

The A,B,C,**D**s of *Diabetes*

Danielle Weiss, MD

Center for Hormonal Health and
Well-Being

Outline

- Why does understanding diabetes (DM) matter to me?
- Prevalence of diabetes
- Pathophysiology: Symptoms, signs and causes of diabetes
- How is diabetes diagnosed and what increases your risk?
- Treatments to proactively prevent or improve diabetes and its complications

Why Does Diabetes Matter?!

- We are in the midst of a diabetes pandemic!
- In 2014, ~30 million people (9.3% of the population) in the U.S. have DM type 2 1 out of 4 of these people do not know they have it!
- 86 million have preDM (1 out of 3 adults) and 9 out of 10 of them do not know they have it! 20% of these people will develop diabetes within 5 years.
- ~ 20% of people >65 yo have DM and 50% have preDM!
- By 2030, the number of people with DM is estimated to almost double (greatest increase in Asia and Africa)

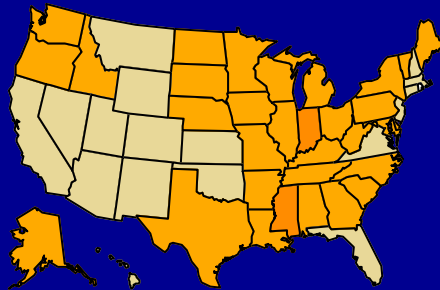
Why Does Diabetes Matter?!

- In the U.S., diabetes costs ~\$245 billion every year and is the 7th leading cause of death.
- Risk of death for adults with diabetes is 50% higher than those without diabetes and medical costs are twice as high.
- Increased risk of dementia – Alzheimer's DM3?
- Losing weight, eating healthy and being more active can cut people's risk of going from preDM to DM in half.

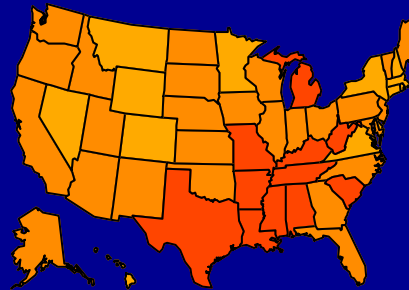
Age-adjusted Prevalence of Obesity and Diagnosed Diabetes Among US Adults

Obesity (BMI ≥ 30 kg/m²)

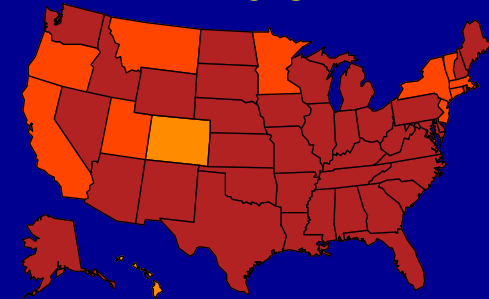
1994



2000



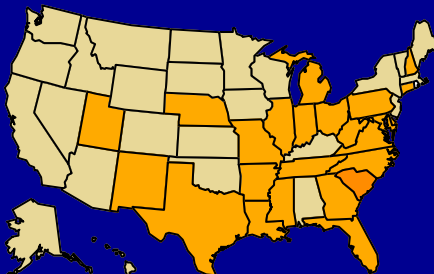
2013



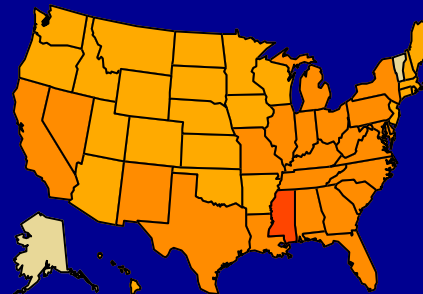
No Data
 <14.0%
 14.0%–17.9%
 18.0%–21.9%
 22.0%–25.9%
 $\geq 26.0\%$

Diabetes

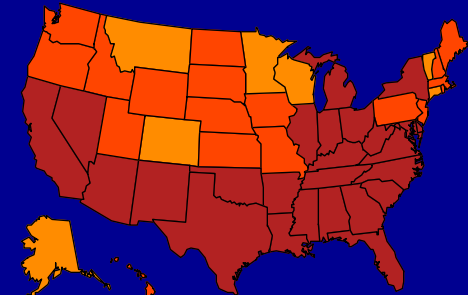
1994



2000



2013



No Data
 <4.5%
 4.5%–5.9%
 6.0%–7.4%
 7.5%–8.9%
 $\geq 9.0\%$

CDC's Division of Diabetes Translation. National Diabetes Surveillance System available at <http://www.cdc.gov/diabetes/statistics>

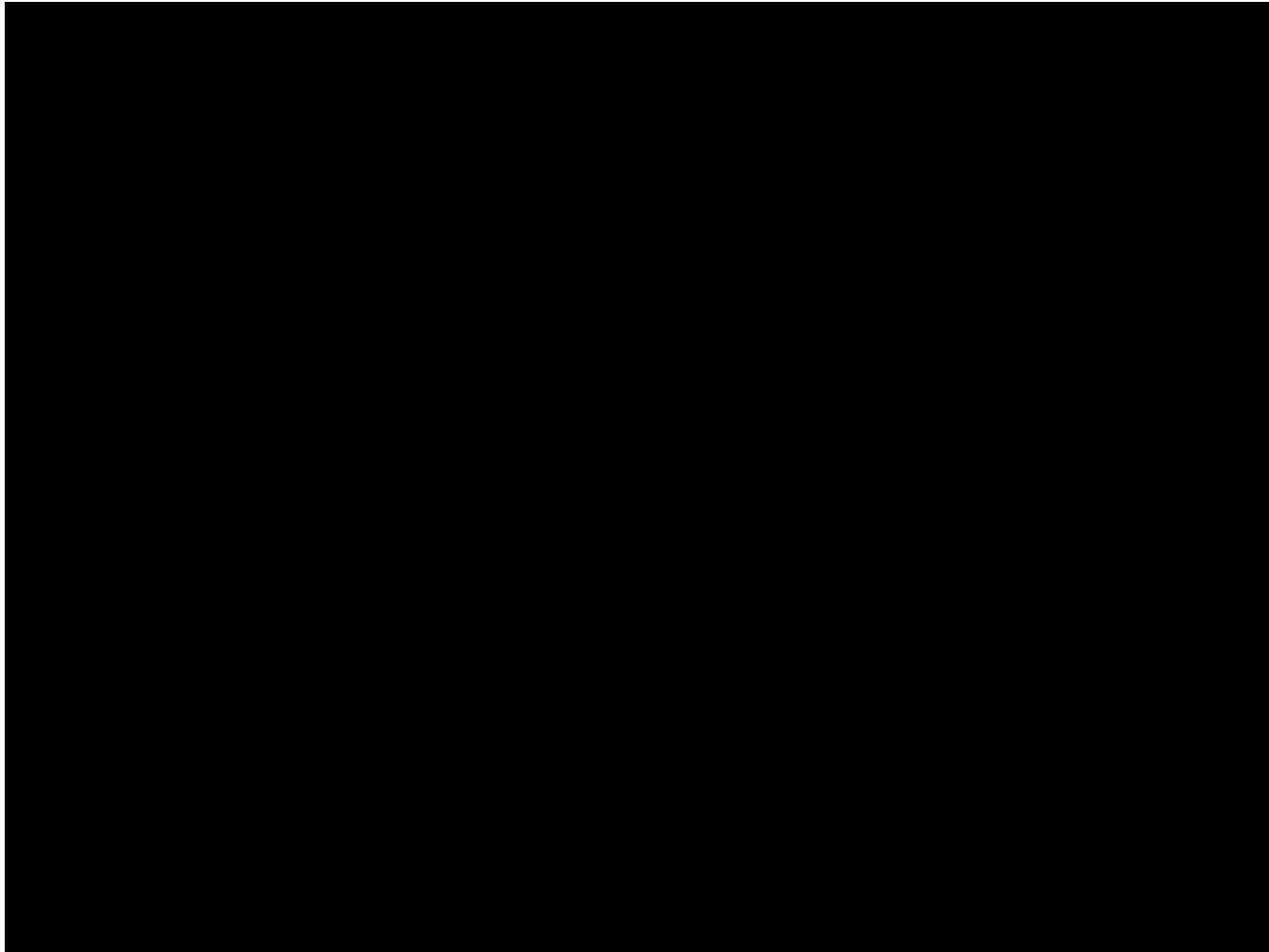


The Diabetes Epidemic: Global Projections, 2010–2030

World 2011 = 366 million
2030 = 552 million
Increase = 51%



Pathophysiology of Diabetes

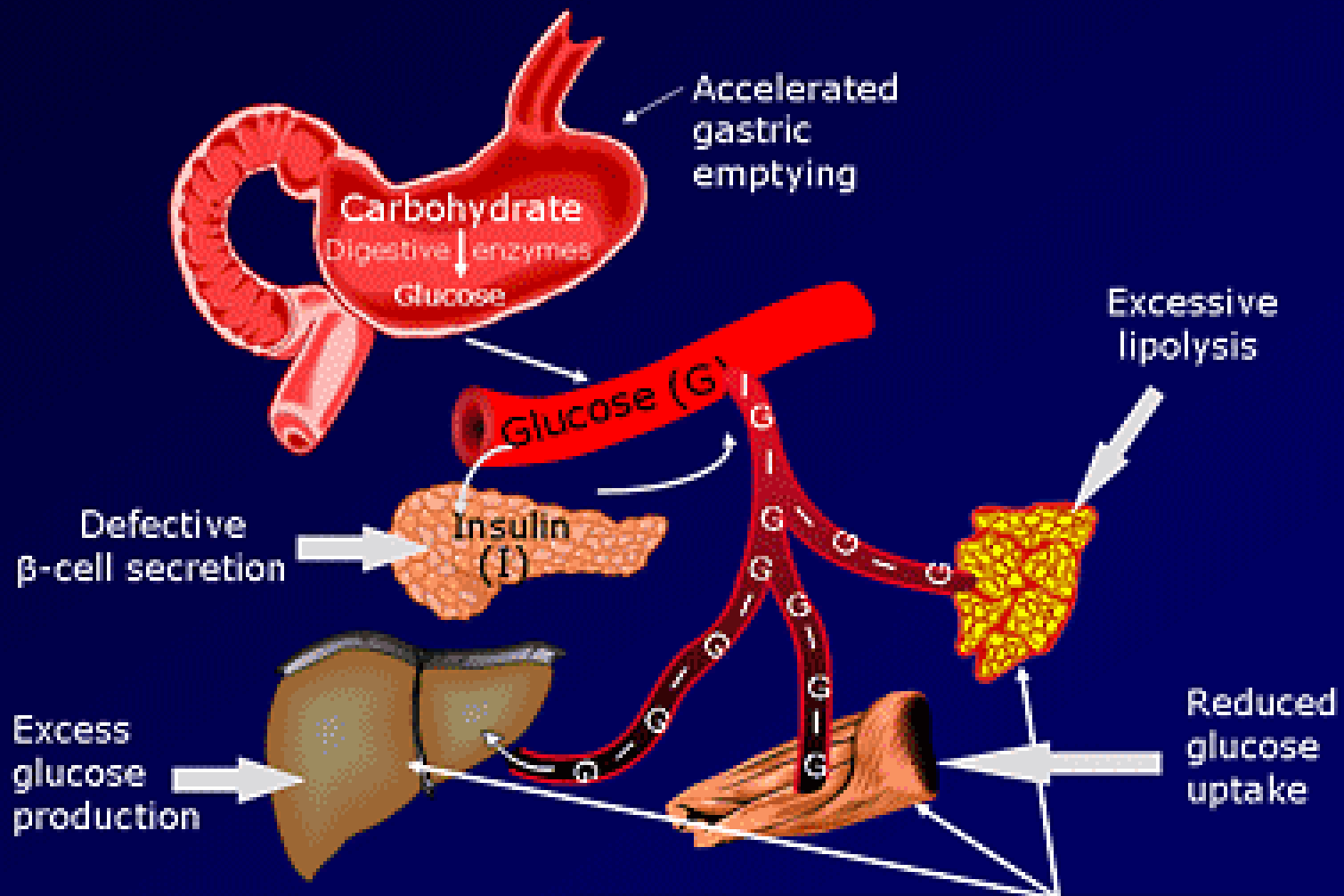


Let's watch a movie to understand *what* is going on inside a person that has diabetes.

Pathophysiology of Diabetes



Pathophysiology of Type 2 Diabetes

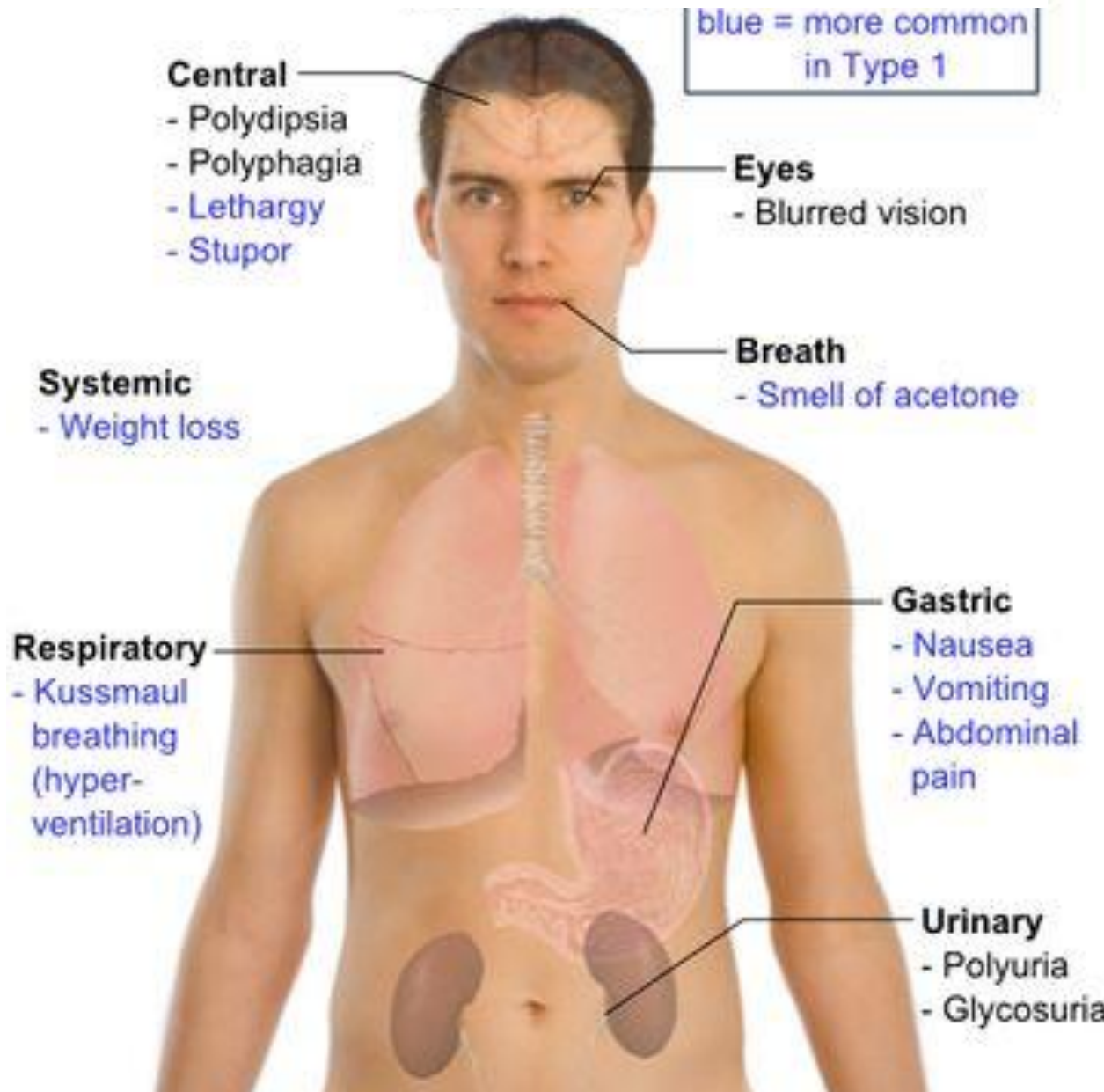


Adapted from DeFronzo R. et al.
Diabetes Care. 1992;15:318-368.

Resistance to the action of insulin

Symptoms of Diabetes

- Increased thirst / urination
- Numbness or tingling
- Increased infections
- Poor wound healing
- Blurred vision



Different Causes of Diabetes (DM)

- Insulin deficiency (DM1)
- Insulin resistance (DM2) (can also have insulin deficiency)
- Gestational DM (insulin resistance)
- Genetic causes - MODY
- Medication side-effects: Steroid induced DM
- Diseases of the pancreas: Pancreatitis/pancreatic cancer/hemochromatosis/cystic fibrosis
- Other endocrine disorders: acromegaly, cushings

Diabetes (DM 1)



- DM type 1
 - Autoimmune condition that destroys pancreatic beta cells
 - Decreased secretion of insulin
 - 5-10% of patients with diabetes have this
 - Need insulin medication

Diabetes (DM2)



- DM type 2
 - Adults and now more children have this
 - Insulin resistance (muscle does not respond to insulin and glucose stays in the blood stream rather than being absorbed by the muscle)
 - Pancreas gradually has harder and harder time secreting insulin (50% reduction by time of diagnosis)
 - Genetic and environmental causes
 - Treatment depends on how early you are diagnosed (diet, exercise, oral meds, injection medications)

Diagnosis of Diabetes

- Hg A1c $\geq 6.5\%$
or
- Fasting glucose ≥ 126 ml/dl (more than once)
or
- 2hr glucose tolerance test ≥ 200 ml/dl
or
- Random glucose > 200 ml/dl

How blood sugar self-testing results may compare with A1C test results.

The chart below shows how an average daily blood sugar number might compare to a 2-3 month A1C number.

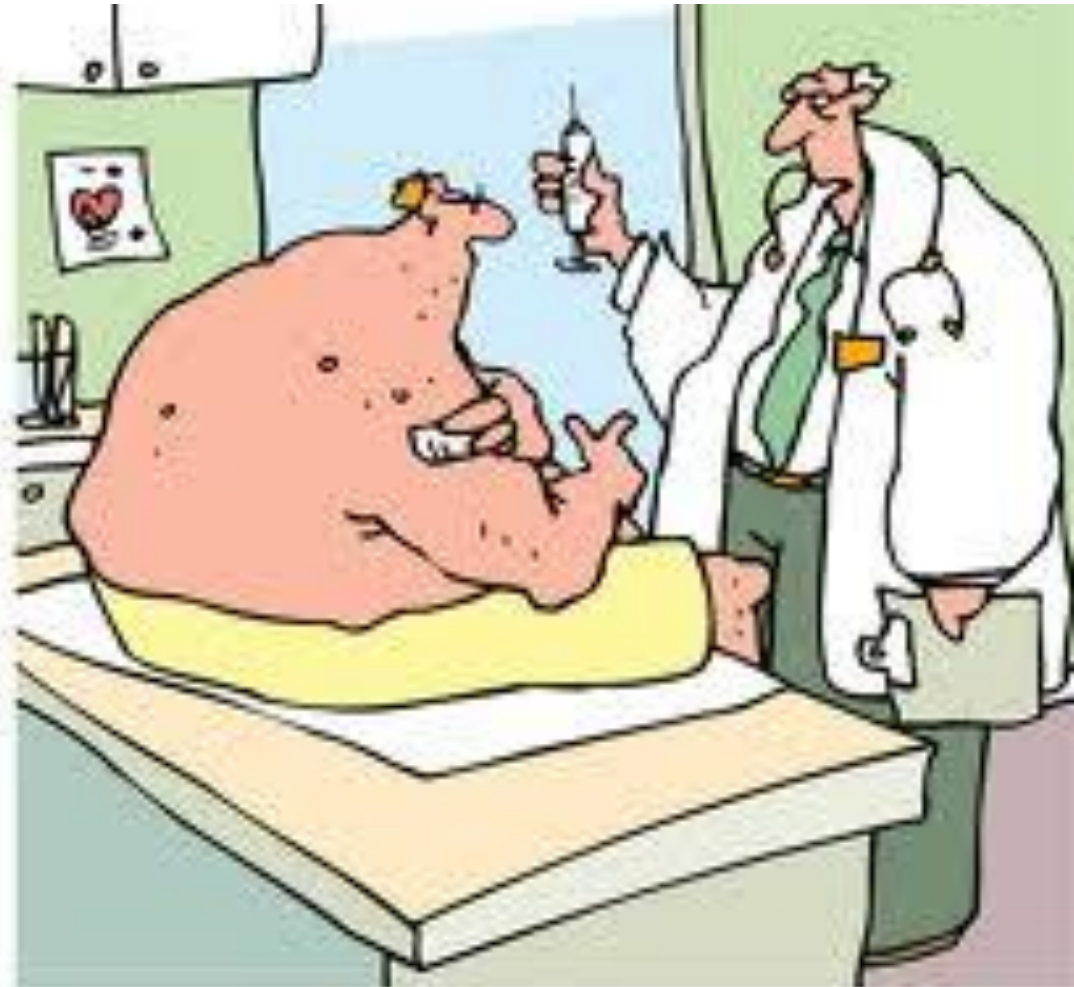
Average* Daily Blood Sugar	A1C Level
135	6%
170	7%
205	8%
240	9%
275	10%
310	11%
345	12%

Average is based on readings taken before and after meals and at bedtime.

The American Association of Clinical Endocrinologists (AACE) recommends that people with type 2 diabetes reach an A1C goal of 6.5% or less. Achieving this goal is important since every 1% increase above 6% elevates the risk of diabetes complications such as stroke, heart attack and loss of limbs.

Risk factors for DM

- Family history
- Overweight (BMI >25)
- Gestational DM
- A1c 5.7-6.4
- Impaired fasting glucose (glucose >100)
- Impaired glucose tolerance (glucose > 140)
- Medications



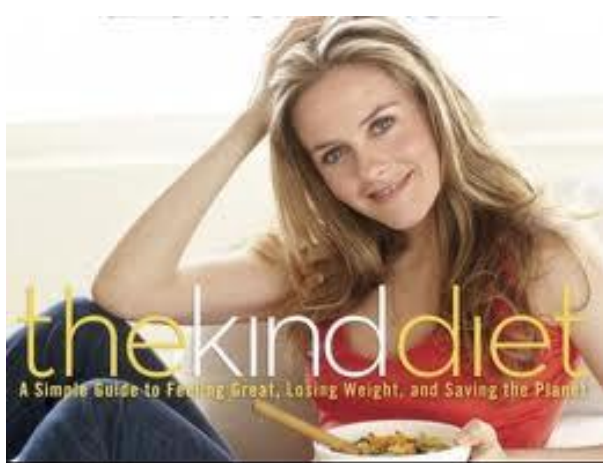
"It wasn't really insulin. You don't have diabetes yet. It was just a warning shot."

Prevention/Treatment

- What if I told you the most effective way to prevent and treat DM is:
 - 100% free!
 - Has minimal side-effects
 - Can be fun!
 - Has the added benefit of helping prevent and treat multiple conditions!
 - Can help reduce or eliminate the need for other medications!



- Loss of ~10% of your body weight can give you 80-90% benefit in treating diabetes!



Diet



- Determine how many calories you need to consume in a day to keep your current weight.
- Meet with a nutritionist/dietician.
- Eat whole foods (high in fiber/volume) and avoid processed foods/simple carbohydrates as much as possible.
- Avoid becoming overly hungry or too full.
 - Drink plenty of water (especially ~10-20minutes prior to eating)
 - Consider eating small and frequent meals (eat breakfast!)

Diet

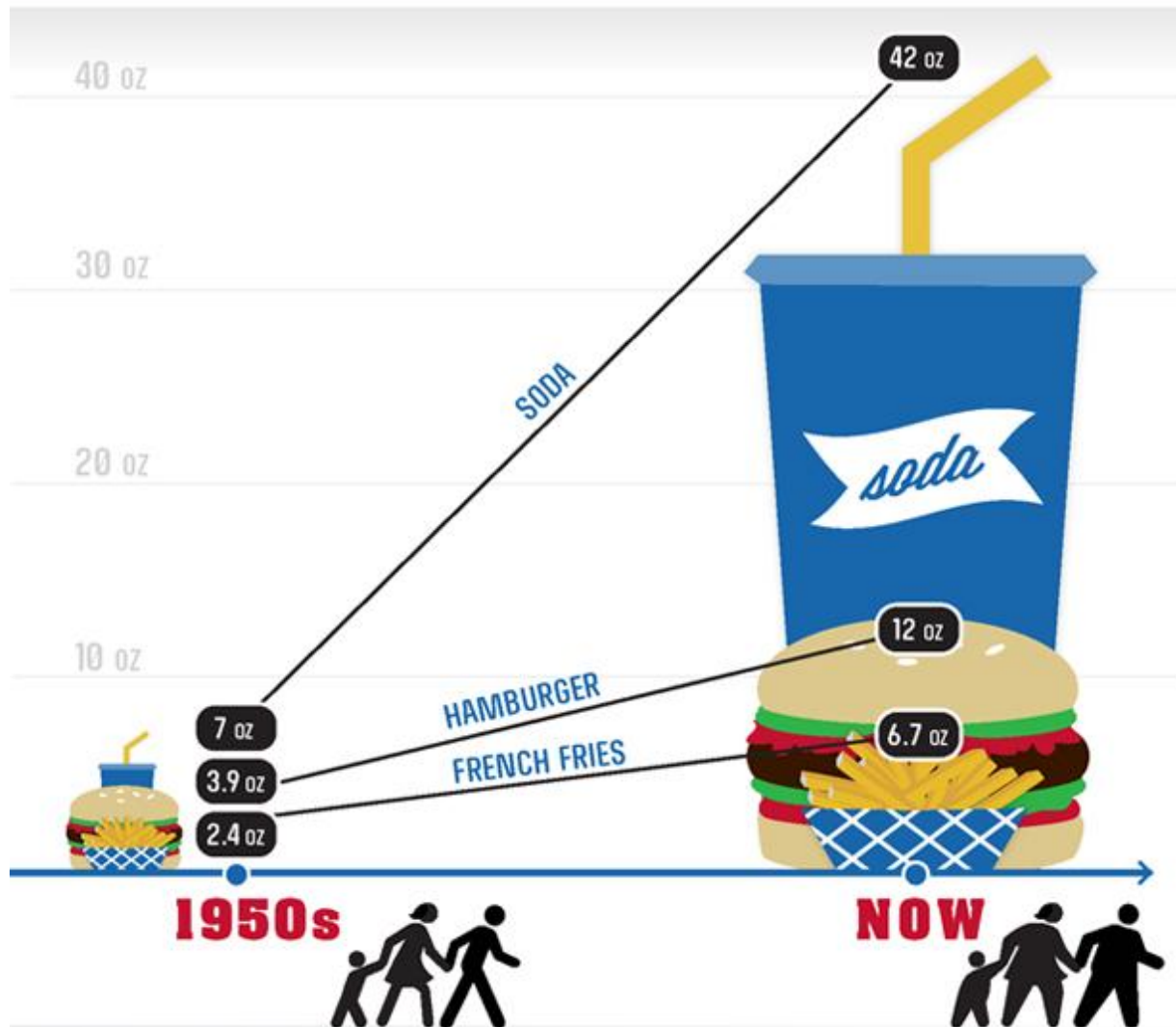
- Where do these extra calories come from?
- Try to eat calories rather than drink them.
- All apples are not the same size!



- Serving sizes have changed (along with the world's increasing waist circumference!)

THE NEW (AB)NORMAL

Portion sizes have been growing. So have we. The average restaurant meal today is more than four times larger than in the 1950s. And adults are, on average, 26 pounds heavier. If we want to eat healthy, there are things we can do for ourselves and our community: Order the smaller meals on the menu, split a meal with a friend, or, eat half and take the rest home. We can also ask the managers at our favorite restaurants to offer smaller meals.



Let's do the Math!

- 1 lb of fat = 3,500 calories
- 7 excess calories/day:
 - In 1 year = 1 lb weight gain, in 20 years = 20 lbs!
- 50 excess calories/day:
 - In 1 year = 5 lb weight gain, in 20 years = 100 lbs!
- 100 excess calorie/day:
 - In 1 year = 10 lb weight gain, in 20 years = 200 lbs!

Physical activity



- Wear a pedometer (fitbit)
 - figure out your average steps per day and increase that daily by 500 steps (5minutes) until you reach the goal of 10,000 steps/day
- Be active at least 30mins at moderate intensity (50-70% of maximum heart rate = $220 - \text{age}$) at least 5 days a week.
- Muscle burns more calories than fat...even at rest!
- Exercise makes your muscles more sensitive to insulin and able to utilize glucose -> prevents/treats DM
- Exercising does not fully counter balance the negative effects of sedentary behavior, so stand instead of sit or break up sitting with standing every 30minutes.



Sleep/stress



- Do people tell you that you snore or stop breathing at night? Do you wake up with a headache, dry mouth, fatigue? Consider being evaluated for obstructive sleep apnea (OSA).
- Treating OSA has been shown to improve glucose, blood pressure, pain tolerance and energy!
- Assess your stress level and how you can improve the amount of stress in your life...or at least your response to it.
- Steroids (eg. Prednisone, oral or topical or injection)
- Infection (poor dental care, urinary tract infections)

If you have Diabetes

- Endocrinologist/internist – every 3-6months
- ophthalmologist–retina exam every year
- Dentist – at least every 6months, floss twice a day
- Podiatrist – as needed
- Psychiatrist/psychologist – as needed
- DM education – as needed
- Vaccinations – influenza yearly, pneumonia (repeat if >65yo), zoster, tdap (booster every 10yrs), hepatitis B
- #1 treatment: diet and exercise!
- Oral medications and/or injectable medications: metformin, etc
- Other medications: Asa, statin, acei
- Consider continuous glucose monitoring (CGM)
- Sleep study? Assess for obstructive sleep apnea
- DEXA? Assess for osteopenia/osteoporosis
- Review medications (try to minimize medications that may increase glucose – hctz, statins, steroids)
- Consider checking other hormones that can effect your glucose: cortisol, IGF-1, testosterone, thyroid

DM treatment (s)

- After diet, exercise, sleep, lifestyle (stress) have been optimized....then consider the following medications.



Metformin (glucophage)

- Decreases production of glucose by the liver
- Improves insulin sensitivity
- No weight gain or hypoglycemia
- Reduces A1c by 1.5-2%
- Generic and cheap
- Can cause diarrhea, abdominal cramping and B12 deficiency
- Contraindicated in reduced kidney function

Sulfonylureas (glipizide, glyburide)

- Increases insulin secretion by the pancreas
- Can cause hypoglycemia (especially if reduced kidney function or not eating well)
- Causes weight gain
- Improves A1c by 1-2% but usually short term
- Low cost

Thiazolidinediones (Pioglitazone/actos, Rosiglitazone/avandia)

- Improves insulin sensitivity
- No hypoglycemia and improves cholesterol
- Causes weight gain (fluid retention), thinning of bones, heart failure/attack
- Can reduce A1c by 0.5-1.3%
- High cost

Alpha Glucosidase Inhibitors (acarbose)

- Inhibits an enzyme that breaks down carbohydrates
- Decreases glucose after you eat
- Reduces A1c by 0.5-1%
- Causes gas and diarrhea

GLP 1 receptor agonists (exenatide/byetta, liraglutide/victoza)

- Increases insulin secretion ONLY when glucose is elevated
- Decreases glucagon ONLY when glucose is elevated
- Can reduce A1c by 1.5%
- Slows gastric emptying
- Increases satiety
- Causes weight loss
- Some have nausea/diarrhea
- Rarely causes pancreatitis and may increase risk of pancreatic cancer and/or thyroid cancer
- Injectable, higher cost, need long term safety data

DPP4 inhibitor (januvia)

- Inhibits the enzyme that breaks down GLP-1
- Increases insulin secretion and decreases glucagon secretion
- No hypoglycemia
- Reduces A1c by 0.5-1%
- Weight neutral
- May increase risk of pancreatitis
- Higher cost, need long-term safety data

Bile acid sequestrants (welchol)

- Binds cholesterol
- No hypoglycemia
- Decreases A1c 0.5%
- Decreases LDL
- Can cause elevated triglycerides, constipation, may interfere with absorption of other medications.
- Higher cost

Other medications

- Dopamine agonist (cycloset)
- SGLT2 inhibitor (invokana, jardiance, farxiga)
- Amylinomimetic (symlin)
- Meglitinides (starlix, prandin)

Supplements

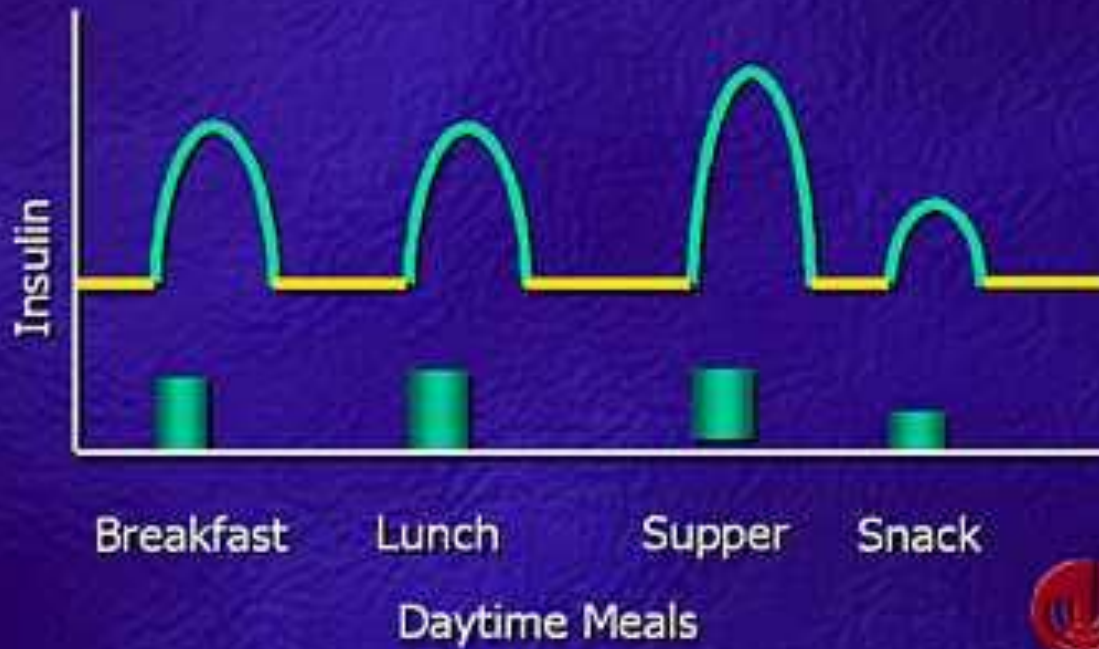
- Cinnamon:
 - 1 to 6 grams (1 gram = ½ teaspoon) a day
- Bitter Melon:
 - 50 to 100 milliliters (~3 to 6 tablespoons) of the juice daily.
- Magnesium:
 - 250 to 350 milligrams once a day
- Prickly Pear Cactus:
 - 1/2 cup of cooked cactus fruit a day
- Chromium:
 - 200 micrograms once daily
- Fenugreek:
 - 5 to 30 grams with each meal or 15 to 90 grams with one meal per day.
- Ginseng:
 - 1 to 3 grams a day in capsule

Other oral DM medications

- ACEi/ARB for blood pressure control and to protect your kidneys (contraindicated during pregnancy).
- Statins for cholesterol control and reducing cardiovascular disease (contraindicated during pregnancy).
- Consider ASA 81mg (or plavix if you have an allergy to ASA) if 10yr heart disease risk >10% (your doctor can calculate this with you)

Insulin

Normal Basal/Bolus Insulin Pattern



Insulin

- Long acting – lantus, levemir, NPH
- Short acting – novolog, humalog, apidra
- Basal, prandial and corrective scales.
- Insulin pumps (omnipod, medtronic, tslim)
- Insulin patch (V-GO)
- Insulin pumps reduce amount of insulin needed, improve glucose control, minimize hypoglycemia and weight gain compared to non-pump insulin.

Insulin

- Anyone on insulin should have a glucagon emergency kit and a medical alert bracelet or necklace or card in their wallet/purse that says they are on insulin.
- Check glucose before driving or operating dangerous machinery.
- Check glucose prior to and during exercise.
- Anyone on an insulin pump should be checking glucose at least 4 times a day and doing basal rate testing at least twice a year.

Bariatric Surgery

- If BMI >35 and diet and exercise not effective at losing weight, consider bariatric surgery.
- ~75% of obese patients had their diabetes resolve within days of surgery....but it can come back so this is not really a cure all!

DM Goals

- A1c <7% (check every 3-6 months)
- Fasting glucose 80-100 mg/dl
- Glucose before meals 80-120 mg/dl
- Glucose after meals <180 mg/dl
- TC <200, HDL >50, TG <150, LDL < 100 (<70*) (check every 6-12 months)
- Blood pressure < 130/80
- Urine Microalbumin (check yearly for kidney disease) <30mg/L
- I would add body mass index (BMI) < 25 (normal weight)
- No smoking!

Hypoglycemia

- Hypoglycemia = glucose < 70
- Symptoms: change in mentation, sweating, shakiness
- If you have a glucose <70 WITHOUT symptoms you must tell your doctor.
- Check glucose if you can and take glucose tab (15-20grams) and recheck in 15 minutes and if still low repeat above
- If it is not safe to eat/drink glucose, you may need glucagon injection (hormone that increases glucose). Anyone on insulin should have this.

Complications

- Retinopathy (eye disease)
- Nephropathy (kidney disease)
- Neuropathy (nerve disease)
- Cardiovascular (heart disease)
- Poor wound healing (can lead to foot amputations)
- Prone to infections (such as urinary tract infections)
- Erectile dysfunction
- Depression
- Osteopenia/osteoporosis
- Pancreatitis

The A,B,C,**D**s of *Diabetes*

- Now that we know how important it is to be knowledgeable about DM and we are armed with vital information, we can start to help ourselves and our friends, family and future become healthier!
- DM may be a part of our lives but we can control its potential complications with diet, exercise, proper sleep and stress levels and a whole host of continually improving medical treatment options.

Thank you!

Danielle Weiss, MD

Center for Hormonal Health and Well-Being

477 N. El Camino Real Suite D200

Encinitas, CA 92024

(760) 753- 3636 (ENDO)

www.centerforhormonalhealth.com