

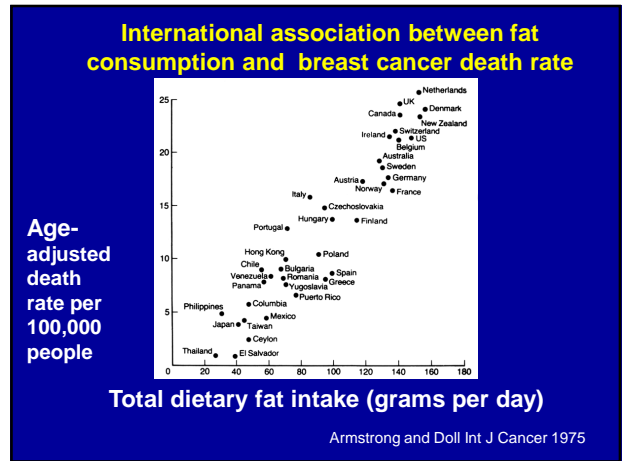
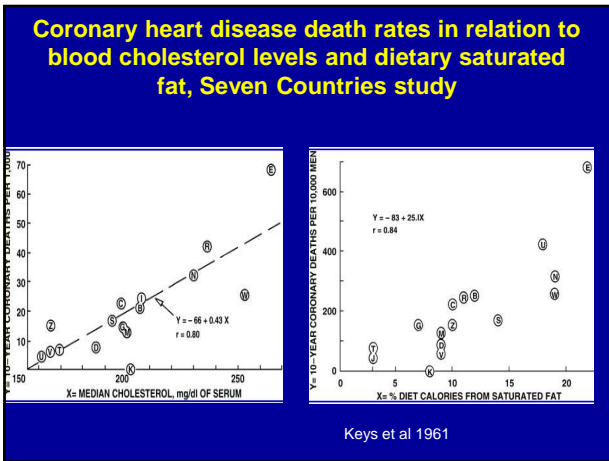
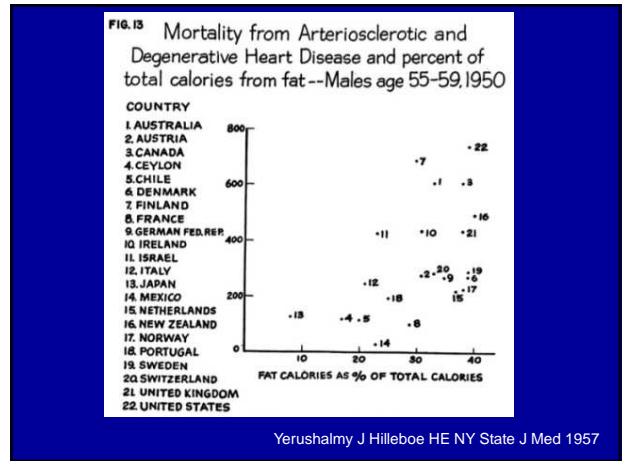
  
 UNIVERSITY OF CAMBRIDGE

## Can foods change your health?

### Good fats and bad fats: what is the evidence?

Kay-Tee Khaw

Hong Kong July 6 2013



The New York Times Health

What if It's All Been a Big Fat Lie?

By Gary Taubes  
Published July 12, 2012

If the members of the American medical establishment were to have a collective find-yourself-standing-naked-in-Times-Square-type nightmare, this might be it. They spend 30 years ridiculing Robert Atkins, author of the phenomenally-best-selling "Dr. Atkins' Diet Revolution" and "The Atkins' New Diet Revolution," accusing the Manhattan Doctor of Lousiness and Fraud.

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Diet Heart News

"Cholesterol Controversy" has become "Great Cholesterol Myth"

As the cholesterol controversy rages on, we can look back in history and review a few books that attempted to clear up the confusion. If the medical profession had been required to read these books - many written by medical doctors - the silly mess War on Cholesterol could have ended decades ago!

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Daily dose

Which dietary fats are healthiest? New research re-opens debate

By Deborah Katz, Globe Staff

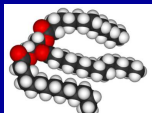
Nearly a decade ago, I traveled to New York City to meet with the Atkins diet folks to discuss

## Main categories of fats

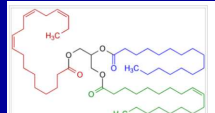
**Saturated fats:**  
foods from animals, some plants e.g. palm oil

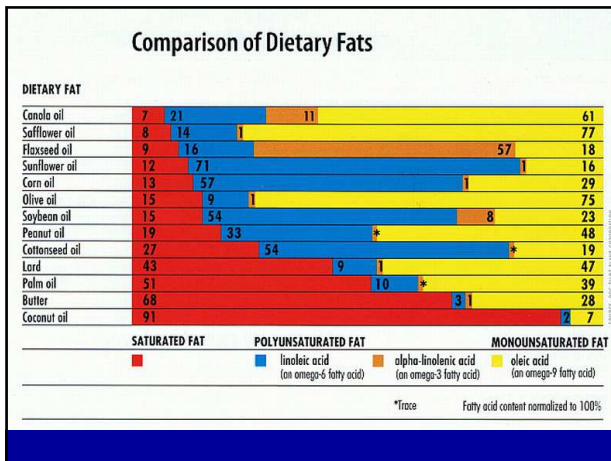
**Unsaturated fats:**  
Polyunsaturated (n-6, and n-3), and Monounsaturated, from seeds and oils from plants, and fatty fish

**Trans fats :**  
hydrogenation and food processing: margarine, red meat



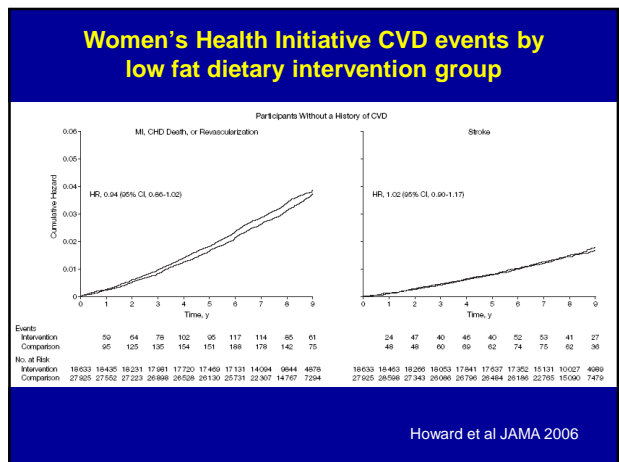
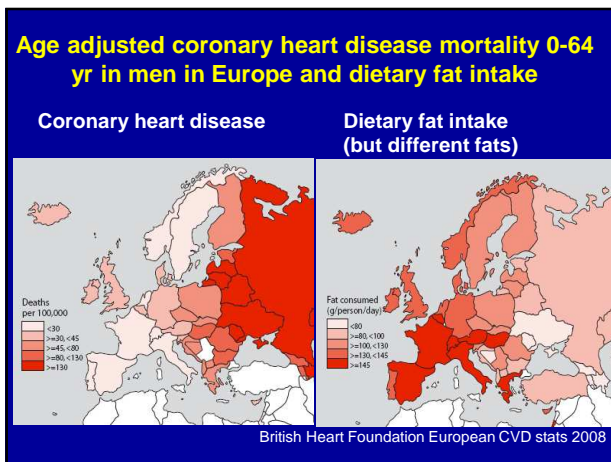
**Triglyceride**





### Joint FAO/WHO Expert consultation on Fatty Acids and Fats, 2008

Fat Type	Amount	Convincing or probable evidence
Total fat	20-35% E	No association CHD, cancers
SFA	10% E	Increase LDL-C
MUFA		Decrease LDL-C if substit for SFA
PUFA total	6-11% E	Decrease LDL-C if substit for SFA Decrease CHD if substit for SFA
n-6 PUFA	2.5-9% E	Decrease LDL-C if substit for SFA
n-3 PUFA	0.5-2% E	Decrease CHD fatal events
Trans Fat	<1% E	Decrease HDL-C, Increase CHD



### Why no effect in trial?

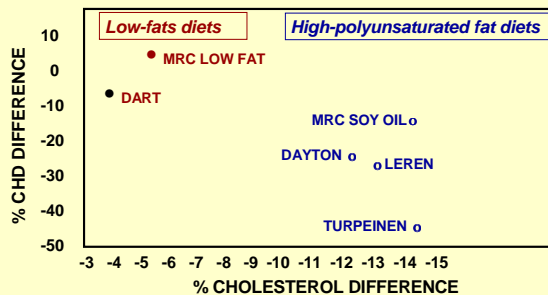
- No association between diet and CHD
- Too late to intervene
- Too little change (little change in CVD risk factors)
- Wrong target e.g. fatty acid balance not total fat important?

### Baseline in intervention group and difference in nutrient intakes at year 6 in intervention and comparison group, WHI

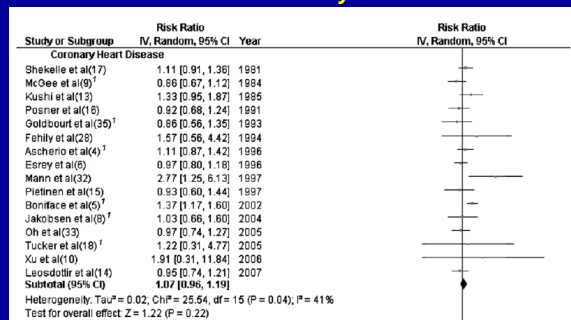
	Baseline	Difference yr6
Total energy kcal/day	1790	-113
Total fat % energy	38%	-8%
Sat fat % energy	13%	-3%
Poly unsat % energy	8%	-1.5%
<b>PS ratio</b>	<b>0.6</b>	<b>0</b>
Fibre g/d	15.4	+2.4
Protein	16.5	+0.6
Carbohydrate	45.6	+8.1
Vegetables and fruit servings daily	3.6	+1.1
Nuts servings/week	1.5	-0.8
Fish servings/week	1.9	0

Howard et al JAMA 2006

### Clinical trials of diet and coronary heart disease (Sacks, J Cardiovasc Risk, 1994)



### Relationship between dietary saturated fat and coronary heart disease: prospective studies meta analysis



Siri-Tarino et al AJCN 2010

### Why little association within cohorts?

- Small inter individual variation
- Large measurement error for fats
- Dietary instruments unable to discriminate between different fatty acids
- Heterogeneity in metabolic and consequent health effects different fatty acids
- Balance between different fatty acids important
- Objective biomarkers?



### EPIC-Norfolk population study

Aims: to improve health through better understanding of the major determinants health in middle and later life

25,000 men and women 40-79 years from GP age-sex registers in Norfolk, UK

Baseline survey 1993-1997

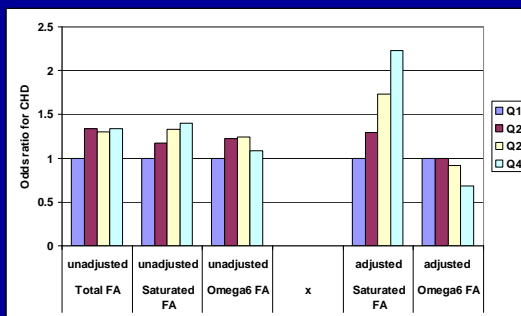
Extensive lifestyle and biologic information

Followed up for health endpoints to present

\* Part of European Prospective Investigation into Cancer:  
a 10 country collaboration with 500,000 participants

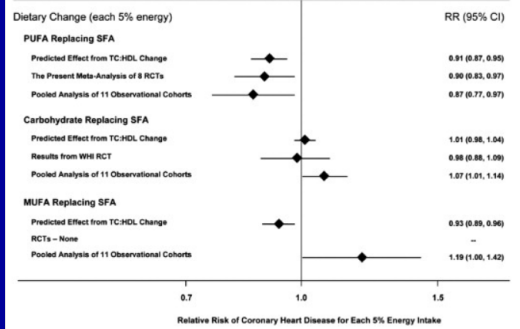
<http://www.epic-norfolk.org.uk>

### Age adjusted odds ratios for CHD by fatty acid quartile, unadjusted and adjusted for other fatty acids in CHD cases and controls, men and women 45-79 years, EPIC Norfolk 1993-2009



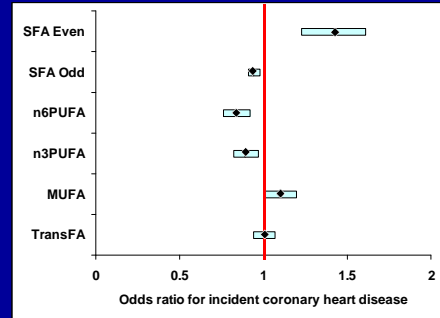
Total or individual categories of fatty acids are not very informative: need to take into account overall balance of fatty acids: e.g. saturated and unsaturated fatty acids

### Review of studies with estimated impact replacing SFA with different dietary components



Mozzafarian PLOS Med 2010

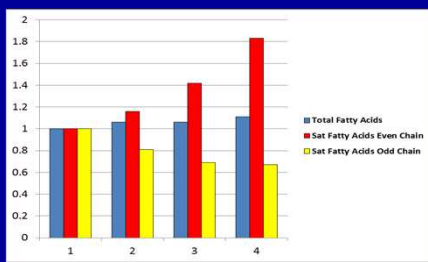
### Odds ratios (95% CI) for incident CHD in 2424 cases and 4930 controls, men and women 1993-2009 EPIC-Norfolk



Adjusted age and sex, similar results when additionally adjusted for BMI, smoking, physical activity, alcohol

Khaw et al PLOS Med 2012

### Odds ratios (95% CI) for coronary heart disease in 2424 cases and 4930 controls, 1993-2009 EPIC-Norfolk by quartile of plasma fatty acids



Adjusted age, sex, BMI, smoking, physical activity, alcohol intake, social class, education, plasma vit C and other fatty acids

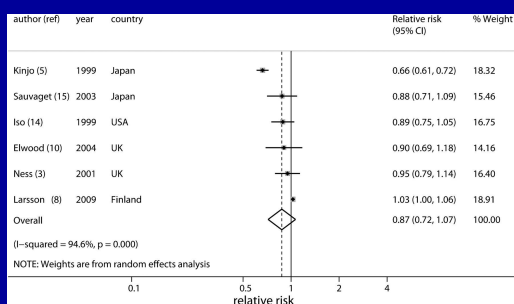
Khaw et al PLOS Med 2012

Even within broad categories of fatty acids, different subgroups are differently associated with health outcomes

e.g. even chain and odd chain saturated fatty acids are metabolised differently

Odd chain SFA: ruminant sources e.g. milk

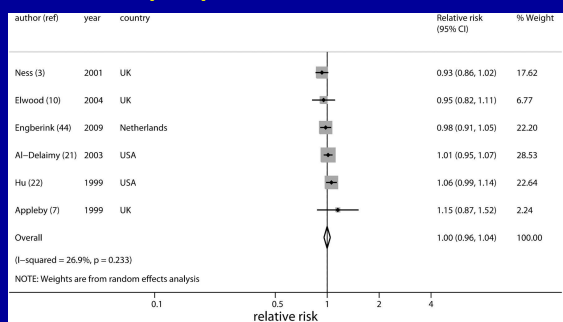
### Relation between milk (200ml/day) and stroke in 6 prospective cohort studies\*



\* 15554 cases, n=375381

Soedamah-Muthu S et al Am J Clin Nutr 2011

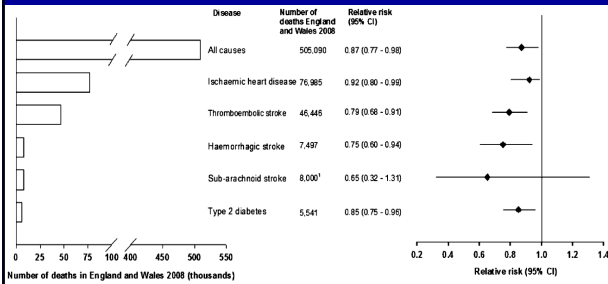
### Relation between milk (200ml/day) and CHD in 6 prospective cohort studies\*



\* 4391 cases, n=259162

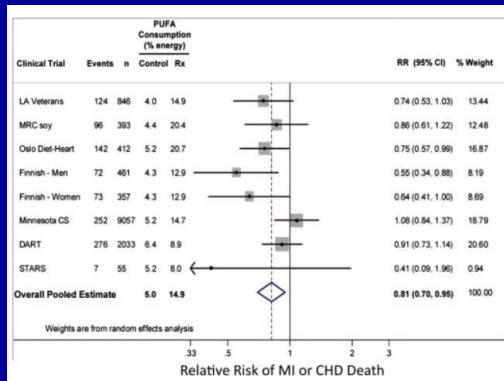
Soedamah-Muthu S et al Am J Clin Nutr 2011

### Metaanalysis prospective studies: estimated relative risks in high vs low milk/dairy consumption for different conditions and estimated deaths in EW 2008



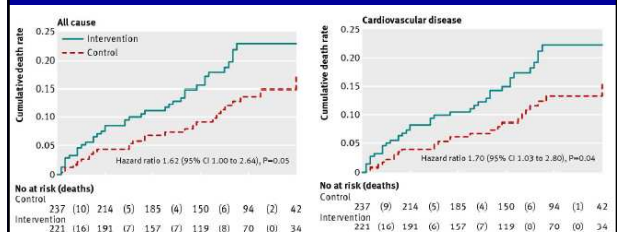
Elwood et al Lipids 2010

### But still inconsistencies: why?



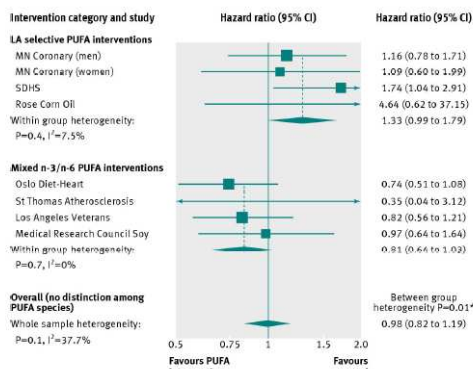
Baum 2012, Mozaffarian D2010

### Sydney Diet Heart Study : secondary prevention trial



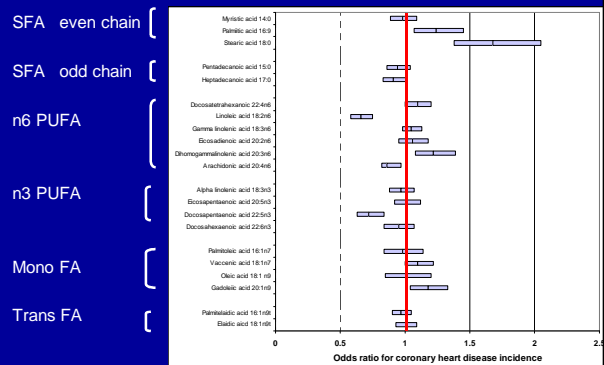
458 men with CHD event, intervention replacement of SFA with safflower oil or margarine (n-6 PUFA)

Ramsden et al BMJ 2013



Ramsden BMJ 2013

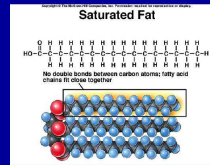
### Odds ratios (95% CI) for incident CHD by individual fatty acids (per SD increase) 1993-2009 EPIC-Norfolk



Within these categories, different individual fatty acids appear to be very differently related to coronary heart disease

May be indicators of different food sources and interactions with other nutrients

## Nutrients



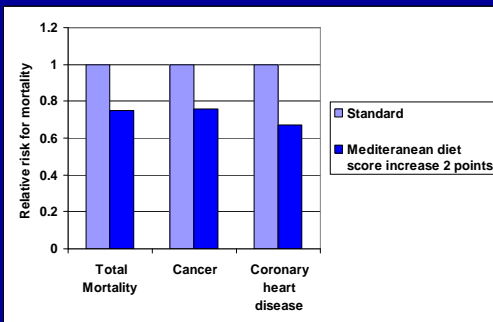
## Foods



## Diets



### Relative risk of all cause, cancer and coronary heart disease according to adherence to Mediterranean diet in Greek men and women

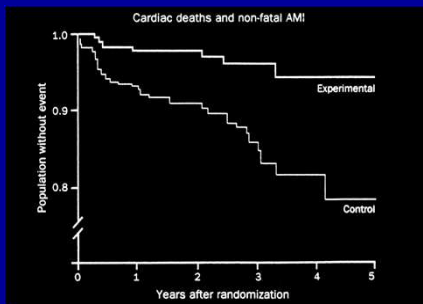


Trichopoulou NEJM 2003

### What is the Mediterranean diet?



### Mediterranean diet and survival after heart attack



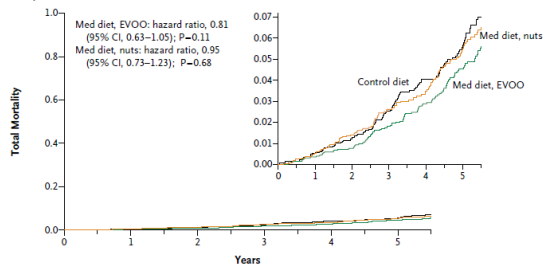
De Lorgeril 1996 Lancet 1996

### Mediterranean diet and secondary prevention of CHD: intake g/day

Foods	Control	Experimental
Bread	145	167**
Vegetables	288	316
Fruit	203	251*
Delicatessen and meat	74	47*
Butter and cream	17	3**
Margarine	5	19**
Fish	40	47

Lorgeril Lancet 1994

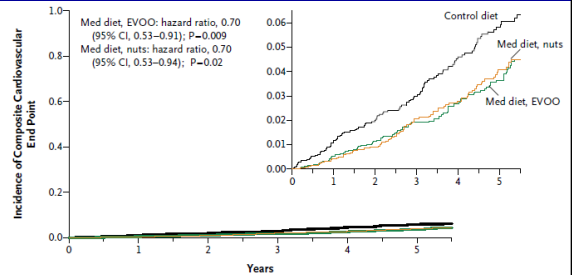
## Total mortality according to intervention diet in PREMED



No. at Risk	0	1	2	3	4	5
Control diet	2450	2268	2026	1585	1272	948
Med diet, EVOO	2543	2485	2322	1988	1690	1308
Med diet, nuts	2454	2345	2097	1662	1395	1037

Estruch et al NEJM 2013

## Incidence of acute MI, stroke or death from CVD according to diet intervention in PREMED



No. at Risk	0	1	2	3	4	5
Control diet	2450	2268	2020	1583	1268	946
Med diet, EVOO	2543	2486	2320	1987	1687	1310
Med diet, nuts	2454	2343	2093	1657	1389	1031

Estruch et al NEJM 2013

## So what dietary recommendations should we make for fat?

## American Heart Association Guidelines ?

- Limit total fat <25-35% total energy
- Limit saturated fat <7% total energy
- Limit trans fat <1% total daily energy
- Remaining fat should come from sources of unsaturated fat e.g nuts, seeds, fatty fish, vegetable oils

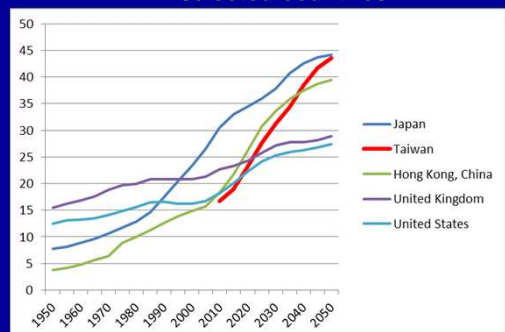
Eg. 2000 cal daily intake should have <15g saturated fat, <2g transfat ,55-77g total fat from other sources.

## Joint FAO/WHO Expert consultation on Fatty Acids and Fats, 2008

"Inherent limitations with the convention of grouping fatty acids based only on number of double bonds. ...major groups of fatty acids are associated with different health effects. However, the consultation experts recognised that individual fatty acids within each broad classification may have unique biological properties or effects..."

Intakes of individual fatty acids differ across world depending on predominant food sources of total fats and oils."

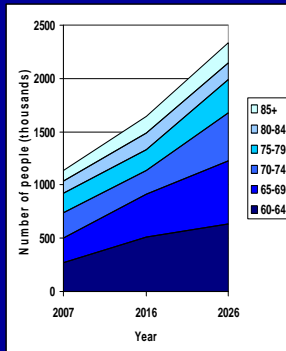
## Projected proportion >60 years 1950-2050 in selected countries



UN Population statistics



### Projected numbers >60 years 2007-2026 Hong Kong

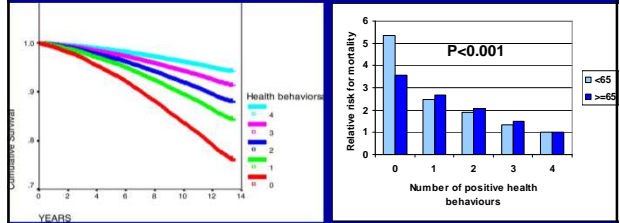


Percent population over 60 years old

2007	16%
2016	22%
2026	29%

<http://www.statistics.gov.hk>

### Four simple health behaviours and mortality in 20244 men and women aged 40-79 years, EPIC-Norfolk 1993-2007, RR in those <65y and 65y+



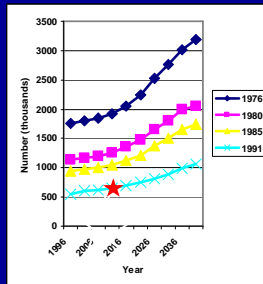
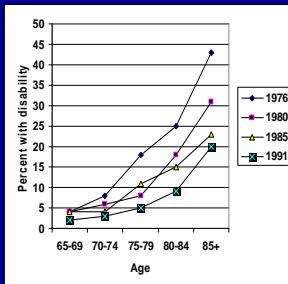
Score 0-4  
 Equivalent 14 years

- 1 Non smoker
- 1 Alcohol >0 <14 units/wk
- 1 Not inactive
- 1 Blood vitamin C >50 umol/l (5 servings fruit and vegetable daily)

Adjusted for age, BMI, social class

Khaw et al PLOS Medicine 2008

### Age specific disability rates in different years E & W and projected numbers over 65 years with disability 1996-2041 using different rates



Khaw BMJ 1999

Substantial evidence for role of lifestyle in preventing chronic disabling diseases

- No smoking
- Physical activity,
- Dietary patterns
  - Higher fruit and vegetable intake
  - Higher unsaturated/saturated fat ratio
  - Lower processed food : lower sodium, higher potassium

BUT : specificity still uncertain fatty acids  
 similar issues: carbohydrates, other nutrients  
 Biomarkers may help clarify relationships

### What we can learn from Hong Kong experience

Hong Kong: traditionally low CHD rates compared to West and high stroke

Traditional diets low in animal products  
 Can we retain benefits of traditional Chinese diet while reducing adverse aspects  
 e.g. high salt, high refined carbohydrate?