to make sure the unhappy truth about soda gets out to the world.



Pin it



If you're interested in receiving information from the Center for Science in the Public Interest about its work to decrease soda consumption and to promote healthier, safer diets, fill in your details below and we'll add you to our email list. [LEARN MORE AT CSPINET.ORG](http://www.cspinet.org)

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IEWS



WATCH

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THE TRUTH

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SIGN
ME UP!

THE TRUTH SODA FACTS 101

Research has proven a direct relationship between consumption of sugary drinks and an increase in obesity, which promotes diabetes, heart disease, stroke, and many other health problems.

Now you know the plight of The Real Bears. Real human families should also know about the risks of drinking too much soda. Here are the unhappy facts.

LIE

"There is no scientific evidence that connects sugary beverages to obesity."

- Katie Bayne
Coca-Cola President of Sparkling Beverages,
North America

Truth: Each additional sugary drink consumed per day increases the likelihood of a child becoming obese by about 60%. Sugary drinks are connected to other health problems as well.

Truth: Each soda consumed per day increases the risk of heart disease by 19% in men.

Truth: Drinking one or two sugary drinks per day increases your risk for type 2 diabetes by 25%.

Truth: Diabetes can lead to erectile dysfunction.

LIE

"If you're consuming the calories from the banana and there is the same number of calories as in a beverage that you consume, the

Truth: Liquid calories are more conducive to weight gain than solid calories, because the human body doesn't compensate by reducing calorie intake later in the day.

Truth: Sugary drinks are the single-largest source of calories in the American diet, providing an average of about 7 percent of total calories per person, and that average includes all the people who rarely drink them. The percentage of calories from sugary drinks is much higher for people who consume them often—such as several times a day.



TWEET

VIEWS



LIKE 77K

LIE

"If you're consuming the calories from the banana and there is the same number of calories as in a beverage that you consume, the impact on your body is calories are calories."

- Maureen Storey
Former Senior Vice President for Science Policy
American Beverage Association

largest source of calories in the American diet, providing an average of about 7 percent of total calories per person, and that average includes all the people who rarely drink them. The percentage of calories from sugary drinks is much higher for people who consume them often—such as several times a day.

Truth: Most sugary drinks are devoid of nutrition—vitamins, minerals, protein, or fiber—and contain only empty calories.

Truth: It would take the average adult over one hour of walking to burn off the 240 calories in a 20-ounce Coke.

Truth: Americans consume about 38 pounds of sugar from sugary drinks each year.

LIE

"At The Coca-Cola Company, we know our business can only be as strong and sustainable and healthy as the communities we serve."

Muhtar Kent
Coca-Cola Chairman and CEO

Truth: If communities were healthier, Coca-Cola Co. would be selling a lot fewer Cokes. The tripling of sugary carbonated drink consumption since the mid-1950s is one of the major causes of obesity.

Truth: Between 20% and 50% of the approximately 300 calories Americans have added to their diets in the past 30 years is attributable to increasing sugary drink consumption, now at an average of 178 calories for men and 103 calories for women per day.

Truth: Coca-Cola plans to spend more than \$21 billion over the next five years to expand its business in just four countries: China, India, Brazil, and Mexico—which will undermine the health of "the communities we serve."

Truth: When Congress was considering a soda tax to help pay for health-care reform and improve the health of communities, Big Soda increased its lobbying expenses by 3,000% over the 2005 levels.

Truth: Big Soda gives generously to community groups, organizations of public officials, minority groups, and medical and health groups to influence policy positions and discourage criticism of the companies for undermining the health of communities. It often "changes the conversation" by focusing on building playgrounds and encouraging physical activity.

Truth: Not only do children under 12 see Coke and Pepsi logos everywhere, but Coca-Cola Co. promotes its products heavily at Disneyland, on American Idol, and on telecasts of the Olympics, all of which are seen by huge numbers of young children. Also, they sell kids' tee-shirts, toys, games, and stuffed animals with Coca-Cola logos at its web store, and the company licenses similar kid-friendly products at Toys "R" Us, and elsewhere.



VIEWS



LIE "Our member companies do not advertise beverages other than juice, water or milk-based drinks to any audience that is comprised predominantly of children under 12."

American Beverage Association

Truth: Coke has long reached millions of young children by marketing its drinks at child-friendly fast food restaurants, including McDonald's, the home of Happy Meals.

Truth: While soda companies, thankfully, have not advertised on TV shows intended for little kids, they have spent heavily to get their brand names onto school scoreboards and their products into elementary, middle, and high schools. An internal 1995 Coke newsletter exclaimed, "The Coca-Cola Company is focusing upon the education market with revitalized efforts around the world." Only recently did public pressure force them to stop.

Truth: Soft drink companies do market aggressively to teens. According to the Federal Trade Commission, in 2006, companies spent \$474 million marketing carbonated beverages directly to adolescents—more than twice the marketing budget for any other consumable product.

LIE "Coca-Cola is an excellent complement to the habits of a healthy life."

Douglas Ivester,
Former Coca-Cola Chairman and CEO

Truth: Coca-Cola and other colas undermine that healthy life with loads of obesity-promoting high-fructose corn syrup, mildly addictive caffeine, caramel coloring with its carcinogenic 4-methylimidazole contaminant, and tooth-rotting phosphoric acid.

UNFORTUNATELY, THIS IS NO LIE:

"There is a large portion of the population that relies on the carbohydrates and energy in our regular beverages."

Katie Bayne, Coca-Cola President
of Sparkling Beverages, North America

Truth: Far too many people do rely too much on soft drinks for their calories. Sugary drinks' empty calories displace healthier foods, and Americans already consume hundreds more calories per day on average than they did 30 years ago.

Truth: Two-thirds of American adults and one-third of children are overweight or obese.

Truth: The American Heart Association urges Americans to consume 60% less sugary drinks by 2020.

Truth: Overall, males 12 to 19 years old consume 273 calories per day from sugary drinks; female teens down 171 per day.

* Want to dive deeper into the facts? Download Soda Facts 101 with citations here >>



VIEWS



young children. Also, they sell kids' tee-shirts, toys, games, and stuffed animals with Coca-Cola logos at its web store, and the company licenses similar kid-friendly products at Toys "R" Us, and elsewhere.

Truth: Coke has long reached millions of young children by marketing its drinks at child-friendly fast food restaurants, including McDonald's, the home of Happy Meals.

Truth: While soda companies, thankfully, have not advertised on TV shows intended for little kids, they have spent heavily to get their brand names onto school scoreboards and their products into elementary, middle, and high schools. An internal 1995 Coke newsletter exclaimed, "The Coca-Cola Company is focusing upon the education market with revitalized efforts around the world." Only recently did public pressure force them to stop.

Truth: Soft drink companies do market aggressively to teens. According to the Federal Trade Commission, in 2006, companies spent \$474 million marketing carbonated beverages directly to adolescents—more than twice the marketing budget for any other consumable product.

LIE "Our member companies do not advertise beverages other than juice, water or milk-based drinks to any audience that is comprised predominantly of children under 12."

American Beverage Association

LIE "Coca-Cola is an excellent complement to the habits of a healthy life."

Douglas Ivester
Former Coca-Cola Chairman and CEO

Truth: Coca-Cola and other colas undermine that healthy life with loads of obesity-promoting high-fructose corn syrup, mildly addictive caffeine, caramel coloring with its carcinogenic 4-methylimidazole contaminant, and tooth-rotting phosphoric acid.

UNFORTUNATELY, THIS IS NO LIE:

"There is a large portion of the population that relies on the carbohydrates and energy in our regular beverages."

Kate Bayne, Coca-Cola President
of Sparkling Beverages, North America

Truth: Far too many people do rely too much on soft drinks for their calories. Sugary drinks' empty calories displace healthier foods, and Americans already consume hundreds more calories per day on average than they did 30 years ago.

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Truth: Overall, males 12 to 19 years old consume 273 calories per day from sugary drinks; female teens down 171 per day.

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VIEWS



THE REAL THING

TRUTH AND
POWER AT
THE COCA-COLA
COMPANY

"Tells the 130-year history
of Coca-Cola with flair and gusto."
—*The Washington Post-Book World*

CONSTANCE L.
HAYS

With a new Afterword
by the author



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Coca-Cola Beverages. When it went public on the London Stock Exchange in July 1998, when the Coca-Cola Company's financial success seemed unstoppable, Isdell expected to be sitting on top of the world. Less than a year later, the stock was in tatters, with a war in Kosovo, a depressed Russian ruble, and a general slowdown in soft-drink consumption ruining the grand vision for the bottle that Ivester and Isdell had shared.

It would not have taken much to persuade Isdell to come to Atlanta and become the president of Coca-Cola. And there were quite a few people who thought he would be an excellent choice. "He was a warm, gracious, inviting personality," one former executive said. "Where Doug was uncomfortable speaking publicly, Neville was a natural. If you had never met Keough, you would say that Neville was the greatest speaker in the world."

But no, Neville Isdell was not going to be Ivester's choice. The chairman and chief executive of Coke preferred to keep his options open a little while longer. With the problems at Coca-Cola Beverages, he couldn't move Isdell now. Besides, he believed he had plenty of time to figure out this issue.

Ivester, impatient himself with failure, must have known the long knives had been unsheathed. First there was the stalled Orangina transaction, then the scaled-back Cadbury deal. And the Belgian episode—the biggest recall of Coca-Cola anywhere, ever—had been another strike against him. But in every case, he could argue, or have others argue on his behalf, this wasn't his fault.

But he didn't. He did not appeal to his friends among the Coke directors or suggest that someone speak on his behalf. He maintained his own sturdy faith in Coca-Cola—that it was the greatest, best-loved brand in all the world. This was a rough patch, but Coke would be fine. He was telling the truth.

IN SEPTEMBER, IVESTER agreed to an interview with a Brazilian newsweekly whose reporter flew to Atlanta for the session. The publication, *Veja*, was widely read in Brazil, and Brazil had been a tantalizing but problem-plagued market for Coke for some time. Ivester believed that the Coca-Cola Company was at a disadvantage there when it came to competing with cheaper sodas, known as *tubainas*, that were locally produced and distributed. The owners of the *tubainas* filled up any old bottle with their flavored drinks. Their reputation for being less than pure and clean was not even debatable. And they did not pay the kinds of taxes that an American company had to pay, Ivester often said, and he pressed the Brazilian government officials he met with to repeal that

Without an even playing field, he believed, Coke would always have to struggle in a market like that. As it was, the company was paying \$1.5 billion in marketing support to its bottlers in Brazil, spread over several years, to help offset the most recent downturn in sales. Brazilian workers would buy a Coke at the beginning of the month, when their paychecks came in, but midway through the month they were drinking *tubainas* exclusively. Were it not for those competitors, Ivester must have fumed privately, Brazil, the country with the fourth-largest population on the planet, would belong to Coke, too.

When the request for an interview came along, he was ready to consider it. Clearly, it would help to have the chairman and chief executive of the Coca-Cola Company talking in print about his company. He could discuss Coke's plans for the future, and detail some of the reasons that Coke was so strong in so many markets, and deliver—courtesy of someone else's publication—the kind of message to the Brazilian consumer that Coke would otherwise have to pay mightily to send out. So Ivester consented to the *Veja* request. He would sit down in Atlanta with one of its reporters, whose name was Euripedes Alcantara.

The day arrived, and Ivester seemed to have made the right decision in allowing the interview. It was boring, mostly, filled with predictable questions and even more predictable corporate answers. The reporter asked one question about Coke's place in a world where people were increasingly concerned about health. Ivester was primed to answer that one. He loved taking on questions about whether Coca-Cola was good for people. For the record, he would always say that it was. In an interview with *The New York Times* in 1998, he had asserted that by selling Coca-Cola across Africa, the company was actually performing an important public health service. "Fluid replenishment is a key to health, and when you have a population that has appropriate fluid intake, what you find is they have a lot less kidney problems and kidney disease," he said. And he did indeed seem to believe it, although the World Health Organization did not even list kidney disease on its long list of Africa's problems. He had spent time with scientists, he said, who understood kidney problems, and "some of them will tell you Coca-Cola does a great service because it encourages people to take in more and more liquids."

Now he addressed the question for Euripedes Alcantara. "First of all, we have a very healthy product," he declared. "Of course, our beverage contains sugar, but sugar is a good source of energy, of vitality, not to mention that it is a source of foreign exchange for exporter countries." Brazil was one of these sugar-producing engines of the world, as Cuba had been when Goizueta lived there. But in many

places Coca-Cola was no longer made with cane sugar. That ingredient had been replaced under Goizueta, who saw high-fructose corn syrup as an acceptable substitute, not to mention one that saved the company millions of dollars a year.

"Coca-Cola is an excellent complement to the habits of a healthy life," Ivester went on. "Naturally, people need to exercise and follow a balanced diet." But concerns about health didn't seem to have stopped anyone from imbibing the world's most popular soft drink, he added. These days, he told Euripedes Alcántara, "people drink more Coca-Cola than in any other period in the past." That, indeed, was true.

The reporter asked Ivester about the company's adventures in Belgium, and about prospects for growth. Ivester responded to both predictably. And then, tape recorder whirring, Alcántara asked another question: about an obscure new technology he had heard Coke may have been testing, a technology focused around the vending machine.

The vending machine was a subject close to Ivester's heart. The company sold about 11 percent of its products through vending machines, known in Coke parlance as "cold-drink equipment." The potential in being able to sell ice-cold Cokes to a thirsty public had first dawned on a Coca-Cola bottler named George Cobb, who turned his idea into a contraption that he field-tested in 1910. Cobb was an Opelika, Alabama, native, the son of a country dentist whose patients brought him kindling and sweet potatoes as payment for his services. He named his machine the Vend-All Nickel in Slot Vending Machine and received a patent on it two years later. Depositing a nickel would release a catch that held down the machine's lid, and once open, a person could help himself to a bottle of Coke. The container held a dozen Coca-Colas, along with a chunk of ice, and Cobb sold several of them to his fellow Coke entrepreneurs. Cobb, whose bottling franchise was based in West Point, Georgia, in the southwestern part of the state, went on to become one of the most successful bottlers in the entire Coke system. "A Coca-Cola bottler with all of his family and loyal employees is one of the strongest business influences in any community," he once wrote, "and what a tremendous asset to the Parent Company!"

It was not until 1932 that the Coca-Cola Company officially approved coin-operated vending machines. Two years earlier it had endorsed mechanically refrigerated coolers as a way to "improved serving of the bottled product," and in 1929, the year of the market crash, Coke had approved a refrigerated tub from which stores and other places could sell bottles of Coke. These tubs, known as open-top coolers, made it possible for Coke to be sold front and center. Bot-

Exhibit 9

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to Super. Ct. R. 5(d)(6)(B)**

Exhibit 10

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SUPERIOR COURT
DISTRICT OF COLUMBIA
2017-CALIFORNIA-004801 B[13998]
PASTOR WILLIAM H. LAMAR IV, et. al.
v. THE COCA-COLA COMPANY, et. al.
Client #: C5530 - THE COCA-COLA COMPANY
Matter #: 112A00

COS2013 Symposia - Coca Cola -
Dr. Rhona Applebaum

1 RHONA APPLEBAUM: People are surprised.
2 I know I was surprised when I came to the company
3 in 2004 when they told me--it was then 50 years--
4 50 years Coca-Cola, our sparkling had not
5 advertised to children. I had to go back. I had
6 to go look. Absolutely.

7 I was in kidvid. I was doing kidvid and
8 FTC, for those here at the Federal Trade
9 Commission, where the industry was attacked for
10 Saturday morning shows featuring chocolate and a
11 host of other products. Reason Coke wasn't there
12 is because Coke wasn't doing it. Oh, my gosh.
13 That was a surprise. And it was a surprise
14 because you just didn't know.

15 And one of the reason people are
16 saying, oh, look, they're getting more active in
17 terms of telling their story--yeah, we are. We
18 are. Because if we don't tell our story, just
19 like with you, other people will tell it for us.
20 And whether intentionally or just by natural
21 error, they're going to get it wrong.

22 So, we're stepping up and we're
23 standing up, as some people have identified, and
24 we're telling our story. So, this is just one of
25 the stories that--and based on fact that I wasn't

1 aware of that needs to be shared. And we're doing
2 more in terms of that particular area of
3 marketing.

4 Innovation, executing and educating
5 around choice? We do believe in choice.
6 Absolutely, we believe in choice. I believe in
7 choice in everything I do. It's a right that I
8 have as an American, but I also have as a citizen
9 of the world, and all of you do also.

10 So, again, what can we do more to
11 provide you with choice and informed choice?
12 Because shame on us if we are not giving you the
13 necessary information. And I'll go into that in
14 terms of what we're trying to do. But if you
15 think we need to do more, that's part of the
16 partnership. That's part of the collaboration.
17 That's part of just engaging, and again,
18 promoting active healthy living.

19 So, let's talk about active healthy
20 living, our vision. Our vision is we want to
21 aspire to help people around the world lead
22 active healthy lives, through our products, our
23 commitments, our actions, and of course, our
24 resources. And our resources is not just about
25 dollars. It's also about our time and it's about

1 what we do as a company.

2 Okay, so active healthy living. When we
3 first did it--and this is the difference between
4 scientists and marketers. As a scientist, we
5 looked at this and it's about, okay, we got it,
6 this is what we have to do. Education isn't easy,
7 but if you teach the people to fish versus giving
8 them a fish, it's gonna make all the difference
9 in their lives.

10 So, it's about education, it's about
11 variety. It's about variety. And I'd be lying to
12 you up here if I didn't say it was about growing
13 our business. Of course, it is. We're a for
14 profit company. But we wanna do right by the
15 consumer and our stakeholders. So, it is about
16 variety.

17 And again, 127 years ago we started off
18 with one beverage that I personally am very proud
19 of. It's safe. It hydrates. It's enjoyable. You
20 can laugh. Thank you. You can laugh.

21 It's about the how, how much, and how
22 often. We're not expecting all your hydration
23 needs to come from Coca-Cola. Lord knows that's
24 not balance, variety and moderation. So, over 127
25 years we have 3500 products. And again,

1 recognizing the issues associated with weight and
2 obesity, 25 percent of those are low and no
3 calorie, and it's continuing to grow.

4 And then, of course, fiscal activity.
5 So, where as a scientist we would say education,
6 variety and physical activity, our marketers
7 looked at it and just said, okay, it's about
8 think, drink and move. Because we're not afraid
9 of consumers who think, who are mindful and make
10 the necessary choices with the information that
11 they're provided with.

12 And if that includes not drinking Coca-
13 Cola, that's why we have 3500--oh, it should say
14 3499 other products. So, let's continue.

15 Okay. What is active healthy living?
16 It's about these three work streams, think, drink
17 and move. We have what we call strategic
18 priorities as it relates to what we wanna do. We
19 wanna identify and understand the issue. If you
20 think we have all the answers, we don't. I'm not
21 trying to be humble. I'm just being truthful. We
22 don't have all the answers.

23 There's a lot of questions we have. We
24 wish there were government agencies and others
25 who would take our questions and do the research.

1 They don't. So, we also support research, hands-
2 off, conflict of interest, independent advisory
3 panels, completely 6 degrees of separation, if
4 not 6000 degrees of separation.

5 But we do, we want to identify and we
6 want to understand the issues. We want to advance
7 and utilize the science. That is truth. As a
8 scientist, research is done to identify what is
9 and what isn't, but it's not a one-you know, it's
10 not a one-trick pony. We have to, when we're
11 working in this area, continue to do research.
12 That's why you just don't do one experiment.
13 That's why you just don't have one sample. I
14 don't have to tell you this. You guys are the
15 experts in this room.

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C E R T I F I C A T I O N

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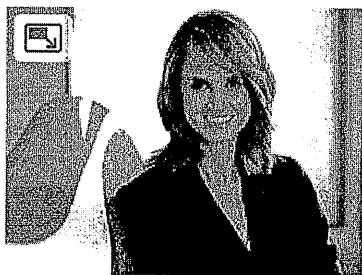
Exhibit 11

Coke executive answers questions about sugary drinks

Updated 6/7/2012 0:18 PM

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Until now, beverage giant Coca-Cola hasn't put a face to its staunch opposition to last week's proposal by New York Mayor Michael Bloomberg to limit to 16 ounces the size of sugary drinks sold at New York restaurants, movie theaters and street carts. But in an exclusive interview, **Katie Bayne**, Coca-Cola's 45-year-old president of sparkling beverages in North America, explains to USA TODAY marketing reporter **Bruce Horowitz** where she differs with Bloomberg and discusses which beverages she permits her young sons to drink. She will speak on Monday in New York City at a *Beverage Digest* conference. This interview is edited for clarity and space.



Coca-Cola

Katie Bayne is president and general manager of sparkling beverages for Coca-Cola North America.

Q: If Mayor Bloomberg were sitting across from you, what would you say to him?

A: I'd say, Mayor, we believe you're absolutely right. Obesity is a critical health challenge facing our nation. But singling out single brands or foods is not going to help the situation. Working together in a partnership will.

STORY: Coke says obesity grew as sugary drink consumption fell

Q: Is there any merit to limits being placed on the size of sugary drinks folks can buy?

A: Sugary drinks can be a part of any diet as long as your calories in balance with the calories out. Our responsibility is to provide drink in all the sizes that

consumers might need.

Q: Is anyone at Coca-Cola trying to figure out a way to get sugar out of all drinks?

A: There is a large portion of the population that relies on the carbohydrates and energy in our regular beverages. When my son gets home from school, he needs a pick-up with calories and great taste.

Q: But critics call soft drinks "empty" calories.

A: A calorie is a calorie. What our drinks offer is hydration. That's essential to the human body. We offer great taste and benefits whether it's an uplift or carbohydrates or energy. We don't believe in empty calories. We believe in hydration.

Q: Because sugary drinks have been linked with obesity, some suggest soft-drink makers place "warning" labels on cans and bottles.

A: There is scientific evidence that suggests a warning label is not the best solution.

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Q: But critics call soft drinks "empty" calories.

A: A calorie is a calorie. What our drinks offer is hydration. That's essential to the human body. We offer great taste and benefits whether it's an uplift or carbohydrates or energy. We don't believe in empty calories. We believe in hydration.

Q: Because sugary drinks have been linked with obesity, some suggest soft-drink makers place "warning" labels on cans and bottles.

A: There is no scientific evidence that connects sugary beverages to obesity. If you look at the data, you can see that during the same period obesity was rising, sugar intake from beverages was decreasing. Between 1999 and 2010, sugars from soda consumption decreased by 39%, but the percentage of obese children increased by 7%, and 13% for adults.

Q: Shouldn't teens drink less cola and more milk and water?

A: Teens should get a healthy diet through food and beverage choices throughout the day.

Q: How much Coke should a kid drink a day?

A: We don't make recommendations on what kids should drink. But a 12-ounce can of Coke has 140 calories, the same as a lunch-box-size bag of pretzels.

Q: What sugary drink limits do you place on your kids?

A: My job as a parent is to guide them through the day to make the best choices. If my son has lacrosse practice for three hours, we go straight to McDonald's and buy a 32-ounce Powerade.

Q: What do you drink daily?

A: I might have a mini Diet Coke while cooking breakfast for my family. After the kids leave for school, I go for a run and then have a Powerade Zero. At work I may have a Diet Coke in the morning and in the afternoon, Gold Peak Tea. In the middle of the afternoon, I may have an 8-ounce Coke. I'd rather have that than a candy bar or cookie for a pick-me-up.

Q: What do you say to those who believe that sugar — particularly in soft drinks — works on the brain like an addictive substance?

A: There is no scientific evidence.

Q: Critics say Coke is pushing sugary drinks in China and India and will cause obesity there just like here.

A: Every person in those countries is different and should be able to choose what's right for them.

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Ray Gibson

Dr. Pepper and Mr. Pibb could get married in NYC but heaven forbid they serve 20 oz bottles at the reception...

Like · Reply · 19 · Jun 7, 2012 5:53pm



Nathan Mathias · Anchorage, Alaska

Who said Dr. Pepper isn't a woman? (assuming your comment is a gay marriage reference)

Like · Reply · 7 · May 8, 2013 11:37am



Jim Charbonneau

We don't have many "sugar" drinks. Get rid of the high fructose corn syrup, and go back to sugar.

Like · Reply · 35 · Jun 7, 2012 7:40pm



David Pipe

Have you ever had a Coke manufactured in Mexico? They still use real cane sugar ... the taste is amazing - so much better! Now, if they'd just go back to putting real cocaine in the recipe...

Like · Reply · 15 · Jul 6, 2012 5:24am



Bruce Teare · Parsippany High School

GMO is high fructose corn syrup double dose of poison ! Boycott all coke products .

Like · Reply · 8 · May 8, 2013 7:02am



Evan Follmer · Site Leader / Manager at Staples Premedia

Switch to Jones Soda - pure cane sugar - no corn syrup

Like · Reply · 3 · May 8, 2013 11:14am

Show 1 more reply in this thread ▾



Infinity Oh · Director at The Jupiter Project

anything that you mix (in your stomach) with Coke becomes indigestible . We need nutrients not 'calories' .

Like · Reply · 21 · Jun 7, 2012 8:26pm



Jacqueline Stickel · Registered Dietitian at Prince Albert Parkland Health Region

I agree that we need nutrients. not calories...but Coke itself doesn't prevent



Infinity Oh · Director at The Jupiter Project

anything that you mix (in your stomach) with Coke becomes indigestible .
We need nutrients not 'calories' .

Like · Reply · 21 · Jun 7, 2012 8:26pm



Jacqueline Stickel · Registered Dietitian at Prince Albert Parkland Health Region

I agree that we need nutrients, not calories...but Coke itself doesn't prevent food components from being digested or nutrients from being absorbed. Yes, it's acidic, but your stomach acid is even more acidic.

Like · Reply · 2 · May 8, 2013 9:56pm



Modesto Rodriguez Montes · Los Angeles, California

There is more than enough scientific evidence that fructose (around 50% of the sugar we eat) is basically a poison that has to be metabolized in our livers and creates a whole bunch of toxins in our bodies.

This video gives a lot of data on this matter. It opened my eyes and the eyes of the 2.4 M people that has seen it. It is sometimes too scientific, but it is very clear on how sugar is pounding our bodies as a poison: <http://www.youtube.com/watch?v=dBnniua6-oM>

Mrs. Baynes will never accept any argument like this, it does not matter who says it or how much science is behind it. She is doing what many others do, close your eyes and continue counting your money. I would not mind if the lives of so many people would not be at stake.

The best way to get more people to realize about this situation and stop drinking colas and sugary drinks is to provide information about the problem. It is better than regulate, as there is an understanding of what is going on.

Like · Reply · 39 · Jun 7, 2012 9:03pm



Danielle Curry

Rocky Sly, as Modesto said--education NOT regulation, however, there are a lot of people with vested interests funding junk science. That said, let the people decide, then let natural selection take over!

Like · Reply · 9 · Jun 9, 2012 11:32am



George Butiri · CTO at ActingShowcase.com

Rocky, I agree. Everything is harmful when not in moderation. We have to learn to control our own selves before we blame others for our actions.

Like · Reply · 6 · Jun 9, 2012 4:50pm



Jake Freppel · Napoleon, Ohio

Too bad restaurants have taken away our right to choose more sensible portion sizes of drinks.

Like · Reply · Jun 9, 2012 6:38pm

Show 6 more replies in this thread ▾



Robert Willison · Chief Engineer, US Post Office Next Generation Vehicle at Workhorse Group

"I might have a mini Diet Coke while cooking breakfast for my family." - This is the dream. To have sugar drinks morning, noon, and night. So funny... "Please keep drinking our stuff so we make money....." Junk Marketing at its finest.

Like · Reply · 3 · Jun 8, 2012 2:57am




Mark Arena · London, United Kingdom

The PR Verdict: F (Full Fiasco) for Coke. Claiming you are as concerned about diabetes and obesity as the next person while advocating the sale of jumbo sodas is a hard sell. Why resist the flow toward health for consumers?

Like · Reply · 1 · Jun 8, 2012 7:16am


drinking our stuff so we make money....." Junk Marketing at its finest..

Like · Reply ·  3 · Jun 8, 2012 2:57am



Mark Arena · London, United Kingdom


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Like · Reply ·  1 · Jun 8, 2012 7:16am



Larry Gregerson · Eastern Illinois University

The Coke PR team really got her prepared. Sugar is like a drug...unhealthy and very difficult to kick the habit.

Like · Reply ·  1 · Jun 8, 2012 7:22am




Kevin Butler

She's totally right. Companies print the calories right on the product. If you're too stupid to moderate your intake, the fault is yours. This whole tactic of blaming companies for producing items is ridiculous.

Now, if Coke was putting acid in their drinks and not putting it on the labels, then by all means, sue them. But everything is right there on the label.


The lazy and stupid don't deserve to profit from their laziness and stupidity.

Like · Reply ·  3 · Jun 8, 2012 8:00am



Christina Sabo

I had a passenger on my aircraft that works in a Coca Cola factory and will never drink it again. He claimed that the syrup dropped on his shoe and the acidity ate right through the fabric! And, you're right...the acid is on the label. It's just that most are too ignorant to know what those big words mean or care enough to look it up. They would rather just be dumb and happy and fat.

Like · Reply ·  5 · Jun 9, 2012 4:22pm



Kevin Butler


Actually, any acid, in a high enough concentration, can eat through things. Even citric acid.

Like · Reply · Jun 14, 2012 4:04am



Sarah Craighead Dedmon · Machiasport, Maine

You're right! That's why I'm coming out with my new line of radioactive gumballs, with machines to sell it on playgrounds. If your kids are too stupid not to buy them, well, don't blame me.

Like · Reply ·  1 · Jun 15, 2012 12:35pm

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Raymond Daniel · Works at Defense Finance and Accounting Service

She is right. People are responsible for their daily health needs and choices. This is after all America. to single out a product is not right. I would rather see high fructose corn syrup taken out of all the canned and boxed products. This is what is making Americans fat and not Coke.

Like · Reply · Jun 8, 2012 8:17am



Jeff Chausse · Principal UX Designer at Forrester

A calorie is not a calorie... Intense sweetness (even artificial) has been proven to override self-control mechanisms. The calories in a Coke may have the same effect on your body as those in a salad, but the Super Size Fries you then eat due to sugar-driven cravings are another thing.

"In 2007, researchers at the University of Bordeaux, France, reported that when rats were allowed to choose between a calorie-free sweetener and intravenous cocaine, 94 percent preferred the sugar substitute. The researchers concluded that "intense sweetness can surpass cocaine reward. . . . The supranormal stimulation of these receptors by sugar-rich diets, such as those now widely available in modern societies,

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<http://www.details.com/.../carbs-caffeine-food-cocaine...>

Like · Reply · 8 · Jun 8, 2012 9:34am

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Exhibit 12

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Exhibit 13

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PASTOR WILLIAM H. LAMAR IV, et. al.

v. THE COCA-COLA COMPANY, et. al.

Client #: C5530 - THE COCA-COLA COMPANY

Matter #: 112A00

Coca-Cola pledges to tackle obesity

1 RICHARD QUEST: Coca-Cola, easily the
2 most recognized brand in the world and the third
3 most powerful brand, according to Forbes, is now
4 trying to take the front foot in the world's
5 fight against obesity. There are 139 calories in
6 each can of Coke. In comparison, Pepsi tips the
7 scale at 142.

8 Now, there's little doubt Coke's
9 challenge is to get consumers to burn these 139
10 calories off. And the company has now determined
11 on a global scale, global scale, mind, that it is
12 going to put the detailed nutritional details and
13 fight obesity.

14 Joining me to talk about it is James
15 Quincey, the President of Coca-Cola in Europe.

16 You have put numbers on cans in mature
17 markets like the EU for a long time, correct?

18 JAMES QUINCEY: Correct. Since 2008,
19 2009.

20 RICHARD QUEST: So, why didn't you do it
21 everywhere else, and why are you doing it
22 everywhere else now?

23 JAMES QUINCEY: Look, I think that it is
24 true that a number of the things in these four
25 commitments we've done in some of the countries

1 before. And that's what important about today is
2 that we're taking those things that we think are
3 starting to contribute to the problem, to solving
4 the problem, and taking them global.

5 So, what today is about is global
6 scaling reach, getting everywhere in the more
7 than 200 countries that we operate in around the
8 world and being public about it, joining very
9 publicly in the conversation and inviting-

10 RICHARD QUEST: Well, what is that
11 conversation? I mean, I'm just going to go and
12 grab one of your cans, if I may.

13 JAMES QUINCEY: Sure.

14 RICHARD QUEST: I mean, what is your
15 conversation actually really all about? Is it
16 saying, well, there's 139 calories, but there's
17 35 grams of sugar in it as well. Is it telling
18 people this is good, this is bad, this is what
19 you need to do?

20 JAMES QUINCEY: What it's about is
21 giving people the information. So, as you can
22 see, we've got already here in the UK all five
23 different ingredients on there, both the calories
24 and the sugars. What we believe in is providing
25 people the information and providing them choice

1 of drinks so that whether they've got calories in
2 the drinks or not got calories in the drinks,
3 they can help manage their balance of intake,
4 which is what they're burning off, which is
5 getting off the sofa is the other half of the
6 problem.

7 RICHARD QUEST: And how are you—and I
8 know Muhtar Kent, of course, your CEO is
9 passionate about—

10 JAMES QUINCEY: Yes.

11 RICHARD QUEST: --this issue. But you
12 need to do more, don't you? And you said you're
13 going to do more.

14 JAMES QUINCEY: Yeah, we believe these
15 four commitments, you know, offering more low and
16 no calorie beverages across the 200 countries we
17 work in gives the choice. Putting the calories
18 on—

19 RICHARD QUEST: I'm gonna come back—

20 JAMES QUINCEY: --gives the information.

21 RICHARD QUEST: I'm gonna come back—

22 JAMES QUINCEY: Yes, of course, Richard.

23 RICHARD QUEST: --to this. I'm coming
24 back to this thing of the cal--you know and I
25 know it's not the caloric content per se. And it

1 says it here, 139 calorie is seven percent of the
2 recommended da--but it's the 35 grams, which is
3 nearly 40 percent, that's the bit that has to be
4 reduced.

5 JAMES QUINCEY: Absolutely not. When we
6 talk about obesity, that's not the case. When we
7 talk about obesity, a calorie is a calorie. The
8 experts are clear, the academics, the government
9 advisors, diabetes associations. We need to have
10 balance of the calories in it. If you're taking
11 in too many or not burning them off, that's a
12 problem wherever they come from. A calorie is a
13 calorie.

14 Now, Coca-Cola can have a role within a
15 balanced diet. If you're taking too many
16 calories, try a Coke Zero, nice black can here
17 with no calories in it.

18 RICHARD QUEST: Right. It's important to
19 point out here that whatever anybody might think
20 of what you're doing, the reality is you are the
21 largest, or one of the largest, in the business.
22 So, where you go, others will follow. And it is
23 up to your company to be that model, that role
24 model, to some extent, isn't it? In the same way
25 that one can arguably say about McDonalds and

1 fast food.

2 JAMES QUINCEY: Yeah, we're a big
3 company. We're a leader in our industry and we
4 believe that businesses need to exert leadership
5 and always engage with government and society in
6 the big issues of the day.

7 We may only count for two to three
8 percent of the calories in the countries in
9 Europe, but we believe we need to engage and take
10 a leadership position. And that's what these four
11 commitments are about, being a leader and being
12 public about it.

13 RICHARD QUEST: Fascinating. Thank you
14 very much indeed for joining us.

15 JAMES QUINCEY: Thank you very much
16 indeed.

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[yeah - zero]

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Exhibit 14



Coca-Cola Teams Up With Nutritionists to Push Coke as Healthy Treat

Mon, 03/16/2015 - 8:25am by CANDICE CHOI, AP Food Industry Writer

NEW YORK (AP) — If a column in honor of heart health suggests a can of Coke as a snack, you might want to read the fine print.

The world's biggest beverage maker, which struggles with declining soda consumption in the U.S., is working with fitness and nutrition experts who suggest its cola as a healthy treat. In February, for instance, several wrote online pieces for American Heart Month, with each including a mini-can of Coke or small soda as a snack idea.

The mentions — which appeared on nutrition blogs and other sites including those of major newspapers — show the many ways food companies work behind the scenes to cast their products in a positive light, often with the help of third parties who are seen as trusted authorities.

Ben Sheidler, a Coca-Cola spokesman, compared the February posts to product placement deals a company might have with TV shows.

"We have a network of dietitians we work with," said Sheidler, who declined to say how much the company pays experts. "Every big brand works with bloggers or has paid talent."

Other companies including Kellogg and General Mills have used strategies like providing continuing education classes for dietitians, funding studies that burnish the nutritional images of their products and offering newsletters for health experts. PepsiCo Inc. has also worked with dietitians who suggest its Frito-Lay and Tostito chips in local TV segments on healthy eating. Others use nutrition experts in sponsored content; the American Pistachio Growers has quoted a dietitian for the New England Patriots in a piece on healthy snacks and recipes and Nestle has quoted its own executive in a post about infant nutrition.

For Coca-Cola Co., the public relations strategy with health experts in February focused on the theme of "Heart Health & Black History Month." The effort yielded a radio segment and multiple online pieces.

One post refers to a "refreshing beverage option such as a mini can of Coca-Cola." Another suggests "portion-controlled versions of your favorites, like Coca-Cola mini cans, packs of almonds or pre-portioned desserts for a meal."

The focus on the smaller cans isn't surprising. Sugary drinks have come under fire for fueling obesity rates and related ills, and the last time Coke's annual U.S. soda volume

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suggests "portion-controlled versions of your favorites, like Coca-Cola mini-cans, packs of almonds or pre-portioned desserts for a meal."

The focus on the smaller cans isn't surprising. Sugary drinks have come under fire for fueling obesity rates and related ills, and the last time Coke's annual U.S. soda volume increased was in 2002, according to the industry tracker Beverage Digest. More recently, the company is pushing its mini-cans as a guilt-free way to enjoy cola. The cans also fetch higher prices on a per ounce basis, so even if people are drinking less soda, Coke says it can grow sales.

In a statement, Coca-Cola said it wants to "help people make decisions that are right for them" and that like others in the industry, it works with health experts "to help bring context to the latest facts and science around our products and ingredients." It said any communications by the experts it works with contain the appropriate disclosures.

Most of the pieces suggesting mini-Cokes say in the bios that the author is a "consultant" for food companies, including Coca-Cola. Some add that the ideas expressed are their own. One column is marked at the bottom as a "sponsored article," which is an ad designed to look like a regular story. It ran on more than 1,000 sites, including those of major news outlets around the country. The other posts were not marked as sponsored content, but follow a similar format.

Kelly McBride, who teaches media ethics at The Poynter Institute, said the phrasing of the disclosure that the author is a "consultant" for food companies, including Coca-Cola, doesn't make it clear the author was specifically paid by Coke for the column.

"This is an example of opaque sponsored content," McBride said.

The Academy of Nutrition and Dietetics, a professional group for dietitians, says in its code of ethics that practitioners promote and endorse products "only in a manner that is not false and misleading." A spokesman for the academy did not respond when asked if the posts on mini-Cokes meet those guidelines.

Meanwhile, a group called Dietitians for Professional Integrity has called for sharper lines to be drawn between dietitians and companies. Andy Bellatti, one of its founders, said companies court dietitians because they help validate corporate messages.

The message that Coke can be a healthy snack is debatable. Alice Lichtenstein, a professor of nutrition science and policy at Tufts University and a member of the nutrition committee at the American Heart Association, said a smaller can of soda might be a "move in the right direction" for someone who regularly drinks soda. Still, she wouldn't recommend soda as a snack.

The health experts who wrote the pieces mentioning Coke stand by their recommendations.

Robyn Flipse, the dietitian who wrote the sponsored article for Coke, said she would suggest mini-cans of Coke even if she wasn't being paid. Although she doesn't drink soda herself, she said the smaller cans are a way for people who like soda to enjoy it sensibly.

"I absolutely think that I provided valuable information," she said.

Flipse said the idea to mention mini-cans of Coke in the post was hers and came about after a public relations agency for Coke suggested a piece on heart health and asked what she might "work in."

Flipse said the idea to mention mini-cans of Coke in the post was hers and came about after a public relations agency for Coke suggested a piece on heart health and asked what she might "work in."

Flipse has worked with Coca-Cola and the American Beverage Association for years; her roles have included sending out messages on social media refuting the idea that sugary drinks are to blame for obesity and making herself available as an expert for news outlets. If a story says something negative about artificial sweeteners, Flipse said she might contact the PR agency and ask, "Do you want me to do something about that?"

Sylvia Melendez-Klinger, a dietitian who wrote another piece mentioning mini-cans of soda, said it's important that health professionals share their expertise with companies and that her work reflects her own views.

She said she could not recall if she was paid for her article mentioning mini-sodas.



Operations

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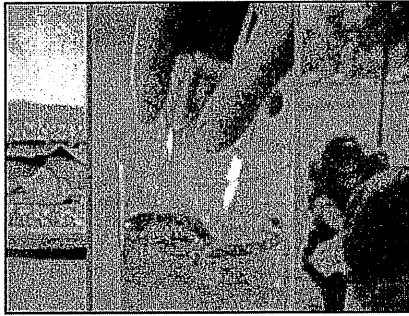
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Exhibit 16



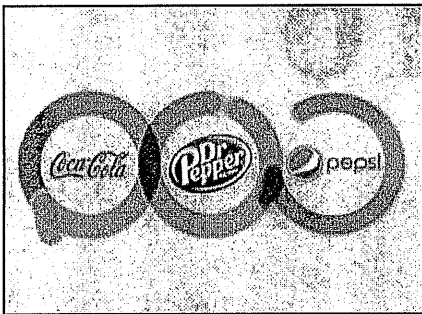
(Music)
VOICE OVER: Every day is a mix of...



food, drinks and physical activities.



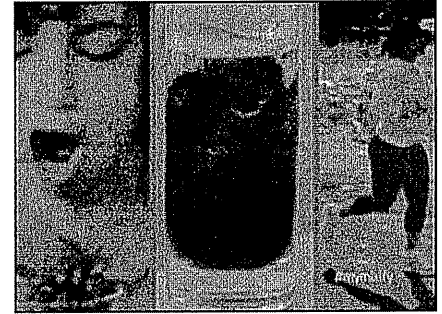
But some days are more balanced than others.



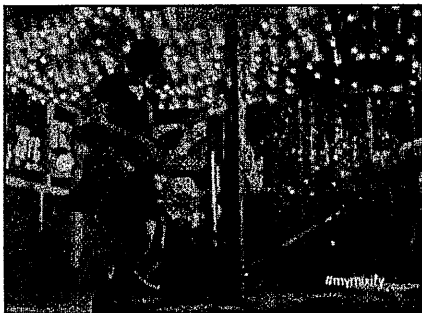
So Coke, Dr. Pepper and Pepsi...



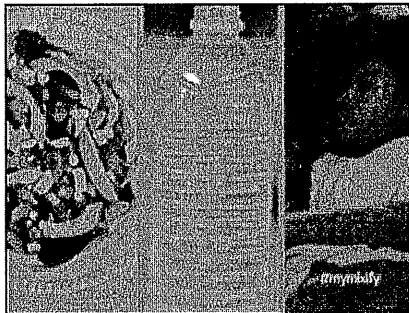
have joined forces to launch Mixify.



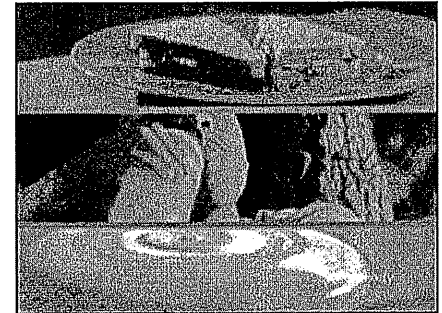
A new project with tips, tools and inspiration...



to help find a balance that's right for you.



Spend a day in the couch? Go for something less.



Just finished an afternoon of Frisbee? Maybe you've earned a little more.

Text: #mymixify.



Balance what you eat and drink with what you do.



That's how you mixify. Balance your mix at mymixify.com and share it with #mymixify.



(Fade Out)

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Exhibit 17



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Hydration: Does it Always Have to be Water?

By Stephanie Ferguson | Jan 24 2010
Last updated Nov 04 2015

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This publication addresses the common misperception that caffeine causes dehydration and provides an overall guide to how all liquids, including milk, fruit juices, sports drinks, watery foods, and even beverages such as soft drinks, coffee and tea can play a role in meeting individual hydration needs.

Whether you're an elite athlete, an avid exerciser, or more the spectator type, there's one common fact: you can't live long without water. Your body needs enough water to carry out many vital body functions and help you perform at your best.

That's why it's so important to stay hydrated both on and off the field, says fitness expert, author and celebrity trainer, Kathy Kaehler. "Proper hydration keeps our bodies running the way they're supposed to," she says.

Download the PDF to learn the ins and outs of hydration, as well as some surprising facts about caffeine and hydration.

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Exhibit 18

SUPERIOR COURT OF THE DISTRICT OF COLUMBIA
CIVIL DIVISION

GREGORY HEMBY,

Plaintiff

v.

BIOTAB NUTRACEUTICALS, INC., et
al.,

Defendants

Docket No. 2014 CA 000190 B
Civil 2 Calendar #11
Judge Stuart G. Nash

ORDER

Before the Court is defendants' Motion to Dismiss Plaintiff's Complaint, filed May 9, 2014. Defendants move to dismiss plaintiff's complaint for lack of standing, pursuant to Rule 12(b)(1), and for failure to state a claim upon which relief may be granted, pursuant to Rule 12(b)(6). Plaintiff has filed an opposition and defendants have filed a reply. For the reasons set forth below, the Court has determined that plaintiff Gregory Hemby lacks standing to bring the instant complaint, and therefore the Court grants defendants' motion to dismiss.

I. Background

Plaintiff Gregory Hemby filed the instant suit against defendants Biotab Nutraceuticals, Inc. and Walgreen, Co. on behalf of "the General Public of the District of Columbia" for alleged violations of the District of Columbia Consumer Protection Procedures Act ("CPPA"), D.C. Code §§ 28-3901, *et seq.* Specifically, Mr. Hemby contends that the defendants have engaged in a "pattern of fraudulent, deceptive and otherwise improper sales and marketing practices" regarding the sale of ExtenZe, a dietary supplement for men that promises to increase their penis size. Compl. ¶ 1.

Biotab Neutraceuticals, Inc. is the manufacturer and distributor of ExtenZe, and Walgreen, Co. sells the product at its retail stores located in the District. Plaintiff contends that the defendants have engaged in unlawful trade practices in violation of the CPPA by misrepresenting the product's ability to perform as advertised and by failing to disclose the potentially dangerous side effects associated with Yohimbe, one of the product's active ingredients.

As support for these assertions, Mr. Hemby provides several examples of advertisements made for ExtenZe on television, the internet, in direct-to-consumer email campaigns, and on the product's packaging. These advertisements include statements promising that ExtenZe is "guaranteed to really increase your penis girth and penis size in just a few short weeks" and that the product is "clinically tested", "safe", and "proven to work." Compl. ¶¶ 34, 42, 50. Mr. Hemby asserts that these advertisements are directed at the residents of the District of Columbia, that they are false and misleading, and that the District's residents are damaged by them. However, Mr. Hemby does not assert that he has actually viewed any of these advertisements or that he acted in reliance on them in purchasing ExtenZe.

Mr. Hemby represents that he purchased a 30-day supply of Liquid Citrus ExtenZe at a Walgreens convenience store located in the District of Columbia at the cost of \$40.99. He further represents, "[u]pon information and belief," that ExtenZe does not in fact increase penis size and that it may cause dangerous side effects. Compl. ¶¶ 19-20. Mr. Hemby does not contend that he ingested the dietary supplement, and therefore he makes no representations based on his own personal experience.

Defendants have moved to dismiss the complaint on several grounds. They argue that (1) Mr. Hemby does not have standing to assert these claims; (2) Mr. Hemby's claims are preempted

by federal law; and (3) as pled, Mr. Hemby’s complaint fails to state a cause of action under the CPPA. Because the Court has determined that Mr. Hemby lacks standing to pursue a claim under the CPPA, it need not address Mr. Hemby’s additional arguments.

II. Discussion

a. Standing Jurisprudence

“Standing is a threshold jurisdictional question which must be addressed prior to and independent of the merits of a party’s claim.” *Grayson v. AT&T Corp.*, 15 A.3d 219, 229 (D.C. 2011) (quoting *Bochese v. Town of Ponce Inlet*, 405 F.3d 964, 974 (11th Cir. 2005)). The standing inquiry requires courts to consider “whether the person whose standing is challenged is a proper party to request an adjudication of a particular issue.” *Id.* (quoting *United States v. Bearden*, 328 F.3d 1011, 1013 (8th Cir. 2003)). Lack of standing is an appropriate basis for dismissal. *See, e.g. Friends of Tilden Park, Inc. v. District of Columbia*, 806 A.2d 1201, 1204 (D.C. 2002).

Although the District of Columbia’s courts were created under Article I of the Constitution, our courts have applied the constitutional standing jurisprudence developed in interpreting the “case or controversy” requirement in Article III. *See Grayson*, 15 A.3d at 234; *Floyd v. Bank of America Corp.*, 70 A.3d 246 (D.C. 2013). In determining whether a particular plaintiff has standing, the Court must apply the three-part test articulated in *Lujan v. Defenders of Wildlife*, 504 U.S. 555, 560-61 (1992):

First, the plaintiff must have suffered an “injury in fact.” an invasion of a legally protected interest which is (a) concrete and particularized, and (b) actual or imminent, not “conjectural” or “hypothetical.” Second, there must be a causal connection between the injury and the conduct complained of, the injury has to be fairly traceable to the challenged action of the defendant, and not the result of the independent action of some third party not before the court. Third, it must be “likely,” as opposed to merely “speculative,” that the injury will be “redressed by a favorable decision.”

The actual or threatened injury contemplated in *Lujan*'s first prong "may exist solely by virtue of 'statutes creating legal rights, the invasion of which creates standing.'" *Grayson*, 15 A.3d at 234-35 (citing *Warth v. Seldin*, 422 U.S. 490, 500 (1975)). This is often referred to as "statutory standing," and it confers standing on individuals whose injury is often less tangible than what a layperson would describe as an actual injury – *e.g.*, sustaining direct financial loss or physical injury. However, where a plaintiff asserts statutory standing, he "still must allege a distinct and palpable injury to himself, even if it is an injury shared by a large class of other possible litigants." *Id.*

b. Standing to Enforce the CPPA

The CPPA provides that "[a] person, whether acting for the interests of itself, its members, or the general public, may bring an action under this chapter . . . seeking relief from use by any person of a trade practice in violation of a law of the District of Columbia . . ." D.C. Code § 28-3905(k)(1). This language was added to the law in 2000, when the D.C. Council amended the CPPA. Prior to the 2000 amendments, § 28-3905(k) provided that an action may be brought under the CPPA by "[a]ny consumer who suffers any damage as a result of the use or employment of a trade practice in violation of the law of the District of Columbia . . ."

In *Grayson v. AT&T Corp.*, the D.C. Court of Appeals, sitting *en banc*, interpreted the 2000 amendments as enlarging the category of persons authorized to bring CPPA enforcement actions. Specifically, the Court found that it was the intention of the D.C. Council to accord standing to those individuals who could establish statutory standing – *i.e.* individuals who had personally suffered the deprivation of a statutorily-protected right – without necessarily suffering "what a layman would describe as actual injury." *Grayson*, 15 A.3d at 243 n. 71. However, the Court also determined that in passing the 2000 amendments, the D.C. Council did not intend to

eliminate the constitutional standing requirement. Thus, any suit to address the invasion of statutorily protected rights would still need to be premised on a “claimed invasion . . . personal to the [plaintiff].” *Id.* at 238-47. With this understanding, the Court turned to the facts of the two consolidated cases before it to determine whether either plaintiff had standing to bring their respective claims under the CPPA.

The first case, *Breakman v. AOL*, involved a claim regarding AOL’s alleged failure to disclose to its existing customers certain cheaper internet service options available to new customers. The plaintiff, Paul Breakman, was not an AOL subscriber and he did not claim to have been personally injured by AOL’s actions. His complaint was brought solely in a representative capacity to enforce the legal rights or interests of third parties – the residents of the District of Columbia. On that basis, the Court determined that Breakman lacked standing. Because Breakman had not asserted any palpable injury that was distinct and personal to him, the Court could not find that he had established a basis for the assertion of even statutory standing:

Without any claimed invasion of statutorily conferred rights and without any other “distinct and palpable injury” personal to Mr. Breakman, we cannot justify the invocation of our jurisdiction and the exercise of . . . remedial powers on his behalf. Mr. Breakman . . . is in no different a position to bring this claim than any other unaffected citizen.

Id. at 247.

The second case, *Grayson v. AT&T Corp.*, involved a claim regarding the failure of AT&T to remit to the D.C. government unused balances on prepaid calling cards (called “breakage”). The plaintiff, Alan Grayson, had purchased one such calling card in the District, and he claimed that he and other District of Columbia consumers had been injured by purchasing services whose actual value was less than the amount that they had prepaid for them. Unlike Breakman, the Court of Appeals found that Mr. Grayson *did* have standing to bring suit, because

he had alleged the violation of a personal statutory right. *Id.* at 250. The precise basis upon which the *Grayson* Court distinguished plaintiff Grayson, who did have standing, and plaintiff Breakman, who did not, is of paramount importance to the resolution of this case, as the plaintiff here, Mr. Hemby, appears to fall exactly on the fault-line between those two fact patterns.

Hemby argues that, taken together, these factual scenarios stand for the proposition that all that is required to establish standing under the CPPA is that the plaintiff is a consumer of the defendant's product. It is true that one important distinction between Grayson and Breakman is that the former plaintiff had purchased the product at issue while the latter had not. However, this Court does not believe that *Grayson* stands for the simple proposition that the mere purchase of a product automatically confers CPPA standing. Instead, as *Grayson* suggests, when a plaintiff is proceeding on a theory of statutory standing, the Court must assess whether the defendant's actions (as alleged) infringed upon a statutorily-protected right personally possessed by the plaintiff.

c. Application to Plaintiff's Complaint

In this case, plaintiff's standing claim, if it is to succeed, must rely on the doctrine of statutory standing. Hemby has not alleged facts upon which it could be asserted that he sustained actual physical or economic damage. He does not assert that he actually ingested ExtenZe, and therefore cannot claim that he sustained any of the purported potentially dangerous side effects. Nor can he claim that ExtenZe did not have its advertised effect. Without having personally used the product as recommended, he cannot claim that the product failed to produce the claimed results: an increase in "penis girth and penis size." Absent any claim that the product failed to perform as advertised, Hemby cannot claim to have incurred economic loss as a result of the defendants' actions, as there is no basis upon which Mr. Hemby can contend that he

did not get what he paid for. *See, e.g. Williams v. Purdue Pharma Co.*, 297 F. Supp.2d 171, 176 (D.D.C. 2003).

Instead, Hemby premises his statutory standing contention on the principle that the CPPA creates “an enforceable right to truthful information.” *See* D.C. Code § 28-3901(c). Accordingly, Hemby asserts that the injury in this case is properly understood as the existence of allegedly fraudulent and deceptive marketing claims to which District of Columbia residents have been subjected. It is perhaps no coincidence that this is the precise theory upon which the Court of Appeals ultimately found standing for plaintiff Grayson. *See Grayson*, 15 A.3d at 249 (“Grayson alleges personal injury to himself . . . based on the defendants’ violation of his statutory right . . . to the disclosure of [truthful] information.”).

However, plaintiff’s argument breaks down upon closer inspection. If Hemby’s sole purported injury is his exposure to fraudulent and deceptive marketing claims, then his actual purchase of the ExtenZe product is rendered immaterial. Hemby would have suffered the same exposure to such fraudulent and deceptive marketing claims whether or not he ultimately purchased the product. Given that there is no allegation that the fraudulent and deceptive marketing claims actually *induced* plaintiff to purchase the product, the fact that he did purchase the product does nothing to enhance the injury that he alleges he had already sustained from being exposed to such fraudulent and deceptive claims. In effect, plaintiff is in the same position as every other citizen of the District of Columbia who was equally exposed to such claims.¹ Yet, in *Grayson*, the Court of Appeals found that this showing was insufficient to establish an injury-in-fact. Plaintiff Breakman had alleged that he was a resident of the District of Columbia, and that defendant AOL made certain deceptive marketing claims to the citizens of the District of

¹ Indeed, Hemby does not even contend that he actually *was* exposed to such allegedly fraudulent and deceptive marketing claims prior to his purchase of the product.

Columbia. See *Grayson*, 15 A.3d at 219. The Court of Appeals found that those assertions, without more, were insufficient to afford Breakman standing, because the assertions did nothing to differentiate Breakman from “any other unaffected citizen.” *Id.* at 246-47.

Admittedly, the Court of Appeals found standing for plaintiff Grayson on allegations similar to those in the instant case – that Grayson had been injured by deprivation “of his statutory right (derived from D.C. Code § 28-3904) to the disclosure of [truthful] information.” *Id.* at 249-50. However, the Court made a further finding that served to distinguish plaintiff Grayson from plaintiff Breakman – a finding that is essential to the analysis of the instant case. The Court found that Grayson’s complaint “amply” established a “causal connection” between the defendant’s acts and the injury plaintiff sustained. *Id.* at 250.²

The causal connection between the defendants’ acts and the plaintiff’s injury, which was essential to the Court’s finding of standing with respect to plaintiff Grayson, is missing in the instant case. Hemby does not assert that he relied on the defendants’ allegedly false and deceptive marketing claims when purchasing the defendants’ product. In the absence of any such assertion, Hemby cannot establish that any injury he sustained from the purchase of that product was “fairly traceable to the challenged action[s] of the defendant[s].” *Grayson*, 15 A.3d at 246-250. On these facts, the Court simply cannot find that Hemby has asserted a sufficiently distinct and palpable injury to invoke this court’s jurisdiction. *Accord In re Vioxx Products Liability Litigation*, 874 F. Supp. 2d 599 (E.D. La. 2012) (interpreting CPPA, court finds no standing for pharmaceutical drug consumer who did not plead that he or his doctor had been

² Unfortunately, the Court of Appeals did not articulate precisely what allegations were made by plaintiff Grayson to establish the requisite causal connection between his injury and the actions of the defendants. However, the only reasonable inference that can be drawn from the opinion is that Grayson pled facts which demonstrated, or at least suggested, that he had relied on the defendants’ deceptive marketing claims when purchasing the prepaid phone card that was subject of his lawsuit. In the absence of such reliance, plaintiff Grayson’s situation becomes indistinguishable from plaintiff Breakman’s, both simply having been exposed to allegedly deceptive marketing claims without any “fairly traceable” consequent injury.

exposed to any of the allegedly misleading product claims regarding the drug, or were deceived by any allegedly false statements of the defendant drug maker).

It is true that the CPPA, in defining an unlawful trade practice, states that false or misleading representations about a product are unlawful “whether or not any consumer is in fact misled, deceived, or damaged thereby.” D.C. Code § 28-3904. However, the fact that reliance is not an element of a substantive claim under the CPPA does not control whether, as a constitutional matter, such reliance is necessary to establish the requisite injury-in-fact. *See Grayson*, 15 A.3d at 236-245 (CPPA amendments not intended to abrogate constitutional standing requirements); *accord Williams*, 297 F. Supp.2d at 176-78, (D.C. 2003) (notwithstanding the above-cited language from the CPPA, plaintiffs had no standing because they failed to allege that they “were in any way deceived – or even saw – any of [the allegedly false and misleading] advertising”).

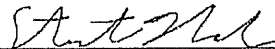
III. Conclusion

For the reasons discussed above, the Court has determined that Mr. Hemby has not asserted an injury-in-fact and he therefore lacks standing to bring this complaint. Based on this determination, the Court need not address the other arguments advanced by the defendants.

It is this 10th day of September, 2014,

ORDERED that defendants’ Motion to Dismiss Plaintiff’s Complaint is **GRANTED**;
and it is further

ORDERED that plaintiff’s complaint is **DISMISSED FOR LACK OF SUBJECT
MATTER JURISDICTION.**



Stuart G. Nash
Judge
Signed in chambers

Copies provided via Case File Xpress:

Tracy Rezvani
Thomas Wilcox
Counsel for Plaintiff

Megan K. Whitney
Jamie R. Mogil
Michael A. Trauben
Counsel for Defendants

Exhibit 19

SUPERIOR COURT OF THE DISTRICT OF COLUMBIA
CIVIL DIVISION

GREGORY HEMBY,

Plaintiff

v.

BIOTAB NUTRACEUTICALS, INC., et
al.,

Defendants

Docket No. 2014 CA 000190 B
Civil 2 Calendar #11
Judge Stuart G. Nash

ORDER

Before the Court is Plaintiff's Motion and Memorandum of Law for Reconsideration, filed September 24, 2014. Defendants have filed an opposition and plaintiff has filed a reply. For the reasons set forth below, the motion is denied.

On September 10, 2014, the Court filed an Order dismissing the Complaint in this matter for lack of standing. The relevant facts and procedural posture of the case are set forth in the September 10 Order, and will not be repeated here.

Plaintiff contends that the Court's reasoning in the September 10 Order, particularly the Court's reliance on *Grayson v. AT&T Corp.*, 15 A.3d 219 (D.C. 2011), is undercut by subsequent amendments to the Consumer Protection Procedures Act ("CPPA"), which became effective in 2013.¹ According to plaintiff, the 2011 amendments broadened the class of plaintiffs that were granted standing under the CPPA, so that even if this Court was correct that the plaintiff in this case did not have standing under the authority of *Grayson* (a point the plaintiff continues to dispute), plaintiff would be accorded standing by the broader standing principles adopted by the 2011 amendments. The Court disagrees.

¹ The amendments passed as part of the Consumer Protection Amendment Act of 2011, and are therefore referred to by the parties as the "2011 amendments." For the sake of clarity, the Court will use the same nomenclature throughout this Order.

First, it is worth emphasizing what the 2011 amendments did *not* do. In *Grayson*, the D.C. Court of Appeals, sitting *en banc*, ruled that earlier amendments to the CPPA, passed by the D.C. Council in 2000, did not evince an intention, on the part of the D.C. Council, to override constitutional principles of standing to which the D.C. courts have traditionally adhered.² The 2011 amendments, which were passed in reaction to the *Grayson* decision, could have simply reversed *Grayson* and plainly articulated that the Council did not intend for traditional principles of standing to constrain the class of plaintiffs who could bring actions under the CPPA.

The 2011 amendments did not do that. Instead, the 2011 amendments made certain specific changes to the standing provisions of the CPPA, explicitly modifying who could bring suit under the CPPA. The 2011 amendments undeniably extended standing to certain new categories of plaintiffs. However, the Council's failure to completely repudiate *Grayson*, as it would have been simple to have done plainly and succinctly, creates the clear inference that those standing limitations identified by *Grayson* that were not explicitly modified by the 2011 amendments continue to govern actions initiated under the CPPA. As will be demonstrated below, the specific expansions of standing effectuated by the 2011 amendments are insufficiently broad to encompass the plaintiff in this case.

The first modification made by the 2011 amendments was to add language clarifying that: "A consumer may bring an action seeking relief from the use of a trade practice in violation

² Because D.C. Courts are established under Article I of the United States Constitution, they are not constitutionally bound to follow the same standing requirements that govern the federal courts, requirements which flow from the "case or controversy" language that establishes the federal courts under Article III of the Constitution. Nevertheless, the D.C. courts have voluntarily adhered to the standing jurisprudence of the federal courts as a matter of "sound judicial economy." Theoretically, the D.C. court's prudential adherence to the federal courts' standing principles can be overridden by an act of the legislature. See *Grayson*, 15 A.3d at 229-36.

of a law of the District.” D.C. Code § 28-3905(k)(1)(A).³ Prior to the amendments, the analogous passage of the CPPA provided: “A person, whether acting for the interests of itself, its members, or the general public, may bring an action . . . seeking relief from the use . . . of a trade practice in violation of a law of the District”

Comparing the statute before and after amendment, it is plain that the effect of this amendment is to substitute the term “consumer” (as defined by the statute) for the term “a person.” It is true that the term “consumer” is defined exceedingly broadly by the statute – so broadly, in fact, that it is likely synonymous with the pre-existing language referring to “a person.” What is clear, however, is that however broadly the term “consumer” is interpreted, it cannot be *more* expansive than the term “a person” that it replaced. Accordingly, while (as discussed below) the 2011 amendments undeniably expanded standing in some respects, it is impossible to construe this particular modification as an expansion of standing.

Plaintiff’s argument that, as a purchaser of the product in question, he clearly meets the statutory term of a “consumer” is a rehash of the argument addressed by the Court in its September 10 Order. While plaintiff clearly is a “consumer” as defined by the CPPA subsequent to the 2011 amendments, he does not, for all of the reasons discussed in the September 10 Order, meet the standing requirements articulated in *Grayson*, which (as discussed above), survive the 2011 amendments to the statute.

Plaintiff has directed this Court’s attention to the decision of another judge of the Superior Court who found standing for a plaintiff under the CPPA apparently exclusively on the basis that the plaintiff had purchased the product in question. *See Mostofi v. Mohtaram, Inc.*, 2011 CA 163, 2013 D.C. Super. LEXIS 12 (Nov. 12, 2013). In the case currently before this

³The amendments add a new definition of “consumer”, which is (in relevant part): “a person who, other than for purposes of resale, does or would purchase, lease (as lessee), or receive consumer goods or services . . . or does or would otherwise provide the economic demand for a trade practice.” D.C. Code § 28-3901(a)(2)(A).

Court, as the Court detailed in its September 10 Order, plaintiff has not pled facts that would permit him to claim physical or economic damage. Rather, he relies on a theory of “statutory standing,” based on the contention that he has been deprived of the right to truthful information. Yet, he has not alleged either that he was aware of any of the allegedly deceptive marketing prior to purchasing the product, or that he purchased the product in reliance on such deceptive marketing. If, on these facts, *Mostofi* can be read to confer standing on a CPPA plaintiff, then this Court simply disagrees that *Mostofi* reflects an accurate reading of *Grayson*.⁴

The remaining expansions of standing effectuated by the 2011 amendments are also of no succor to the plaintiff. The 2011 amendments provide explicit CPPA standing to “testers,” that is, “individual[s] [who] purchased or received [a product] in order to test or evaluate qualities pertaining to use for personal, household, or family purposes. D.C. Code § 28-3905(k)(1)(B). It may well be that, as argued in plaintiff’s motion, plaintiff purchased the product in question to “test its efficacy against the advertisements.” Unfortunately, that assertion is contained nowhere in plaintiff’s complaint (nor was it referenced in plaintiff’s original opposition to the motion to dismiss). The Court has no evidentiary support for the assertion, made at this late juncture, that plaintiff has performed, or contemplated performing, any testing on the product he purchased.

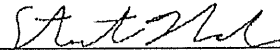
The 2011 amendments also clarified, and arguably expanded, the standing of non-profit and public interest organizations to bring CPPA claims. D.C. Code §§ 28-3905(k)(1)(C) and 28-

⁴ Plaintiff takes issue with the Court’s conclusion in the September 10 Order that plaintiff had not pled facts that would allow him to claim economic damage. Plaintiff asserts that his claims: (1) that he purchased the product for \$40.99; and (2) that the product did not work as advertised; combine to establish “the epitome of economic damages.” However, plaintiff has *not*, in fact, pled that the product did not work as advertised. Having failed to ingest the product, plaintiff has no empirical basis for making such a claim. The most plaintiff could conceivably establish is that the product did not work for other people (possibly even in a clinical environment). He cannot assert that the product did not work for him, and, as a result, cannot establish injury-in-fact. As set forth in the Court’s September 10 Order, because plaintiff cannot rely on a theory of injury-in-fact, he must instead rely on a theory of statutory standing based on an alleged deprivation of his right to truthful information. Such statutory standing is plainly cognizable under the statute, but it is not a magic shortcut automatically manufacturing universal standing. For the reasons set forth in the Court’s September 10 Order, the Court has determined that plaintiff has not pled sufficient facts to establish even statutory standing in this case.

3905(k)(1)(D). Those amendments have no applicability to the plaintiff in this case, who is an individual.

In sum, there is nothing in the 2011 amendments to the CPPA that undercuts the reasoning set forth in the Court's September 10 Order. Plaintiff has advanced no other argument that would warrant reconsideration of the Order. Plaintiff's Motion for Reconsideration is hereby **DENIED**.

Dated and docketed on January 22, 2015



Stuart G. Nash
Judge
Signed in chambers

Copies provided via Case File Xpress:

Tracy Rezvani
Thomas Wilcox
Counsel for Plaintiff

Megan K. Whitney
Jamie R. Mogil
Michael A. Trauben
Counsel for Defendants