

Obesity and Diabetes Impact on RTW Outcomes

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Learning Objectives

- › Understand the phases of healing
- › Discuss the incidence of co-morbidities in the general population
- › Understand the impact of co-morbidities on the musculoskeletal system
- › Discuss the implications of co-morbidities on the rehabilitation of work injuries



Healing Phases

> Inflammatory phase

- First 72 hours
- Bleeding and continual associated inflammation of the injured tissues

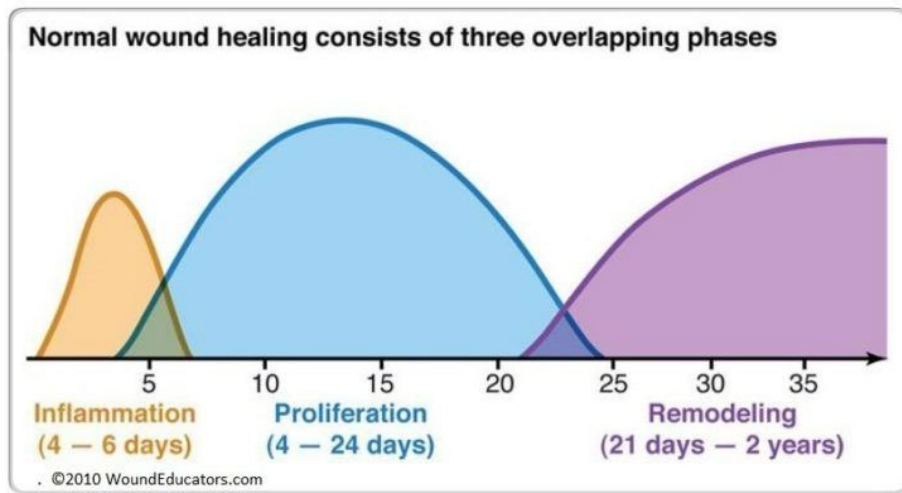
> Phase of regeneration

- 72 hours to 6-8 weeks
- Disruption in the injured muscles and ligaments is bridged
- The gap is more than 90% bridged

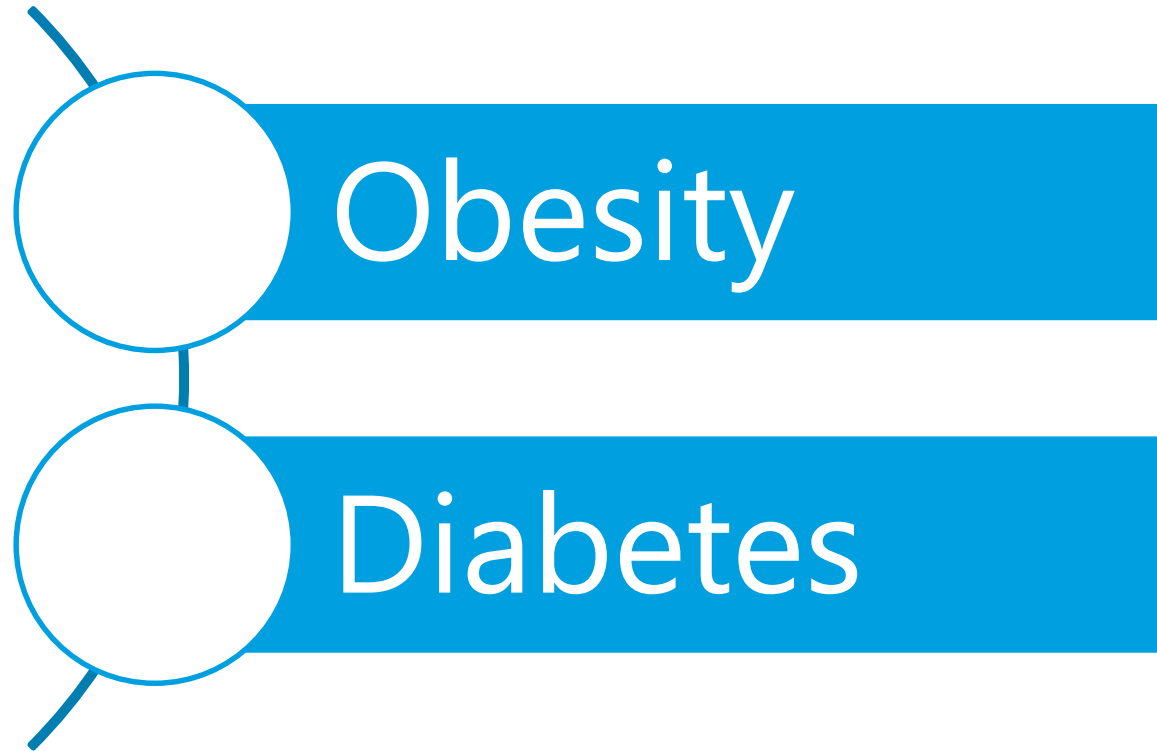
Healing Phases

> Phase of remodeling

- 6-8 weeks to 6-12 months
- Fibers in the tissue will become stronger to form a pattern more like the original undamaged tissues



Common Co-Morbidities



Obesity

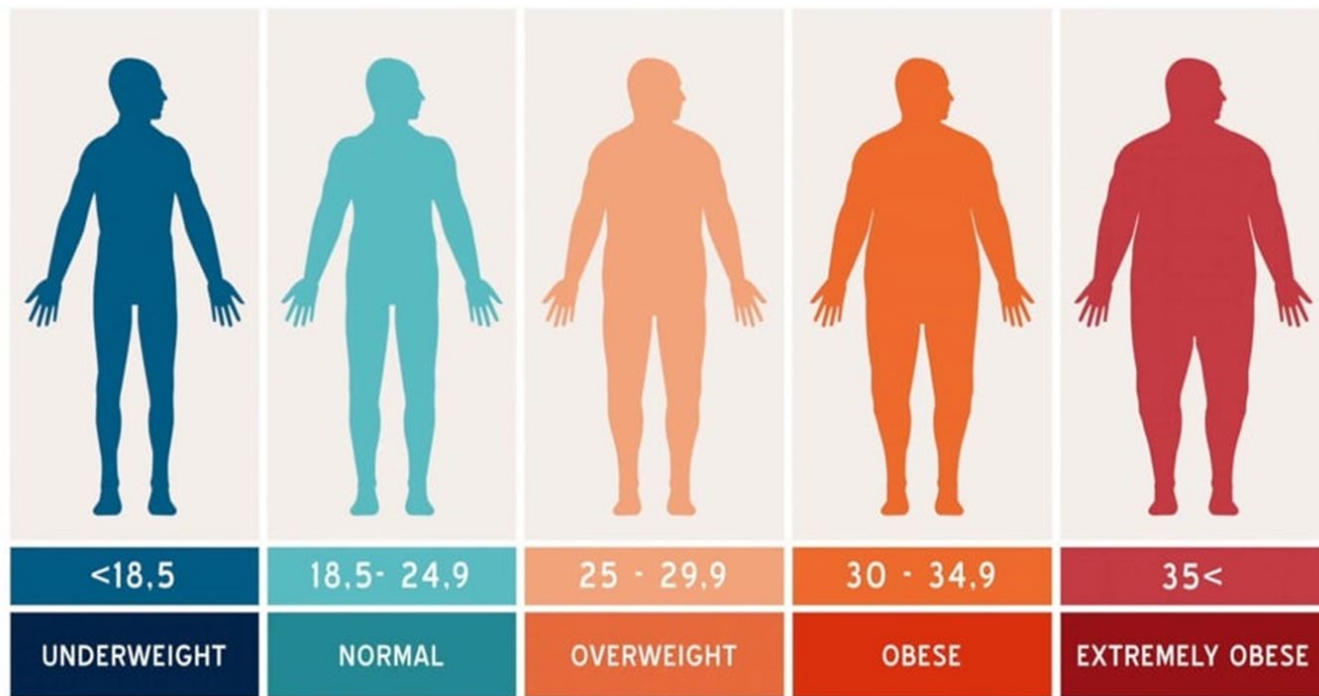


Obesity

According to the National Institute of Health:

- › Obesity is a complex, chronic disease that develops from multiple genetic and the environmental factors.
- › It involves "the integration of social, behavioral, cultural, physiological, metabolic and genetic factors."
- › Obesity is the over accumulation of fat that exceeds the body's skeletal and physical standards.
- › An increase in BMI of more than 30 is the point at which excess weight becomes a health risk

BMI



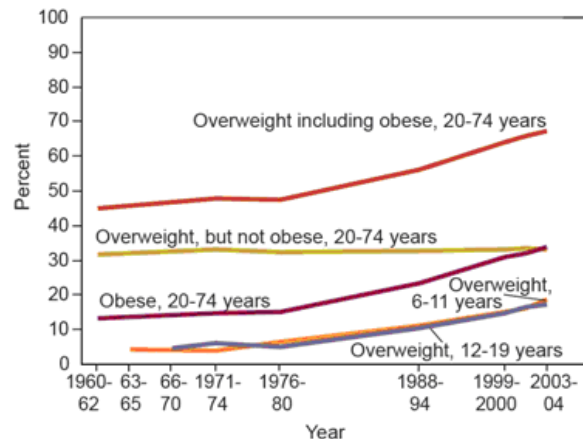
Statistics

› Since the mid-seventies, the prevalence of overweight and obesity for both adults and children, has increased sharply

› NHANES (National Health and Nutrition Examination Survey) :

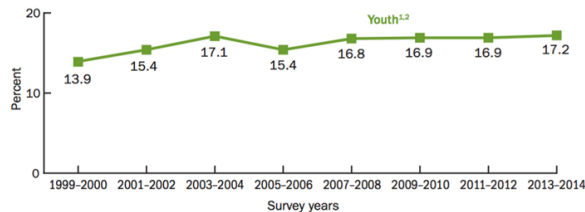
- Adults aged 20–74 the prevalence of obesity increased from 15.0% to 32.9% between the 1976/1980 and 2003/2004 survey.

Overweight and obesity



SOURCES: Centers for Disease Control and Prevention, National Center for Health Statistics, Health, United States, 2006, Figure 13. Data from the National Health and Nutrition Examination Survey.

Trends in obesity prevalence among youth aged 2–19 years: United States, 1999–2000 through 2013–2014



¹ Significant increasing linear trend from 1999–2000 through 2013–2014.

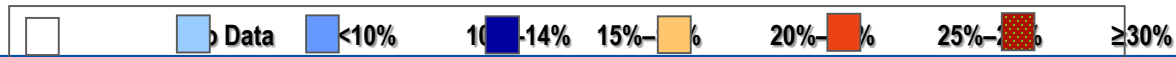
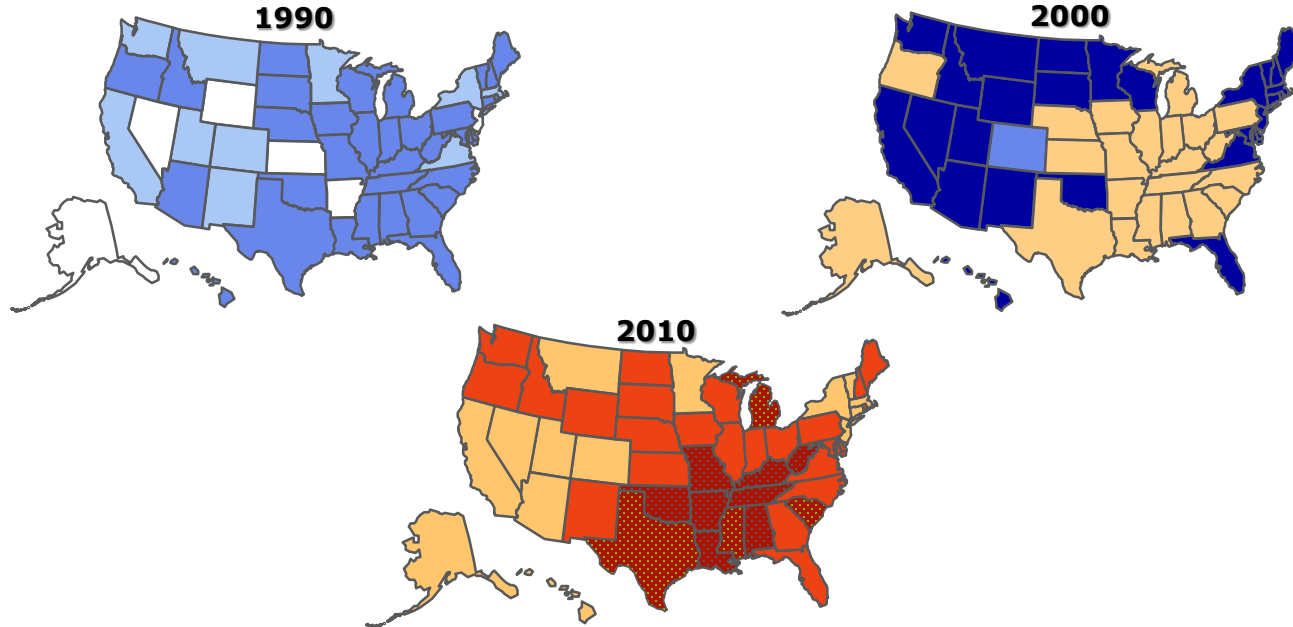
² Test for linear trend for 2003–2004 through 2013–2014 not significant ($p > 0.05$).

SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey.

Obesity Trends* Among U.S. Adults

BRFSS, 1990, 2000, 2010

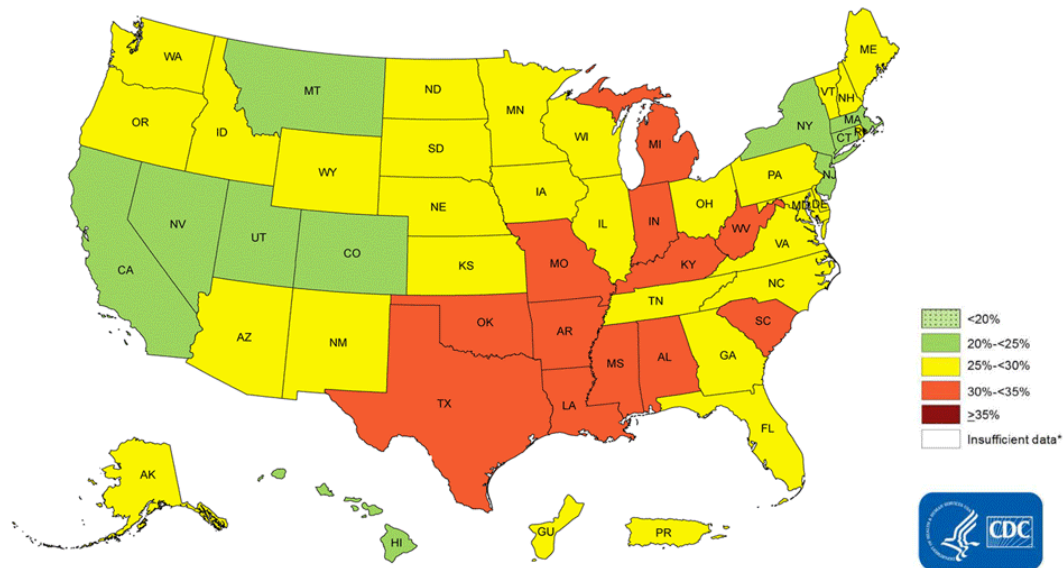
(*BMI ≥ 30 , or about 30 lbs. overweight for 5'4" person)



Prevalence of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS

[†]Prevalence estimates reflect BRFSS methodological changes started in 2011. These estimates should not be compared to prevalence estimates before 2011.

2011 2012 2013 2014 2015 2016 2017 2018

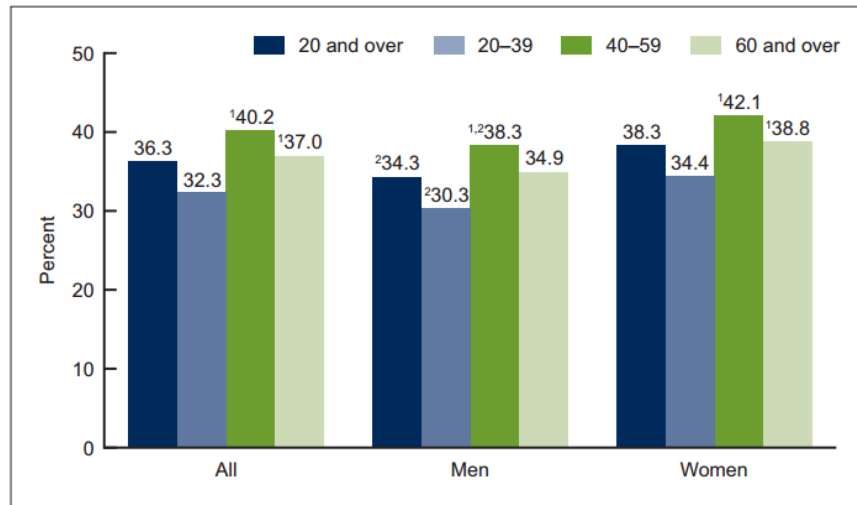


*Sample size <50 or the relative standard error (dividing the standard error by the prevalence) ≥ 30%.

Prevalence of Obesity Among Adults 2011–2014

- The prevalence of obesity was 36.5% (crude estimate) among U.S. adults during 2011–2014. Overall, the prevalence of obesity among middle-aged individuals was highest.

Figure 1. Prevalence of obesity among adults aged 20 and over, by sex and age: United States, 2011–2014



¹Significantly different from those aged 20–39.

²Significantly different from women of the same age group.

NOTES: Totals were age-adjusted by the direct method to the 2000 U.S. census population using the age groups 20–39, 40–59, and 60 and over. Crude estimates are 36.5% for all, 34.5% for men, and 38.5% for women.

SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey, 2011–2014.





In 2018, how many states in the US had an obesity percentage of the population at 30% or higher?

›A: 24

›B: 27

›C: 22

›D: 30



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Obesity Prevalence in 2017 by Education and Age

- › Obesity decreased by level of education. Adults without a high school degree or equivalent had the highest self-reported obesity (35.6%), followed by high school graduates (32.9%), adults with some college (31.9%) and college graduates (22.7%).
- › Young adults were half as likely to have obesity as middle-aged adults. Adults aged 18-24 years had the lowest self-reported obesity (16.5%) compared to adults aged 45-54 years who had the highest prevalence (35.8%).



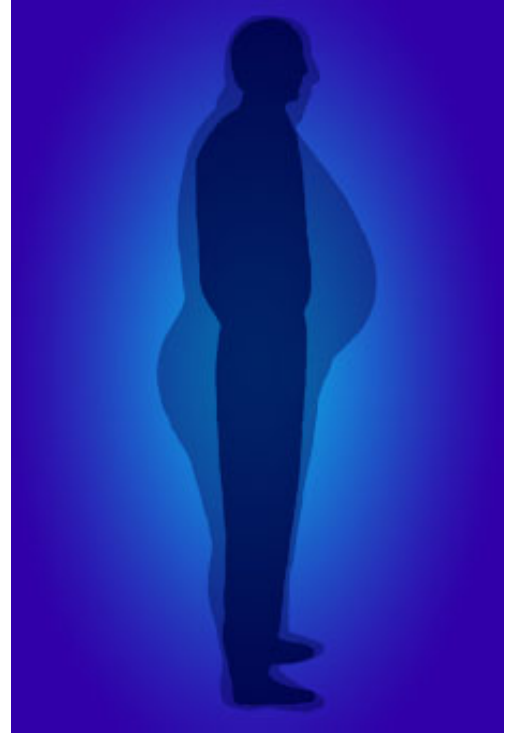
Obesity Prevalence in 2017 Varies Across States and Territories

- › All states had more than 20% of adults with obesity.
- › 20% to less than 25% of adults had obesity in 2 states (Colorado and Hawaii) and the District of Columbia.
- › 25% to less than 30% of adults had obesity in 19 states.
- › 30% to less than 35% of adults had obesity in 22 states, Guam, and Puerto Rico.
- › 35% or more adults had obesity in 7 states (Alabama, Arkansas, Iowa, Louisiana, Mississippi, Oklahoma, and West Virginia).
- › The South (32.4%) and the Midwest (32.3%) had the highest prevalence of obesity, followed by the Northeast (27.7%), and the West (26.1%).

Epidemiological Reviews

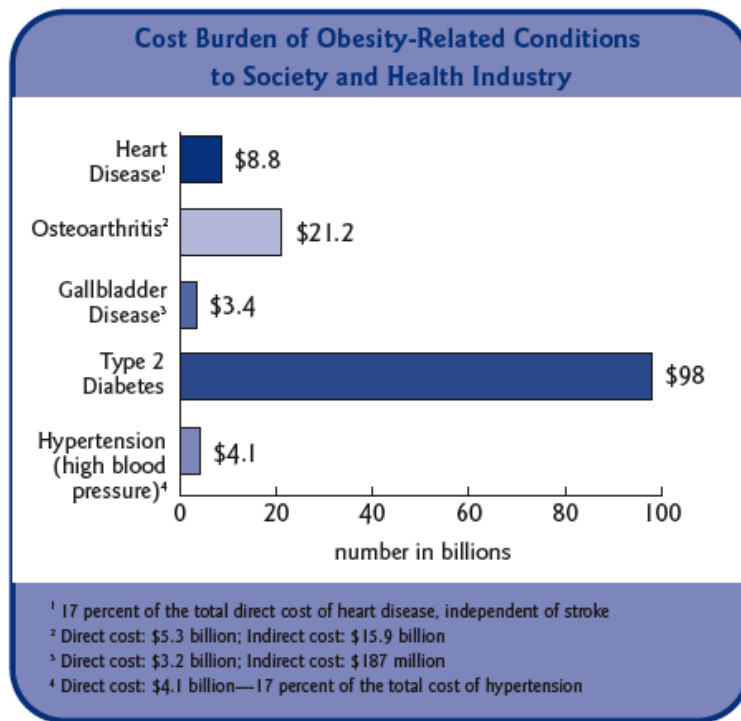
- May 2007, Wang & Others

- › 58 million Americans are overweight
- › 40 million Americans are obese
- › 3 million Americans are morbidly obese
- › Eight out of 10 Americans over 25 years old are overweight
- › At this time all states exceed a prevalence of obesity of 20%.



Economic Impact of Obesity

- › The estimated annual cost of overweight and obesity in the U.S. is \$122.9 billion.
- › Services for obesity-related diseases and conditions \$64 billion:
- › Direct health care costs related to:
 - preventive, diagnostic and treatment
- › Indirect costs \$58.5 billion:
 - The value of wages lost by people unable to work and the value of future earnings lost by premature death.
 - Obesity related conditions result in \$39.3 million in lost workdays each year.





Economic Impact of Obesity

- › Obesity accounts for 9 percent of national health care expenditures.
- › The estimated cost of obesity in a hypothetical 1-million-member health plan is \$29 per member per month.
- › Over a nine-year period, overweight (body mass index (BMI) between 25 and 29.9) spend 37 percent more on prescription drugs; obese (BMI >30) spend twice as much.
- › Employees with a BMI > 40 had twice as many workers compensation claims as employees at their recommended weight.



Specific Cost

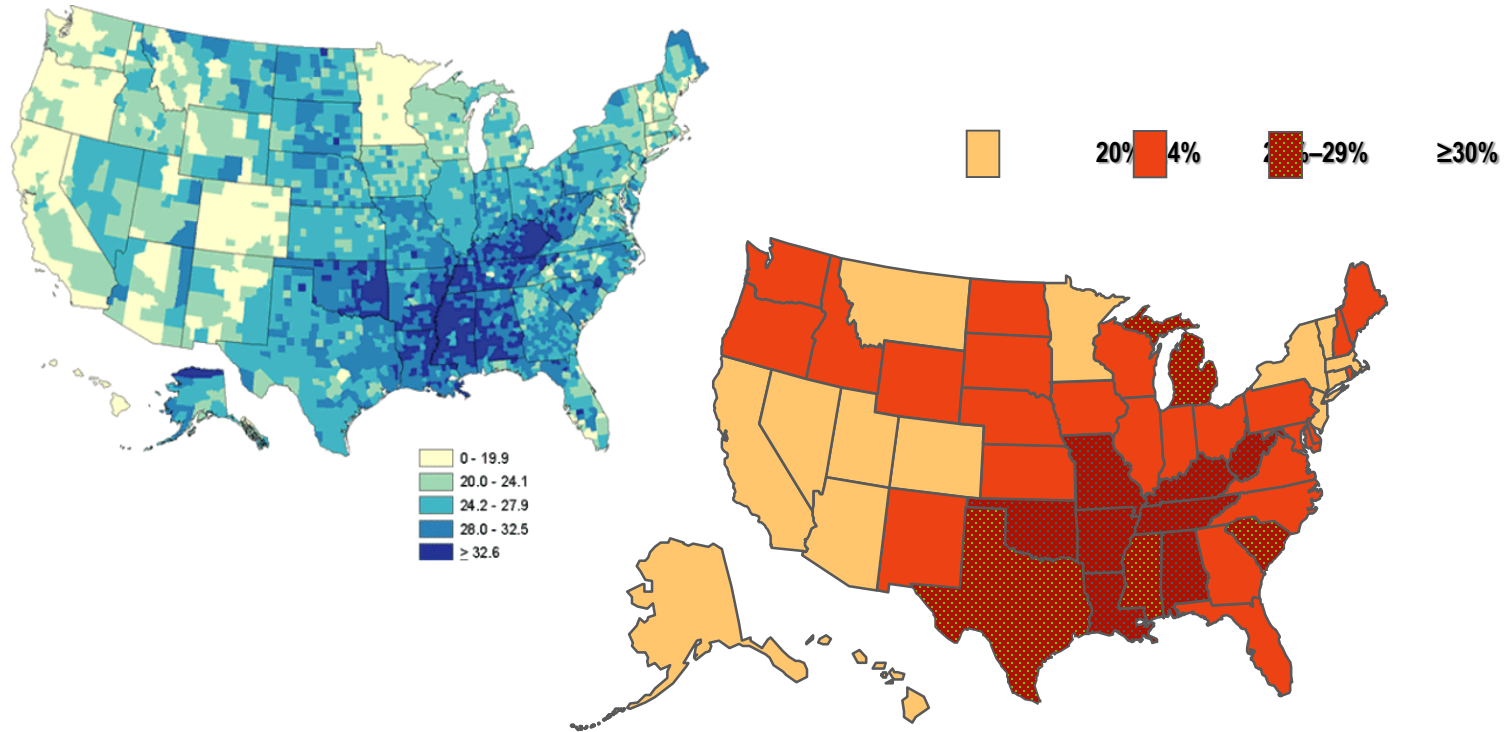
- › Added healthcare cost in 2007 of obese worker compared to normal weight
 - ~\$2,000
 - Morbidly obese worker higher
- › Added absenteeism/presenteeism cost in 2007 of obese worker compared to normal and overweight
 - ~\$600



Life Expectancy

- › The risk of death for people with a BMI ≥ 25 at age 50 is 20 percent to 40 percent higher than those with a BMI of less than 25.
- › Obesity was associated with double the mortality risk in men and a 60 percent increase in women compared with those of normal weight.

Percentage of Adults Inactive vs. Percentage of Adults who are Obese




- › Obesity and Workers' Compensation
- › Results from the Duke Health and Safety Surveillance System
- › Study of relationship between body mass index (BMI) and number and types of workers' compensation claims, associated costs, and lost workdays.
- › 11,728 health care and university employees



Conclusion


- › The researchers found that workers with a BMI greater than 40 had:
 - 11.65 claims per 100 workers, compared with 5.8 claims per 100 in workers within the recommended range.
 - In terms of average lost days of work, the obese averaged 183.63 per 100 employees, compared with 14.19 per 100 for those in the recommended range.
 - The average medical claims costs per 100 employees were \$51,019 for the obese and \$7,503 for the non-obese.
 - The body parts most prone to injury among obese workers were the lower extremity, wrist or hand, and back. The most common causes of these injuries were falls or slips and lifting.



True or False: Employees with a BMI > 40 had twice as many workers compensation claims as employees at their recommended weight.

› True

› False



True or False: Employees with a BMI > 40 had twice as many workers compensation claims as employees at their recommended weight.

› True

› False

Orthopedic Issues in Obesity

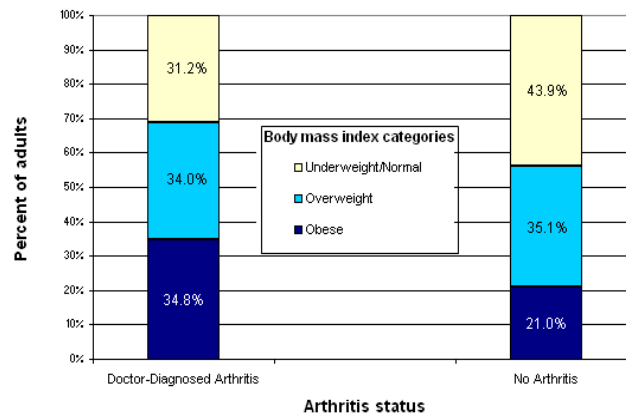
- › Being only 10 pounds overweight increases the force on the knee by 30-60 pounds with each step.
 - Therefore, a force of ~ three to six times one's body weight is exerted across the knee while walking.
- › Increased joint loading accelerates the breakdown of cartilage.



Osteoarthritis

- › Obesity is a known risk factor for the development and progression of knee osteoarthritis and other weight bearing joints
- › Obese adults are up to 4 times more likely to develop knee osteoarthritis than normal weight adults.
- › 35% of adults with diagnosed arthritis are obese compared to only 21% of those without arthritis.
- › Most modifiable risk factor for development and progression of OA.

Figure 4. Body Mass Index* Categories Among Adults With and Without Doctor-Diagnosed Arthritis in 2002





Knee Osteoarthritis Incidence

In the Framingham study, Felson and colleagues noted:

- Among women with (BMI) > 25, weight loss was associated with a significantly lower risk of knee OA.
- For a woman of normal height, for every 11 lb weight loss (approximately 2 BMI units), the risk of knee OA dropped > 50%.
- Conversely, a comparable weight gain was associated with an increased risk of later developing knee OA (odds ratio 1.28 for a 2 BMI weight gain).



Additional Orthopedic Outcomes:

Research shows that Obesity:

- › Is associated with a substantially higher risk for infection in women, led to more dislocations (with a greater increase in women)
- › Resulted in more revisions due to septic loosening (caused by infection).
- › After five years, outcomes for 635 hips in non-obese patients and 183 hips in obese patients were evaluated. Obese women, but not obese men, reported moderately lower functional outcomes and slightly less satisfaction, mostly due to a higher incidence of complications.



Rehabilitation in Obesity

- › Understanding the role of rehabilitation in the treatment of joint replacement patients has been studied and found to improve outcomes.
- › Exercise participation prior to total joint arthroplasty dramatically reduces the odds of inpatient rehabilitation
- › Among THR patients, exercise intervention was associated with improvements in preoperative function score.
- › Exercise participation increased muscle strength preoperatively, whereas the control patients had essentially no change in strength.
- › The authors concluded that a 6-week pre-surgical exercise program can safely improve preoperative functional status and muscle strength levels in patients undergoing THR.

Rooks, et al



Obesity Related Challenges in Rehabilitation

- › Slowed Progress which may require increased visits to achieve desired outcome
- › Modified Positioning for Testing and Exercise
 - Tissue Restrictions
 - Trunk girth
 - Extremity width
- › Deconditioning
 - Reduced exercise capacity
- › Flexibility limitations due to tissue bulk
- › Balance
 - Abnormalities in base of support
 - Foot placement or arm swing due to tissue bulk, flexibility etc.
- › Postural deviations
 - Compensations for excess body weight
- › Reimbursement

Diabetes

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What is Diabetes?

- › Group of diseases that affect how your body uses blood sugar (glucose)
- › Too much glucose in your blood
- › Chronic diabetes conditions include type 1 diabetes and type 2 diabetes
- › Prediabetes — when your blood sugar levels are higher than normal, but not high enough to be classified as diabetes



Type 1 Diabetes

- › Type 1 diabetes occurs when the immune system mistakenly attacks and kills the beta cells of the pancreas
- › No, or very little, insulin is released into the body
 - Sugar builds up in the blood instead of being used as energy
- › 5-10% of people with diabetes have type 1
- › Always treated with insulin



Type 2 Diabetes

- › Type 2 diabetes occurs when the body can't properly use the insulin that is released (called insulin insensitivity) or does not make enough insulin
- › Sugar builds up in the blood instead of being used as energy
- › 90% of people with diabetes have type 2
- › Managed through physical activity and meal planning, or may also require medications and/or insulin to control blood sugar more effectively



Diabetes Statistics

- › An estimated 30.3 million people of all ages—or 9.4% of the U.S. population—had diabetes in 2015
 - 25.2% among those aged 65 years or older
- › 23.1 million diagnosed
- › 7.2 million (23.8%) were not aware of or did not report having diabetes
- › An estimated 33.9% of U.S. adults aged 18 years or older (84.1 million people) had prediabetes in 2015
 - Nearly half (48.3%) of adults aged 65 years or older had prediabetes



Cost of Diabetes

- › The total direct and indirect estimated cost of diagnosed diabetes in the United States in 2012 was \$245 billion
- › Average medical expenditures for people with diagnosed diabetes were about \$13,700 per year. About \$7,900 of this amount was attributed to diabetes
- › Average medical expenditures among people with diagnosed diabetes were about 2.3 times higher than expenditures for people without diabetes



Risk Factors

- › **Obesity**

- › Age

- › Family History

- › Malnutrition

- › African American, Hispanic/Latino American, American Indian or Alaska Native
(some Pacific Islanders and Asian Americans are also at higher risk)



Implications of Diabetes

- › Chronic kidney disease
- › Foot problems
- › Non-traumatic lower limb (leg, foot, toe, etc.) amputation
- › Eye disease (retinopathy) that can lead to blindness
- › Heart Attack
- › Stroke
- › Anxiety
- › Nerve damage
- › Erectile dysfunction (men)



Diabetes is responsible for ____ dollars in reduced productivity per year

- A: 84 Billion
- B: 123 Billion
- C: 90 Billion
- D: 327 Billion



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Diabetes Scary Truth

- › Diabetes was the seventh leading cause of death in the United States in 2015
- › Diabetes was listed as any cause of death on 252,806 death certificates in 2015



Common Musculoskeletal Complications

- › Osteomyelitis
- › Diabetic neuropathic arthropathy
- › Tendonopathies (tendonitis, tendon rupture and tenosynovitis)



Diabetes and Healing

- › Narrowed blood vessels lead to decreased blood flow and oxygen to an injury/wound
- › Elevated blood sugar level decreases the function of red blood cells that carry nutrients to the tissue
- › Lowers the efficiency of the white blood cells that fight infection
- › Without sufficient nutrients and oxygen, an injury/wound heals slowly



Treatments

- › Medication
- › Losing weight if overweight
- › Eating healthier
- › Getting regular physical activity



Conclusion

- › Co-morbidities can significantly impact the healing process; however, there are ways to improve the outcomes
 - Healthy Diet
 - Lose Weight
 - Quit Smoking
 - Exercise
 - Manage Stress

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