

ABSTRACT

Little is known about the work impact of obesity and of diabetes. We evaluated work absence and work effectiveness among nine subgroups of individuals defined by BMI (i.e., 30+ or obese, 25-29.9 or overweight, and <25 or normal weight) and diabetes (i.e., self-reported type 2 diabetes [T2D], high and low cardiometabolic risk) status. High risk (HR) was defined as 3-5 of the following factors: abdominal obesity, BMI ≥ 28 kg/m², reported diagnosis of cholesterol problems, hypertension, or coronary heart disease or stroke and low risk (LR) was defined as ≤ 2 factors.

Work impact was assessed using baseline data from 6432 actively working adult respondents participating in the Study to Help Improve Early evaluation and management of risk factors Leading to Diabetes (SHIELD), a large US longitudinal study among individuals with or at risk for T2D. Work impairment was measured using the Work Productivity and Activity Impairment Questionnaire. Percent work time missed, percent impairment while working and overall work impairment were computed.

Proportion of individuals with some ($\geq 5\%$ of work time) work impairment increased according to BMI category and diabetes risk (T2D and HR compared to LR). A greater proportion of obese respondents within each diabetes risk group (T2D, HR, LR) had some work impairment compared with normal weight and overweight individuals (p<0.05, Table 1). More overweight respondents had some work impairment compared with normal weight respondents among HR and LR groups (p<0.05), but not among T2D. There was greater work impairment among T2D and HR respondents compared with LR individuals (Table 1).

SHIELD data indicate that BMI and diabetes risk status independently influence work impairment among active workers. These data do not address other potential work productivity factors like underemployment, change in occupation, and disability.

Table 1. Percent of respondents reporting >5% overall work impairment by BMI category within each risk group

Risk group	Obese BMI ≥ 30 kg/m ²		Overweight BMI=25.0-29.9 kg/m ²		Normal weight BMI <24.9 kg/m ²	
	n	% with work impairment	n	% with work impairment	n	% with work impairment
T2D (N=1203)	824	50%	260	38%	99	42%
HR (N=1992)	1525	52%	428	46%	39	41%
LR (N=3237)	831	41%	1133	37%	1273	33%

BACKGROUND

- Obesity and overweight are prevalent health problems in the United States¹
 - 61% of US adults are overweight
 - 24% are obese

- Increased risk of diabetes, cardiovascular disease, depression and cancer is associated with excessive body weight²⁻³

- Decreased physical health and quality of life have been associated with overweight and obesity⁴⁻⁵

- Little evidence is available on the impact of obesity on work productivity

OBJECTIVES

- Describe the relation between overweight and work absence and work effectiveness among respondents with type 2 diabetes mellitus or varying levels of cardiometabolic risk

METHODS

Study Design

- Cross-sectional analysis of the relation between BMI and work impact among SHIELD respondents with or at risk for T2D
- Study to Help Improve Early evaluation and management of risk factors Leading to Diabetes (SHIELD) is a 5-year population-based survey conducted to better understand the burden of illness of people living with diabetes and those at risk for its development
 - SHIELD survey captures patient-reported information on health status, attitudes and behaviors and work status from a representative sample of the US population that is typically lacking in other surveys or databases

Impact of Obesity on Work Productivity among Individuals with Type 2 Diabetes Mellitus and Varied Levels of Cardiometabolic Risk

Walter F. Stewart¹, James R. Gavin III², Kathleen M. Fox³, Susan Grandy⁴

¹Geisinger Clinic, Danville, PA; ²Emory Univ. School of Medicine, Atlanta, GA; ³Strategic Healthcare Solutions, LLC, Monkton, MD; ⁴AstraZeneca LP, Wilmington, DE

METHODS (Continued)

Study Population

- Respondents were categorized as having T2D or at risk for diabetes based on cardiometabolic risk factors
- Having T2D was based upon self-report of having been told by a doctor, nurse or other healthcare professional that they have type 2 diabetes
- High risk for T2D was defined as having at least 3 of the following self-reported factors and low risk was defined as having ≤ 2 of these factors
 - Abdominal obesity: waist circumference >97 cm for men, >89 cm for women
 - BMI ≥ 28 kg/m²
 - Dyslipidemia
 - Hypertension
 - Coronary heart disease
 - Stroke

- Work impact was evaluated by BMI (Obese = ≥ 30 , Overweight = 25-29.9, Normal = <25 (kg/m²) and T2D status (T2D, High Risk, Low Risk)

Study Measures

Work Productivity and Activity Impairment Questionnaire: General Health (WPAI-GH) was completed by respondents⁶

- 6-item questionnaire about work performance and other regular activities
- Scores work productivity by measuring:
 - Absenteeism = work time missed
 - Number of hours missed from work because of their health problems during the past 7 days
 - Presenteeism = impairment at work, reduced on-the-job effectiveness
 - How much did health problems affect productivity while working during the past 7 days, using a scale of 0 to 10 with 0 indicating no effect on work and 10 indicating completely prevented from working
 - Work productivity loss = overall work impairment, absenteeism plus presenteeism

- Scores are expressed as impairment percentages adjusting for hours actually worked and hours missed due to vacation or holidays

- Higher scores indicate greater impairment and less productivity

Statistical Analyses

- Assessed BMI impact on actively working adult respondents
- Tested whether work impact was directly related to increasing BMI
- Multivariate linear regression was used to examine associations between overall work impairment and BMI, age, gender, income, depression, and diabetes risk level

RESULTS

There were 6,499 actively working adult respondents who completed the WPAI-GH questionnaire

Table 1. Baseline characteristics of SHIELD respondents completing the WPAI-GH

Characteristics	T2D (N=1229)	High risk (N=2009)	Low risk (N=3261)
Age, mean years	50.5 (8.4)	48.6 (9.6)*	41.4 (11.3)*
Women, %	53.7	54.6	62.8*
Race, % White	82.8	87.2*	88.6*
Education, % with some college or higher	76.8	77.4	79.9*
Income, % <\$40,000/yr	35.6	31.2*	29.7*
BMI ≥ 30 kg/m ² , % obese	68.6	76.7*	25.7*
BMI 25.0-29.9 kg/m ² , % overweight	23.2	21.4	35.0
BMI <25 kg/m ² , % normal weight	8.2	1.9	39.3

*p<0.01 for comparison with T2D respondents

- T2D respondents were significantly older and a smaller proportion of them were women, white and had at least some college education
- Significantly fewer T2D respondents were obese, compared with high-risk respondents, but there were significantly more obese respondents in the T2D group than in the low risk group

Table 2. Absenteeism (% work time missed) among BMI and diabetes risk groups

Diabetes Risk Group	Normal weight (BMI ≤ 25.0 kg/m ²)	Overweight (BMI= 25.0-29.9 kg/m ²)	Obese (BMI ≥ 30 kg/m ²)
T2D (N=1213)	2.3 (10.8)	3.4 (12.6)	3.9 (13.7)
High risk (N=2009)	0.7 (2.9)	3.4 (13.4)	3.8 (13.9)
Low risk (N=3261)	2.7 (12.2)	2.4 (11.2)	3.3 (20.0)

- There was no significant difference in absenteeism across diabetes risk groups and BMI groups

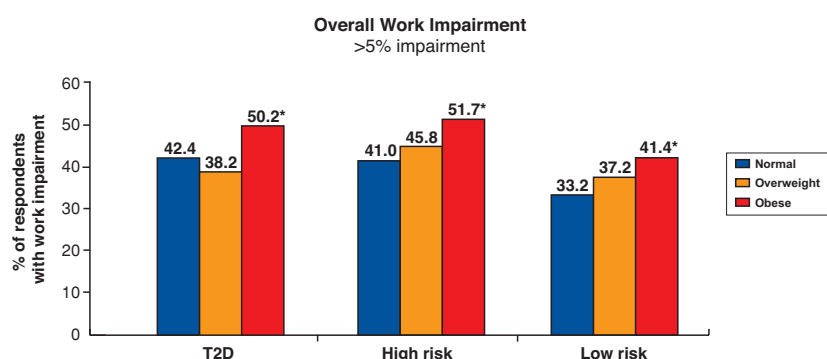
Table 3. Presenteeism (% impairment while working) among BMI and diabetes risk groups

Diabetes Risk Group	Normal weight (BMI ≤ 25.0 kg/m ²)	Overweight (BMI= 25.0-29.9 kg/m ²)	Obese (BMI ≥ 30 kg/m ²)
T2D (N=1232)	9.1 (14.5)	9.9 (18.7)	14.9 (21.4)*
High risk (N=2006)	11.0 (16.8)	11.5 (18.6)	14.4 (21.0)*
Low risk (N=3279)	8.9 (18.5)	8.5 (16.2)	11.5 (19.4)*

*p<0.05

- Obese respondents reported greater impairment while working than overweight and normal weight respondents in each diabetes risk group
 - Low-risk obese respondents experienced significant impairment at work, compared with normal weight and overweight low-risk respondents, p=0.001
- There were no differences in impairment while working across the diabetes risk groups; T2D respondents had similar impairment as high-risk and low-risk respondents

Figure 1. Work impairment ($\geq 5\%$ impairment) on the WPAI-GH for each diabetes risk group and weight group



*p<0.001 comparing obese to overweight or normal weight

- Proportion of respondents with $\geq 5\%$ work impairment significantly increased across BMI groups
- A significantly greater proportion of obese respondents within each risk group had work impairment, compared with normal weight and overweight respondents, p<0.001
- More overweight respondents had work impairment, compared with normal weight respondents among high risk and low risk groups (p<0.05), but not among T2D respondents
- There was greater work impairment among T2D and high risk respondents compared with low risk respondents

Table 4. Odds ratio* of overall work impairment among BMI and diabetes risk groups

Group	Odds ratio	P value
Overweight vs. normal weight	1.16	0.014
Obese vs. normal weight	1.41	<0.001
High risk vs. low risk	1.57	<0.001
T2D vs. low risk	1.46	0.005

* adjusted for age, gender, income, and depression

- Odds ratios of overall work impairment in overweight and obese respondents were significantly higher (16% and 41%, respectively), compared with normal weight respondents
- Compared with low-risk respondents, the odds ratio of overall impairment was significantly higher in high-risk and T2D respondents (57% and 46%, respectively)

LIMITATIONS

- Work absenteeism and presenteeism were self-reported. Validation of the study findings with work records was not feasible
- Household panels, like the SHIELD study, tend to under-represent the very wealthy and very poor segments of the population and do not include military or institutionalized individuals
- Other factors not included in the SHIELD study may influence the association between BMI and work productivity, such as underemployment, change in occupation, and disability

SUMMARY

- BMI and diabetes risk status independently influence work impairment among active workers
- Increased BMI, specifically obesity, is associated with greater work impairment
- Obese respondents had the greatest impairment of work in low-risk, high-risk, and T2D respondents
- High cardiometabolic risk for T2D or presence of T2D were associated with overall work impairment

CONCLUSIONS

- The study findings provide evidence of the impact of obesity on work productivity and the importance of this relationship may intensify as obesity increases in the US population
- This study highlights the importance of initiatives to reduce obesity to enhance productivity (presenteeism and overall work impairment) in the work place.

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LIST OF ABBREVIATIONS

BMI	Body mass index
SHIELD	Study to Help Improve Early evaluation and management of risk factors Leading to Diabetes
T2D	Type 2 diabetes mellitus
WPAI-GH	Work Productivity and Activity Impairment: General Health (questionnaire)

Notes:

BMI = weight in kg/height² in meters
1% of Normal weight group had BMI <18.5 kg/m2 (underweight)

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