



What is the evidence base for the prevention of diabetes through lifestyle change interventions?

Over the last 15 years, a number of scientific studies have evaluated the design and effectiveness of lifestyle change interventions for delaying or preventing the onset of type 2 diabetes among overweight or obese adults who have blood glucose levels in the prediabetes range. A few representative studies are summarized below.

The original NIH-funded Diabetes Prevention Program study

Funded by the National Institutes of Health (NIH), a multi-center randomized controlled clinical trial of 3,234 overweight adults with prediabetes proved that a structured intensive behavioral counseling intervention that lowered body weight by 7 percent through a low-fat diet and increased physical activity reduced the risk of progression to diabetes by 58 percent over three years compared with placebo. Among adults 60 years and older, the risk reduction was even greater at 71 percent. This translates to one case of diabetes prevented for every seven adults receiving the lifestyle change intervention.

Knowler WC, Barrett-Connor E, Fowler SE, et al. Diabetes Prevention Program Research Group. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med*. 2002;346(6):393-403.

The intervention delivered in the community

The Diabetes Education and Prevention with a Lifestyle Intervention Offered at the YMCA (DEPLOY) study—a matched-pair, group-randomized pilot intervention—compared group-based diabetes prevention program behavioral counseling delivered by trained YMCA staff to brief counseling alone and found that a scaled-down, low-cost version of the program delivered in a community setting could achieve weight loss comparable to the original NIH-funded study.

Ackermann RT, Finch EA, Brizendine E, Zhou H, Marrero DG. Translating the Diabetes Prevention Program into the community. The DEPLOY Pilot Study. *Am J Prev Med*. 2008;35(4):357-363.

The intervention delivered in a real-world primary care setting

In a randomized controlled trial conducted in a primary care clinic, two adapted diabetes prevention program lifestyle interventions—a coach-led group intervention and self-directed DVD intervention—were compared with usual care and found that both interventions achieved weight loss similar to the original NIH-funded study. The adapted curriculum was delivered jointly by certified dietitians and fitness instructors to the coach-led group at clinic sites, whereas both groups received secure email reminders about self-monitoring via the clinic's electronic health record.

Ma J, Yank V, Xiao L, et al. Translating the Diabetes Prevention Program lifestyle intervention for weight loss into primary care: a randomized trial. *JAMA Intern Med.* 2013;173(2):113-121.

The intervention delivered via an online social network

In a before-after comparison of subjects recruited online to participate in a diabetes prevention program-based group lifestyle intervention that integrated online social networking, online health coaching and a wireless scale and pedometer, participants achieved outcomes that met the Centers for Disease Control and Prevention (CDC) Diabetes Prevention Recognition Program standards and compared favorably to other program translations.

Sepah SC, Jiang L, Peters AL. Translating the Diabetes Prevention Program into an online social network: validation against CDC standards. *Diabetes Educ*. 2014;40(4):435-443.

Ten-year outcomes of the original NIH-funded Diabetes Prevention Program study

A 10-year follow-up of 2,766 participants from the original NIH-funded research study revealed that diabetes incidence in the 10 years since study randomization was reduced by 34 percent in the lifestyle group compared with placebo. Participants older than 45 years at randomization had more sustained weight loss over the 10 years of follow-up. The estimated delay to onset of diabetes was four years in the lifestyle group compared with placebo.

Knowler WC, Fowler SE, Hamman RF, et al. Diabetes Prevention Program Research Group. 10-year follow-up of diabetes incidence and weight loss in the Diabetes Prevention Program Outcomes Study. *Lancet*. 2009;374(9702):1677-1686.

Systematic review of translational studies based on the original NIH-funded study

A systematic review of 17 translational studies based on the original NIH-funded research study found that group-based interventions yielded significant weight loss—with the expectation of concomitant reductions in the risk of type 2 diabetes—with the resulting benefits increasing proportionately with sustained weight loss over time. A review of behavioral strategies used in these studies revealed that interventions comprising modified versions of most of the core modules of the original NIH-funded research study were most effective in producing the desired behavioral changes.

Johnson M, Jones R, Freeman C, et al. Can diabetes prevention programmes be translated effectively into real-world settings and still deliver improved outcomes? A synthesis of evidence. *Diabet Med.* 2013;30(1):3-15.

Primary predictor of reduced diabetes incidence

An investigation into the relative contributions of changes in weight, diet and physical activity on the risk of developing type 2 diabetes among participants in the lifestyle intervention group from the original NIH-funded Diabetes Prevention Program study found that weight loss was the primary predictor of reduced diabetes incidence.

Hamman RF, Wing RR, Edelstein SL, et al. Effect of weight loss with lifestyle intervention on risk of diabetes. *Diabetes Care*. 2006;29(9):2102–2107.

Impact of the diabetes prevention program lifestyle intervention on hypertension and hyperlipidemia

An assessment of the impact of the lifestyle intervention on hypertension and hyperlipidemia revealed that hypertension control improved significantly, triglycerides decreased significantly and HDL cholesterol increased significantly in the lifestyle intervention group compared with placebo, resulting in a greater than 25 percent reduction in medication use for hypertension and hyperlipidemia.

Ratner R, Goldberg R, Haffner S, et al. Impact of intensive lifestyle and metformin therapy on cardiovascular disease risk factors in the diabetes prevention program. *Diabetes Care*. 2005;28(4):888-894.

Cost-effectiveness of the diabetes prevention program intervention

Estimation of the lifetime cost-utility of the intervention using a Markov simulation model based on data from the original NIH-funded research study showed that the lifestyle intervention was cost-effective across all age groups. The lifestyle intervention cost approximately $1,100 per quality adjusted life year and cost-effectiveness improved when the intervention was implemented as it might be in routine clinical practice. (Cost-effectiveness analyses in the United States commonly use a figure of $40,000 per life-year or quality-adjusted life-year gained as a threshold for assessing the cost-effectiveness of an intervention, meaning anything below $40,000 is cost-effective.)

Herman WH, Hoerger TJ, Brandle M, et al. The cost-effectiveness of lifestyle modification or metformin in preventing type 2 diabetes in adults with impaired glucose tolerance. *Ann Intern Med*. 2005;142(5):323-332.

15-0091:2/15:JT