Adverse Pregnancy Outcomes: Predictors of Later Maternal Health

September 17, 2024

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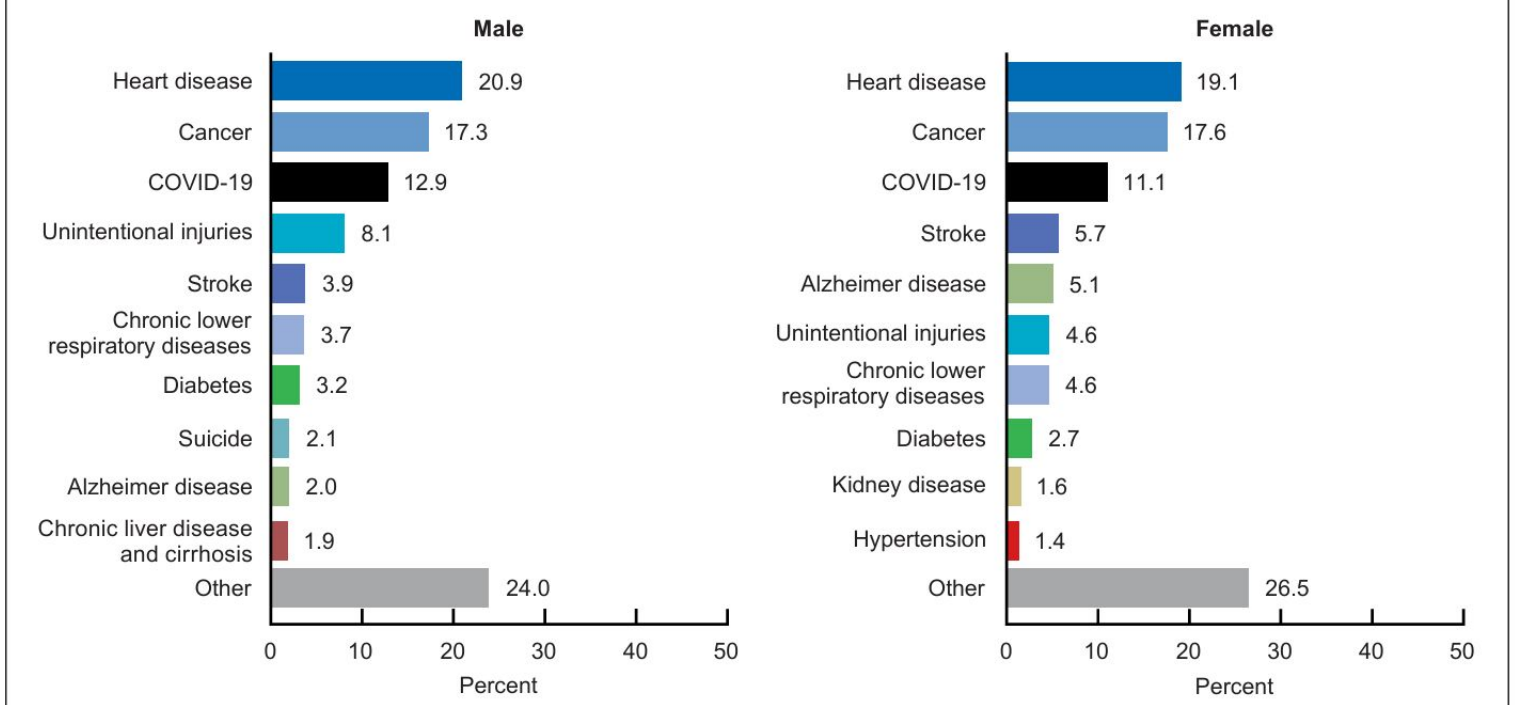
Cardiovascular Disease: Leading Cause of death in North America

Figure 1. Percent distribution of the 10 leading causes of death, by sex: United States, 2021



NOTE: Values show percentage of total deaths.
SOURCE: National Center for Health Statistics, National Vital Statistics System, mortality data file.

Early diagnosis and treatment of modifiable risk factors could prevent up to 80% of heart disease

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journal homepage: www.elsevier.com/locate/lanwpc

Commentary

Cardiovascular disease prevention: Risk factor modification at the heart of the matter ☆

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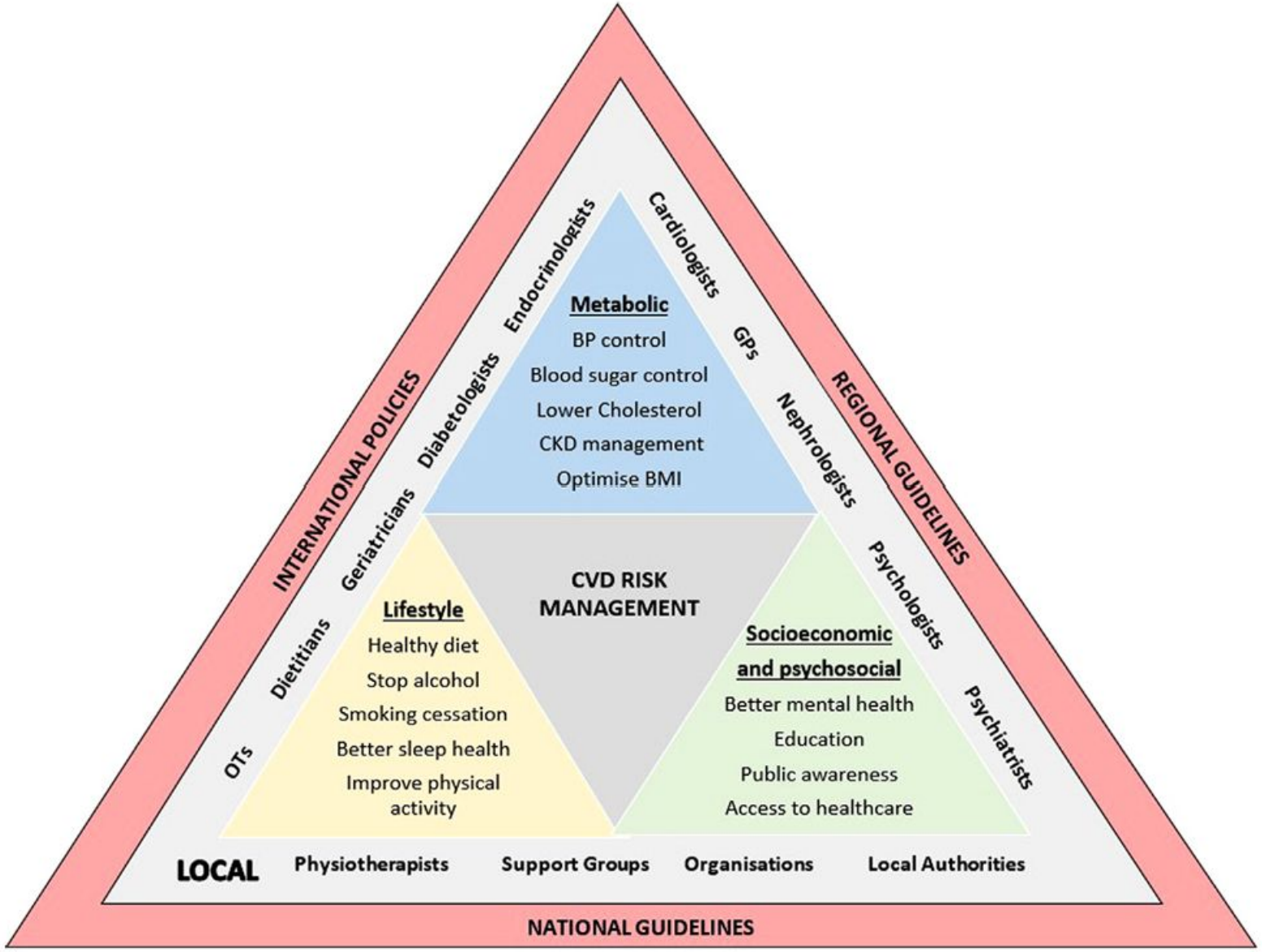


Figure 1. depicts the biopsychosocial model for modifying cardiovascular risk and the wider multi-disciplinary components essential for this
CVD – Cardiovascular disease, GPs – General practitioners, OTs – Occupational therapists, BP – blood pressure, CKD – chronic kidney disease, BMI – Body mass inde

How can we identify women at risk to make a difference?

A 9 month stress test

Pregnancy is a physiologic stress

Placental hormones create insulin resistance

Cardiac output increases by 50%

Intravascular volume increases

Increased clotting

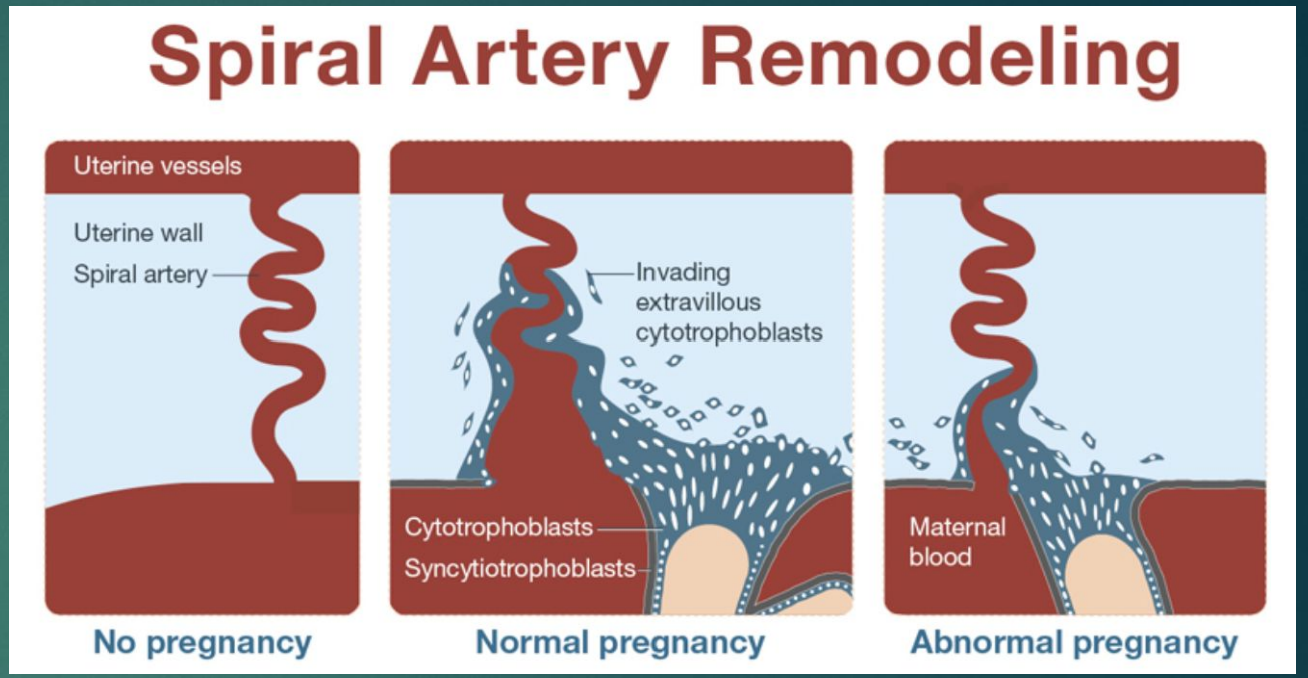
Placental invasions remodels uterine vessels

Common Adverse Pregnancy Outcomes

- Gestational Diabetes
  - Diabetes first diagnosed in pregnancy, typically at 26-28 weeks
  - Treated with diet and insulin if required
    - For women who refuse insulin, Metformin may be tried
- Preeclampsia
  - A disease specific to human pregnancy
  - Results in abnormal endothelial regulation leading to vasospasm, hypertension and end organ damage.
- Preterm Birth: delivery at < 37 weeks
  - Late preterm birth: 34-37 weeks
- Pregnancy Loss: Miscarriage, ectopic pregnancy and still birth
- Low birth weight: GA specific definitions

Preeclampsia

- Preeclampsia affects 2% to 8% of all pregnancies.[2,3]
- Defined as onset HTN ≥ 20-weeks + proteinuria, organ dysfunction, or fetal growth restriction
- Specific cause for an individual is unknown
- Common pathways of failed uterine spiral artery remodeling in the second trimester
  - placental hypoperfusion and hypoxia.
  - oxidative stress triggers a systemic inflammatory response
  - endothelial dysfunction
  - vasoconstriction
  - systemic hypertension and end-organ hypoperfusion



Human Placenta Project: How Does the Placenta Form? | NICHD - Eunice Kennedy Shriver National Institute of Child Health and Human Development (nih.gov)

Collaborative Perinatal Project

- Original Title: The Collaborative Investigation on the Clinico-Pathologic Correlation in Cerebral Palsy, Mental Retardation, and other Neurological Disorders having their Origin in the Perinatal Period.
- Cohort 1959-1966
  - LA, MD, MA, NY, OR, PA, RI, TN, VA
  - 12 recruiting academic institutions, includes Children's of Buffalo – only site including private patients
  - No IRB or informed consent
  - 745 publications as of 2009
- Enrolled at first prenatal visit, PE and interview by trained personnel at each visit and through childhood
- 2016 linked to National Death index and Social Security death Master File
- Co-Variates: Age, tobacco, pre-existing disease, BMI, education, self-identified race ethnicity, marital status, year of pregnancy, family income

Demographics

- N=48,197
  - 8, 772 (18.2%) > 1 pregnancy, used the last
- Time from index to follow up: 52 years
- Age at delivery: 24.1 years
- Age at Death: 74
- Self-Identified: Black 45.8% White 46.0%
- BMI pre-pregnancy: 24.5
- Married: 75.7%
- Husband at home: 74.4%
- Years of Education: 10.6
- Family Income
  - 2000-6,000 ~66%

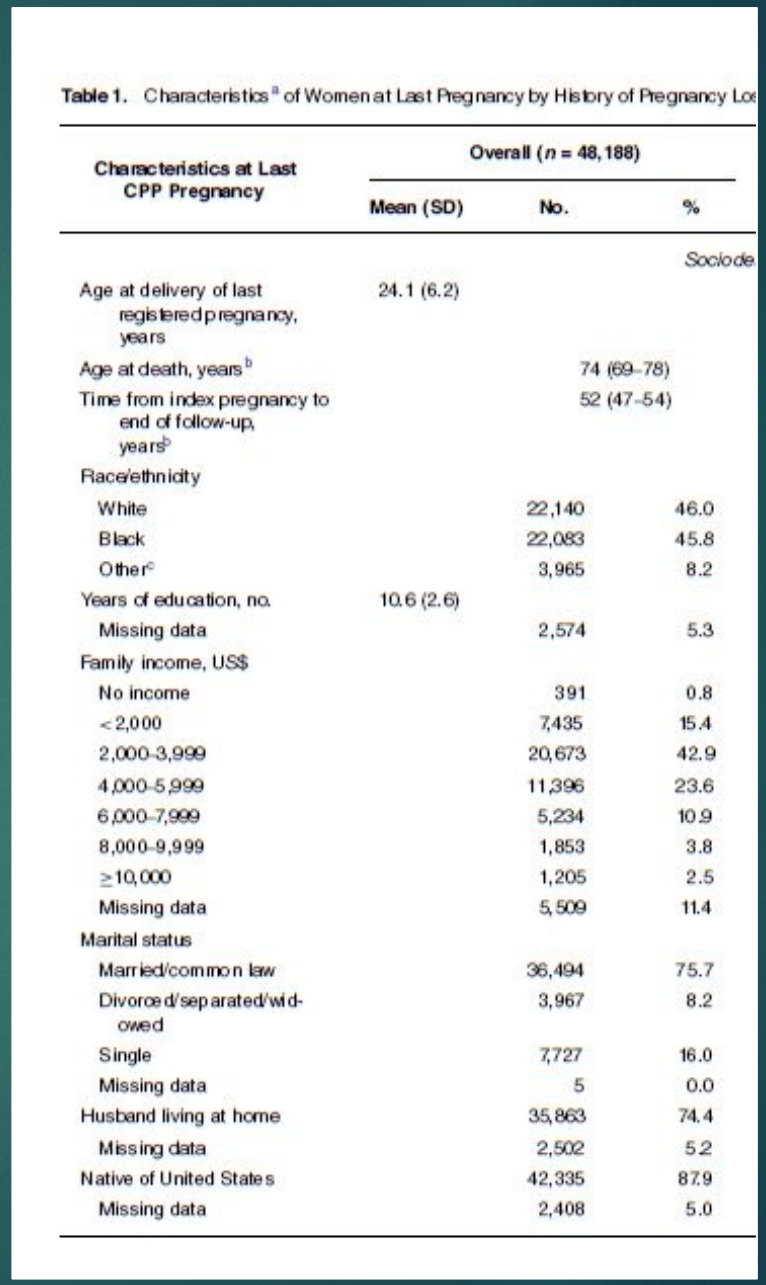


Table 1. Characteristics[a] of Women at Last Pregnancy by History of Pregnancy Lo

Characteristics at Last CPP Pregnancy	Overall (n = 48,188)		
	Mean (SD)	No.	%
			Sociode
Age at delivery of last registered pregnancy, years	24.1 (6.2)		
Age at death, years[b]		74 (69–78)	
Time from index pregnancy to end of follow-up, years[b]		52 (47–54)	
Race/ethnicity			
White		22,140	46.0
Black		22,083	45.8
Other[c]		3,965	8.2
Years of education, no.	10.6 (2.6)		
Missing data		2,574	5.3
Family income, US$			
No income		391	0.8
<2,000		7,435	15.4
2,000–3,999		20,673	42.9
4,000–5,999		11,396	23.6
6,000–7,999		5,234	10.9
8,000–9,999		1,853	3.8
≥10,000		1,205	2.5
Missing data		5,509	11.4
Marital status			
Married/common law		36,494	75.7
Divorced/separated/widowed		3,967	8.2
Single		7,727	16.0
Missing data		5	0.0
Husband living at home		35,863	74.4
Missing data		2,502	5.2
Native of United States		42,335	87.9
Missing data		2,408	5.0

Cause of Death Categories

-not contributing factors

- Cardiovascular Disease (CV):
  - Coronary Heart Disease (CHD)
  - Cerebrovascular disease
- Cancer
- Diabetes
- Respiratory
- Infection
- Renal
- Liver
- Dementia
- Suicide

Evaluative Studies

- Weight Gain
- APO in pregnancy
  - Pregnancy Loss
- Fetal Gender
- Multiple gestation

Circulation

ORIGINAL RESEARCH ARTICLE

Pregnancy Complications and Long-Term Mortality in a Diverse Cohort

Stefanie N. Hinkle, PhD; Enrique F. Schisterman, PhD; Danping Liu, PhD; Anna Z. Pollack, PhD, MPH; Edwina H. Yeung, PhD; Sunni L. Mumford, PhD; Katherine L. Grantz, MD, MS; Yan Qiao, MPH; Neil J. Perkins, PhD; James L. Mills, MD; Pauline Mendola, PhD; Cuilin Zhang, MD, PhD

MARCH 28, 2023

Hinkle - Hypothesis

- APO are associated with increased chronic disease
- Most studies predominantly white population
- Race is a social construct
  - No biologic hypotheses suggest effects of pregnancy vary by race
  - Race impacts access to health care which can impact choric disease incidence, morbidity and mortality
- Do APO differentially contribute to the incidence of chronic disease and earlier mortality in historically marginalized populations?

Hinkle: Methodology

- Collaborative Perinatal Project linked to NDI and SSDM
- Evaluated APO in last pregnancy
  - PTD (15%), HTD (5%), GDM/IGT (1%)
- Estimated adjusted hazard ratios for all case and cause-specific mortality
- Cox models adjusted for age, BMI, Tob, Race, Ethnicity, parity, martial status, income, education, medical history, site and year
- APO: HDP, PTB, GDM

Hinkle: Results PTD

- Higher mortality black (41%) vs white (37%)
- All APO were associated with higher all cause mortality
- Preterm Delivery (PTD= 15%)
  - 13% sPTB, < 1% PPROM, < 1% IOL, < 1% Preterm pre-labor cesarean
    - sPTB: 18% Black vs 7% white
- Increased all cause mortality
- Significant interaction for black vs white race
  - Mortality slightly stronger for black for preterm induced labor
  - Mortality higher for white Pre-labor cesarean.
- Primary causes for increased mortality:
  - CVD mort increased for all types of PTD except unknown reason
  - DM mort increased for: PPROM, pre-labor IOL, pre-labor CD
  - Kidney disease mort increased for: Preterm IOL (HR 5.22) pre-labor CD

sPTB: Spontaneous PTB, PTD: Preterm Delivery, CD: Cesarean delivery, IOL: Induction of Labor, PPROM: Preterm Premature Rupture of Membranes

Hinkle Results: Hypertension in Pregnancy

Table 1. Continued

Characteristic at index pregnancy	Overall (n=46 551)	Black (n=21 107 [45%])	White (n=21 502 [46%])
Hypertensive disorders of pregnancy			
Normotensive	41 966 (91)	18 749 (89)	19 396 (93)
Chronic hypertension	1776 (4)	1164 (6)	579 (3)
Gestational hypertension	775 (2)	291 (1)	462 (2)
Preeclampsia/eclampsia	453 (1)	201 (1)	232 (1)
Superimposed	927 (2)	642 (3)	253 (1)

Hinkle Results: HTN in Pregnancy 9%

- GHTN PET increased all cause mortality
  - CVD and DM were increased in both
  - PET: also increased mortality from infection and kidney disease
- Mortality associated with PET stronger for black vs white HR 1.33 vs 1.00
- Superimposed PET: stronger white vs black HR 1.50 vs 1.27
- PTD with HDP: small numbers, no consistent pattern.
  - PTD in normotensive person was still associated with an increase in all-cause mortality

Hinkle Results GDM/IGT

- Affected 1% of pregnancies
- Black vs White equally distributed
- Higher all cause mortality 1.14
- Increased risk of death by DM, infection and renal disease
- No difference between black vs white

Table 3. Associations of Preterm Delivery and Long-Term All-Cause and Cause-Specific Underlying Mortality of the Collaborative Perinatal Project Mortality Linkage Study

	Term	Reason for preterm delivery				
		Spontaneous	PROM	Induced	Prelabor cesarean delivery	Unknown
All-cause mortality						
Total, n (%)*	14 814 (38.2)	2353 (41.4)	162 (54.4)	75 (50.3)	174 (71.9)	261 (38.0)
Risk difference per 100 (95% CI), adjusted†‡	0 Reference	1.5 (–0.6 to 3.6)	4.5 (0.3–8.7)	6.0 (–0.1 to 12.1)	19.1 (13.2–25.1)	–1.7 (–5.1 to 1.7)
HR (95% CI), adjusted†‡	1 Reference	1.07 (1.03–1.12)	1.23 (1.05–1.44)	1.31 (1.03–1.66)	2.09 (1.75–2.48)	0.92 (0.79–1.07)

Table 4. Associations for Hypertensive Disorders of Pregnancy and Long-Term All-Cause and Cause-Specific Underlying Mortality of the Collaborative Perinatal Project Mortality Linkage Study

	Normotensive	Gestational hypertension	Preeclampsia/ eclampsia	Superimposed preeclampsia/eclampsia*
All-cause mortality				
Total, n (%)†	15 978 (37.5)	338 (42.6)	218 (47.2)	596 (63.8)
Risk difference per 100 (95% CI)				
Adjusted‡	0 Reference	1.7 (–1.2 to 4.7)	2.8 (–0.8 to 6.5)	6.2 (3.1–9.3)
Hazard ratio (95% CI)				
Adjusted‡	1 Reference	1.09 (0.97–1.22)	1.14 (0.99–1.32)	1.32 (1.20–1.46)

Table 5. Associations for Gestational Diabetes/Impaired Glucose Tolerance in Pregnancy and Long-Term All-Cause and Cause Specific Underlying Mortality, Collaborative Perinatal Project Mortality Linkage Study

	Normoglycemic*	Gestational diabetes/impaired glucose tolerance
All-cause mortality		
Cases, n (%)†	17 359 (38.4)	267 (49.0)
Risk difference per 100 (95% CI)		
Adjusted‡	0 Reference	2.8 (–0.6 to 6.1)
HR (95% CI)		
Adjusted‡	1 Reference	1.14 (1.00–1.30)

Gestational weight change in a diverse pregnancy cohort and mortality over 50 years: a prospective observational cohort study

Stefanie N Hinkle, Sunni L Mumford, Katherine L Grantz, Pauline Mendola, James L Mills, Edwina H Yeung, Anna Z Pollack, Sonia M Grandi, Rajeshwari Sundaram, Yan Qiao, Enrique F Schisterman*, Cuilin Zhang*

***Lancet* 2023; 402: 1857–65**

Excessive Weight Gain: CPP

- Exceeding recommendations causes postpartum retention of 3.06 Kg
  - Increased visceral fat even without retention
  - Visceral fat associated with CVD and DM
- Used guideline weight gain as the standard for each pre-pregnancy weight class

CPP Mortality Linkage Outcomes

Pre-preg wt N=46,042 (% of pop)	CV Mortality > wt rec	All Mortality > wt rec	DM Mort > wt rec	DM Mort < wt rec
BMI < 18.5 (9.4%)	HR 1·84 [1·08–3·12]	HR 1·14 [0·86–1·51]	HR 0·90 [0·13–6·35]	
18.5-24.9 (68.6%)	HR 1·20 [1·04–1·37]	HR 1·09 [1·01–1·18]	HR 0·95 [0·61–1·47]	HR 0·62 [0·48–0·79]
25.0-29.9 (15.4%)	HR 1·12 [0·94–1·33]	HR 1·12 [1·01–1·24]	HR 1·77 [1·23–2·54]	
> 30 (6.7%)	NS	NS	NS	

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Original Contribution

Long-Term Mortality in Women With Pregnancy Loss and Modification by Race/Ethnicity

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* Correspondence to Dr. Sonia Grandi, Child Health Evaluative Sciences, The Hospital for Sick Children, 686 Bay Street, Toronto, ON, Canada, M5G 0A4 (e-mail: sonia.grandi@sickkids.ca).

Initially submitted August 12, 2021; accepted for publication February 1, 2022.

Mortality with Pregnancy Loss (PL)

- Incidence: 20% of pregnancies
  - Black women experience 2x increased risk of PL vs white
  - Black women have higher CVD risk
  - SES disparities, structural racism and stress, inequal access to health care
- In non-US studies of white women, associated with CVD
- Biologic link: endothelial dysfunction from biologic changes in lipid profiles and inflammatory markers lead to both pregnancy loss and CVD

Mortality with Pregnancy Loss

- Definition: abortion(spontaneous and induced) stillbirth, ectopic
  - Before or during last pregnancy with CPP
- Created binary variable of "pregnancy loss"
- Secondary analyses based on number and type
  - Very early ≤ 10 weeks
  - Early ≤ 20 weeks
- Sensitivity Analyses
  - Looked at women without a history of CVD or CA
  - Excluded ectopic pregnancy
  - Excluded women who did not link to NDI
  - Confounding for auto-immune disorders

Incidence of Pregnancy Loss

Table 1. Continued

Characteristics at Last CPP Pregnancy	Overall (n = 48,188)			Pregnancy Loss (n = 12,330)		
	Mean (SD)	No.	%	Mean (SD)	No.	%
Fetal deaths		2,944	6.1		2,944	23.9
Stillbirths/neonatal deaths		4,837	10.0		4,837	39.2
Abortions[†]		9,236	19.2		9,236	74.9

Abortions: Spontaneous and Induced
Fetal Deaths: Not defined

Mortality with Pregnancy Loss

- 25.7% at least 1 loss
  - 27.4% black, 23.6% white
- Women with loss: older, smokers, CHTN, DM, longer time to pregnancy
- Women with loss (binary)
  - 10% increase all cause of death (4 excess per 100)
  - CVD 21% increased risk with 2.2 excess/100 women
  - No increased risk of death with CA
- Black vs White
  - Black women had an overall higher risk of death from CVD vs white
  - Pregnancy loss increased the risk of death from CVD for white but not black women
    - White women achieved same risk of CVD death as black with pregnancy loss
- ≥ 2 losses: 35% incr all-cause, 51% incr CVD, 24% incr CA mortality
  - Persisted for both black and white women

Conclusion

In a racially diverse cohort of US women, pregnancy loss was associated with a greater risk of all-cause and CVD mortality, which was exacerbated for women with repeated pregnancy loss. Pregnancy loss did not confer an excess risk in Black women, above the observed higher baseline risk of death, for all-cause and cause-specific mortality. In contrast, pregnancy loss did confer an excess risk for White women for all-cause, CVD, and CHD mortality. These data suggest that pregnancy loss may be a risk factor for long-term mortality among subgroups of women of reproductive age in the United States.

Studies from other countries vary, supporting ethnic differences.

Impact of loss is probably underestimated as this is just a snapshot of reported pregnancy

Could not control for GA of loss or cause of loss

In the USA worry about
-White women with any pregnancy loss
-Black women with recurrent pregnancy loss

Other Odd Questions from the CPP

- Does birth of a male vs female child increase the risk of all cause mortality? NO
- What about twins and above?
  - Need to adjust for age and preexisting conditions
  - No increase in all cause mortality
  - Decrease in premature death
- Small placenta weight vs birthweight? Increase in all cause mortality

RESEARCH ARTICLE | Originally Published 22 February 2017 |

Check for updates

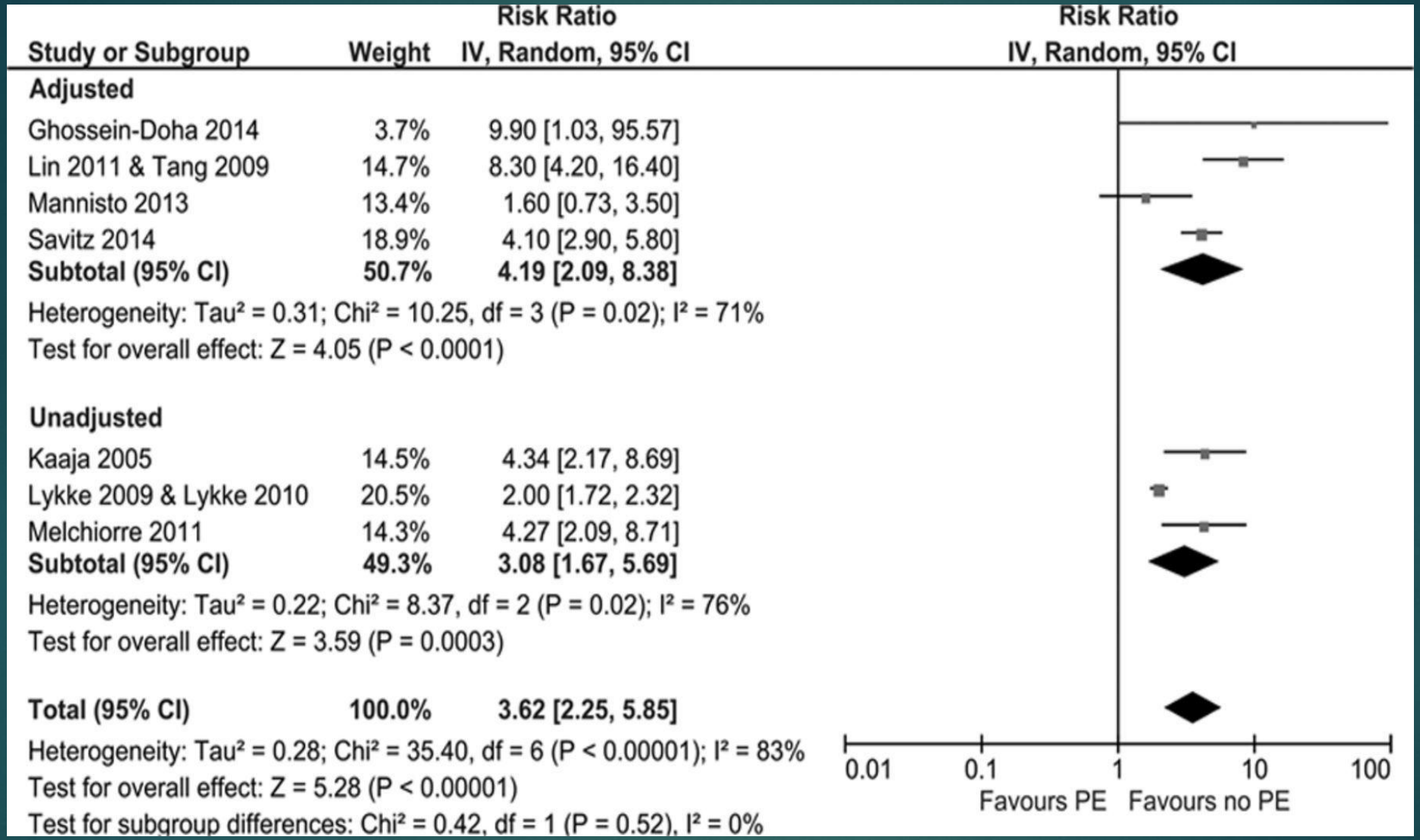
Preeclampsia and Future Cardiovascular Health: A Systematic Review and Meta-Analysis

Pensée Wu, MBChB, MD(Res), Randula Haththotuwa, MBChB, Chun Shing Kwok, MBBS, Aswin Babu, BM, BS, Rafail A. Kotronias, MBChB, Claire Rushton, PhD, Azfar Zaman, MBChB, MD, Anthony A. Fryer, PhD, Umesh Kadam, MBChB, PhD, Carolyn A. Chew-Graham, MBChB, MD, and Mamas A. Mamas, BM BCh, DPhil | AUTHOR INFO & AFFILIATIONS

Circulation: Cardiovascular Quality and Outcomes • Volume 10, Number 2 • https://doi.org/10.1161/CIRCOUTCOMES.116.003497

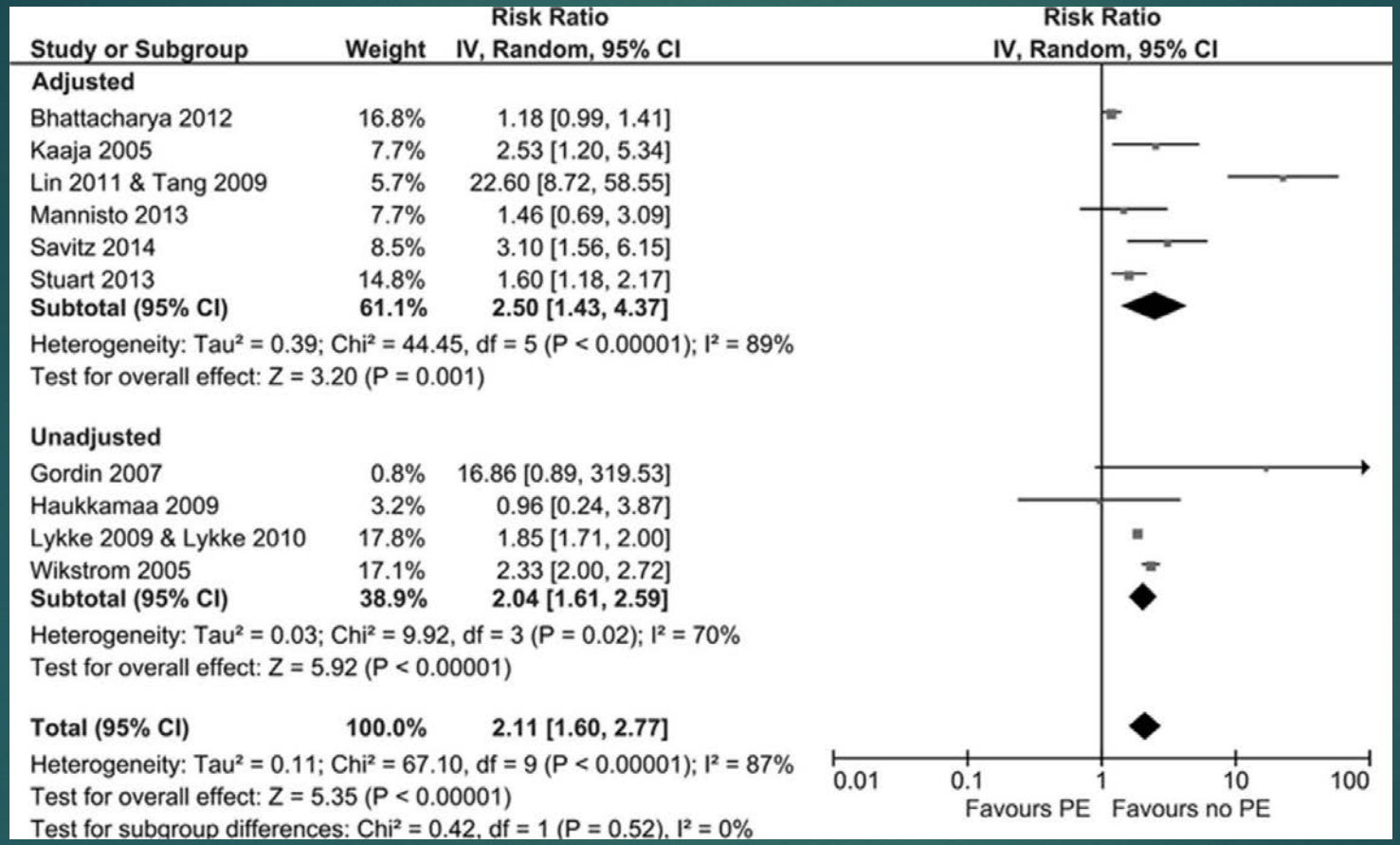
- Meta-analysis 6.5 million women in studies from 2005-2015
- Preeclampsia was independently associated with
  - Future Heart Failure RR 4.19; (CI], 2.09–8.38)
  - Coronary heart disease RR 2.50; (95% CI, 1.43–4.37),
  - Cardiovascular disease death RR 2.21; (95% CI, 1.83–2.66),
  - Stroke RR,1.81; (95% CI, 1.29–2.55).
- Sensitivity analyses showed persistence in disease risk after adjusting for age, BMI, DM
- Increased risk higher during first 10 years after a pregnancy affected by preeclampsia compared to >10 yrs

Figure 2. Risk of heart failure with preeclampsia (PE)



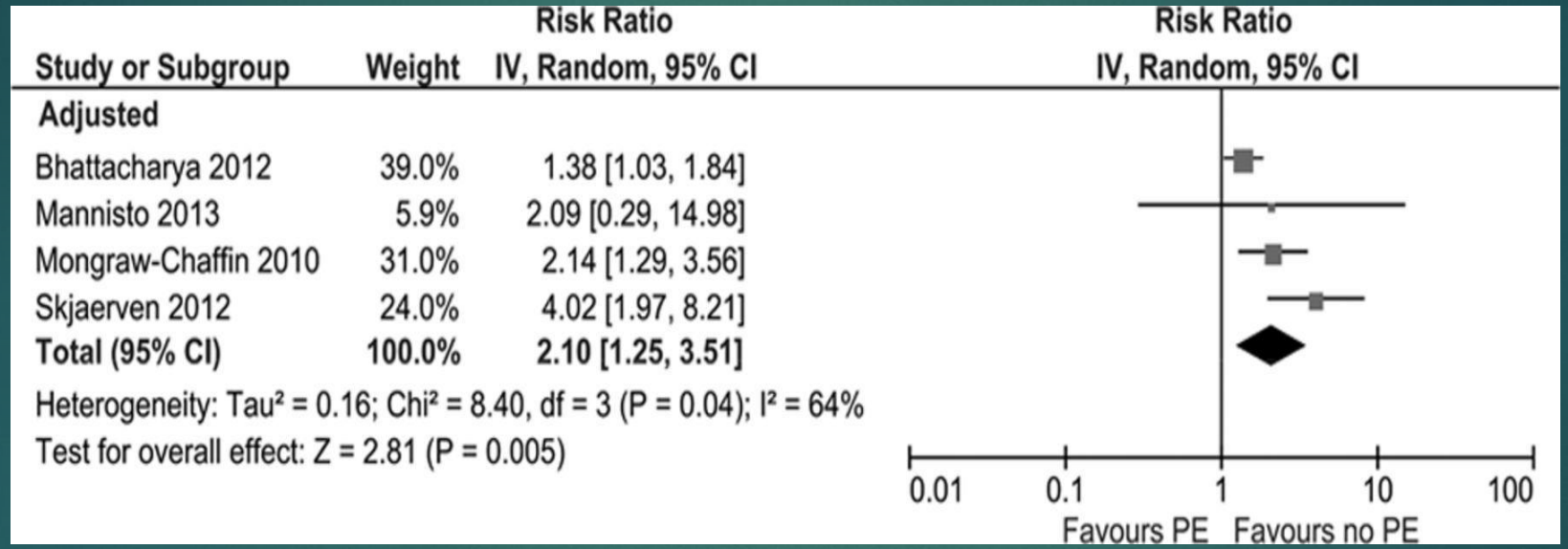
Pensée Wu. Circulation: Cardiovascular Quality and Outcomes.
Preeclampsia and Future Cardiovascular Health, Volume: 10, Issue: 2,
DOI: (10.1161/CIRCOUTCOMES.116.003497)

Figure 3. Risk of coronary heart disease with preeclampsia



Pensée Wu. Circulation: Cardiovascular Quality and Outcomes. Preeclampsia and Future Cardiovascular Health, Volume: 10, Issue: 2, DOI: (10.1161/CIRCOUTCOMES.116.003497)

Figure 4. Risk of coronary heart disease death with preeclampsia



Pensée Wu. Circulation: Cardiovascular Quality and Outcomes.
Preeclampsia and Future Cardiovascular Health, Volume: 10, Issue: 2,
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Risk of Stroke

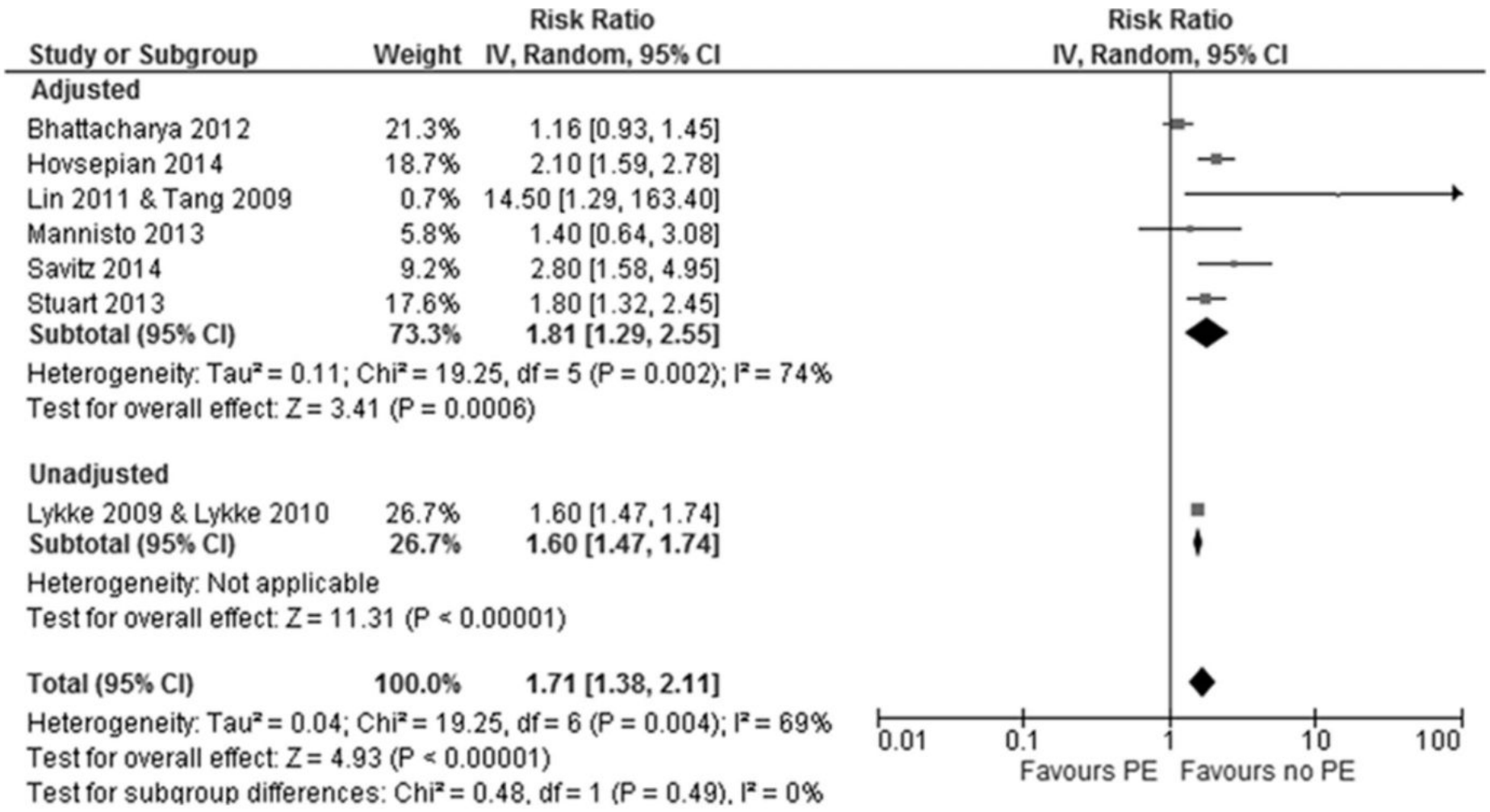


Figure 6. Risk of stroke with preeclampsia (PE).[8–10,19,23–25,35,37] CI indicates confidence interval.

Sensitivity analysis to evaluate impact of follow up time on disease incidence (all studies on death had > 10 year follow up)

Outcomes		<1 y	1–10 y	>10 y
Cardiovascular disease death	Adjusted	…	2.30 (1.65–3.20), n=1	2.21 (1.73–2.81), n=3
Coronary heart disease	Adjusted	3.10 (1.56–6.15), n=1	3.78 (0.43–77.30), n=2	1.46 (0.95–2.25), n=3
	Unadjusted	…	…	2.09 (1.64–2.66), n=3
Coronary heart disease death	Adjusted	…	…	2.10 (1.25–3.51), n=4
Heart failure	Adjusted	4.10 (2.90–5.80), n=1	8.42 (4.39–16.17), n=2	1.60 (0.73–3.50), n=1
	Unadjusted	…	4.27 (2.09–8.71), n=1	2.73 (1.30–5.74), n=2
Stroke	Adjusted	2.22 (1.73–2.85), n=2	3.56 (0.52–24.28), n=2	1.18 (0.95–1.46), n=2
	Unadjusted	…	…	1.60 (1.47–1.74), n=1

- Greatest risk of disease incidence is within 1-10 years
- Still see significant risk with < 1 year
- Results remained after adjusting for age, BMI and DM

Conclusions

- Pregnancy is a stress test, unveils those at increased risk for future chronic disease
- Pregnancy complications may cause vascular dysfunction leading to lifelong health impacts, independent of native risk factors
- APO have lifelong health implications

Pregnancy is a Window into the Future

Cardiovascular Disease Predictors

Effectiveness-Based Guidelines for the Prevention of Cardiovascular Disease in Women—2011 Update: A Guideline From the American Heart Association

High risk (≥1 high-risk states)	Clinically manifest CHD
	Clinically manifest cerebrovascular disease
	Clinically manifest peripheral arterial disease
	Abdominal aortic aneurysm
	End-stage or chronic kidney disease
	Diabetes mellitus
	10-y Predicted CVD risk ≥10%

At risk (≥1 major risk factor[s])	Cigarette smoking
	SBP ≥120 mm Hg, DBP ≥80 mm Hg, or treated hypertension
	Total cholesterol ≥200 mg/dL, HDL-C <50 mg/dL, or treated for dyslipidemia
	Obesity, particularly central adiposity
	Poor diet
	Physical inactivity
	Family history of premature CVD occurring in first-degree relatives in men <55 y of age or in women <65 y of age
	Metabolic syndrome
	Evidence of advanced subclinical atherosclerosis (eg, coronary calcification, carotid plaque, or thickened IMT)
	Poor exercise capacity on treadmill test and/or abnormal heart rate recovery after stopping exercise
	Systemic autoimmune collagen-vascular disease (eg, lupus or rheumatoid arthritis)
	History of preeclampsia, gestational diabetes, or pregnancy-induced hypertension

2.2% Low

Current 10-Year ASCVD Risk**

e Risk Calculator only provides lifetime risk estimates for individuals 20 to 59 years of age.

Optimal ASCVD Risk: **2.6%**

Current Age *

61

⚠ Lifetime Risk Calculator only provides lifetime risk estimates for individuals 20 to 59 years of age.

Age must be between 20-79

Sex *

Male | ✔ Female

Race *

✔ White | African American | Other

Systolic Blood Pressure (mm Hg) *

110

Value must be between 90-200

Diastolic Blood Pressure (mm Hg) *

70

Value must be between 60-130

Total Cholesterol (mg/dL) *

249

Value must be between 130 - 320

HDL Cholesterol (mg/dL) *

100

Value must be between 20 - 100

LDL Cholesterol (mg/dL) ○

115

Value must be between 30-300

History of Diabetes? *

Yes | ✔ No

Smoker? *

Current | Former | ✔ Never

On Hypertension Treatment? *

Yes | ✔ No

On a Statin? ○

Yes | ✔ No

On Aspirin Therapy? ○

Yes | ✔ No

5.7% Borderline — **Current 10-Year ASCVD Risk****

Lifetime ASCVD Risk: **39%** Optimal ASCVD Risk: **1.0%**

Current Age * 50

Age must be between 20-79

Sex * Male | ✔ Female

Race * White | ✔ African American | Other

Systolic Blood Pressure (mm Hg) * 130

Value must be between 90-200

Diastolic Blood Pressure (mm Hg) * 85

Value must be between 60-130

Total Cholesterol (mg/dL) * 180

Value must be between 130 - 320

HDL Cholesterol (mg/dL) * 45

Value must be between 20 - 100

LDL Cholesterol (mg/dL) ○ 70

Value must be between 30-300

History of Diabetes? * ✔ Yes | No

Smoker? * Current | Former | ✔ Never

On Hypertension Treatment? * Yes | ✔ No

On a Statin? ○ Yes | ✔ No

On Aspirin Therapy? ○ Yes | ✔ No

What Next?

- Can knowledge result in intervention that changes the trajectory?
- What's the risk of metabolic syndrome in women with prior PET and does it change over time – I.e. is it better to wait to screen, or can we screen right away
- 2003-2009 recruited women with PET and control group, assessed at 1 and 3 years postpartum
  - PET more likely to be obese, elevated BP and be on meds at 1 year
  - Similar risk at 3 years
  - PET associated with an increased risk of metabolic syndrome

Graeme Smith, MD, PhD

Metabolic Syndrome: 3 or more American Heart Association

- Central or abdominal obesity (measured by waist circumference)
  - Men – greater than 40 inches
  - Women – greater than 35 inches
- High triglycerides – 150 milligrams per deciliter (mg/dL) or more, or you're taking medicine for high triglycerides
- Low HDL cholesterol, or you're taking medicine for low HDL cholesterol
  - Men – Less than 40 mg/dL
  - Women – Less than 50 mg/dL
- High blood pressure – 130/85 millimeters of mercury (mm Hg) or more, or you're taking medicine for high blood pressure
- High fasting glucose (blood sugar) – 100 mg/dL or more, or you're taking medicine for high blood glucose

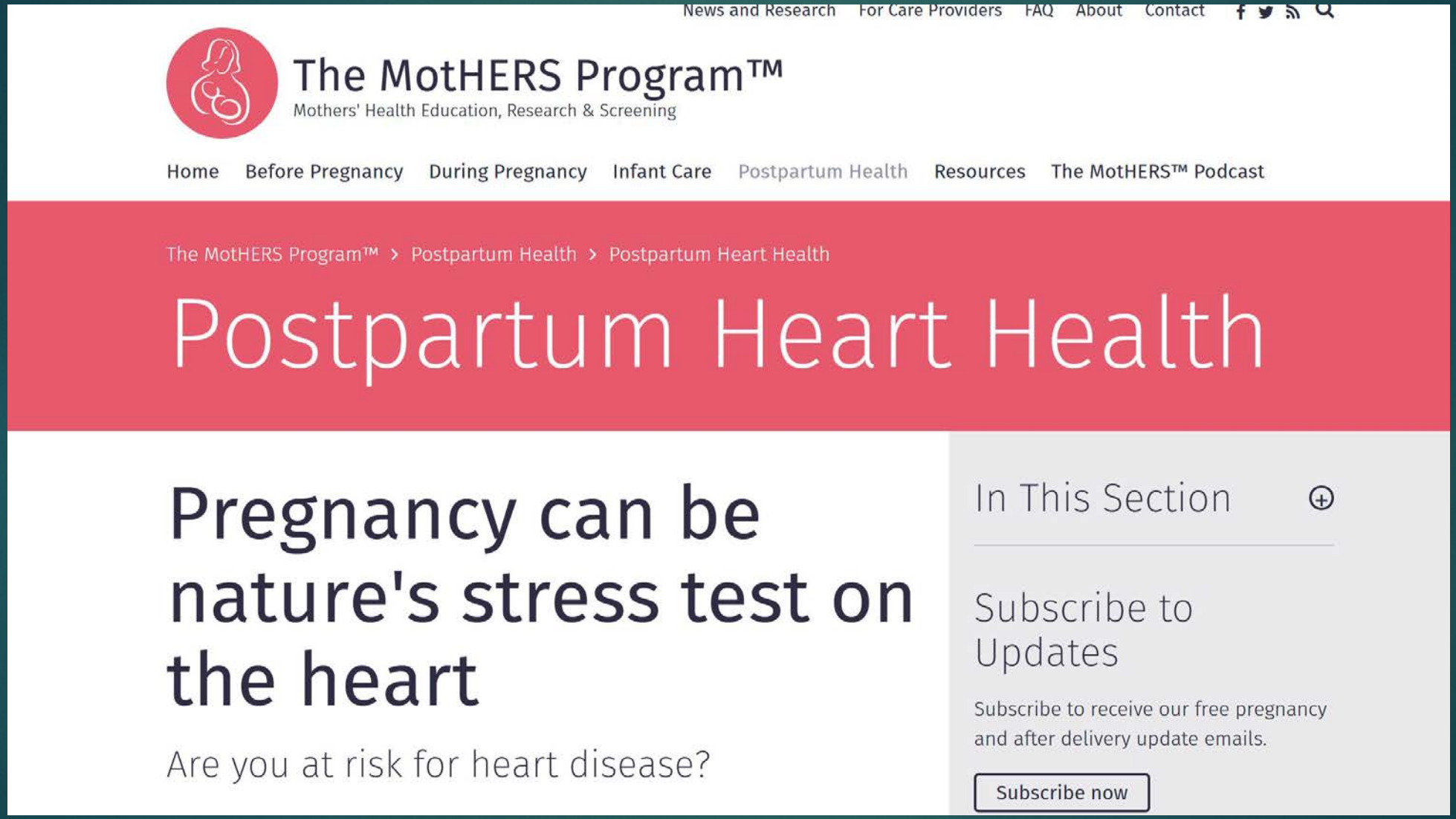
Smith Results

Metabolic Syndrome	Year 1	Year 3
PET	18.2%	21.9%
Control	6.8%	6.4%

No difference over time
No difference if PTD due to PET or FGR

Smith Conclusion

- Later screening would result in later treatment
- Greater burden of atherosclerosis
- Recommends screening at 1 year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Maternal Health Clinic
The Mothers Program

- Appointment at 6 months
- Referral automated through postpartum order set
- Held in the OBGYN clinic
- Indications for referral (20% of their patient population)
  - HDP (GHTN, PET)
  - GDM
  - IUGR $\leq$ 2500 g at $\geq$ 37 weeks or < 5%
  - Spontaneous Preterm Birth
  - Abruption leading to delivery
- Half day 2x/month 20' appointments

Program Materials

- Letter to patient
  - Their specific risk factor
  - Heart disease is number one killer of women
  - Early diagnosis and treatment of risk factors can prevent up to 80% of heart disease
- Personal and family History screening Form
  - Family or personal history of Heart attack, stroke, HTN, DM
  - Family history of HDP
  - Pre-pregnancy weight
  - Ethnicity
  - Medications

Pre-visit lab work after 12 hours of fasting

- Triglycerides
- Cholesterol
- HDL
- LDL
- Glucose
- CRP
- 2 hour 75 OGGT

Women who did not do lab work pre-visit are given requisitions and reminders at 6, 10 and 18 weeks after the appointment

Clinic Appointment 30-40 minutes

- Screening with nurse and consent to participate in research
- Nurse completes history and physical
  - Family and personal history
  - 6 BP over a 10' period
  - Waist circumference
- Computer generated risk profile – does not include pregnancy history
  - Life time risk of heart disease
  - 30 year risk of heart disease
  - Presence of metabolic syndrome
- Computer generated estimates of how risk may change when risk factors are optimized.
- Physician visit focuses on how pregnancy complication may relate to future risk for heart disease and lifestyle and other modification strategies

Program Structure

- Pre-visit blood work to be done 6 weeks prior to visit
- Post-visit summary for patient and their family physician
  - Wait until blood work received
- Patient must make appointment with family physician

- Website has software with all the forms to help you create your own clinic

Recommended Actions Based on Positive Factors

- Lose 7-10% year one
- Lower BP to < 135/80 with medication
- Diet: low saturated fat and cholesterol
- Decrease LDL with medications
- Increase HDL with through weight reduction and activity
- Increase activity: 30-50' 5 days/week
- Aspirin for high risk patients

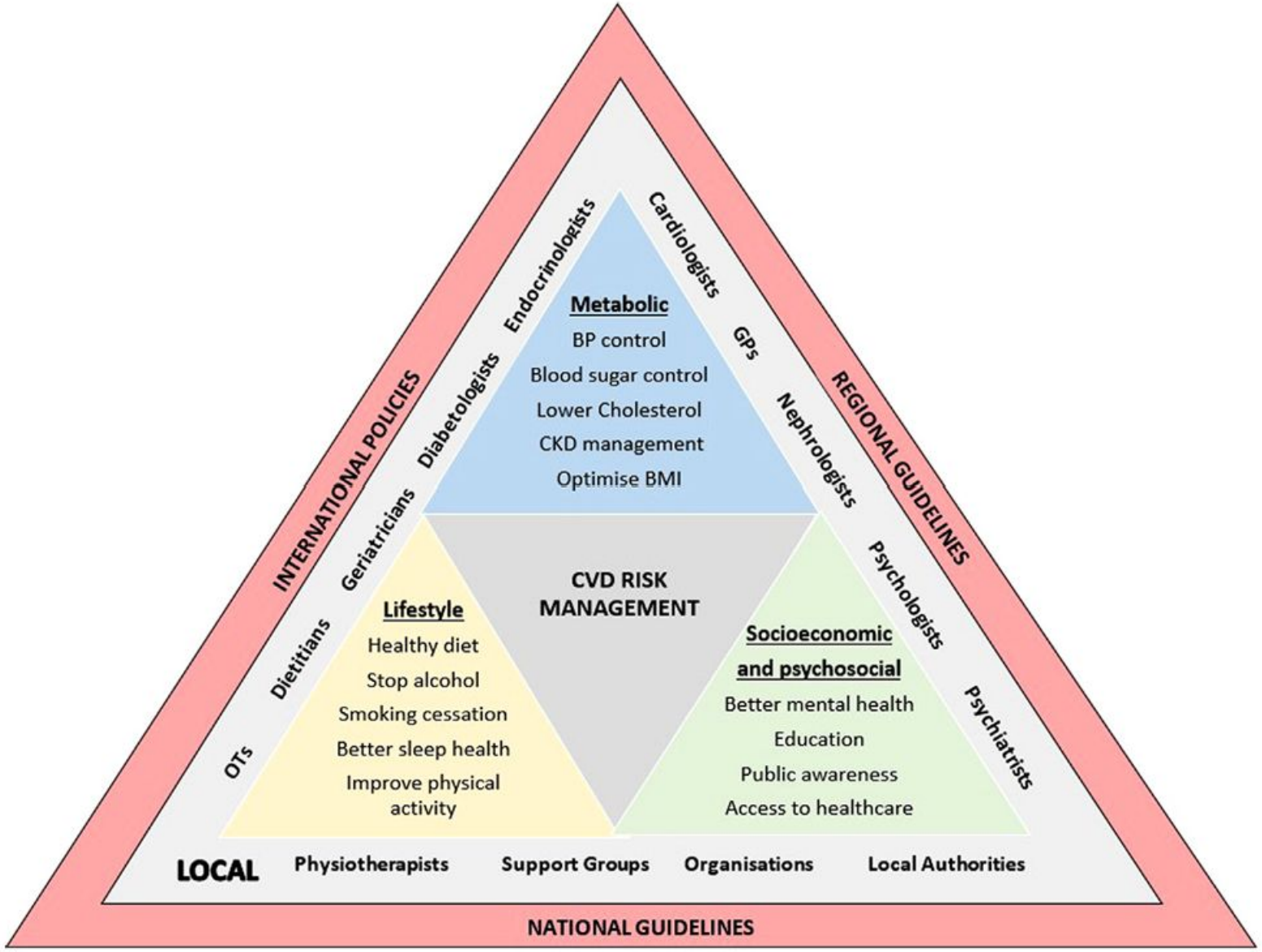

Figure 1. depicts the biopsychosocial model for modifying cardiovascular risk and the wider multi-disciplinary components essential for this
CVD – Cardiovascular disease, GPs – General practitioners, OTs – Occupational therapists, BP – blood pressure, CKD – chronic kidney disease, BMI – Body mass inde

Questions & Comments

Improving Rural Postpartum Health

Scan the code to access a **short survey** to give your opinions on potential services to improve the health of new parents and their families in rural communities. The survey is **anonymous**.

tinyurl.com/ImproveRuralPostpartumHealth

This is part of a research study conducted by the University at Buffalo. Participation in the survey is voluntary and you can skip any questions or stop at any time. If you have questions or concerns, you can contact the investigators: Dr. Pauline Mendola, 716-829-5356 or Dr. Ted Waters, 716-323-0615