Improving chronic disease outcomes for Indigenous Australians

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Australian Aborigines as hunter gatherers

- Physically fit
- Lean - BMI < 20 kg/m²
- Low blood pressure
- No rise of body weight or BP with age
- Low fasting glucose (< 4mmol/L)
- Low fasting cholesterol (< 4mmol/L)
- ? Insulin resistance?
Aborigines from NE Arnhemland, 1985

• Traditionally oriented lifestyle
  – 18 adults, fasting blood sample
    • glucose 3.8 ± 0.4 mmol/L
    • Cholesterol 3.90 ± 0.21 mmol/L
    • Triglycerides 1.13 ± 0.09 mmol/L
    • Insulin 13 ± 4 mU/L
    • Haematocrit 45.7 ± 1.1%
    • Red cell folate 302 ± 23 ng/ml

• Mean age 34 (15 - 68) years
• BMI 16.7 (13.4 - 19.3) kg/m²

Aborigines after westernisation

- Extreme social disadvantage
  - high unemployment
  - welfare dependency
  - poor education
  - overcrowded living conditions

- Poor health
  - heavy burden of infectious diseases, particularly among children
  - heavy burden of lifestyle-related chronic diseases among adults

- Poor quality diet
  - high cost and limited availability of fresh vegetables and fruit in rural and remote Australia
  - High consumption of sugar and fat
Contrast with health of Indigenous Australians today

- Epidemic of lifestyle-related chronic diseases
  - High prevalence of LBW
  - High prevalence of smoking
  - Poor quality diet
    - Low in fresh fruit and vegetables
    - High in fat, sugar and salt
  - Central adiposity
    - relatively more body fat for given BMI
  - High prevalence of diabetes, with early age of onset in reproductive years
    - likely high prevalence of GDM and pre gestational diabetes
  - Very high prevalence and early age of onset of CVD and kidney failure
Chronic diseases in Indigenous Australians: an escalating epidemic

- Obesity
  - centralised fat distribution in both men and women
- Early onset type 2 diabetes
  - 10 times higher in those aged 20-50 yr
- Premature cardiovascular disease
  - 10 times higher in the 25-45 yr age group
    - dyslipidemia (high TG, low HDL-chol)
    - hypertension
    - microalbuminuria
  - heavy burden of infectious diseases?
- Kidney failure
  - Up to 100 times higher than in Australia generally
Common risk factors

• Share risk factors
  – Smoking
  – Poor quality diet
  – Physical inactivity
  – Central obesity
  – Low birth weight

• Frequently occur together in same individuals

• Interact to amplify mortality risk
  – Heart disease risk increased
    • 4-6 times by diabetes
    • 12-20 times by kidney failure
What can be done about it?

• Pharmacologic intervention
  – Daily, supervised

• Implementation of Guidelines

• Major lifestyle change
  – Is effective
  – How practical?

• All challenging to maintain
Incidence (per million)

- 0 to 99
- 100 to 299
- 300 to 469
- 470 to 769
- 770 to 1300

End Stage Renal Disease in Indigenous Australians – by ATSIC region

Cass et al. MJA 2001, 175: 24 - 27

full text at: www.mja.com.au
Risk factors for ESRD in Aboriginal populations

- Diabetes
- Hypertension
- Low birth weight
- Insulin resistance
- Central obesity
- Post streptococcal GN
- Social disadvantage
Disadvantage and ESRD by ATSIC region

(Circle size proportional to regional population)

Summary rank of indigenous socioeconomic disadvantage
(rank from 1 = least to 36 = most disadvantaged region)
Screening and early intervention: Tiwi Islands

*Hoy et al*
*MJA 2000, 172, 473-8*

Daily Perindopril

**8: New cases of end-stage renal disease and natural deaths in Tiwi adults aged 20 years and over**

Cases (annual rolling average)

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<tr>
<th>Year</th>
<th>ESRD</th>
<th>Natural death</th>
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<tr>
<td>1987/88</td>
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Treatment program began November, 1995

*full text at: www.mja.com.au*
Why were these benefits not maintained after the intensive intervention ended?

• Inadequate on-going support from the health service provider
  – Intensive clinical management costly - to ensure tablets are taken daily
  – Need for local health Indigenous health workers to be given the responsibility

• Examples of models that do seem to work
  – Local people in control
    • Health Service Board
    • Local clinics
Challenges of health service provision in remote Australia

- Many different models across jurisdictions
  - Federal, state, government provision, community-controlled
- Difficulty in attracting health professionals
  - High turnover of non-Indigenous health professionals
- Variable access to specialist services
  - Outreach services effective where they can be provided
- Inconsistent use of recall systems
- Data linkage across regions not systematic
- Need for interpreters to assist external health professionals
- Local Indigenous health workers need professional development and on-going support
- Small dispersed communities
  - High mobility of Indigenous people
Improving diabetes care: a randomised cluster trial in remote Indigenous communities

- **Design**: randomised unblinded cluster trial over 1 year
- **Setting**: 21 primary health care centres Torres Strait Islands (15) and the tip of Cape York Peninsula (6)
- **Participants**: 678 people with diabetes, mostly Torres Strait Islanders
- **Audit prior to the trial**: All 21 clinics were sent the results of their audit (hospitalisations in previous 12 mo.) Plus the combined data.
- **All 21 sites** were sent the new Evidence-based Diabetes Care Guidelines, and received visits from the new diabetes outreach team
- **Intervention**: Diabetes recall system established at 8 of the 21 sites, plus staff training in basic diabetes care, regular phone calls from project officer, newsletter, workshop
- **Main outcome measures**: Regular checks of weight, BP, lipids, glucose, HbA1c, creatinine, urinary ACR, eye and foot care, hospitalisations

Outcomes

• Except for BP, all sites showed improvement in care processes (after audit, feedback, guidelines, outreach team)
• Sites with recall systems improved care processes more than control sites (RR 1.21, 1.04-1.43)
• Intermediate clinical measures (HbA1c, BP, lipids, self-monitoring) did not improve over 12 months
• However, a marked reduction in diabetes-related hospitalisations in sites with recall systems
• A diabetes outreach service improves diabetes care, but an effective community-based register and recall system, managed by local health workers, is critical to its success.

Percentage of diabetics hospitalised for diabetes-related conditions in the previous 12 months, Torres Strait, 1999-2000

Reversal of type 2 diabetes with a low calorie diet

- Lim et al, Diabetologia on line 9 June, 2011
- Optifast, + 3 portions of non-starchy vegetables. 600 kcal/day
- 11 people with T2D
- Liver and pancreas fat by Magnetic Resonance
- Hepatic glucose production and insulin sensitivity
- B-cell function
- Age and BMI-matched controls
- Tested at baseline and after 1, 4 and 8 weeks after commencement of diet
Reversal of T2D - 2

- After one week, fasting plasma glucose and HGP had normalised and stayed down.
- Liver fat fell to the obese control levels after one week, and by 8 weeks had fallen to healthy non-obese levels.
- Pancreas fat fell slowly and by 8 weeks had normalised and the 1st phase insulin response was completely normalised.
- Both defects of T2D (insulin resistance, B-cell function) can be reversed by energy restriction.
- Both defects accompany excess fat in liver and pancreas.
Therapeutic potential of the traditional hunter-gatherer lifestyle
West Kimberley, 1982: Mowanjum Community

Impact of 7 weeks of hunter-gatherer lifestyle on metabolic markers of diabetes and risk factors for heart disease

- Metabolic control in diabetes
  - Fasting and 2 hr glucose fell markedly
  - Fasting insulin fell
  - Insulin secretory response increased

- Risk factors for heart disease
  - Blood pressure fell
  - Triglycerides and other lipids normalised
  - Bleeding time increased
Rapid health impact of the hunter-gatherer diet and lifestyle

7 weeks traditional lifestyle in middle-aged diabetic people

- weight loss (~8kg)
- ↓ fasting glucose
- ↓ fasting insulin
- ↓ triglycerides
- ↓ blood pressure
- ↑ bleeding time
  - ↑ long chain n-3/ n-6 PUFA

O’Dea, Diabetes, 33:596-603, 1984
The diet in that 1982 study

- Over a 2 week period, documented and weighed all foods that were eaten by the group.
- Samples were stored in liquid nitrogen for transport and analysis in Melbourne.
- Estimated mean individual intake for the group.
- Three foods comprised over 80% energy consumed:
  - Kangaroo 36%
  - Long yams 28%
  - Freshwater bream 19%
Composition of that diet

- 1200 kcal/person/day
- 54% energy as protein
- 33% energy as CHO
- 13% energy as fat
  - 4% saturated
  - 5% monounsaturated
  - 4% polyunsaturated
    - n-6/n-3 = ~ 1
    - Particularly rich in long chain n-3 PUFA (EPA and DHA)
Diet and lifestyle of Aborigines as hunter gatherers

• Diet
  – Derived from non domesticated animals, marine foods and uncultivated plant foods
    • Low fat, esp. saturated fat – lean meat, fish, crustacea
    • Relatively rich in polyunsaturated fat with low ratio of n-6/n-3 PUFA
    • Rich source of bioactive phytochemicals from uncultivated plant foods
      – Carotenoids, flavonoids, polyphenols, etc
  – High nutrient quality: anti-oxidant and anti-inflammatory
  – Low energy density: high bulk
• Water was the major/only liquid consumed
• Physical activity built into daily routines
• No evidence of substance abuse
• High level of social cohesion
The therapeutic potential

• Protected against the major lifestyle-related chronic diseases of contemporary Indigenous peoples
  – Obesity and metabolic syndrome
  – Type 2 diabetes
  – CVD
  – Kidney failure

• But how achievable is it given the circumstances of many Indigenous people today – particularly those in remote locations?
Poverty and the food supply: The economics of food choice

Brimblecombe and O’Dea MJA 2009; 190: 547-48
Key nutrition issues – links to insulin resistance and metabolic syndrome?

High quality diets cost more
  – Poverty versus genetics
• High intakes of refined carbohydrates and saturated fat
  – Sugar, fat and salt
  – Fatty meat, take-away foods
  – Liquid calories
– Very low intakes of fresh fruit and vegetables
Improving chronic disease outcomes for Indigenous Australians?

• Primary prevention of type 2 diabetes
  – High quality diet, regular physical activity
  – Must start early in life
    • Diabetes in pregnancy
    • Under nutrition in utero
      – Smoking, teenage pregnancies

• Secondary prevention in diabetes
  – Implementation of treatment guidelines

• Primary prevention of vascular disease
  – High quality diet, regular physical activity
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