

Prediabetes risk screening assessments may predict pathologic glycated hemoglobin (HgbA1c) levels in the Piedmont Triad of North Carolina

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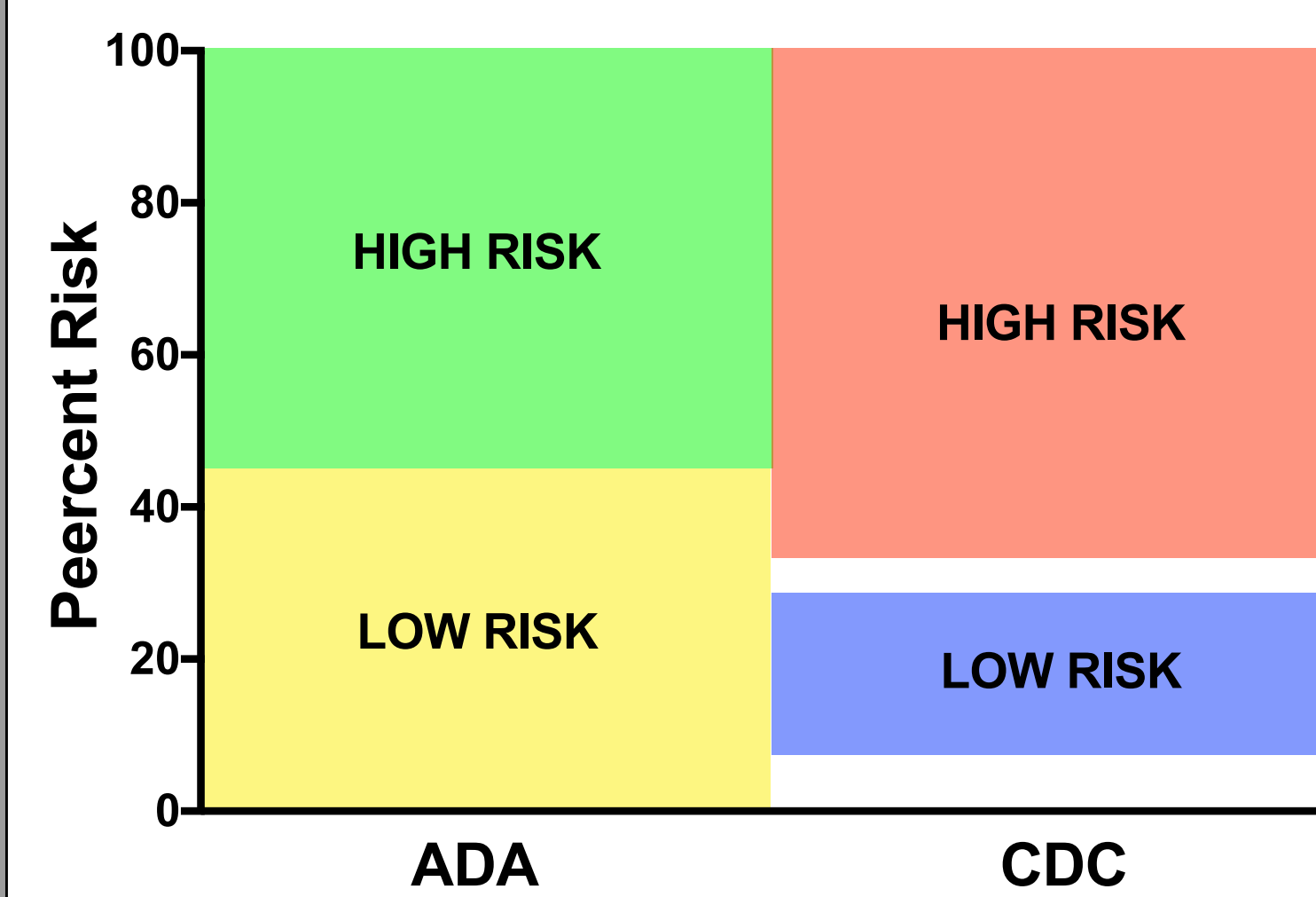
Introduction:

- Approximately 90-95% of patients with type two diabetes mellitus (T2DM) had a diagnosis of prediabetes in the five years prior.
- The American Diabetes Association (ADA) and Centers for Disease Control (CDC), among others, have developed publicly available screening questionnaires to provide patients with information regarding their prediabetes risk.
- Large-scale studies have questioned the predictive validity of these questionnaires.
- We explored of the predictive validity and inter-test reliability of two prediabetes screening assessments in a patient population from the Piedmont Triad area of central North Carolina.

Purpose:

Establish correlative evidence showing that the risk of prediabetes *is or is not* associated with HgbA1c outcomes (healthy: <5.6%; prediabetes: 5.7%-6.4%; T2DM: >6.5%; ADA, 2016), in our local community.

Figure 2: High vs low prediabetes risk categories

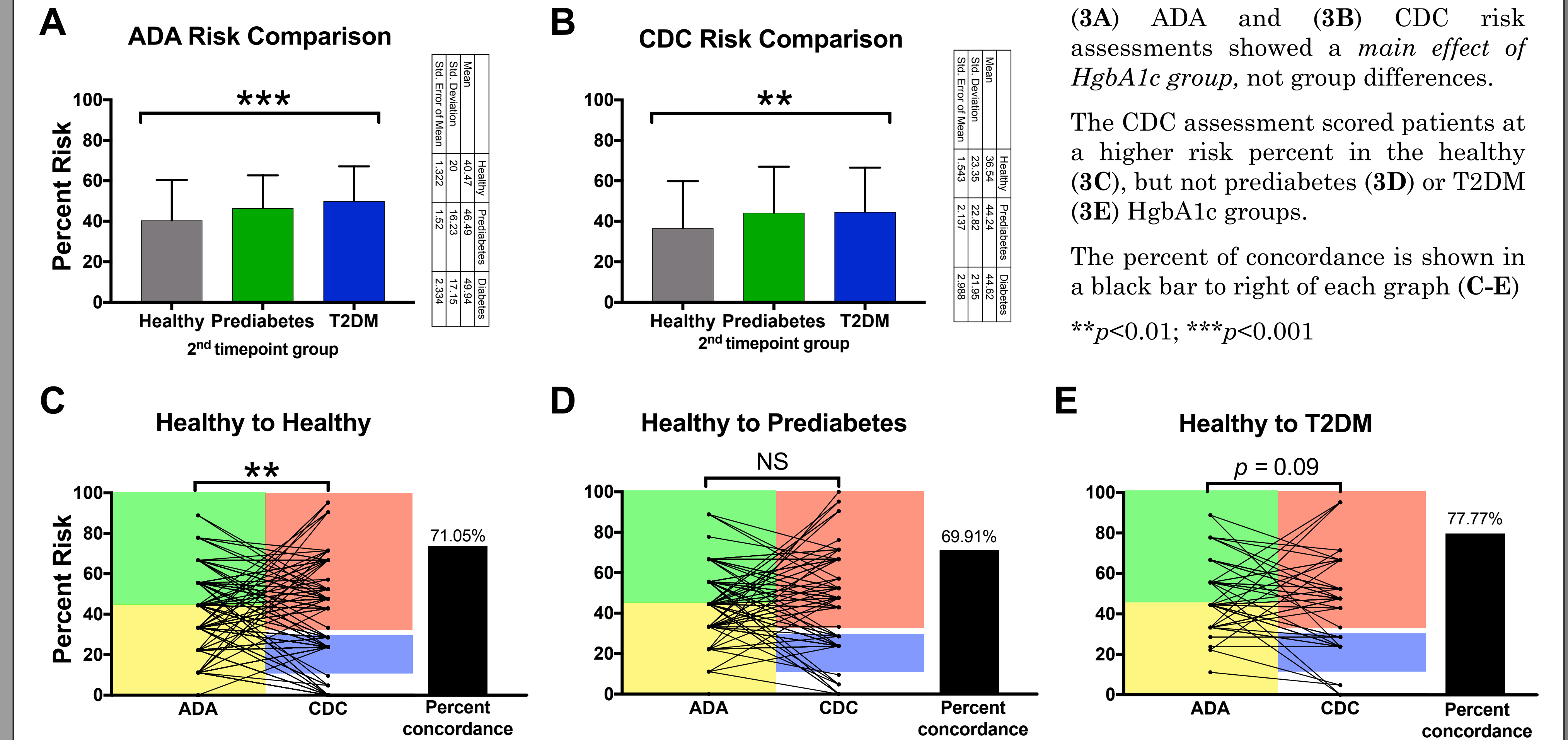


Following questionnaire application, patients were stratified into risk groups based on their percent prediabetes risk.

Color coordination has been maintained throughout the poster for clarity.

ADA: Low risk: <45.50%; High risk: >45.51%
CDC: Low risk: 11.11%-29.70%; High risk: >33.40%

Figure 3: Questionnaires provide distinct risk scores for each group, but inter-test reliability is lacking.



(3A) ADA and (3B) CDC risk assessments showed a *main effect of HgbA1c group*, not group differences.

The CDC assessment scored patients at a higher risk percent in the healthy (3C), but not prediabetes (3D) or T2DM (3E) HgbA1c groups.

The percent of concordance is shown in a black bar to right of each graph (C-E)

p*<0.01; *p*<0.001

Table 1: Modified prediabetes screening questionnaires

AMERICAN DIABETES ASSOCIATION PREDIABETES SCREENING QUESTIONNAIRE			
POINTS	YES	NO	
0	1	0	1. How old are you?
0	1	0	Less than 40 years old
1	0	1	40-49 years old
2	0	1	50-59 years old
3	0	1	60 years or older
1	0	1	2. Are you a man or a woman?
0	1	0	Man
0	0	1	Woman
1	0	1	3. Do you have a mother, father, sister or brother with diabetes?
1	0	1	4. Have you ever been diagnosed with high blood pressure?
0	1	0	5. What is your weight status (per chart at the right)
OMITTED QUESTIONS			
1	0	1	If you are a woman, have you ever been diagnosed with gestational diabetes?
1	0	1	Are you physically active?

HEIGHT	WEIGHT (lbs)		
4'10"	119-142	143-190	191+
4'11"	124-147	148-197	198+
5'0"	128-152	153-203	204+
5'1"	132-157	158-210	211+
5'2"	136-163	164-217	218+
5'3"	141-168	169-224	225+
5'4"	145-173	174-231	232+
5'5"	150-179	180-239	240+
5'6"	155-185	186-246	247+
5'7"	159-190	191-254	255+
5'8"	164-196	197-261	262+
5'9"	169-202	203-269	270+
5'10"	174-208	207-277	278+
5'11"	179-214	215-285	286+
6'0"	184-220	221-293	294+
6'1"	189-226	227-301	302+
6'2"	194-232	233-310	311+
6'3"	200-239	240-318	319+
6'4"	205-245	246-327	328+

If you weigh less than the amount in the left column, 0 points.

Assessments have been reproduced in their entirety.

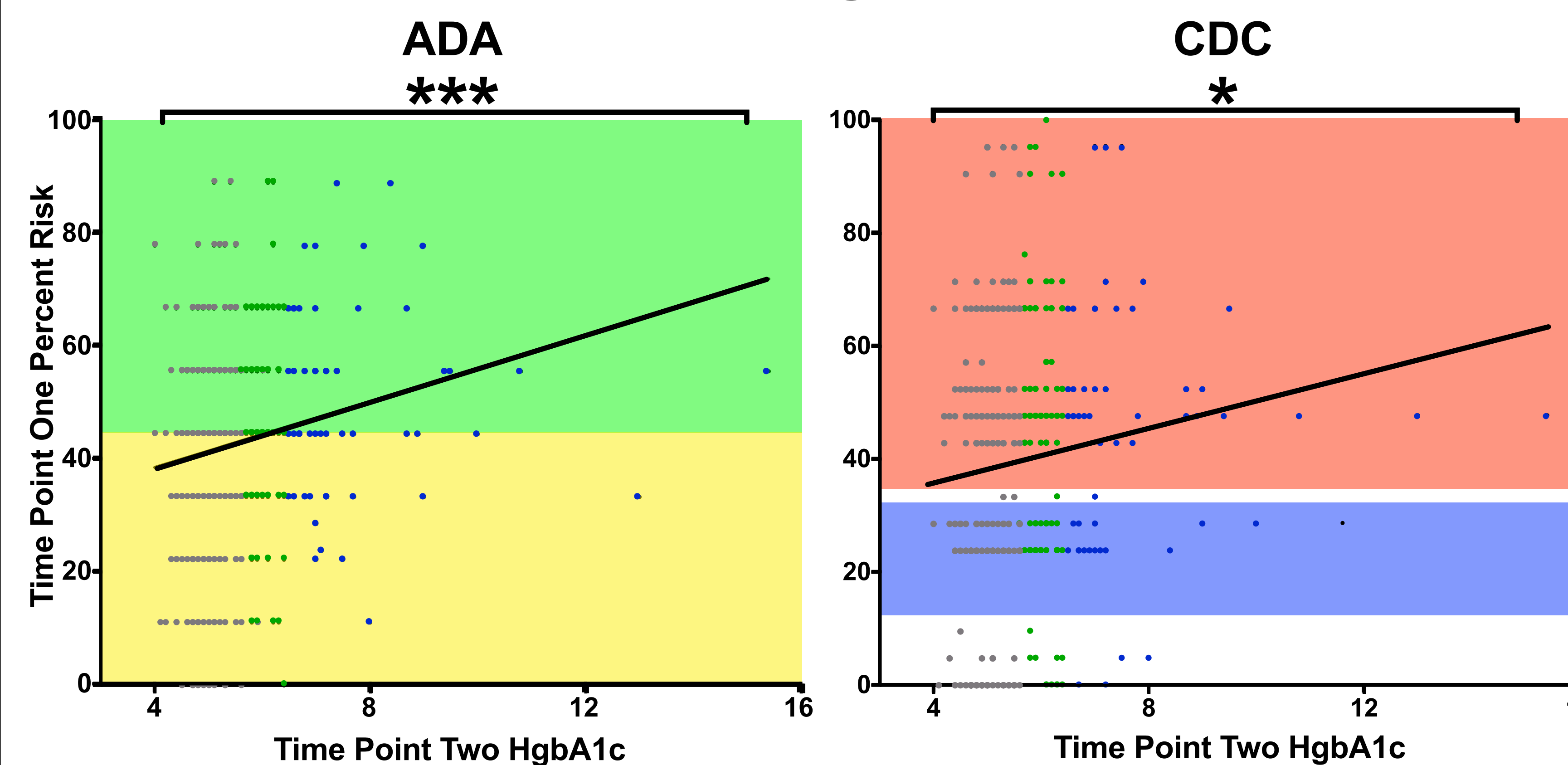
Questions 1-5 of each questionnaire were applied to all patient files.

Two questions per assessment were not applied to patient files, and are under: "Omitted Questions".

CENTERS FOR DISEASE CONTROL PREDIABETES SCREENING QUESTIONNAIRE			
POINTS	YES	NO	
1	0	1	1. Do you have a brother or sister with diabetes?
1	0	1	2. Do you have a parent with diabetes?
5	0	1	3. Find your height on the chart at right. Do you weigh as much as or more than the weight listed for your height?
5	0	1	4. Are you between 45 and 64 years of age?
9	0	1	5. Are you 65 years of age or older?
OMITTED QUESTIONS			
1	0	1	Are you a woman who has had a baby weighing more than 9 pounds at birth?
5	0	1	Are you younger than 65 years of age and get little to no exercise in a typical day?

HEIGHT	WEIGHT (lbs)	HEIGHT	WEIGHT (lbs)
4'10"	129	5'8"	177
4'11"	133	5'9"	182
5'0"	138	5'10"	188
5'1"	143	5'11"	193
5'2"	147	6'0"	199
5'3"	152	6'1"	204
5'4"	157	6'2"	210
5'5"	162	6'3"	216
5'6"	167	6'4"	221
5'7"	172		

Figure 5: Both modified prediabetes risk assessments positively correlated risk scores with future HgbA1c levels.



HgbA1c reference: Healthy: <5.6%; Prediabetes: 5.7%-6.4%; T2DM: >6.5%

Code: HgbA1c at timepoint two: ● Healthy; ● Prediabetes; ● T2DM. **p*<0.05; ****p*<0.001

Methods:

Participants: Medical record numbers of patients were received through a secure electronic interface with Cone Health (Greensboro, NC). Of 1196 charts reviewed, 395 met inclusion criteria and did not meet exclusion criteria. **Inclusion/Exclusion:** Patients must have been 18 years old or older at the time of chart review with at least two physician visits with vital signs, HgbA1c and blood glucose measure 2-7 years apart. HgbA1c must have been in the normal range, <5.6%, at the earliest timepoint. Patients with Type 1 diabetes were excluded from the study. **Data analysis:** Blood glucose values were converted to HgbA1c. Statistics included paired two-tailed Student's t-tests, one-way analyses of variance, correlations and linear regressions. Significance was met when *p*>0.05.

Conclusions

- The main effect of HgbA1c in percent risk for prediabetes is likely due to group size, as opposed to a meaningful difference between risk percentages.
- Assessments did not assign percent risk similarly; however, as the population taking these modified assessments will identify with a risk category, rather than a percent prediabetes risk, high assessment concordance support inter-test reliability.
- A positive correlation between risk percent and HgbA1c underscores the assessments' predictive validity and their utility in the public sector.
- Based on the evidence presented here, we suggest the use of the modified prediabetes assessments in lieu of the original questionnaires for patient use.

Subject HgbA1c: Healthy: 4.87% ± 0.40% - 5.01% ± 0.38%; Prediabetes: 4.89% ± 0.35% - 6.02% ± 0.23%; T2DM: 5.02% ± 0.37% - 7.79% ± 1.71%

Years between assessments: 4.621 ± 1.237.

References

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