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BREASTFEEDING AND THE MEASUREMENT OF ECONOMIC PROGRESS

Julie P. Smith and Lindy H. Ingham

Thoughtful economists have long been aware of the limitations of conventional National Accounts in measuring economic activity and material wellbeing (Smith 1982). In principle, estimates of Gross Domestic Product (GDP) attempt to cover all transactions in economic goods and services. As early as 1941, a pioneer of national accounting, Simon Kuznets, observed that:

'Exclusion of the products of the family, characteristic of virtually all national income estimates, seriously limits their validity as measures of the scarce and disposable goods produced by the nation' (*Kuznets 1941, p. 10*).

Since the early 1970s, the conventional measure of the economy, the United Nations' System of National Accounts (SNA), has come under increasing criticism for providing an inaccurate and misleading measure of economic well being (Nordhaus and Tobin 1972; Mamalakis 1996; Weinrobe 1974; Zolotas 1981; Nordhaus 2000).

By excluding the value of unpaid work, GDP understates economic production. For example, estimates for the United Kingdom show that the fraction of disposable adult time devoted to market work is only around 20 per cent (Ausubel and Gruebler 1995; Nordhaus 2000). Increased participation of women in the paid workforce over recent decades also involves a shift in the economy from unpaid work which is not measured, to paid work which is measured. This has been shown in studies in the United States (Weinrobe 1974) and Australia (Smith 1982)

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to bias estimates of economic growth upward, and give misleading indications of economic progress.

As conventionally measured, GDP also overstates economic growth because it does not take proper account of the environment:

- Expenditures on remedying damage from pollution, etc, are included in GDP but are more properly measured as 'defensive expenditures' (which are made to compensate for, redress or guard against losses resulting from production) or degradation of the value of natural resource assets.
- The national accounts exclude the value of (non-economic) environmental assets and hence take no account of the depletion of assets such as the wilderness, air and water. However, the income received from sale of the products is included. This means the nation's economic income is wrongly estimated. Receipts from selling assets should take account of a fall in the nation's assets, not just be counted as a flow of current income.
- Where production within the scope of the national accounts causes pollution or damage to natural assets which is not remedied, the full resource costs of that production are not measured, so GDP overstates growth in economic welfare.

Moves have been made to respond to such criticisms. Recent progress is summarized in Boskin (2000), with non-market work time seen as the most important area for further work in the US. Boskin also lists environmental capital and human capital among items of high priority for inclusion as 'satellite accounts',¹ and notes recent US initiatives in this area. Economists attempted during the 1970s to adjust measures of Gross National Product to account for the costs of pollution in reducing 'Net National Welfare' or 'NNW' (Nordhaus and Tobin 1972; Peskin and Peskin 1978). A recent study by the US Environment Protection Agency

¹ Satellite accounts are accounting statements which are separate from, but consistent with, the core national accounts detailing market transactions. See discussion below on the Revised System of National Accounting.

(1997) shows the economic impact of air quality on human health is highly significant (see also (Nordhaus and Kokkelenberg 1999)).

Moulton (2000) surveys improvements in US national accounting practice and notes, for example, the work of Landefeld and Carson (1994) who provide satellite accounts for natural resources to estimate the contribution of environmental assets to national income. Landefeld and McCulla (1999) also present satellite accounts for nonmarket household production, incorporating unpaid household work and the value of services provided by consumer durables in the US.

Surveying new directions in national economic accounting, Nordhaus (2000) points out the importance of properly valuing human capital, with a large and growing share of economic resources devoted to investments in education and health. A recent study (Nordhaus 1999) considers how standard measures of income would change if they adequately reflected improvements in the US population's health status. Asking how much consumption the individual would be willing to pay as a trade-off for better health status, this research showed that proper accounting of the value of mortality and morbidity improvements would produce a major revision to our measured standard of living over the last century. Specifically, between 1900 and 1998 in the US the value of improvements in life expectancy alone equaled the growth of all other market goods and services put together.

Also, a number of countries including Australia now publish official estimates of the economic value of unpaid work (for example, see Australian Bureau of Statistics 1992). In the early 1990s, work began at the Australian Bureau of Statistics (ABS) to estimate the value of Australia's natural resource assets and include them in balance sheet accounts (Australian Bureau of Statistics 1990; Ingham 1991; Ingham 1993).

Since 1997, the Australia Institute has produced an alternative to GDP as a measure of economic progress, the Genuine Progress Indicator or GPI (Hamilton 1997, 1999). This measure, which is known in some countries as the Index of Sustainable Economic Welfare or ISEW, now adjusts GDP for items such as income distribution changes, the value of unpaid

and community work, and environmental degradation (Hamilton and Dennis 2000).

However, feminist economists have also criticised the failure to include reproductive functions and breastfeeding in measures of economic value (Waring 1988), and this remains unaddressed. By ignoring human milk production and the adverse health consequences of artificial infant feeding, the national accounts produce incomplete and biased estimates not only of food production, but also of economic progress and well being.

While the health care cost implications of breastfeeding for developing countries have long been accepted, recent research has highlighted significantly increased health costs for artificially fed infants in developed countries such as Australia (Drane 1997), the US (Ball and Wright 1999; Riordan 1997), and the UK (Broadfoot 1995). In 1997, the American Academy of Pediatrics 'Policy Statement on Breastfeeding and the Use of Human Milk' cited epidemiological research from developed countries, among predominantly middle class populations, showing that human milk and breastfeeding of infants significantly decreased risk for a large number of acute and chronic diseases.² Breastfeeding has also been related to possible enhancement of cognitive development (Drane and Logemann 2000), and artificial feeding has been shown to have significant adverse long-term effects on the health of mothers (Labbok 1999).

This paper examines the treatment of human milk production in international standards for national accounting and in Australian national

² This research was said to provide 'strong evidence that human milk feeding decreases the incidence and/or severity of diarrhea, lower respiratory infection, otitis media, bacteremia, bacterial meningitis, botulism, urinary tract infection and necrotizing enterocolitis'. The Academy of Pediatrics also pointed to a number of studies showing a possible protective effect of human milk feeding against sudden infant death syndrome, insulin-dependent diabetes mellitus, Crohn's disease, ulcerative colitis, lymphoma, allergic diseases, and other chronic digestive diseases. Since the AAP study, several important high quality epidemiological studies have provided further evidence of the health risks of artificial formula feeding, including its long term effects on the risk of obesity, high blood pressure and heart disease as well as pneumonia, gastroenteritis, respiratory illness, allergy and necrotizing enterocolitis.

accounts, and shows that human milk meets the criteria for inclusion in Australia's GDP. It then sets out the process for appropriately adjusting the national accounts to incorporate human milk supply, and externalities associated with infant feeding method. Using previously published estimates of the economic value of human milk supplied in Australia for 1992, we show that economic gains from increased breastfeeding are substantial compared with gains from recent major microeconomic policy reforms. We also estimate the capitalised value of Australia's human milk production capacity, conceptually integrating our estimates of human milk production with the building block for national accounting, the nation's capital stock.

The Revised System of National Accounting (1993)

In 1993, revised international guidelines were published for National Accounting (commonly referred to as *SNA93*) (Commission of the European Communities 1993). *SNA93* describes how to compile estimates of GDP, broadly comprising paid or marketable goods and services.

SNA93 now includes in the measured boundary of production the 'own account' production of *goods* by households. This includes agricultural subsistence production, such as sowing, planting, tending and harvesting field crops; growing vegetables, fruit and other trees and shrub crops; gathering wild fruits, medicinal and other plants; tending, feeding or hunting animals mainly to obtain meat, milk, hair, skin or other products; and storing or carrying to some basic processing of this produce. In Australia, the ABS already includes the value of homegrown fruit, vegetables, eggs, beer, wine and meat in estimates of final private consumption expenditure and therefore GDP. Continuing present practice, *SNA93* includes in the core accounts the value of agricultural produce consumed on the farm. This means the national accounting framework includes all non-marketed *goods*, including the production, processing and storage of food by households, within the production boundary for GDP. According to the ABS, the core accounts now include 'the own account production of all goods retained by their producers for their own final consumption or gross capital formation' (Australian

Bureau of Statistics 1992, pp. 6-7), thereby following the practice set down in SNA93 (para 6.18).

Like its predecessor, SNA93 excludes from the core production boundary for GDP 'own account' production of *services* within households. However, it recommends for the first time incorporating estimates of unpaid work, including unpaid household work (such as domestic chores and childcare) and volunteer and community work, into an expanded boundary of production. Production of *services* for own final consumption within households are to be placed outside the core accounts, in 'satellite accounts'. However, SNA93 still makes no mention of 'reproductive work' in either the core accounts or in satellite accounts. Reproductive work covers a range of women's activities, including childbearing, and breastfeeding.

It may be argued in this context that breastfeeding (which includes human milk production) should be viewed as own account production of a *service* for own consumption. In national accounting language, a breastfeeding mother (the producer) would be providing an output (human milk) to the consuming unit (her child). By the time the production is completed the 'service' is consumed. It might be argued that, unlike a good, this 'service' cannot be stored or resold; production and consumption occur simultaneously (Commission of the European Communities 1993, para. 6.3). Breastfeeding would then be excluded from the core national accounts, but included in a 'satellite account'.

However, this approach suggests that when a mother expresses milk to feed her baby, for example in a bottle or for tube-feeding, SNA93 defines it as a *good* included within the core production boundary. When she breastfeeds her or another mother's baby, it is excluded from both the core and satellite accounts of the national accounting framework, as neither apparently include breastfeeding 'services'. This approach amounts to defining human milk according to the container the consumer obtains it in.

An alternative interpretation is that the value of 'breastfeeding services' and 'human milk production' can be considered separately, and that human milk is a food commodity or *good*. As such, its production and

value should be included in core account estimates of national food production, consumption and GDP.

More specifically, human milk can be viewed as 'own account' production of 'a good' for 'own consumption'. As noted above, the ABS now considers that the core accounts include the own account production of all goods retained by their producers. In national accounting language, human milk is a *good* because it can be produced, stored, sold on markets, and thus be valued (Commission of the European Communities 1993, para. 6.7). Viewed as a commodity which is supplied by mothers, either through breastfeeding, or through expressing and storing for supply via other mechanisms, human milk thus qualifies for inclusion in the core accounts.

Human milk is a commodity, like home-produced and consumed goods including on-farm production and use of milk, eggs and meat which, as noted earlier, are included in the core accounts and GDP. Human milk is a food commodity produced and expressed by mothers, and commonly stored for various uses: this may include for tube feeding to sick or premature babies; for feeding in a bottle or cup to a mother's baby during her absence such as while at work, or it may be fed to her own or another mother's baby either mixed with weaning foods or undiluted. Human milk is a commodity like blood, sperm or human organs which can, in principle, be valued for national accounts purposes. The fundamental criterion for inclusion of a good is that it can be traded in a market. Numerous milk banks operate around the world, buying and selling human milk.³ The existence of a market in human milk means there is a price of a closely related or analogous product - a shadow price - from which to impute its economic value.

³ Information on the operation of human milk banks in North America, Europe and Asia is provided in (Arnold 1994; Arnold 1996; Fernandez, Mondkar and Nanavati 1993; Gutierrezde and Almeida 1998; Human Milk Banking Association of North America 2001; Springer 1997; Tully 1991; United Kingdom Association for Milk Banking 2001)

Implications of Current Practice

There is clearly a very fine line between what is a good, and what is a service for national accounts purposes, particularly regarding "own-account" consumption within households. The distinction between a good and a service in some areas is controversial among national accountants.

National accounts provide a misleading picture of human food production and consumption activities because they continue to exclude human milk while including the manufacture and sale of artificial formula milk. GDP presently also includes expenditures on health which are needed to treat infant illnesses attributable to artificial feeding, and thus overstates the gain in economic welfare from higher spending on breastmilk substitutes and medical services.

Present practice has the startling result that increased breastfeeding and human milk production *reduces* national food output and GDP, because it lowers artificial formula and commercial baby food sales and reduces private and public health expenditures. This is in spite of the substantial economic gains from using a virtually-free, and environmentally-friendly food resource, and despite the economic resource savings from maintaining good health and reducing illness without the need for use of medical services or products.

An equally questionable corollary is that the dramatic drop in breastfeeding rates during the 1960s and 1970s improved national output and economic growth by expanding production of formula and adding to national health expenditures. This illustrates that increased expenditures on formula and commercial baby food and associated higher health spending cannot be interpreted as necessarily benefiting economic growth or material well-being.

For example, the value of human milk production in Australia has been estimated for 1972 and 1992, using several accepted valuation methods – replacement cost, opportunity cost, and market cost (Smith, Ingham and Dunstone 1998; Smith 1999). Using estimated breastfeeding prevalence and daily milk yields for different ages of infants, annual human milk production in Australia in 1992 was found to be 33 million kg. Based on

the value of human milk traded by milk banks in Norway of US\$50 per litre (Oshaug and Botten 1994), this had a market value of around \$2.2 billion a year. It was also shown this could be increased by \$500 million annually (0.1% of GDP) by meeting the National Health Target for breastfeeding⁴ (Nutbeam et al. 1993) in the year 2000. If virtually all Australian infants were breastmilk fed, in line with World Health Organisation and UNICEF recommendations for optimal nutrition, the implied increase in the value of output was \$3.5 billion a year (0.7% of GDP) to around \$5.5 billion.⁵ This work showed that the extent of artificial feeding in 1972 meant a loss of over \$1 billion annually in the value of Australia's human milk production compared to 1992 levels, and a loss of output of around \$5 billion annually compared to the biological potential production.

The ability of women to breastfeed represents a significant economic productive capacity. As the production flow from this human capital asset is not recorded as contributing to GDP or economic well-being, or even acknowledged as a service in the satellite accounts recommended by SNA93, it is rendered invisible to policymakers who use economic statistics and GDP estimates to determine economic priorities.

Accounting for Human Milk

Properly applying existing definitions of the goods production boundary for GDP would mean including estimates of human milk production within the core accounts and in GDP. For meaningful and conceptually consistent measures of economic well being, the attributable health costs of formula feeding would be deducted from measured GNP.

The estimate of unpaid work would treat the value of time spent by households nursing infants ill from artificial feeding as a 'defensive

⁴ The National Health Target is for at least 50 per cent of infants to be fully breastfed at 6 months of age.

⁵ According to WHO/UNICEF, optimal infant feeding involves exclusive breastfeeding for around 6 months with continued breastfeeding to aged 2 years or more (UNICEF 1999; WHO/UNICEF 1995).

expenditure',⁶ not an increase in imputed income. Costs of waste-disposal attributable to artificial feeding would be deducted from the value of GDP and counted as another 'defensive expenditure'. The degradation of natural (e.g. land) assets arising from the additional production of animal milk supplies, would be counted as an added cost of production, or as a depletion of assets as appropriate. For example, increased dairy herds to provide bovine milk supplies represent an unnecessary resource cost.⁷

Similarly by-products of the manufacturing process for artificial formula, and associated products, packaging, transportation, etc, will add to air and water pollution (Bundrock 1992; Radford 1992). To the extent the costs of these production 'externalities' are not borne by the manufacturers, they should be treated in the national accounts as a cost of production or as 'negative production'. On the other hand, the economic opportunity cost of breastfeeding - where this is truly incompatible with productive economic activity - should be recognised as an offset to the value of human milk output. Some allowance might be made for any loss of economic output (market and unpaid work productivity) attributable to a mother's lactation status.⁸ That is, the economic value of human milk should be reflected in the Australian National Accounts by:

- *adding* to measured GDP the annual market value of human milk produced, after

⁶ That is, expenditures made to compensate for, redress or guard against losses due to artificial feeding.

⁷ Each dairy cow typically requires 0.77 ha of land to produce around 5000 litres of milk annually. Hence producing the 32 million kg estimated annual production of artificial formula milk powder, equivalent to 238 million litres of milk, requires the use of around 37,000 ha of Australia's prime farming land which could be used for other productive purposes.

⁸ Many Australian mothers combine continued lactation with paid employment, especially those with sufficient maternity leave to allow proper establishment of lactation, those with flexibility in their working arrangements and/or timing of return to work, or those with an older baby requiring less frequent milk feedings. Employment is not given by mothers as the major reason for early weaning in most surveys of breastfeeding cessation.

- *deducting* the goods cost of human milk production (additional food consumption for lactating mothers is already included in final consumption expenditures but should be counted as intermediate consumption), and
- *deducting* from GDP an amount reflecting any reduction in market output by mothers which is necessary on account of their lactation status.

In principle, accounting for the economic value of human milk requires adjusting for the negative externalities of artificial formula manufacture, distribution and use:

- *deducting* from measured GDP the public and private health expenditures associated with increased relative risks of infant and maternal ill health from current levels of artificial feeding;
- *deducting* from GDP and national natural capital stock estimates, the attributable waste and degradation of economic land assets from dairy production to supply manufactured formula milks or cows milk to infants under two years old;
- *deducting* the pollution and waste disposal costs arising from artificial formula milk production, packaging, distribution, sterilisation, preparation and disposal.

A full accounting for the economic implications of breastfeeding would also be reflected in satellite accounts for household services where time assumed to be economically unproductive or unnecessary should be deducted:

- *reducing* estimates of the value of unpaid household work to reflect any additional time cost of breastfeeding compared to artificial feeding;
- *deducting* the additional home nursing and other unpaid time costs attributable to artificial formula feeding.

Capital Stock Estimates

A basic building block of SNA93 is an estimate of a nation's capital assets. These assets, of physical ('man-made') capital, and natural resources such as land, (along with, theoretically, human capital), produce a production and income flow. Increases in that income flow are measured as economic growth.

The capacity of Australian women to breastfeed yields a potential annual flow of economic income. Breastfeeding is a skill that is largely culturally acquired. Our society's ability to sustain breastfeeding, and therefore to maintain current or potential production levels of breastmilk and its beneficial health 'externalities', depends on a supportive breastfeeding culture. This 'culture' or knowledge of breastfeeding, passed on from mother to mother, or through public education and institutional or organisational knowledge, is therefore a valuable economic asset. Whether this asset is used to its full capacity in nourishing children depends on whether institutional arrangements and cultural values or practice are fully supportive of breastfeeding.⁹

To maintain consistency between estimates of annual contributions to national income from breastfeeding and estimates of the capital stock underpinning such production, it is necessary to value this underlying human capital asset.¹⁰

The usual way of valuing an asset is as the capitalised value of its future net income stream. The net economic value of breastfeeding in Australia is estimated at around \$2 billion a year, after adjustment for additional maternal food consumption (Smith, Ingham and Dunstone 1998). The capitalised value of Australia's current breastfeeding capacity is therefore

⁹ Breastfeeding also contributes to the long term health status and productive capacity of the labour force because it promotes better health for both mother and child.

¹⁰ The conceptual basis for such a calculation is implicitly acknowledged in research by the Commonwealth Treasury on Australia's public investment performance (Depta, Ravalli and Harding 1994), which suggests increased public investment in human capital in the form of certain health and education expenditures as an offset to slower expansion of public investment in physical capital in recent years.

around \$37 billion, assuming a 50 year time horizon and a 5% rate of discount of future benefits.

The value of this human capital asset in 1992 makes it comparable with the value of Telstra, at around \$30 billion (Quiggin 1995). It greatly exceeded the value of Australia's livestock (\$17.9 billion) and Australia's plantation forests (\$4.5 billion) (Australian Bureau of Statistics 2000).

The potential economic value of Australia's human milk productive capacity is currently considerably greater than its actual level. In the 1920s, around 80 per cent of Australian infants were reportedly fully breastfed at aged 9 months (Mein-Smith 1991). According to WHO, around 95-98% of women are physiologically capable of breastfeeding (World Health Organisation 1991). If all Australian infants met this criteria for optimal nutrition, the value of human milk production would be nearly three times its value based on present breastfeeding rates (Smith 1999). The value of this capital asset at the physiological maximum is thus around \$100 billion, standing alongside Australia's sub-soil mineral assets, currently valued by the ABS (2000) at around \$152 billion.

The above capital stock value estimates are in gross terms, that is, they ignore depreciation on the asset. Physical assets are usually depreciated at a rate which reflects the economic life of the asset. In principle, the economic life of the asset represented by women's biological capacity to produce human milk is unlimited or infinite. Recognising the importance of cultural and institutional influences on breastfeeding rates in a market economy suggest nevertheless that maintaining the value of the asset intact, or ensuring its full utilisation, is not totally costless.¹¹

¹¹ This is, for example, because of the apparent need for provision of breastfeeding support services, lactation consultants and counsellors, and breastfeeding education, and the small but significant conflict between employment institutions and breastfeeding for some mothers. The actual cost is difficult to estimate, although the Federal government recently allocated a total of \$2 million over 3 years for breastfeeding promotion through its National Breastfeeding Strategy, while some State governments also provide financial support for breastfeeding programs through their health departments.

In fact, the difference between this biological maximum value of of Australia's breastfeeding capital stock at around \$100 billion, and the estimated current value of \$37 billion, is a measure of the extent to which industrialisation, and commercialisation of infant feeding, has degraded this component of Australia's natural capital.

Implications

Previous research has shown that human milk is important enough economically in Australia that increasing breastfeeding overshadows all government 'microeconomic reform' measures in raising national output and living standards (see Table 1). Yet governments continue to devote effort to reforming relatively low return sectors of the national economy.

Table 1: Micro-Economic Policy Changes

Policy	Estimated Economic Gain
Deregulating statutory marketing for dairy producers (Industry Commission 1995a)	\$50 million
Waterfront reform (Industry Commission 1995b)	\$15 million
Deregulating telecommunications or public utilities (Quiggin 1996)	\$500 million - \$3 billion (0.1-0.6% of GDP) annually over 5 to 10 years
Introducing a Goods and Services tax (GST) (Chisholm 1993)	\$1 billion (0.2% of GDP)
Achieving National Breastfeeding Targets (Smith 1999)	\$500 million (0.1% of GDP) annually

Source: Table 9, Smith, Ingham and Dunstone (1998).

Unlike for many other 'microeconomic reforms', the economic gains from increased human milk production are potentially ongoing. Unlike other efficiency boosting measures, increasing breastfeeding has the potential to directly improve equity, as breastfeeding is equally possible

physiologically for virtually all mothers and babies regardless of income (World Health Organisation 1991).¹²

As well as being a major economic issue, infant feeding practices are significant to public health. Increasing pressures to lower health costs are leading to a focus on preventing health problems, rather than treating illness and disease after it occurs. Breastfeeding is a key preventative health measure (American Academy of Pediatrics 1997). Promoting, encouraging and supporting breastfeeding is a primary aim of nutrition and better health programs in Australia (National Health and Medical Research Council 1996). Making human milk more widely available would produce significant savings in national health costs, including costs met by taxpayers. Most studies of breastfeeding vastly understate its economic value because of difficulties quantifying the health costs of artificial feeding.

Breastfeeding is an activity with elements of a "public good", with a strong tendency to be under-produced if infant-feeding choice is left to market forces alone. As the Australian Panel on Marketing of Artificial Infant Formulas commented in 1994:

Breast milk does not have the marketing resources of commercial products. Its superior nutritional, immunological and health advantages are not well known. Industry promotion has contributed to the belief held by many health professionals that infant formula resembles breast milk so closely that it does not really matter which is used (*Advisory Panel for the Marketing in Australia of Infant Formula 1994*).

There are strong commercial pressures promoting artificial milk formulae and commercial baby foods as an alternative to breastfeeding. Annual sales of infant formula in Australia are estimated at around \$135 million (Smith, Ingham and Dunstone 1998), while the size of the

¹² Realising this potential gain would however, require policy, institutional and policy change to ensure that mothers in disadvantaged socio-economic groups have comparable access to breastfeeding support and flexible employment as other mothers. Although in developing countries, poorer, rural mothers are more likely to breastfeed than urban, middle-class mothers, the reverse is generally true in Australia (Donath and Amir 2000).

commercial baby food market, such as for cereals and other weaning foods, is unknown but likely to be of at least a similar magnitude. Notwithstanding the efforts of volunteer breastfeeding support groups such as the Nursing Mothers' Association, or the growing number of lactation consultants with a professional interest in breastfeeding problems, there is no comparable industry lobby developing a market for breastfeeding, or promoting the wider availability of human milk. Nor is there any powerful force redressing the negative cultural images, misinformation and mythology about human milk and breastfeeding management that became prevalent during the 1960s.

Making human milk more widely available to Australian babies depends on the active and energetic commitment of government and the health professions, as well as recognising its significance. Political leadership and commitment of resources comparable with that on the vaccination issue is necessary to overcome entrenched attitudes, widespread ignorance, and inappropriate practices which hinder breastfeeding and the consumption of human milk. For example, it would be a major human rights incident with significant political and legal consequences if inmates of mental institutions or residents of nursing homes were fed a diet which doubled their risk of illness, and dramatically increased their risk of cancer, diabetes, and mental disability. Yet few question the provision of such a diet to Australian babies, less than half of whom are exclusively breastfed for around 6 months (Donath and Amir 2000).

Acknowledging the economic implications of breastfeeding should raise its priority with governments. The economic case for public action to promote, encourage and support breastfeeding is strong - the existence of significant "externalities", information failure, and substantial welfare/efficiency and equity gains.

However, unless the nutritional and health value of breastfeeding is clearly visible to policymakers, production of this unique food and 'broad spectrum medicine' will continue to be undervalued. Human milk should be included in national and international economic statistics as breastfeeding will not otherwise be given the importance it deserves in the formulation of economic, fiscal and preventative health policy.

Conclusion

The economic wealth of a nation is calculated in terms of a wide variety of assets ranging from raw materials and capital goods to the value added to natural resources through industrial processing. Human labour is a major economic resource and valued for its role in producing wealth through work, such as farming, extraction of raw materials or manufacturing. The lactating mother is an exceptional national resource, for not only does she process coarse cheap foods to produce a unique and valuable infant food, but also the production process (lactation) provides immeasurable benefits to health ... In contrast to virtually all processing industries, the lactating woman requires no capital outlays and the direct benefits are enjoyed uniquely and fully by the producer and her child. Mother milk production is the ultimate in economic equity, with "right-to-work" enjoyed by all, direct and immediate value to the producer and far reaching benefits affecting all of society (*Rohde 1982*).

This article has applied conventional economic logic and officially accepted principles of national accounting to the measurement of production of human milk. It has shown that current ABS treatment, which supposedly includes all *goods* within the 'core' production boundary for the national accounts, excludes breastmilk production and its consumption by infants, and that this practice is inconsistent with the present international system for national accounting, SNA93. Even that part of human milk production which is expressed and fed to babies in artificial containers - and is thus completely 'commodified' - is presently not counted in GNP. This is despite official ABS imputations being made for comparable goods which are produced and consumed on-farm, but are not actually marketed. As a commodity which can be stored, marketed and traded, we have shown using SNA93 guidelines for the 'core production boundary' that all production of human milk should be included in 'core' national accounts. While an argument can be made for viewing breastfeeding as a service, we show breastfeeding is best viewed as supply of a good, and point out that breastfeeding does not appear to be included as a service in SNA93 satellite accounts.

Using the logic of SNA93 and using existing published estimates of the value of human milk supply in Australia, we have shown that large economic gains could be achieved, in the form of increased goods production, if breastfeeding of infants was increased. Also, using the key building blocks for conventional national income accounting, this article considers the capital stock value of Australia's breastmilk production capacity. The difference between the value of this asset at its biological maximum of around \$100 billion, and its value measured at current Australian breastfeeding rates of around \$37 billion, is a measure of the extent to which industrialisation and commercialisation of infant feeding has degraded one of Australia's most important environmental assets.

Exclusion of human milk production distorts the view of economic activity provided by Australia's national accounts because it implies significant mismeasurement of food production and consumption, and wrongly counts as economic gain the increased defensive expenditures on health care arising from higher consumption of breastmilk substitutes.

Due to the present ABS practice of excluding human milk, measured GDP would decline if more babies were breastfed. Present national accounting conventions mean the precipitous fall in human milk availability during breastfeeding declines of the 1960s and 1970s boosted economic growth, in spite of this actually representing an estimated fall in national food production exceeding \$1 billion a year and a worsening of infant health and nutrition status. These are ridiculous results and severely undermine the public credibility of GDP estimates and other economic data.

As well as resulting in a distorted view of changes in material living standards, the invisibility of human milk in Australian economic statistics has contributed to a distorted perspective of economic reform priorities. Excluding human milk from production statistics reinforces an erroneous view of households as consumers, rather than as producers of goods and services having economic value. An example of this is the consumption tax anomaly whereby some mothers' milk is effectively 'input taxed' through imposition of the Goods and Services Tax (GST) on lactation aids such as breastpumps. Both commercial baby foods and formulae are free of GST at all stages of production and sale with, for

example, no GST on-farm milking machinery, or infant food manufacturing equipment (Smith 2000).

Including human milk in national food production statistics emphasizes the extent of breastfeeding and its value to societies as well as to economies. Incorporating human milk in food supply and other economic statistics such as GDP would improve the quality of economic policymaking and help prevent policies being distorted by a narrow focus on market production and commercial objectives.

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