

National Diabetes Education Program Webinar

**Update on NIH's Latest Clinical Research for Diabetes Prevention, Management and Obesity:
Applying the Findings from NIH's Look AHEAD and Diabetes Prevention Program Clinical Trials
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Joanne Gallivan, M.S., RDN—Director, National Diabetes Education Program (NDEP), National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK)

Good afternoon, everyone, and thank you for joining the National Diabetes Education Program's webinar, "Update on NIH's Latest Clinical Research for Diabetes Prevention, Management and Obesity: Applying the Findings from NIH's Look AHEAD and Diabetes Prevention Program." We are very excited today to co-sponsor this webinar with the Academy of Nutrition and Dietetics Diabetes Care Practice Education Practice Group.

As a joint program of the NIH and the CDC, our mission is to reduce the burden of diabetes in the United States by facilitating the adoption of proven approaches to prevent or delay the onset and progression of diabetes and its complications. As many of you know, we host a variety of webinars throughout the year to support all of you working to improve diabetes management, outcomes—and prevent or delay the onset of type 2 diabetes.

Just a few words about today's webinar: Please know that all your lines are muted. We will have a Q&A session after the presentation is over. We are recording this webinar, and it will be available on the NDEP website in a few weeks, and we'll let all of you know when it's available. Please complete the evaluation survey; we really like your feedback. We really welcome your feedback to these webinars; they give us lots of ideas for topics for new webinars. And if you would like a certificate of completion, please—you can see where you can e-mail ndep@hagerssharp.com. And if you're looking for CEs, you can get that through the Academy of Nutrition and Dietetics. I also want to mention that we did post the slides as a PDF, so you can download them right away.

And before we begin the presentation, I want to introduce Carolyn Harrington, who is a representative to NDEP from the Academy. And Carolyn, hopefully, you can say just a few words.

Carolyn Harrington, RD, LDN, CDE—NDEP Liaison for DCE

Thanks, Joanne. As Joanne mentioned, the Diabetes Care and Education Practice Group and NDEP have had a longstanding partnership. With our members and NDEP's partners asking for continuing education opportunities, we decided in 2013 to begin co-sponsoring webinars that address the learning interests of both groups. Today's webinar is the third webinar that NDEP and DCE have co-sponsored.

In May 2014, we held the "Diet Counseling for People with Diabetes and Kidney Disease" webinar, led by Dr. Andrew Narva, Program Director of the National Kidney Disease Education Program at NIH. In September 2013, DCE invited NDEP partners to participate in its "Exercising on Insulin, Staying in Balance" webinar, led by exercise physiologist Dr. Sheri Colberg. The Diabetes Care and Education Group co-brands and promotes NDEP's patient education materials, and our members can download many of these resources from the "Professional Resources" section on DCE's website. In December 2013, the NDEP featured DCE on its partner spotlight Web page to highlight our involvement in activities over the years.

We will continue this partnership to keep bringing you, our DCE members and NDEP partners, diabetes information and educational resources that can enhance your skills and practice setting. A special thank-you goes out to our DCE leaders: Jo Jo Dantone, who is our DCE Industry Chair and past Chair; Betty Krauss, our Chair; Susan Yake, Chair-Elect; Alice Thomas, our Professional Development Chair; and of course all the workgroup members that bring these webinars to us—Suzanne Pecoraro, Donna Plyler, Sarah Williams, Adam Reppert, Paula Ackerman, Kim Handley, Andrea Hebert, Mary Lou Perry. And you can contact any of the DCE leaders at dcewebinars@gmail.com.

For those who registered through the Academy of Nutrition and Dietetics DCE website, the handouts are available at DCE.org. You can log in, go to “Member Features” tab to “My Media.” And to get your CEUs, everyone who registered through the DCE website will receive an e-mail within the next 24 hours that contains a link to the CEU certificate. If you’re a registered dietician, please use this link to obtain and print your CEU certificate. If you do not receive the e-mail, please contact DCE at dcewebinars@gmail.com. Thanks, Joanne.

Joanne Gallivan, M.S., RDN—Director, NDEP, NIDDK

Thank you, Carolyn. And we are very excited today to have Dr. Mary Evans as our guest presenter. Dr. Evans is a Program Director for special projects in nutrition, obesity and digestive diseases in the Division of Digestive Diseases and Nutrition at the National Institute of Diabetes and Digestive and Kidney Diseases at NIH. Dr. Evans administers a portfolio of grants and cooperative agreements in the area of obesity, nutrition and digestive diseases. She’s responsible for the scientific oversight and administration of research programs on behavioral and lifestyle interventions, the clinical research and epidemiology of nutrition and obesity, nutrition/obesity research centers, and pregnancy and the intrauterine environment. Dr. Evans also serves as the project officer for single-site and multicenter clinical studies where multidisciplinary teams come together to encourage healthy nutrition efforts across the nation, with the goal of improving overall health as well as the health of the digestive system.

Dr. Evans, welcome, and I now turn the webinar over to you.

Mary Evans, Ph.D.—Program Director, Division of Digestive Diseases and Nutrition, NIDDK

Great; thank you. Afternoon, everybody. I am excited to discuss some of the results from a number of NIH clinical trials looking at diabetes prevention, management and obesity. Can somebody turn the slides over to me, please? Okay.

Obesity is a complex phenomenon, and it is attributed to a combination of causes and contributing factors. This ranges from behavior, specifically dietary patterns, calories and dietary content; as well as physical activity, including both exercise and sedentary time. And other factors playing a role are genetics and biology as well as psychosocial and environmental features, including the built environment, education, economic status, and food marketing and promotion. I seem to have lost control of the slides. There we go.

So the method of assessing overweight and obesity, as you all are probably aware, is called the body mass index. This is a formula using kilograms per meter squared, and it’s largely a screening tool that is used to assess risk for development of chronic conditions and other health complications. It basically classifies people according to weight, with the categories being normal weight, with a BMI of 18.5 to 24.9; overweight, being 25 to 29.9; obesity, being over 30 kilograms per meter squared, with extreme obesity or—which is also known as severe obesity, being a BMI of over 40. In general, overweight is associated with an excess amount of body weight that can come from many components, including muscle, bone, fat

and water; but in most cases, overweight is associated with an increase in body fat. Obesity, on the other hand, with the exception of special cases like Arnold Schwarzenegger, generally is associated with an excess amount of body fat.

Obesity is also associated with a number of comorbidities and health problems and the public health. Starting on the bottom left, obesity is associated with a number of complications, including gout and skin problems. There are a number of cancers that are associated with obesity. There's also fatty liver disease—non-alcoholic fatty liver disease, or NAFL—a number of pulmonary diseases, including one very important one, obstructive sleep apnea, which is both associated with the development of obesity as well as metabolic complications. Obesity is also associated with an increased risk of stroke and depression, vision problems and a number of health complications like—that many people are familiar with, such as coronary heart disease; diabetes, which is the emphasis for today's webinar; dyslipidemia or increased cholesterol; high blood pressure; and a number of gynecologic abnormalities, arthritis and phlebitis. Note that 16 percent—16.9 percent of 2- to 19-year-old children and adolescents, as well as 34.9 percent of adults, are obese as of 2011, 2012.

The CDC also regularly collects data on the age-adjusted prevalence of obesity and diagnosed diabetes among U.S. adults and has converted it into maps of the United States showing the percent of folks who are obese or have a BMI of 30 kilograms per meter squared. Okay. The map on the left shows the prevalence, on the top, of obesity across the U.S., with darker colors representing higher prevalence. If you look at the bottom figure—bottom map in 1994, this is the prev—which shows the prevalence of diabetes, it largely tracks with increasing amount of obesity, which would be expected. The prevalence of obesity increased in 2000, with some states reaching above 22 percent—22 to 25 percent, with a concomitant increase in prevalence across the U.S. And in 2013, the incidence—or the prevalence of obesity increased again, with many states in the U.S. exceeding 26 percent of adults having—being obese. And this is also associated with an increase in diabetes, with the largest increase being in the South, as shown here. The total cost of obesity in 2012 was calculated to be \$150 billion per year; this is both health care cost as well as cost associated with reduced productivity and work efficacy.

The prevalence of diabetes in U.S. adults—as far as the figures are shown here, 29.1 million U.S. adults have diabetes. Twenty-one point—21 million of these adults have diagnosed diabetes. There are another 18.1 million adults who have diabetes but are unaware that they have it. There are another 86 million people who have prediabetes, which puts them at high risk for developing type 2 diabetes. And as of 2014, the total cost of diabetes care was \$245 billion.

So now I'm going to transition to talking about two NIH-funded weight loss efficacy trials. The first is the Diabetes Prevention Program, or DPPOS—and DPPOS, which enrolled individuals who are at high risk for the development of type 2 diabetes. In contrast, Look AHEAD was a clinical trial that enrolled overweight and obese individuals who were diagnosed with type 2 diabetes.

Focusing first on the Diabetes Prevention Program or DPP, the goals of DPP were to prevent or slow the development of type 2 diabetes in persons at high risk for developing it; this would be impaired glucose tolerance, abnormal fasting glucose levels and at least overweight or obese. The baseline characteristics of the DPP study population is shown here. They had a mean age of 51 years. Their BMI was an average of 34. Sixteen percent of the participants had had a pregnancy where they were diagnosed with gestational diabetes. As with many weight loss studies, about 67 percent were women, and there was a wide age range, with 20 percent being older than age 60.

And this pie chart shows the percentage of racial and ethnic minority groups, with 20 percent coming from African-American population, another 16 percent being Hispanic Americans—4 percent were from Asian and Pacific Islands, and another 5 percent were American Indians. So DPP successfully enrolled a large percentage of people from racial and ethnic minority groups.

The study interventions, as well as the enrollment timeline, are shown here. Eligible part—identified and randomized to one of four study groups. Prior to enrolling in the specific study group, all of the participants received standard lifestyle recommendations focused, in general, on healthy eating, exercise and control of weight.

The four groups included an intensive lifestyle program, which was designed to produce weight loss; a metformin group, and metformin is a diabetes drug, which was taken twice a day; a placebo group—and then there was a fourth group that took the diabetes drug troglitazone. However, troglitazone use was discontinued in June of 1998, when the FDA decided to take it off the market for safety problems. This left three groups that had a combined number of participants of about 3,200.

The lifestyle intervention program was an intensive behavioral modification program with a specific goal of achieving a greater than 7 percent loss of body weight and maintenance of this weight loss over time, as well as greater than 150 minutes per week of moderate-intensity physical activity. This was mostly completed in walking; however, participants were allowed to engage in other types of physical activity, as long as they reached a moderate intensity. The lifestyle intervention program was supervised by a case manager. Participants were offered 16 individual sessions within a defined core curriculum that lasted for 6 months. After the 6-month period, they received monthly individual visits, and they had to be seen in person at least every 2 months. The study also offered periodic group classes as well as motivational campaigns to increase weight loss or reverse weight—any weight regain.

Here are the results of DPP as far as the weight change. This figure shows the placebo group in green, the metformin group in yellow and the lifestyle intervention group in blue. Compared to the placebo, the lifestyle intervention group lost 7.2 percent of their body weight at 6 months and regained a modest amount and still remained at 4.2 percent lower at 30 months, with a gradual but sustained loss over the remainder of the study. They also achieved a 220-minute—approximately 220 minutes per week of moderately intense physical activity at 6 months and—as well as a maintenance of 190 minutes per week at 30 months. The metformin group also saw a small amount of weight loss compared to placebo, but the weight loss was much lower than that seen in the lifestyle intervention over time.

Moving to the study's primary outcome results, which is the percent developing diabetes, you see the results according to the study groups, the placebo again being shown in green, metformin in yellow and the lifestyle intervention in blue. Compared to the metfor—compared to placebo, the metformin group experienced a 31 percent reduction in the risk for development of type 2 diabetes. This was compared to the lifestyle intervention, which achieved a 58 percent reduction in the development of type 2 diabetes, which is approximately twice the benefit shown with metformin.

So in conclusion, after a mean study duration of three years, the DPP lifestyle intervention as well as metformin were established as effective means of delaying and preventing diabetes in these high-risk persons. However, it was considered important to continue to assess the longer-term effects regarding development of diabetes; diabetes complications, including microvascular effects—this would be kidney disease and vision problems—as well as neurological and cardiovascular disease events. The study group also assessed the health care implications—health economic implications of the study intervention.

For this reason, the study was converted into the Diabetes Prevention Program Outcome Study, or DPPOS. DPPOS enrolled all participants and re—that were eligible to continue and were—was successful in re-consenting 88 percent of the original cohort. All of the participants in all three groups were offered another initial 16-session curriculum, this time in a group format. The placebo was discontinued. The metformin group continued to take metformin in an open-label manner. And the lifestyle group was offered two four-class sessions focused on weight loss per year.

The 15-year results of DPPOS have been published recently, and it found that study participants in both intervention groups continued to experience benefits, as shown in this table, with the first row being the lifestyle intervention program and the second row being the metformin program. Again, after 2.8 years of DPP, the lifestyle intervention participants experienced a 58 percent reduction in development of type 2 diabetes, compared to 31 percent for the metformin group.

After 10 years of DPP DPOS—DPPOS, the lifestyle intervention group continued to experience a benefit, with a 34 percent reduction in the risk of developing diabetes, compared to a reduction of 19 percent in the metformin group. After another 5 years of follow-up, so a total of 15 years, there was a sustained benefit of the lifestyle intervention program, which was associated with a 27 percent reduction in risk, compared to an 18 percent reduction in risk for the development of type 2 diabetes in the metformin group. Importantly, participants in DPP continue to be monitored for other conditions, such as cardiovascular disease and events, as well as microvascular complications.

The study group also analyzed the effects of the intervention according to genetic risk. In this case, they assessed all of the DPP participants for the presence of a specific form of a gene that plays a role in the risk for the development of type 2 diabetes. This figure shown on the left is the placebo group, and you can see that there are three different types of—three different forms of the gene, including the CC and the CT form, which is in contrast to a third form, the TT form of the gene, which is associated with a much higher risk for developing type 2 diabetes. Looking at the effects of the lifestyle intervention, all three forms—all three groups with the different forms of the gene experienced a benefit, with the lifestyle intervention being able to eliminate the increased risk in development of type 2 diabetes within the TT group, which means that the lifestyle intervention was able to trump genetic risk.

Now I want to transition to Look AHEAD, which was a lifestyle intervention study designed to produce long-term weight loss in overweight and obese people who have been diagnosed with type 2 diabetes. The rationale for Look AHEAD was that weight loss had been shown to have numerous short-term benefits in overweight and obese individuals with type 2 diabetes; however, it was not known whether weight loss reduced cardiovascular morbidity and mortality. This question was particularly important because observational epidemiological studies had previously provided conflicting results on the effect of weight loss in people with type 2 diabetes, with some actually showing increased mortality with weight loss. However, these studies were not able to discriminate between intentional and unintentional weight loss. Thus, the objective of Look AHEAD was to compare, in overweight and obese people with type 2 diabetes, the long-term health effects of an intensive lifestyle intervention compared to a less intensive program of diabetes education and support on the primary outcome, which was the first occurrence of a composite of CVD death, myocardial infarction, stroke and hospitalized angina over a period of up to 13 and a half years.

The clinical sites for Look AHEAD are shown here. There are 16 clinical sites, and they were genetically—geographically diverse states across the U.S., which allowed for a diverse enrollment of U—of adults.

In the inclusion shown here, all participants had type 2 diabetes. They could be on any treatment, but fewer than 30 percent could be on insulin. They had to be overweight, so they had to have a BMI of greater than 25 or 27 if they were on insulin. They were in an age range of 45 to 75 years. They could have prior CVD history if it was determined to be safe for them to participate in the program. The study had a goal of enrolling more than 33 percent minorities. Hemoglobin A1C had to be controlled at less than 11 percent. Blood pressure had to be below 160 over 100. Triglycerides needed to be below 600 milligrams per deciliter. Importantly, participants had to have a source of medical care outside of Look AHEAD, meaning that Look AHEAD did not manage any of the health problems—any of the health care issues related to diabetes or other complications. However, the study did assure that everybody had access to a primary care provider, and if they didn't have one, they found one for them. Participants also had to pass a maximal exercise test or treadmill test to assure that the participants could engage in the physical activity program, and they also had to demonstrate an ability to adhere to the program.

There were two study interventions. The first was a Diabetes Support and Education, or DSE. This was the control condition. It provided health—information on health education topics, including diet, physical activity or exercise, as well as social support, which was primarily associated with coping with diabetes. The intervention—or the Intensive Lifestyle Intervention, which I'll call ILI from now on—the goals were to achieve equal to—greater than or equal to 7 percent weight loss, sustained across the entire study period, and it was focused on caloric restriction and exercise.

The lifestyle intervention program was divided into four phases. The first or most intensive was during the first 6 months. Participants were expected to attend three group meetings as well as one individual session per month. In months 7 through 12, they were expected to attend a minimum of two face-to-face contacts per month in the form of two group meetings and one individual session. In years 1—years 2 through 4, they were offered a minimum of two contacts per month, with one expected to be face to face. From year 4 on, they were offered a minimum of two contacts per year. And again, the study did not provide medical management for diabetes or other health problems.

As far as the interventions—Intensive Lifestyle Intervention program, it was focused on dietary intake, physical activity—and provided a behavioral component. For participants—looking at dietary intake, for participants who weighed less than 250 pounds at baseline, they were instructed to consume 1,200 to 1,500 kilocalories—calories per day. For those who weighed more than 250 pounds, they were instructed to consume 1,500 to 1,800 kilocalories—kilocalories per day.

The recommendation was to consume less than or equal to 30 percent of calories from fat. All participants were offered meal replacements in the form of shakes or bars. For those who were not interested in consuming meal replacements, they were provided with menu plans.

The physical activity recommendations were to gradually increase the amount of physical activity per week in order to achieve at least 175 minutes per week of moderately vigorous physical activity and to engage in 10,000 steps per day. There was also a behavioral component, which was mostly focused on goal setting, troubleshooting and motivational interviewing.

The comparison group—the Diabetes Support and Education, or DSE, group was offered three group educational social support sessions per year for four to six and a half years, and attendance was encouraged but not required. One session per year was focused on diet and nutrition; one was focused on exercise and physical activity; and then there was one other session focused on support, which is an open-

discussion forum. None of these sessions were focused on in—provided individual recommendations for weight control.

As far as the baseline characteristics of the Look AHEAD participants, Look AHEAD randomized 5,145 participants into either ILI group or the DSE group. Much like many weight loss studies, about 60 percent were women. The study enrolled 37 percent from racial and ethnic minority groups. They were, on average, 59 years old. Approximately 15 percent were insulin users at baseline. Fourteen percent had a history of a prior CVD event. Their hemoglobin A1C or diabetes was in relatively good control, at 7.2 percent. The women had a BMI of approximately 36, whereas the males had a BMI of approximately 35 percent—35 kilograms per meter squared.

Now I'm going to present some of the results of Look AHEAD. And to orient you in all cases, the DSE group is going to be shown in red, and the ILI group is going to be shown in the blue dash line. This first figure shows the weight loss results across the entire study period. Compared to DSE, the ILI group, in blue, achieved a substantial amount of weight loss, 8.6 percent at year 1, and experienced a gradual weight regain over time but a stabilization as the out—in the out years. This is compared to the DSE group, in red, who experienced a slight loss of weight through year 5 and an increasing amount of weight loss through year 10, but note that there was a significant difference in weight loss across all time periods of the study program.

The hemoglobin A1C results are shown here. As in the weight loss results, the ILI group experienced the greatest benefit in reduction of hemoglobin A1C at year 1, with a gradual increase over time. But note that they—compared to the DSE, there were substantial differences across the entire 10-year study program.

The study group also looked at the use of medications, specifically blood pressure medication, statins and insulin in the DSE versus ILI groups. And in all three cases, the ILI group took fewer medications, with the most significant differences in use of insulin. In—the study group also looked at health care costs associated with medications, and this reduced use of medication was associated with a savings of health care costs.

So the study also looked at a number of secondary outcomes and results. And compared to the DSE group, the ILI group experienced improvements in fitness, sustained improvements in systolic blood pressure, a higher HDL value over the 10-year period—the ILI participants also showed a slowing in the loss of mobility that's typically associated with aging and type 2 diabetes, and a sub-study also found a reduction in sleep apnea.

This figure shows the primary outcome results of Look AHEAD. As a reminder, the primary outcome was a composite of the first occurrence of CVD deaths, myocardial infarction, stroke and hospitalized angina—and again, the DSE group shown in red and the ILI group shown in blue. And as demonstrated here, despite the benefits seen in other outcomes, there was actually no difference in the occurrence of the primary outcome according to group. For this reason, the DSMB actually recommended that the intervention be stopped, but participants continued to be followed for the remainder of the study period.

So in conclusion, Look AHEAD found that individuals with diabetes—with type 2 diabetes can successfully lose and maintain modest weight loss long term. The intervention, or ILI, was shown to improve fitness and CVD risk factors. It also improved glycemic control relevant to—relative to the DSE group. It reduced use of insulin and other medications, but it did not show a reduction in risk for

cardiovascular disease morbidity and mortality. But as I mentioned, inter—the intervention has been discontinued, and follow-up is continuing. I want to note that the intervention materials provided on the study websites—they are available to the public for use in interventions.

NIDD—NIH is also funding translation research of the Diabetes Prevention Program. Translation research is defined as population delivery—population-wide delivery of effective interventions. In specific, NIH is funding studies looking at the feasibility of approaches to deliver the DPP-based lifestyle intervention to adults with prediabetes in a more cost-effective manner. There are a number of DPP translation studies that are ongoing; however, there are encouraging preliminary results from two groups, which I'm going to show in subsequent slides.

As far as translation research, the goal is to put proven therapies into practice. They test practical and generalizable approaches to implement therapies with proven efficacy. These therapies have to have potential for dissemination. They need to have sustainable models of implementation, be cost effective, have broad reach and be effective in diverse populations, and be able to be administered in real-world settings such as communities, work sites and other locations.

The first study I want to talk about is the DPP Lifestyle Intervention, delivered in the YMCA. This study used a group-based DPP intervention conducted at the YMCA, versus a brief-education-only group. And this study randomized 92 participants who were at risk for diabetes to one of the two conditions. They had three primary study questions; one was whether the YMCA was able to deliver a group-based DPP intervention, the second was whether it could achieve similar weight losses as seen in DPP, and the third was whether it would be less costly.

This figure shows the results of the weight loss and maintenance of the YMCA DPP program. The program was divided into four components. The first was 16 weekly visits conducted over a six-month period. After that, there were monthly visits over an additional six months. For another eight months, there were no visits, and then there were 12 visits that were offered to both groups in the subsequent eight months.

Looking at the percent weight loss, the YMCA group in the first six months experienced a 6 percent weight loss, compared to 2 percent in the brief-advice-only group. Over the next 12 months, when visits were offered monthly, the YMCA group DPP intervention saw sustained loss of body weight, 6 percent, compared to a similar amount of weight loss, 2 percent, in the brief-advice group. Once the visits were discontinued, when participants were followed up, there was a slight regain in weight in the YMC—in the group DPP, so they reached a 4 percent weight loss—sustained weight loss over that eight months, compared to, again, 2 percent in the brief-advice group. Once the intervention was offered to both groups, the YMCA group DPP participants returned to their initial body weight loss of 6 percent, and there was also a small but significant increase in weight loss in the brief-advice group.

The study also examined cost and cost-effectiveness of the D—of the YMCA program compared to the initial DPP study. Looking at the first row, this shows the Intensive Lifestyle—or the DPP study. And the second row is the—looked at the group lifestyle intervention at the YMCA. Looking at the first column, which assessed the cost per year, the DPP or Intensive Lifestyle program had costs of \$1,500 in the first year and \$700 in the second year. This was compared to \$240 per year for the group lifestyle intervention at the YMCA.

The second question's focused on cost-effectiveness, which is assessed by the dollar amount per QALY, when QALY stands for "Quality-Adjusted Life Years," which is a combination of quality of life and life expectancy, and this is used in assessing the monetary value of an intervention. The Intensive Lifestyle Intervention or DPP study was associated with a cost of \$11,000, which, in many health care organizations, is considered to be acceptable for an intervention. The group lifestyle intervention at the YMCA, in contrast, was considered to be cost-saving. So the intervention—the YMCA intervention was considered to be cost-effective.

Because of these studies, in 2011, Congress passed legislation that established the CDC-led National Diabetes Prevention Program, which had a goal of establishing local evidence-based lifestyle change programs for people at high risk for type 2 diabetes. The inaugural partners were, again, the YMCA, a national program; as well as the health insurer, United Health Group. And they delivered an intervention based on the initial YMCA study. This program allowed services to reach thousands of patients who are unlikely to get this intervention without the program.

So the study—a second study was the community health worker delivery of DPP—the DPP intervention study, which was called "Help Prevent Diabetes." This study capitalized on a partnership with existing community-based diabetes education programs. It conducted a randomized trial in which 301 overweight or obese persons with prediabetes were randomized to a group behavioral lifestyle intervention compared to usual care. And these—the lifestyle intervention was delivered by trained community health workers, and they were persons who were diagnosed with type 2 diabetes who had completed diabetes education, successfully made lifestyle changes and were judged to have the personality and competency necessary to lead intervention groups.

And this figure shows the percent weight loss of the Help Diabetes—Prevent Diabetes study. The eight—the lifestyle intervention group, shown in red—and compared to the usual care, they achieved a 7.3 percent reduction in weight care—in weight loss at 6 months and a decrease of 5.1 percent from baseline to 24 percent—actually 24 months. So this study was also effective in achieving weight loss.

They also looked at fasting blood glucose with the—in the lifestyle—in the intervention group, shown in the black dash line, compared to the usual care group, shown in blue. And they saw a reduction of 4.2 milligrams per deciliter from baseline to 12 months in the intervention group, compared to 0.3 in the usual care group. And after 24 months, they saw sustained reduction of 2.1 milligrams per deciliter in the intervention group, compared to an increase in 2.1—of 2.1 milligrams per deciliter in the usual care group.

The study also looked at the cost of delivering the intervention. In specific, they looked at the direct medical care costs—medical costs, including the community health worker, the registered dietitian and other staff time, as well as materials and overhead, and they looked at these costs over two years. In looking at the last row, the sum of the two columns—of the two years, in the first column, DPP had a cost of approximately \$2,600, compared to much lower costs of the Help Prevent Diabetes Program of \$850 per—over two years.

So in conclusion, NIH has shown that behavioral lifestyle intervention programs can produce weight loss in people at risk for diabetes or who are diagnosed with diabetes. These weight loss programs have been shown to prevent conversion to diabetes and to improve glucose control, and they've also been shown—it's also been shown that it can be conducted at a reasonable expense in clinic or medical care centers, in the YMCA and in health care centers.

And that is the conclusion of my presentation. I believe that we have a few more slides.

Joanne Gallivan, M.S., RDN—Director, NDEP, NIDDK

Yes, we do, Mary. Thank you. Thank you; that was a really informative and excellent presentation. Before we open it up for Q&A with Dr. Evans, I just want to remind you and share with you a couple of resources from NIDDK and the National Diabetes Education Program and the Weight-control Information Network that you could use with your patients to help them achieve weight loss or diabetes prevention, diabetes management and obesity.

The NDEP translated findings from the DPP clinical trial into a type 2 diabetes prevention campaign for both health care professionals and patients. I think many of you are familiar with the *Small Steps. Big Rewards. Prevent Type 2 Diabetes* campaign to encourage adults to learn about their risk for prediabetes and steps that they can take to prevent or delay the onset of the disease. A key message is that overweight—losing some weight—you have prediabetes; people who are overweight can prevent or delay the onset by losing a modest amount of weight with increased physical activity and maintaining a low-fat, low-calorie eating plan, as Dr. Evans just described. We also encourage physicians and other health care team members to assess patients at risk for diabetes and help them make these modest changes.

As shown on this slide, we have a variety of different print and online resources that can help you help your patients make these lifestyle changes. Our most popular prevention resource is the *Small Steps. Big Rewards. Your GAME PLAN for Preventing Type 2 Diabetes: Information for Patients*. This is a toolkit which is designed to help patients assess their risk for developing type 2 diabetes and then implement a program to prevent or onset—or delay the onset of the disease. It is based on the lifestyle modification strategies in the DPP and includes an activity tracker and a fat and calories counter.

We recently updated our *GAME PLAN for Preventing Type 2 Diabetes* toolkit for health care professionals and teams to give all of you, both in the clinical and community settings, the tools and information to identify prediabetes and to facilitate effective interventions. This resource, which is now online only, features three sections: prediabetes screening, how and why; how to talk to patients about their prediabetes diagnosis; and how to help your patients make lifestyle changes after a prediabetes diagnosis. There's additional information on reimbursement and coding, prediabetes facts and statistics, and related resources.

We also have diabetes management campaigns to emphasize that diabetes can be managed by healthy eating, getting regular physical activities, taking medications when deprived and knowing one's blood glucose numbers. Our diabetes management publications, such as *Four Steps to Managing Diabetes for Life* and *Taking Care of Diabetes Means Taking Care of Your Heart*, encourages patients to work with all of you on your health—on their health care team to create a diabetes care plan and follow that plan to prevent other health problems. These are great resources for people who are newly diagnosed with diabetes or those who've been diagnosed for years who want to learn more.

I hope, by now, many of you are familiar with our online tool, Diabetes HealthSense. This is an online library that provides easy access to more than 160 resources from 80 organizations that support people with diabetes, people at risk and those who care for them in making changes to live well or facilitating behavior change in others. There's a health care professionals section, which includes research articles on behavior change and psychosocial issues, including review articles, landmark studies and meta-analyses.

Also in this section are selected resources that can help health care professionals gain skills and knowledge to work more effectively with patients seeking to make and sustain lifestyle changes.

We also have a section in diabetes health that's called "Make a Plan." You can use this to guide your patients through the process of deciding on a behavior change goal and developing a plan to achieve that goal. It was designed to help patients think about what's important to their health and have them make a plan to take small but important steps to reach their goals. You can fill out the "Make a Plan" form online, and you print it and then discuss it with your patients each time at their visit with you.

Most recently or most—one of our more recent resources is the Body Weight Planner. This is developed through the NIDDK, and it's on the NIDDK website. This is an interactive online tool that helps adults make personalized calorie and physical activity plans to reach a goal weight with a specific time—within a specific time period and to maintain it afterward. To use the Body Weight Planner, the user would enter his or her starting information, including weight, sex, age, height and physical activity level. Then the planner generates a results report to help the user determine how many calories and how much exercise is needed to meet personal weight management goals.

We recently partnered with the U.S. Department of Agriculture to include the Body Weight Planner to the USDA's SuperTracker online tool as a goal-setting resource to help people achieve and stay at a healthy weight. You can learn more by visiting the URL that's on the website right now.

We also have a lot of resources from the NIDDK's Weight-control Information Network. It's a service of the NIDDK, and it provides science-based information on obesity, weight control, physical activity and related nutrition issues. Health care professionals and the general public can turn to it for lots of information on nutrition and overweight, which is tailored to people throughout the life span, from little children to older adults. For more information, you can visit win@win.niddk.nih.gov.

We'll now take questions from all of you. If you have a question, please type it into the question panel on your "Go to Webinar" screen, and we'll read it out loud, and we'll be happy to answer any questions. So Candice, do we have any questions today?

Candice Watkins Robinson, M.A.—Account Supervisor, Hager Sharp

Yes, we do; we have quite a few. One question—it's actually a request for a recap. Dr. Evans, one person wants to know if you could revisit the slide with the map—one of the very first slides with the map. I believe it's the total cost of obesity in 2012.

Mary Evans, Ph.D.—Program Director, Division of Digestive Diseases and Nutrition, NIDDK

Right. Okay, scrolling back, way...yes. Okay, a recap—oh, you mean to recap that.

Candice Watkins Robinson, M.A.—Account Supervisor, Hager Sharp

Yeah.

Mary Evans, Ph.D.—Program Director, Division of Digestive Diseases and Nutrition, NIDDK

Okay, so basically, the CDC assesses the prevalence of obesity in diagnosed diabetes among U.S. by using a questionnaire that participants fill in, and they determine the number of people who have obesity and present that as a proportion in each of the individual states. So you can see, in the top three maps, an increase in prevalence of obesity in states over time, with, in 2013, most having a prevalence of greater than or equal to 26 percent. If you look at the maps at the bottom, this is diabetes, and this assesses the

number of people who have diabetes across the U.S., and it largely, if you compare to the obesity map, shows that diabetes tracks with increased prevalence of obesity. And in general, we see more diabetes in the South compared to the more northern states, which is similar to the prevalence of obesity in the South.

Candice Watkins Robinson, M.A.—Account Supervisor, Hager Sharp

The next question is, “The ILI has to be very expensive. What can be done realistically to intervene?”

Mary Evans, Ph.D.—Program Director, Division of Digestive Diseases and Nutrition, NIDDK

Well, so there actually is a study ongoing that’s translating or using the study in—implementing it in health care costs—in health care systems, and it could be done by having—so, for example, training people who are less expensive—whose salaries are lower, who are less expensive, like community health workers, similar to what the DPP did. And it also could be more streamlined in order to achieve the weight loss. But really—and also, the study materials are actually on the website, so part of the costs were associated with developing the study materials. So by the fact that we have posted them online, that would reduce costs somewhat.

Candice Watkins Robinson, M.A.—Account Supervisor, Hager Sharp

Next question: “Is the DPP still using fat gram counting and fat restriction? Have the DPP recommendations for fat been updated or changed?”

Mary Evans, Ph.D.—Program Director, Division of Digestive Diseases and Nutrition, NIDDK

That is a good question. I believe that they are using—they are encouraging more consumption of healthy fats rather than just a cap on the percentage, but they still are using reduced calories and recommended macronutrient intake according to the U.S. Dietary Guidelines.

Candice Watkins Robinson, M.A.—Account Supervisor, Hager Sharp

The next question is, “Were there any unique findings in Look AHEAD for the older adult subgroup, 65 and older?”

Mary Evans, Ph.D.—Program Director, Division of Digestive Diseases and Nutrition, NIDDK

Yes, actually, very interestingly, similar to DPP, the older adults were more successful in achieving their weight loss goals. They—we’re not entirely sure of the reason, but it maybe has something to do with having more time or placing a greater emphasis on being healthier. We did not see a difference in the primary outcome according to age. But DPP had the same results in that the older adults were more successful.

Candice Watkins Robinson, M.A.—Account Supervisor, Hager Sharp

We have two questions related to participation for DPP; one is, “Our Y offers the program but has difficulty getting people to participate. Do you have any suggestions?” And then the next question is, “Recommendations for preventing participant drop-out from lifestyle intervention?”

Mary Evans, Ph.D.—Program Director, Division of Digestive Diseases and Nutrition, NIDDK

Right, so as far as enrolling participants or recruiting participants in the Y, that is a challenge. I think one approach is always more promotion and educating participants on the—I’m sure you do that already, but—re-emphasizing education on the risk associated with being overweight and prediabetes. Encouraging more flexible programs after work on the weekend with—is helpful. Perhaps targeting specific groups who would be more inclined to participate together—having a buddy system. I think there

are creative ways to encourage enrollment. But yeah, it's always a challenge, particularly with busy schedules. And I mean, everybody has busy life—a busy life with lots of competing commitments.

Candice Watkins Robinson, M.A.—Account Supervisor, Hager Sharp

Next question: “Are there any theories on why the cardiovascular disease morbidity and mortality was not reduced in the Look AHEAD ILI group?”

Mary Evans, Ph.D.—Program Director, Division of Digestive Diseases and Nutrition, NIDDK

So—sure, so one is, even though we did achieve greater weight losses than any other long-term study has ever shown, it may be that greater weight losses are necessary. It could be that, well, health care has changed; it always changes over time, and so there were earlier increases—early interventions in health and use of more medications. It may be—or it may be that, on average, participants had had diabetes for 5 to 7 years, so it may be necessary to intervene earlier, like right when participants are diagnosed with diabetes. And also, the other thing is that when participants were screened, they had to pass a maximal exercise test or treadmill test, and so they might have been healthier than your average population, which would put them at lower risk in the first place.

Candice Watkins Robinson, M.A.—Account Supervisor, Hager Sharp

Next question is, “Did anyone study the combination of Intensive Lifestyle Interventions along with the use of metformin?”

Mary Evans, Ph.D.—Program Director, Division of Digestive Diseases and Nutrition, NIDDK

In DPP, they did, obviously, but not in Look AHEAD. In many cases, they were already on diabetes drugs, including metformin, so they would already have been taking that, so there was no way to add it.

Candice Watkins Robinson, M.A.—Account Supervisor, Hager Sharp

The next question is, “Are trends in obesity linked to decreasing rates of tobacco use?”

Mary Evans, Ph.D.—Program Director, Division of Digestive Diseases and Nutrition, NIDDK

That is not my area of expertise. I don't want to provide inaccurate information, but I'm sure that that information is probably on the CDC website.

Candice Watkins Robinson, M.A.—Account Supervisor, Hager Sharp

And we have one more question: “Was the study question for Look AHEAD, being ‘Does weight loss lead to fewer adverse CVD outcomes?’—it seems”—I'm sorry; I just can't make out the rest of the question; I'm so sorry.

There's another question: “Is there NIH research about bariatric surgery for people with diabetes?”

Mary Evans, Ph.D.—Program Director, Division of Digestive Diseases and Nutrition, NIDDK

Yes, that is an active area of research. We fund a number of studies, including a study—an observational study of adults who have had bariatric surgery. It's called the Longitudinal Assessment of Bariatric Surgery Study, and it has followed the effects of bariatric surgery on people who had—who either did or didn't have diabetes over time and who do see a benefit of bariatric surgery as far as remission of type 2 diabetes in the short term. I think the question—the jury's still out about longer-term remission of diabetes, which is why we're continuing to follow and conduct a number of research studies in this area.

Candice Watkins Robinson, M.A.—Account Supervisor, Hager Sharp

Okay, one more question: “Does Dr. Evans have a comment on how the improvement in fitness, systolic blood pressure and HDL doesn’t end up translating into improved cardiovascular disease outcomes?”

Mary Evans, Ph.D.—Program Director, Division of Digestive Diseases and Nutrition, NIDDK

So—sure, so in this case, we did see improvements, but they might not have been strong enough to translate into an improve—a reduction in risks for outcomes. However, I think a number—a good amount of that—I mean, the weight loss program was obviously successful. I think it’s complicated, but a lot of the—I think a number of the issues might have been related to changes in health care. And even though it didn’t—you didn’t—we didn’t see a difference in cardiovascular disease events, it’s very important to note that there are other—there were many other benefits as far as health care utilization, quality of life, cost and mobility, and we’re still looking at some other outcomes. So just because we didn’t see a benefit in the primary outcome doesn’t mean that there weren’t a number of benefits—other benefits of Look AHEAD. So—and that’s important to note.

The other thing is that in those who were in the DSE group or the control condition took more medications as well, so it may be that people feel it’s more important—that they want to lose weight to—in order to avoid taking medications.

Candice Watkins Robinson, M.A.—Account Supervisor, Hager Sharp

Okay, and that was actually our last question.

Joanne Gallivan, M.S., RDN—Director, NDEP, NIDDK

Okay, thank you, Dr. Evans; that was really excellent—a lot of good information—lots of good questions. Just want to remind everybody that there are NDEP and NIDDK resources—especially for those people who can’t or don’t want to enter DPP programs. That’s one of the reasons why we have the GAME PLAN for Patients; I think there’s good information in there. We have information for older adults who are involved with the DPP that—a challenge for them, as well as some of the other groups that were involved in the DPP, including women with a history of gestational diabetes and those racial and ethnic groups that were involved in the DPP. So we do have resources for you; they’re free, and you can go to the NDEP and the NIDDK website and download all of our resources from all the education programs, including NDEP and the Weight-control Information Network.

So thank you very much, Dr. Evans; that was excellent. We really appreciate your time today, and we hope that everybody enjoyed the presentation. Please fill out the evaluation form that we will send to you later today. Thank you again. This concludes the webinar.