

# **Gestational Diabetes: Getting on the Same Page**

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# Gestational Diabetes

- **Carbohydrate Intolerance first recognized during pregnancy**
- **Varying prevalence**
- **U.S.: 5 – 6% (current criteria)**
- **240,000 births / year**
- **Increasing with increase in risk factors such as obesity**

# **Gestational Diabetes**

## **Maternal Outcomes**

- **Gestational hypertension**
- **Preeclampsia**
- **Subsequent type 2 diabetes**
- **Cesarean delivery**
- **Subsequent CV disease**

# **Gestational Diabetes**

## **Fetal Outcomes**

- **Preterm birth (preeclampsia)**
- **Macrosomia**
- **Shoulder dystocia**
- **RDS**
- **Neonatal metabolic complications**

# Gestational Diabetes Standard Screening

- **Two steps**
- **50 gram GCT (1 hour – 1 test)**
- **100 gram GCT (3 hours – 4 tests)**
- **14 – 23% require second step**
  - **Varies by threshold**
- **Recommended by ACOG**

# **Gestational Diabetes Controversies**

- **Value of routine screening**
- **Most appropriate method**
- **Most appropriate thresholds**
- **IADPSG advocates one step testing (FBS, 1 hour and 2 hour) with GDM requiring 1 abnormal**
- **May increase GDM by 2 – 3 fold**
- **Impetus for consensus conference**

# **Gestational Diabetes**

## **HAPO**

- **Observational Cohort Study**
- **International Multi-center**
- **25,505 women**
- **24 – 32 weeks gestation**
- **75 gram oral GTT**
  - **Fasting, one hour, two hours**
- **Adverse pregnancy outcomes based on increased glucose levels**

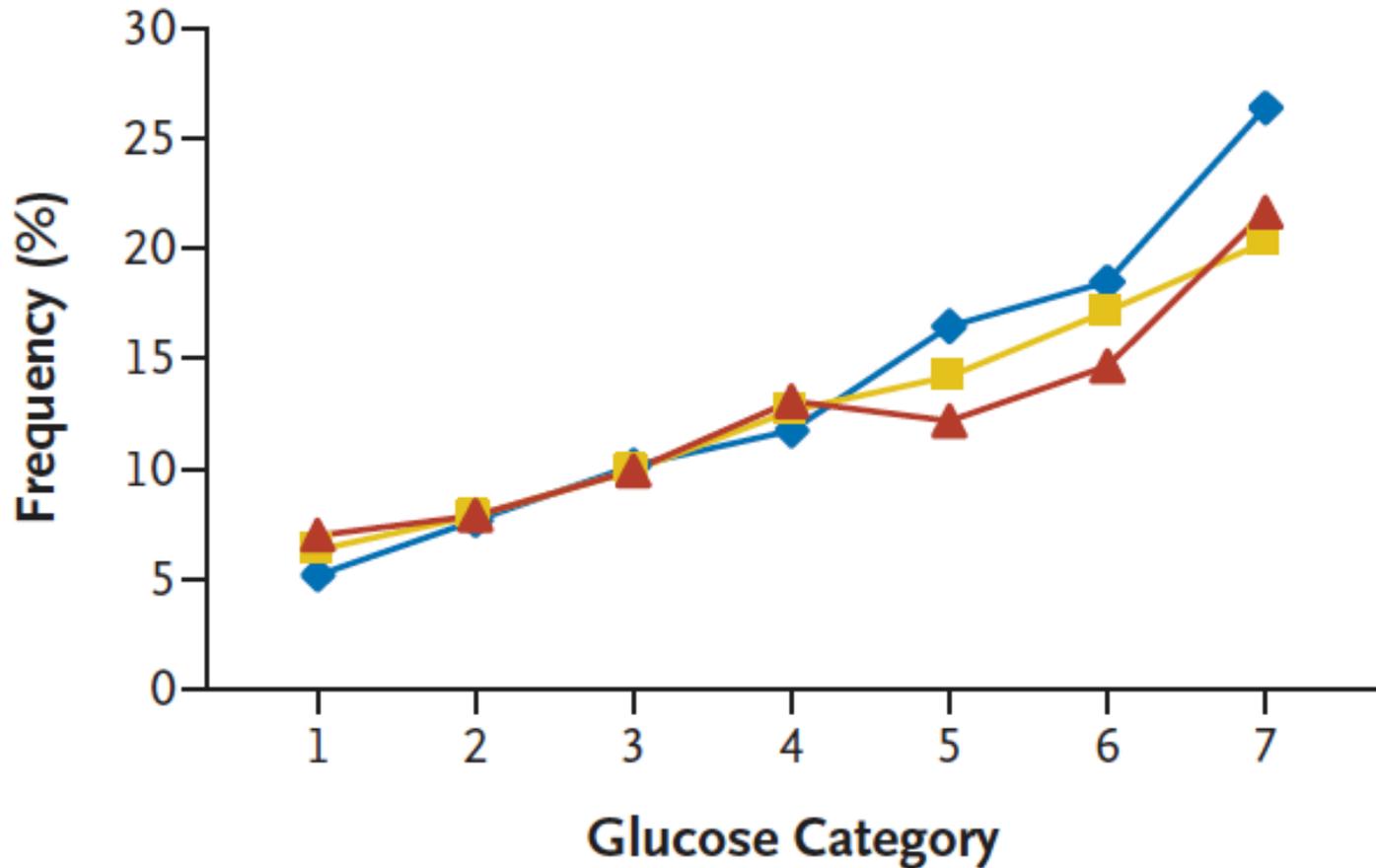
# Gestational Diabetes

## HAPO

- Clear diabetes excluded (unblinded)
  - FBS > 105 mg/dL
  - 2 hour > 200 mg/dL
- Fasting (1 SD): 6.9 mg/dL
- One hour (1 SD): 30.9 mg/dL
- Two hours (1 SD): 23.5 mg/dL
- Adjusted odds ratios for serial increases in glucose

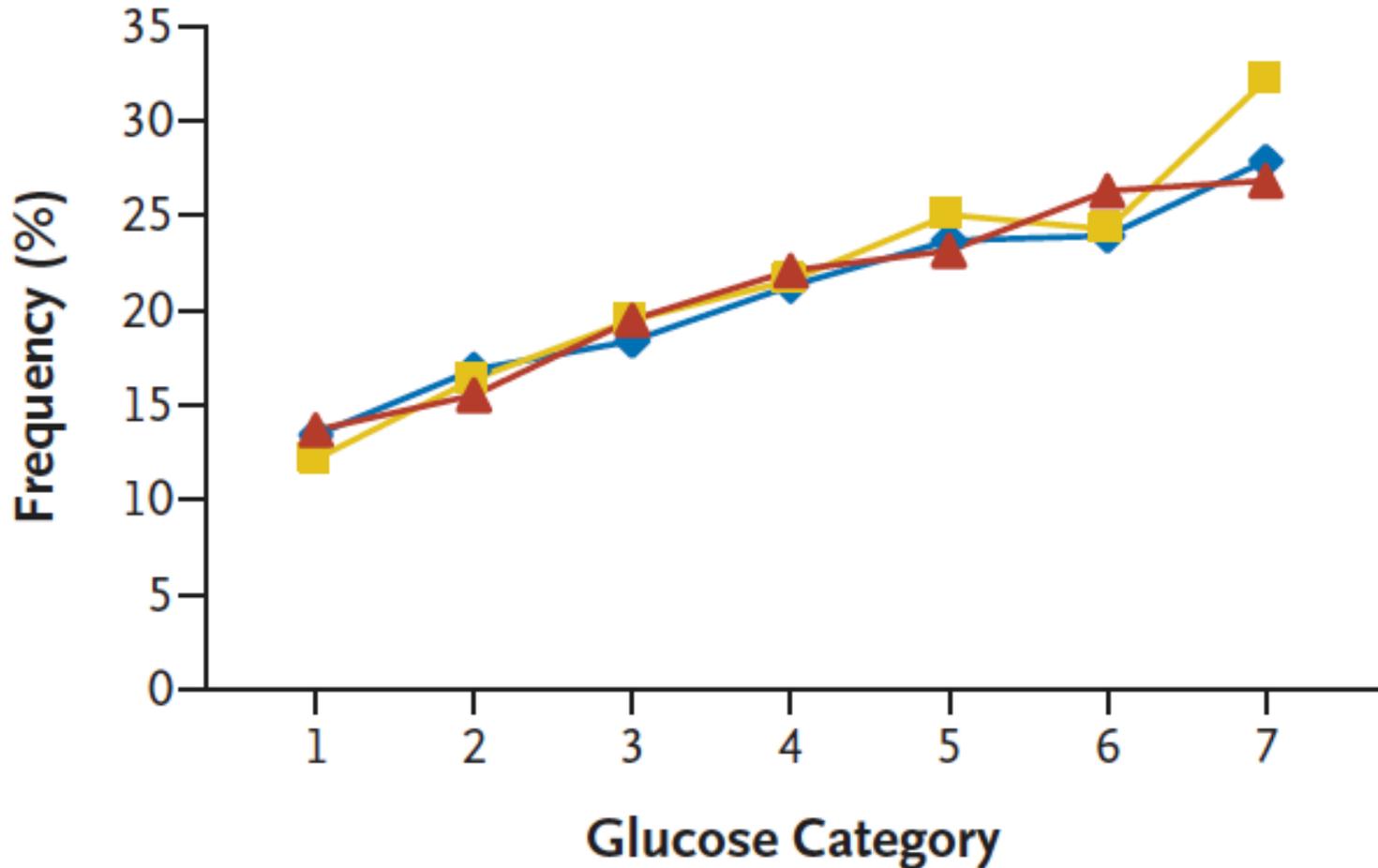
# Gestational Diabetes

A Birth Weight >90th Percentile



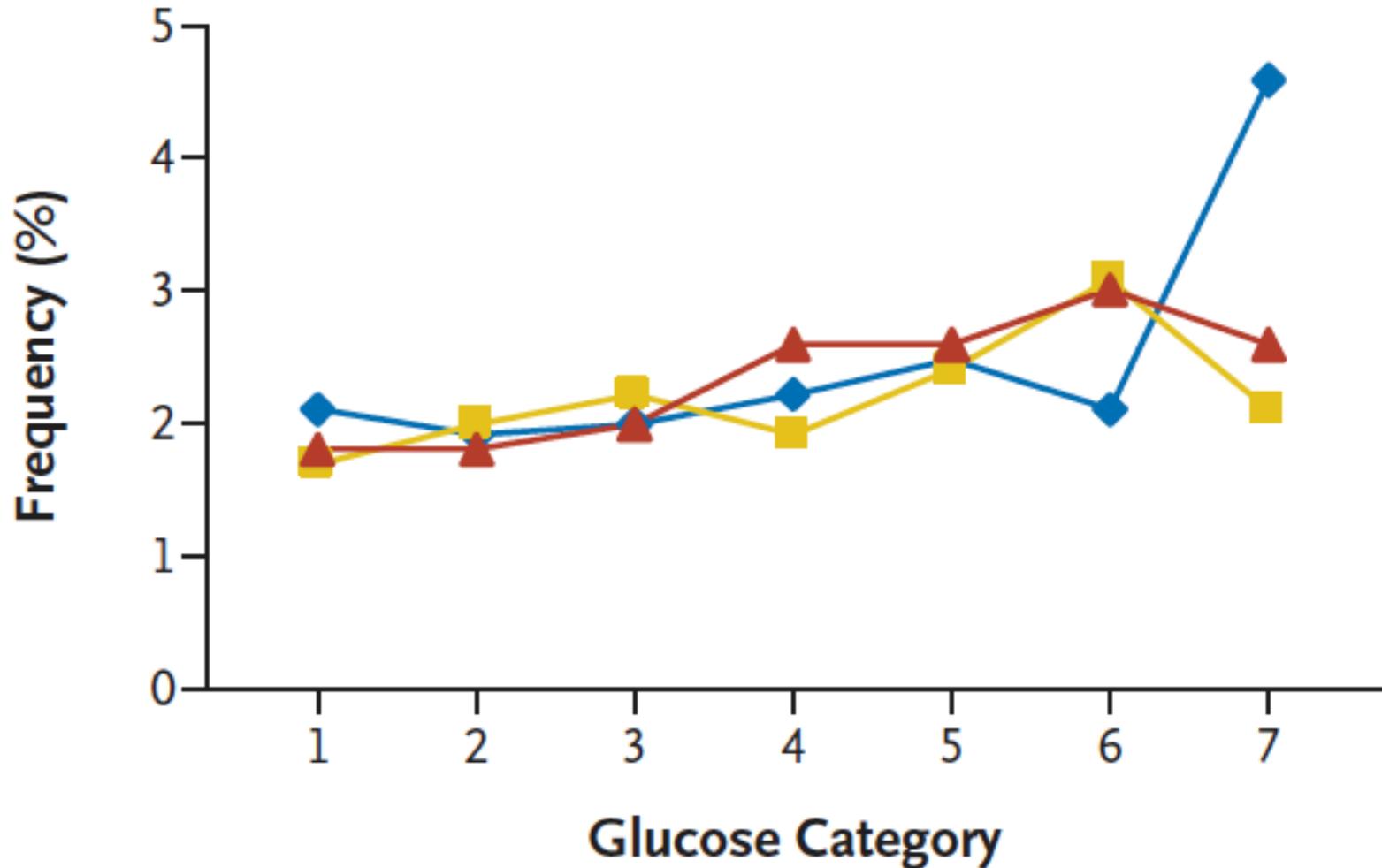
# Gestational Diabetes

## B Primary Cesarean Section



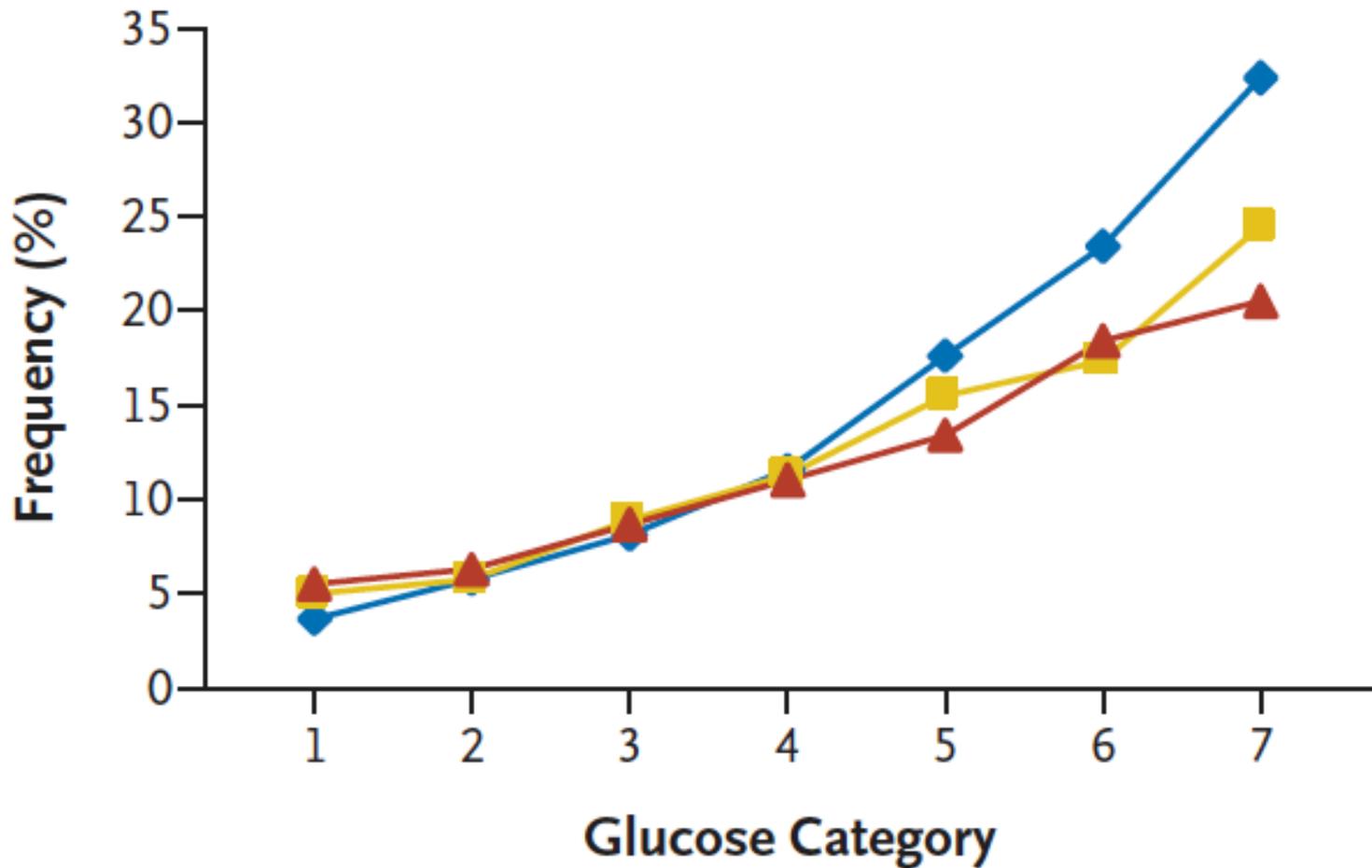
# Gestational Diabetes

C Clinical Neonatal Hypoglycemia



# Gestational Diabetes

D Cord-Blood Serum C Peptide >90th Percentile



# Gestational Diabetes

## HAPO (FBS)

- **Macrosomia:** 
  - OR 1.38 (1.32 – 1.44)
- **Cord blood C-peptide > 90%**
  - OR 1.55 (1.47 – 1.64)
- **Primary cesarean delivery**
  - OR 1.11 (1.06 – 1.15)
- **Neonatal hypoglycemia**
  - OR 1.08 (0.98 – 1.19)

# Gestational Diabetes

## MFMU

- Observational Cohort Study
- U.S. Multi-center
- 24 – 32 weeks gestation
- Type II DM excluded
- Traditional “two step” testing
- $> 200$  mg/dL on one hour excluded
- $\geq 2$  abnormal values on 3 hour GTT with normal FBS – included (“mild”)

# Gestational Diabetes

## MFMU



- Random assignment to either usual prenatal care or treatment (counseling / diet / insulin)
- N = 958 (485 RX; 473 Controls)
- Primary outcome:
  - Composite of stillbirth or perinatal death and neonatal complications

# Gestational Diabetes

## MFMU



- Random assignment to either usual prenatal care or treatment (counseling / diet / insulin)
- N = 958 (485 RX; 473 Controls)
- Primary outcome:
  - Composite of stillbirth or perinatal death and neonatal complications

# Gestational Diabetes

## MFMU



- **Primary outcomes:**
  - Rx: 32.4%
  - Control: 37%
  - No difference!
  - No perinatal deaths!

# Gestational Diabetes

## MFMU

- **Secondary outcomes (Rx vs control):**
  - Mean birth weight: 3302 vs 3408 gms
  - Neonatal fat mass: 427 vs 464 gms
  - Macrosomia: 5.9% vs 14.3%
  - Shoulder dystocia: 1.5% vs 4.0%
  - Cesarean delivery: 26.9% vs 33.8%
  - PIH: 8.6% vs 13.6%

# Gestational Diabetes

## IADPSG

- 2 hour 75 gram oral GTT
- “One step”
- Abnormal defined as 1.75 SD > mean
- FPG  $\geq$  92 mg/dL
- One hour  $\geq$  180 mg/dL
- Two hour  $\geq$  153 mg/dL
- Total incidence of GDM is 17.8% (HAPO)

# Gestational Diabetes Controversies

- **Key issue:**
  - **Should criteria for diagnosis of GDM be changed?????**

# **Gestational Diabetes**

## **Question 1**

- **What are the current screening and diagnostic approaches for GDM, what are the glycemic thresholds for each approach, and how were these methods chosen?**

# **Gestational Diabetes**

## **Current approaches**

- **Two-step approach (NDDG and Carpenter- Coustan)**
- **50 gram GCT (not fasting)**
- **Threshold (130 – 140 mg/dL)**
- **100 gram GCT (fasting)**
- **FBS and 1, 2, 3 hours (2 abnormal)**
- **Canadian: Modified 2 step with 75 gram GCT as second step**

# **Gestational Diabetes**

## **Current approaches**

- **One step approach**
  - **WHO and IADPSG**
- **75 gram GCT (fasting)**
- **FBS and 1, 2 hours or 2 hours**
- **One abnormal**
- **Thresholds based on 1.75 fold increased risk in adverse pregnancy outcomes**

# **Gestational Diabetes**

## **Question 2**

- **What are the effects of various diabetes mellitus screening / diagnostic approaches for patients, providers, and U.S. healthcare system?**

# **Gestational Diabetes**

## **Effect of approaches**

- **Adopting IADPSG criteria:**
  - **All women would have FBS / GCT**
  - **Increase proportion of GDM**
  - **Diagnosis of GDM increases cost / time to patient, provider, healthcare**
  - **Dietician, educator, clinic visits, NSTs, ultrasounds**
  - **Childcare, transportation, missed work**

# **Gestational Diabetes**

## **Effect of approaches**

- **Adopting IADPSG criteria:**
  - **Clinic workload would increase by 30%**
  - **450,000 more education visits**
  - **1,000,000 more clinic visits**
  - **1,000,000 more prenatal testing visits**
  - **Increase in U.S. cost for GDM from 636 million to 2 billion**
  - **Quality cost-effectiveness data lacking**

# **Gestational Diabetes**

## **Question 3**

- In the absence of treatment, how do health outcomes of mothers who meet various criteria for gestational diabetes mellitus and their offspring compare with those who do not?**

# **Gestational Diabetes Health Outcomes**

- **Maternal outcomes – increased:**
  - **Cesarean delivery**
  - **Preeclampsia**
  - **Gestational hypertension**
  - **Subsequent diabetes and metabolic syndrome**

# **Gestational Diabetes Health Outcomes**

- **Fetal outcomes – increased:**
  - **Macrosomia**
  - **Shoulder dystocia (rarely brachial plexus injury)**
  - **Hypoglycemia**
  - **Hyperbilirubinemia**
  - **Potential increase in subsequent obesity**

# Gestational Diabetes

## Health Outcomes

- **HAPO study**
  - 25,505 women, 15 centers
  - Glucose tolerance 24 – 32 weeks
  - Observational cohort
    - Traditional GDM identified
      - FBS > 105; 2 hour > 200; random > 160
    - “Mild” GDM - blinded

# Gestational Diabetes

## Health Outcomes

- **HAPO study**
  - **Increasing glucose levels**
    - **Increased birth weight**
    - **Increased infant body fat**
    - **Increased cord C peptide**
    - **Increased primary CS**
    - **Increased risks for preterm birth, preeclampsia, shoulder dystocia, hyperbilirubinemia**

# **Gestational Diabetes**

## **Question 4**

- **Does treatment modify the health outcomes of mothers who meet various criteria for gestational diabetes mellitus and their offspring?**

# **Gestational Diabetes Health Outcomes**

- **Few data available (maternal)**
- **Treatment (using 2 step approach)**
  - **Reduces hypertensive disorders (40%)**
  - **Reduces shoulder dystocia (60%)**
  - **Absolute risk decreased 3.5 to 1.5%**
  - **No change in cesarean delivery!**
  - **Inconsistent data regarding weight gain, induction, other outcomes**

# **Gestational Diabetes Health Outcomes**

- **Few data available (fetal)**
- **Treatment (using 2 step approach)**
  - **Reduction in macrosomia (50%)**
  - **Absolute difference: 150 grams**
  - **No difference in neonatal hypoglycemia!**
  - **No data regarding prematurity, NICU admits, mortality, long term outcomes**

# Gestational Diabetes

## Health Outcomes

- **Caution!**
  - **Studies may not apply to real world**
    - **Motivated, closely monitored women**
  - **Many confounding treatments today (e.g. oral hypoglycemics)**
  - **Varied criteria for GDM**
    - **Milder GDM may not have same benefits**

# **Gestational Diabetes**

## **Question 5**

- **What are the harms of treating gestational diabetes, and do they vary by diagnostic approach?**

# **Gestational Diabetes**

## **Harms of Increased Dx**

- **Patient anxiety**
- **Lower sense of well being**
- **Loss of personal control**
- **Potential increase in false positive results (with one vs two step test)**
- **Risks of oral hypoglycemic agents and insulin**

# **Gestational Diabetes**

## **Harms of Increased Dx**

- **Increased risk of induction**
- **Increased antenatal testing**
- **Increased ultrasound**
- **Increased cesarean delivery**
- **Increased neonatal care**
- **Increased cost**
- **All of these concerns are “theoretical”**

# **Gestational Diabetes**

## **Question 6**

- **Given all of the above, what diagnostic approach(es) for GDM should be recommended, if any?**

# **Gestational Diabetes**

## **Recommended Approach**

- **Current two step approach**
  - **5-6% GDM**
  - **Originally used to predict type 2 DM**
  - **Recent evidence that this IDs adverse maternal and fetal outcomes**
  - **Most women do not need to fast**

# **Gestational Diabetes Recommended Approach**

- **Newly proposed one step approach:**
  - **IDs increased risk of maternal and perinatal morbidities**
  - **15 – 20% GDM**
  - **Some operational advantages**
    - **One visit instead of two**
    - **Faster Dx and Rx**
  - **Consistency throughout the world**

# **Gestational Diabetes**

## **Recommended Approach**

- **Criteria to justify change to one step**
  - **The additional women identified with GDM have an increase in morbidity**
  - **These morbidities can be reduced by interventions in the additional subgroup of women**
  - **The benefits of the decrease in morbidity is greater than potential harms**

# **Gestational Diabetes**

## **Recommended Approach**

- **Criteria to justify change to one step**
  - **The additional women identified with GDM have an increase in morbidity**
  - **True! However, no clear threshold**
  - **Also, many outcomes are surrogate markers of true morbidity**
  - **No clear decrease in brachial plexus injury, perinatal mortality, preterm birth, subsequent obesity or metabolic disease**

# Gestational Diabetes

## Recommended Approach

- **Criteria to justify change to one step**
  - **These morbidities can be reduced by interventions in the additional subgroup of women**
  - **Not true! Results of RCTs in mild GDM cannot be generalized to IADPSG criteria**
  - **Major morbidities such as composite neonatal morbidity, CS, and long term maternal and infant outcomes are not improved**

# Gestational Diabetes

## Recommended Approach

- **Criteria to justify change to one step**
  - **The benefits of the decrease in morbidity is greater than potential harms**
  - **Not true!**
  - **Increased costs and burden on patients, clinicians and health care systems**
  - **Anxiety / psychosocial burden**
  - **Medical harms (CS / inductions)**

# **Gestational Diabetes Recommended Approach**

- **Conclusions**

- **Not enough data to justify change**
- **Still are potential benefits to IADPSG**
  - **More research is needed**
- **Single standard for two step approach should be adopted**

# **Gestational Diabetes**

## **Question 7**

- **What are the key research gaps in the diagnostic approach of gestational diabetes mellitus?**

# **Gestational Diabetes Research Gaps**

- **Develop a U.S. approach that is consistent with the world.**
  - **Perhaps using RR 2.0 in HAPO**
  - **Would allow one step approach**
  - **Avoid increase in Dx**

# **Gestational Diabetes Research Gaps**

- **Determine if additional women with GDM based on IAPDSG criteria can benefit from diagnosis and treatment**
  - **RCTs needed**
  - **Need to assess important outcomes**

# **Gestational Diabetes Research Gaps**

- Cost / benefit analyses**
- Patient burden / preferences**
- Real world impact of GDM Dx and Rx**
- Lifestyle interventions in pregnancy**
- Long term impact: more pregnancies**
- Long term impact: mother and child**
- Interventions to improve long term impact**