

## Evaluating Diabetes Prevention Strategies in the NHS 'Healthier You' Programme and Risk Assessment Tools

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### Abstract

### Review Article

It has become imperative for healthcare systems globally to reduce incidence of diabetes due to its rise and associated complications. Several measures and interventions have been suggested to prevent the progression of Non-Diabetic Hyperglycaemia to Type 2 Diabetes Mellitus. In England, the NHS Diabetes Prevention Programme (NHS DPP), launched in 2016, aims to reduce diabetes incidence through behavioural interventions focusing on weight loss, dietary improvements, and increased physical activity. This is based on evidence from international studies, including the Da Qing Study and Finnish Diabetes Prevention Study, which have proven that lifestyle modifications are the most effective strategy for diabetes prevention. A service evaluation of the NHS DPP revealed that while the program led to significant reductions in weight and HbA1c, participation and retention rates remained suboptimal, particularly among ethnic minority groups. Challenges include variability among provider delivery, the need for better risk assessment tools, and inadequate patient engagement. Improving referral pathways, introducing digital interventions, and increasing public awareness through targeted opportunistic campaigns may improve participation and effectiveness. Furthermore, there are several risk assessment tools for early detection of high-risk individuals like FINDRISK and CANRISK. However, local population characteristics must be considered. Studies indicate that the Leicester Risk Assessment Score is the most effective in predicting NDH in England, making it a viable tool for widespread use in general practice. Proactive screening strategies and refining risk models could enhance the NHS DPP's impact, ultimately reducing the burden of diabetes on healthcare systems.

**Keywords:** NHS Diabetes Prevention Programme (NHS DPP), Non-Diabetic Hyperglycaemia (NDH), Type 2 Diabetes Mellitus (T2DM), Lifestyle Modifications, HbA1c/Weight Reduction.

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## INTRODUCTION

Given the rise in diabetes prevalence worldwide, the complications and costs associated with it, reducing the incidence of diabetes have become a priority for many healthcare systems. There have been several studies in different countries comparing different types of interventions to prevent patients at high risk of developing diabetes progressing from Non-Diabetic Hyperglycaemia (NDH) into Type 2 Diabetes Mellitus (T2DM).

In England, 'The Healthier You' NHS Diabetes Prevention Programme (NHS DPP) has been put in place in 2016 to prevent the progression of NDH to T2DM. Understanding it The outcomes were set as reduction in:

- Incidences of diabetes
- Weight
- HbA1c or FPG at 12 months from referral and beyond. (NHS, 2016)

Multiple prospective randomized controlled studies have shown similar results clearly stating that lifestyle changes are the most effective in terms of reducing the progression from NDH to T2DM. The Da Qing Study (Pan *et al*, 1997) showed that the incidence of T2DM was 25-50% lower in the intervention groups compared to the control group. The Finnish study (Tuomilehto *et al*, 2001) confirmed what was noticed in China and the follow-up (Lindström *et al*, 2006) suggested that intensive lifestyle changes not only reduced the cumulative incidence of diabetes by 58% following the intervention period but also showed a lasting effect after 6 years.

Hence, the NHS-DPP, guided by benchmark diabetes prevention studies, aims a large scale intervention in patients by offering lasting behavioural interventions to enable them to reduce their risk of developing T2DM through weight loss, as a result of

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improved diet and increased levels of physical activity (NHS, 2016). Knowler *et al.*, (2002) and later the Indian DPP (Ramachandran *et al.*, 2006) have shown that the interventions can be generalized in a patient from minority groups at high risk of diabetes (Asian, Afro-Caribbean, Hispanic origin). Therefore, similar interventions could be carried out in England despite ethnic diversity. Furthermore, a systematic review and meta-analysis, including 36 studies (11 of which RCTs), published by Public Health England in 2015 confirmed that behavioural interventions conducted in real-world settings reduced incidence of T2DM by 26% over 12-18 months post-intervention with a pooled weight loss of 2.46kg and a pooled mean HbA1c reduction of 0.8mmol/mol paving the way to the largest and most ambitious DPP in the world (Public Health England, n.d.).

Patients at high risk were identified through NHS Health Check, Online Risk Tools, or Computer-based risk assessment tools. People with a high-risk score, BMI, BP were offered a blood test (HbA1c/FPG)(NHS, 2019). Only 18 years old, non-pregnant, with HbA1c of 42 – 47mmol/mol or an FPG of 5.5 – 6.9mmol/l within the 12 months before the date of referral are eligible for this program (NHS, 2016).

Four framework providers were selected to deliver the NHS-DPP nationally. The behavioural interventions consist of face-to-face contacts of a minimum of 13 sessions over at least 9 months with at least 16 hours of contact time. Dietary changes consist of increasing fibre, fruit and vegetables, oily fish, and cutting down saturated fat, salt, and free sugars. These have to be tailored according to participants' customs and location to empower them for a lasting change and improved accessibility (NHS, 2016). 150 min per week of moderate-intensity physical activity is suggested (Nice.org.uk, 2012).

A prospective service evaluation of the NHS DPP estimated intervention effectiveness by assessing changes in weight and HbA1c in all those referred from programme launch in June 2016 to the end of December 2018 (Jonathan Valabhji *et al.*, 2020). Data analysis shows that out of 324699 people referred, 53% attended the initial assessment and only 36% attended the first group intervention. 17252 attended at least 60% of the sessions were considered to have completed the intervention representing 19% of those referred to the programme. Primary outcome of the study was set to be change in weight and HbA1c. These were reflective of the aims of the NHS-DPP in preventing the incidence of diabetes. HbA1c change was analysed only in those participants who had a HbA1c check at their initial assessment to ensure all the values analysed for one individual were from the same device.

Results show that in an intention-to-treat analysis there was a 2.3kg mean weight loss and a mean

HbA1c reduction of 1.26mmol/mol. The results were even better in the 'completed group' who attended at least 60% of the session with a clear correlation between the results and the number of sessions attended. These findings were concordant with previous DPPs, and the meta-analysis of pragmatic studies conducted by PHE increasing the optimism in reducing the incidence of diabetes in real-life interventions at scale (Jonathan Valabhji *et al.*, 2020).

However, the secondary analysis showed that the retention rate was lower in the Asian and other mixed ethnic categories. There were significant differences in the completion between providers.

### Suggestions for Improvement

Overall, the roll-out of the "Healthier You" at a national level was a big challenge. This was measured against NICE guidance for diabetes prevention. Findings showed that although the interventions have a strong evidence base, some limitations in fidelity assurance, data collection, and recruitment were identified. This was probably due to the degree of reasonable flexibility allowed to different intervention providers in detailed session planning to allow a national delivery of the programme without opposing some contextual variation due to local diversity. Better clarity in the provider's role and monitoring of variations in intervention provision when trying to accommodate local needs might help reduce significant variability between providers and improve fidelity to the NHS-DPP programme specifications (Penn *et al.*, 2018).

Participants are currently recruited through the NHS Health program which is meant to recur for an individual every 5 years. This is a long time and changes in clinical circumstances for patients may go undetected. It is patient prompted rather than healthcare service. This is not aimed to identify patients at high risk of diabetes (referral did only based on raised BP or BMI). There should be an ad-hoc risk assessment tool actively circulated to the patients to identify those with a high risk in every GP surgery. Those who have a high-risk score should be referred to the DPP, even without a blood test or through self-referral. Dedicated funding should be commissioned for this service for the general practice.

Data shows that in the first 2.5 years, out of 324699 referrals to the program 59% attended the initial assessment (Jonathan Valabhji *et al.*, 2020). A suggestion could be to encourage warm referrals as opposed to cold referrals to increase uptake. These would mean a brief counselling/leaflet on the importance and impact that DPP could bring, possibly given by the GP or a member of staff 'on behalf' of the GP.

Recently, digital access for people declining or unable to attend the face-to-face programme was piloted in certain areas and then. This platform allows accessing health coaches through apps and monitors exercise

targets through wearable devices. A large scale real-world uncontrolled evaluation between December 2017 and November 2018 shows the uptake was 68% (higher) and was more marked in the younger age ranges. In the future, this should be made accessible if found to be equally effective for those who prefer a remote intervention.

Furthermore, only 17252 completed 60% of the intervention sessions. This shows there is a huge margin of improvement in the program engagement and retention and adherence (Jonathan Valabhji *et al*, 2020). Asian, mixed ethnic minority, and people from an area of high deprivation index have shown the highest rates of drop out. Incentives should be put in place for providers to retain these subgroups of people.

There should be an ad-hoc communication campaign to raise awareness of complications of diabetes and the benefit of the NHS-DPP. Different media formats and languages should be included to be able to reach those at high risk and vulnerable. Educational sessions in general practice should be arranged with vision, rationale, and updates of the NHS-DDP. This will possibly improve the engagement of the clinicians and support more warm referrals.

### **Risk Assessment Tools Available for Daily Practice to Identify Patients at High Risk of Developing Diabetes**

IDF Guidelines for T2DM do not recommend universal screening as this could be not cost-effective (IDF, 2005) and suggest a two-step approach which has also been supported by NICE public health guidance 38 (Nice.org.uk, 2012). Stage1 consists of identifying a patient at high risk of developing diabetes through a risk assessment tool followed by blood testing for those with a high-risk score in Stage2. However, NICE guidance does not suggest any specific risk assessment tool.

Risks models and scores have been widely used around the world and incentivized in the UK in cardiovascular disease prevention (ie Framingham score/QRisk). However, despite several non-invasive risk assessment tools suggested for Stage 1 from different studies, there is limited formal use from a health policy point of view. A good risk score generally should be able to estimate accurate individual risk differentiating high-risk people from low risk. Validation is confirmed when the risk tool maintains the same ability in a different population with similar qualities or in a different period (Noble *et al*, 2011). The most well-known risk assessment tools internationally are the FINRISK, CANRISK, the AUSDRISK, and ADA risk test.

ADA suggests “Screening for diabetes through an assessment of risk factors with regard to an age- and body mass index (BMI)-based criteria (screening criteria); or with the American Diabetes Association (ADA) diabetes risk test (risk test) is recommended by the ADA to guide healthcare providers on whether or not

a diagnostic test, i.e. blood glucose or HbA1c measurement, is necessary” (Woo *et al*, 2017). Although the BMI is modified based on ethnicity, the risk test does not take into account ethnicity.

Lindstrom *et al.*, suggested a simple scoring system to identify NDH and undiagnosed diabetes. 4746 participants aged between 35–64, stratified by sex, not on any anti-diabetes medication were followed up for 10 years. Risk factors contributing towards the development of diabetes requiring treatment were analysed and given a score (Lindstrom *et al*, 2003). The validity of the scoring system was tested prospectively 5 years later and showed to be a reliable tool to identify people at high risk of developing T2DM. The FINDRISK scoring system included Age, BMI, and waist circumference, HTN on treatment, history of previous high blood glucose, physical activity, and consumption of vegetables, fruits or berries. However, family history and ethnicity were not included. This might have been due to local population characteristics. The Canadian Risk (CANRISK) was based on the FINRISK, however, smoking history, ethnic origin of parents, FHx of diabetes, and history of GDM were included due to local population characteristics.

Sensibility and sensitivity are both important to have a good representation of true positive and true negative. Hence, it is important to find a suitable cut-off point to have a reliable risk assessment tool. (Al Khalaf *et al*, 2010) demonstrate how validated risk assessment tools in a certain population do not apply to a population with different characteristics, at least not with the same cut-off of risk scores. This study clearly shows how sensitivity and specificity in detecting diabetes in the Kuwaiti population improve with an adjusted cut-off score of ADA, Rotterdam, and Danish risk scores.

Thus, in order for us to identify the best risk assessment tool, it is important to analyse the risk factors contributing to diabetes locally. In England, the Cambridge risk score, the Leicester Risk Assessment Score, the Leicester Practice Risk Score, and QDiabetes are available in daily practice to assess the risk of developing T2DM.

In 2015, NCVIN published a study on a subgroup of 18406 people with NDH (HbA1c 6.0-6.4%) from five years of Health Survey for England (HSE) population data collected between 2009 and 2013 (NCVIN and PHE, 2015). Family history of diabetes was not assessed as it was not included in the HSE database. Risk factors for NHD were analysed using the weighted data. CHI-squared test showed age, Asian or black ethnic background, BMI, waist circumference, HTN, and CVD were found to be associated with NDH in England with p value <0.05 for all these risk factors. Furthermore, risk scores were calculated using all 4 tools available in the current database/online in England for all patients in the HSE dataset with an HbA1c available.

Sensitivity and specificity were also calculated for each of them to understand and compare how well they predict NDH. The Leicester practice risk score (Age, Sex, Family history of diabetes, Ethnicity, HTN, BMI) was found to have the best-combined sensitivity and specificity followed by the Leicester risk assessment score (which includes also waist size).

## CONCLUSION

Healthcare system in every country should promote a DPP to reduce incidence of diabetes. Stakeholders should try to limit the variability among the service providers and offer a framework that is able to capture a larger proportion of patients at high risk, including those who prefer remote interventions and those who would benefit from different media formats and languages. Considering all that has been mentioned so far, despite the possibility of user-related error, we would favour the use of the Leicester risk assessment score in primary care. It would allow a relatively accurate prediction of NHD, taking into consideration all the risk factors that have been identified to be significant in the English population following the HSE NDH data analysis. This is a very simple questionnaire that can be filled by the participants without the intervention of a healthcare professional and is also easily available online. Furthermore, the Leicester practice risk score could be considered for GP practices trying to identify patients with NDH. However, this would involve additional resources to assess BMI and waist size.

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