

Appendix 1 (as supplied by the authors): Supplemental material

1. Diabetes Population Risk Tool (DPoRT) Algorithm

DPoRT is a statistical model based on the Weibull survival distribution and is validated to calculate up to 10-year type 2 diabetes risk in population-based data that contains self-reported risk factor information, including age, sex, body mass index, education, smoking status, heart disease and hypertension. Methodological details about the development and validation of DPoRT are described elsewhere (15,16). Briefly, the original risk algorithm was based on a cohort of 19,861 individuals ≥ 20 years of age without diabetes followed between 1996 and 2005, and validated in two external cohorts in the provinces of Ontario ($n = 26,465$) and Manitoba ($n = 9,899$) which were representative of the general population, including Indigenous people living off-reserve (15). The algorithm was updated with more recent data including individuals from the original 1996 Ontario cohort and Ontario respondents of CCHS Cycle 1.1 (2001) and 2.1 (2003), and externally validated in Ontario respondents to the 2005 CCHS, with follow-up until 2011 (16). DPoRT was demonstrated to have good discrimination and calibration (c-statistic = 0.77; HL $X^2 < 20$), which was informed by linkage to administrative databases that identified observed diabetes cases during the prediction period (16).

The appropriateness of using DPoRT to estimate diabetes risk for First Nations populations living in First Nations communities was determined in this study by applying the DPoRT algorithm to the RHS data and examining the model's performance according to self-reported type 2 diabetes across diabetes risk categories.

In the Ontario RHS (phase 3), 228 respondents ≥ 20 years old (representing 11,209 First Nations adults after applying survey sampling weights) reported being diagnosed with type 2 diabetes.

Among those who self-reported a diabetes diagnosis, DPoRT correctly classified 30.0% as high risk ($\geq 20\%$ diabetes risk) compared to only 7.9% among those without diabetes; while only 9.8% of those with diabetes were classified as low risk ($< 5\%$ diabetes risk) compared to 41.6% among those without diabetes, demonstrating that DPoRT's predicted risk corresponded closely with diabetes status at baseline (i.e. those with diabetes were much more likely to be classified as high risk versus those that did not have diabetes and those without diabetes were more likely to be classified as low risk compared to those with diabetes). In comparison, DPoRT's performance on classifying individuals with type 2 diabetes was observed to be similar in the general Ontario population:: 45.4% classified as high diabetes risk, 49.4% classified as moderate diabetes risk, and 5.1% classified as low diabetes risk (estimated using the Canadian Community Health Survey (CCHS), cycle 2013/14).

DPoRT Algorithm

Males:

$$\mu = 10.3062$$

- 0.3629 \times hypertension
- 0.3483 \times heart disease
- 0.5697 \times non-white ethnicity
- 0.0585 \times smoker
- + 0.1884 \times attended post-secondary
- + 0.1173 \times top income quintile
- 0 \times (BMI < 23 & age < 45)
- 0.5520 \times ($23 \leq$ BMI < 25 & age < 45)
- 0.9521 \times ($25 \leq$ BMI < 30 & age < 45)
- 1.7162 \times ($30 \leq$ BMI < 35 & age < 45)
- 2.3310 \times ($35 \leq$ BMI & age < 45)
- 1.3602 \times (BMI < 23 & age ≥ 45)
- 1.6537 \times ($23 \leq$ BMI < 25 & age ≥ 45)
- 2.0563 \times ($25 \leq$ (BMI < 30 & age ≥ 45)
- 2.5513 \times ($30 \leq$ BMI < 35 & age ≥ 45)
- 2.9353 \times ($35 \leq$ BMI & age ≥ 45).

$$\text{Scale} = 0.7994$$

Females:

$$\mu = 10.5777$$

- 0.4098 × hypertension
- 0.4528 × non-white ethnicity
- 0.1477 × immigrant
- + 0.1939 × attended post-secondary
- 0 × (BMI < 23 & age < 45)
- 0.7432 × (23 ≤ BMI < 25 & age < 45)
- 1.1521 × (25 ≤ BMI < 30 & age < 45)
- 1.8479 × (30 ≤ BMI < 35 & age < 45)
- 2.0562 × (35 ≤ BMI & age < 45)
- 1.5832 × (BMI = missing & age < 45)
- 0.7100 × (BMI < 23 & 45 ≤ age < 65)
- 1.2338 × (23 ≤ BMI < 25 & 45 ≤ age < 65)
- 1.8357 × (25 ≤ BMI < 30 & 45 ≤ age < 65)
- 2.3742 × (30 ≤ BMI < 35 & 45 ≤ age < 65)
- 2.6631 × (35 ≤ BMI & 45 ≤ age < 65)
- 2.1988 × (BMI = missing & 45 ≤ age < 65)
- 1.5956 × (BMI < 23 & age ≥ 65)
- 1.6144 × (23 ≤ BMI < 25 & age ≥ 65)
- 1.9830 × (25 ≤ BMI < 30 & age ≥ 65)
- 2.2148 × (30 ≤ BMI < 35 & age ≥ 65)
- 2.6448 × (35 ≤ BMI & age ≥ 65)
- 2.4209 × (BMI = missing & age ≥ 65).

$$\text{Scale} = 0.8419$$

$$m = \frac{\log(\text{follow-up time in days}) - \mu}{\text{scale}}$$

$$p = 1 - \exp(-\exp(m))$$

$$\text{Number of diabetes cases} = p * \text{survey weights}$$