**Type 2 Diabetes Mellitus in Native Americans: Critique of past and current strategies at Individual, Interpersonal and Community Level and a Recommendation**

**Introduction**

Diabetes Mellitus type 2 is a significant public health issue worldwide. One in ten adults (20–79 years old), or 537 million, have diabetes. By 2030 and 2045, this number is expected to increase to 643 million and 783 million, respectively.1 Previously referred to as adult-onset diabetes, type 2 diabetes (T2D) is a type of diabetes mellitus marked by elevated blood sugar, insulin resistance, and a relative deficiency of insulin.2 1 in 10 Americans, or more than 37 million people, have diabetes, and 90–95% of them have T2DM.3 According to 2018–2019 National Health Interview Survey, American Indians and Alaska Natives (14.5%) had the greatest prevalence of diagnosed diabetes among both men and women in USA.4

The Social Ecological Model(SEM) takes a comprehensive approach to health, emphasizing the variety of elements that can influence well-being providing insights and complex interactions of various determinants at individual, interpersonal, community and societal level for a public health problem.5,6 In my previous paper I identified being overweight as the determinant under the individual level, social support at the interpersonal level, food insecurity at the community level and discrimination at the policy level of the SEM.7–11 Based on this knowledge, in this paper, I am going to critique interventions that address these determinants at individual, interpersonal and community levels of the SEM and propose an innovation, an improvement to that existing intervention.

**Critique of past and current strategies at Individual, Interpersonal and Community Level**

Within the individual level of the SEM, while examining Native American patients with type 2 diabetes mellitus (T2DM), a notable association was observed between T2DM and overweight/obesity, with a co-prevalence rate of 78.2%, highlighting a significant correlation between these two conditions.7 Key clinical trials like the U.S. Diabetes Prevention Program (DPP) have demonstrated that lifestyle changes can successfully prevent or postpone the start of diabetes in high-risk individuals.12,13 The Special Diabetes Program for Indians – Diabetes Prevention (SDPI-DP), which is the most extensive adaptation of the DPP for a minority group in the U.S. (specifically American Indians/Alaska Natives), achieved considerable success.12,14 The "Strong Men, Strong Communities" (SMSC) study is a trial aimed at diabetes prevention among Native American men. It focuses on refining the SMSC intervention, comparing diabetes risk changes between groups, and maintaining participant engagement. The intervention, adapted from the Group Lifestyle Balance program, includes 18 sessions focusing on increasing physical activity and achieving a 7% weight loss, delivered by peer educators in a community setting. The program integrates interactive activities, goal setting, and strategies for healthy eating and physical activity.12 Only about 25% of the 2,553 Native American participants in the SDPI were men, with a significant drop-off in follow-up, especially among men . The SMSC study addresses this gap by focusing specifically on recruiting and retaining Native American men in interventions promoting weight loss and healthy lifestyles to prevent diabetes, a demographic historically underrepresented in such programs.12,14,15 This was a major strength of this intervention. The limitation of this intervention is that it was only carried out in the Urban settings of Minneapolis, Minnesota; Portland, Oregon; and Phoenix, Arizona, where the resources and the healthcare facilities were easily available. Rural tribal communities might lack these resources, making it challenging to replicate the study's methods.

At the interpersonal level of SEM, social support measures the structure, processes, and functions of relationships. A greater positive social support helps T2D management, whereas negative social support can have the reverse effect, especially among the Native American population.9 Enhancing our knowledge of social support in the context of managing type 2 diabetes can have significant positive effects on public and clinical health.16 Together Overcoming Diabetes (TOD), is a family-based, culturally centred, home-delivered program to prevent and manage type 2 diabetes (T2D) among Native American communities. This approach recognizes the vital role that family and close interpersonal relationships play in health behaviours and outcomes. The TOD program targets the interpersonal risk factor- Social Support for T2D management by involving family members and support persons, engaging community members through advisory boards, delivering culturally tailored education through community-connected health coaches, and organizing community events and activities. This holistic and community-oriented approach enhances the social support system, which is crucial for effective diabetes management.16 This intervention has 162 participants in Ojibwe communities, uses a randomized waitlist control design. It involves a 6-month intervention and subsequent maintenance phase, with assessments including HbA1c, cholesterol, and blood pressure, conducted by a blinded evaluation team. The study, starting June 18, 2021, aims for primary completion by April 2025, with an end date in June 2026.17 Along with emphasizing interpersonal determinants like social support, a main strength of the TOD program is its incorporation of individual-level determinants, such as enhancing behavioural knowledge, psychological well-being and personal motivation for the management of T2D. Another important strength according to me is its specific design for Native Americans, thoughtfully addressing the unique cultural, social, and health needs of these communities, which enhances the program's relevance, effectiveness, and acceptance. This can be a limitation as well, as, the program's strong focus on American Indian cultural norms and values might limit its direct applicability to non-Indigenous populations without significant modifications. Moreover, another limitation is that being an ongoing study, there is a lack of extensive evaluation studies or reviews available to comprehensively analyse its effectiveness in the target communities.

Food insecurity is a community level determinant of SEM that is associated with T2D in Native Americans.10 Food insecurity is defined as the limited or uncertain availability of nutritionally adequate and safe foods. Among the Native American participants, 56% reported insufficient food quantity, while 62% reported inadequate food quality. The prevalence of diabetes was notably higher at 28.4% in participants experiencing food quantity inadequacy, compared to 18.4% in those with adequate food supply.10 The Traditional Foods Program (TFP) was developed based on the results of previous studies that showed traditional foods could improve health and help avoid type 2 diabetes. 18 The goal of the TFP was to address community health in Native American community, specifically type 2 diabetes prevention, by promoting access to traditional foods, physical activity, and social support. The Traditional Foods Project began in 2008 with 11 tribes and expanded to 17 in 2009, receiving $100,000 yearly per partner.19 In 2012, a sixth year was added for capacity building, with 16 of 17 partners participating. Data collection varied, with the initial 11 partners participating for 5 years, 5 new partners for 4 years, and one for 3 years. The project focused on tribal-driven solutions based on traditional ecological knowledge to reclaim food systems. This involved increasing access to traditional foods that are healthier and culturally significant to these communities.19 One major strength of this intervention is that it recognized the importance of addressing the complex historical and contemporary context of policy, poverty, historical trauma, and food systems that contribute to health disparities in Native American communities. By focusing on these root causes, the project aimed to create systemic long-term changes to promote health and address food insecurity.19 The project faced challenges in changing existing food systems, particularly in areas with high food insecurity. For instance, on a reservation in the Great Plains, 40% of families with children were food insecure, and much of the available food was purchased from convenience stores. These conditions highlight the difficulty in shifting food habits and availability in some communities, which is a limitation of this intervention.19

**Recommendation**

I recommend the strategy named – ‘Together Overcoming Diabetes’ which is a multi-generational preventive intervention created for American Indian families to combat Type 2 Diabetes (T2D). It was developed through community-based participatory research and has been implemented in diverse tribal communities​. 16 It targets the interpersonal determinant – social support, of the Socioecological Model. The TOD program's success hinges on its holistic approach, community involvement, culturally sensitive curriculum, and adaptive methodology, making it an effective intervention to address T2D in Native American population. The reason for recommending this intervention is that it, also addresses the individual level determinants by enhancing personal health knowledge and behavioural skills for diabetes management, and by providing psychological support within a culturally tailored framework for American Indian communities. Moreover, TOD's curriculum is holistic, addressing spiritual, mental, physical, and emotional wellness. This aligns well with the values and traditions of American Indian communities, ensuring greater acceptance and relevance​.

To enhance the "Together Overcoming Diabetes" (TOD) program, an innovative approach would be the introduction of a Behavioural Goal-Setting and Reward System. This system would involve participants setting individualized health goals, such as dietary changes or increased physical activity, in collaboration with Family Health Coaches. These goals, aligned with SMART criteria (Specific, Measurable, Achievable, Relevant, Time-bound), would be tracked regularly, either through digital tools or physical diaries.20 21

The innovation lies in the integration of a reward mechanism, where achieving these health goals is linked to rewards. These could range from symbolic acknowledgments like certificates to tangible items like healthy food baskets, encouraging further healthy lifestyle choices. This approach draws on Operant Conditioning, a concept in Health Behaviour Theory, emphasizing the impact of positive reinforcements in shaping behaviour. By rewarding participants for meeting their health goals, the program would enhance motivation and likelihood of sustained behaviour change.

Operant conditioning, is a learning process where behaviours are influenced by the use of rewards and punishments. In this method, behaviours that receive rewards tend to be repeated, while those that are punished are less likely to recur. This approach is utilized to alter behaviour patterns by encouraging desirable actions and discouraging undesirable ones.20 This innovation would not only add an engaging element to the TOD program but also provide participants with continuous motivation and recognition for their efforts. The success of this innovative approach can be gauged through participants' adherence to set goals and improvements in diabetes-related health metrics. This addition would leverage the TOD program's strengths in providing personalized care while addressing the need for ongoing engagement and motivation among participants.

**Conclusion**

This analysis provides a comprehensive overview of the interventions addressing Type 2 Diabetes Mellitus (T2DM) in Native American communities, guided by the Social Ecological Model (SEM). The key determinants at different levels of SEM I chose were, being overweight at the individual level, social support at the interpersonal level, and food insecurity at the community level. My critique of past and current strategies revealed significant efforts in managing T2DM, such as “Strong Men, Strong Communities” addressing the individual level, “Together Overcoming Diabetes” (TOD) at the interpersonal level and “Traditional Foods Project” at the community level of the SEM. I recommended “Together Overcoming Diabetes” (TOD) program as it stood out for its holistic approach, targeting interpersonal determinants like social support and integrating individual-level determinants. My innovative proposal enhances the TOD program by introducing a Behavioural Goal-Setting and Reward System. This system, based on operant conditioning, aims to motivate sustained healthy behaviours through individualized health goals and rewards, pushing the intervention strategy forward by focusing on continuous participant engagement and motivation.

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