

Gender Differences in Physical Inactivity and Cardiac Events in Men and Women with Type 2 Diabetes

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Society of Behavioral Medicine

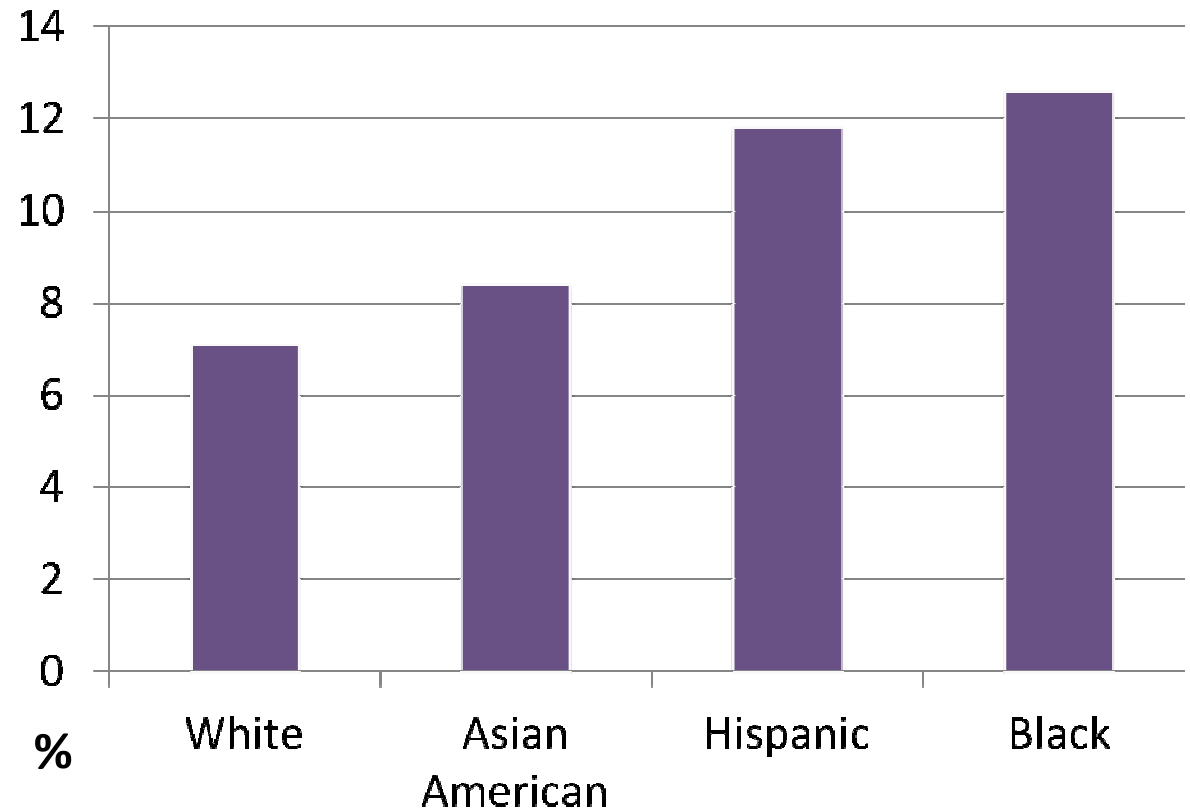
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Introduction

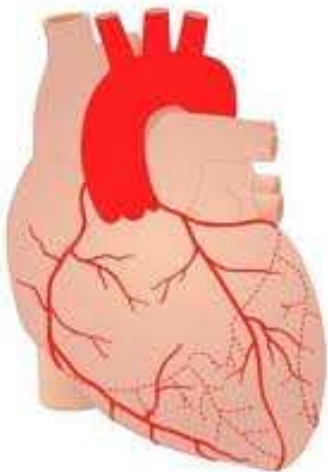
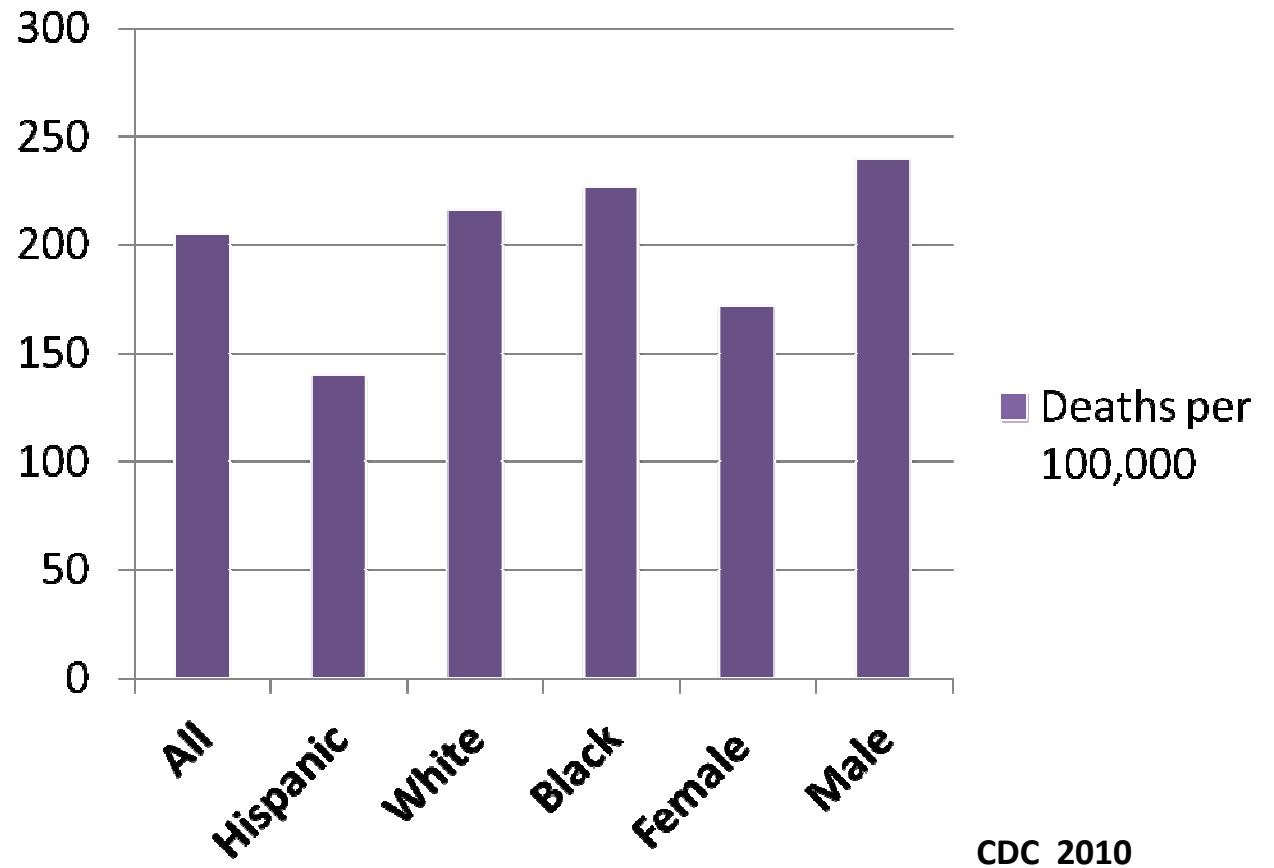
- **Prevalence Type 2 Diabetes (T2DM)**
- **Cardiovascular Disease Deaths**
- **Physical Inactivity in Adults**

T2DM

- Age \geq 20 years: 25.6 million (11.3%)
- Age \geq 65 years: 10.9 million (26.9%)
- T2DM = 90-95%
- Leading cause of:
 - Kidney failure
 - Non-traumatic lower limb amputations
 - New cases blindness
- Annual cost: \$174 billion



Cardiovascular Disease Deaths in Diabetes



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Physical Inactivity



- All 36%
- Black 47%
- Hispanic 47%
- White 35%
- Female 38%
- Male 34%

Purpose

To identify factors associated with physical inactivity and factors predictive of cardiac events in men and women with T2DM

Methods

- Secondary analysis of data from a multi-site trial, the **Detection of Ischemia in Asymptomatic Diabetics** (DIAD) Study
- Randomized screening trial
- Silent ischemia
 - Prevalence
 - Predictors
- 5 year outcomes of events

Subjects and Setting

- **Men and women (N=1119)**
- **Age 50 to 75**
- **History of T2DM**
- **No previous diagnosis of coronary artery disease (CAD)**
- **Followed over 5 years from 14 sites across the United States and Canada**
- **Follow-up phone calls every 6 months**

Measures

- **Baseline assessment of sociodemographic, diabetes-related and CAD risk factors, testing for cardiac autonomic neuropathy**
- **Physical activity levels (hours performed weekly) at 6 month intervals and later dichotomized (none/any)**
- **Cardiac events**

Data Analysis

- **SAS 9.2**
- **Chi-square and t-tests**
- **McNemar's test**
- **Multivariate logistic regression with standard backward elimination strategy**
- **Cox Proportional Hazard**

Results

- **Subject characteristics**
- **Factors associated with baseline physical inactivity in men and women**
- **Cardiac events over 5 years**
- **Factors associated with and predicting cardiac events in men and women**

Subject Characteristics

- **Mean age: 61 ± 6.6 years**
- **Women: 46% (n=519)**
- **Race/ethnicity: 17% (n=190) Black**
- **T2DM duration: 8.5 ± 7.0 years**
- **HbA1c: 7.1 ± 1.5 %**
- **Insulin use: 23% (n=260)**
- **Physical activity at baseline: 3.9 ± 5.3 hours**

Factors Associated with Physical Inactivity at Baseline: Men

Factor	OR	95% CI	Significance
Part-time employment	0.46	0.29-0.72	P=.0007
Education	0.91	0.86-0.96	P=.0006
Being married	2.05	1.31-3.22	P=.002
Cardiac autonomic neuropathy	2.0	1.2-3.3	P=.007
Waist circumference	1.04	1.00-1.07	P=.047

Factors Associated with Physical Inactivity at Baseline: Women

Factor	OR	95% CI	Significance
Part-time employment	0.49	0.31-0.79	P=.003
Peripheral neuropathy	1.85	1.2-2.94	P=.009
Peripheral pain	2.62	1.45-4.78	P=.002
Body mass index (kg/m ²)	1.05	1.02-1.09	P=.0006

Physical inactivity rose from 24% to 33% over 5 years (p<.001)

Cardiac Events over 5 Years

- **8.4% (n=94) had cardiac events**
- **Cardiac death**
- **Acute coronary syndrome**
- **Heart failure**
- **Revascularization**



Factors Associated with Cardiac Events: Men

Factor	No Event (N=540)	Event (N=60)	Significance
Duration of T2DM--years (mean \pm sd)	8.2 \pm 6.8	12.3 \pm 7.8	P<.001
Insulin use—no. (%)	110 (20%)	20 (33%)	P=.02
HbA1c % (mean \pm sd)	7.0 \pm 1.52	7.5 \pm 1.49	P=.004
Waist-to-hip ratio (mean \pm sd)	.94 \pm .09	.97 \pm .08	P=.002
Peripheral numbness-- no. (%)	170 (31%)	31 (52%)	P=.002
Highest quartile resting pulse pressure	109 (20%)	22 (37%)	P=.003
Cardiac autonomic neuropathy—no. (%)	89 (16%)	20 (33%)	P=.001

Factors Predicting Cardiac Events: Men

Factor	HR	95% CI	Significance
Duration of T2DM	1.04	1.00-1.07	P=.02
HbA1c	1.2	1.04-1.34	P=.009
Peripheral numbness	2.0	1.2-3.3	P=.009
Waist-to-hip ratio	1.04	.99-1.07	P=.05
Highest quartile resting pulse pressure	1.8	1.01-3.05	P=.046
Cardiac autonomic neuropathy	2.03	1.2-3.5	P=.01

Factors Associated with Cardiac Events: Women

Factor	No Event (N=485)	Event (N=34)	Significance
Duration of T2DM--years (mean \pm sd)	8.05 \pm 6.6	13 \pm 8	P<.0001
Insulin use—no. (%)	123 (25%)	7 (21%)	P=.53
Peripheral numbness—no. (%)	173 (36%)	17 (50%)	P=.09
Family history of heart disease	98 (20%)	13 (38%)	P=.01
Highest quartile resting pulse pressure—no. (%)	131 (27%)	17 (50%)	P=.004
Black race—no. (%)	19 (4%)	1 (3%)	P=.10
No physical activity at baseline—no. (%)	120 (25%)	13 (38%)	P=.08

Factors Predicting Cardiac Events: Women

Factor	HR	95% CI	Significance
Black race	0.31	.09-1.03	P=.05
Insulin use	0.34	0.12-0.89	P=.03
Duration of T2DM	1.10	1.06-1.15	P<.0001
HbA1c	1.3	0.99-1.68	P=.05
Family history of heart disease	2.3	1.11-4.72	P=.02
Highest quartile resting pulse pressure	3.02	1.5-6.07	P=.002

Conclusions

- Identify those at high risk for baseline physical inactivity:

Men

-Employment

-Education

-Being married

-Cardiac autonomic neuropathy

-Waist circumference

Women

-Employment

-Peripheral neuropathy

-Peripheral Pain

-Body mass index

Conclusions

- Identify predictors of cardiac events in:

Men

- Duration of T2DM*
- HbA1c*
- Highest pulse pressure*
- Waist-to-hip ratio
- Peripheral Numbness
- Cardiac autonomic neuropathy

Women

- Duration of T2DM*
- HbA1c*
- Highest pulse pressure*
- Family history of heart disease
- Insulin use**
- Black race**

Limitations

- **Limited by previously collected data**
- **Factors collected at baseline only**
- **Mean hours of PA measured by self report and were estimates of actual hours**

Strengths

- **Large cohort study with 5 years of follow-up**
- **Extensive assessment of diabetes-related factors**
- **Able to identify different factors associated with baseline inactivity and those predictive of cardiac events in men and women**

Implications

- **PA has known benefits on glycemic control and cardiac risk**
- **Assess individuals with T2DM at high risk of inactivity and cardiac events**
- **Focused interventions**
 - **↑ physical activity**
 - **Improve glucose control**
 - **↓ cardiac risk**

Thank you

Cardiac Autonomic Neuropathy

- **Damage to autonomic nerves innervating heart and blood vessels**
- **Abnormalities**
 - Resting tachycardia
 - Orthostatic hypotension
 - Exercise Intolerance
- **Heart rate testing**
 - Heart rate during deep breathing
 - Valsalva ratio
 - Heart rate after standing

Pulse Pressure

- Resting pulse pressure: Resting systolic and diastolic pressure taken 3x and averaged to obtain resting pulse pressure
- $SBP - DBP = PP$

Sociodemographic and Cardiac Factors Associated with Cardiac Events

Factor	No Event (n=1025)	Event (n=94)	Significance
Race			
White	790 (77%)	81 (86%)	.07
Black	182 (18%)	8 (9%)	
Other	53 (5%)	5 (5%)	
Family history -- no. (%)	188 (18%)	26 (28%)	.027
No physical activity -- no. (%)	249 (24%)	32 (34%)	.037
Waist-to-hip ratio (mean \pm sd)	.94 \pm .09	.96 \pm .08	.002
Cardiac Autonomic Neuropathy	178 (17%)	30 (32%)	.0005
Highest quartile resting pulse pressure -- no. (%)	240 (23%)	39 (41%)	.0001

Diabetes Factors Associated with Cardiac Events

Factor	No Event (n=1025)	Event (n=94)	Significance
Duration of T2DM—years (mean \pm sd)	8.2 \pm 6.8	12.2 \pm 7.8	<.0001
HbA1c % (mean \pm sd)	7.04 \pm 1.5	7.52 \pm 1.49	.0038
Insulin use	233 (23%)	27 (29%)	0.18
Peripheral numbness -- no. (%)	343 (33%)	48 (51%)	.0006



Predictors of Cardiac Events in All Subjects

Factor	HR	95% CI	Significance
Black Race	HR=.41	.19-.88	P = .02
Insulin Use	HR=.51	.30-.88	p=.01
Duration of T2DM	HR=1.07	1.04-1.10	p<.0001
HbA1c	HR=1.26	1.10-1.43	p=.0007
Peripheral Numbness	HR=1.92	1.27-2.92	p=.002

Predictors of Cardiac Events in All Subjects

Factor	HR	95% CI	Significance
Family history CAD	HR=1.69	1.06-2.69	p=.03
Waist-to-Hip Ratio	HR=1.04	1.01-1.07	p=.003
Highest Quartile Resting Pulse Pressure	HR=2.17	1.41-3.3	p=.004
Cardiac Autonomic Neuropathy	HR=1.59	1.02-2.48	p=.04
<u>Baseline Physical Inactivity</u>	HR=1.52	.99-2.35	p = .05