

**Cost-Effectiveness of the National Diabetes Prevention Program:  
A Case Study of Montefiore Health System**

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## **I. Introduction**

### **A. Global and national burden of diabetes (prevalence, complications, and economic implications)**

Diabetes is a growing public health concern globally; according to Saeedi et al. (2021), the number of adults with diabetes reached 537 million in 2021 and is projected to increase to 643 million by 2030. This chronic condition poses significant health risks, as it can lead to severe complications such as cardiovascular diseases, kidney failure, blindness, and lower-limb amputations (American Diabetes Association, 2018). The economic burden associated with diabetes is also substantial, with global healthcare expenditures on diabetes estimated at \$760 billion in 2021 (IDF Diabetes Atlas, 2021).

### **B. Importance of preventive care in managing chronic diseases**

Preventive care plays a crucial role in managing chronic diseases like diabetes by identifying and addressing risk factors before the onset of the disease. Through early intervention, preventative care can help reduce the incidence of diabetes, improve health outcomes, and decrease the economic burden on healthcare systems (Centre for Disease Control and Prevention, 2017). Moreover, preventive care can enhance the quality of life for individuals at risk of diabetes and their families.

### **C. Introduction to Montefiore Health System and its implementation of the NDPP.**

Montefiore Health System, a prominent healthcare organization in New York, recognized the importance of preventive care in addressing the growing prevalence of diabetes. To this end, the organization implemented the National Diabetes Prevention Program (NDPP), a CDC-developed, evidence-based lifestyle intervention program to reduce the risk of type 2 diabetes in high-risk individuals (Albright & Gregg, 2013). Montefiore Health System's adoption of the NDPP demonstrates its commitment to tackling the public health crisis of diabetes.

### **D. Purpose of the study and research questions.**

The primary aim of this study is to conduct a comprehensive analysis of the cost-effectiveness of the NDPP at Montefiore Health System while assessing its impact on mitigating the burden of diabetes among the targeted population. This paper seeks to provide valuable insights for healthcare organizations and policymakers by synthesizing existing research and literature. The research objectives are as follows:

- Assess the effectiveness of the NDPP at Montefiore Health System in reducing diabetes incidence and enhancing health indicators among the targeted population, thereby contributing to better management and prevention of diabetes.
- Examine the costs of implementing and maintaining the NDPP at Montefiore Health System, including personnel, training, materials, and other resources.
- Evaluate the cost-effectiveness of the NDPP within the context of the Montefiore Health System, compared to other diabetes prevention programs, to determine the value of investing in such interventions for healthcare organizations.
- By addressing these research objectives, the study aims to present a robust and impactful analysis of the NDPP at Montefiore Health System to inform decision-making processes and guide future research and practice in diabetes prevention.

## **II. Literature Review**

### **A. Overview of diabetes prevention strategies.**

#### **i. Lifestyle interventions**

Lifestyle interventions are crucial to diabetes prevention strategies, promoting healthy behaviors such as weight loss, dietary modification, and increased physical activity. The Diabetes Prevention Program (DPP) study demonstrated that lifestyle interventions led to a 58% reduction in the incidence of diabetes among high-risk individuals (Knowler et al., 2002). Such interventions have proven effective in various settings, including primary care, community, and workplace (Haw et al., 2017).

#### **ii. Medication-based approaches**

Medication-based approaches for diabetes prevention involve using medications such as metformin, which has been shown to reduce the risk of developing type 2 diabetes among high-risk individuals (Knowler et al., 2002). However, these approaches may have potential side effects and are generally less effective than lifestyle interventions (Diabetes Prevention Program Research Group, 2009).

### **iii. Technology-assisted interventions**

Recent technological advancements have allowed the development of interventions that leverage digital tools, such as mobile applications and web-based platforms, to support diabetes prevention efforts (Holtz & Lauckner, 2012). These technology-assisted interventions have shown promise in improving patient engagement and adherence to lifestyle modification recommendations, which can lead to improved health outcomes (Pal et al., 2013).

## **B. The National Diabetes Prevention Program (NDPP)**

### **i. Background and Development.**

The NDPP is a lifestyle intervention program developed by the Centers for Disease Control and Prevention (CDC) in collaboration with various stakeholders. It is based on the DPP study and was established as a response to the growing prevalence of diabetes in the United States and the need for a scalable, evidence-based intervention to address this public health crisis (Albright & Gregg, 2013).

### **ii. Key components and structure.**

According to the Centers for Disease Control and Prevention (2021), the NDPP is a program that spans over a year and consists of 16 weekly core sessions and monthly maintenance sessions. Trained lifestyle coaches deliver the program to participants and offer education, skills training, and support to facilitate behavior change. The program's core components include weight loss, healthy eating, physical activity, and behavioral strategies for long-term success.

## **C. Cost-effectiveness of diabetes prevention programs in various settings, including the NDPP.**

Several studies have evaluated the cost-effectiveness of diabetes prevention programs, including the NDPP, in various settings. (Li et al., 2010) The DPP intervention was cost-effective compared to standard care, and the NDPP was even more cost-effective due to its lower implementation cost. Similarly, (Ely et al., 2017) found the NDPP cost-effective in a community-based setting, with a cost-effectiveness ratio of \$13,761 per quality-adjusted life year (QALY).

### **III. Methodology**

#### **A. Montefiore Health System and its implementation of the NDPP: A review of past research**

Instead of conducting original research on Montefiore Health System, this study will focus on a comprehensive review and synthesis of existing literature and research on Montefiore's implementation of the NDPP. The review will examine the program's design, structure, outcomes, and the challenges and successes Montefiore Health System experienced in implementing the NDPP.

The Montefiore Health System's implementation of the NDPP was examined through a review of past research. A key source was the study titled "Effectiveness of a National Diabetes Prevention Program in Real-world Clinical Practice Settings within Montefiore Health System." (Rehm et al., 2017)

The Montefiore Health System is a large and constantly growing healthcare network that serves about 3 million individuals in New York. It includes 11 hospitals and 190 ambulatory care facilities and employs over 28,000 staff. The Office of Community and Population Health is a part of this network and is responsible for the health education program. Health educators provide one-on-one and group coaching at 15 of 22 Montefiore Medical Group primary care sites. Preventing type 2 diabetes is a crucial focus due to its high prevalence within the Montefiore patient community, according to Rehm et al. (2017).

#### **B. Data collection methods (e.g., research articles, reports, case studies)**

Multiple data sources will be utilized to gather information on the Montefiore Health System's implementation of the NDPP, including peer-reviewed research articles, reports from the Montefiore Health System and the CDC, case studies, and other relevant literature. The search strategy will use databases such as PubMed, Google Scholar, and the CDC website to identify publications related to the NDPP at Montefiore Health System. Inclusion and exclusion criteria will be established to ensure the selected literature is relevant and high-quality.

Rehm et al.'s (2017) study collected data from several sources, including electronic medical records, NDPP program records, and surveys of participants. The data included demographic information, clinical measures, attendance records, and self-reported changes in behavior, such as physical activity and dietary habits.

### **C. Data analysis techniques (e.g., narrative synthesis, thematic analysis)**

The collected literature will be analysed using various qualitative techniques to synthesize and interpret the findings related to the NDPP at Montefiore Health System. A narrative synthesis approach will be employed to summarize the included studies' key findings and identify patterns and trends in the data. Thematic analysis will be used to explore common themes and issues that emerge from the literature, such as factors contributing to the program's success, challenges faced in implementation, and the program's impact on health outcomes and costs. By reviewing and synthesizing existing research, this study aims to provide a comprehensive understanding of the cost-effectiveness of the NDPP at Montefiore Health System and to identify areas for future research and practice.

## **IV. Analysis**

### **A. Critical evaluation of fundamental values and data related to the NDPP.**

This section will analyse the critical vital values and data related to the NDPP, utilizing online information, and citing relevant sources. This analysis aims to provide valuable insights that will help assess the effectiveness of the NDPP at Montefiore Health System and other similar settings.

#### **i. Diabetes incidence reduction and weight loss achievements**

According to the Centers for Disease Control and Prevention (CDC, 2021), the NDPP can reduce the risk of developing type 2 diabetes by 58% among adults with prediabetes. Moreover, the program has been shown to achieve an average weight loss of 4%-7% of body weight among participants (CDC, 2021). These statistics underscore the potential effectiveness of the NDPP in preventing the onset of diabetes.

The Montefiore Network (Rehm et al., 2017) reported a significant reduction in diabetes incidence and weight loss among participants who completed the program. On average, participants experienced a 5.5% reduction in body weight, and the overall incidence of diabetes was reduced by 40%.

#### **ii. Long-term sustainability of behaviour changes**

A long-term follow-up study of the Diabetes Prevention Program (DPP) found that the lifestyle intervention group had a 27% lower incidence of diabetes after ten years of the initial intervention (Knowler et al., 2009). This suggests that lifestyle interventions promoted by the NDPP may lead to sustainable behaviour changes that can have lasting impacts on participants' health.

Participants who completed the program demonstrated a sustained adoption of healthy behaviors, such as increased physical activity and improved dietary habits, contributing to maintaining weight loss and reducing diabetes risk over time (Rehm et al., 2017).

### **iii. Healthcare cost savings**

According to a study by Li et al. (2015), the average cost per participant for implementing the NDPP was estimated at around \$417. This included program delivery, materials, and staff time. The study estimated that the NDPP could result in a net savings of \$2,650 per participant over ten years in medical costs by preventing or delaying the onset of type 2 diabetes (Li et al., 2015).

Given this information, if Montefiore Health System were to implement the NDPP for 100 participants, the estimated cost would be approximately \$41,700. However, the potential savings in medical expenses over ten years could reach around \$265,000.

Please note that these figures are based on a specific study and may not directly apply to Montefiore Health System. Costs may vary depending on location, staffing, and program scope. It wasn't easy to obtain real-time figures for the costs associated with the Montefiore Health System. The study by Li et al. (2015) estimates that the NDPP could save \$5.7 billion in healthcare costs over 25 years by preventing or delaying the onset of diabetes. This finding highlights the potential economic benefits of investing in diabetes prevention programs like the NDPP.

By examining these fundamental values and data, it becomes evident that the NDPP has the potential to be an effective and cost-saving intervention for diabetes prevention. However, it is crucial to recognize that the program's success largely depends on its implementation, participant engagement, and long-term sustainability of the behaviour changes promoted by the intervention.

According to the results of a tool provided by the Centers for Disease Control and Prevention (CDC)(cited), it has been found that individuals who are at high risk of developing diabetes can potentially save a significant amount of money on medical costs.

After running the tool, it was determined that at the end of year 10, a person who is at high risk of developing diabetes could potentially save up to \$1,018 on average. This substantial amount of money could

be put towards other essential expenses.

| Year | Medical Cost with No Intervention (\$) | Medical Cost with Intervention (\$) | Medical Cost-savings <sup>1</sup> (\$) | Program Cost <sup>2</sup> (\$) | Net Cost <sup>3</sup> (\$) |
|------|--|-------------------------------------|--|--------------------------------|----------------------------|
| 1    | 6,193                                  | 5,988                               | 205                                    | 535                            | 330                        |
| 2    | 12,468                                 | 12,087                              | 380                                    | 535                            | 155                        |
| 3    | 18,800                                 | 18,236                              | 564                                    | 535                            | -29                        |
| 4    | 25,175                                 | 24,475                              | 700                                    | 535                            | -165                       |
| 5    | 31,656                                 | 30,821                              | 835                                    | 535                            | -300                       |
| 6    | 38,154                                 | 37,181                              | 974                                    | 535                            | -439                       |
| 7    | 44,672                                 | 43,557                              | 1,115                                  | 535                            | -580                       |
| 8    | 51,204                                 | 49,944                              | 1,260                                  | 535                            | -724                       |
| 9    | 57,737                                 | 56,332                              | 1,406                                  | 535                            | -871                       |
| 10   | 64,272                                 | 62,719                              | 1,553                                  | 535                            | -1018                      |

Note: All costs are discounted back to year 0. The default discount rate (3%) or user-entered rate is used to discount costs.

1. The "Medical Cost-savings" column is the cumulative difference between costs in the "Medical Costs with No Intervention" column and the "Medical Costs with Intervention" column.
2. Program Cost includes the cost of screening if you have chosen to do a screening program. The cost of screenings that do not detect cases of prediabetes are accounted for in the program cost.
3. The "Net Cost" column is the difference between the "Program Cost" column and the "Medical Cost-savings" column.

It is important to note that these savings are only possible if the individual takes steps to reduce their risk of developing diabetes. This can be done through lifestyle changes such as eating a healthy diet, increasing physical activity, and maintaining a healthy weight.

In addition to the financial benefits, reducing the risk of developing diabetes can lead to improved health outcomes and a better quality of life. It is recommended that individuals at high risk of developing diabetes speak with their healthcare provider to discuss strategies for reducing their risk and improving their overall health.

## V. Results

### A. Summary of findings from the literature on the NDPP at Montefiore Health System

#### i. Program design, structure, and outcomes.

The literature indicates that the NDPP at Montefiore Health System is designed based on the principles of the national program, focusing on lifestyle intervention and group support. The program includes 16 core sessions, followed by maintenance sessions, aimed at achieving weight loss and increased physical activity among participants (CDC, 2021). The outcomes reported in the literature show reduced diabetes incidence, improved health indicators such as weight loss and increased physical activity, and overall positive patient satisfaction (Ali et al., 2019).



## **ii. Factors contributing to the program's success and challenges faced in implementation.**

The success of the NDPP at Montefiore Health System can be attributed to factors such as solid organizational commitment, dedicated staff, and effective patient engagement strategies (Aziz et al., 2015). However, the literature also highlights challenges faced in implementation, including resource constraints, staff turnover, and difficulties in retaining participants in the long term (Aziz et al., 2015; Hafez et al., 2017).

## **iii. Impact on health outcomes and costs.**

The literature suggests that the NDPP at Montefiore Health System positively impacts health outcomes, with participants experiencing a reduced risk of diabetes, improved weight management, and increased physical activity (Ali et al., 2019). In terms of costs, the program has been reported to be cost-effective, with the potential for long-term savings in healthcare utilization (Ely et al., 2017). A comparison with other diabetes prevention programs and their cost-effectiveness, including the NDPP in different settings.

Compared to other diabetes prevention programs, the NDPP at Montefiore Health System demonstrates similar success in outcomes and cost-effectiveness. For instance, the Diabetes Prevention Program Research Group (2015) found that lifestyle and medication-based approaches reduced diabetes incidence, with lifestyle interventions being more cost-effective in the long run. A systematic review by Dunkley et al. (2014) also reported that technology-assisted interventions effectively reduced diabetes incidence but were generally less cost-effective than in-person interventions such as the NDPP.

## **B. Pros and cons of Montefiore Health System's implementation of the NDPP**

### **i. Pros:**

- Proven effectiveness: The NDPP is an evidence-based program with a proven track record of reducing the risk of developing type 2 diabetes in high-risk individuals.
- Cost-effectiveness: The NDPP is cost-effective in multiple settings, with long-term healthcare cost savings potential.
- Promotes healthy behaviours: The NDPP promotes healthy lifestyle behaviours such as weight loss, healthy eating, and increased physical activity, which can positively impact overall health and well-being.

- Group support: The NDPP is a group-based program that provides participants with social support and accountability, which can improve participant engagement and adherence.

**ii. Cons:**

- Limited access: The NDPP may not be available in all areas or may not be accessible to all individuals due to factors such as cost or location.
- Participant retention: Retaining participants in the program can be challenging, as some individuals may find it difficult to commit to the program's year-long structure.
- Program sustainability: The long-term sustainability of behaviour changes promoted by the NDPP is uncertain, as it may be challenging for individuals to maintain healthy behaviours after the program ends.
- Resource-intensive: The NDPP requires resources such as trained lifestyle coaches, program materials, and facilities, which may be resource-intensive for some healthcare organizations to implement and maintain.

**VI. Conclusion**

The NDPP at Montefiore Health System is effective in reducing diabetes incidence and improving health indicators among the targeted population. The program's cost-effectiveness is comparable to other diabetes prevention programs, with lifestyle interventions proving more cost-effective than medication-based and technology-assisted interventions. The success of the NDPP at Montefiore Health System can be attributed to factors such as solid organizational commitment, dedicated staff, and effective patient engagement strategies. However, challenges in implementation, including resource constraints, staff turnover, and difficulties in retaining participants in the long term, are also noted in the literature. Overall, the performance of the NDPP at Montefiore Health System demonstrates the potential benefits of investing in preventive care for chronic diseases like diabetes while highlighting the need to address implementation challenges to ensure the program's success and sustainability.

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