



UNIVERSITY OF
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The Effect of Neighbourhood Level Crime On ACS Incidence (The SafeHeart Study)

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Disclosures

- None

- INTERHEART study - 1/3 of the population level risk of acute MI can be attributed to psychosocial stress
- Chronic stress leads to both:
 - Poor health decisions (smoking)
 - Activation of the hypothalamic-pituitary-adrenal (HPA) axis
 - release of catecholamines
 - inflammatory cytokines
 - coagulation factors

■ Psychosocial Stress

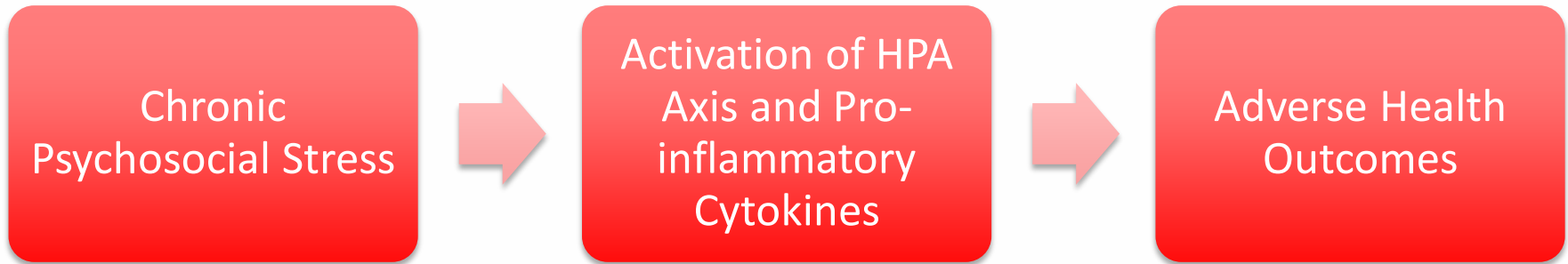
— Individual Factors



— Environmental/Contextual Factors



Proposed Mechanism



Study Framework



- Specific Aim: To determine the association of neighbourhood crime rates on ACS incidence in two large metropolitan centres
- Hypothesis: living in a high crime neighbourhood is associated with increase risk of ACS and increase mortality at 1-year

1. Canadian Census – 2006,2011
 - Neighbourhood level income and population statistics
 - Postal Code level merged to neighbourhood level
2. Edmonton and Calgary Police Service crime data
 - Organized by neighbourhood and type of crime from 2006-2015
3. Discharge Abstract Database
 - All first time admissions to hospital for ACS from January 1st 2006 to December 31st 2013
 - Includes demographic and mortality data
4. APPROACH
 - Linked to DAD
 - adds clinical comorbidities, and cardiac cath data

Citizens Living in Edmonton
and Calgary (n=1,870,000)



ACS (UA,NSTEMI,STEMI)
(n=27,977)

- Age > 18
- Jan 1 2006 – Dec 31 2013



Final Cohort (n=27,221)



765 patients excluded for
living in neighbourhood
newly developed since
2006

■ Predictors

— Area Level

1. Neighbourhood crime rate
(crimes/1000p/year)
2. Neighbourhood Median Household income
3. Neighbourhood Proportion >65 years old

— Individual Level:

1. Age, sex, CV risk factors, clinical comorbidities

■ Outcomes

1. Area Level

- ACS Incidence
(events/1000p/year)

2. Individual Level

- 1-year mortality rate among those that have ACS

- Area Level
 - Hierarchical linear regression to estimate the ACS incidence per quintile of neighbourhood crime
 - Adjusted for
 - Median household income of neighbourhood
 - Proportion of age > 65 living in the neighbourhood
 - City
- Individual Level
 - Hierarchical logistic regression to estimate odds of death at 1 year post ACS among survivors
 - Adjusted for
 - Age, Sex, CV risk factors and comorbidities
- Random effects for neighbourhoods, cities - clustering

Quintile of Neighbourhood Crime (N=# of Neighbourhoods)

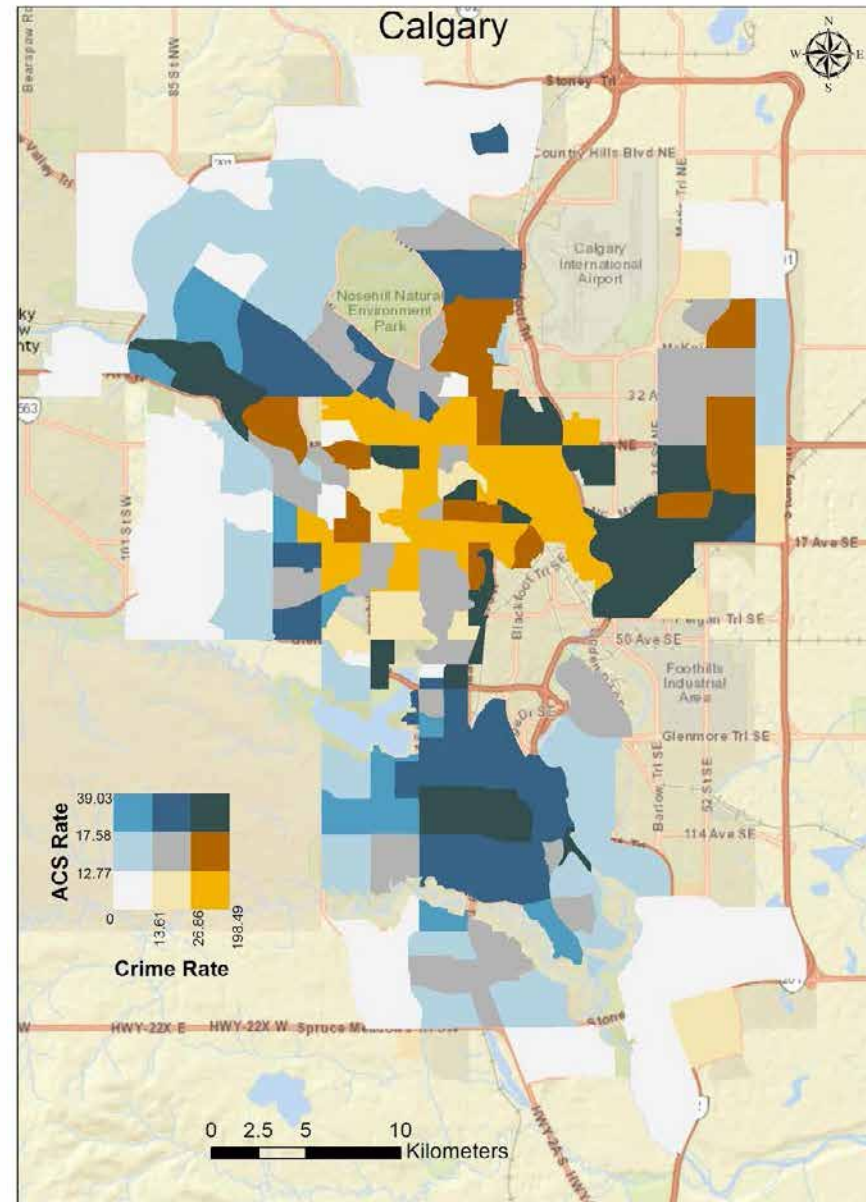
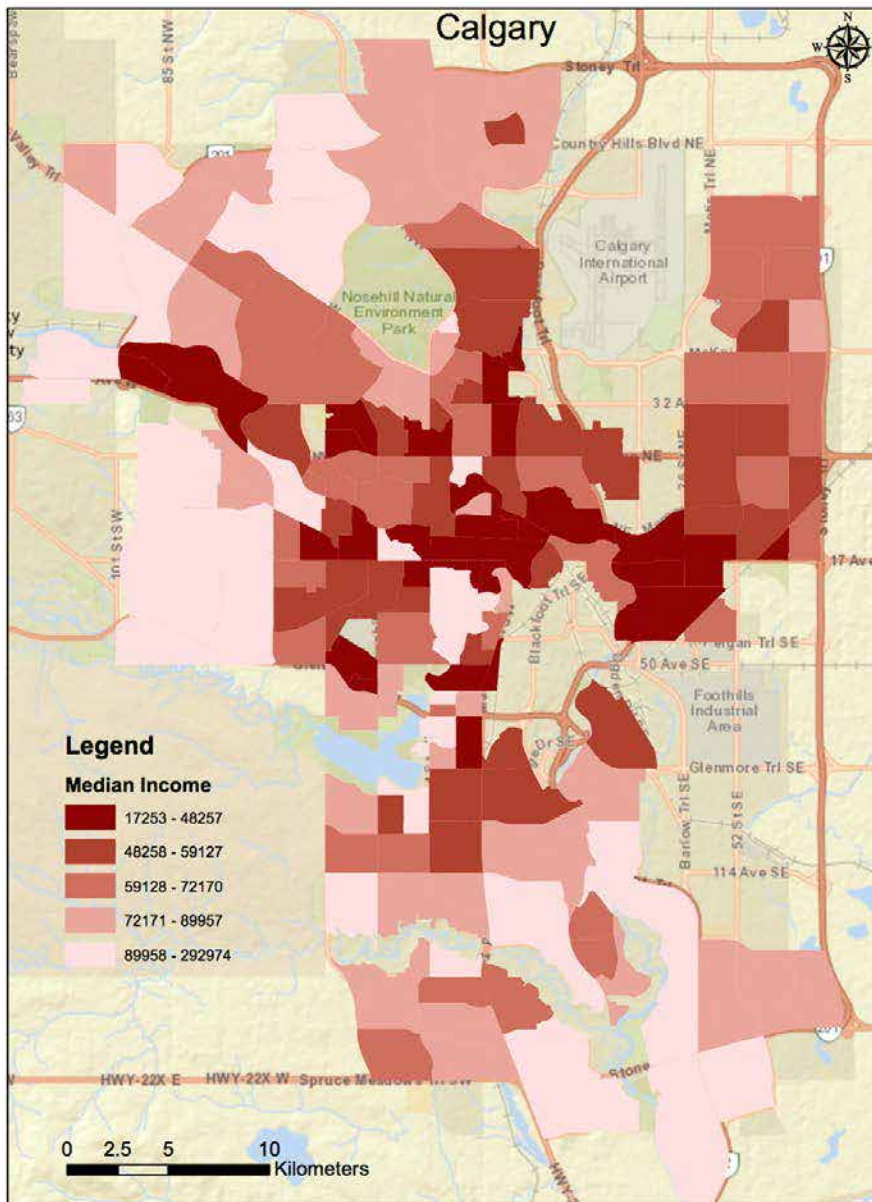
	Q1(N=85) (lowest)	Q2(N=85)	Q3(N=85)	Q4(N=85)	Q5(N=85) (highest)
Mean					
Crimes/1000persons(SD)	8(2)	13(2)	19(3)	29(4)	59(31)
Population	445,012	400,256	302,500	354,627	346,177
Proportion Age > 65 (%)	10	13	14	16	16
Median Income (CAD)	93,932	76,840	66,011	54,172	45,255

Quintile of Neighbourhood Crime (N=# of ACS)

	Q1(N=5940)	Q2(N=4758)	Q3(N=5174)	Q4(N=5865)	Q5(N=5484)	P-value
Age [SD]	61.9[13]	61.9[12]	63.4[13]	63.8[13]	63[13]	<.001
Sex (%Male)	73.4	70.8	69.1	66.9	67.5	<.001
HTN (%)	65	66	67	68	69	<.001
Smoking (%)	17	21	25	30	34	<.001
BMI [SD]	28[5]	28[5]	28[6]	29[6]	29[6]	<.001
Diabetes (%)	22	24	24	26	27	<.001
CHF (%)	11	12	14	15	18	<.001

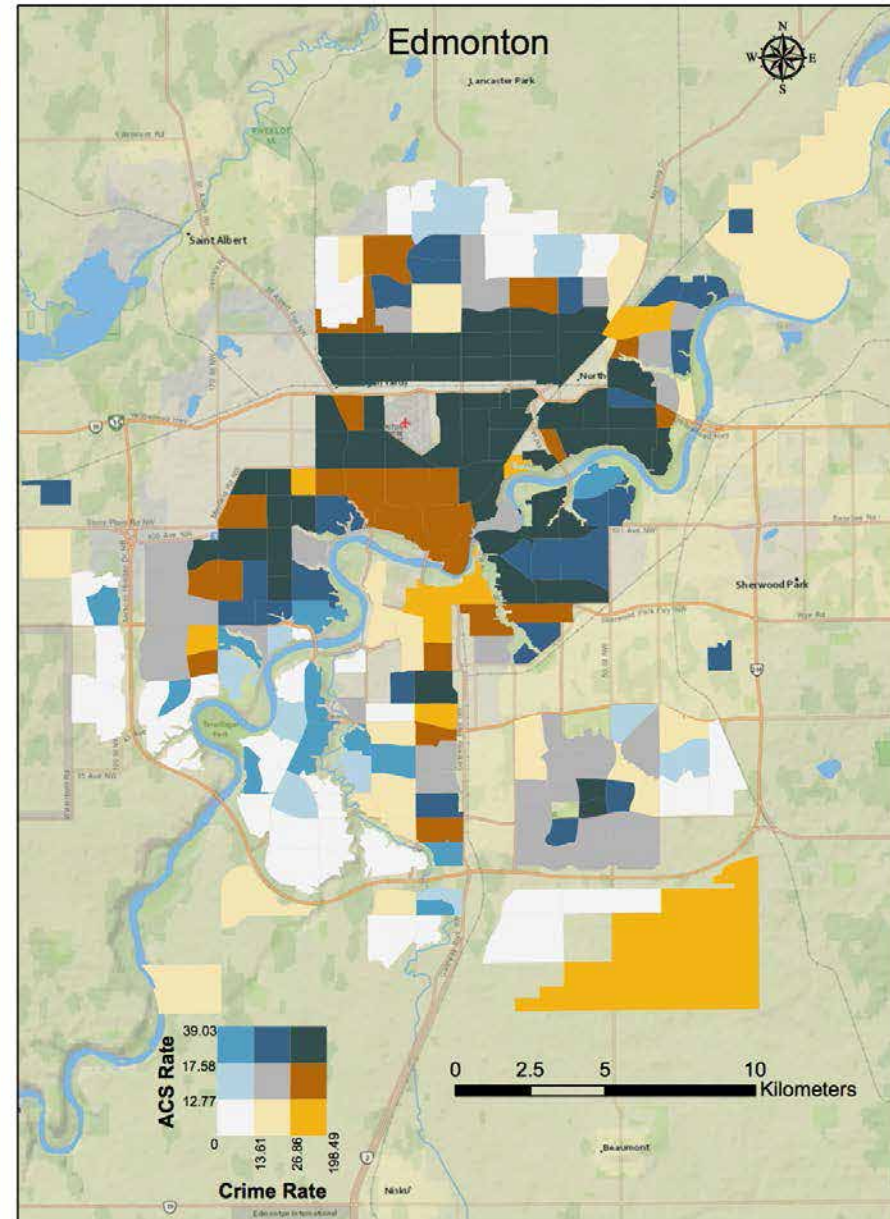
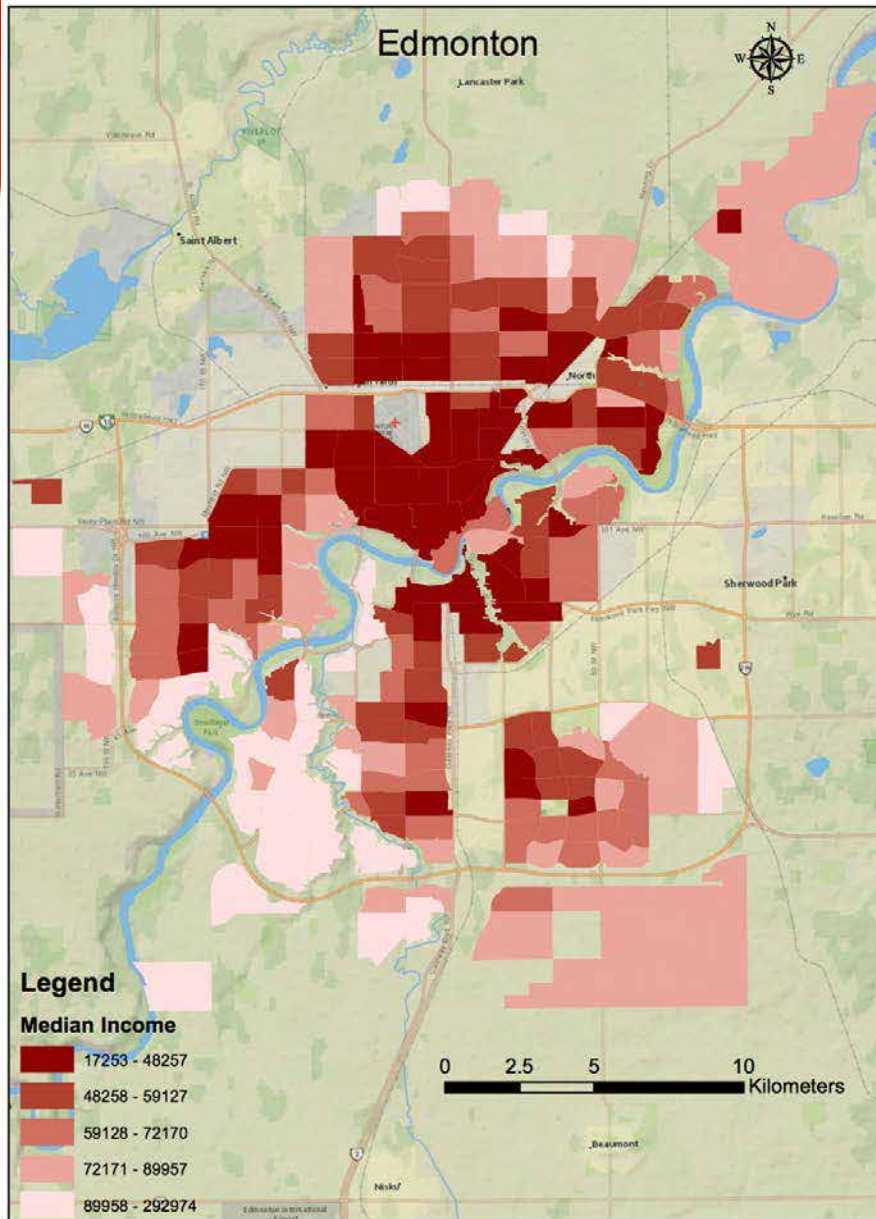


Calgary

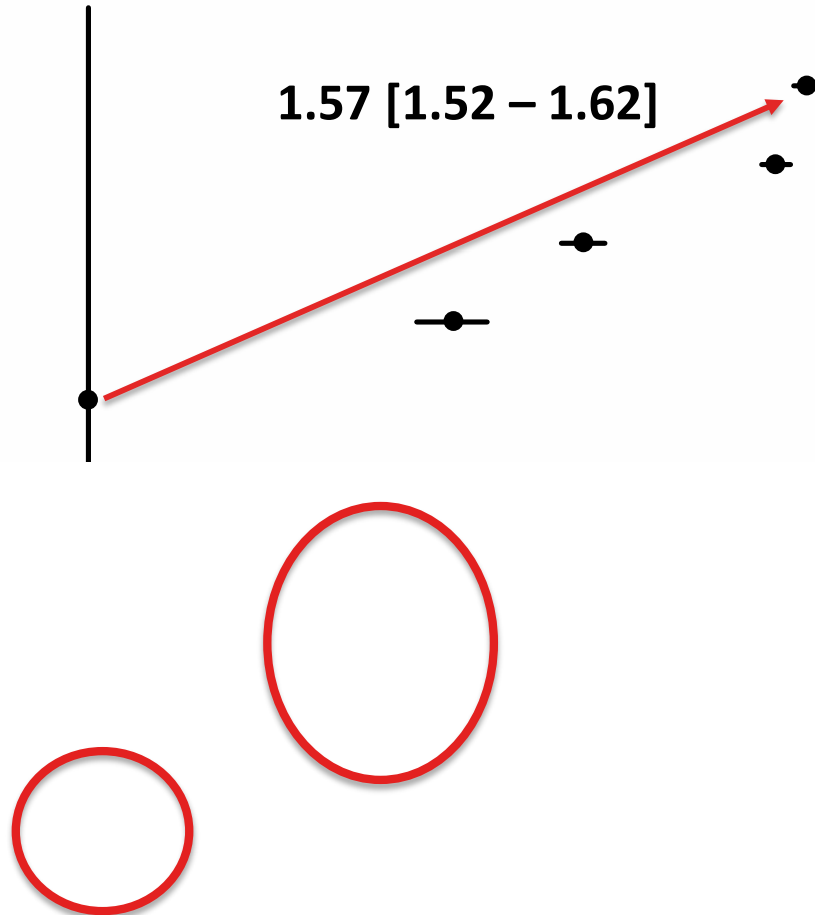




Edmonton



Subgroup	ACS Incidence (95% CI)
Unadjusted Quintile 5	6.75 [6.51 - 6.99]
Unadjusted Quintile 4	6.21 [5.97 - 6.45]
Unadjusted Quintile 3	3.73 [3.51 - 3.94]
Unadjusted Quintile 2	2.64 [2.39 - 2.88]
Unadjusted Quintile 1	1.0 (Ref)



	Q1(N=5940)	Q2(N=4758)	Q3(N=5174)	Q4(N=5865)	Q5(N=5484)
Mortality at 1-year (#)	131	115	145	181	181
Proportion Mortality (%)	2.2	2.4	2.8	3.1	3.3

	Unadjusted	Adjusted
OR Mortality at 1-year [95% CI]	1.11 [1.06-1.17]	0.98 [0.89 - 1.05]

- ACS incidence rate is associated with an increase in neighbourhood crime rate

- Mortality after an ACS event is not significantly associated with neighbourhood crime rate when individual clinical comorbidities are accounted for

- Patient movement between neighbourhoods not accounted for
- Unmeasured area-level confounders likely exist
- Not capturing patients who do not make it to hospital

- Living in a neighbourhood of highest crime translates to an extra 742 ACS admissions per year in Edmonton and Calgary
 - This amounts to 9 million dollars in direct hospital costs per year
- Further evidence to support funding of crime prevention, and upstream social determinants of health

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Figure 1. A stress model integrating psychosocial risk factors of cardiovascular disease

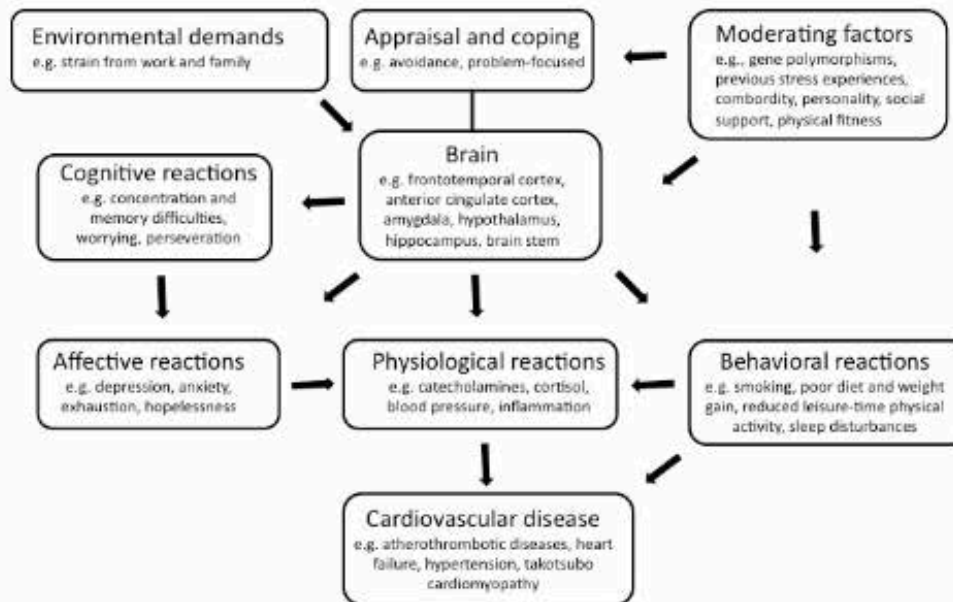


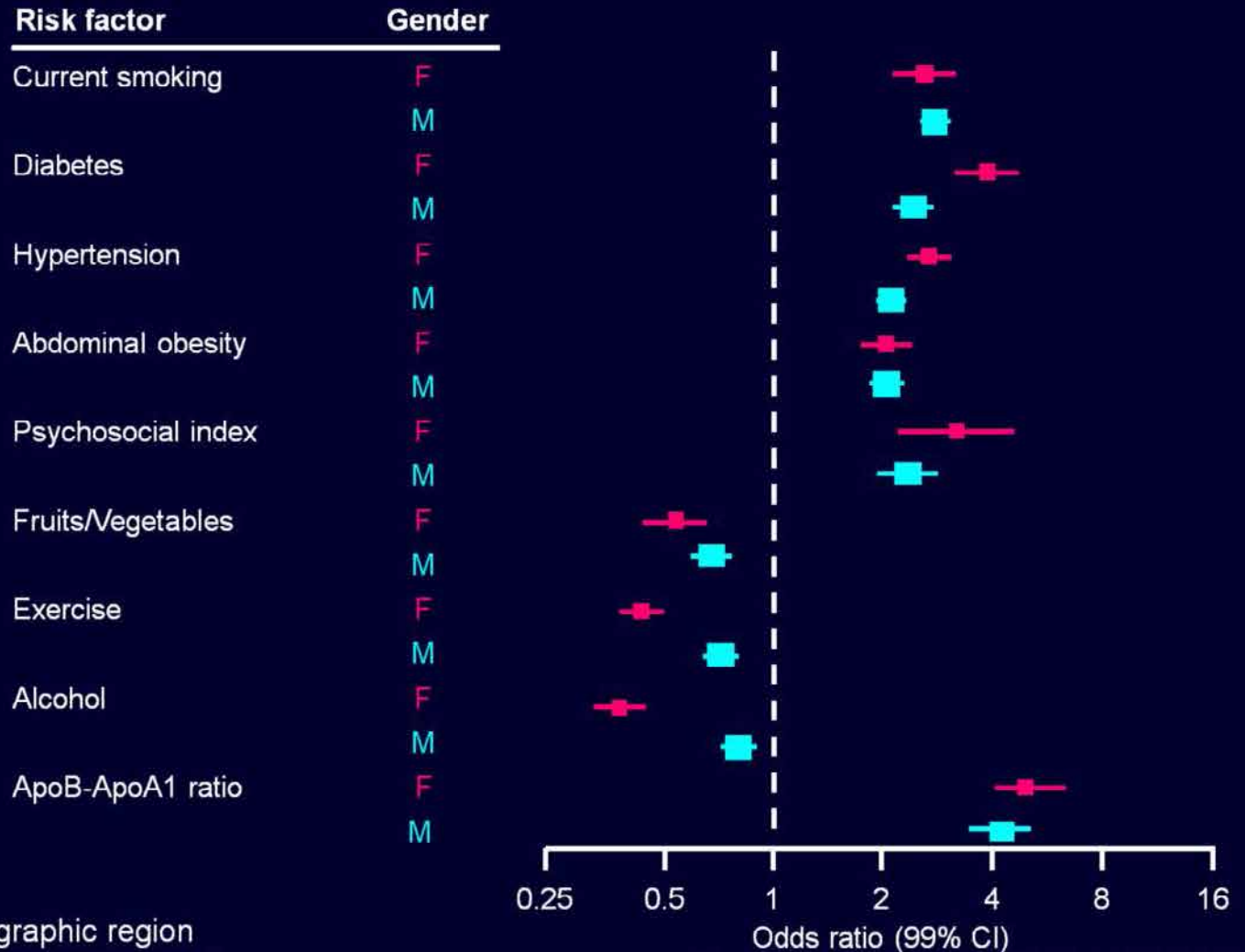
Figure 1

Depending on appraisal, coping resources, and several moderating factors, environmental demands trigger a neurobiologically driven stress reaction across cognitive, affective, behavioural, and physiological domains, all contributing directly and/or indirectly to cardiovascular disease.

- Swedish study followed the city of Stockholm for 1 year for admission to hospital for coronary heart events
 - CHD event OR 1.75 (95% CI 1.37–2.22) among men from highest compared to lowest quintile of neighbourhood crime
- Baltimore memory study - neighbourhoods with high psychosocial hazard scores found
 - Those living in highest quartile of psychosocial hazard had OR 4.68 (95% CI 1.50-14.6) for history of MI

		2006									
		1	2	3	4	5	6	7	8	9	10
ABBEYDALE	Commercial Robbery										
ABBEYDALE	Street Robbery				1		1				
ABBEYDALE	Assault (Non-domestic)	2	3	1	2	1	2	1	3	1	2
ABBEYDALE	Violence 'Other' (Non-domestic)							2	2		1
ABBEYDALE	Residential Break & Enter	22	10	3	11	3	6	1	1	1	5
ABBEYDALE	Commercial Break & Enter			2	1		1		1	2	
ABBEYDALE	Theft FROM Vehicle	12	2	3	1	5	1	5	6	2	4
ABBEYDALE	Theft OF Vehicle	7	6	4	4	5	7	4	7		7
ABBEYDALE	SOCIAL DISORDER	40	24	22	48	34	37	42	41	35	38
ABBEYDALE	PHYSICAL DISORDER	13	4	9	7	8	8	4	12	10	4
ACADIA	Commercial Robbery				1	1		1			
ACADIA	Street Robbery				1				1		

INTERHEART: Association of risk factors with acute MI in women and men



Adjusted for age, sex, geographic region
 Note: odds ratio plotted on a doubling scale