

## BACKGROUND

- Colorectal cancer (CRC) is the 3<sup>rd</sup> most common cancer, and the 4<sup>th</sup> most common cause of cancer mortality in the United States.
- Metabolic dysfunction (obesity, diabetes, metabolic syndrome (MetS, comprises obesity, hyperglycemia, dyslipidemia, and hypertension) are risk factors for CRC.
- However, little is known about the prevalence and severity of metabolic syndrome and metabolic dysfunction among individuals with CRC thus the impact of these conditions on survival is unclear.

## OBJECTIVE

- To evaluate the association of metabolic syndrome and/or metabolic dysfunction with colorectal cancer.

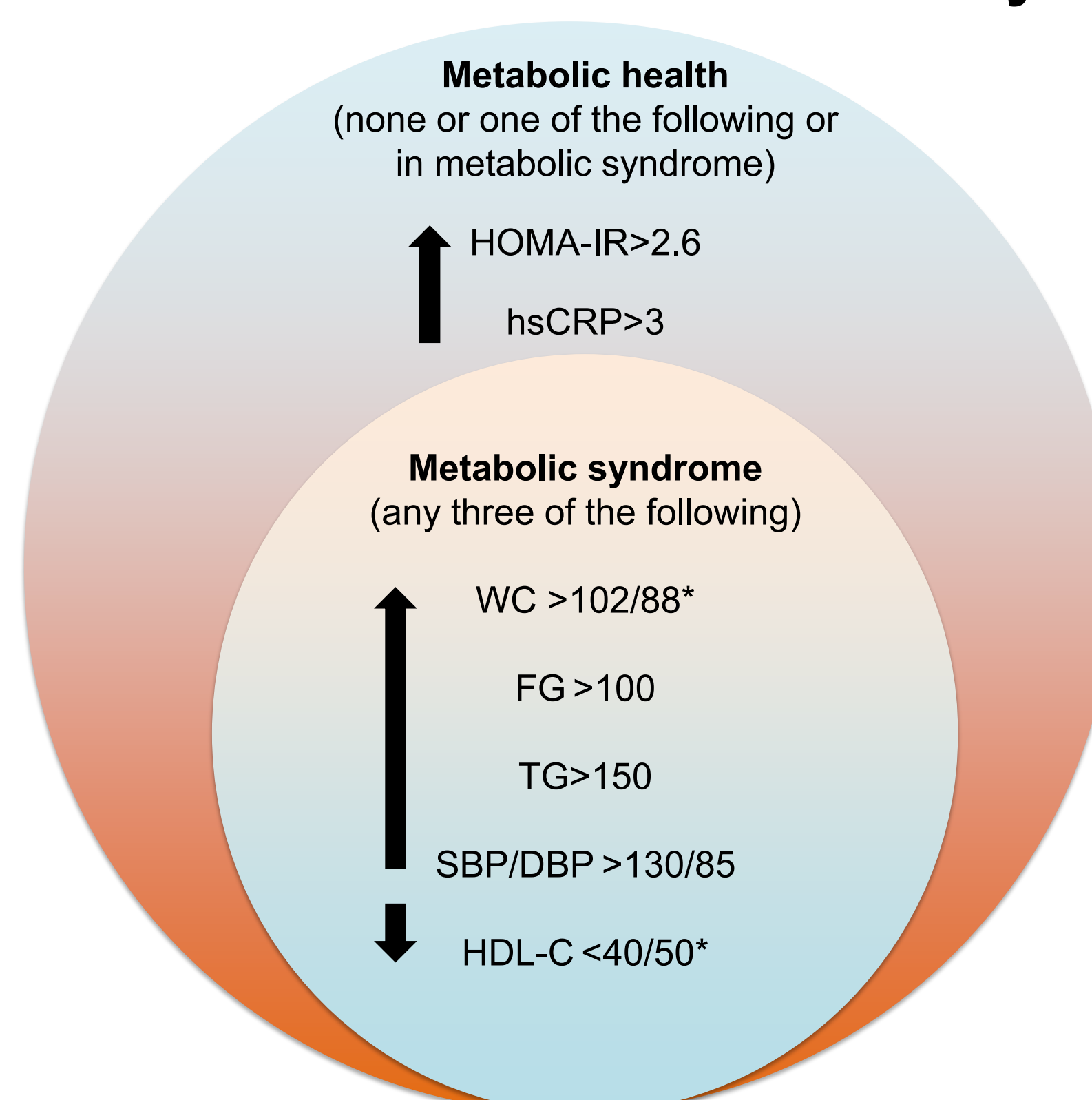
## METHODS

- Study Population:** National Health and Nutrition Examination Survey (NHANES) participants from 1999-2016 (N=25,925).
  - Nationally representative survey conducted by the Centers for Disease Control and Prevention (CDC) that examines ~ 5,000 people/yr.
  - Collects data on past medical history and performs physical and laboratory examinations.
- Outcome assessment:** Diagnosis of colon or rectal cancer (yes/no) was self reported by participants.
- Exposure Assessment:** Metabolic syndrome was defined according to the National Cholesterol Education Program's Adult Treatment Panel III (NCEP ATP III) report (**Figure 1**).
- Metabolic Syndrome and Dysfunction Scores (MSS and MDS)** calculated using clinical cutoffs for metabolic health parameters (score 1 if above cut-off, otherwise 0).
- MSS and MDS beta scores (MSS $\beta$  and MDS $\beta$ ) computed using beta coefficients for the association of metabolic health parameters with colorectal cancer.
- Statistical Analysis:** Logistic regression evaluated associations of MSS and MDS with CRC case status.
  - Adjusted odds ratios (OR) and 95% confidence intervals were estimated.
  - Stratified analyses were performed for age, race, sex.
  - Models were adjusted for covariates.

**Table 1. Selected Characteristics of Participants with Colorectal Cancer and Controls**

	Controls, n = 25,761	Colorectal Cancer Cases n = 164
Age in years, mean	55 ± 13	71 ± 10
White (non-Hispanic)	11515 (44.7%)	105 (64.0%)
Black (non-Hispanic)	5269 (20.5%)	33 (20.1%)
Hispanic	6867 (26.6%)	21 (12.8%)
Female	13158 (51.1%)	80 (48.8%)
Never Smoked	13597 (52.8%)	73 (44.5%)
Alcohol Use	14754 (57.3%)	93 (56.7%)
No Physical Activity	3391 (13.2%)	24 (14.6%)
>5 Sedentary Hours	12162 (47.7%)	87 (53.0%)

**Figure 1. Metabolic Health and Metabolic Syndrome Criteria**



HOMA-IR, homeostatic model assessment of insulin resistance; hsCRP, high-sensitivity C-reactive protein; WC, waist circumference; FG, fasting glucose; TG, triglycerides; SBP/DBP, systolic blood pressure/diastolic blood pressure; HDL-C, high-density lipoprotein cholesterol; HOMA-IR, homeostatic model assessment of insulin resistance; hsCRP, high-sensitivity C-reactive protein. Presence of hyperglycemia, dyslipidemia, and hypertension include participants on drug treatment. \*Males/Females respectively

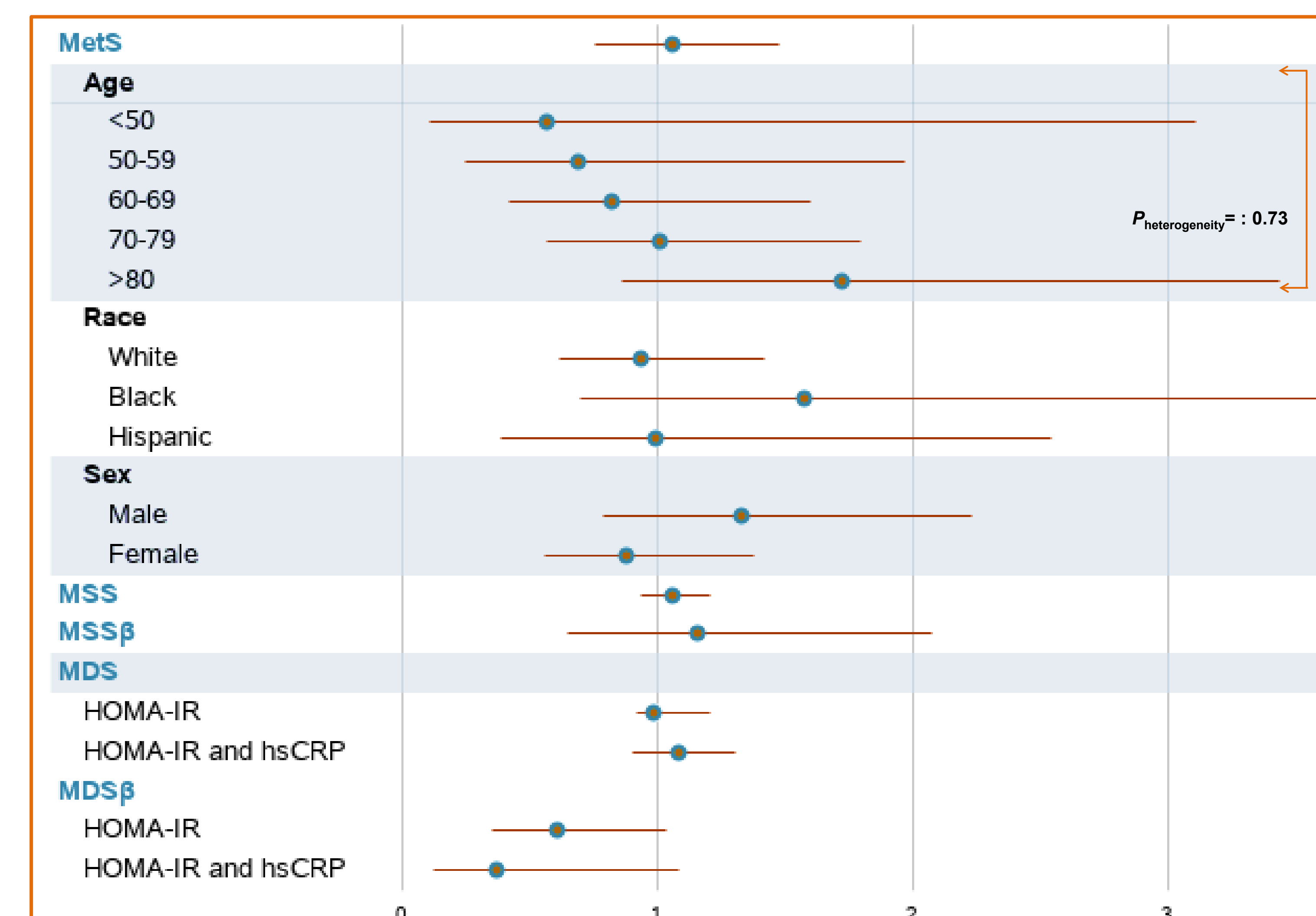
**Table 2. Mean Metabolic Health Parameters among Participants with Colorectal Cancer and Controls**

	Controls, n = 25,761	Cases n = 164
Metabolic Syndrome	13677 (53.1%)	104 (63.4%)
CRP (mg/dL)	0.4 ± 0.49	0.5 ± 0.59
HOMA-IR	3.6 ± 3.5	4.4 ± 5.3
Fasting Blood Glucose (mg/dL)	110 ± 38	115 ± 37
Systolic Blood Pressure (mmHg)	128 ± 18	137 ± 21
Diastolic Blood Pressure (mmHg)	73 ± 10	70 ± 9
HDL Cholesterol (mg/dL)		
Male	47 ± 14	47 ± 8
Female	56 ± 16	59 ± 15
Triglycerides (mg/dL)	143 ± 129	148 ± 77
Waist Circumference (cm)		
Male	102 ± 14	104 ± 14
Female	97 ± 15	98 ± 13

## RESULTS

- N=164 (<1%) reported CRC diagnosis; N=3781 (53%) had MetS.
- Presence of MetS was not associated with CRC case status (OR 1.15, 95% CI 0.83-1.60).
- Metabolic scores were not associated with CRC case status:
  - MSS [OR 1.06, 95% CI 0.93-1.21]; MSS $\beta$  [OR 1.16, 95% CI 0.65-2.07]
  - MDS (with HOMA-IR) [OR 1.08, 95% CI 0.90-1.30]; MDS  $\beta$  (with HOMA-IR) [OR 0.37, 95% CI 0.13-1.09].
  - MDS (with HOMA-IR and hsCRP) [OR 0.99, 95% CI 0.92-1.21]; MDS  $\beta$  (with HOMA-IR and hsCRP) [OR 0.61, 95% CI 0.36-1.03]
- The association of MetS with CRC was stronger among older individuals (**Figure 2**):
  - age <50 [OR 0.57, 95% CI 0.11-3.11]
  - age 50-59 [OR 0.69, 95% CI 0.25-1.97]
  - age 60-69 [OR 0.82, 95% CI 0.42-1.60]
  - age 70-79 [OR 1.01, 95% CI 0.57-1.80]
  - age >80 [OR 1.72, 95% CI 0.86-3.43]
  - However, this trend was not statistically significant, *p-trend*=0.73.

**Figure 2. Odds of Colorectal Cancer Case Status among Participants with Metabolic Syndrome and Dysfunction**



## CONCLUSIONS

- Our results found that metabolic syndrome or metabolic dysfunction was not associated with colorectal cancer in NHANES.
- We observed a trend for stronger association of colorectal cancer with metabolic syndrome with increasing age, however it was not statistically significant.
- Future prospective studies are needed to better understand the relationship between metabolic syndrome/dysfunction with CRC.