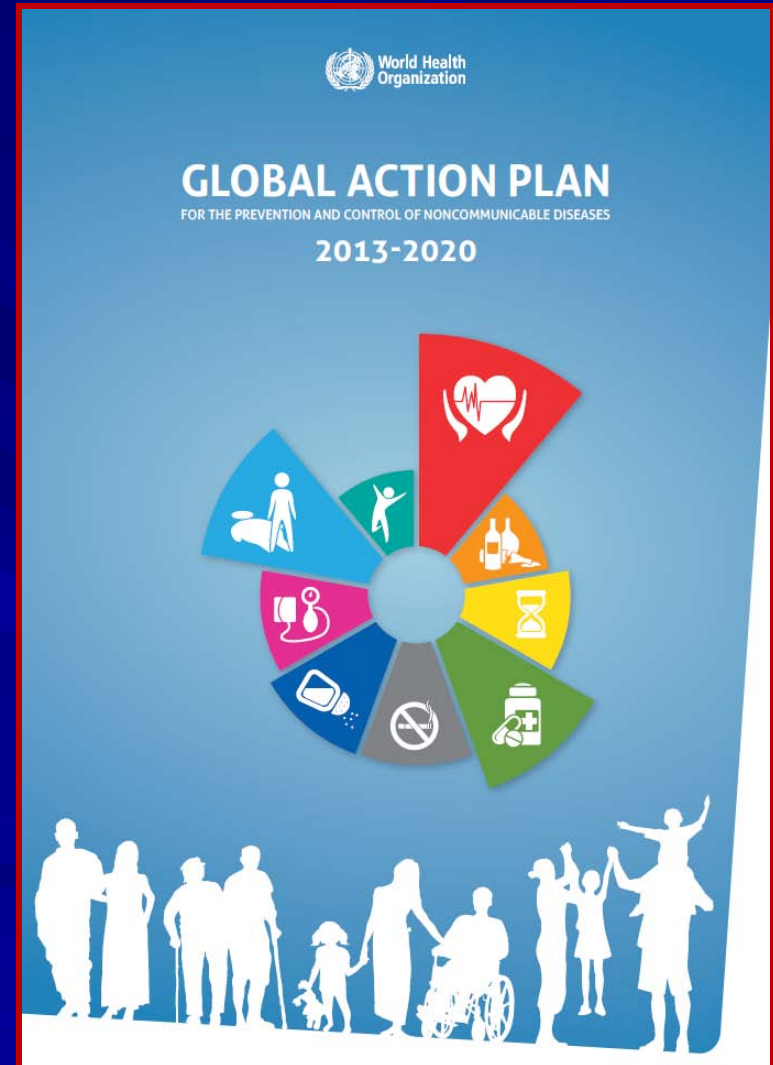# Preventing chronic disease through lifestyle modification: longitudinal approaches
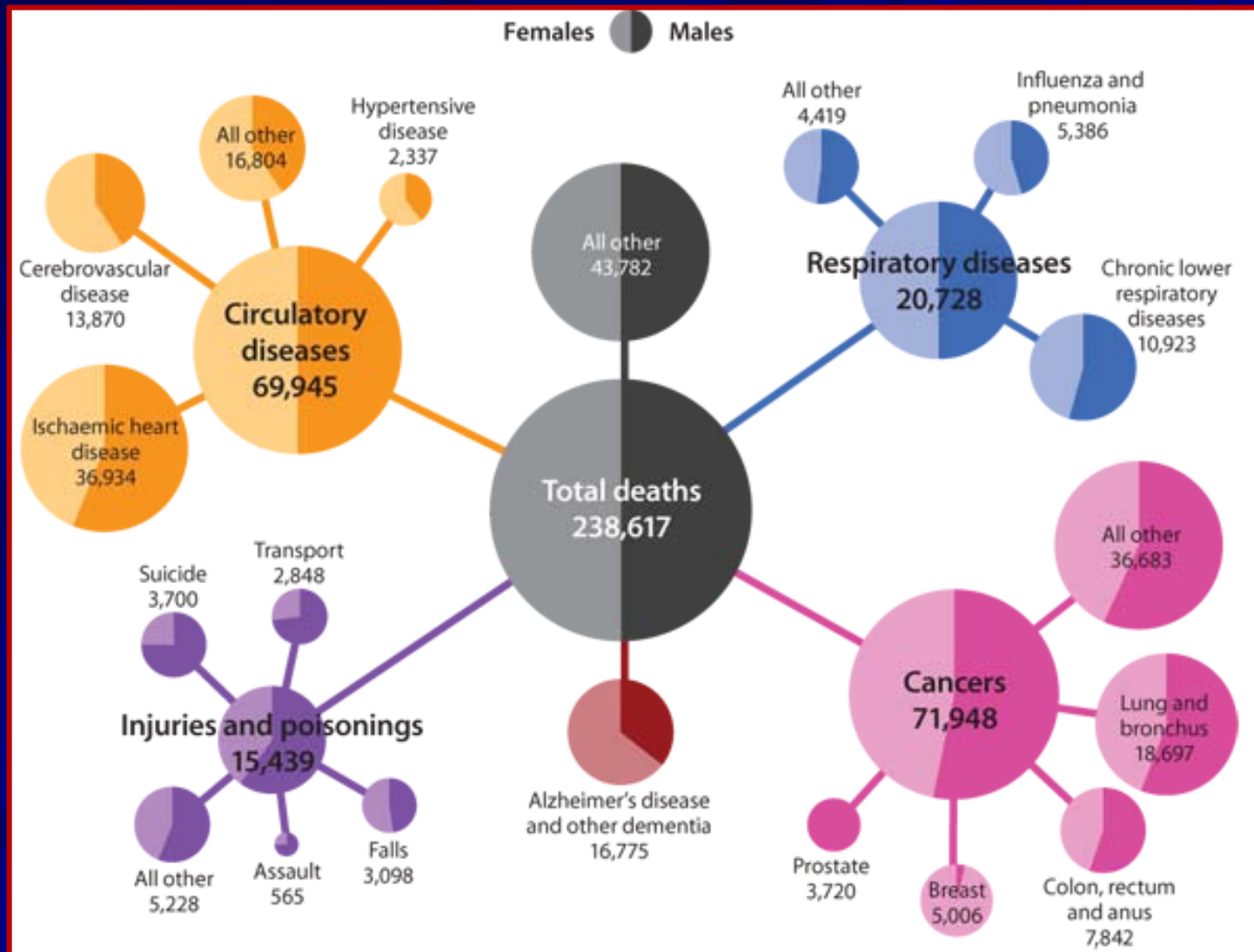
Katerina Maximova, PhD

School of Public Health, University of Alberta
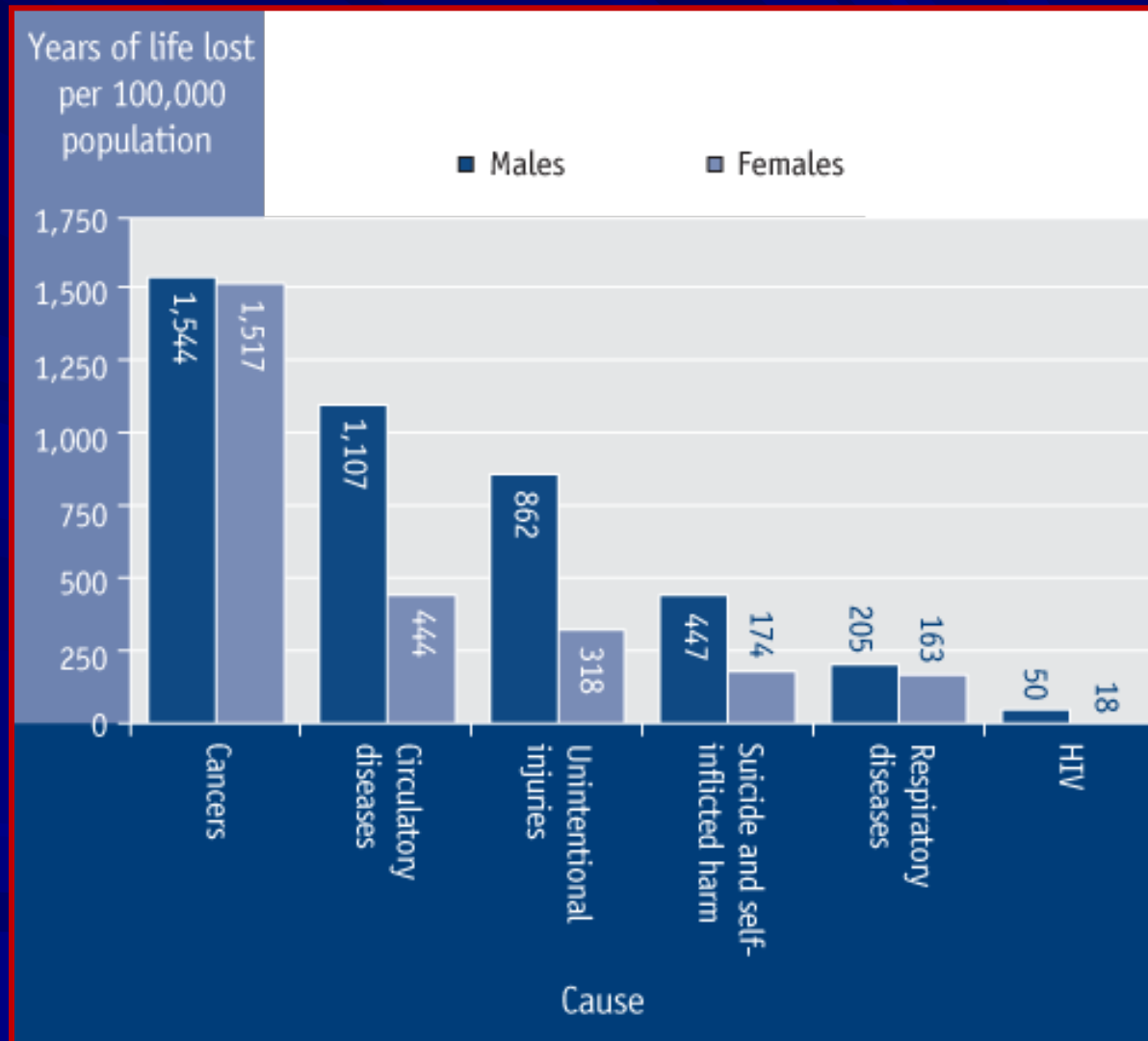
November 1, 2016

Chronic disease burden

- Chronic diseases a priority on the global public health agenda
- >60% deaths due to chronic diseases globally
- Chronic disease deaths are projected to increase by 15% between 2010 and 2020
- CVD, cancers, respiratory diseases, diabetes – leading causes

World Health Organization
GLOBAL ACTION PLAN
FOR THE PREVENTION AND CONTROL OF NONCOMMUNICABLE DISEASES
2013-2020

World Health Organization. Preventing chronic diseases: a vital investment. 2005
Lozano, R., M. et al. Lancet 2012; 380(9859): 2095-2128.
Yusuf S et al. Circulation 2001; 104:2746-53.

Chronic disease burden in Canada

Chronic disease burden in Canada

Nine global NCD targets by 2025

A **25%** relative reduction in risk of premature mortality from cardiovascular diseases, cancer, diabetes or chronic respiratory diseases

At least a **10%** relative reduction in the harmful use of alcohol

A **10%** relative reduction in prevalence of insufficient physical activity

A **25%** relative reduction in prevalence of raised blood pressure or contain the prevalence of raised blood pressure

A **30%** relative reduction in prevalence of current tobacco use

A **30%** relative reduction in mean population intake of salt/sodium

An **80%** availability of the affordable basic technologies and essential medicines, including generics, required to treat NCDs

At least **50%** of eligible people receive drug therapy and counselling to prevent heart attacks and strokes

Halt the rise in diabetes and obesity

Set of 9 voluntary global NCD targets for 2025. Geneva: WHO; 2012 (http://www.who.int/nmh/global_monitoring_framework/en/, accessed 24 August 2015).

Targeting the chronic disease burden

- About 70% chronic diseases are preventable through behaviour modification

- Key behavioural risk factors: tobacco and alcohol use, physical inactivity, unhealthy eating, and obesity

Estimates (PAF%)[1] of cancer preventability by appropriate food, nutrition, physical activity and body fatness[2] in the USA

	By appropriate food, nutrition, and physical activity and body fatness[2]	By appropriate body fatness only [2,3]	
		Male	Female
Stomach	47	▪	▪
Pancreas	39	34	25
Gallbladder	21	11	28
Liver	15	-	-
Colorectum	45	16	3
Breast	38	-	17
Endometrium	70	-	49
Prostate	11	-	-
Kidney	24	20	28

1. These values are percentages calculated as Population Attributable Fraction (PAF) rounded to the nearest whole number and are based on several assumptions. There is a range of likely plausible figures around these point estimates, but they represent the most likely estimates.
2. Based on the conclusions of the 2007 WCRF/AICR Diet and Cancer Report.
3. Estimated for those cancers of which body fatness is a cause (based on the conclusions of the 2007 WCRF/AICR Diet and Cancer Report).

World Health Organization. Preventing chronic diseases: a vital investment. 2005
WCRF/AICR. Policy and Action for Cancer Prevention: Food, Nutrition and Physical Activity. 2010

Recommendations for cancer prevention

RECOMMENDATION 1

BODY FATNESS

Be as lean as possible within the normal range[1] of body weight

PUBLIC HEALTH GOALS

Median adult body mass index (BMI) to be between 21 and 23, depending on the normal range for different populations[2]

The proportion of the population that is overweight or obese to be no more than the current level, or preferably lower, in 10 years

PERSONAL RECOMMENDATIONS

Ensure that body weight through childhood and adolescent growth projects[3] towards the lower end of the normal BMI range at age 21

Maintain body weight within the normal range from age 21

Avoid weight gain and increases in waist circumference throughout adulthood

- Be as lean as possible without becoming underweight.
- Be physically active for at least 30 minutes every day. Limit sedentary habits.
- Avoid sugary drinks. Limit consumption of energy-dense foods.
- Eat more of a variety of vegetables, fruits, whole grains and legumes such as beans.
- Limit consumption of red meats (such as beef, pork and lamb) and avoid processed meats.
- If consumed at all, limit alcoholic drinks to 2 for men and 1 for women a day.
- Limit consumption of salty foods and foods processed with salt (sodium).

Prevalence of obesity in Canada
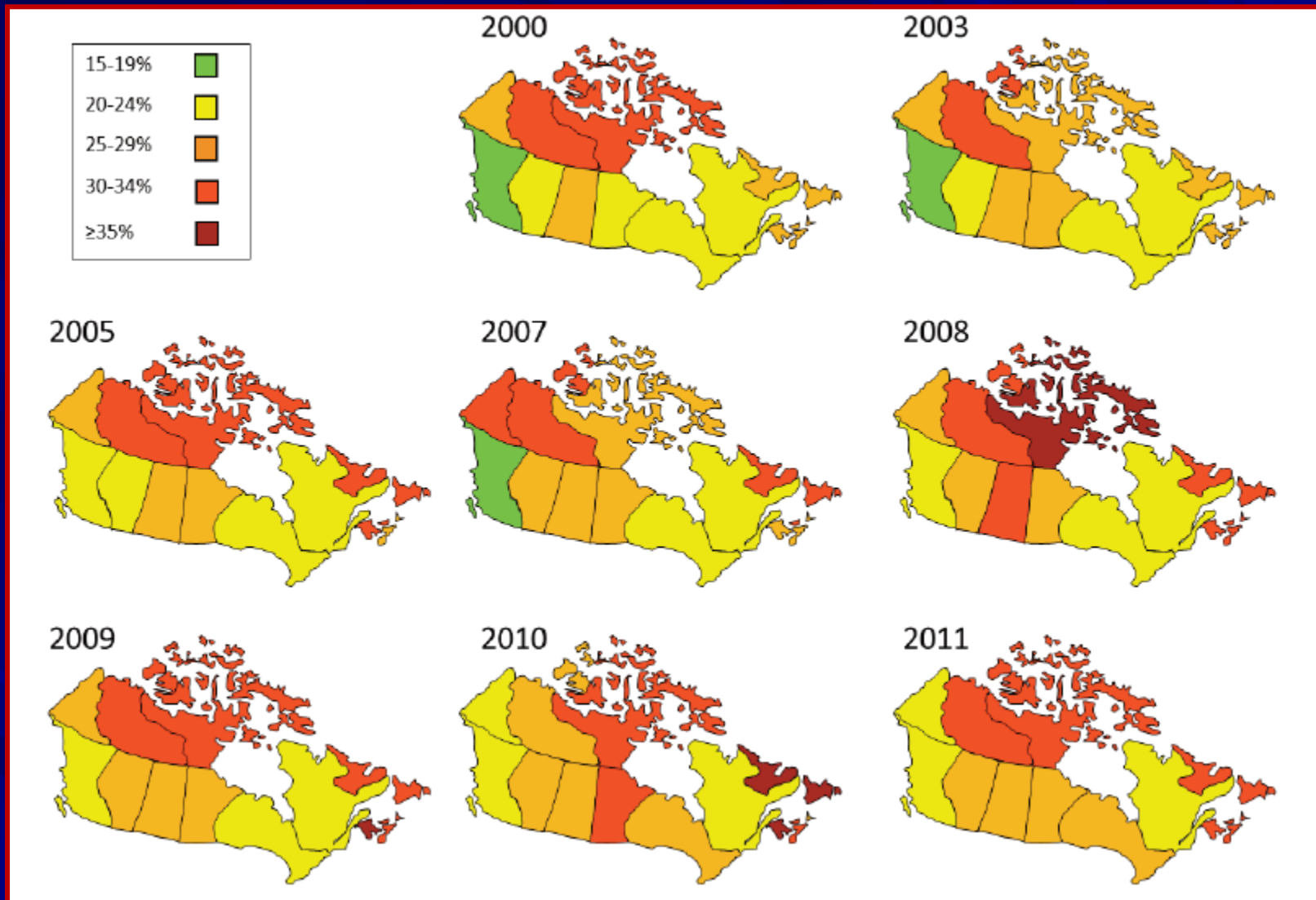
Prevalence of chronic disease risk factors is high among Canadian adults

Smoking prevalence ↓

- declined by 50% since 1970s but remains at ~20%
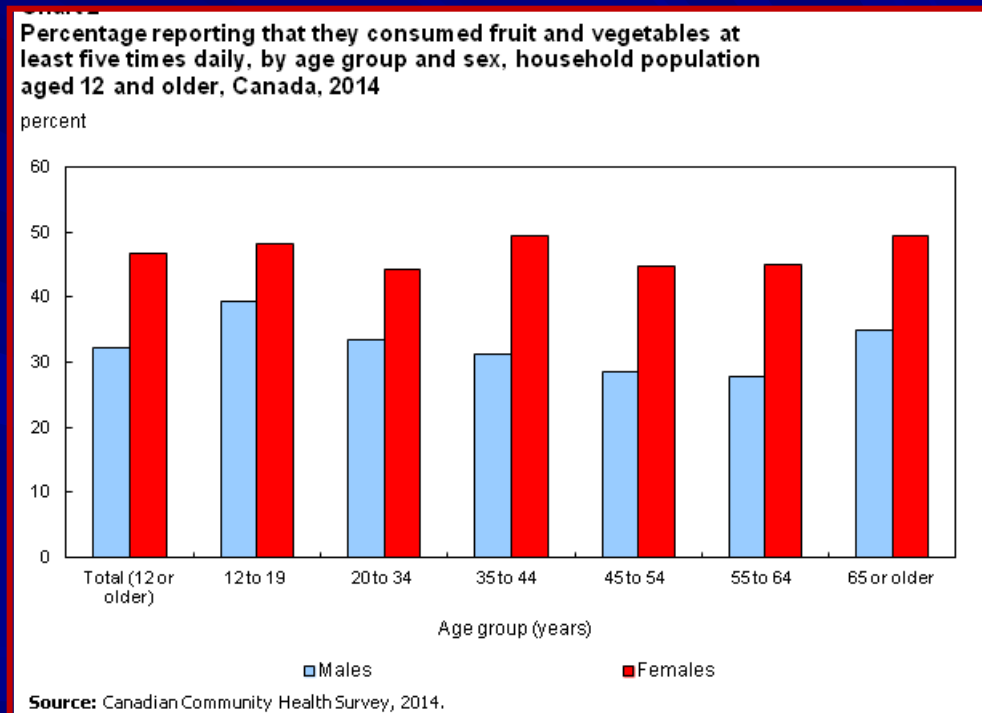
Obesity prevalence ↑

- 47% are overweight or obese
- Increases with age

Physical activity ↓

- 15% meet physical activity recommendations
- Declines with age

Healthy eating ↓

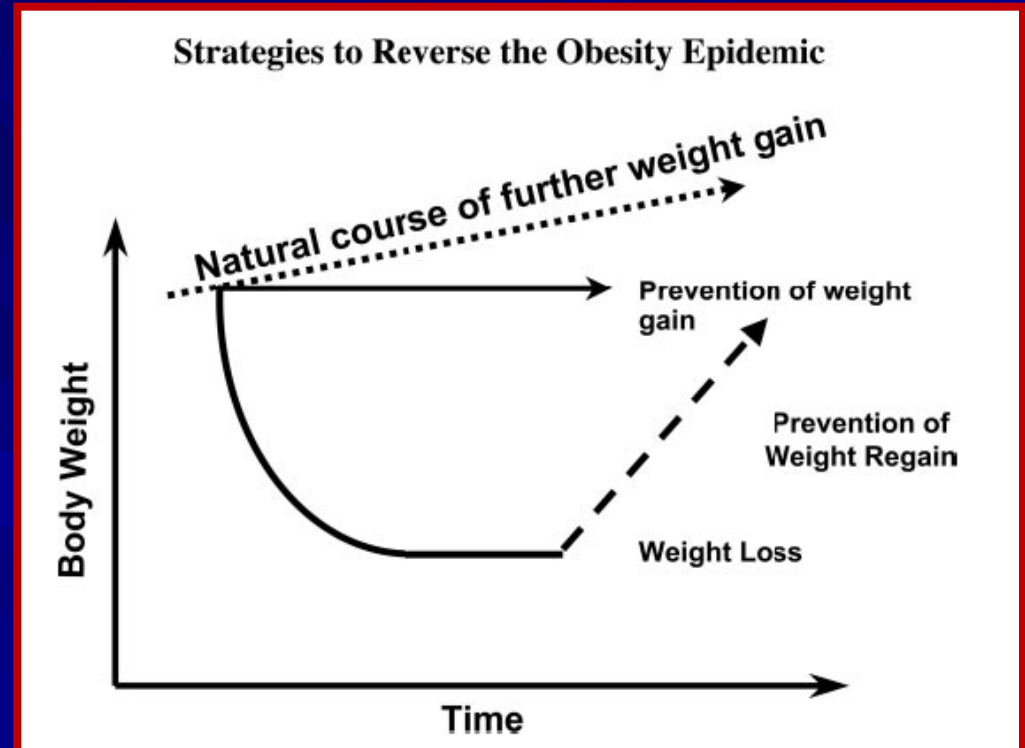- ~40% meet recommended daily fruit & vegetables intake

Percentage reporting that they consumed fruit and vegetables at least five times daily, by age group and sex, household population aged 12 and older, Canada, 2014

percent

Age group (years)

□ Males   ■ Females

Source: Canadian Community Health Survey, 2014.

Reid JL et al. Tobacco Use in Canada: Patterns and Trends. PROPEL 2012.
Colley RC et al. Health Reports 2011; 22:1-8.
Garriguet, D. Health Reports 2012; 18(2):17–32.

Past interventions not successful

Prevention

- Modest improvements in behaviours and little reduction in weight

Treatment

- Increased PA/HE lead to weight loss and risk improvement
- Transient effect on weight

Strategies to Reverse the Obesity Epidemic

Flodmark CE et al. *International journal of obesity* 2006;30(4):579-89
Summerbell CD et al. *Cochrane Database of Systematic Reviews* 2005
Wareham NJ et al. *Proceedings of the Nutrition Society* 2005;64(2):229-47
Reilly JJ et al. *British medical journal* 2006;333(7577):1041
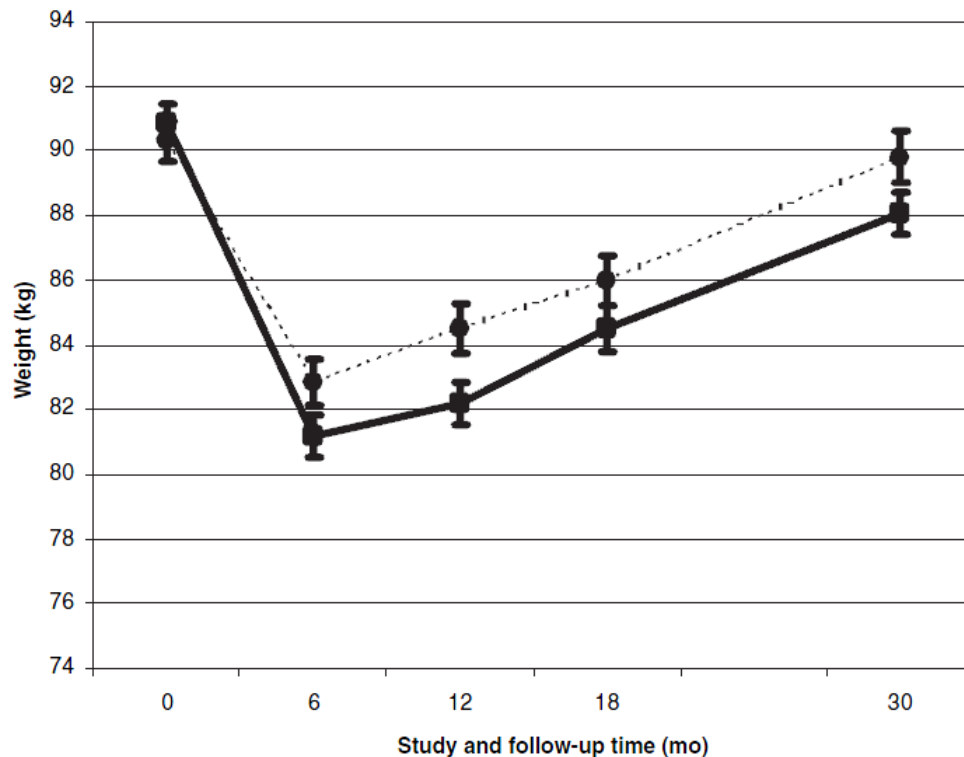
Maintenance is a challenge

FIGURE 1. Weight by randomized group. ●, Standard behavior treatment group ($n = 66$); ■, high physical activity group ($n = 75$). Time effect, $P < 0.001$; treatment × time interaction, $P = 0.21$ (repeated-measures ANOVA).

Tate DF et al. *Am J Clin Nutr* 2007; 85:954-9.

What's needed for successful weight loss

- National Weight Control Registry (NWCR)
- *Eligibility criteria*: maintain weight loss of ≥30lb for ≥1 yr
- N = 6000 adults
- On average, maintain weight loss ≥70lb for ≈6 yrs

Key strategies

- Very high levels of physical activity
  - 2800 kcal/wk or 60 min/d of MPA
- Consistent self-monitoring of body weight, food intake, and physical activity

Hill JO. *Endocrine reviews* 2006;27(7):750-761.

What's needed for successful maintenance

Univariate Regression Models for Individual Moderators

Moderator	B	SE B	β	Model R^2
Participant age				
Linear term	−0.24***	0.06	−2.02	0.29
Quadratic term	0.28***	0.06	2.24	
Participant gender	0.10**	0.04	0.30	0.09
Participant ethnicity: % Black/Hispanic	0.01	0.01	0.06	0.00
Risk status of participants	0.02	0.03	0.10	0.01
Intervention duration				
Hr	−0.01	0.01	−0.06	0.00
Weeks	−0.03*	0.01	−0.26	0.07
Parental involvement	0.01	0.03	0.03	0.00
Psychoeducational content	−0.06	0.04	−0.20	0.04
Dietary improvement	−0.04	0.04	−0.13	0.02
Physical activity increase	−0.01	0.03	−0.04	0.00
Reduced sedentary behavior	0.09	0.05	0.21	0.04
No. of behavioral targets	−0.04**	0.01	−0.33	0.11
Teachers vs. interventionist	0.02	0.03	0.10	0.01
Didactic vs. interactive	0.04	0.03	0.16	0.03
Pilot study	0.12**	0.04	0.35	0.12
Recruitment method	0.12**	0.04	0.37	0.13
Random assignment	−0.02	0.03	−0.09	0.01
Nested data modeled incorrectly	0.02	0.03	0.11	0.01

Note. The parameter estimates of the linear and quadratic effect for age of participants were drawn from a model containing both these terms. All other parameter estimates were drawn from univariate models.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Weight status misperception is common

Models of behaviour change

- Health Belief Model
- Transtheoretical Model of Health Behaviour Change
- Decisional Balance Model
- Social Cognitive Theory

Common theme: necessity of perceiving oneself "at risk"

Table 1 Percentages of men and women of varying weight statuses that believe they are healthy weight/underweight
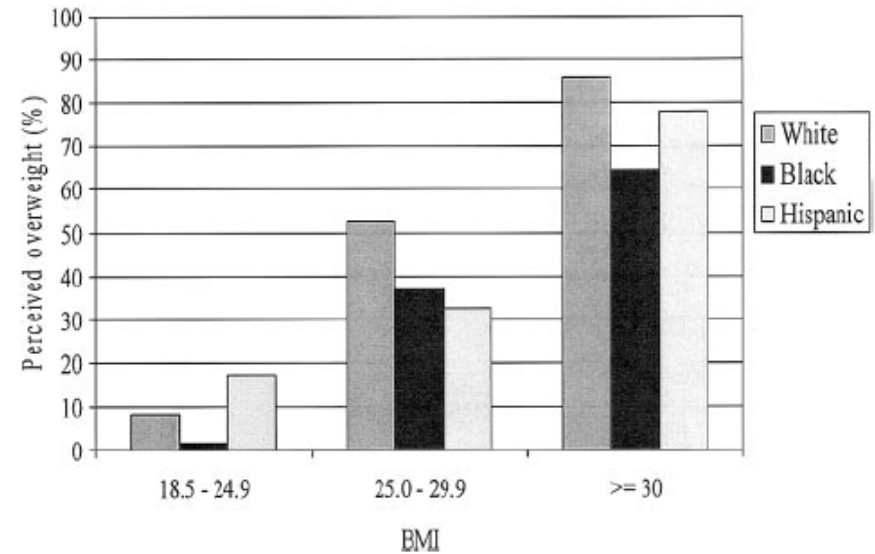
	Males	Females
Obese	11.90	4.61
Overweight	42.74	18.40
Healthy weight/underweight	89.04	64.68
Sample size	7758	8451

Kuchler F, Variyam JN. *Int J Obes Relat Metab Disord* 2003;27(7):856-861
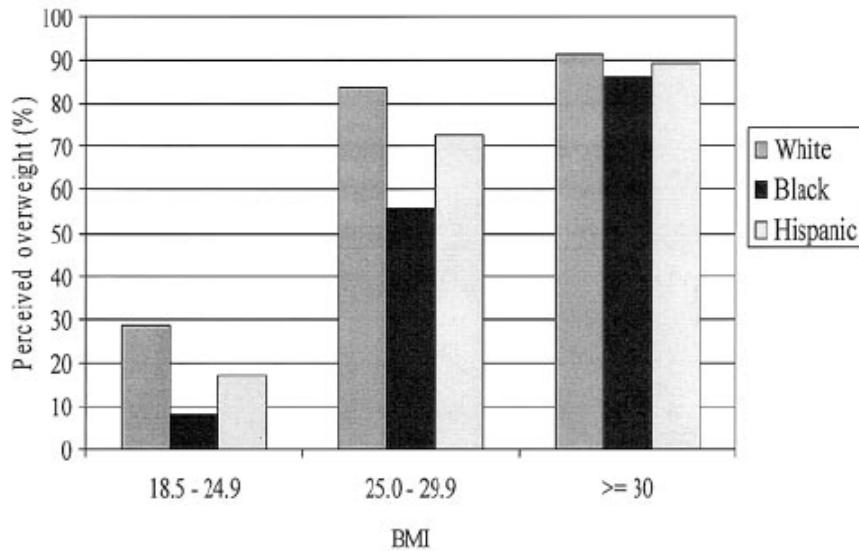
Weight status misperception is common
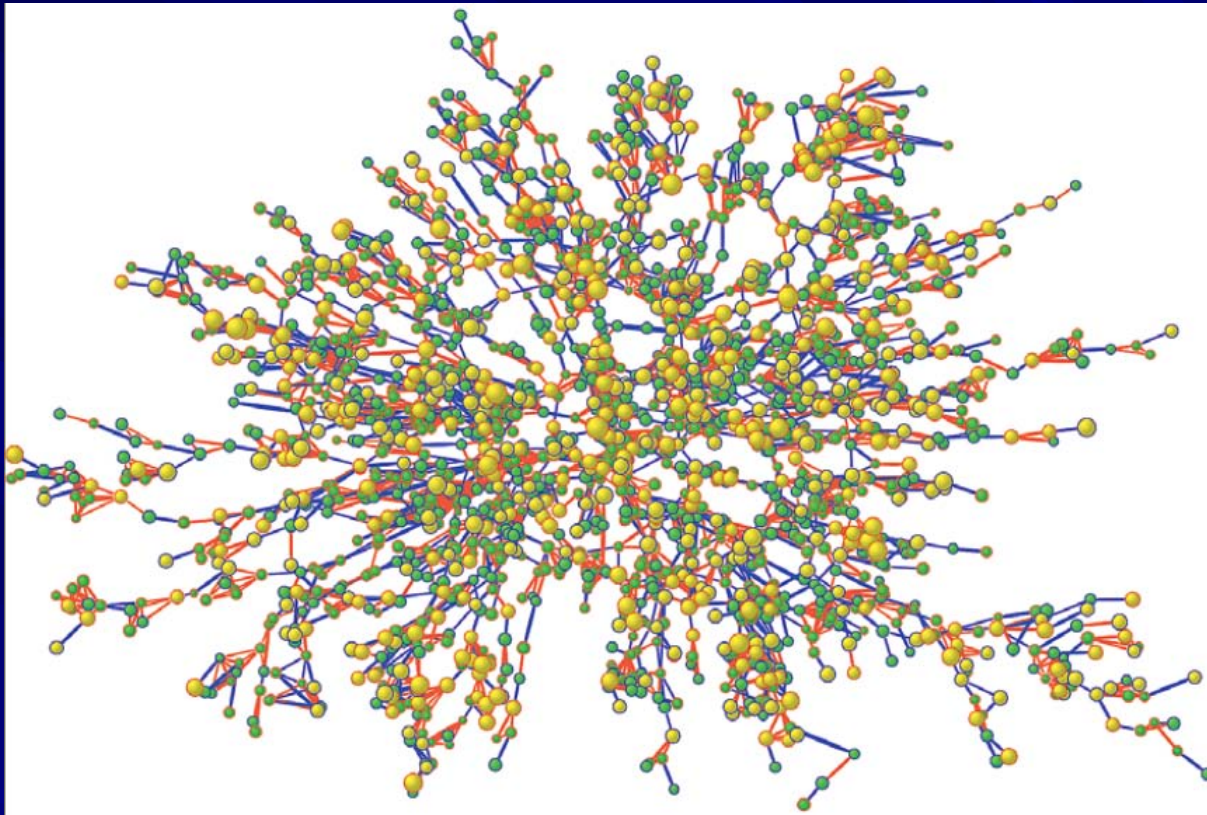
Exposure to obesity and weight status

Figure 1. Largest Connected Subcomponent of the Social Network in the Framingham Heart Study in the Year 2000.
Each circle (node) represents one person in the data set. There are 2200 persons in this subcomponent of the social network. Circles with red borders denote women, and circles with blue borders denote men. The size of each circle is proportional to the person's body-mass index. The interior color of the circles indicates the person's obesity status: yellow denotes an obese person (body-mass index, ≥30) and green denotes a nonobese person. The colors of the ties between the nodes indicate the relationship between them: purple denotes a friendship or marital tie and orange denotes a familial tie.

Impact of exposure to obesity on misperception

Table 4 Multilevel models for exposure to obesity on misperception score by age

Model	Age 9 (n = 1049)				Age 13 (n = 1170)				Age 16 (n = 1144)			
	β	s.e.	t	P	β	s.e.	t	P	β	s.e.	t	P
Base												
Random effects												
Between schools	0.068	0.023	—	—	0.034	0.014	—	—	0.024	0.010	—	—
Within schools	1.211	0.050	—	—	0.655	0.028	—	—	0.543	0.023	—	—
Fixed effects												
Intercept	−0.398	0.044	−8.98	<0.0001	−0.940	0.033	−28.79	<0.0001	−0.738	0.029	−25.02	<.0001
Gender (boy = 1)	0.075	0.059	1.09	NS	0.111	0.052	2.00	<0.05	−0.132	0.049	−2.71	<.01
1												
Parent BMI	−0.040	0.007	−5.75	<0.0001	−0.011	0.006	−1.97	<0.05	−0.016	0.005	−2.96	<0.01
2												
Schoolmate BMI	−0.270	0.033	−8.11	<0.0001	−0.063	0.022	−2.91	<0.001	−0.117	0.030	−3.89	<0.0001
3												
Parent BMI	−0.035	0.007	−5.23	<0.0001	−0.011	0.006	−1.92	NS	−0.015	0.005	−2.83	<0.01
Schoolmate BMI	−0.281	0.035	−7.99	<0.0001	−0.075	0.023	−3.28	<0.001	−0.113	0.035	−3.20	<0.001

Abbreviations: BMI, body mass index; NS, not significant. Model 3, Student level: misperception $= \beta_0 + \beta_1$ (gender) $+ \beta_2$ (parent BMI) $+ \varepsilon_0$. School-level: $\beta_0 = \gamma_{00} + \gamma_{01}$ (schoolmate BMI) $+ \mu_0$. $\beta_1 = \gamma_{10} + \gamma_{11}$ (schoolmate BMI). $\beta_2 = \gamma_{20}$.

KEY POINTS

Prevention of weight gain

- Body mass index is easy and inexpensive to measure, and can be used to monitor weight changes over time.

- Interventions for prevention of weight gain in adults of normal weight have a minimal effect and the effects are not sustained over time.

- Some individuals with normal weight may still benefit from interventions for weight-gain prevention, such as those with metabolic risk factors, high waist circumference, or a family history of type 2 diabetes or cardiovascular disease.

- For adults who are gaining weight and motivated to make lifestyle changes, practitioners should consider offering or referring to prevention interventions to prevent further weight gain.

Treatment of overweight and obesity

- Weight loss interventions (behavioural and/or pharmacologic) are effective in modestly reducing weight and waist circumference.

- Although most participants in weight-loss studies regain some weight after intervention, the average amount regained is lower among intervention participants than control participants.

- For adults who are at risk of type 2 diabetes, weight-loss interventions delay the onset of type 2 diabetes.

- Behavioural interventions are the preferred option, as the benefit-to-harm ratio appears more favourable than for pharmacologic interventions.

Weight misperception and weight-related attitudes and behaviors

Table 2 Effect of Weight Misperception on Weight Loss Attitudes and Behaviors Among Overweight and Obese US Adults by Gender and Race/Ethnicity, NHANES 2003-2006[a]

		Weight Loss Attitudes and Behaviors	
		Wants To Lose Weight RR (95% CI)	Has Tried To Lose Weight RR (95% CI)
Total	Total	0.30 (0.26, 0.35)	0.40 (0.33, 0.47)
	Men	0.29 (0.25, 0.34)	0.40 (0.30, 0.52)
	Women	0.35 (0.29, 0.42)	0.44 (0.32, 0.59)

"Weight misperception was associated with less interest in or attempts at weight loss and less physical activity, highlighting the importance of focusing on inaccurate weight perceptions in targeted weight loss efforts."

Table 3 Effect of Weight Misperception on Dietary Intake and Physical Activity Behaviors Among Overweight and Obese US Adults by Gender and Race/Ethnicity, NHANES 2003-2006[a]

		Dietary Intake[b]	Physical Activity Behaviors[c]	
		Total Energy Intake (kcals) Change (95% CI)	Insufficiently Active RR (95% CI)	Meets Activity Recommendations RR (95% CI)
Total	Total	9.53 (-85.24, 104.32)	0.74 (0.60, 0.92)	0.86 (0.68, 1.10)
	Men	10.54 (-107.68, 128.76)	0.68 (0.52, 0.89)	0.95 (0.69, 1.30)
	Women	-64.29 (-161.26, 32.69)	0.79 (0.55, 1.14)	0.74 (0.54, 1.00)

Duncan DT et al. Int J Behav Nutr Phys Act. 2011; 22;8:20.

- Clinical practice guidelines recommend the assessment of motivational factors prior to initiating therapy for obesity management

Objective

- To characterize stages of readiness to change nutrition and physical activity habits among parents whose children with obesity were enrolled in obesity management and to examine differences in parents' own nutrition and physical activity habits according to their stage of readiness

Stages of behaviour change

Prochaska JO, Velicer WF, 1997.
Maximova K et al. *Pediatric Obesity* 2014.
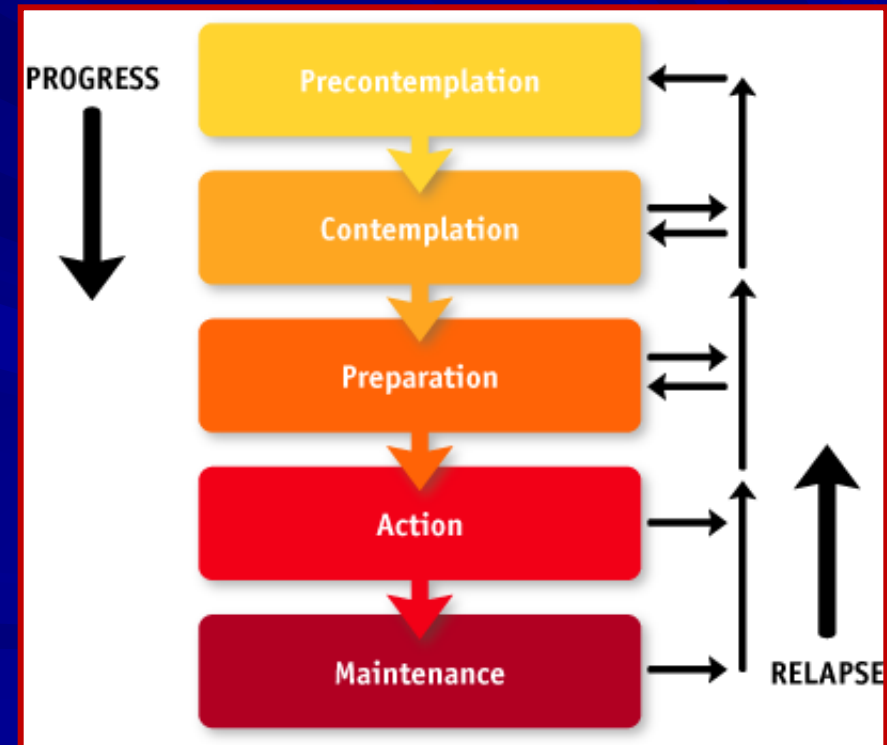
Motivation and healthy behaviours

Proportion (%) of parents meeting recommendations for lifestyle behaviors according to their degree of readiness in making healthy changes

	More ready n = 43	Less ready n = 70	*P*-value
Vegetables and Fruit Intake	48.8	24.3	0.007
Sugar Sweetened Beverages	29.0	14.5	0.072
Total Physical Activity	42.9	22.9	0.026
Sleep Duration	56.1	50.7	0.585

Maximova K et al. *Pediatric Obesity 2014.*

RIPPLE

The Resource Information Program for Parents on Lifestyle & Education

What is it?

RIPPLE is a *screening*, *brief intervention*, and *referral to treatment* (SBIRT) program. The program will **screen** children's weight status, deliver a **brief intervention** to parents related to their child's dietary & physical activity behaviors, and provide **referrals to treatment** and other relevant resources to interested parents, all within 10- to 15-minutes.

Who, When, & Where?

<u>Who</u>: Parents of children (5-17 years old)

<u>When</u>: While parents & children await their upcoming pediatrician appointment

<u>Where</u>: Parents will complete RIPPLE on an iPad in a pediatric primary care waiting room

Why?

To prevent obesity in children! Specifically, to enhance parents' concern for and motivation to support children's healthy lifestyle behaviors, *and* connect families with resources and health services for the prevention of childhood obesity.

Want more information? Contact Jill (avis@ualberta.ca)

UNIVERSITY OF ALBERTA

PrimaryCare Network

Cognitive discrepancy

Parents' perceptions of weight and lifestyle behaviors

Normative or Injunctive data

RIPPLE
The Resource Information Program for Parents on Lifestyle & Education

Aftermath of misperceptions

I don't want to be right:
Why do people persist in believing
things that just aren't true?

Last month, Brendan Nyhan, a professor of political science at Dartmouth, published the results of a study that he and a team of pediatricians and political scientists had been working on for three years. They had followed a group of almost two thousand parents, all of whom had at least one child under the age of seventeen, to test a simple relationship: Could various pro-vaccination campaigns change parental attitudes toward vaccines? Each household received one of four messages: a leaflet from the Centers for Disease Control and Prevention stating that there had been no evidence linking the measles, mumps, and rubella (M.M.R.) vaccine and autism; a leaflet from the Vaccine Information Statement on the dangers of the diseases that the M.M.R. vaccine prevents; photographs of children who had suffered from the diseases; and a dramatic story from a Centers for Disease Control and Prevention about an infant who almost died of measles. A control group did not receive any information at all. The goal was to test whether facts, science, emotions, or stories could make people change their minds.

The result was dramatic: a whole lot of nothing. None of the interventions worked. The first leaflet—focussed on a lack of evidence connecting vaccines and autism—seemed to reduce misperceptions about the link, but it did nothing to affect intentions to vaccinate. It even decreased intent among parents who held the most negative attitudes toward vaccines, a phenomenon known as the backfire effect. The other two interventions fared even worse: the images of sick children increased the belief that vaccines cause autism, while the dramatic narrative somehow managed to increase beliefs about the dangers of vaccines. "It's depressing," Nyhan said. "We were definitely depressed," he

Sustained participation in physical activity over 5 years

Belanger et al. IJBNPA 2009
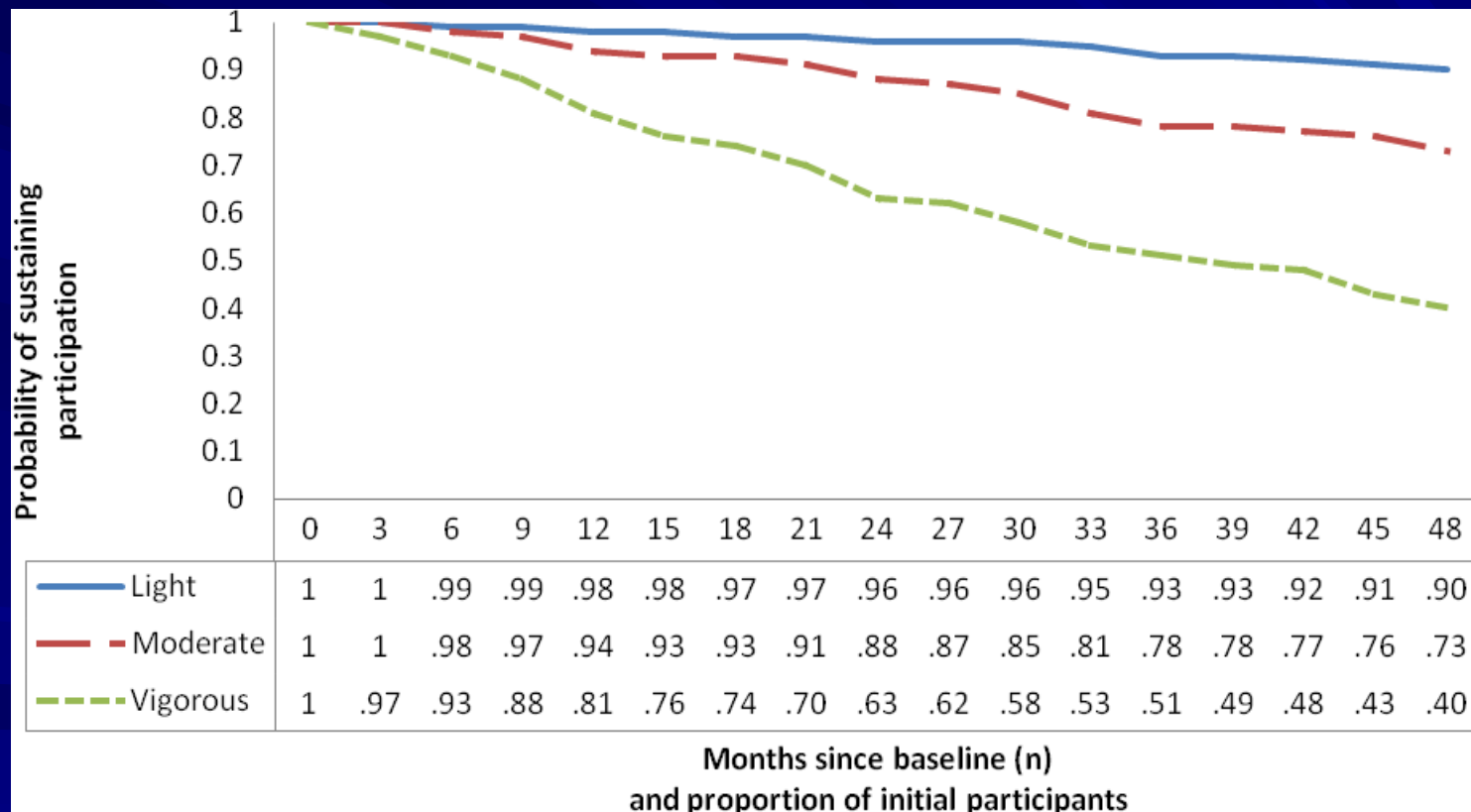
Latent trajectory classes of physical activity over 5 years
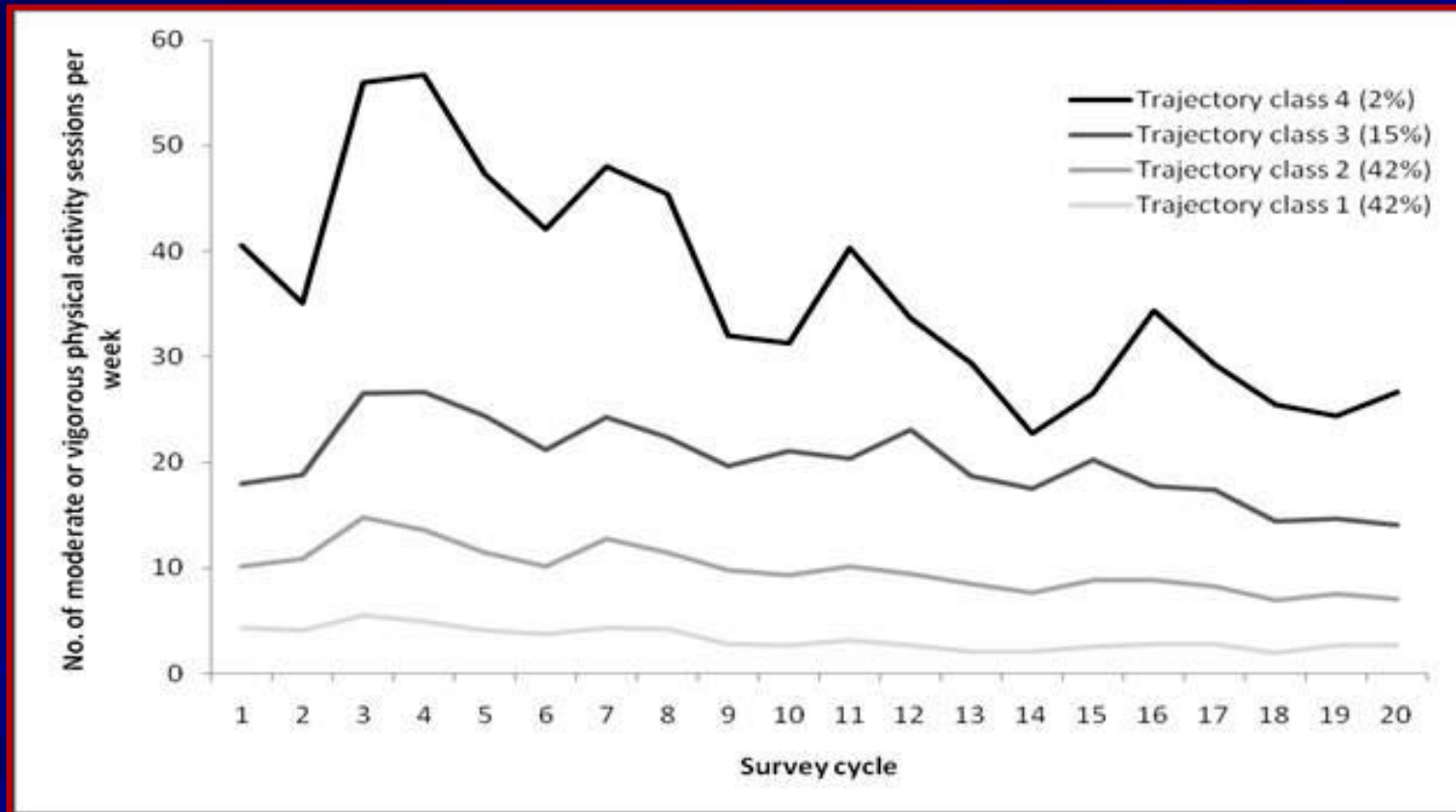
Research

Open Access

Distinct trajectories of leisure time physical activity and predictors of trajectory class membership: a 22 year cohort study

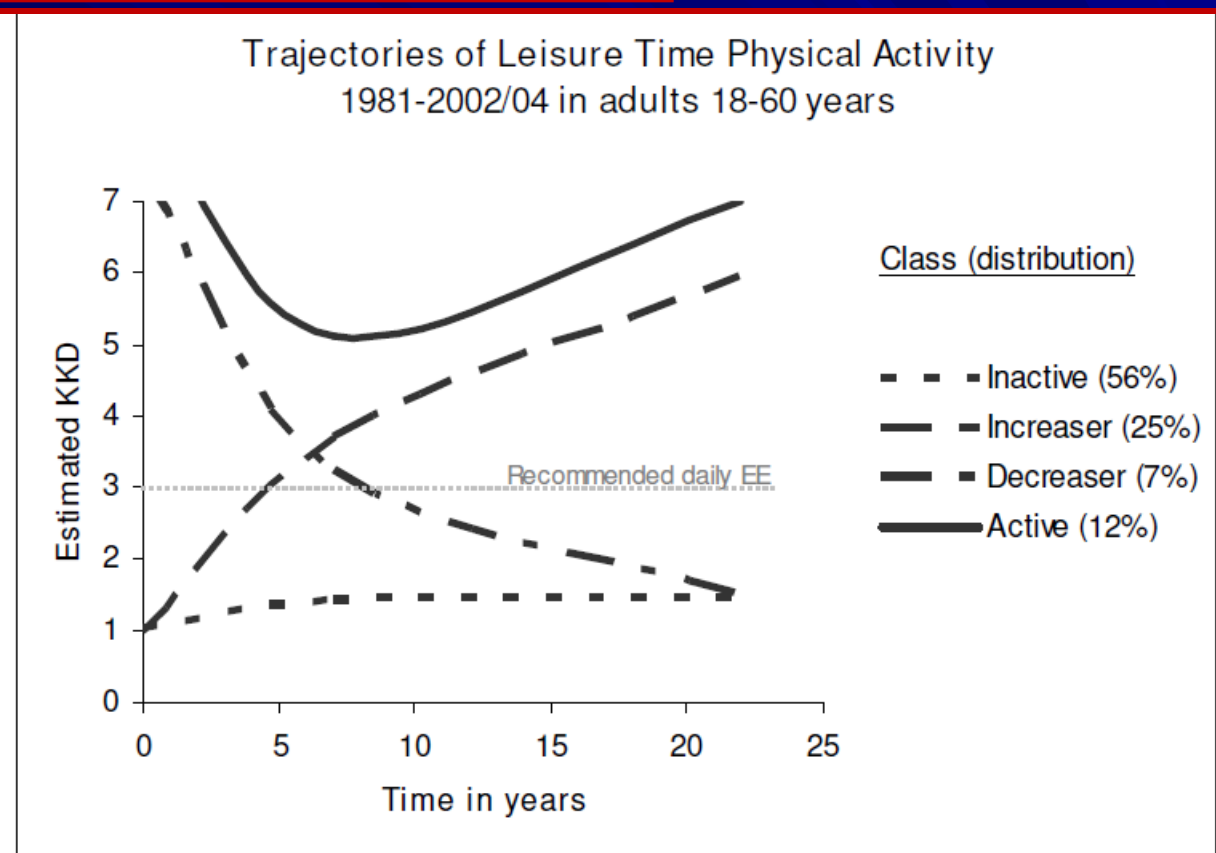Tracie A Barnett[*1,2], Lise Gauvin[2,3], Cora L Craig[4] and Peter T Katzmarzyk[5]

Figure 1
The four trajectory classes of leisure time physical activity: consistently active, consistently inactive, decreasers, and increasers. Physical Activity Longitudinal Study 1981–2002/04. (n = 884).

Table 2: Independent predictors of leisure time physical activity trajectory class membership. Physical Activity Longitudinal Study 1981–2002/04.

	Active Vs. Inactive	Decreaser Vs. Inactive	Increaser Vs. Inactive
	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)
Sex			
Male (ref)	-	-	-
Female	**0.38 (0.25–0.58)**	**0.37 (0.20–0.66)**	**0.62 (0.44–0.86)**
Age (years)			
18–27 (ref)	-	-	-
28–39	**0.44 (0.26–0.74)**	**0.43 (0.22–0.83)**	1.04 (0.69–1.56)
40–60	**0.51 (0.26–0.99)**	**0.35 (0.15–0.81)**	1.48 (0.93–2.35)
Highest reported education			
Completed University (ref)	-	-	-
Completed Secondary (<Uni.)	**0.38 (0.24–0.61)**	0.81 (0.44–1.49)	0.94 (0.62–1.42)
Secondary incomplete	**0.39 (0.17–0.87)**	0.85 (0.32–2.22)	1.28 (0.75–2.19)
1981 Household income			
High (ref)	-	-	-
Average	**0.56 (0.32–0.97)**	0.63 (0.30–1.31)	0.93 (0.61–1.40)
Low	**0.30 (0.13–0.67)**	0.97 (0.44–2.14)	0.55 (0.30–1.01)
Missing	0.59 (0.28–1.25)	1.77 (0.51–2.70	0.74 (0.43–1.27)
1981 Degree of urbanization			
Large city (ref)	-	-	-
Other urban area	0.91 (0.48–1.72)	1.18 (0.65–2.14)	0.91 (0.60–1.37)
Rural area	1.08 (0.62–1.89)	**0.41 (0.18–0.95)**	0.77 (0.51–1.15)

Models include all variables in the Table. Estimates significant at $p < 0.05$ are in bold.
*. Polytomous logistic regression analysis with "Consistently inactive" as the reference class and controlling for clustering within families.
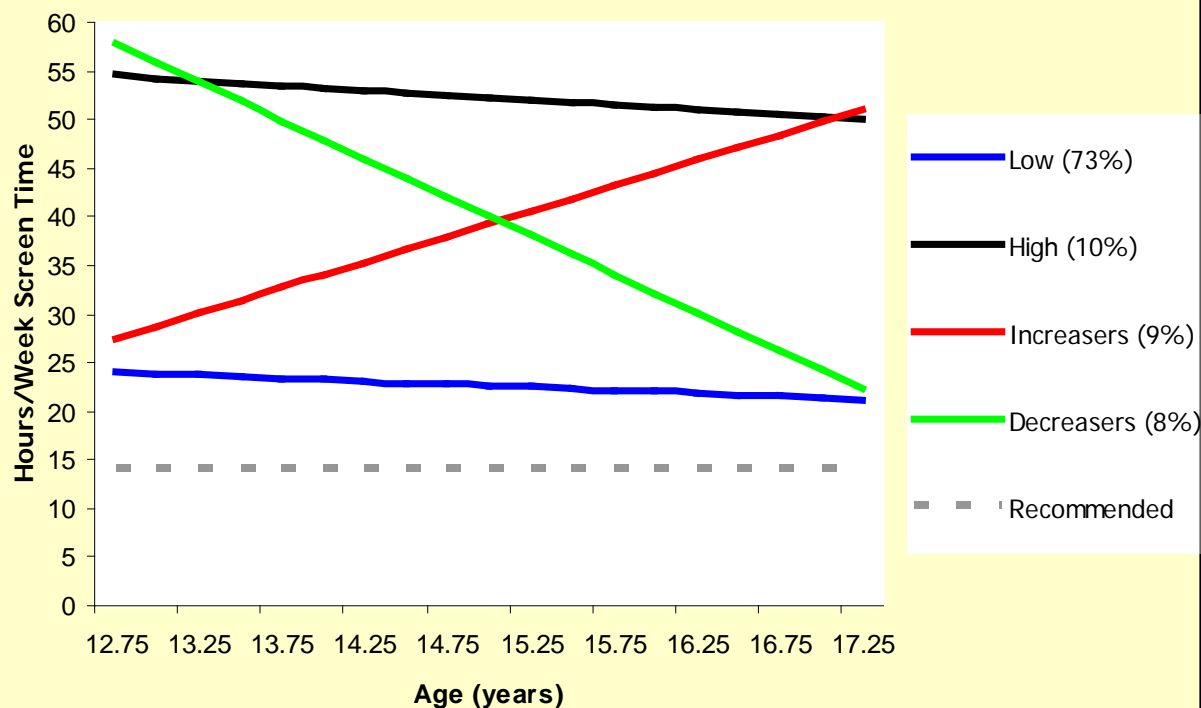AOR = Adjusted Odds Ratio

Screen time trajectories

Original Contribution

Teens and Screens: The Influence of Screen Time on Adiposity in Adolescents

Tracie A. Barnett*, Jennifer O'Loughlin, Catherine M. Sabiston, Igor Karp, Mathieu Bélanger, Andraea Van Hulst, and Marie Lambert

Distinct Trajectories of Weekly Screen Use
NDIT Study, Montreal, Canada, 1999-2005

- 4 classes of trajectories emerged:

I: low intensity, non-progressors (72%)

II: slow escalators (11%)

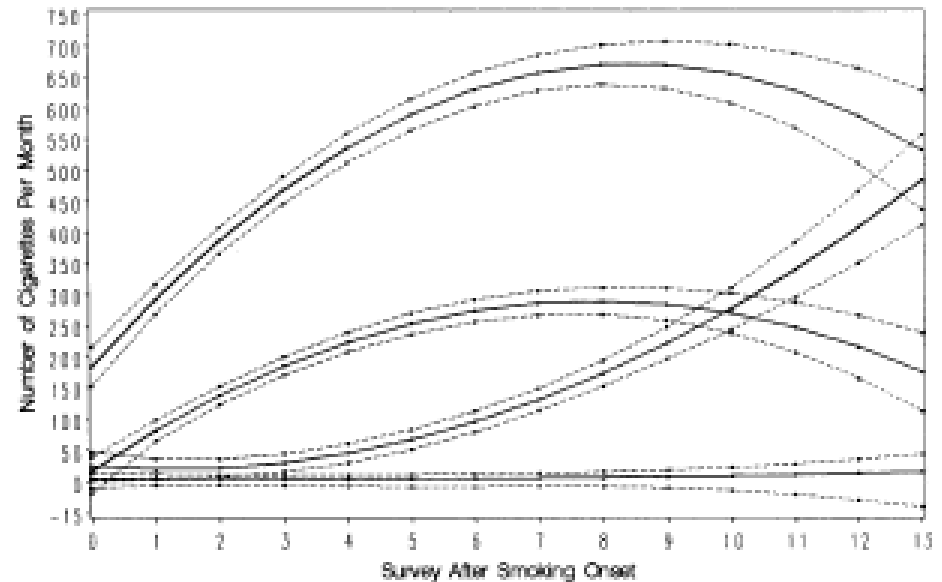III: moderate escalators (11%)

IV: rapid escalators (6%)

FIGURE 1. Overall trajectory of smoking intensity (top panel) and four classes of smoking intensity trajectories (bottom panel). Solid lines are point estimates, and dashed lines are the corresponding 95% confidence interval estimates. McGill University Study on the Natural History of Nicotine Dependence (NDIT), Montreal, Quebec, 1999–2002.

Identifying class membership

TABLE 4. Adjusted associations of characteristics measured at smoking onset with specific patterns of smoking intensity[a]

Characteristic	Class II		Class III		Class IV		p-value
	Adjusted OR	95% CI	Adjusted OR	95% CI	Adjusted OR	95% CI	
Age (per year)	0.63	0.27, 1.49	1.50	0.55, 4.08	2.04	0.51, 8.16	0.4129
Gender							
Male	0.48	0.19, 1.16	0.24	0.06, 0.88	1.84	0.49, 6.85	0.0355
Female[b]							
Poor academic performance							
Yes	1.67	0.62, 4.49	3.96	1.38, 11.40	7.26	1.77, 29.77	0.0066
No[b]							
Parents smoke							
Yes	1.15	0.52, 2.52	2.04	0.77, 5.42	4.94	1.13, 21.53	0.1071
No[b]							
More than half of friends smoke							
Yes	1.72	0.31, 9.60	10.18	2.59, 40.56	7.58	1.27, 45.30	0.0053
No[b]							
Attends school with clear rules on smoking							
Yes	0.91	0.28, 2.90	0.26	0.08, 0.78	0.84	0.09, 7.78	0.1205
No[b]							
Very confident in ability to succeed at school							
Yes	0.50	0.20, 1.23	0.68	0.23, 2.05	1.30	0.13, 4.48	0.4324
No[b]							

OR, odds ratio; CI, confidence interval.

[a]Polytomous logistic regression analysis using class I as the reference category. Maximum-rescaled $R^2 = 0.25$.

[b]Reference category.

Smoking cessation and risk reversal

| Year	Reversal of risk
1	Risk of coronary heart disease, heart attack and stroke is half that of a smoker.
5-15	Risk of stroke is that of a non-smoker. Risk of cancers of the mouth, throat, esophagus, and bladder is cut in half. Cervical cancer risk falls to that of a non-smoker.
10	Risk of death from lung cancer is half of a smoker.
15	Risk of coronary heart disease is that of a non-smoker.
20	Female excess risk of death from all smoking related causes, including lung disease and cancer, is that of a non-smoker. Risk of pancreatic cancer is that of a non-smoker (2011 study).

Centers for Disease Control and Prevention. Benefits of Quitting.
Jha P et al. N Engl J Med. 2013;368(4):341-350.
US Surgeon General's Report, 2010
WHO/IARC. *Tobacco Control: Reversal of Risk After Quitting Smoking* 2007

Smoking cessation and survival
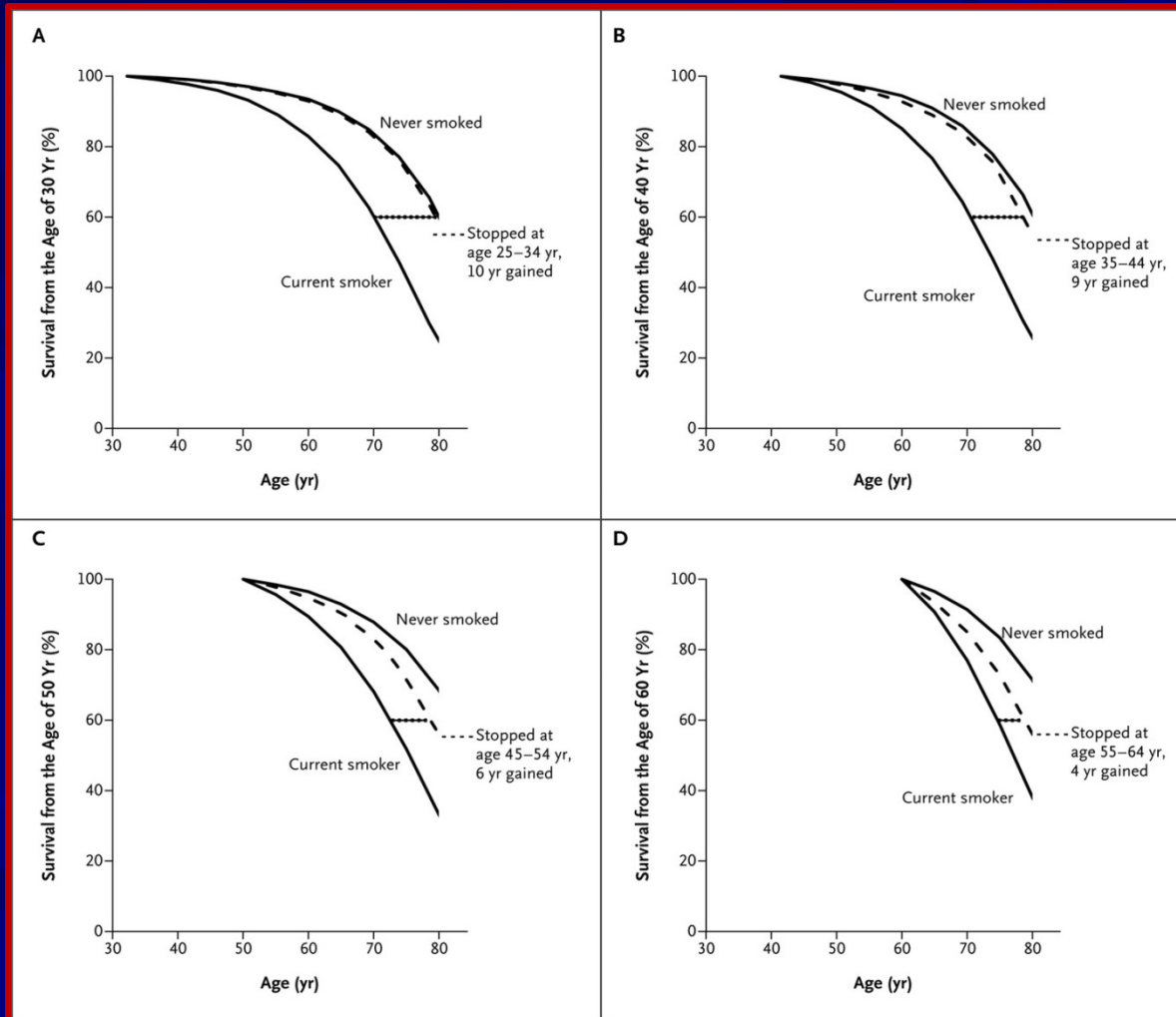
Risk of death following smoking cessation
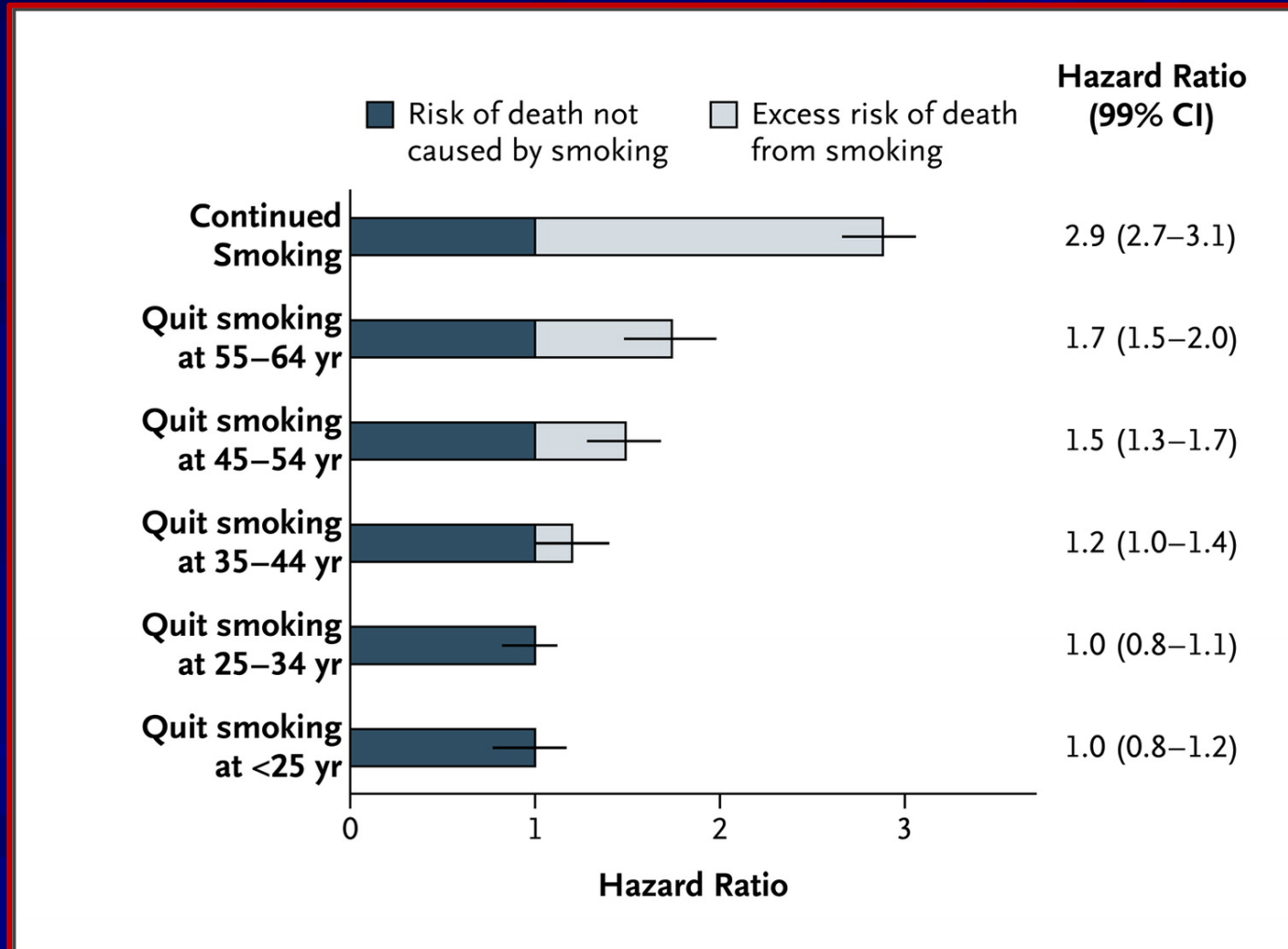
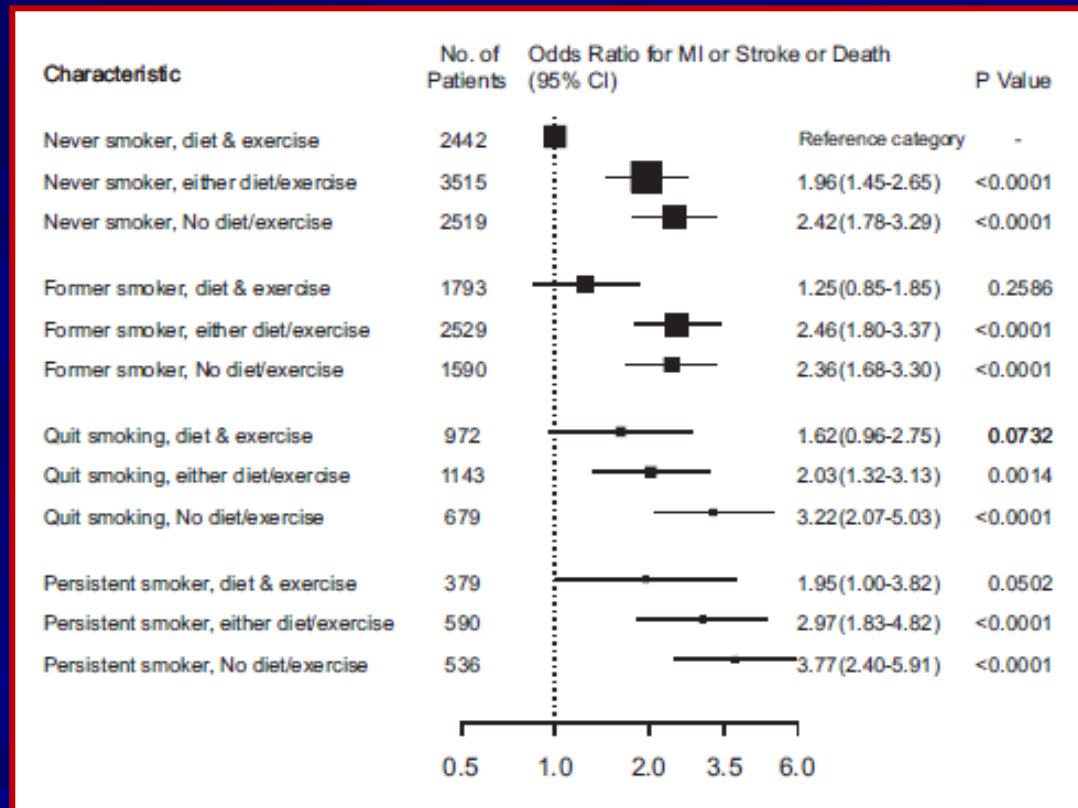# Diet quality and prospective changes in adiposity

Data: QUALITY (QUebec Adipose and Lifestyle InvesTigation in Youth) study

- Diet Quality Index - International
- Four categories: *dietary adequacy, variety, moderation and overall balance*

- Two-year prospective changes in adiposity from dual-energy X-ray absorptiometry:
    - Fat mass index (kg/m^2)
    - Central fat mass index (kg/m^2)
    - % body fat
    - % central body fat

Setayeshgar S et al. *Public Health Nutrition* 2016 Sept; [in press].
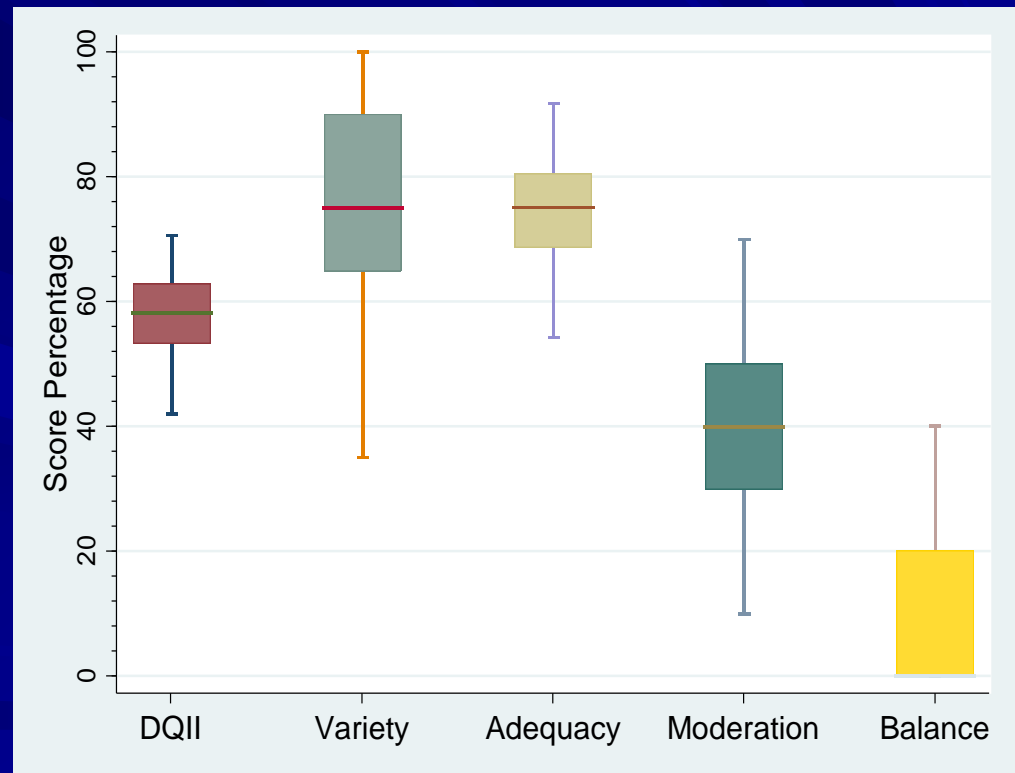
Can lifestyle changes reverse coronary heart disease?

Data 18,809 patients in 41 countries from Organization to Assess Strategies in Acute Ischemic Syndromes (OASIS) 5 randomized clinical trial

Characteristic	No. of Patients	Odds Ratio for MI or Stroke or Death (95% CI)		P Value
Never smoker, diet & exercise	2442		Reference category	-
Never smoker, either diet/exercise	3515		1.96 (1.45-2.65)	<0.0001
Never smoker, No diet/exercise	2519		2.42 (1.78-3.29)	<0.0001
Former smoker, diet & exercise	1793		1.25 (0.85-1.85)	0.2586
Former smoker, either diet/exercise	2529		2.46 (1.80-3.37)	<0.0001
Former smoker, No diet/exercise	1590		2.36 (1.68-3.30)	<0.0001
Quit smoking, diet & exercise	972		1.62 (0.96-2.75)	0.0732
Quit smoking, either diet/exercise	1143		2.03 (1.32-3.13)	0.0014
Quit smoking, No diet/exercise	679		3.22 (2.07-5.03)	<0.0001
Persistent smoker, diet & exercise	379		1.95 (1.00-3.82)	0.0502
Persistent smoker, either diet/exercise	590		2.97 (1.83-4.82)	<0.0001
Persistent smoker, No diet/exercise	536		3.77 (2.40-5.91)	<0.0001

0.5   1.0   2.0   3.5   6.0

■ Adherence to behavioral advice (diet, exercise, and smoking cessation) linked to substantially lower risk of recurrent cardiovascular events

Chow et al. Circulation. 2010;121:750-758

Diet, physical activity and cancer prevention

Legend:
- Convincing decreased risk
- Probable decreased risk
- Convincing increased risk
- Probable increased risk
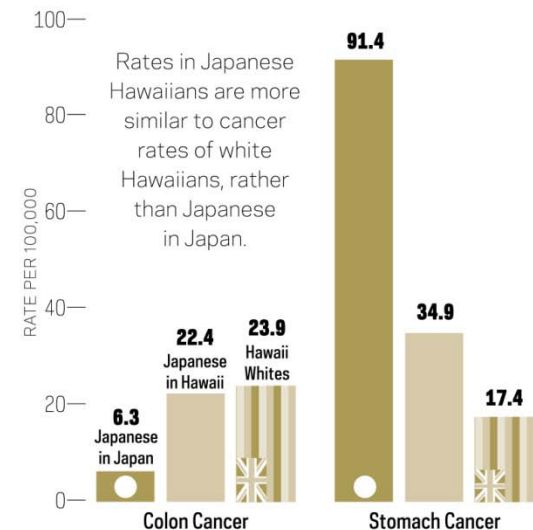- Substantial effect on risk unlikely

	MOUTH, PHARYNX, LARYNX (2007)	NASOPHARYNX (2007)	OESOPHAGUS (2016)	LUNG (2007)	STOMACH (2016)	PANCREAS (2012)	GALLBLADDER (2015)	LIVER (2015)	COLORECTUM (2011)	BREAST PREMENOPAUSE (2010)	BREAST POSTMENOPAUSE (2010)	OVARY (2014)	ENDOMETRIUM (2013)	PROSTATE (2014)	KIDNEY (2015)	BLADDER (2015)	SKIN (2007)
Foods containing dietary fibre									Convincing decreased								
Aflatoxins								Convincing increased									
Non-starchy vegetables[1]	Probable decreased																
Allium vegetables																	
Garlic									Probable decreased								
Fruits[2]	Probable decreased			Probable decreased													
Red meat									Convincing increased								
Processed meat[3]					Probable increased				Convincing increased								
Cantonese-style salted fish		Probable increased															
Diets high in calcium[4]									Probable decreased								
Foods preserved by salting					Probable increased												
Glycaemic load													Probable increased				
Arsenic in drinking water				Convincing increased												Probable increased	Probable increased
Mate[5]			Probable increased														
Alcoholic drinks[6]	Convincing increased		Convincing increased		Probable increased			Convincing increased	Convincing increased / Probable increased	Convincing increased	Convincing increased				Probable decreased		
Coffee						Substantial effect unlikely		Probable decreased					Probable decreased				
Beta-carotene[7]				Convincing increased										Substantial effect unlikely			Substantial effect unlikely
Physical activity[8]									Convincing decreased				Probable decreased				
Body fatness[9]			Convincing increased			Convincing increased	Probable increased	Convincing increased	Convincing increased	Probable decreased	Convincing increased	Probable increased	Convincing increased	Probable increased	Convincing increased		

Migration and cancer risk

■ Adoption of western diet and lifestyle shown to substantially increase cancer risk (colorectal, breast and prostate) in migrant populations

■ But lower risk for stomach cancer among Asian immigrants due to diets high in salt and nitrite-containing foods

■ Highlights the important role of lifestyle factors in carcinogenesis

Cancer is more often caused by the environment a person lives in, rather than his or her innate biology.

Cancer incidence age-standardized rates (world) per 100,000, circa 1970

Rates in Japanese Hawaiians are more similar to cancer rates of white Hawaiians, rather than Japanese in Japan.

THE CANCER ATLAS

CANCER.ORG/CANCERATLAS
Copyright © 2014 American Cancer Society, Inc.

Satia JA. Appl Physiol Nutr Metab. 2010; 35(2):219-23.
Arnold M et al. Cancer Eur J Cancer. 2010;46(14):2647-59.
Balzi D, et al. Cancer Causes and Control 1995; 6(1): 68-74.
Ziegler RG et al. J Natl Cancer Inst 1993;85:1819-1827.
Lippman & Hawk Cancer Res 2009;69(13):5269-84

"Healthy immigrant effect"

- Health advantage on arrival which wanes with time (~10 years)

- Demonstrated for mortality (all cause, cancer and CVD), cancer incidence, self-reported chronic conditions
  - Except stomach, liver and nasopharyngeal cancer

- Limited research on chronic disease risk factors, outcomes, or preventive services utilization, including cancer screening

Figure 1 Fully adjusted hazard ratios of mortality by sex, and age and duration, all immigrants, Canada, 1991–2006
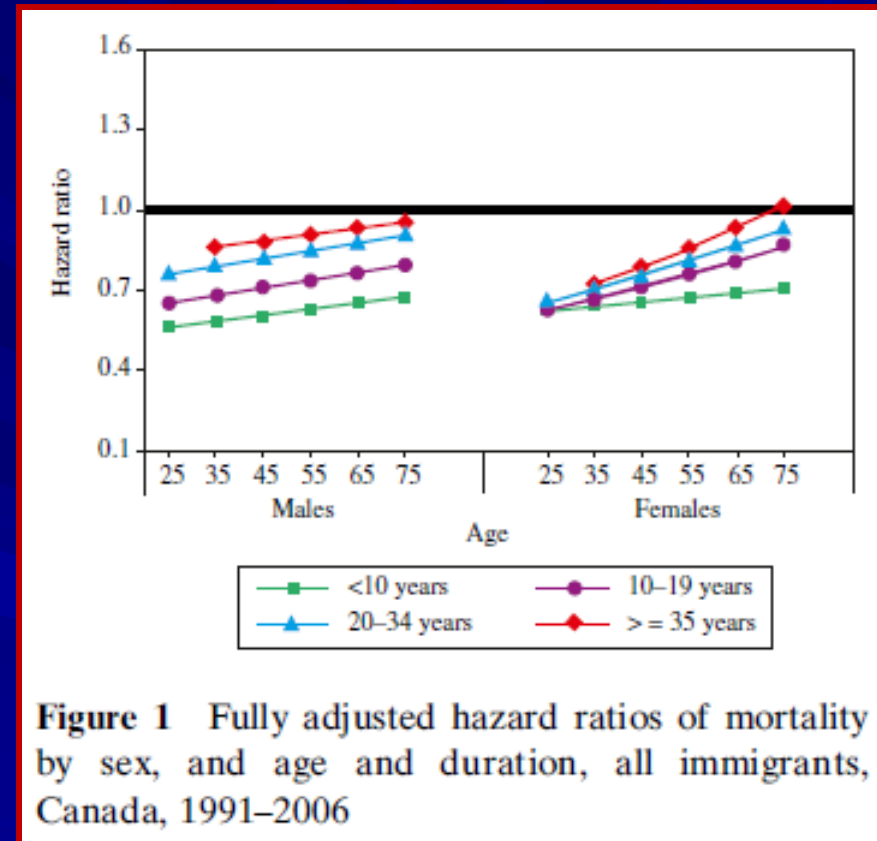
Kerner J et al. Curr Oncology 2015; 22(2).
Sheth T et al. CMAJ 1999; 161:132-8
Wilkins R et al. Health Reports 2008; 19 (3).
Ng E. Health Reports 2011; 22 (4).
McDermott S. J Immigrant Minority Health 2011;13:15–26.
Vahabi M. BMC Public Health 2015;15:679

Healthy Weight Advantage Lost in One Generation

- Significant, positive relationship between body mass index and duration of residence

- Vulnerability to obesogenic environment

- Ethnic variations in risk

- Dietary and lifestyle acculturation
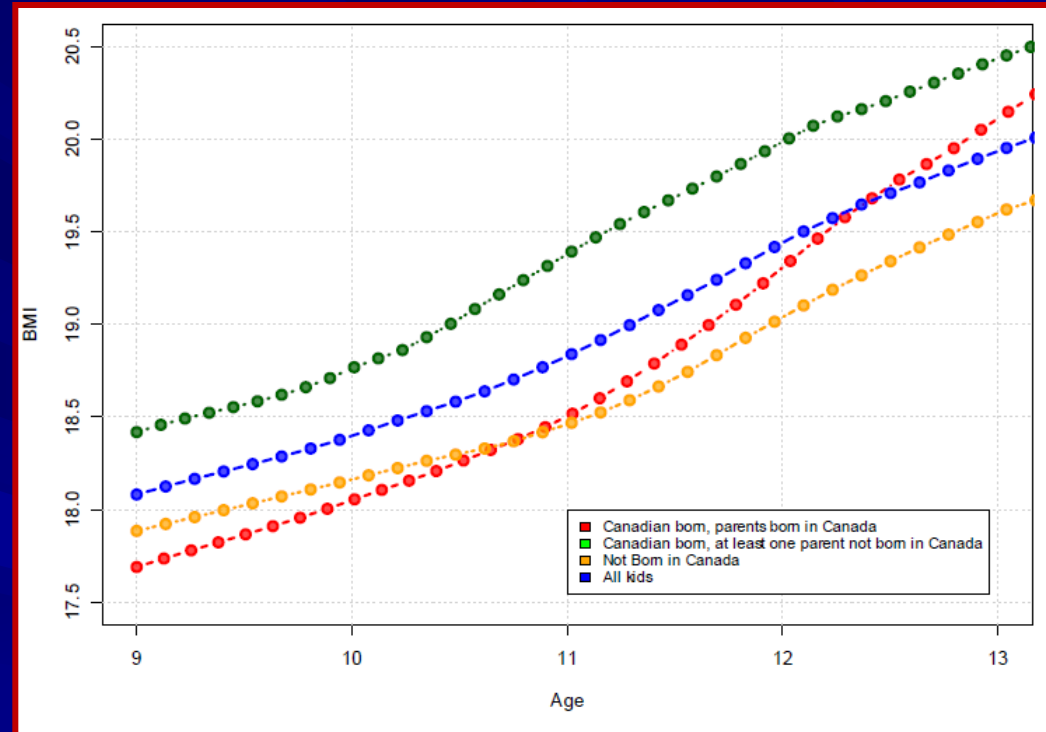
- Importance of public health strategies to protect immigrants from developing obesity and associated chronic disease

Oza-Frank R, Cunningham SA. Obes Rev. 2010;11(4):271-80.
Flynn MAT et al. Obesity Reviews 2006; 7(1): 7-66.
Satia JA. Appl Physiol Nutr Metab. 2010 Apr;35(2):219-23.
Maximova et al. Ann Epidemiol 2011;21:238–244.

Healthy Weight Advantage Lost in One Generation

	First generation immigrant	Second generation immigrant	Native-born
BMI: Initial level	18.2 (17.74, 18.61)	18.8 (18.49, 19.19)	18.1 (17.74, 18.44)
BMI: Rate of increase (Age)	0.59 (0.49, 0.64)	0.73 (0.64, 0.81)	0.82 (0.68, 0.97)

Repeated BMI measurements analyzed using individual growth models for each immigrant grouping, adjusted for sex, mother's and father's employment status, and family origin (Europe, Asia, Central/South America, Other) for first and second generation immigrant children.

"Healthy immigrant effect" for smoking
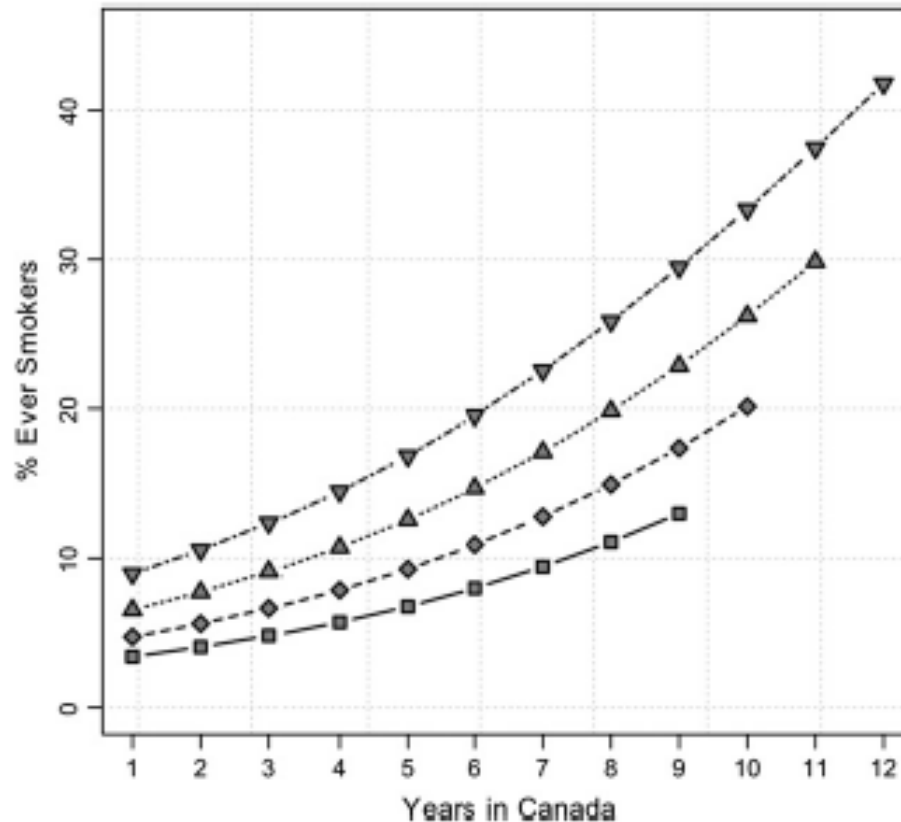
Figure 1. Predicted prevalence of ever smokers by number of years lived in Canada and age. The symbols ■, ◆, ▲, and ▼ indicate ages 9, 10, 11, and 12 years, respectively.

Built, food and social environment characteristics
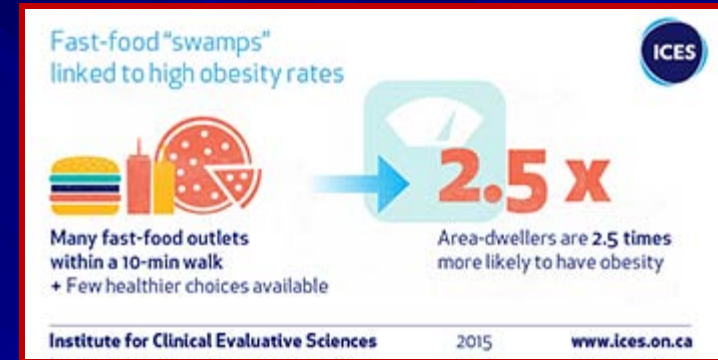
Census data: poverty and prestige

- low income, single-parent families, unemployment, university degree, homeowners, 1 year mobility, housing value

Land use data: level of urbanicity and traffic

- residential density, parks within 500 m, 3- or 4-way intersections, length of streets with normal/high traffic at rush hour
- convenience stores and fast food restaurants within 500 m

In-person audit data: physical disorder and deterioration, and pedestrian friendliness

- Graffiti, litter, roadways/buildings in bad condition, streets with speed limit ≤30km/hour, all-direction stop signs, mid-street segment stop signs, zebra crossing, and pedestrian crossing signs

Fast-food "swamps" linked to high obesity rates

Many fast-food outlets within a 10-min walk + Few healthier choices available

2.5 x — Area-dwellers are 2.5 times more likely to have obesity

Institute for Clinical Evaluative Sciences — 2015 — www.ices.on.ca
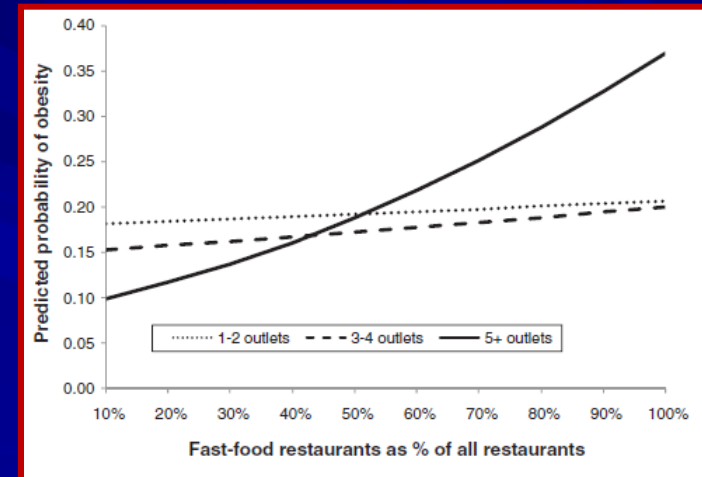
Polsky JY et al. Prev Med. 2016; 82:28-34.
Spence JC et al. BMC Public Health 2009; 9:192.
Galvez MP et al. Curr Opin Pediatr 2010; 22:202–7.
Pate RR et al. Obes Rev. 2013; 14:645–58.
Safron M et al. Int J Environ Health Res. 2011; 21:317–30.
Van Hulst A et al. Int J Obesity 2013; 37: 1328–1335.

A Nutrition Report Card on Food Environments for Children and Youth

POWER UP

- Provide an assessment of how current environments and policies support or create barriers to improving eating behaviours and body weights

- Increase awareness of the public, practitioners and policy makers of the relevance of food environments for health promotion and obesity prevention

Olstad DL et al. Prev Med. 2014; 69:287-95.
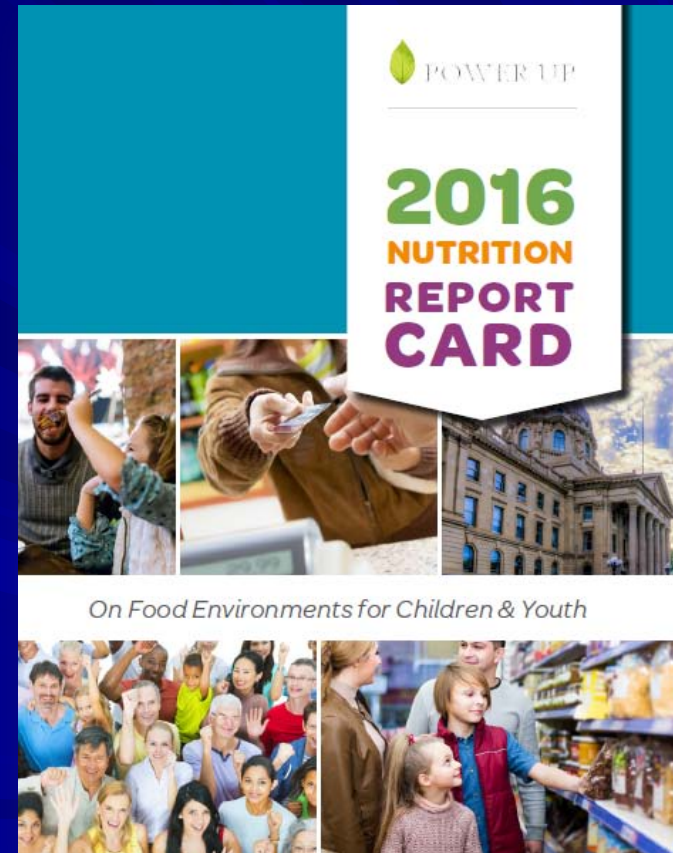
Five environments

POWER UP

Physical Categories

- Food availability within settings
- Neighbourhood availability of restaurants and food stores
- Food composition
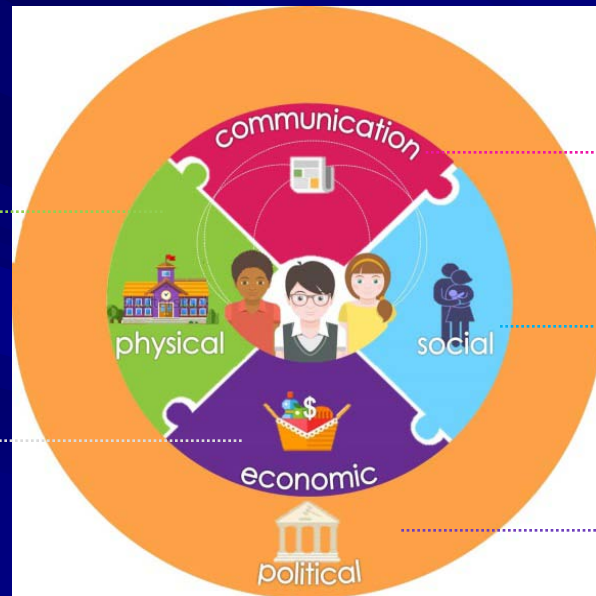
Communication Categories

- Nutrition information at the point-of-purchase
- Food marketing
- Nutrition education

Social Categories

- Weight bias
- Corporate responsibility
- Breastfeeding support

Economic Categories

- Financial incentives for consumers
- Financial incentives for industry
- Government nutrition assistance programs

Political Categories

- Leadership and coordination
- Funding
- Monitoring and evaluation
- Capacity building

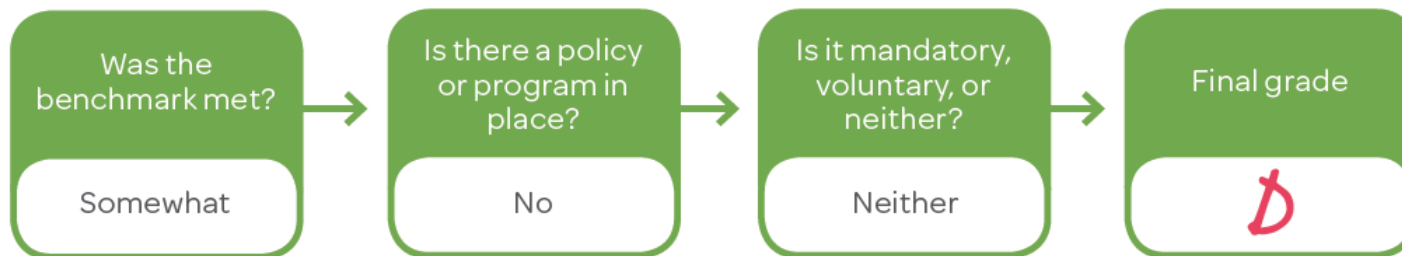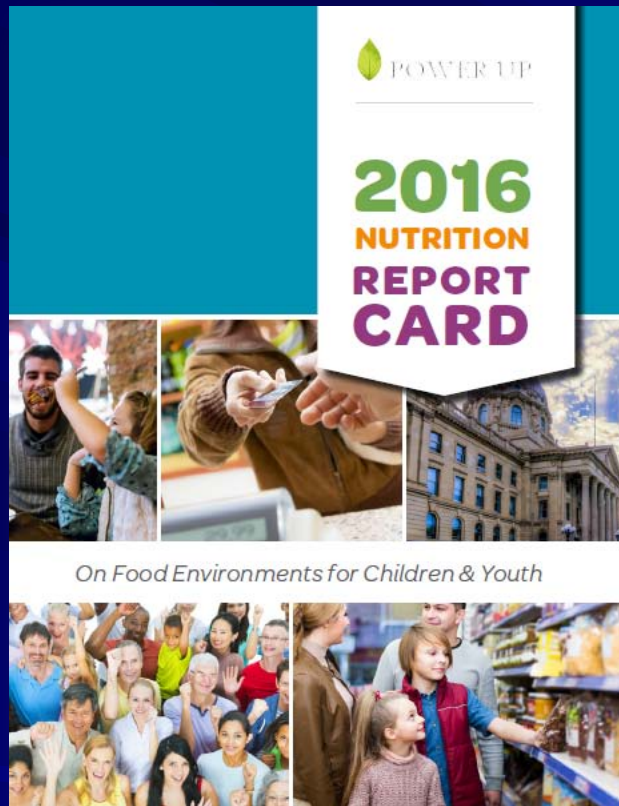# Number of convenience stores and fast-food restaurants located within 500 m of schools
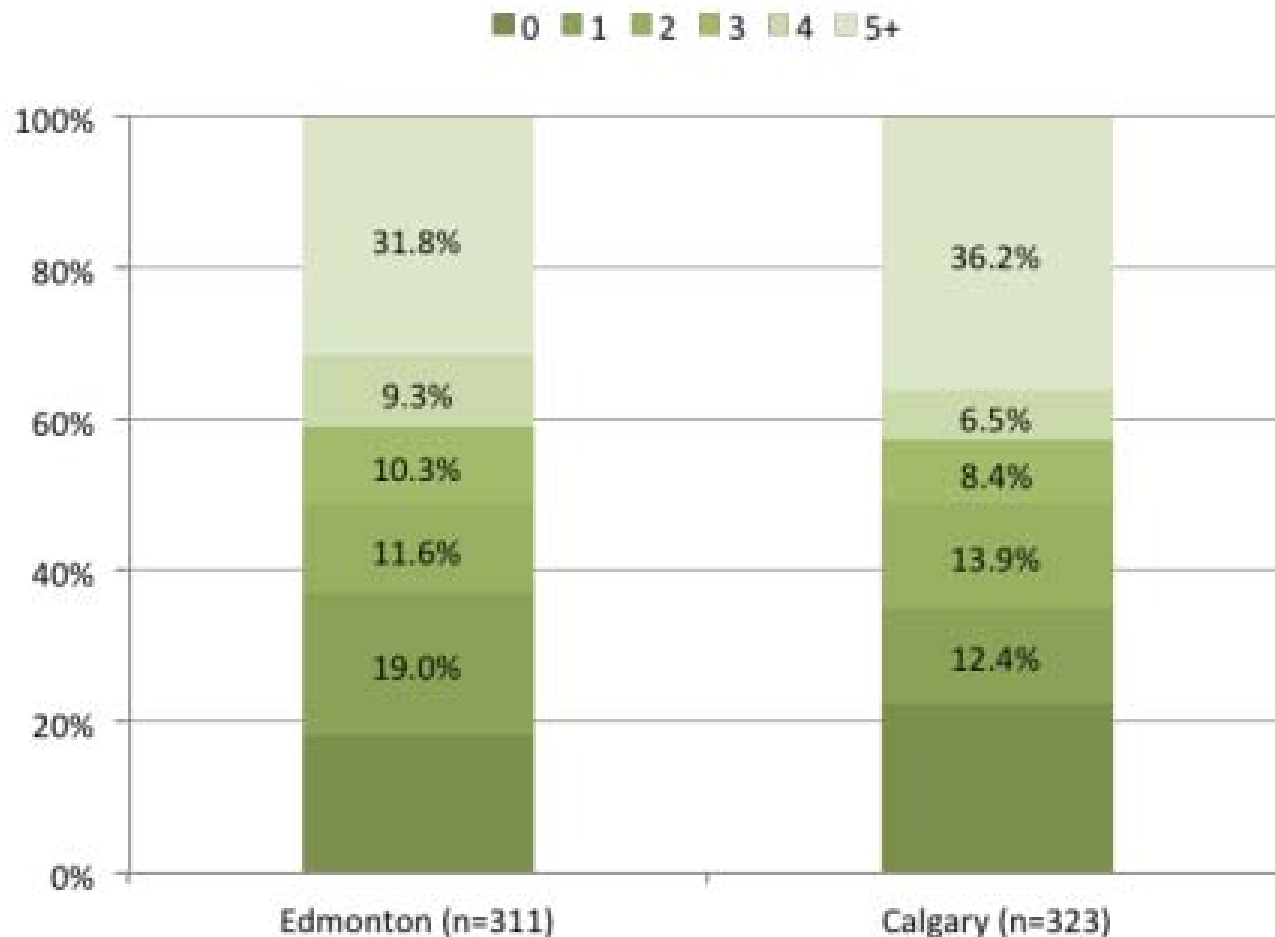
5

INDICATOR

Limited Availability of Food Stores and Restaurants Selling Primarily Unhealthy Foods

BENCHMARK

Traditional convenience stores (i.e. not including healthy corner stores) and fast-food outlets not present within 500 m of schools.

Was the benchmark met?	Is there a policy or program in place?	Is it mandatory, voluntary, or neither?	Final grade
Somewhat	No	Neither	D

Alberta's 2016 Nutrition Report Card Highlights

Thank you