



# **ASSOCIATIONS BETWEEN CHRONIC DISEASE AND PREMATUREITY IN HAWAI'I, 2012-2014**

**Presented by Divya Patil, MPHc  
Graduate Student Epidemiology Program (GSEP)  
Family Health Services Division**

**September 12, 2017  
Honolulu, HI**

# WHAT HAVE I BEEN UP TO THIS SUMMER?

- Domestic Violence Training
- Child Death Review
- Maternal Mortality Review
- Title V Block Grant Review





# PUBLIC HEALTH SIGNIFICANCE

- Studies on single chronic diseases during preconception have found associations with negative pregnancy outcomes
  - Chronic and gestational diabetes have been found to be risk factors for preterm birth <sup>2</sup>
  - Overweight and obese women have a higher risk of induced preterm births <sup>3</sup>



<sup>2</sup> Rosenberg TJ, Garbers S, Lipkind H, Chiasson MA. Maternal obesity and diabetes as risk factors for adverse pregnancy outcomes: differences among 4 racial/ethnic groups. American journal of public health. 2005 Sep;95(9):1545-51.

<sup>3</sup> McDonald SD, Han Z, Mulla S, Beyene J. Overweight and obesity in mothers and risk of preterm birth and low birth weight infants: systematic review and meta-analyses. Bmj. 2010 Jul 20;341:c3428.

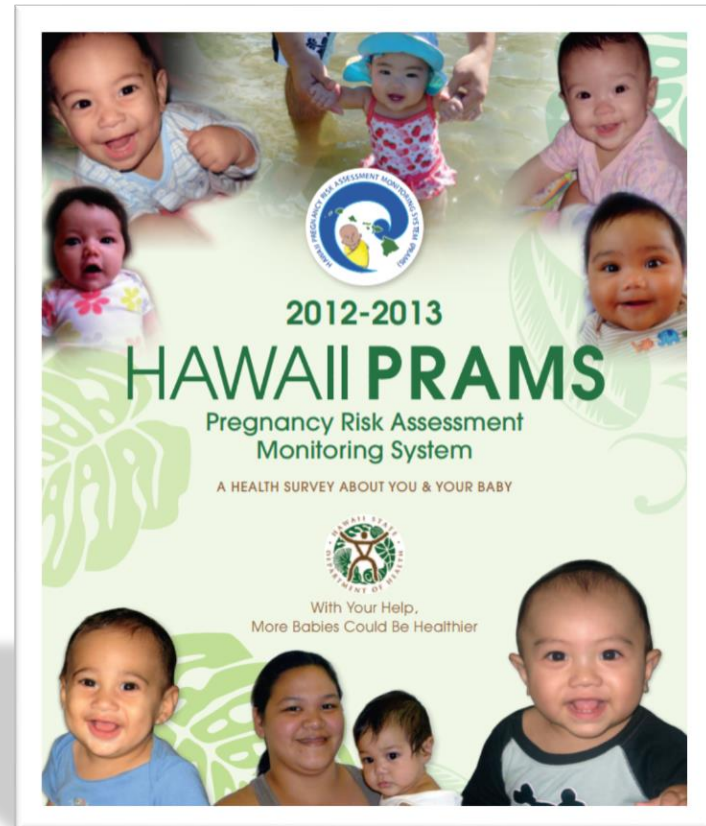
# STUDY QUESTION

Is there an association between number of chronic conditions and preterm or early term birth in Hawai'i?



# PREGNANCY RISK ASSESSMENT AND MONITORING SYSTEM (PRAMS)

- Started in 1987 to collect state-specific information on maternal behaviors and experiences before, during, and after pregnancy
  - Hawai'i PRAMS began as a pilot program in 1999 and became an official PRAMS state in 2000
- Funded by the Centers for Disease Control and Prevention (CDC)



# PREGNANCY RISK ASSESSMENT AND MONITORING SYSTEM (PRAMS)

- Mailed questionnaire
  - Followed up by telephone
  - 200 mothers invited to participate
- Core questions and state-specific questions
- Topics: unintended pregnancy, contraception, breastfeeding, smoking/alcohol use, postpartum depression, IPV



# METHODS

- 2012-2014 Hawaii PRAMS
  - N=3704
- Outcome
  - Preterm and Early Term Birth
- Exposure
  - Multiple Chronic Conditions
- Other Covariates
  - Age, race/ethnicity, smoking, insurance status, infant's sex, marital status, previous preterm birth
- Analysis using SAS and SUDAAN



# OUTCOME

## ○ Preterm and Early Term Birth

- Full Term: 39-44 weeks
- Early Term: 37-38 weeks
- Late Preterm: 35-36 weeks
- Moderate Preterm: 32-34 weeks
- Very Preterm: <32 weeks



# RISK FACTORS

## ○ Multiple Chronic Conditions

- Hypertension before and during pregnancy
- Diabetes before and during pregnancy
- Pre-pregnancy overweight or obesity

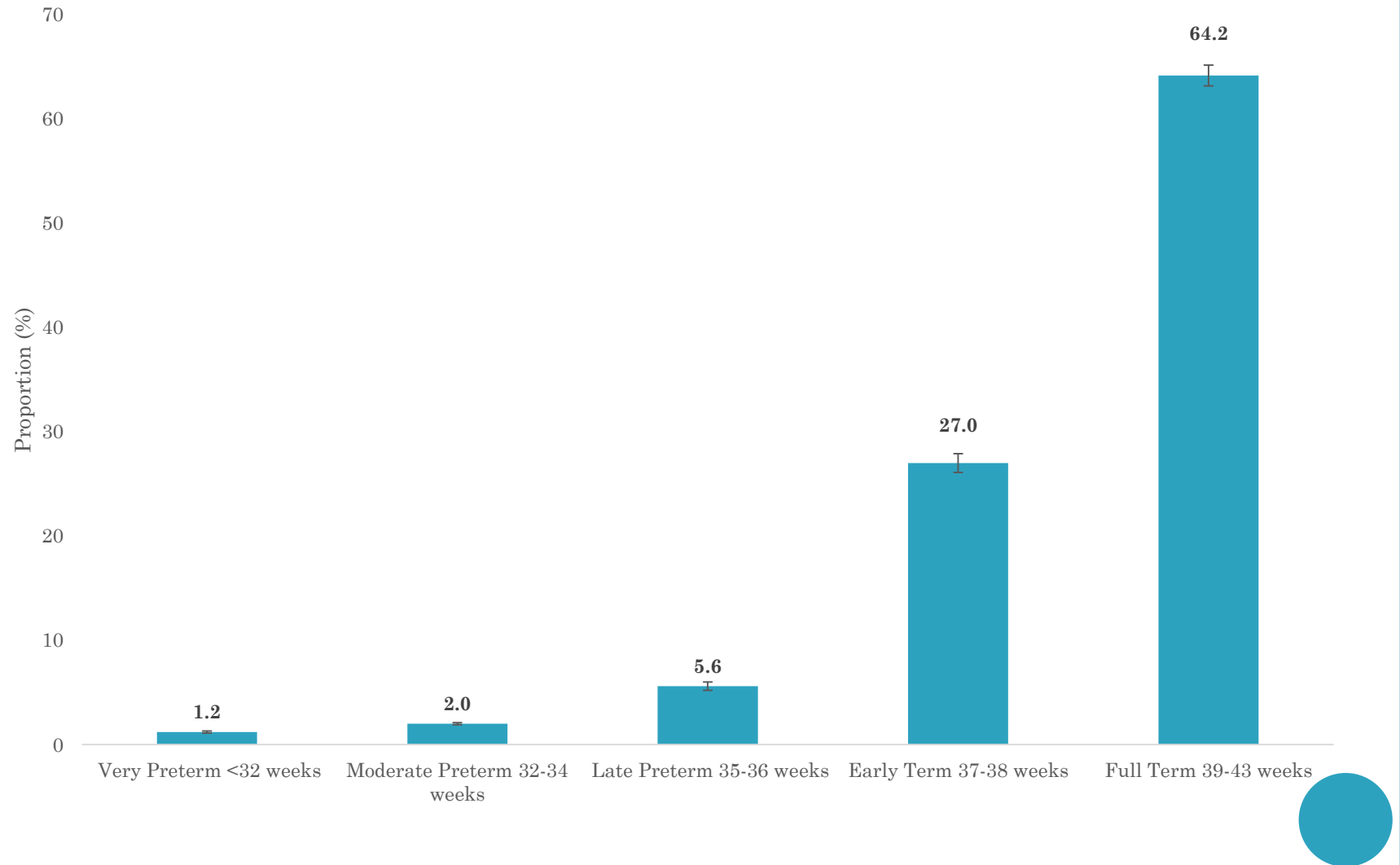


**TABLE 1: DEMOGRAPHICS OF PRAMS RESPONDENTS, 2012-2014**

	<b>Proportion (95% CI)</b>
<b>Marital Status</b>	
Married	63.3 (61.4 65.1)
Not Married	36.7 (34.9 38.6)
<b>Parity</b>	
First Time Mom	44.0 (42.0 46.0)
Previous Preterm Delivery	6.4 (5.5 7.4)
No Previous Preterm Delivery (not primiparous)	49.6 (47.6 51.6)
<b>Age</b>	
<20	4.6 (3.8 5.4)
20-24	21.0 (19.3 22.7)
25-34	55.9 (53.9 57.9)
35+	18.6 (17.1 20.2)
<b>Maternal Race</b>	
Caucasian	23.8 (22.1 25.5)
Black	3.1 (2.4 3.9)
Hawaiian	28.3 (26.6 30.1)
Other Pacific Islander	7.0 (6.1 8.2)
Japanese	9.2 (8.1 10.4)
Chinese	5.1 (4.3 6.1)
Filipino	17.1 (15.6 18.7)
Other Asian	3.5 (2.8 4.3)
All Others	3.0 (2.4 3.7)
<b>Insurance Status During Pregnancy</b>	
Medicaid	31.5 (29.7 33.4)
No Insurance	0.9 (0.6 1.3)
Private/Other Insurance	67.6 (65.7 69.4)
<b>Smoking</b>	
Yes	4.7 (4.0 5.6)
No	95.3 (94.4 96.0)



# FIGURE 1: OUTCOMES, 2012-2014 PRAMS



# FIGURE 2: RISK FACTORS, 2012-2014 PRAMS

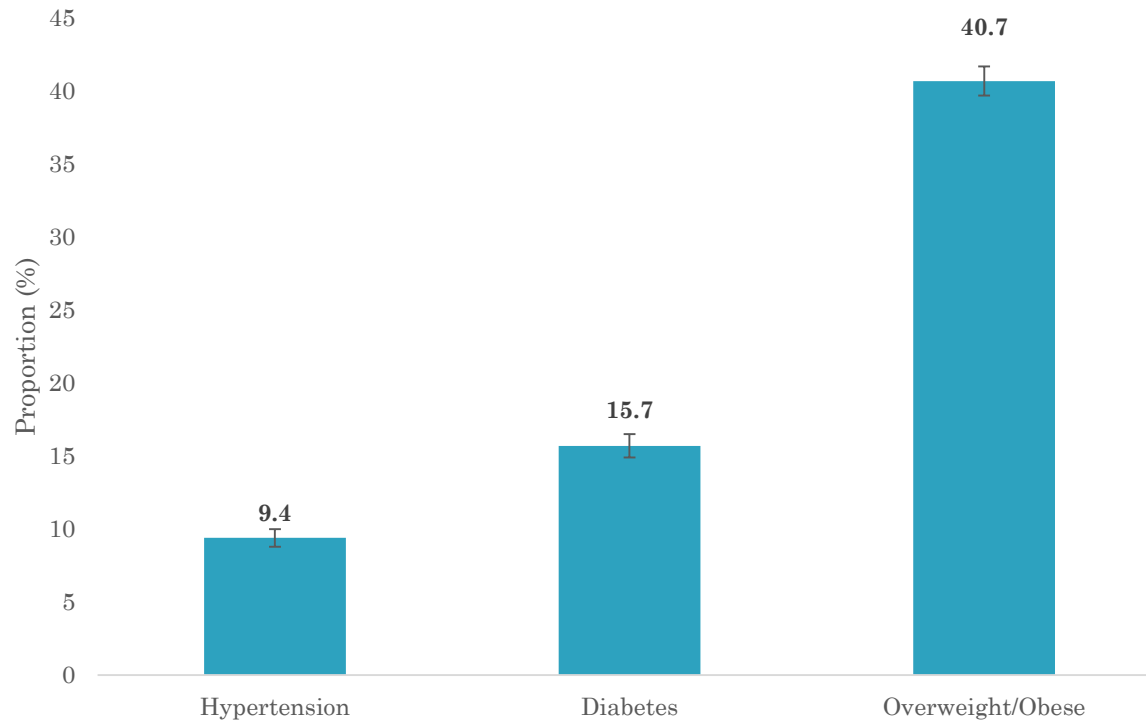
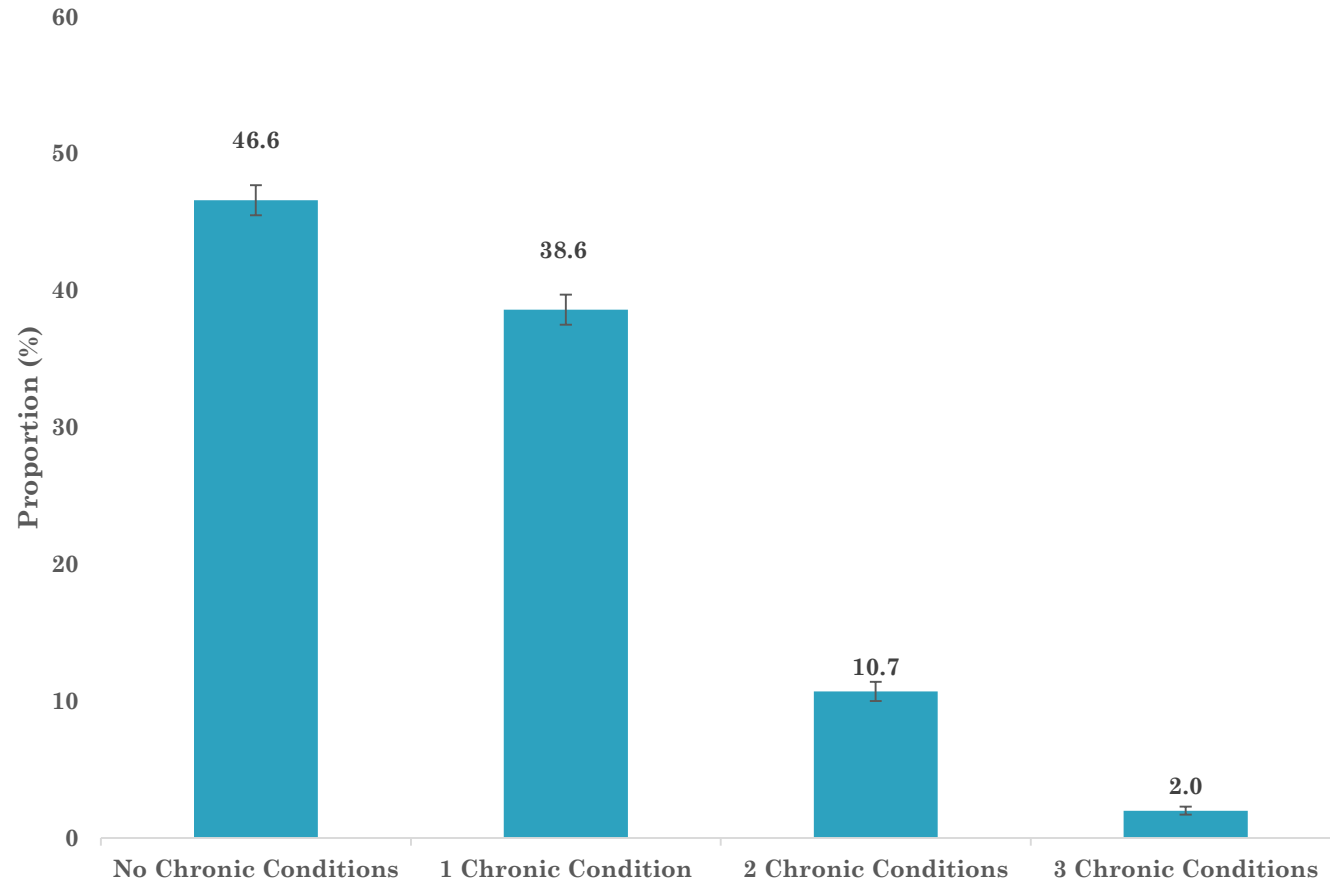


FIGURE 3: MULTIPLE CHRONIC CONDITIONS, 2012-2014 PRAMS



**TABLE 2: BIVARIATE ANALYSIS- DEMOGRAPHICS, PRAMS 2012-2014**

		<b>Very Preterm</b>	<b>Moderate Preterm</b>	<b>Late Preterm</b>	<b>Early Term</b>	<b>Term</b>
		<32 weeks	32-34 weeks	35-36 weeks	37-38 weeks	39-43 weeks
<b>Marital Status</b>						
	Married	1.0 (0.8 1.2)	1.8 (1.5 2.1)	5.9 (4.9 7.0)	25.9(23.7 28.2)	65.5 (63.0 67.8)
	Not Married	1.4 (1.1 1.8)	2.3 (1.8 3.0)	5.2 (4.2 6.4)	29.0 (26.1 32.0)	62.1 (59.0 65.1)
<b>Parity</b>						
	First Time Mom	1.3 (1.0 1.6)	2.2 (1.7 2.8)	5.3 (4.3 6.6)	23.5 (21.0 26.1)	67.8 (65.0 70.5)
	Previous Preterm Delivery	3.9 (2.7 5.5)	6.1 (4.6 8.1)	14.2 (10.0 19.9)	49.0 (41.4 56.6)	26.8 (20.4 34.3)
	No Previous Preterm Delivery (not primiparous)	0.8 (0.6 1.0)	1.3 (1.0 1.7)	4.9 (3.9 6.2)	27.5 (25.0 30.2)	65.5 (62.7 68.2)
<b>Age</b>						
	<20	1.3 (0.6 2.9)	3.3 (1.9 5.6)	4.3 (2.3 8.1)	25.1 (18.2 33.5)	66.0 (57.5 73.6)
	20-24	1.1 (0.8 1.6)	1.5 (1.0 2.4)	5.0 (3.6 6.9)	27.2 (23.4 31.3)	65.2 (61.0 69.2)
	25-34	1.1 (0.9 1.4)	1.8 (1.5 2.3)	5.6 (4.6 6.8)	26.1 (23.7 28.5)	65.3 (62.8 67.8)
	35+	1.3 (1.0 1.8)	2.7 (2.1 3.4)	6.6 (5.0 8.6)	30.1 (26.0 34.6)	59.3 (54.8 63.7)
<b>Race</b>						
	Caucasian	0.7 (0.5 1.0)	1.6 (1.1 2.4)	5.7 (4.2 7.8)	18.4 (15.3 21.9)	73.7 (70.0 77.1)
	Black	2.3 (1.2 4.3)	1.8 (0.9 3.7)	8.2 (3.4 18.4)	28.3 (18.1 41.3)	59.4 (46.5 71.2)
	Hawaiian	1.4 (1.0 1.9)	2.2 (1.6 2.9)	5.1 (4.0 6.6)	29.1 (25.9 32.4)	62.2 (58.8 65.6)
	Other Pacific Islander	0.9 (0.5 1.6)	2.7 (1.8 4.1)	4.9 (3.0 8.0)	26.7 (20.3 34.2)	64.8 (57.3 71.7)
	Japanese	0.6 (0.3 1.1)	1.8 (1.2 2.5)	2.8 (1.8 4.4)	30.2 (24.2 36.9)	64.6 (58.0 70.8)
	Chinese	1.4 (0.7 2.7)	1.3 (0.8 2.3)	5.0 (2.4 9.9)	29.4 (21.7 38.4)	62.9 (53.8 71.2)
	Filipino	1.3 (0.9 1.9)	2.4 (1.7 3.5)	7.7 (5.7 10.4)	34.6 (30.1 39.4)	53.9 (49.0 58.6)
	Other Asian	1.1 (0.5 2.3)	1.5 (0.8 3.1)	4.3 (1.9 9.5)	29.8 (20.2 41.6)	63.2 (51.7 73.4)
	All Others	2.7 (1.4 5.0)	1.6 (0.8 3.2)	4.6 (2.6 8.1)	17.5 (10.7 27.3)	73.5 (63.9 81.4)
<b>Insurance Status</b>						
	Medicaid	0.9 (0.7 1.3)	1.7 (1.4 2.2)	5.8 (4.5 7.4)	29.0 (25.9 32.3)	62.5 (59.1 65.8)
	No Insurance	0.7 (0.1 4.0)	NR	8.8 (1.6 35.5)	31.4 (15.2 54.0)	59.1 (37.2 77.9)
	Private/Other Insurance	1.3 (1.1 1.6)	2.1 (1.8 2.6)	5.4 (4.5 6.4)	26.2 (24.0 28.5)	65.0 (62.6 67.3)
<b>Smoking</b>						
	Yes	1.9 (0.9 3.8)	2.3 (1.3 3.9)	7.2 (3.9 12.9)	37.1 (28.9 46.1)	51.5 (42.7 60.2)
	No	1.1 (1.0 1.3)	2.0 (1.7 2.4)	5.6 (4.8 6.5)	26.2 (24.4 28.1)	65.1 (63.1 67.0)

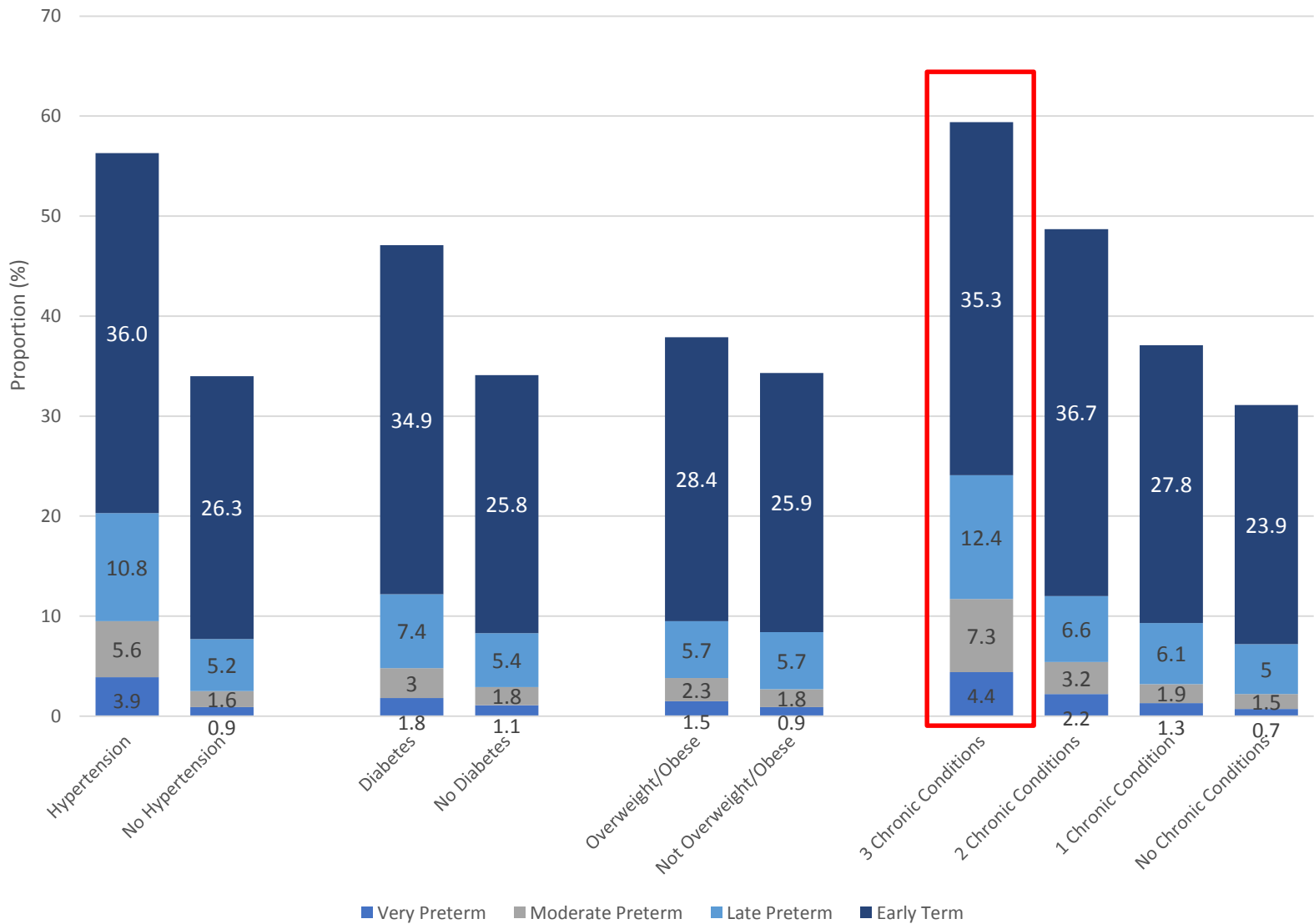


TABLE 3: BIVARIATE ANALYSIS- CHRONIC CONDITIONS, PRAMS 2012-2014

		Very Preterm	Moderate Preterm	Late Preterm	Early Term	Term
		<32 weeks	32-34 weeks	35-36 weeks	37-38 weeks	39-43 weeks
<b>Hypertension</b>	Yes	3.9 (2.9 5.3)	5.6 (4.3 7.1)	10.8 (7.8 14.6)	36.0 (30.1 42.4)	43.8 (37.4 50.3)
	No	0.9 (0.8 1.1)	1.6 (1.3 1.9)	5.2 (4.4 6.1)	26.3 (24.5 28.3)	66.0 (63.9 67.9)
<b>Diabetes</b>	Yes	1.8 (1.3 2.6)	3.0 (2.3 2.9)	7.4 (5.3 10.3)	34.9 (30.1 40.1)	52.7 (47.6 57.8)
	No	1.1 (0.9 1.3)	1.8 (1.5 2.1)	5.4 (4.6 6.3)	25.8 (23.8 27.8)	66.1 (64.0 68.1)
<b>Overweight/ Obese</b>	Yes	1.5 (1.2 1.9)	2.3 (1.8 2.9)	5.7 (4.5 7.2)	28.4 (25.5 31.5)	62.1 (58.9 65.2)
	No	0.9 (0.7 1.1)	1.8 (1.4 2.2)	5.7 (4.7 6.9)	25.9 (23.5 28.3)	65.8 (63.2 68.2)
<b>Number of Chronic Conditions</b>	0	0.7 (0.5 0.9)	1.5 (1.1 2.0)	5.0 (4.0 6.3)	23.9 (21.4 26.6)	68.9 (66.1 71.6)
	1	1.3 (1.0 1.7)	1.9 (1.4 2.5)	6.1 (4.7 7.8)	27.8 (24.8 31.1)	62.8 (59.5 66.1)
	2	2.2 (1.5 3.2)	3.2 (2.3 4.4)	6.6 (4.4 9.8)	36.7 (30.6 43.3)	51.3 (44.8 57.8)
	3	4.4 (2.4 8.1)	7.3 (4.3 11.9)	12.4 (6.0 23.9)	35.3 (23.3 49.4)	40.7 (27.3 55.6)



# FIGURE 4: GESTATIONAL AGE DISTRIBUTION BY CHRONIC CONDITIONS, PRAMS 2012-2014



# RESULTS

Table 4: Individual Conditions Odds Ratios

	Very Preterm	Moderate Preterm	Late Preterm	Early Term
	<32 weeks	32-34 weeks	35-36 weeks	37-38 weeks
<b>Unadjusted</b>				
Hypertension	6.33 (4.24 9.45)	5.30 (3.65 7.70)	3.12 (2.04 4.76)	2.06 (1.50 2.84)
Diabetes	2.17 (1.45 3.25)	2.16 (1.51 3.08)	1.74 (1.16 2.62)	1.70 (1.32 2.19)
Overweight/Obese	1.75 (1.25 2.45)	1.39 (0.99 1.95)	1.05 (0.76 1.47)	1.16 (0.95 1.42)
<b>Adjusted*</b>				
Hypertension	5.98 (3.84 9.30)	4.32 (2.86 6.52)	2.86 (1.78 4.61)	2.07 (1.46 2.93)
Diabetes	2.15 (1.38 3.34)	1.93 (1.31 2.82)	1.71 (1.08 2.72)	1.60 (1.23 2.10)
Overweight/Obese	1.71 (1.18 2.48)	1.37 (0.90 2.90)	1.04 (0.72 1.49)	1.16 (0.93 1.44)

\* Adjusted for maternal age, maternal race, insurance during pregnancy, infant's sex, marital status, previous preterm birth, and smoking.



# RESULTS

Table 5: Multiple Chronic Conditions Odds Ratios

	Very Preterm	Moderate Preterm	Late Preterm	Early Term
	<32 weeks	32-34 weeks	35-36 weeks	37-38 weeks
<b>Unadjusted</b>				
1 Chronic Conditions	2.12 (1.43 3.14)	1.41 (0.91 2.18)	1.33 (0.92 1.91)	1.28 (1.03 1.59)
2 Chronic Conditions	4.28 (2.58 7.10)	2.88 (1.76 4.72)	1.77 (1.06 2.95)	2.06 (1.49 2.86)
3 Chronic Conditions	10.96 (4.82 24.93)	8.28 (2.89 17.62)	4.16 (1.64 10.52)	2.50 (1.24 5.04)
<b>Adjusted*</b>				
1 Chronic Conditions	1.89 (1.23 2.91)	1.34 (0.81 2.22)	1.35 (0.92 1.98)	1.28 (1.01 1.61)
2 Chronic Conditions	4.02 (2.26 7.17)	2.65 (1.51 4.64)	1.82 (1.00 3.31)	1.95 (1.37 2.77)
3 Chronic Conditions	12.80 (5.09 32.19)	9.25 (3.88 22.06)	4.18 (1.50 11.68)	2.74 (1.23 6.11)

\* Adjusted for maternal age, maternal race, insurance during pregnancy, infant's sex, marital status, previous preterm birth, and smoking.



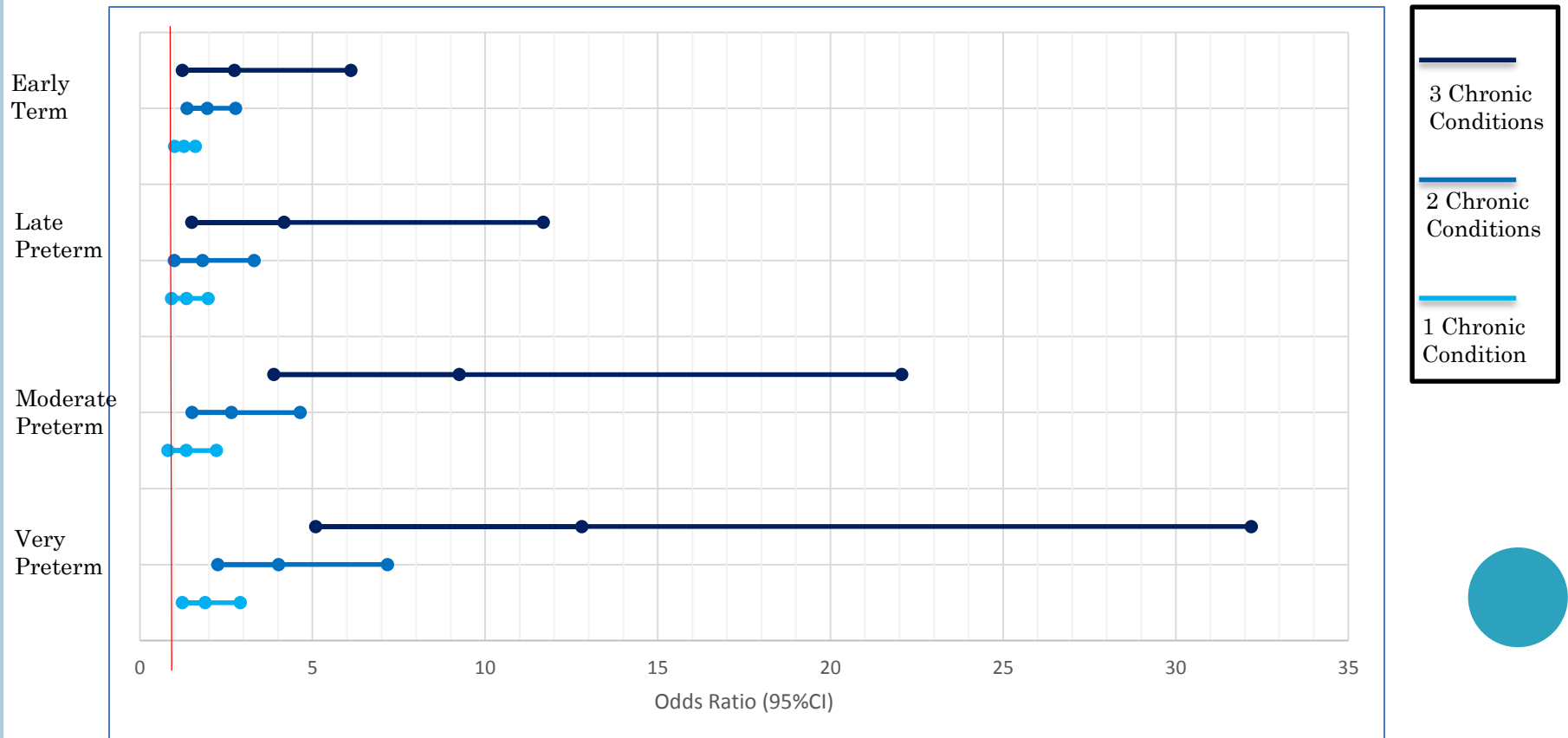
# LIMITATIONS

- PRAMS is a self-reported survey
  - Recall bias
  - Response bias
- Changes in the birth certificate
- Race/ethnicity reporting



# CONCLUSION

- Multiple chronic conditions were associated with preterm and early term birth.



# PUBLIC HEALTH IMPLICATIONS

- Management of chronic conditions may be beneficial in efforts to reduce preterm birth rates in Hawaii.
- Special consideration should be paid to women who have multiple chronic conditions.



# ACKNOWLEDGEMENTS

- Donald Hayes, MD MPH
- Matthew Shim, PhD MPH
- Lin Joseph, MPH
- Alice Yang, MPH
  
- Hawai'i Department of Health, Family Health Services Division
- Hawai'i PRAMS and CDC PRAMS Program
  
- This internship was supported in part through funding from the Health Resources and Services Administration (HRSA) and Graduate Student Epidemiology Program (GSEP).





Questions?

dpatil@uw.edu

