How to strengthen the link between biology and implementation for sustainable action

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Evidence for Implementation

• require composite knowledge of biology plus nutrition, food, social, behavioral, implementation sciences etc

• Policy and Program Advocacy

  Good nutrition for maternal health, child development esp BRAIN, work capacity, prevention of disabilities and diseases, longevity + quality of life

  Investing in nutrition – economic benefits

• Targeting and timing of intervention

• Program design – Proven effective intervention

• Monitoring – Progress, Feedback for Adjustment

• Impact evaluation
Era of Nutrition Research

- **1920-1950** Vitamin discovery/deficiency diseases; nutrient focus strategies; RDAs
- **1950-1970** Staple calories; caution-fat; protein-enriched formulas
- **1970-1990** Address hunger/micronutrient def – supplementation and fortification
- **1990-2010** Double burden of malnutrition-rapid rise of obesity/NCDs in LMICs; dietary patterns for chronic diseases
- **FUTURE** Complexities of diet and health; food quality focus; modern agriculture, food processing and innovation-→ optimal diet patterns

Source: D Mozaffarian BMJ 2018
Food Systems Are Central to Diets & Human Health

Biophysical and environmental drivers
- Natural resource capital
- Ecosystem services
- Climate change

Innovation, technology and infrastructure drivers
- Innovation
- Technology
- Infrastructure

Political and economic drivers
- Leadership
- Globalization and trade
- Conflicts and humanitarian crises
- Food prices and volatility
- Land tenure

Socio-cultural drivers
- Culture
- Religions & rituals
- Social traditions
- Women’s empowerment

Demographic drivers
- Population growth
- Changing age distribution
- Urbanization
- Migration & forced displacement

Food supply chains
- Production systems
- Storage and distribution
- Process and packing
- Retail and markets

Food environments
- Consumer behaviour
- Diets
- Nutrition and health outcomes

Political, programme and institutional actions

Sustainable Development Goals

HLPE Report 2017
Short-term and long-term effects of undernutrition

**Short-term**
- Brain development
- Growth & muscle mass
- Body composition
- Metabolic Programming of glucose, lipids, protein
- Hormone/receptor/gene

**Long-term**
- Cognitive & education performance
- Immunity
- Work capacity
- Diabetes, Obesity, Heart disease, high blood pressure, cancer, stroke and ageing

**Early nutrition in utero and childhood**

Key Messages (Lancet 2008)

- Undernutrition: stunting, wasting, IUGR—3.6 mil child deaths, 11% disease burden
- Stunting in first 2 yrs – irreversible damage; rapid wt gain after undernutr-increase risk of NCDs as adults
- Proven effective interventions to reduce stunting and MN def: breastfeeding/CF, VA and Zn suppln; mgt of severe malnutrition
- Crucial period: conception to 2 yr old or 1,000 days window
- Greater natl priority; intersectoral approaches; better coordination in the global nutrition system
Environment Special: The oceans—why 70% of our planet is in danger

Afghanistan: After a flawed election, how the world can help

How the first nine months shape the rest of your life

The new science of fetal origins

BY ANNIE MURPHY PAUL
Lifecycle: the proposed causal links

- **Elderly Malnourished**
  - Reduced capacity to care for baby
  - Inadequate food, health & care

- **Baby Low Birth Weight**
  - Higher mortality rate
  - Impaired mental development
  - Inadequate growth

- **Woman Malnourished**
  - Pregnancy Low Weight Gain
  - Higher maternal mortality
  - Inadequate food, health & care

- **Adolescent Stunted**
  - Reduced mental capacity
  - Inadequate food, health & care

- **Child Stunted**
  - Reduced mental capacity
  - Inadequate food, health & care

- **Epigenetic susceptibility to chronic diseases if diet becomes inappropriate**
  - Weaning
  - Frequent infections
  - Inadequate food, health & care

- **Baby**
  - Reduced capacity to care for baby
  - Impaired mental development
  - Inadequate growth

- **Inadequate foetal nutrition**

- **Inadequate food, health & care**

Adapted from James et al. SCN Millennium Rep. Food & Nutrition Bulletin, 2000, 21, 3S.
“Nutrition is crucial to both individual and national development. The evidence in this Series furthers the evidence base that good nutrition is a fundamental driver of a wide range of developmental goals. The post-2015 sustainable development agenda must put addressing all forms of malnutrition at the top of its goals”
Figure 1: Framework for actions to achieve optimum fetal and child nutrition and development
‘1000 Days’: The Window of Opportunity--DOUBLE DUTY intervention

Conception

Child birth

2-yrs old
CONCEPT & STRATEGY

1,000 วันแรกของชีวิต

Target groups

Pregnant women (270 วัน)
0-6 mo old infants (180 วัน)
6-24 mo old children (550 วัน)

Strategy

Integrated health and social activities by local government and participation of stakeholders

Integrated package: nutrition, play, child development, dental hygiene, water, sanitation, etc

ANC, WCC and family well-being through local H and MCH board

Committee on quality of life at district level – Hlth/Social protection/Ed/Interior

Achievements: Optimal growth (height) & development
### Menu of activities for 1000 days

#### Health functionary

**Pregnant women**

- **At ANC:**
  - Monitor preg wt gain - GWG graph
  - Assess - counsel – demonstrate diets
  - Iron-folate-iodine supplement throughout preg

**Lactation 6-24 mo**

- Services for lactating mothers:
  - Reviving 10-step for successful BF
  - Enforce code of marketing for infant formula
  - Counsel on breastfeeding/ diets during lactation
  - Provide iron/folate/iodine supplement
  - Assessing child growth and development
  - Assessing child eating (dietary diversity)
  - Demonstrate: preparation of child diets
  - Counsel & demonstrate to mothers on monitoring & interpretation of child growth

**0-6 mo infants**

- Counsel - diets for 1-2 y old
- weekly iron suppl.
“A study with great national impact - to prevent and manage diseases like diabetes and obesity.” Mr Heng Swee Keat, Minister for Education. MOE FY2015 Committee of Supply Debate-Speech, 6 Mar 2015.

“The research findings showed how a mother’s anxiety from pregnancy could affect her child intellectually and emotionally from birth.” Deputy Prime Minister Teo Chee Hean. 30th anniversary of Institute of Molecular & Cell Biology, 8 May 2015

- Launched in 2009
- 1247 mother-child pairs
- 3 Asian ethnic groups
- Very close longitudinal follow-up
- Very deep phenotyping & biosampling
- >15,000 phenotypic measures across 10 domains

Courtesy: Prof. Yap-Seng Chong, TCN Oct 2018
Imaging in GUSTO

MRI at 1 week, 6 weeks, 6 months, 4.5 years, 6 years, 7.5 years

Abdominal adipose tissue
Liver & Muscle fat (MRS)
Brown fat

Brain imaging (DTI)

Courtesy: Prof Yap-Seng Chong, TCN Oct 2018
Intergenerational transmission of risks

Mother

Pregnancy mood

Child

IQ / Cognitive skills

Child

Behaviours / Executive functions

Child

School readiness / Achievement

Child

Anxiety / Depression

Courtesy: Prof Yap-Seng Chong, TCN Oct 2018
Recommendations for Maternal Emotional Health made to Ministry of Health on 3 Sep 2015

Maternal Emotional Well-being:
Screening and Management may benefit Singapore’s future generations.

3 September 2015

Prepared by:
Dr Cai Sheng, NUHS; Prof Michael Mooney, SICS & McGill University; Dr Anne Hinke Graber, SICS; Dr Brill Leuchter-Geikebren, NUHS & SICS; Dr Gui Ang; NUHS; Dr Paul Bu Y; SICS; Prof Kenneth Kwek, KK Women’s & Children’s Hospital; and Prof Cheng Yap Xiang, NUHS & SICS

- Poor maternal emotional health, even in sub-clinical ranges of maternal anxiety and depression, may be associated with increased neurodevelopmental disorders in the offspring including anxiety, depressive or disruptive behavior disorders.

RECOMMENDATIONS TO MOH, 3 SEP 2015
1. Integrate screening for anxiety and depression into routine prenatal and postnatal care across all government and private maternity hospitals.
2. Provide professional emotional health support for women during pregnancy and continuity of care services from hospital to home.
3. Identify risk factors and social determinants for perinatal anxiety and depression and provide targeted help for high-risk groups.

Courtesy: Prof Yap-Seng Chong, TCN Oct 2018
Strengthen Biology - Implementation

• Type and quality matters-The BEST of Science drives Policy– endorsed by international experts
• Existing international events global gatherings as dialogue platform for knowledge sharing and interactive discussion
• strategic communication- insights on national policy/program decision and PRIORITY area
• translation of advanced biological evidence for effective interventions
• identification of ‘entry point’ for dialogue-building trust
• proposing model of collaboration to speed up achievement of committed goals.
THANK YOU!