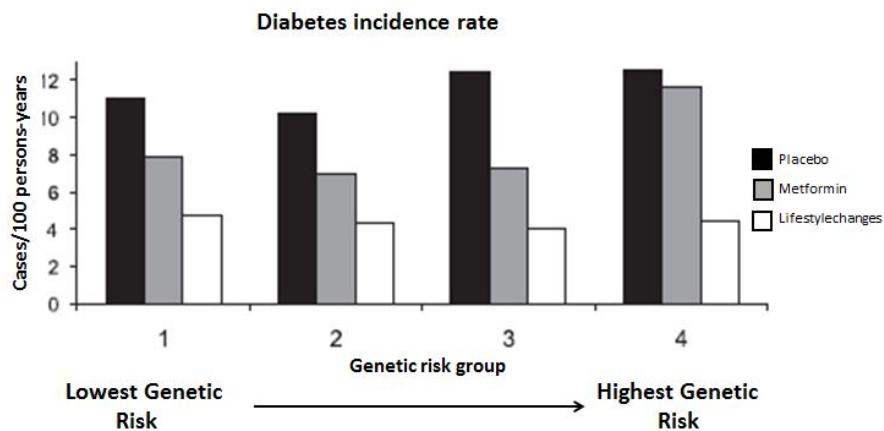


Option 1: Medications

A person who is diagnosed with type 2 diabetes may be prescribed one or more drugs to control their condition. There are many classes of oral drugs that use different tactics to control blood glucose levels, including those that help the body to respond better to insulin, those that stimulate insulin release from the pancreas, and those that slow down digestion. In addition, people with type 2 diabetes are sometimes given medication to help them lose weight.

The most commonly prescribed oral medication (and generally first to be prescribed) is called Metformin. It helps the body respond better to insulin, mainly by decreasing the release of glucose by the liver.

The graph below shows results from a long-term research study involving over 3000 people who were pre-diabetic at the start of the study. People in the study were randomly divided into three treatment groups. The Lifestyle changes group received extensive coaching on diet and exercise. The Metformin group was prescribed Metformin twice a day for the duration of the study. The placebo (control) group did not get the drug or Lifestyle coaching. All participants in this study had their DNA analyzed to measure their genetic risk for developing type 2 diabetes based on their alleles for 34 risk genes. The graph below compares the rate of progression to type 2 diabetes for people in the study. How effective do you think Metformin is compared to the other groups? Does it have a similar effect for all genetic risk groups?



Hivert, M-F et al., 2011; *Diabetes* 60:1340-1348

Copyright © 2011 American Diabetes Association, Inc.

Overall, participants who took metformin lowered their chances of developing type 2 diabetes by 31 percent compared with participants who took a placebo. Metformin was most effective for younger people, people with a body mass index over 35, and women with a history of diabetes during pregnancy.

Like all drugs, Metformin has side effects. These include loss of appetite, upset stomach, bloating, gas, and diarrhea. If it does not work well enough at reducing a person's blood glucose, then sometimes an additional drug is given.

Insulin may be prescribed if a person's beta cells in the pancreas are not functioning well enough and oral medications and lifestyle interventions are not lowering blood glucose sufficiently. Although insulin is very effective at lowering blood glucose, it needs to be administered carefully so that a person's blood glucose does not get too high or too low. According to the American Diabetes Association, the cost of insulin has tripled in the past ten years, which is cause for concern for insulin-dependent diabetics.

Option 2: Food Labeling and Marketing

Reversing the obesity trend in Chile through a national nutritional labeling law

In the three decades between the late 1960s to the late 1990s, Chile, like many other Latin American countries, made great improvements in socio-economic status, literacy, infant mortality, life expectancy, and gross national product. However, as malnutrition and undernutrition decreased during this period, Chile saw a significant increase in obesity and the chronic diseases associated with obesity (see Figure 1).

This increase in obesity is associated with increased intake of foods high in saturated fats, a decrease in consumption of cereals and legumes, and a more sedentary lifestyle.

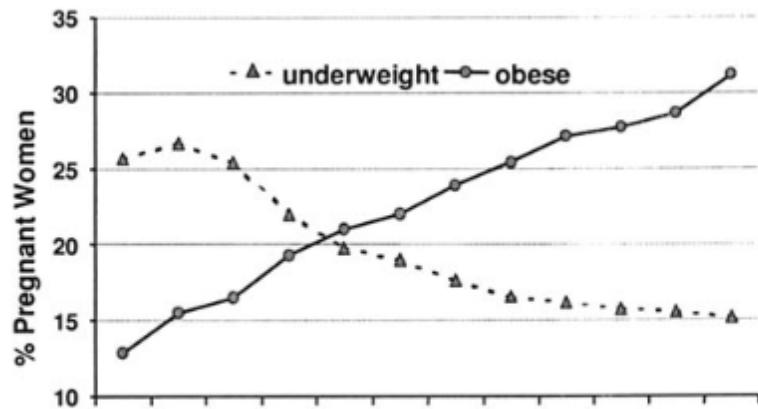


Figure 1

In 2016, the Chilean government adopted a sweeping nation-wide war on obesity through policies directed at unhealthy food, including changes in how foods are labeled, a ban on junk foods in and around schools, and prohibition of advertising for junk food on TV programs and websites viewed by children. Foods that are high in salt, sugar, fats, or calories are required to show a black stop sign label for each—and based on their ingredients, some foods are required to show all four. In addition, manufacturers are no longer allowed to use cute mascots or symbols that appeal to children, like Tony the Tiger or Chester Cheetah.

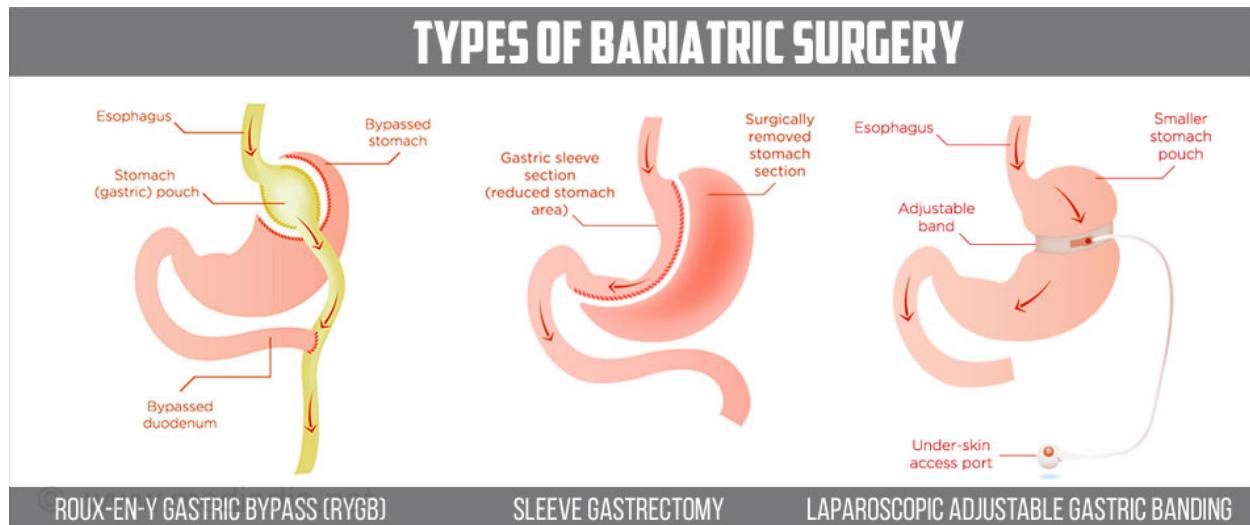
There has not been sufficient time in the last two years to see changes in the obesity rates. However, the new laws are having effects on products being sold, which in many cases have been re-formulated to get rid of one or more of their black labels. Furthermore, children are advising their parents about which products not to buy because of their labels. Two other South American countries, Ecuador and Brazil, are now considering adopting similar rules.



Option 3: Surgery

Bariatric surgery: A Magic Bullet to cure type 2 diabetes?

'Bariatric' means 'weight treatment,' and bariatric surgeries are designed to help very obese people to lose weight. There are three common types, all of which either bypass or constrict the stomach. In the most effective type of surgery (RYGB, below) the bypassed portion of the stomach is sealed surgically, and the bypassed duodenum is attached to the lower part of the small intestine so digestive juices from the stomach can enter the small intestine.



As well as losing weight, people with type 2 diabetes who have bariatric surgery are much more likely to have their diabetes go into remission than matched controls who do not get surgery. In one study in the United Kingdom, people having bariatric surgery were 43 times (for gastric bypass), 17 times (for sleeve gastrectomy), and 7 times (for gastric banding) more likely to have their t2d in remission within 6 months of treatment, as compare to controls.

There are risks associated with bariatric surgery, including a small risk of death within 30 days of the operation (a rate similar to other surgeries), the need for subsequent surgery to repair the initial surgery or treat other GI conditions, increased depression, increased use of drugs and alcohol, and nutritional deficiencies. In addition, diabetes remission can reverse over time. For example, in one study conducted in Sweden, the rates of remission decreased from 72% after two years to 30% after 15 years.

Who qualifies for bariatric surgery? The criteria were set in the 1991 National Institutes of Health Consensus Conference Guidelines and are as follows: patients must have a body mass index (BMI) of 40 or greater, or a BMI greater than 35 and a condition such as type 2 diabetes, hypertension, or heart disease. Additional criteria might be set by the hospital offering the surgery, such as length of time being obese, whether the patient has tried other methods to lose weight, psychological factors, and willingness to eat a healthy diet.

Who typically gets bariatric surgery, and how much does it cost? Typically, patients able to get surgery are middle to upper class. The costs vary depending on type of surgery, from \$23,000 for gastric bypass surgery to about \$15,000 for gastric sleeve and gastric banding surgery. Some, but not all health insurance policies will cover some or most of the cost, but it depends on the patient's insurance policy. Gastric bypass surgery is covered by Medicaid in 48 states.

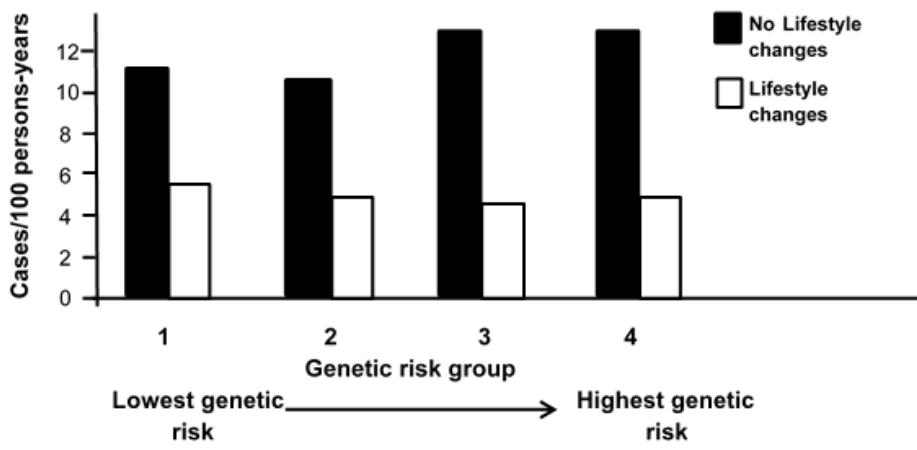
Option 4: Lifestyle Changes

The Diabetes Prevention Program (DPP) was a long-term research study involving over 3000 people in the United States. At the beginning of the DPP, participants were all overweight and had prediabetes, but not diabetes. The participant group was composed of 45% racial and ethnic minorities.

In the DPP, participants were randomly divided into different treatment groups. The first group, called the **lifestyle** intervention group, received intensive training in diet, physical activity, and behavior modification. By eating less fat and fewer calories and exercising for a total of 150 minutes a week, they aimed to lose 7 percent of their body weight within six months and maintain that loss.

Related studies identified 34 different allele combinations (gene variants) associated with type 2 diabetes. Each of the 34 risk alleles was weighted according to its effect on the development of type 2 diabetes. DPP participants were genotyped, and the weights of their risk alleles were added together to give the participant a Genetic Risk Score between 1 and 4.

The graph below compares the rate of progression to type 2 diabetes for people in all four genetic risk groups with or without lifestyle interventions. There was a 58% reduction in the incidence of type 2 diabetes in the lifestyle group compared to the control group over an average follow-up time of about 3 years. The Program was effective for all participating racial and ethnic groups and both men and women. The Program worked particularly well for participants ages 60 and older, lowering their chances of developing type 2 diabetes by 71 percent.



Modified from Hivert, M-F et al., 2011; *Diabetes* 60:1340-1348

The cost of the lifestyle intervention in the original DPP study was \$1400 per participant for the first year. The costs included an individualized goal-based approach that included weight loss and exercise goals. Each participant was assigned an individual lifestyle coach, who taught a 16-session core curriculum and follow-up sessions to help the participant achieve their goals. Although the cost of the intervention seems high, it is much lower than the average health care cost for one person with type 2 diabetes, which in 2009 was \$11,700.

Option 5: Soda Ban

Trimming Sugary Soda Sales Leads to Trimmer Waists, Study Finds

In recent years, hospitals and medical centers across the country have stopped selling sugar-sweetened beverages to reduce obesity and diabetes.

Now a new study carried out at the University of California, San Francisco (UCSF), has documented the health effect of a soda sales ban on its employees.

Ten months after a sales ban went into effect, UCSF workers who tended to drink a lot of sugary beverages had cut their daily intake by about half. By the end of the study period, they had, on average, reduced their waist sizes and belly fat, though they did not see any changes in their body mass index. Those who cut back on sugary beverages also tended to see improvements in insulin resistance, a risk factor for Type 2 diabetes.

The new research, published in *JAMA Internal Medicine*, is the first peer-reviewed study to examine whether a workplace sales ban on sugary drinks could lead to reduced consumption of the beverages and improve employee health.

“This was an intervention that was easy to implement,” said Elissa Epel, an author of the study and director of the Aging, Metabolism, and Emotions Center at UCSF. “It’s promising because it shows that an environmental change can help people over the long run.”

The study was funded by UCSF and several philanthropic groups, including the Robert Wood Johnson Foundation and the Laura and John Arnold Foundation, which has given money to support taxes on sugary beverages.

In recent years, the link between sugar and obesity has drawn increasing scientific attention. Health authorities say that Americans have gotten fatter because they are consuming too many calories of all kinds. But some experts have singled out the role of added sugar consumption, which increased more than 30% between 1977 and 2010.

According to the Harvard School of Public Health, sports drinks, fruit punches, sodas and other sweetened drinks are the single largest source of calories and added sugar in the American diet and “a major contributor to the obesity epidemic.” Large studies have linked them to an increased risk of Type 2 diabetes, heart disease and premature death.

According to multiple studies, sugary-drink sales bans have been somewhat less controversial than soda taxes, which have had mixed results.

Story by Anahad O’Connor of *The New York Times*

Published in *The Seattle Times*, November 12, 2019

Resources for Options Packet:

Medications:

References

American Diabetes Association: What Are My Options?

<http://www.diabetes.org/living-with-diabetes/treatment-and-care/medication/oral-medications/what-are-my-options.html>

Diabetes.co.uk: The Global Diabetes Community

<https://www.diabetes.co.uk/treatment-for-type2-diabetes.html>

Joslin Diabetes Center: Oral Diabetes Medications Summary Chart

http://www.joslin.org/info/oral_diabetes_medications_summary_chart.html

List of Medications Available for Diabetes

Last reviewed Mon 27 June 2016

By Markus MacGill

Reviewed by [Alan Carter, PharmD](#)

<https://www.medicalnewstoday.com/articles/311300.php>

Background on the DPP

<https://www.niddk.nih.gov/about-niddk/research-areas/diabetes/diabetes-prevention-program-dpp>

Food Labeling and Marketing Resources

Morbid obesity in a developing country: the Chilean experience

Claudia Bambs, Jaime Cerda, Alex Escalona

Bulletin of the World Health Organization

<http://www.who.int/bulletin/volumes/86/10/07-048785/en/>

Nutrition Reviews Special Article

June 2001: 170-176

Nutrition Transition in Latin America: The Case of Chile

Cecilia Albala, M.D., M.P.H., Fernando Vio, M.D., M.P.H., Juliana Kain, M.P.H., and Ricardo Uauy, M.D., Ph.D.

In sweeping war on obesity, Chile slays Tony the Tiger

By Andrew Jacobs, Feb 7, 2018

<https://www.nytimes.com/2018/02/07/health/obesity-chile-sugar-regulations.html>

Surgery Resources

Abbasi, J. (2017). Unveiling the “Magic” of Diabetes Remission After Weight-Loss Surgery. *JAMA*. 317 (6), 571-574. <https://jamanetwork.com/journals/jama/fullarticle/2601499>

Galchen, R. (2016) Bariatric Surgery: The Solution to Obesity? The New Yorker [September 26, 2016 Issue](#). <https://www.newyorker.com/magazine/2016/09/26/bariatric-surgery-the-solution-to-obesity>

Keider, A., (2011). Bariatric Surgery for Type 2 Diabetes Reversal: The Risks. *Diabetes Care* 34 Supplement 2, S361-S366. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3632208/>

Obesity Coverage Staff (2013). Weight Loss Surgery Coverage and Costs. In *Insurance and Costs, Pre-approval Process*. <https://www.obesitycoverage.com/weight-loss-surgery-insurance-coverage-and-costs/>

Yska, J. P., van Roon, E. N., de Boer, A., Leufkens, H. G. M., Wilffert, B., de Heide, L. J. M., de Vries, F. and Lalmohamed, A. (2015). Remission of Type 2 Diabetes Mellitus in Patients After Different Types of Bariatric Surgery: A Population-Based Cohort Study in the United Kingdom. *JAMA Surg.* 150 (12) 1126-1133. <https://jamanetwork.com/journals/jamasurgery/fullarticle/2446843>

Other Surgery Resources

American Diabetes Association. Bariatric Surgery. <http://www.diabetes.org/living-with-diabetes/treatment-and-care/bariatric-surgery.html>

Kolata, G. (2016). After Weight-Loss Surgery, A Year of Joys and Disappointments. New York Times December 27, 2016 issue. <https://www.nytimes.com/2016/12/27/health/bariatric-surgery.html>

National Institute of Diabetes and Digestive and Kidney Diseases. Bariatric Surgery. <https://www.niddk.nih.gov/health-information/weight-management/bariatric-surgery>

Lifestyle Changes Resources

Updated Genetic Score Based on 34 Confirmed Type 2 Diabetes Loci Is Associated With Diabetes Incidence and Regression to Normoglycemia in the Diabetes Prevention Program
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3064108/>

The Diabetes Prevention Program (DPP): Description of lifestyle intervention
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1282458/>