# **Session I :**
# Epidemiologic Transition and its Consequences

# Area-level influences related to obesity and cardiometabolic diseases: environmental factors and their mechanisms

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Prevalence rates of obesity/overweight have risen in Canada and will grow higher with an increasing prevalence of overweight/obesity among youth. Societal shifts to greater intake of energy-dense food and reduced energy expenditure underpin rising rates of obesity around the globe. These risk behaviours do not arise in a vacuum.

A large literature concedes the role of environmental factors in predisposing, enabling and reinforcing risk behaviours for overweight/obesity. Neighbourhood disadvantage has been linked to unhealthful dietary behaviour, reduced physical activity and higher risk of cardiometabolic diseases. Associations between neighbourhood disadvantage and unhealthful diet and activity level are partly explained by residential variations in sources of healthful food, and built environmental factors affecting opportunities for planned or recreational physical activity. Availability of environmental resources has also been shown to be associated with overweight/obesity, and greater mortality and rates of admission for acute coronary syndromes. The availability of environmental resources has been clearly shown to vary with neighbourhood characteristics. Studies in the US indicate that disadvantaged neighbourhoods and high numbers of minorities have a lower availability of stores selling healthful foods, greater availability of fast-food outlets, and lesser opportunity for physical activity than advantaged residential areas or those with fewer minorities. Research in Canada, the UK, Australia, and New Zealand has similarly indicated that area-level socio-economic status (SES) is inversely related to the density of fast-food outlets and positively to physical activity opportunity. The inverse relationship found in the US between area disadvantage and stores offering healthful foods has not, however, been observed by studies in the UK or Australia. Canadian studies have noted spatial variations in access to sources of fruits and vegetables, and such disparity has not been clearly explained by area

SES. These approaches will inform public health and urban planning action to reduce unhealthful or enhance healthful commercial presence related to obesity and disease in particular areas.

## Research Needs:

1. Investigate true environmental factors (e.g., availability of food sources and physical activity opportunity) and their spatial variations that impact behaviour, obesity/overweight, and cardiometabolic outcomes in addition to, or interactively with, neighbourhood SES: Socio-demographic indicators beyond SES, including family structure and size, marital status, immigration status, and urban form indicators, including residential density, waterways, roadways, obstructions to movements, and aesthetic features including green space, are especially relevant for research attention as such factors can conditional social and cultural norms or options for eating and physical activity level. Areas defined by social or built environmental risks can be targeted for multi-level health intervention to change places and the behaviour of people in these places.
2. To study the correlates as well as the causal direction of relationships, so as to make the behavioural, psychosocial, and the direct biological pathways by which environments influence health outcome explicit.
3. The need is to contextualize our individual level knowledge to act on the environmental drivers of sick populations.

## Suggested reading

1 Daniel M, Moore S, Kestens Y (2008). Framing the biosocial pathways underlying associations between place and cardiometabolic disease. Health and Place 14:117-32

2 Morland K, Diez Roux AV, Wing S (2006). Supermarkets, other food stores, and obesity the atherosclerosis risk in communities study. American Journal of Preventive Medicine 30(4):333-9.

3 Auchincloss AH, Diez Roux AV, Brown DG, et al. (2008). Neighborhood resources for physical activity and healthy foods and their association with insulin resistance. Epidemiology 19:146-57

# Ethnic heterogeneity of obesity in Canada

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Over the past 30 years, the prevalence of obesity (body mass index ≥30 kg/m2) in adults living in Canada has increased to 23.1%. This has been paralleled by a concomitant increase in obesity in children to 18%. As Canada is a country of many cultures, these prevalence rates do not tell the whole story as the prevalence of obesity can vary by more than seven-fold comparing those of East/Southeast Asian to those of Aboriginal origin. In children of East/Southeast Asian origin, the prevalence of obesity is approximately 12%.

As of 2006, those identifying themselves as being of South Asian origin were the largest self-identified minority group in Canada at over 1.2 million. Of greater importance is that the increase in this population from 2001 to 2006 was nearly seven-fold of the general population. It is expected that this population will grow even more in the future, therefore, the health of South Asians is of great importance to Canada.

Previous research has identified potential differences in body composition among ethnic groups which is important for the development of targeted prevention strategies. In comparing the body composition of men and women of European and South Asian origin living in Canada, we reported that South Asians have a higher percentage body fat, visceral adipose tissue, deep subcutaneous adipose tissue and less lean mass than the Europeans. These differences were apparent even taking into consideration demographics, lifestyle parameters and body size. This would indicate that with the increasing prevalence of obesity in those of South Asian origin, the burden of type 2 diabetes and cardiovascular disease will likely be much higher than in Caucasian populations, necessitating the development and implementation of appropriate obesity prevention strategies.

## Research Needs:

1. What are the obesity trends in children of different ethnicity?
2. Are measures of abdominal obesity more effective for identifying at risk populations?

3. Are there ethnic differences in body fat distribution in children?
4. What are the determinants (genetic, environmental) of ethnic differences in body fat distribution?
5. At what stage in life are ethnic differences in body fat distribution present and do they change over time?
6. Do these ethnic differences translate into obesity-related morbidities and mortality

## Suggested reading:

1. Lear SA, et al. Am J Clin Nut. 2007;86:353-359.
2. Lear SA, et al. Obesity. 2007;15:2817-2824.
3. Shields M. Measured obesity: Overweight Canadian children and adolescents. Statistics Canada 2005.

# Epidemiological transition: An Indian perspective

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Overweight and obesity in childhood is increasing at an alarming rate in the developed countries, and the same is expected to happen in developing economies as their prosperity rises. These countries are amidst an epidemiological transition from undernutrition to overweight and obesity. This transition needs to be looked along with the distally occurring demographic, economic, social and nutritional transition; proximal health related nutritional, disease profile and health care and the outcome transition in terms of underweight/overweight and obesity.

Over the past several decades, India has been seeing an increasing population, literacy, urbanization, consumption of fat in food items, physical inactivity, rise in heart diseases, diabetes and other major Noncommunicable diseases in adulthood, and concomitant with declining energy intake, stunting and underweight in children. There is lot of heterogeneity in these parameters in the urban, rural, age groups in various regions of the country. These can be attributed to the use of different methods to measure and classify anthropometry findings, selection of study population, and lack of prevalence trends in the same population. Studies done at several places across the country showed rising overweight and obesity rates, especially among the urban population. The recent surveys (2005-06) of NNMB and NFHS have shown overweight across the age groups. However, ratio of prevalence of underweight to overweight is estimated for NFHS and NNMB surveys amongst the childhood population, remains below 1. In district Ernakulum, Kerala, more than 20,000 school going children aged 5-16 years had their anthropometry measured twice- in 2003-04 and 2005-06 under the ICMRs registry on Rheumatic fever/heart disease. Overweight and obesity increased from 4.6% to 6.5% in these 2 years, while a 2-3% decline in undernutrition was also seen.

Thus, the settings for an epidemiological transition from underweight to overweight and obesity are occurring, but prevalence data does not show uniform shifts across the populations. It is appropriate time to put effective strategies in place to check the rise in overweight and obesity amongst children.

## Research Needs:

1. Identification of simple and valid indicators for tracking epidemiological transition: anthropometry, nutrition profiling, socio-economic parameters etc.
2. Correlate these changes to Noncommunicable diseases morbidity and mortality patterns so as to understand the consequences of this transition.

# Cardio-metabolic risk of epidemiologic transition

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The prevalence of obesity and the metabolic syndrome is rapidly increasing in developing countries, leading to increased morbidity and mortality due to type 2 diabetes mellitus (T2DM) and cardio-vascular disease (CVD).

With improvement in economic situation in developing countries, increasing prevalence of obesity and the metabolic syndrome is seen in adults, as well as in children. The main causes are; increasing urbanization, nutrition transition, and reduced physical activity. Some evidence suggests that widely prevalent perinatal undernutrition and childhood 'catch-up' growth may play a role in adult-onset metabolic syndrome and T2DM.

Some of the important characteristics of Asian Indians which predispose them to develop hyperglycemia and atherosclerosis are; excess adiposity, high subcutaneous and intra-abdominal adipose tissue, insulin resistance and the metabolic syndrome, hepatic steatosis, sub-clinical inflammation and endothelial dysfunction. Some of these manifestations appear at birth or early childhood. Further, in Asian Indians, cardiovascular risk manifests at a lower level of adiposity and abdominal obesity. Such cardiovascular risk profile has been increasingly reported in economically disadvantaged people in rural areas and urban slums. In such populations, risk factor profile is continuosly changing and becoming increasingly adverse.

## Research Needs:

1. Characterize the cardio-metabolic risk related to obesity and epidemiological transition in various population categories (ethnicity, age groups, geographic distributions etc).
2. Develop a comprehensive intensive risk reduction package through a life cycle approach

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## WORKING GROUP REPORTS

1. **Working Group - I**

# Surveillance of obesity and its determinants in children and adolescents

Surveillance in the context of overweight and obesity would aim at determining its trends over a period of time as well the determinants at multiple levels. There are no specific programs in India and Canada for the said purpose. However, existing health surveys/ programs could include the selected parameters. In India, data on school health does not have wide coverage and accessibility. There is need to identify simple and valid indicators to measure obesity, adiposity and a few novel makers (eg. Body image) to facilitate tracking its changes. This system should also monitor trends of the associated co-morbidities during the life span and relate it to changes in obesity and adiposity.

## Recommendations:

1. Establish surveillance mechanisms based on valid parameters which are locally relevant and globally comparable.
2. Identify the tools and methods for planning, data collection, monitoring and assessment.
3. Monitor outcomes of changing obesity and its co-morbidities
4. Assessment of existing growth standards for monitoring growth from early infancy onwards to their relation to specific health outcomes, and the need to develop more specific ones.

**2. Working Group - II**

# Double burden and its relevance to developing economies

The co-existence of undernutrition and overnutrition at population level poses a unique public health challenge. The problem is more relevant to India than Canada. However, migration of population within India and from India to Canada is a form of epidemiological transition and puts forth double burden problems. The Indian population is multi-ethnic and transitioning at different rates. Comparisons between Indians living in Canada and the non-Indian ethnic population would provide useful insights.

## Recommendations:

1. Study co-existing undernutrition and overnutrition (obesity) within the ethnic heterogeneities within each Country and amongst population migrating from developing to more developed environments.
2. Determine the healthy and unhealthy trajectories of growth in children, their outcomes and differences in India and Canada
3. Identify appropriate methodologies for research in the Indo-Canadian context: i.e.: qualitative research- experiences of children, building consortium of existing cohorts, physical activity