

Levels of Depression in SHIELD Respondents Transitioning to Type 2 Diabetes

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Abstract

Depression is prevalent in people with diabetes and is associated with increased likelihood of developing type 2 diabetes (T2D). However, less is known about levels of depression experienced by people at high risk for diabetes just before and after they are diagnosed with T2D. The Study to Help Improve Early evaluation and management of risk factors Leading to Diabetes (SHIELD) assessed depression using the PHQ-9 in longitudinal surveys of US adults with varying cardiometabolic risk levels. A substantially lower percentage of respondents transitioning from higher to lower levels of risk were considered to have moderately severe to severe depression at 1 year compared with baseline. Surprisingly, in respondents reporting a new diagnosis of T2D, the proportion with moderately severe to severe depression decreased at 1 year compared with baseline. Receiving a T2D diagnosis did not lead to higher likelihood of severe depression in people who were at high risk.

Introduction

- Depressive symptoms are common among patients with diabetes and may have a significant impact on self-management and health outcomes,¹ with the presence of diabetes alone doubling the odds of comorbid depression.²
- Individuals with diabetes and comorbid major depression have higher odds of functional disability compared with individuals with either diabetes or major depression alone.³
- Furthermore, coexisting depression is related to decreased quality of life,⁴ greater diabetes symptom reporting, poorer physical functioning, less adherence to exercise and diet regimens,¹ and increased odds of extended work loss and extended disability bed days.⁵
- However, little is known about the impact of a *diagnosis* of diabetes on depression.
- The Study to Help Improve Early evaluation and management of risk factors Leading to Diabetes (SHIELD) provides a unique opportunity to better understand the impact of a diabetes diagnosis on depression and may, in fact, be the first study to evaluate this association.

Methods

- SHIELD is a 5-year, annual longitudinal survey of US adults (aged ≥18 years) with diabetes or varying levels of cardiometabolic (CM) risk.
- A screener questionnaire was mailed in April 2004 to a stratified random sample of 200,000 US households who were part of the TNS NFO household panel -- a survey panel of >600,000 households constructed to represent the US population in terms of geographic residence, age of head of household, and household size and income. The screener survey yielded 211,097 responses from 127,420 households (64% response rate).

- Respondents were asked if they had ever been diagnosed as having each of several conditions, including diabetes. In addition, respondents reported the presence of several risk factors for a diabetes diagnosis: abdominal obesity, high BMI, dyslipidemia, hypertension, and CV events. Risk factor level was calculated as the unweighted number of risk factors reported by each respondent on the screener survey; those with 0-2 risk factors were considered low risk (LR) and those with 3-5 risk factors, high risk (HR).
- A baseline questionnaire was mailed in 2004 to 22,001 screener respondents with self-reported diabetes or various numbers of CM risk factors. Responses were received from 17,640 adults (80% response rate). A 1-year follow-up survey was conducted in 2005, yielding 15,925 responses (72% response rate).
- Matched responses with non-missing data on level of depression for both baseline and follow-up surveys were available from 11,088 adults.
- The main research question addressed the relationship between diagnosis of T2D and depression level. Depression level was measured using the 9-item Patient Health Questionnaire (PHQ-9), with scores from 0-9 considered "mild or none," 10-14 "moderate," and 15-27 "severe or moderately severe."
- Each respondent was categorized into a CM risk transition group, based on change in CM risk level from baseline to follow-up. The groups were:
 - LR-LR: Remained low risk
 - LR-HR: Low risk to high risk
 - LR-T2D: Low risk to T2D
 - HR-LR: High risk to low risk
 - HR-HR: Remained high risk
 - HR-T2D: High risk to T2D
 - T2D-T2D: Remained T2D
- Other potential categorical predictors included:
 - Gender (reference category: Male)
 - Age group: 18-24 (reference category), 25-34, 35-44, ... 75+ years
 - Education level: < HS (reference category), HS graduate, >HS
 - Employed (reference category: No)
 - Health insurance (reference category: No)
- Physical component summary score on the SF-12 quality-of-life scale at baseline and follow-up was included as a covariate.
- In addition to being measured separately at baseline and follow-up, the *change* in level of depression, employment, health insurance, and SF-12 score from baseline to follow-up was calculated.

Statistical Analyses

- Bivariate relationships between each predictor and level of depression (or change in level of depression) were assessed using cross-tabulation methods and the χ^2 test (p value <0.05 considered statistically significant).
- Simultaneous impacts of all predictors on level of depression (or change in level of depression) were assessed using multinomial logistic regression analysis, with "mild" depression as the reference category.
- The statistical significance of each regression model was assessed using a p value <0.05 for the likelihood ratio χ^2 test comparing the model with predictors included versus the model with intercept only.
- The statistical significance of each predictor, adjusting for the influence of all of the other included predictors, was assessed using a p value <0.05 for its regression coefficient (Wald χ^2 test). Odds ratios and their 95% confidence intervals are also reported for each predictor.
- All computations and analyses were performed using SPSS version 13.0.1.

Results

Characteristics of the Study Population

- Table 1** shows the respondent characteristics, and the numbers of matched respondents in each CM risk transition group. Most respondents reported the same CM risk levels at follow-up as at baseline.
 - However, 114 respondents who were HR at baseline reported T2D at follow-up, and 53 who were LR at baseline reported T2D at follow-up, indicating diagnosis of T2D in the intervening year.
 - Note that far more respondents went from LR at baseline to HR at follow-up ($n = 509$) than went from HR at baseline to LR at follow-up ($n = 109$).

Table 1. Characteristics of SHIELD Respondents at Baseline and 1-Year Follow-up (n = 11,088)

Variable		Baseline (%)	Follow-up (%)
Gender	Male	38	—
	Female	62	—
Age	18-24	3	—
	25-34	8	—
	35-44	15	—
	45-54	21	—
	55-64	22	—
	65-74	18	—
Education	75+	14	—
	<HS	6	—
	HS graduate or GED	25	—
	>HS	68	—
Employed	Yes	49	46
	No	51	54
Health Insurance	Yes	89	90
	No	11	10
Depression	Mild	84	84
	Moderate	9	9
	Severe	7	7
Depression Diagnosis	Yes	80	77
	No	20	23
CM Risk	LR (0-2)	35	30
	HR (3-5)	38	40
	T2D	27	30
CM Risk Transition	LR-LR	—	29
	LR-HR	—	5
	LR-T2D	—	1
	HR-LR	—	1
	HR-HR	—	35
	HR-T2D	—	1
	T2D-T2D	—	28

Predictors of Level of Depression Baseline and Follow-up

- In multivariable, multinomial logistic regression models for both baseline and follow-up, all of the included predictors had an independent and statistically significant impact on level of depression (both moderate versus mild, and severe versus mild).
 - Respondents in the HR and T2D groups were more likely to be moderately or severely depressed (AOR = 1.31-1.52 for HR; AOR = 1.55-1.62 for T2D).
 - Higher levels of depression were also associated with being female, unemployed, and uninsured.
 - Lower levels of depression were associated with higher levels of education, higher SF-12 physical component score, and higher age.

Predictors of Level of Depression (continued)

Change from Baseline to Follow-up

- For change from baseline to follow-up, all of the predictors except change in employment status (gender, age group, and education level at baseline, change from baseline to follow-up in CM risk level, health insurance, and SF-12 physical component score) had a statistically significant bivariate association with change in level of depression from baseline to follow-up.
- Table 2** shows the percentage of respondents by level of depression at baseline and follow-up, by CM risk transition group. The percentage of respondents with major depression decreased substantially in the HR-LR and HR-T2D groups, but was stable over time in all other groups.

Table 2. Percent of Respondents by Level of Depression at Baseline and Follow-up by CM Risk Transition Group

Level of Depression		HR-LR	LR-LR	LR-HR	LR-T2D	HR-HR	HR-T2D	T2D-T2D	Total
Baseline	Mild	79%	90%	86%	83%	84%	81%	81%	85%
	Moderate	9%	6%	10%	10%	9%	8%	11%	9%
	Major	11%	4%	4%	6%	8%	11%	8%	7%
Follow-up	Mild	82%	90%	85%	86%	84%	82%	81%	85%
	Moderate	11%	5%	10%	8%	9%	12%	10%	9%
	Major	7%	5%	5%	6%	7%	7%	9%	7%

- Figure 1** shows the percentage of respondents with a change in depression (either a decrease or increase) by change in level of CM risk from baseline to follow-up. Overall, the percentage of respondents with a decrease in depression was higher than the percentage with an increase in depression in all of the CM risk transition groups except LR-LR and T2D-T2D.

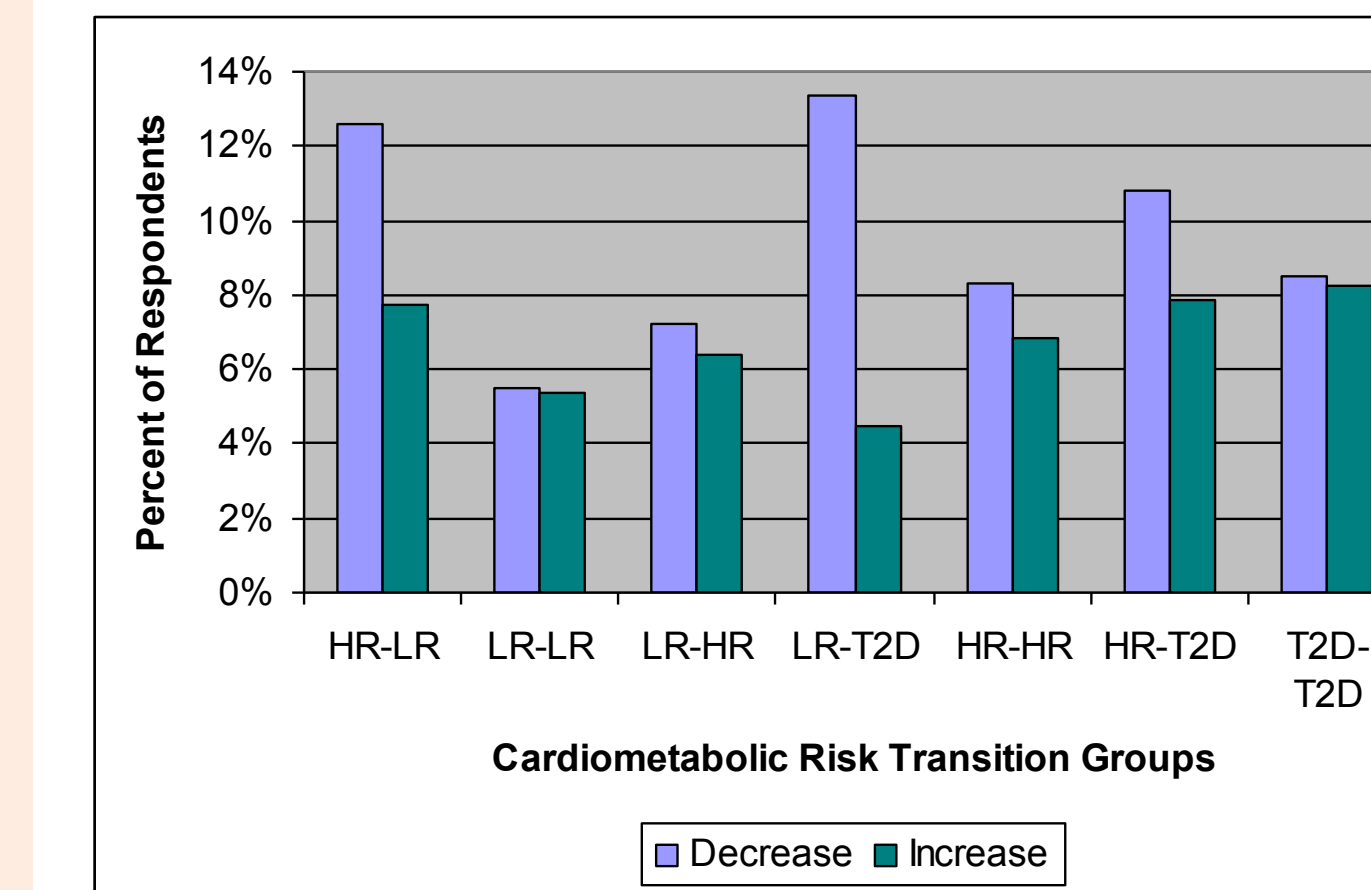


Figure 1. Percent of respondents with an increase or decrease in depression by CM risk transition group, from baseline to follow-up

Predictors of Level of Depression (continued)

- Being in a higher CM risk transition group (LR-T2D, HR-HR, HR-T2D, or T2D-T2D) had the strongest impact on level of depression from baseline to follow-up (compared with the LR-LR group).
- That impact was also in the positive direction, ie, respondents in those higher-risk transition groups were more likely to have a *decrease* in depression, compared with the LR-LR group. Yet being in one of the three highest-risk transition groups (HR-HR, HR-T2D, or T2D-T2D) *also* had the second strongest (and positive) impact on an *increase* in depression (along with the HR-LR group).

Limitations

- The households participating in the TNS NFO panel had voluntarily elected to do so, leading to the possibility of bias due to self-selection.
- Household panels also tend to under-represent the very wealthy and very poor segments of the population and do not include military or institutionalized individuals.
- Non-response bias is also a possibility here, as more depressed subjects may be less likely to respond to a follow-up survey than those with lower levels of depression.

Conclusions

- The patterns of change in levels of depression when adults are diagnosed with T2D are quite complex. An association between an increase in CM risk and an increase in depression is expected. However, for some people, receiving a diagnosis of T2D appears to lead to a reduction in their level of depression. The reason for this pattern is not clear from these results, but it may be that patients are relieved to know that the symptoms they experienced had an identifiable and treatable cause.
- This suggests that an excellent opportunity to help patients with diabetes establish healthy self-management practices may be at the time of their diagnosis, when they may be less likely to be depressed.
- Subsequent years of SHIELD data will be used to track levels of depression following T2D diagnosis, allowing us to identify whether and at which point in the duration of disease depression levels typically change.

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Abbreviations

AOR = adjusted odds ratio; BMI = body mass index; CI = confidence interval; CM = cardiometabolic; CV = cardiovascular; GED = general equivalence degree; HR = High risk; HS = high school; LR = low risk; OR = odds ratio; PHQ-9 = 9-item Patient Health Questionnaire; SF-12 = Short-Form 12; SF-12 (Physical) = physical component summary score of the SF-12; SHIELD = Study to Help Improve Early evaluation and management of risk factors Leading to Diabetes; SPSS = Statistical Product and Service Solutions; T2D = type 2 diabetes; TNS NFO = Taylor Nelson Sofres National Family Opinion