Cost-effectiveness of a digital Diabetes Prevention Program (dDPP) in Prediabetic Patients

PRESENTER: **Sooyeol Park** (spark14@tulane.edu)

Sooyeol Park MPH MHS[12]; Trevor Ward MHS[2]; Andrew Sudimack MS MHS[2]; Sam Cox MHA[2]; Jeromie Ballreich PhD MHS[2]*

1. Department of Health Policy & Management, Tulane University School of Public Health and Tropical Medicine, New Orleans
2. Department of Health Policy & Management, Johns Hopkins Bloomberg School of Public Health, Baltimore

BACKGROUND

- Diabetes Prevention Program (DPP) has proven to be a highly effective intervention. However, there is a shortage of DPP services in the US. The digital Diabetes Prevention Program (dDPP) has emerged as a potential alternative to the DPP, reducing the barriers to access that the DPP has. Thus, this study aims to assess the cost-effectiveness of a dDPP in preventing type 2 diabetes mellitus (T2DM) among prediabetic patients.

METHODS

- **Markov cohort model,** 10-year time horizon with annual cycles was constructed. Societal perspective and a 3% discount rate was applied. 15% of the dDPP participants were assigned as partial completers with reduced treatment and long-term effects.
- **Intervention**: dDPP includes 12 months of lessons focusing on weight loss. SGE is a lifestyle intervention composed of a single session to promote healthy behaviors.
- **Model Structure**: Five mutually exclusive states, consisting of two stages: (1) treatment stage where the treatment effect (decline in HbA1c [1]) was applied (cycle 1) (2) after-treatment stage (cycle 2-10).
- **Transition probability**: Annual incidence of T2DM based on the HbA1c distribution of the population was used to derive the transition probability of the treatment stage [2]. After-treatment stage was based on a meta-analysis of long-term transitions of lifestyle intervention participants [3-5].

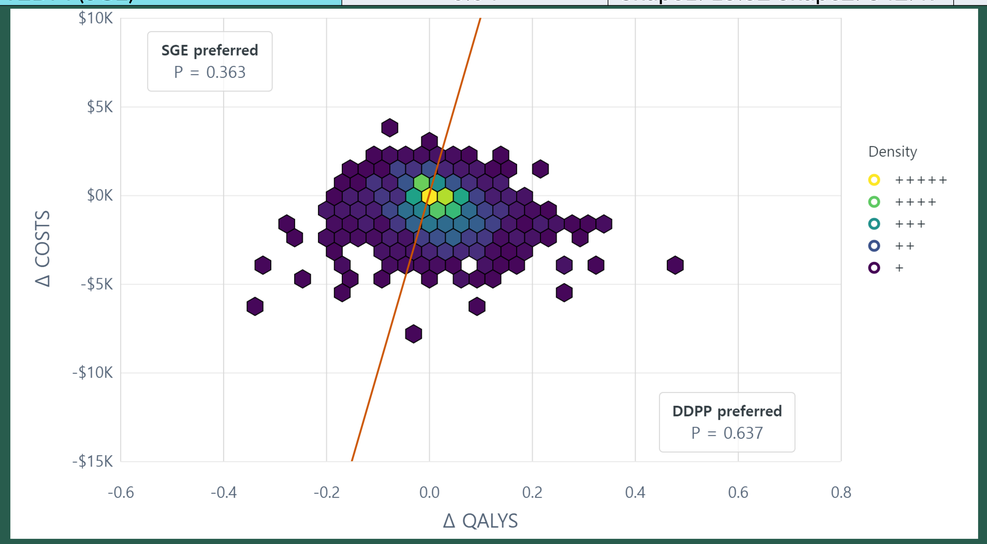
RESULTS

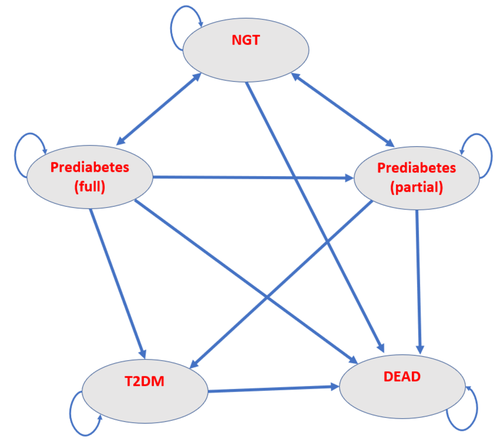
- dDPP dominated the SGE at $50,000, $100,000, $150,000 willingness-to-pay (WTP) threshold per QALY.
- Probabilistic sensitivity analysis showed that the dDPP was preferred at around 64% across the three WTP thresholds.

digital DPP can be a cost-effective intervention for prediabetic patients preventing type 2 diabetes

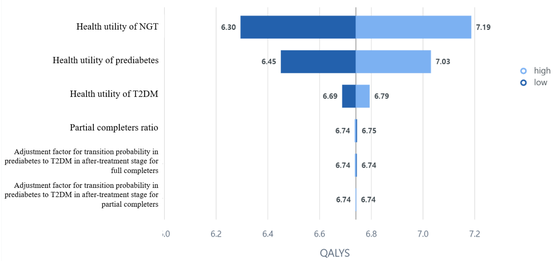
	QALYS	COSTS	Comparator	Δ QALYS	Δ COSTS	ICER
dDPP	6.74	13,279				
SGE	6.70	14,729	dDPP	-0.04	1,450	Dominated

Parameter	Applied value	SD	Distribution
Starting age	45		
Time horizon	10 years		
Health utility of NGT	0.84	Shape1: 2.77 Shape2: 0.58	Beta
Health utility of prediabetes	0.71	Shape1: 3.38 Shape2: 0.90	Beta
Health utility of T2DM	0.68	Shape1: 3.98 Shape2: 1.32	Beta
Omada health startup cost	960	120	Gamma
Omada annual cost	240	30	Gamma
SGE cost	4.05125		
T2DM nonmedical cost	7009.50	1752.38	Gamma
T2DM medical cost	6471.28	1617.72	Gamma
Prediabetes medical cost	525.72	131.43	Gamma
Starting HbA1c	5.8	0.3	Normal
Treatment effect (dDPP full)	-0.23	0.26	Normal
Treatment effect (dDPP partial)	-0.16	0.19	Normal
Treatment effect (SGE)	-0.16	0.35	Normal
Proportion of partial completers	0.15	0.38	Gamma
Treatment stage transition probability			
Prediabetes to T2DM (dDPP full)	0.032	Shape1: 15.49 Shape 2: 468.28	Beta
Prediabetes to T2DM (dDPP partial)	0.035	Shape1: 15.37 Shape2: 374.39	Beta
prediabetes to T2DM (SGE)	0.038	Shape1: 15.38 Shape2: 382.68	Beta
After-treatment stage transition probability			
prediabetes to T2DM (dDPP full)	0.04* 0.80	Shpae1: 15.45 Shape2: 435.80	Beta
prediabetes to T2DM (dDPP partial)	0.04* 0.86	Shape1: 15.41 Shape2: 404.03	Beta
prediabetes to T2DM (SGE)	0.04	Shape1: 15.32 Shape2: 342.49	Beta





Scenario	ICER (Comparator: dDPP)
Deduction in the treatment effect	
30% deduction	dDPP dominates SGE
35% deduction	4,882
40% deduction	SGE dominates dDPP
Varying proportion of partial completers	
100% partial	SGE dominates dDPP
Dropouts instead of partial completers	
25% dropout	dDPP dominates SGE
30% dropout	28,605
35% dropout	SGE dominates dDPP



REFERENCES

[1] Katula JA, Dressler EV, Kittel CA, Harvin LN, Almeida FA, Wilson KE, et al. Effects of a Digital Diabetes Prevention Program: An RCT. Am J Prev Med. 2022;62(4):567-77

[2] Zhang X, Gregg EW, Williamson DF, Barker LE, Thomas W, Bullard KM, et al. A1C level and future risk of diabetes: a systematic review. Diabetes Care. 2010;33(7):1665-73

[3] Balk EM, Earley A, Raman G, Avendano EA, Pittas AG, Remington PL. Combined Diet and Physical Activity Promotion Programs to Prevent Type 2 Diabetes Among Persons at Increased Risk: A Systematic Review for the Community Preventive Services Task Force. Ann Intern Med. 2015;163(6):437-51

[4] Meigs JB, Muller DC, Nathan DM, Blake DR, Andres R. The natural history of progression from normal glucose tolerance to type 2 diabetes in the Baltimore Longitudinal Study of Aging. Diabetes. 2003;52(6):1475-84

[5] Morris DH, Khunti K, Achana F, Srinivasan B, Gray LJ, Davies MJ, et al. Progression rates from HbA1c 6.0-6.4% and other prediabetes definitions to type 2 diabetes: a meta-analysis. Diabetologia. 2013;56(7):1489-93

Tulane SCHOOL OF PUBLIC HEALTH AND TROPICAL MEDICINE

JOHNS HOPKINS BLOOMBERG SCHOOL of PUBLIC HEALTH