

# ARGUMENTS FOR MEASURING A UNIQUE AND COMPLEX FOOD - HUMAN MILK - IN GDP

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Julie P. Smith, Korea University, "Beyond GDP: Experiences and Challenges in the measurement of Economic Well-being," Westin Hotel, Seoul, Korea, April 26-28, 2017.  
*Session 3A National Accounts and Well Being    26 April 2017    15.30-15.45*

## S-S-F Commission review

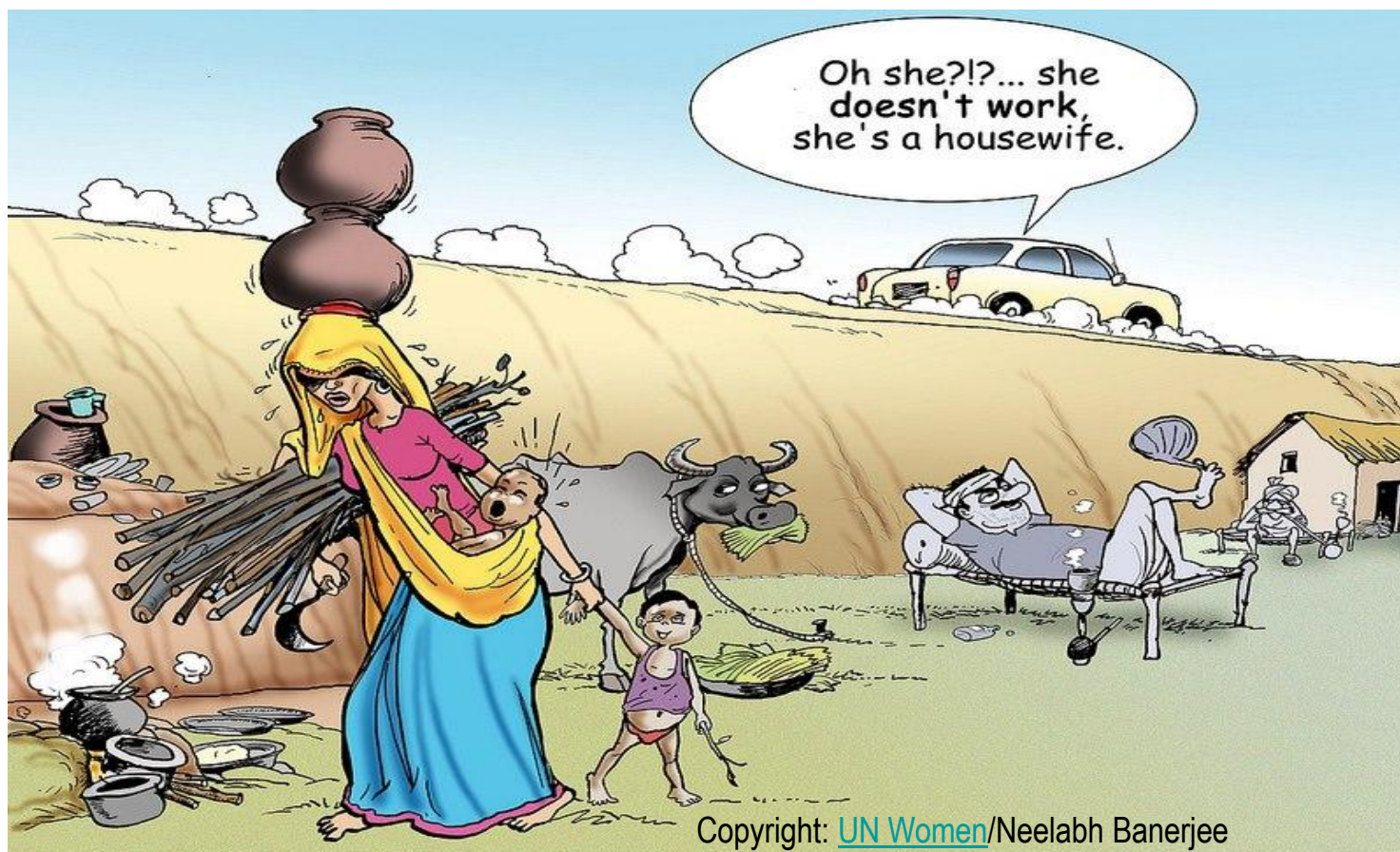
***“There is a serious omission in the valuation of home-produced goods – the value of breast milk. This is clearly within the System of National Accounts production boundary, is quantitatively non-trivial and also has important implications for public policy and child and maternal health.”***

Stiglitz, J.E., Sen, A., and Fitoussi, J.-P. (2009) The measurement of economic performance and social progress revisited; Reflections and overview, Centre de recherche en économie de Sciences Po (OFCE).

## Breastfeeding, human milk and the SNA Framework

| <i>Domains of impact</i>                | <i>Effects of infant and young child feeding</i>                                                                                                                                                                                                    | <i>Relevant SNA impact</i>                                                                                                                   | <i>SNA framework</i>                                                                                            |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>Social and Gender equity</b>         | Unpaid time inputs to household production and consumption of IYC nutrition and care including health care                                                                                                                                          | Childcare and preventative healthcare                                                                                                        | Satellite accounts of non-market household production                                                           |
| <b>Food system</b>                      | IYC feeding and nutrition – undernutrition and overnutrition                                                                                                                                                                                        | IYC food production and consumption                                                                                                          | Core production boundary/GDP                                                                                    |
| <b>Health cost externalities</b>        | Preventative health care and avoided attributable health costs of premature breastfeeding cessation                                                                                                                                                 | Health care costs and defensive health expenditures                                                                                          | Core production boundary/GDP                                                                                    |
| <b>Environmental cost externalities</b> | Environmental asset degradation of milk formula production eg GHG emissions, pollution, packaging and waste generation                                                                                                                              | Defensive environmental expenditures                                                                                                         | Core production boundary/GDP                                                                                    |
| <b>Human capital</b>                    | Avoided acute infectious illness (respiratory, gastrointestinal); maternal survival and fertility regulation; avoided later life chronic disease child and mother (obesity, diabetes, reproductive cancers eg breast cancer), cognitive development | Increased labour productivity and human capital stock via lower chronic disease risk, child cognitive development and educational attainment | Human capital accounts – income and cost methods                                                                |
| <b>Environmental assets</b>             | Avoided land clearing, biodiversity, water use and other avoided impacts of breastmilk substitutes                                                                                                                                                  | Environmental asset depletion                                                                                                                | Environmental accounts – depletion of land, water, air, energy resources due to milk formula production and use |

# Time inputs to non-market production

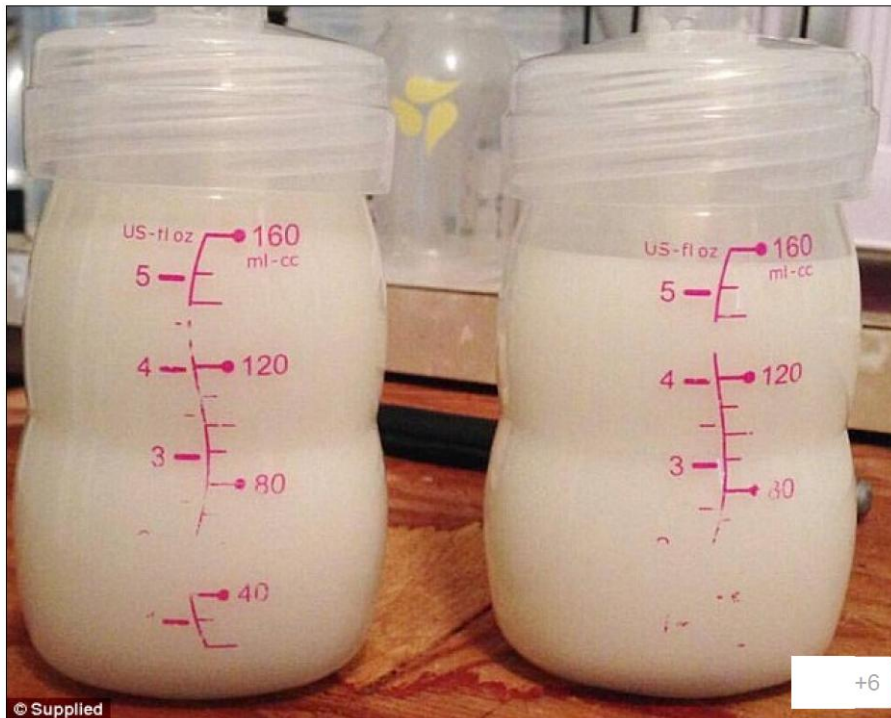




# Non-market food production

2/28/2017

Australian mothers sell their breast milk for \$500 a litre |



Cancer patients, athletes and people with fetishes are most likely to offer big-money for the product but mothers who can't produce their own milk also buy it

## TECH & SCIENCE THE BOOMING MARKET FOR BREAST MILK

BY CAROLINA BUJA ON 5/23/15 AT 4:11 PM



Nursing mothers express their breast milk on the first day of donation at a hospital in Medellin, Colombia, August 20, 2014. These volunteers will supply the milk bank, to offer a more nutritious alternative for children whose mothers are not able to provide them with breast milk.

FREDY BUILES/REUTERS



Post an ad and help babies get Only The Breast.

Buy, sell or donate breast milk with our discreet classifieds system.

- Want to donate breast milk to a fellow mother?
- Considering selling or donating to a needy baby?
- Need natural breastmilk for your growing baby?
- Do you believe breastfeeding is best?
- Are you over-producing and want to list your liquid gold for sale?
- Looking to make a few extra bucks while clearing out your freezer?

# Non market production of health care and nurture

- Infectious illness in child
- Later life chronic disease risk
- Child development – physical and mental
- Maternal reproductive health and mental health and later life chronic disease risk

Mothers are handing over breastfeeding duties to friends... and even strangers

BY FRANCES HARDY  
FROM DAILY MAIL  
MAY 16, 2013 11:11AM  
7 COMMENTS



Would you let another woman breastfeed your baby? Picture: Shutterstock. Source: Supplied

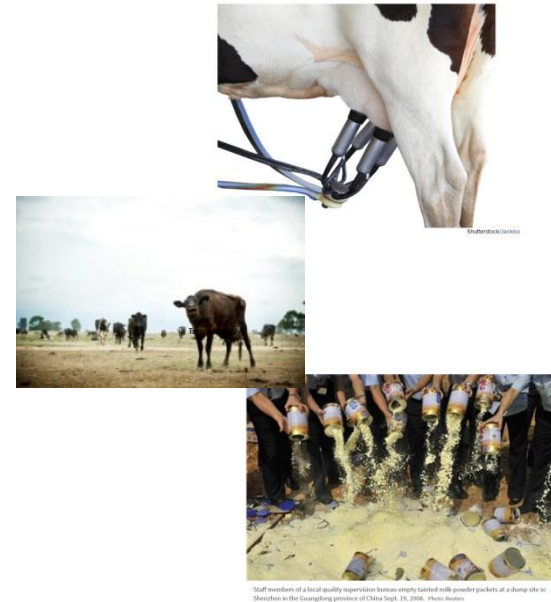


A page from the website of Ambrosia Labs Limited explaining their policy on breast milk donors. Cambodia has now banned the sale and export of human breast milk. Photo: Supplied

# Defensive expenditures of breastmilk substitutes

Attributable costs of dairy production  
and milk formula product use

- **Environmental remediation expenditures**
  - Pollution
  - Waste
- **Health care expenditures**
  - Child
  - Mother



Staff members of a local quality supervision bureau empty tainted milk powder packets at a dump site in Shaoyuan in the Guangxi province of China Sept. 18, 2008. Photo: Reuters

# Human capital stock and breastfeeding

- **Higher cost of time inputs**
- **Higher rate of return**
  - **Lifetime health and chronic disease & obesity risk reduction for child**
  - **Reproductive health and chronic disease risk reduction for mother**
  - **Child development, educational attainment and later life earnings and labour force productivity**

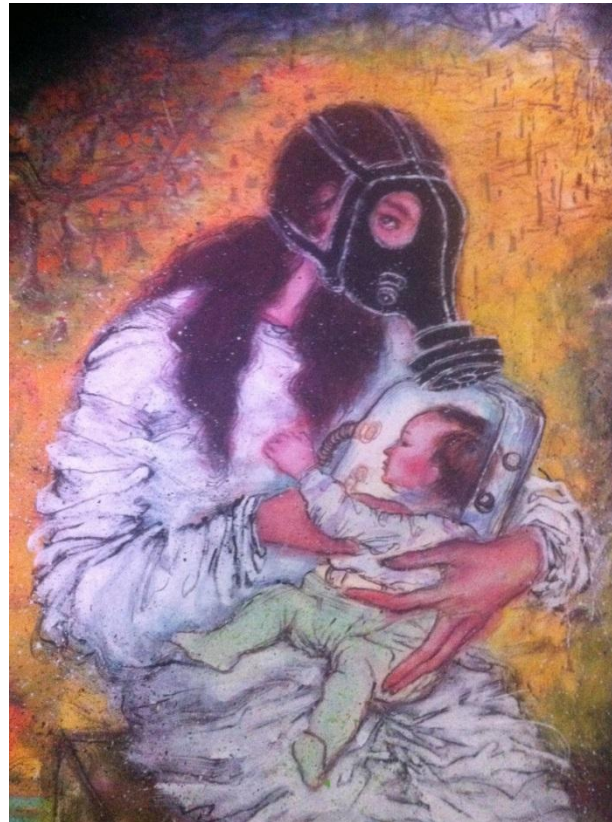




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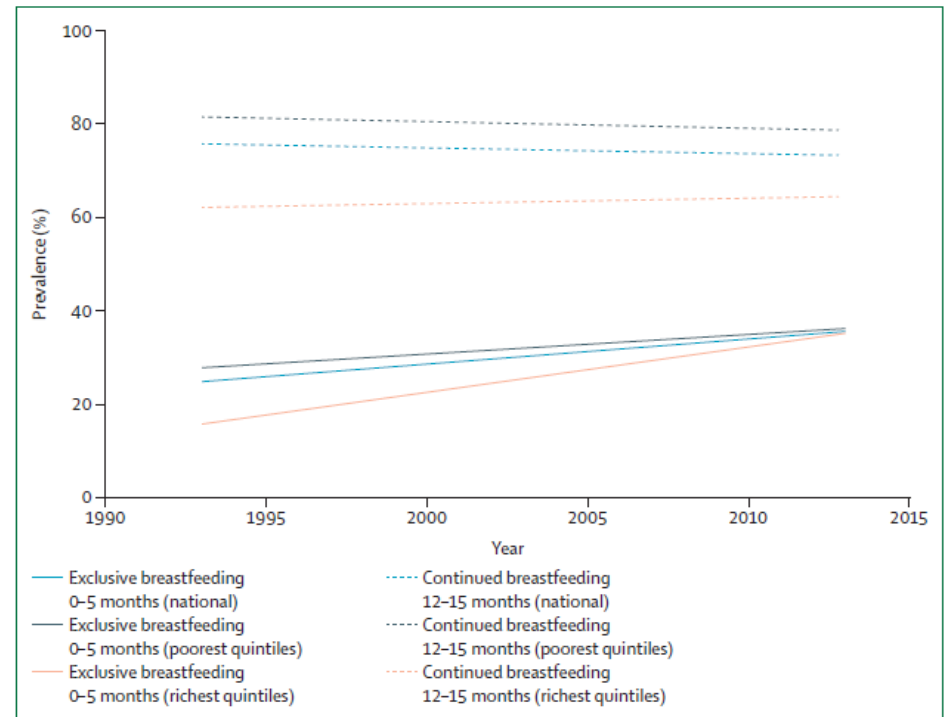
# Environmental asset depletion and breastmilk substitutes



Philippines artist Jonahmar Salvosa

# Global breastfeeding trends

- Stagnation in exclusive breastfeeding < 6 months
- Declines in continued breastfeeding to 12-15 months
- Growing social inequality in breastfeeding access

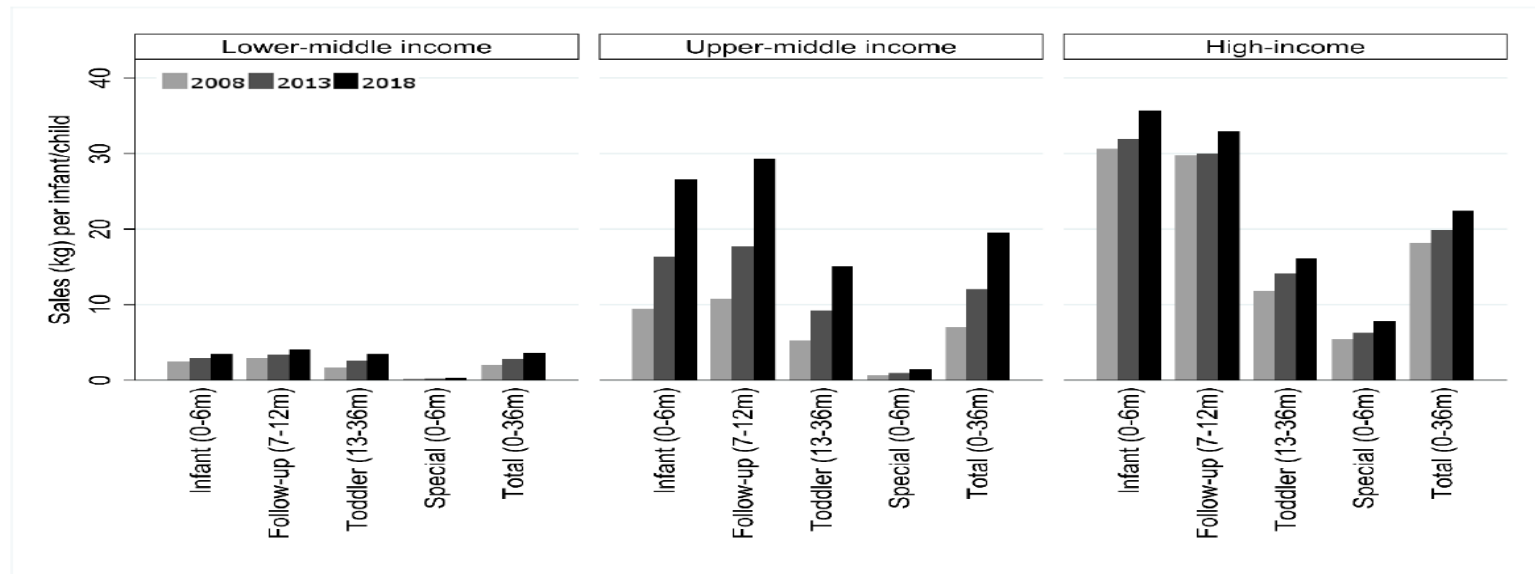


**Figure 4: National and wealth quintile-specific time trends in exclusive and continued breastfeeding, 1993–2013**

Data are weighted by national populations of children younger than 2 years at the time of the survey. Analyses restricted to 66 countries with information about household wealth.

# Global sales trends of breastmilk substitutes

**Figure 3:** Formula category sales volumes (kg) per infant/child by country income groups, 2008-2013 with projections to 2018



Data from Euromonitor Passport Global Market Information database; estimates for high-income countries excludes toddler formula in JPN and follow-up formula in the USA; countries grouped by World Bank country lending categories.

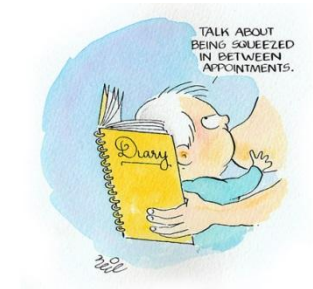
Baker P, Smith J, Salmon L, Friel S, Kent G, Iellamo A, JP Dadhich, Renfrew MJ. Global trends and patterns in commercial milk-based formula consumption: is an unprecedented infant and young child feeding transition underway? *Public Health Nutrition* 2016.

Rollins NC, Bhandari N, Hajeebhoy N, Horton S, Lutter CK, Martines JC, et al. Why invest, and what it will take to improve breastfeeding practices? *The Lancet* 2016;387(10017):491-504

# Time inputs into production

## Mothers time investments in infant nutrition and care

| <i>mean weekly hours</i> | EBF  | Not EBF |
|--------------------------|------|---------|
| <b>Milk feeding*</b>     | 18.2 | 11.6    |
| <b>Solids feeding**</b>  | 0.1  | 2.5     |
| <b>Preparing feeds*</b>  | 0.4  | 1.4     |
| <b>Total</b>             | 18.7 | 15.4    |



Smith, J. P., & Forrester, R. (2013). Who pays for the health benefits of exclusive breastfeeding? An analysis of maternal time costs *Journal of Human Lactation*, 29(4), 547 - 555.

Smith JP, Forrester R. Maternal time use and nurturing; Analysis of the association between breastfeeding practice and time spent interacting with baby ,*Breast Feeding Medicine* 2017 forthcoming.



# Markets and prices

| Market                               | Price (\$US per oz.)                                                                                               | Location | Comment/source                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Human milk banks</b>              |                                                                                                                    |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| HMBANA                               | \$3-\$4.5 <sup>(1)</sup>                                                                                           | USA      | Currently there are 12 HMBANA member milk banks providing donor human milk in the United States and Canada. HMBANA milk banks charge no fee for the actual milk, but charge a processing fee to offset the milk bank's overhead costs. This fee ranges from US\$3 to US\$4.50 per ounce, plus shipping costs. Each milk bank has the authority to determine the processing fee for its facility, which is the reason for the wide variation in price.                                                                                                                                                                             |
| Norwegian milk banks                 | \$3.42 (US\$100 per litre) <sup>(2)</sup>                                                                          | Norway   | 13 milk banks were operating in Norway in 2009, all located in hospitals with level 111 NICUs. All preterm infants are offered donor milk if mothers' milk is unavailable or insufficient, and all infants who need milk from the milk bank are offered it. Donors are given a free hospital grade breast pump, and US\$20 per litre to cover electricity and travel expenses, and donate for 6 months. At the main Oslo hospital where 2000 of the country's 60,000 annual births occur, the milk bank collects around 1000-1100 litres of human milk p.a. There is a charge of US\$100 for milk transferred to other hospitals. |
| Standardised human milk formulations | US\$35 (US\$1183 per litre) <sup>(3)</sup>                                                                         |          | Prolacta products are for in hospital use only and the company does not supply or charge directly to parents for Prolacta products. The cost is absorbed by the hospital or covered by medical insurance, where the infant is prescribed human milk products. <sup>(4)</sup> The company's website explains its 'co-promotion' arrangement with a major formula manufacturer, Abbott Ross, which is involved in promoting and distributing these human milk products to hospitals.                                                                                                                                                |
| Human milk fortifier                 | US\$6.25/mL (US\$6250 per litre) <sup>(3)</sup>                                                                    | USA      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Internet milk exchange</b>        |                                                                                                                    |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Only the Breast                      | US\$1-\$3 <sup>(5)</sup><br>UK\$2-8 <sup>(5)</sup>                                                                 | Online   | Milk can be bought and sold, as well as shared (donated). Exchange is organised into various categories, including by age of the infant, fresh (rather than shipped frozen), milk bank certified mother, milk bank screened mother, bulk sales, local sales, fat babies, special diet (vegan etc). Site offers donor blood testing at US\$219.45. Also has trading from Canada, United Kingdom and elsewhere                                                                                                                                                                                                                      |
| <b>Wet-nurse employment</b>          |                                                                                                                    |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Wet-nursing                          | Daily rate between US\$50 and US\$200 (2012 prices). <sup>(5)</sup><br>US\$1,000/week (2007 prices) <sup>(6)</sup> | USA      | Offered at between US\$50 and US\$200 per day. Also has trading from Canada, United Kingdom and elsewhere. Equivalent to US\$71-286 per litre at 700 ml daily intake.                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Wet-nursing                          | US\$2585/month <sup>(7)</sup>                                                                                      | China    | Chinese wet nurses earned up to 18,000 Yuan/month in 2008. Exchange to USD is based on 2008 exchange rates. Equivalent to US\$121 per litre at 700 ml daily intake                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

Smith, JP (2013 ) "'Lost Milk?" Counting the Economic Value of Breast Milk in Gross Domestic Product', J of Human Lactation 29(4): 537 - 546.

# Market values for human milk

## Market prices for human milk 2012 prices and exchange rates, US\$ per litre

| <i>Online milk sharing<sup>1</sup></i> | <i>Internet trading<sup>1</sup></i> |            | <i>Wet nurse</i>          |                      | <i>Human milk banks</i> |                    | <i>Commercial human milk products<sup>5</sup></i> |           |
|----------------------------------------|-------------------------------------|------------|---------------------------|----------------------|-------------------------|--------------------|---------------------------------------------------|-----------|
| USA, UK, AU                            | USA                                 | UK         | USA                       | China                | HMBANA                  | Norway             | Human milk                                        | Fortifier |
| \$0                                    | \$28 - \$85                         | \$57-\$227 | \$71 - \$286 <sup>2</sup> | \$121 <sup>2,3</sup> | \$85 - \$128            | \$100 <sup>4</sup> | \$1,183                                           | \$6,250   |

<sup>1</sup>Purchase price varies depending on quantity, packaging, and shipping distance; offered at prices of \$1-3 per oz. in the US and \$2-8 per oz. in the UK (excluding shipping costs).

<sup>2</sup>based on an assumed 700mL daily intake.

<sup>3</sup>2008 price.

<sup>4</sup>Milk banks in Norway pay donors a US\$20 per L expenses allowance.

<sup>5</sup>For in-hospital use only, charged to hospitals or medical insurance and distributed through a 'co-promotion' with a major formula manufacturer.



A woman breastfeeds her newborn child earlier this year at the Maternal and Child Health Center in Phnom Penh.  Heng Chivon

## Local breast milk for sale in the US

Thu, 24 December 2015 Will Jackson

N267615

August 24, 2015

CLA-2-04-OT:RR:NC:N2:231

CATEGORY: Classification

TARIFF NO.: 0401.20.2000; 0401.20.4000

Mr. Ryan P. Newell Ambrosia Labs 1156 S. State St. (Suite 201) Orem, UT 84097-8235

RE: The tariff classification of human milk from Cambodia.

Dear Mr. Newell:

In your letter dated August 10, 2015, you requested a tariff classification ruling.

The product in question is human milk (breast milk) that will be imported in frozen

The company operates a donation facility in Cambodia, where mothers are compensated between 50 cents and \$1 per ounce for their breast milk, which is then imported, purified and sold to customers in the United States.

## Compensate women for breast milk donations



By Ada Sivilski, 24 Hours Vancouver  
Wednesday, March 23, 2016 8:53:43 PDT AM



A nurse examines bottles of breast milk kept in a fridge. REUTERS

The BC Women's Provincial Milk Bank is short on donations — its stock of breast milk is running low. Representatives from the bank have been doing media interviews, pitching mothers on the benefits of donating their breast milk to babies in the NICU.

# Non-market food production

## Annual production of human milk, 2006-2010

| Country               | Actual human milk production volume (million liters) <sup>a)</sup> | Market value of human milk production, US\$ million <sup>b)</sup> | Biologically feasible potential volume of production (million liters) <sup>b)c)</sup> | 'Lost' production US\$ million <sup>b)</sup> |
|-----------------------|--------------------------------------------------------------------|-------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------------|
| <i>Norway</i>         | 11                                                                 | 907                                                               | 18                                                                                    | 598                                          |
| <i>Australia</i>      | 41                                                                 | 3,466                                                             | 89                                                                                    | 4,134                                        |
| <i>United Kingdom</i> | 47                                                                 | 3,980                                                             | 223                                                                                   | 15,009                                       |
| <i>Philippines</i>    | 467                                                                | 39,701                                                            | 691                                                                                   | 19,096                                       |
| <i>United States</i>  | 525                                                                | 44,649                                                            | 1,269                                                                                 | 63,238                                       |
| <i>China 2010</i>     | 3,574                                                              | 303,961                                                           | 4,862                                                                                 | 109,577                                      |
| <i>World 2010</i>     | 23,315                                                             | 1,982,942                                                         | 39,744                                                                                | 1,397,251                                    |

a) Production volume calculated as sum of total infants breastfeeding each month from age 0 to 24 months, times monthly milk intake for each age

b) 2012 prices, valued at US\$85.05 per litre (US\$3 per oz.), assuming 1 ml is equivalent to 1 gram.

c) as in a), assuming optimal breastfeeding prevalence of 95% from 0-24 months. WHO estimates that fewer than 5% of mothers or infants cannot breastfeed. The medical contraindications for human milk feeding of infants as advised by the US Center for Disease Control are rare. See <https://www.cdc.gov/breastfeeding/disease/>, accessed 11-4-2017.

Smith JP, 'Including household production in the System of National Accounts (SNA) – exploring the implications of breastfeeding and human milk provision' International Association for Research on Income and Wealth General Conference - August 5-11, 2012 2012; Boston, U.S.A.



# Defensive expenditures of breastmilk substitutes

## Economics studies of acute illness costs of milk formula use



- Australian hospital system costs of premature weaning were estimated at \$60-120m pa for just 4 conditions (gastrointestinal illness, respiratory illness, eczema & NEC)
- US study showing avoidable child health treatment costs including later life chronic illness of \$10.5 billion p.a. from poor US breastfeeding rates
- In China, around \$224 million a year could be saved by the health system from increases in breastfeeding
- Vietnam study based on programme showed potential savings in health care treatment costs (\$0.3 billion annually) of seven countries in Southeast Asia from reduced incidence of diarrhoea and pneumonia

Smith JP, Thompson JF, Ellwood DA: Hospital system costs of artificial infant feeding: estimates for the Australian Capital Territory. *Australian and New Zealand Journal of Public Health* 2002, 26(6):543-551.

Bartick, M. and A. Reinhold (2010). "The burden of suboptimal breastfeeding in the United States: a pediatric cost analysis." *Pediatrics* 125(5): e1048.

Rollins NC, Bhandari N, Hajeebhoy N, et al. Why invest and what it will take to improve breastfeeding practices. *The Lancet* 2016; Vol 387 January 30, 2016:491-504

Walters, D., S. Horton, A. Y. Siregar, et al., 2016, The cost of not breastfeeding in Southeast Asia. *Health Policy Plan*.

# Defensive expenditures of breastmilk substitutes

## Economic studies of chronic disease costs of milk formula use



- Around 8-24% of current chronic disease cases in Australia are estimated to be attributable to high formula feeding of infants in previous generations
- US studies calculate the maternal health, morbidity and mortality costs of suboptimal breastfeeding to be more than \$17 billion (78% maternal, medical \$3 billion, premature death (myocardial infarction , breast cancer, diabetes; SIDS, necrotizing enterocolitis ) \$14 billion, n = 3,340
- UK study estimates health care system saving from increasing breastfeeding of £40 million per year including reductions in the costs of maternal breast cancer
- Worldwide, at least 20,000 avoidable deaths from maternal breast-cancer

Smith JP, Harvey PJ: Chronic disease and infant nutrition: is it significant to public health? *Public Health Nutrition* 2011, 14(02):279-289.

Bartick MC, Schwarz EB, Green BD, Jegier BJ, Reinhold AG, Colaizy TT, Bogen DL, Schaefer AJ, Stuebe AM. Suboptimal breastfeeding in the United States: Maternal and pediatric health outcomes and costs. *Matern Child Nutr* 2016. doi:10.1111/mcn.12366.

Renfrew MJ, Pokhrel S, Quigley M, McCormick F, Fox-Rushby J, Dodds R, Duffy S, Trueman P, Williams A: Preventing disease and saving resources; the potential contribution of increasing breastfeeding rates in the UK: UNICEF UK; 2012.

Victora CG, Bahl R, Barros AJ, Franca GV, Horton S, Krasevec J, et al. Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelong effect. *Lancet* 2016;387(10017):475-90.

## Breastfeeding as an economic investment

In sheer, raw bottom line economic terms, breastfeeding may be the single best investment a country can make.



- Keith Hansen, World Bank Global Practices Vice President, speaking at the 7<sup>th</sup> Annual [#ABMSummit](#) on Breastfeeding

If breastfeeding did not already exist, someone who invented it today would deserve a dual Nobel Prize in medicine and economics. For while “breast is best” for lifelong health, it is also excellent economics. Breastfeeding is a child’s first inoculation against death, disease, and poverty, but also their most enduring investment in physical, cognitive, and social capacity.

The gains from early childhood nutrition are forever. And to a large extent, many of them are free because they have come prepackaged in this unbelievable intervention called breastfeeding. This is, of course, what defines us as a mammalian species. And the proof of this is in the lifelong impacts.

Hansen, K., 2015, The power of nutrition and the power of breastfeeding. *Breastfeeding Medicine* 10(8): 385-388.

Hansen, K., 2016, Breastfeeding: a smart investment in people and in economies. *The Lancet* Vol 387 January 30, 2016: 416.

## Economic loss from cognitive deficits associated with current infant feeding practices<sup>a)</sup>



| Country              | Economic loss, US\$ billion, 2012 | Economic loss as % of GNI <sup>b)</sup> |
|----------------------|-----------------------------------|-----------------------------------------|
| <i>Norway</i>        | 0.57                              | 0.42                                    |
| <i>Australia</i>     | 6.3                               | 0.46                                    |
| <i>Philippines</i>   | 0.73                              | 0.31                                    |
| <i>United States</i> | 84.24                             | 0.53                                    |
| <i>China</i>         | 26.04                             | 0.33                                    |
| <i>India</i>         | 0.63                              | 0.03                                    |

a) compared to all children receiving some breastmilk to up to age 6 months b) Gross National Income 2012

Rollins NC, Bhandari N, Hajeerhoy N, et al. Why invest and what it will take to improve breastfeeding practices. *The Lancet* 2016; Vol 387 January 30, 2016:491–504



# Environmental asset depletion

Greenhouse gas emissions (kg CO<sub>2</sub> eq) associated with milk formula, 2012, tonnes p.a.



|                                        | Australia | China     | India   | Malaysia | Philippines | South Korea | Total     |
|----------------------------------------|-----------|-----------|---------|----------|-------------|-------------|-----------|
| <b>Milk formula - Total</b>            | 31,742    | 2,249,287 | 111,227 | 218,149  | 204,304     | 78,321      | 2,893,030 |
| <b>Milk formula (0-6 months)</b>       | 18,281    | 575,515   | 44,621  | 35,945   | 58,460      | 39,166      | 771,987   |
| <b>Follow up formula (7-36 months)</b> | 13,461    | 1,673,772 | 66,606  | 182,204  | 145,844     | 39,155      | 2,121,042 |

Dadhich J, Smith J, Iellemo A, Suleiman A. Report on Carbon Footprints Due to Milk Formula: A study from select countries of Asia-Pacific region. New Delhi: BPNI/IBFAN Asia2015.

## Conclusion

- SNA is a social institutional framework which contributes to globalizing cultural norms, policies and practices
- The important reform agenda laid out by Waring's critique of national accounting as 'applied patriarchy' remains largely unimplemented [\(175\)](#).
- Current SNA provides for inclusion of human milk but only commercial milk formula is presently counted [\(122\)](#).
- The invisibility of such household food production seriously distorts public policy priorities.
- To make GDP more relevant and useful to collective human decisionmaking, use measures which include human milk, the care economy, defensive expenditure adjustments, and creation and depletion of human and environmental capital.
  - Use breastfeeding and human milk to exemplify issues and links, and implications for gender equity and policy
- Countries to develop experimental estimates within the System of National Accounts (SNA) using breastfeeding and human milk in GDP and wider SNA framework



**Australian Research Council, Discovery Project  
(2004-07) (DP0451117)**

**Australian Research Council, Future Fellowship  
(2014-18) (FT140101260)**

**Lindy Ingham, Australian Bureau of Statistics**

**Mark Dunstone**