

# Using Clinical Decision Trees to Identify Individuals at Risk for Sexually Transmitted Diseases During Pregnancy

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**“The important thing in science is not so much to obtain new facts as to discover new ways of thinking about them.”**

**William Bragg Sr.**

# New Approaches to the Same Problem

- Main goal of HIV/STD research is to identify factors that put people at risk
- Tend to use same variables and methods
- These methods are not easy to implement in clinical settings
- Purpose of this study is to use a method to identify risk groups for STDs during pregnancy that can be easily implemented in prenatal care clinics

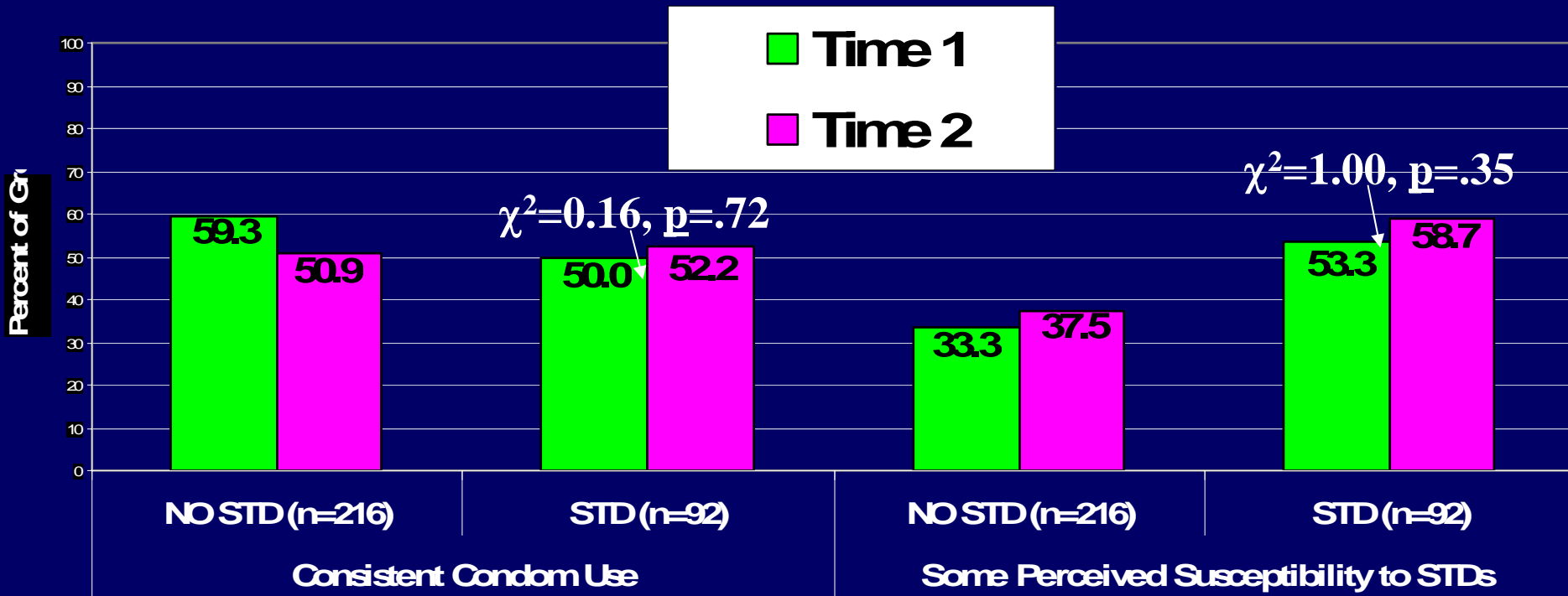
# Women, Pregnancy, & Sexual Risk

- 1 out of every 4 sexually active adolescents have had an STD<sup>1</sup>
- Young pregnant women are at particularly high risk<sup>2</sup>
  - 80% have unprotected sex and are less likely to use condoms than non-pregnant young women
  - 19-39% get STD during pregnancy
  - 14-39% get STD 6-10 months postpartum
  - 2x as likely to get an STD compared to nulliparous peers

# A “Window of Opportunity” for Prevention

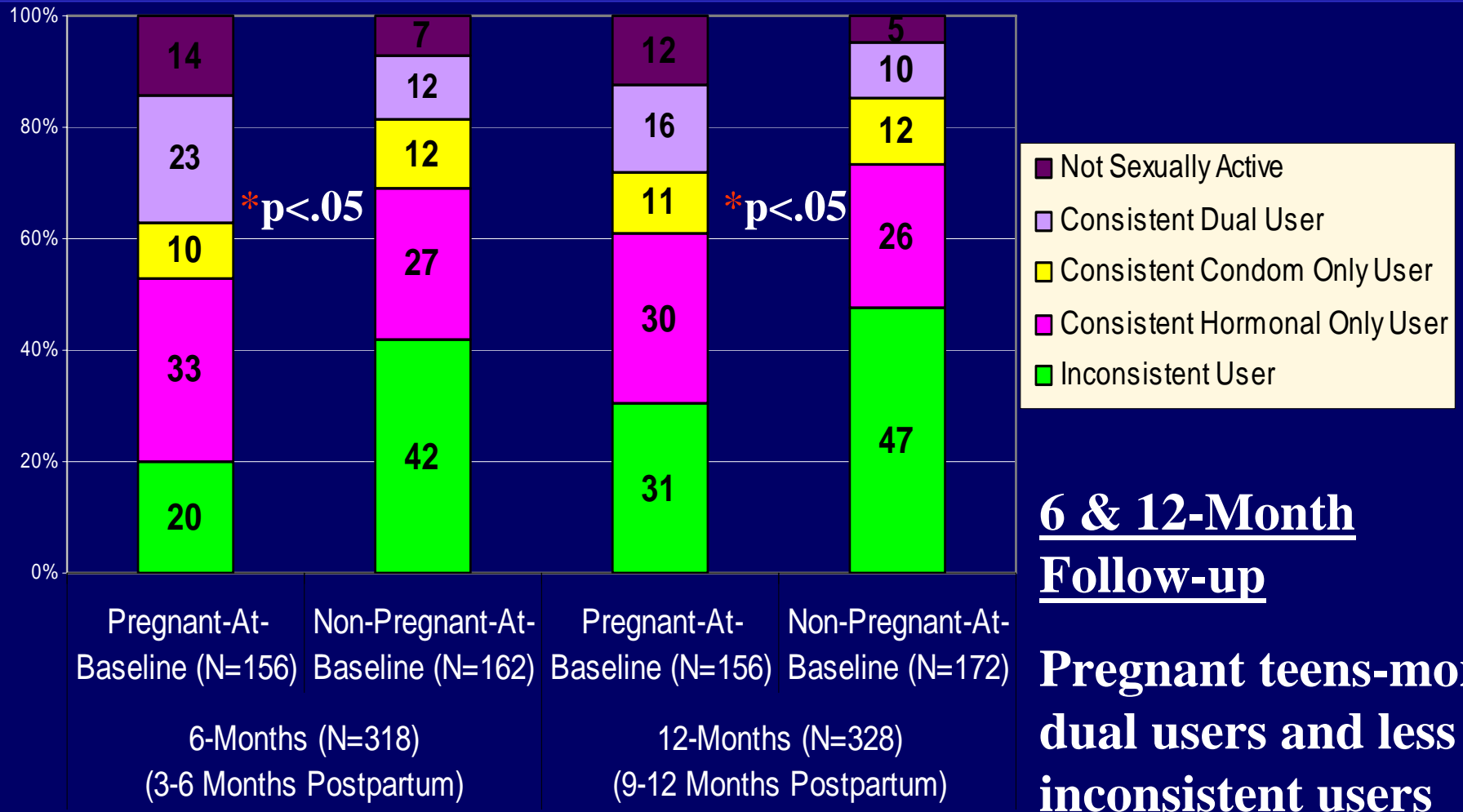
- Frequent contact with health care providers
- Behavior change during pregnancy
- Motivated to have healthy pregnancy and child
- STDs vs. Pregnancy as a motivator for change

# Incident STD: No Change in Condom Use and Perceived Susceptibility



**\*No significant change within and between groups**

# Pregnancy: Increase in Hormonal Contraception and Dual-Use



<sup>1</sup>Kershaw et al., 2003, Journal of Adolescent Health

# A “Window of Opportunity” for Prevention

- STDs vs. Pregnancy as motivator to change
  - STD not enough to motivate behavior change
  - Pregnancy leads to positive reproductive health changes
  - Pregnancy as a potential “window of opportunity” for intervention
- Need to identify subgroups at varying risk during pregnancy and implement treatment, care, and prevention that best match subgroups

# Ways to Identify Risk Subgroups

- Go beyond medical and sexual history questions
  - Traditional: Age, # of partners, condom use, STD history
  - New: Ecological
    - Individual, dyad, family/community factors
- Go beyond traditional linear statistical approaches
  - Traditional: Multiple and logistic regression
    - Assumes simple linear relationships
    - Difficult to interpret and implement in clinical settings
  - New: Classification trees
    - Recursive partitioning

# Classification Tree Analysis

- **A non-parametric technique that recursively partitions groups into smaller subgroups that maximally differ on a desired outcome**
- **Cross between stepwise regression and cluster analysis**

# How to Conduct a Classification Tree Analysis?

- Growing
  - Start with all subjects in 1 group (parent node)
  - Divide into “child nodes” based on best predictor
  - Based on all possible variable splits/combinations
  - Repeat process for each child node
- Pruning
  - Compares error rates of subtrees
  - Eliminate spurious branches
- Cross-Validation
  - Iterative replication (10-fold validation)
  - Compares error rates of subtrees

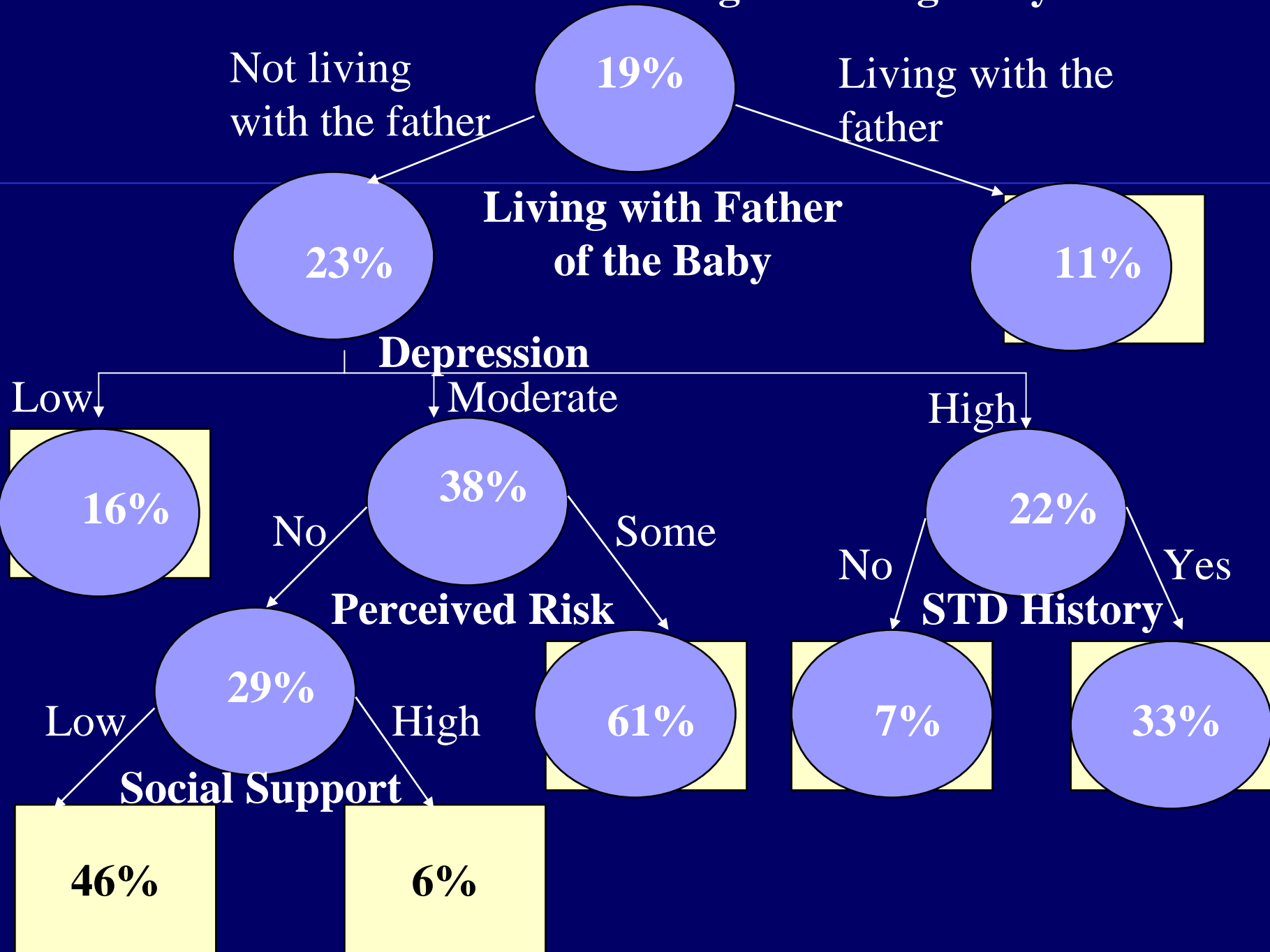
# Study Sample and Methods

- Longitudinal RCT design
- 647 pregnant women from non-intervention arm
  - 2 large hospital obstetrics and gynecology clinics
  - 75% African-American, 16% were Latina
  - Age: M= 20.4 years (SD=2.6)
  - Condom use % in the past 6 months: M=36 (SD=37)
  - 51% History of an STD
  - Using Time 1 (18 weeks GA) and Time 2 (35 weeks GA)

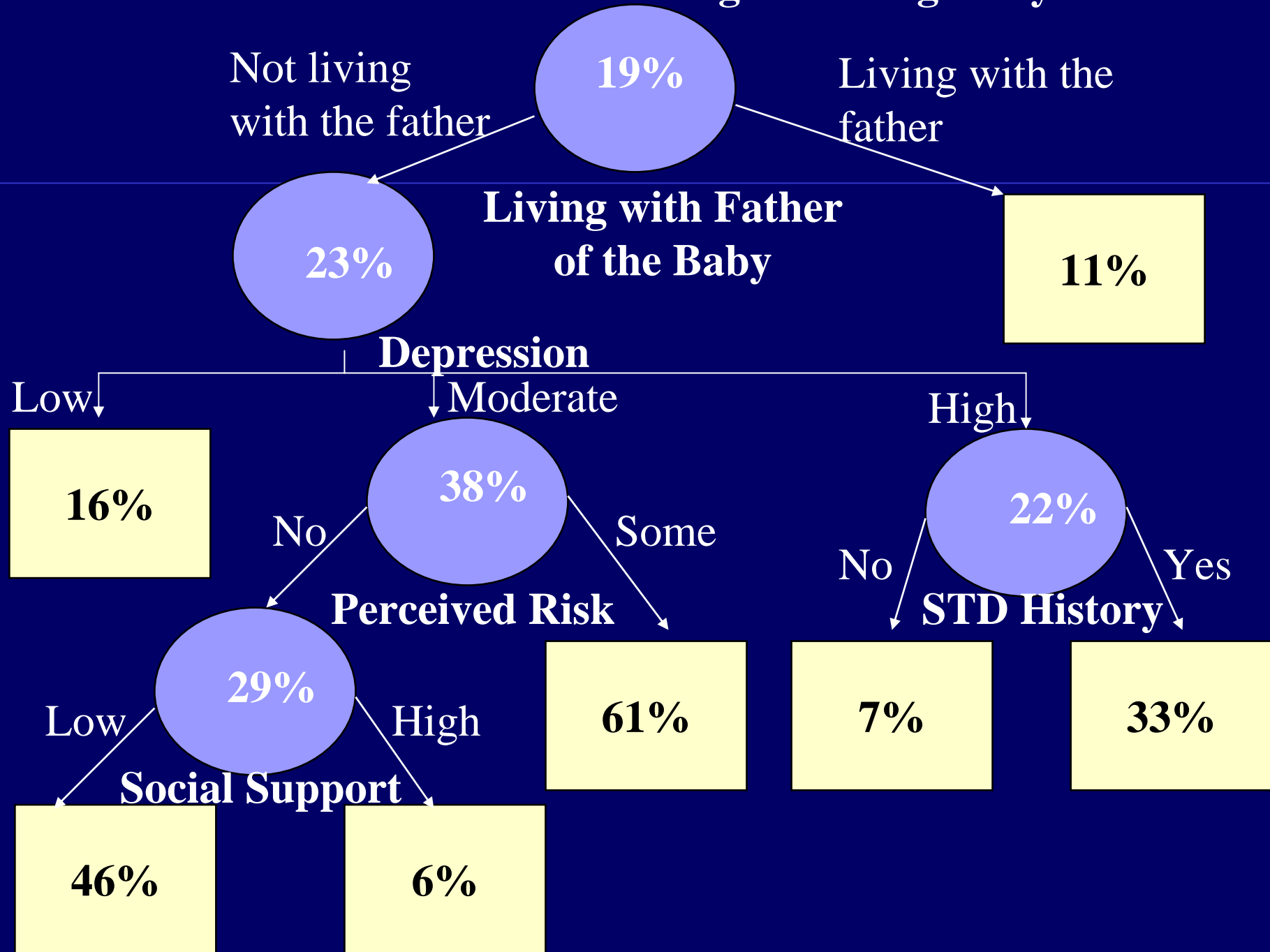
# Measures

- **Dependent Variable:** Incident STD at Time 2
- **Predictors at Time 1:**
  - **Individual**
    - **Demographic:** parity, education, age
    - **Behavioral:** % condom use, # of partners, unprotected sex with a risky partner, history of an STD
    - **Psychological:** depression, stress, barriers to condom use, perceived risk, HIV/STD risk knowledge
  - **Dyad**
    - Relationship with the father of the baby
    - Living with the father of the baby
    - Relationship duration
    - Partner age
    - Partnership commitment
  - **Family/Community**
    - Social support
    - Peer norms of condom use

# Incident STD During Late Pregnancy



# Incident STD During Late Pregnancy



# Results

- Cross-validation showed good replicability
- Conducted logistic regression to:
  - Test whether tree groups significantly predict incident STD after controlling for common clinically used demographic and sexual risk variables
    - Parity, age, education, # sex partners, condom use, STD history
      - Accounted for 10% of the variance of STDs ( $p < .01$ )
    - Tree groups
      - Accounted for an additional 13% of the variance ( $p < .001$ ) above and beyond demos and sexual risk variables
  - Shows that tree groups are not mere proxies to demographic and sexual risk factors

# Results

- Conducted logistic regression to:
  - Directly compare the predictability of the classification tree groups and the predictability of the 6 common demographic and sexual risk variables

	Variance accounted for	Sensitivity
Demos and Sexual Risk	10%	72%
Classification Tree	17%	79%

# Conclusions

- Classification trees had better predictability, sensitivity, and equal specificity than traditional logistic regression models.
- Shows importance of:
  - Non-parametric analytic techniques
  - Modeling complex relationships
  - Ecological approaches

# Conclusions

- Important to expand the type of questions assessed in clinical settings regarding STD risk
  - Only 1 of the 5 predictors were traditional demographic, medical, or sexual risk indicators (e.g., STD history)
  - Condom use, # partners, age—did not predict
  - Individual (depression, perceived risk), dyad (living with the father), and family/community (social support) all predicted STDs
  - Living with father was most important
    - important to understand relationship and family context

# Conclusions

- Classification trees identified groups at high risk for STD in later pregnancy from characteristics early in pregnancy
  - 3 high risk groups
    - Not living with father, moderate depression, perceived STD risk
    - Not living with father, moderate depression, low social support
    - Not living with father, high depression, history of STD
- Clinicians can use tree to develop screening tools that guide care, treatment, and prevention within prenatal care setting
- Work with public health practitioners to choose and implement prevention programs that best fit characteristics of risk groups
- Complement and extend clinical care to include prevention of future negative reproductive health outcomes