OF THE MILLIONS OF CHILDREN living in Africa, more than 38 per cent suffer from chronic undernutrition (stunting) (WHO, 2006). In 2011 stunting affected at least 165 million children worldwide (Black, 2012). One of the short-term consequences of this pattern is that more than one-fifth of all mortality for children aged under five is related to stunting. Among the longer-term consequences are that stunted children suffer lasting cognitive defects, go through fewer years of schooling and exhibit poorer performance while in school; they experience more severe consequences of common infections, and grow up to manifest lower economic productivity in their adult lives (Black, 2012).

Stunting presents a significant public health challenge due to increased morbidity and mortality over the life course. The scale of the stunting problem is global, and chronic undernutrition is frequently
referred to as an epidemic. For reasons explored in this chapter, the common understanding of epidemics does not fit well with the near universal presence of undernutrition in sub-Saharan Africa. First, there has been no outbreak; stunting is omnipresent and the casualties it claims far exceed those of conventional epidemics. Yet its presence has been under appreciated. Second, the conditions that favour undernutrition tend to be related to specific local environmental conditions; leaving such an environment reduces risks and the risks are not transmitted upon relocation. Third, current evidence suggests that stunting and its accompanying physiological changes cannot be considered a disease; rather it is a syndrome with multiple signs and conditions pointing to one or more medical abnormalities (Prendergast & Humphrey, 2014).

The syndemics model of health, as most recently elaborated by Singer et al. (2017), centres on the biosocial complex, comprising interacting diseases and the social/environmental factors that heighten the negative effects of disease interaction. This approach creates a new perspective on the conventional understanding of diseases as distinct entities, separate from other diseases and independent of the social contexts in which they occur. In the syndemics model multiple factors interact synergistically in important ways and have a significant impact on the health of individuals and entire populations. As Singer et al. emphasise, the syndemics approach specifically explores why some diseases cluster and investigates the pathways through which they interact biologically in individuals and within populations and thus increase their overall burden. An added focus is the ways in which socio-economic environments, particularly conditions of inequality and injustice, contribute to disease clustering and interaction, as well as to vulnerability.

This chapter explores the relationship between worsening child nutrition and underlying socio-economic indicators, using Zimbabwe as a primary case. Through a syndemics framework, the chapter highlights the correlates between nutritional status and the setting of rural households. It then spotlights environmental, demographic, and socio-economic factors and their challenges to health. It broadens the debate about food security and

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1 Undernutrition as used here refers to chronic undernutrition, or stunting, a much more narrowly delimited concept than malnutrition, which embraces both overnutrition and the dual burden of a spectrum extending from starvation to obesity.
improving nutritional status through an encounter between conventional wisdom on food supply and broader biomedical understandings. In Zimbabwe, the mean prevalence of stunting over decades is high. The deterioration in a child’s nutritional status begins very soon after birth (and perhaps before) and continues at least until its second birthday. This pattern, which is common across Africa, is leading to a deepening recognition that the first 1,000 days of life – from conception to the second birthday – are absolutely vital in shaping a child’s biosocial trajectory for the rest of its life. Limited evidence of catch-up growth, either physical or cognitive, reinforces the unique importance of this early period of life.

Recently there has been a growing shift away from identifying nutritional status exclusively with food intake and towards a developing recognition that with broader conceptual frameworks the policy implications might differ strikingly. The recognition that undernutrition is a multifactorial problem has also strengthened a trend towards convergence between biomedical and social science researchers. It is now widely accepted that nutritional status depends not only on the intake of nutrients, but also upon non-nutrient food attributes that affect nutrition (such as cleanliness and freshness of foodstuffs), publicly provided goods (sewage, potable water, electricity, nutritional and health services, education, and the like), and privately provided inputs (such as the time and care taken to prepare food and look after children). Although closely related, food security and nutritional status are not the same things. It is here that a syndemic perspective can assist to draw together what have previously been separate disciplinary strands.

The remainder of the chapter is structured in seven sections. The first sets out the scale of the chronic undernutrition problem in Africa and points out the challenges posed by its coexistence with food security. The next section serves to break the assumed link between food intake and nutritional status. Then the trajectories of child nutrition in Zimbabwe are detailed, at both macro- and micro-levels. In the following sections, attention turns to an examination of the relationship between nutritional status and indicators of welfare, at both household and at per-capita levels. The concluding section recaps the theme of a complex nutritional syndemic, and suggests policy dimensions that need to be addressed if nutritional interventions are to become more effective.
The shorthand for chronic undernutrition is stunting, defined as a delay in linear growth due to a failure to thrive. While the determinants of stunting are complex, the factors most commonly associated with impaired linear growth include poverty – manifested in households’ low socio-economic status, inadequate food supply, repeated episodes of infection in infants, poor domestic hygiene, and maternal health before, during and after pregnancy (WHO, 2014).

Stunting is associated not only with increased morbidity and mortality over the life course, but also with a lifetime of negative economic and social consequences. Globally stunting affects at least 165 million children annually (WHO, 2014). Nearly 40 per cent of children in Africa and Asia suffer from stunting. The scale of undernutrition in Africa is staggering – it has been estimated that some 58 million children aged under five years are stunted (UNICEF, WHO & World Bank, 2012). Research shows that poor nutritional outcomes in childhood are linked to a lifetime of negative economic and social consequences: impaired development, compromised immunity, reduced energy levels, infection and disease, diminished educational performance, reduced productivity, and decreased prospects of moving out of poverty (Alderman, 1990; Hoddinott & Kinsey, 2006).

There are also suggestions that stunting may be a transgenerational phenomenon; children who were stunted in childhood grow up to have stunted children of their own. Indeed, the adversities consequent upon stunting – the multiple pathological changes marked by linear growth retardation, increased morbidity and mortality, and reduced physical, neurodevelopmental and economic capacity – have led to stunting being characterised as a syndrome (Prendergast & Humphrey, 2014). And these impacts at the individual level are multiplied many times over to create adverse national consequences. Hence, the complexities of stunting can best be understood through a syndemics framework.

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ii The technical definition of stunting is having a height-for-age (HA) index score more than two standard deviations (z-scores) below the median of WHO’s international child growth standards (UNICEF, 2013; WHO, 2007).
The prevalence of stunting among children aged fewer than five years in Africa ranges from a low of 10 per cent to some 60 per cent. Only nine of the 54 African countries are estimated to be on course to meet global targets on nutrition. Because of methodological controversies, however, even these prevalence figures may be too low. Recent work suggests, for example, that the number of children globally suffering from severe acute malnutrition, or wasting,\textsuperscript{iii} may be as high as 110 million instead of the 17–19 million usually quoted. Table 1 compares the mean prevalence of stunting for rural and urban children across Africa with patterns elsewhere in the world.

Table 1: Stunting prevalence (%) in children under five years of age by area of residence, 2009–2015\textsuperscript{*}

<table>
<thead>
<tr>
<th>Area of Residence</th>
<th>Urban (%)</th>
<th>Rural (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Least-developed countries</td>
<td>29</td>
<td>41</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>26</td>
<td>41</td>
</tr>
<tr>
<td>Eastern &amp; Southern Africa</td>
<td>29</td>
<td>40</td>
</tr>
<tr>
<td>West &amp; Central Africa</td>
<td>25</td>
<td>41</td>
</tr>
<tr>
<td>South Asia</td>
<td>33</td>
<td>42</td>
</tr>
<tr>
<td>Latin America &amp; the Caribbean</td>
<td>13</td>
<td>26</td>
</tr>
<tr>
<td>Global</td>
<td>21</td>
<td>35</td>
</tr>
</tbody>
</table>

*Based on the most recent year available.

The concept of food security has continuously evolved since the term was first used at the 1974 World Food Conference. The definition almost universally used today, however – ‘Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life’ (FAO, 2002) – still focuses on supply issues and food quality. Interpretations vary, of course, but there is an implicit assumption that once access to food is assured the world’s nutritional problem is solved.

\textsuperscript{iii} Low weight-for-age, a form of undernutrition more directly linked to inadequate food supplies or quality than is stunting.
For decades, development practitioners believed that the key to improving nutritional status in Africa lay in boosting food security to provide a nutritionally adequate diet. Observations about the millions of undernourished people living in Africa usually became a call for increasing food supply through increasing agricultural productivity or supplying more food aid.

Development economists have tended to focus on undernutrition in one of two ways. In the first, they have sought statistical evidence to examine the relationship between nutrition and income. Over some 30 years, a growing body of literature has examined the interactions among nutritional status in low-income countries (LICs) and nutritional intake and household income. Recommendations on how to improve nutrition have been made based on empirical studies of food expenditure systems at the household level. The second focus has been to take nutritional status as a given – the outcome of behavioural decisions at the household level – and to examine the consequences of poor nutritional outcomes in childhood for the life trajectories of afflicted children.

Over time, the perspectives adopted in empirical studies have broadened as it has been found that the policy recommendations derived from analyses depend both on the definition of nutrition and, more broadly, on the conceptual framework employed. For example, critical elements of the pathway from changes in income to their effect on nutritional status are still questioned. Moreover, by showing that nutrient intakes are unresponsive to changes in income even at very low-income levels, some studies have questioned whether nutrition in LICs will improve with income gains (for example, Behrman & Deolalikar, 1987). There has thus been a trend away from identifying nutritional status exclusively with nutrient intake and towards a wider recognition that the policy implications might differ strikingly with broader conceptual frameworks (Skoufias, 2016). Phrased differently, there is a growing awareness that a narrow focus on discipline-based indicators masks the fact that numerous single-channel interventions,
even if successfully implemented, have minimal or no impact on more-encompassing nutritional outcomes.

THE PHYSIOLOGY OF DEPRIVATION: AN OVERVIEW

Chronic undernutrition in Africa is persistent. It is relatively unaffected by agricultural output, household incomes, or food security. Stunting remains widespread in Africa’s rural areas despite consumption of diets that are adequate according to nutritional standards (Prentice, 1993; Prendergast & Humphrey, 2015). This lack of association challenges conventional thinking. Current research suggests that unhygienic conditions at the household level, exposure to pathogens borne by domestic animals, and the consumption of mycotoxins lead to a condition – environmental enteric dysfunction (EED) – in which food consumed is unable to be fully utilised. This condition is widespread throughout the tropical world.

The evidence examined in this chapter suggests that nutritional status reflects things other than a straightforward causal chain linking agricultural production and economic wellbeing to food availability, and food availability to nutritional outcomes. Nutritional status is an outcome of not only the quantity and quality of food consumed, but is also determined by the body’s ability to extract and utilise the nutrients contained in the food.

EED has been known for some 50 years, after recognition that most people in LICs had an abnormality of the small intestine (Prendergast & Kelly, 2012). This disorder was hypothesised to arise from unhygienic conditions, because among sufferers who relocated to high-income countries the condition slowly resolved. Essentially EED has two basic effects: it causes the villi to atrophy and creates cellular overgrowth, thus impeding absorption of nutrients; it also impairs the intestinal barrier function, allowing virulent organisms to stimulate an immune response and causing the body to waste nutrients in fighting the resulting inflammation. Thus EED impacts the ability of a child’s body to absorb nutrients from the diet, facilitates infections, and may impair the efficacy of oral vaccines.

EED is normally asymptomatic: the sufferer does not experience any overt symptoms, and there are no pains to complain about. It is invisible
to those experiencing it. Moreover, EED is also both socially and medically invisibilised. It falls into that category characterised as chronic illnesses that ‘do not necessarily involve ... an evident change or physical deterioration that makes others think that somebody is sick’ (Masana, 2011: 130). Since high proportions of the children in the Zimbabwe panel are stunted in any given year (see below), socially acceptable ideas about what constitutes a healthy body are strongly influenced by this pattern. If everyone is sick (stunted), then sick (stunted) is the normal. Thus neither the parents nor the community detects anything unusual when stunted, underweight children are observed. Further supporting this argument is that parents in the Zimbabwe panel feel more shame about whether their children wear decent clothes, have shoes and attend school than about whether they are visibly undernourished and stunted. EED is medically invisibilised because medical practitioners tend to interpret stunted status as a consequence of a dietary problem and because diagnosis requires sophisticated laboratory equipment and trained clinicians.

While much more still needs to be learned about the precise aetiology of EED, the redesignation of tropical enteropathy as environmental was a reflection of the growing awareness that it is largely a complex of factors related to diet, hygiene and sanitation, and mycotoxins that is the cause of the condition. Efforts to understand EED, therefore, fit well into a syndemics framework.\(^{vi}\)

The characterisation of chronic undernutrition as a stunting syndrome, marked by a plethora of adverse pathological changes, with different consequences manifesting over the short, medium, and long term, helps to shift researchers’ focus away from a preoccupation with food supply as a unidimensional solution. Stunting is also a transgenerational phenomenon because women who were themselves stunted in childhood tend to have stunted offspring, contributing to a cycle of poverty and reduced human capital that is difficult to break. Moreover, EED modifies the effects of oral medications and vaccines, alters the outcomes of trials in the treatment and prevention of stunting, and is associated with low-level immune responses – diverting resources away from child growth. For

\(^{vi}\) EED is one of a number of conditions common in the tropics and characterised by malabsorption, a feature that has led to its also being known as leaky gut syndrome (Manson-Bahr & Apsted, 1982).
these reasons, using Singer’s conceptualisation, the chapter characterises chronic undernutrition in sub-Saharan Africa as a syndemic, the aetiology of which is yet fully to be understood.

**TRAJECTORIES OF CHILD NUTRITION OVER TIME IN ZIMBABWE**

At the time when Millennium Development Goals (MDGs) became a focal concern for development practitioners, per-capita income in Zimbabwe was only fractionally higher than at independence 20 years earlier. The absence of changes in income was not, however, mirrored in other spheres. On the contrary, several developments initiated dramatic changes: a land redistribution programme launched only six months after independence; drought (in the 20 years following 1980 at least six droughts were experienced); economic reform (an economic adjustment programme began in 1991); and the arrival and rapid spread of HIV/AIDS.

In 1980 Zimbabwe began a programme of land reform that was generally well planned and implemented (in contrast to the experience since 2000). This original land reform was intended to do many things, among them increase agricultural productivity, enhance food security, and improve rural welfare. Since 1982, the author has conducted a panel study of some 500–700 households, including both beneficiaries and non-beneficiaries of land reform. A component of this study has been the use of multiple measures of the welfare of these rural households, among which are anthropometric measures of the nutritional wellbeing of both children and their parents.

An unexpected finding is that the nutritional status of children included in the study for nearly 20 years declined by an average of 1.4 per cent annually, so that children whose families benefited from land reform had nutritional levels two decades later that were worse, by 25 per cent, than when land reform began. These declines mirror secular worsening elsewhere in Zimbabwe and occurred despite generally rising farm productivity and incomes, a gradual accumulation of assets, and improvements in social welfare.

The investigation upon which this chapter is based was launched to answer a basic question: what are the effects of land redistribution
on the welfare of rural families? Starting with a baseline data set established in the early 1980s, data have been collected over a 30-year period from 22 randomly selected communities in three of Zimbabwe’s earliest resettlement schemes. These schemes were chosen to ensure representation of the three major agro-ecological zones in Zimbabwe suited to cropping. Beginning in 1997, coverage was extended to include households in villages in the communal areas (CAs) from which the resettled households originated in the early 1980s. This supplemental data permits explicit comparisons between the resettlement and communal experiences and between living conditions in the CAs and the resettlement areas (RAs).

The nutrition data from the panel study can be best understood if it is appreciated that they come from what is a moving cohort sampled across many years. In 1983 and 1984, all children aged between six months and five years and resident in the household were weighed and measured. The same procedure was followed in all subsequent years with two exceptions: the upper age cut-off point was moved initially to six years and subsequently to seven years in order to include as many children as possible from previous survey rounds, and children were included in the panel from birth instead of at age six months. Thus the pool of children included in any given year will contain neonates born since the previous round and will drop older children who are then above the age of seven years. To the extent that there are secular influences from incomes or poverty on long-term child nutrition, these will be manifested as each year’s recruits to the cohort grow to the age of seven years and then exit the cohort.

With these comments, the chief anthropometric indicator of interest here is height for age (HA), the indicator normally used to assess chronic undernutrition. As noted, HA is assessed using z-scores – the difference above and below the expected median value (Dibley et al., 1987), with a z-score of -2 as the threshold of stunting. Rather than work directly with z-scores, Figure 1 plots over time the percentage of children falling below -2 standard deviations. The figure also plots comparable data from the periodic Zimbabwe Demographic and Health Survey (GoZ, 2012). Two important differences between the data series in Figure 1 should be noted. ZRDHS (Zimbabwe Rural Demographic and Health Survey) is a panel study that involves the same households in three areas in
Epidemics and the Health of African Nations

every iteration, whereas for the ZDHS a new random sample is drawn nationally for every round. Thus the ZRHDS allows a true assessment of annual changes, or changes over short intervals, while the ZDHS presents a more representative national picture over longer intervals.

Figure 1: The evolution of nutritional outcomes for rural households, HAZ, 1984–2011

Sources: The annual rounds of the ZRHDS, the rural households from the ZDHS surveys at roughly five-year intervals, and the 2005–06 data are from Mbuya et al (2010). The ZDHS plot for 1994 represents only children aged less than three years, whereas the other years are results for children aged less than five years. The expected value for all years is 2.3 per cent.

The perspective in the plots represents the proportion of the children assessed lying below the threshold of stunting. HA exhibits dramatic changes. In 1983/84, nearly 34 per cent of children were stunted. In the following assessment period, 1987, the extent of stunting dropped by more than a third. This improvement was a consequence of several factors. Among them was a rapid expansion in social welfare expenditure, which supported cost-effective, community-based health interventions and improvements in child immunisation rates. And

vii In addition, the ZDHS (Zimbabwe Demographic and Health Survey) prevalence rates are based on the 2006 WHO standards (Victora et al., 2010) while the ZRHDS (Zimbabwe Rural Households Dynamics Study) rates use the NCHS standards (NCHS, 1977). Compared to the WHO standards, the NCHS reference tends to report lower height-for-age z-scores for children aged 12, 24 and 60 months and higher z-scores for ages 1, 36 and 48 months.
although the early 1980s experienced three consecutive years of drought, an effective drought-relief programme meant that crop failures were seldom experienced in the form of pronounced checks to child growth.

In the late 1980s or early 1990s, however, this improvement in HA was reversed. By 1992 stunting was close to the level of eight years earlier, while the following year, 1993, was the second worst ever recorded. The 1993 outcomes reflect the severe drought of the 1991–1992 season, but they may embody also the early signs of the cutbacks in public health services as part of Zimbabwe’s structural adjustment programme. Following 1993, there was one year of marked improvement, but this was then succeeded by a continuation of poor outcomes. The linear trend is clearly for a growing proportion of children in resettlement areas to be stunted. In addition to the worsening of average nutritional status, 12 per cent more children were likely to be stunted at the end of the period than at the beginning.

The data plotted from the ZDHS represents only rural families from the national data set and thus provides a useful comparison with the panel data set. Looking at the two trend lines, Figure 1 strongly suggests that nutritional outcomes have worsened over time for all rural areas of Zimbabwe. Moreover, an assessment of progress toward the MDG targets for eradicating extreme poverty and hunger concludes that the targets are unlikely to be met (UNDP, 2012).

While it is far from obvious what is driving the changes observed, they are consistent with two possible but very different explanations. First, they match well the timing of the reversal of other health care indicators – infant, child, and maternal mortality – at the national level. This pattern is explained in part at least by the fact that real per capita health spending – which had increased more than 60 per cent between 1980 and 1990 – was in the late 1990s marginally lower than at independence (GoZ, 2006). A second factor that helps explain worsening nutritional outcomes during the 1990s is the fact that every growing season between 1988 and 1996 (seven consecutive years) experienced below long term average rainfall, including the two serious drought years of 1992 and 1995. When heavy rains came, as they did in 1996 and 1999, they brought with them national epidemics of malaria (see Chapter 4), which is particularly serious in the case of already undernourished children.

In summary, the ZRHDS data in Figure 1 shows a somewhat mixed
picture, but the worsening of chronic undernutrition over time tells us that the resettlement experience has not led to general improvements – either in food security or in other underlying conditions – sufficient to reduce this dimension of undernutrition.

The analysis underlying the figure suggests that two related processes are unfolding together. Using median values for z-scores, we know half the children assessed will have better scores than the values used; and half will have worse scores. This latter group generates the consistently worsening results shown in Figure 1. What appears to be happening is that serious child undernutrition is becoming increasingly concentrated in one group of households and, moreover, that children in this particular group of households are becoming increasingly badly nourished. The focus to this point has been on aggregate indicators of nutritional status. But what underlies the patterns observed?

The first two years of life are a critical time for linear growth and particularly for brain growth and development of complex neural networks. Stunting develops during what has been termed the vital first 1,000 days – nine months of foetal life up to the second birthday – and its effects are thought to be largely irreversible.\(^8\) Figure 2, which plots the average z-scores for both height-for-age and weight-for-age (WA) over eight consecutive years, shows clearly the pattern of the onset of stunting in Zimbabwe. At the age of six months, children’s HAZ begins a rapid decline that continues until just before the second birthday. At that point, some modest catch-up growth begins, but it never becomes complete.

Two features of Figure 2 are important. First, the fact that the youngest children have postpartum z-scores above expected values suggests that maternal nutrition and health may not be causes for major concern in rural Zimbabwe.\(^9\) Second, the very rapid decline in nutritional wellbeing from the age of six months to 18–25 months

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\(^8\) The reversibility of stunting remains controversial, and divergent findings are reported depending upon whether studies address physical or cognitive stunting and the stage of life when assessments are done (for examples see Victora et al., 2010; Leroy et al., 2014 and 2015; Lundeen et al., 2014; Bhutta & Yakobovitch-Gavan, 2016; Georgiadis et al., 2017; Desmond & Casale, 2017; Prentice, 2017).
\(^9\) The major characteristic associated with low birth weights is the interval between the birth of the previous child and the child being assessed. Of multiple-birth children, 60 per cent had low birth weight (< 2500g), while 58 per cent were stunted at the time of the national survey (Mbuya et al., 2010).
(which is also reflected in national data (GoZ, 2014)) corresponds with two changes in infant-rearing practices: (1) the abandonment of exclusive breastfeeding and the introduction of supplementary foods and beverages, and (2) increasing exposure of infants to pathogens in their immediate environment. The latter arises because busy mothers or caregivers are likely to place infants and young children on the floor/ground while they do their chores or farm work. Anyone who has raised children knows that children explore their world by putting bits of it in their mouths; such exploratory ingestion creates direct pathways for bacterial infection (Ngure et al., 2013).\textsuperscript{x}

In their study in Zimbabwe, Ngure et al (2013) observed caregiver-infant pairs to identify pathways of transmission of bacteria among infants. They tested the fingers, food, and drinking water of infants. Some infants actively ingested handfuls of soil and some also ingested chicken faeces. Hand-washing with soap was rare, and drinking water was contaminated with E. coli in more than half the households.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure2.png}
\caption{Timing of growth faltering among rural Zimbabwean children, 1993–2001}
\label{fig:figure2}
\end{figure}

(n=7,235)

Source: Author’s data. The expected value for all ages is 0.00.

\textsuperscript{x} The compulsion in RAs to live in nucleated villages (in contrast to the dispersed pattern of dwellings in CAs) also almost certainly increases the risk of contamination.
In earlier work investigating nutritional status and socio-economic status (Kinsey, 2010b), anthropometric data (measurement of the size and proportions of the human body) were collected for both children and their parents, and households were identified where the phenomenon of undernutrition was present in adults, children, or both. Undernutrition exists among adults in a household if any one parent of young children has a body mass index (BMI) below 18.5.\(^\text{xi}\) Similarly, undernutrition among children exists if any one of the three z-scores (HA, WA, and weight-for-height (WH)) for any young child in the household lies beneath two standard deviations below the median,\(^\text{xii}\) the standard threshold for undernutrition.

Two new binary variables – BMI and Z – were created. The variable BMI is set to 0 in cases where no parent has a low BMI and to 1 where any parent has a BMI score below 18.5. An identical procedure was followed in creating the second variable: Z is assigned a value of 0 if all of the young children in the household have WA, HA and WH z-scores greater than two standard deviations below the median. If any one child has any one of the three z-scores below two standard deviations below the mean, Z is assigned a value of 1. Values of 0 for BMI and Z thus indicate an absence of undernutrition-symptomatic households, while values of 1 indicate the presence of undernutrition-symptomatic households.

A simple way of assessing household nutritional status is to create a two-by-two matrix with adults on one axis and children on the other. This cross-tabulation procedure was applied to the pooled data sets for the five years from 1997 to 2001.\(^\text{xiii}\) The distribution of households obtained by applying this approach is summarised in Table 2. The four cells of the matrix contain: (1) households with no undernourished children or adults (the 0/0 households); (2) households with both undernourished children and undernourished adults (the 1/1

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\(^{\text{xi}}\) A threshold for the diagnosis of chronic energy deficiency using BMI has been defined as less than 18.5 (Shetty & James, 1994).

\(^{\text{xii}}\) Including all three anthropometric indicators along with BMI for adults means that both chronic and acute undernutrition are being considered.

\(^{\text{xiii}}\) None of these years was affected by drought.
households); (3) households with one or more undernourished adults but no undernourished children (1/0 households); and (4) households with one or more undernourished children, but no undernourished adults (0/1 households).

A third of households exhibited no sign of undernutrition on the basis of the z-scores of the children, while nearly 80 per cent of resident parents had BMIs above the cut-off. The significance level for the cross-tabulation indicates that the hypothesis that intra-household child and adult nutrition levels are independent can be rejected. Examining the cross-tabulations, the most common outcome is a household with at least one undernourished child, but no parent below the cut-off point. The rarest outcome is a household with an undernourished adult, but no undernourished child; there are only 89 such cases across the five years in this category.

Looking only at the outcomes where neither adults nor children are undernourished or both are, in 14.4 per cent of households undernourishment exists in both groups, while it exists in neither group in about a third of all cases. Each cell of the matrix thus represents households that differ in significant ways. The 0/0 households exhibit no adverse nutritional phenomena and are therefore not regarded as impoverished or vulnerable. If both adults and children from the same household are undernourished, the 1/1 households, this suggests the same pathways may be affecting nutrition among the young and the old and that poverty, health, food availability and/or EED may be major contributing factors. The mixed cases present greater challenges to interpretation. If adults are well-nourished and children poorly nourished (the 0/1 households) – which is the case for nearly half the households – the primary cause is not likely to be so much a lack of food as poor intra-household distribution of food, poor child-feeding practices, child neglect, or complications of nutritional status caused by child-specific, health-related, and hygienic factors, such as EED.

xiv Many instances exist where children were assessed but no parent was present. These cases are excluded here. This exclusion may, however, bias the results since children who are being fostered, as the result of the death of parents, because of a broken marriage, or as a family coping mechanism, may be particularly prone to failure to thrive.
In the other mixed case, where adults are undernourished and children well-nourished (the small number of 1/0 households), the intra-household allocation of food is likely to be satisfactory but adults are perhaps experiencing a situation in which physical activity levels are high relative to the supply of food; or the time available to prepare and eat nutritionally satisfactory meals is inadequate. An alternative, or additional, explanation is that adult-specific health-related factors, such as HIV/AIDS, are at work.

If the 14.4 per cent of symptomatic households (undernourishment in both parents and children) constitute the same group in each year, this would further implicate structural and social factors, such as poverty, hygiene, and sanitation. But it is not the same households that show up in each category over time. Indeed, on average, the doubly undernourished households appear somewhat less than twice over the five years.\textsuperscript{xv} However, an assessment of 7,235 children across nine consecutive years from 1993 to 2001 reveals an average of one-third of children stunted (with a range of 28.1 per cent in 2001 to 38.1 in 1996), a pattern strongly suggesting that undernutrition is structural in nature and that environmental factors may be implicated.

Analysis of the nutritional data revealed that, contrary to all

\textsuperscript{xv} There is, however, some indication of a neighbourhood effect because of the much greater frequency of appearance of doubly undernourished households in certain villages. This finding again suggests structural, social and environmental factors may be responsible.
expectations, children’s nutritional levels in Zimbabwe’s RAs are lower than virtually anywhere else in the country.\textsuperscript{xvi} It was originally thought that this outcome might have been a consequence of the experience of relocating at a time of great environmental stress – the three-year drought of the early 1980s. Subsequent reporting suggests, however, that the relatively poor nutritional status of children in RAs appears to reflect persistent structural causes (Kinsey, 1998; GoZ, 1989; 1995; 1997; 2006).

\textbf{Household-level outcomes}

A syndemics approach dictates an examination of the proposition that undernutrition is structural in the RAs through scrutiny of underlying biosocial indicators. Accordingly, with households divided into the four groups shown in Table 2, a set of 90 variables was constructed comprising multiple indicators of socio-economic wellbeing. Although detailed explanation is impossible here, the significant outcomes serve to illustrate the frequent mismatch between nutritional status and presumed steps along a causal pathway linking food supply to nutrition. Because household size is such an important variable in assessing outcomes, this treatment merely highlights major findings from the aggregated analysis.\textsuperscript{xvii}

A few results were anticipated. For example, households with no undernutrition have a significantly lower incidence of illness and a significantly higher income from the sale of livestock. Many more results, however, were seemingly perverse. Examples include the fact that the highest-income group in terms of revenue from cash crop sales has the worst nutrition and that neither total off-farm income nor total income is significantly associated with any nutritional category. Other findings were also counterintuitive.

The enigmatic association between nutritional status and the underlying measures suggests that the relationship between nutrition and traditional indicators is not as straightforward as intuition might suggest, certainly not as an indicator of household welfare.\textsuperscript{xviii} Evidence for this contention can be found by correlating the entire set of indicators with

\textsuperscript{xvi} Jenkins and Prinsloo (1995) report similar patterns.
\textsuperscript{xvii} Full details of the calculations can be found in Kinsey (2010a; 2010b).
\textsuperscript{xviii} See Behrman & Deolalikar (1987: 505) for an analysis of rural panel data which concludes that ‘increases in income will not result in substantial improvements in nutrient intakes’. 

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the separate nutritional indicators for adults and children, a procedure that reveals some startling relationships. Of the four groups based on nutritional status, only the group of poorly nourished adults appears at all well differentiated according to the indicators used, and some of the differentiating factors are counterintuitive. Examples are households with a poorly nourished adult that possess cattle herds with lower market values and earn less from sales of livestock. Such households also receive more remittances in cash – 80 per cent more than the mean – and plant larger areas of cash crops (mainly tobacco and cotton) and have the highest ratio of cash crops to food crops. In comparison, households with only well-nourished children earn more from sales of livestock.

The presence of a poorly nourished adult is a good predictor that there will also be a poorly nourished child; just under 80 per cent of households with a poorly nourished adult will also contain a poorly nourished child. These households also have very low expenditure on staple grain and possess low-valued livestock holdings from which they earn relatively little in sales. They do, however, plant the largest area of cash crops, both in absolute terms and in relation to the area of food crops. These households also have mean total incomes more than 8 per cent above those of households with only well-nourished adults and have the lowest incidence of incapacitating illness.

Unambiguous results emerge from the correlations between crop- and livestock-related indicators and the nutritional outcomes of both adults and children. An increase in a crop-related indicator always worsens nutritional status, while an increase in a livestock-related indicator always enhances nutritional outcomes. Why should this pattern occur so clearly?

Answers to this question may come from a deeper appreciation of both the data and the farming systems from which they come. The data is collected annually at a period of peak labour stress and when food supplies are at their lowest point in the season. Collectively, an increase in the crop-related indicators can be interpreted as an increase in the seasonal demand for labour for field operations. This increase implies, in turn, two other associated shifts: an increase in the demand for caloric energy to sustain the labour inputs and a reduction in the amount of time available for women to care for children. Thus, greater commitments to
cropping (and especially to cash-cropping) are associated with poorer nutritional outcomes. Nor do higher crop incomes from the previous harvest compensate during the current season.

Why do the livestock-related indicators have consistently the opposite effect? There are likely to be at least four effects at work. First, livestock are probably the best single indicator of wealth for rural households and of their ability to cope with cash shortfalls. Second, the labour demands for livestock keeping are non-seasonal and require little caloric expenditure; moreover, cheap, unskilled labour is often hired for herding during the busy cropping period, and cattle are often herded collectively, thereby saving labour. Third, the value of the herd is positively associated with possession of draft oxen, which can significantly substitute for human labour in the demanding tasks of land preparation and weeding. Finally, revenue from sales of livestock products is indicative that households have surpluses of milk and eggs, suggesting that the family is consuming all of these food sources.

A more simplified explanation is also possible. Households with large livestock holdings are the wealthy; they have made it, and they have decreased their vulnerability to the vicissitudes of rain-fed farming. Households with many positive crop-related indicators aspire to make it in a similar fashion and are working extremely hard to do so. Much of their income from crops may, therefore, be used to increase investment rather than improve consumption.

In contrast to the crop, livestock, and health indicators, however, the income and consumption indicators exhibit ambiguous outcomes. For example, in almost half the cases, the indicators exhibit opposite signs for adults and children, suggesting that the pathways to better household nutrition are more complex than is sometimes suspected.

It feels intuitively correct that total household non-food consumption would be positively associated with child nutrition since there has to be a strong association with household income, but why should it be negatively associated with adult nutrition? And why should food purchases be negatively associated with nutrition for both children and adults, while grain purchases and the amount of grain in storage have positive effects for adults and negative ones for children? The income

variables are, if anything, even more paradoxical. Why should all sources of cash income (aside from crop income and income controlled by women) be positively correlated with child nutrition and yet only one (non-agricultural income) correlate positively with adult nutrition?

**Per-capita outcomes**

Examination of the relationship between nutritional indicators and associated measures at the household level revealed some puzzles and suggested that the ability of the combined indicators to point out pathways for nutritional improvement was generally weak. This section replicates the analysis reported above, but transforms the measures from a household to a per-capita basis. Table 3 presents a selected subset of measures defined in per-capita terms and adds a new variable representing household size. Households with no undernutrition are significantly smaller than the average, whereas those with undernutrition among both adults and children are significantly larger than the average.

Overall, the undernutrition-free and the all-undernourished groups differ significantly according to some 70 per cent of the indicators, and in the manner expected. Expenditure on food differentiates the all-undernourished group as expected, but its significance for the undernourished-adults group is hard to explain. Other variables that differentiate the worst-nourished group of households include grain storage, both consumption measures, the value of livestock and sales of livestock products, total income, and the area planted to cash crops. The only measures that successfully differentiate all four groups in Table 3 are the two non-food consumption measures.

With the transformation of the measures to per-capita terms, the two groups with undernourished children tend to drop below the population means of the selected measures, while the two with well-nourished children tend to rise above the mean. Thus the procedure of transforming the values is picking up the same thing that inclusion of the household size variable does: larger households are far more likely to contain poorly nourished children.
Table 3: Mean levels of socio-economic measures on a per-capita basis according to combined nutritional indicators for the household

<table>
<thead>
<tr>
<th>Nutritional group profile of the household</th>
<th>All households</th>
<th>No under-nutrition</th>
<th>Only under-nourished children</th>
<th>Only under-nourished adults</th>
<th>Only under-nourished adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grain purchases $</td>
<td>1.18</td>
<td>0.93</td>
<td>1.68</td>
<td>0.63</td>
<td>0.30</td>
</tr>
<tr>
<td>Food purchases $</td>
<td>43</td>
<td>46</td>
<td>43</td>
<td>51</td>
<td>38</td>
</tr>
<tr>
<td>Stored grain kg</td>
<td>65</td>
<td>76</td>
<td>63</td>
<td>55</td>
<td>53</td>
</tr>
<tr>
<td>Stored legumes kg</td>
<td>0.27</td>
<td>0.45</td>
<td>0.03</td>
<td>0.02</td>
<td>0.73</td>
</tr>
<tr>
<td>Consumption 1 $a</td>
<td>593</td>
<td>729</td>
<td>'516</td>
<td>'698</td>
<td>533</td>
</tr>
<tr>
<td>Consumption 2 $b</td>
<td>686</td>
<td>'842</td>
<td>'604</td>
<td>'764</td>
<td>'627</td>
</tr>
<tr>
<td>Crops value $c</td>
<td>1 272</td>
<td>1 510</td>
<td>1 132</td>
<td>1 488</td>
<td>1 173</td>
</tr>
<tr>
<td>Crops revenue $d</td>
<td>975</td>
<td>'1 146</td>
<td>859</td>
<td>'1 201</td>
<td>930</td>
</tr>
<tr>
<td>Livestock value $e</td>
<td>1 765</td>
<td>1 994</td>
<td>1 715</td>
<td>1 732</td>
<td>1 473</td>
</tr>
<tr>
<td>Livestock sales 1 $f</td>
<td>16</td>
<td>20</td>
<td>14</td>
<td>135</td>
<td>11</td>
</tr>
<tr>
<td>Livestock sales 2 $g</td>
<td>112</td>
<td>162</td>
<td>95</td>
<td>95</td>
<td>71</td>
</tr>
<tr>
<td>Remittances $h</td>
<td>75</td>
<td>76</td>
<td>62</td>
<td>'169</td>
<td>86</td>
</tr>
<tr>
<td>Non-ag income $</td>
<td>349</td>
<td>'494</td>
<td>288</td>
<td>'204</td>
<td>288</td>
</tr>
<tr>
<td>Total income $</td>
<td>1 824</td>
<td>2 261</td>
<td>'1 590</td>
<td>'1 990</td>
<td>'1 629</td>
</tr>
<tr>
<td>Female income $</td>
<td>69</td>
<td>76</td>
<td>66</td>
<td>78</td>
<td>60</td>
</tr>
<tr>
<td>Area cropped ha</td>
<td>0.34</td>
<td>'0.37</td>
<td>0.33</td>
<td>0.33</td>
<td>0.31</td>
</tr>
<tr>
<td>Cash crops ha</td>
<td>0.09</td>
<td>0.10</td>
<td>0.09</td>
<td>'0.12</td>
<td>0.10</td>
</tr>
<tr>
<td>Household size</td>
<td>10</td>
<td>9</td>
<td>11</td>
<td>10</td>
<td>'12</td>
</tr>
</tbody>
</table>

Source: Author’s data.

*Significantly different from the mean at P=0.05.
†Non-food consumption excluding educational expenditure. ‡Non-food consumption including educational expenditure. §Market value of all crops grown. ¶Market value of actual crop sales. ‡Market value of all livestock holdings. °Revenue from sale of livestock products.
†°Revenue from sale of livestock. ‡°Excludes in-kind remittances.

While there are clearly fundamentally different socio-economic situations represented in the data set, these are not well delineated by the distribution of the nutritional indicators. Nor is there any consistent evidence that households with adults identified as being underweight are any worse off in terms of food security or health status than households without thin adults. Moreover, the combined measures lack discriminatory power when a group in which undernutrition exists is
the norm, as is the case here, where households with undernourished children and well-nourished adults are the expected outcome.

Several factors help to explain this weakness in discriminatory power. First, much has been lost by converting the anthropometric scales to simple 0-1 dummy variables depending upon the position of an observation relative to a defined threshold. This procedure fails to differentiate among degrees of undernutrition, and it may be the severity of undernutrition – rather than merely its presence – that accords better with the socio-economic indicators. It could well be that the extent of within-household undernutrition is more significant.

A basic problem, however, is that because BMI for adults does not correlate well with the anthropometric indicators for children, many of the most promising cause-and-effect variables operate in opposite directions for children and for adults. This makes generalisations about the household unit extremely difficult. Nubé et al (1997) note a limitation to the use of BMI: seasonal fluctuations in food availability and/or labour demands may affect measures. The adults assessed here were all examined during periods of peak labour demands and at a time when food supplies from the previous harvest would normally have been running low. The outcomes suggest that, in this setting, BMIs may be better at identifying stress in terms of arduous farm labour than at differentiating households with poorly nourished adults from other rural households.

Finally, while structuring analysis on the basis of per-capita rather than household values yields results more indicative of underlying relationships, improvements can still be made since a per-capita approach weights adults and children equally and thus masks significant differences arising from household composition.

The analysis above illustrates well some of the difficulties that arise in attempting to apply a syndemics framework to the problem of child and household undernutrition. Analytically, a syndemics approach calls for the broadest possible perspective and inclusion of all relevant variables. Anthropologists will appreciate that this methodology can yield deep insights into the complexities that underlie observed nutritional outcomes, while economists will lament the presence of so many confounding variables and the challenge of assessing significance.
Given the poor record of so many past nutritional interventions, however, it becomes increasingly clear that a belief in simplistic solutions or unilateral causal pathways is misguided.

**The influence of ecology and tenurial regime**

In order to test further the proposition that the selected indicators themselves are valid measures, the data were restratified using two criteria for Zimbabwe which we know a good deal about: by land tenure regime (RAs and CAs) and by agro-ecological zone (natural regions or NRs).

If the indicators are valid, we would expect to find two strong patterns. First, since 84 per cent of households in CAs are poor in total consumption terms (GoZ, 1997) and RAs have been provided access to a superior resource base, we would expect to find systematically stronger indicators of wellbeing in RAs than in CAs. Second, rural households attempting to make a living from agriculture will achieve more positive results in areas physically better suited to farming. Thus, it would be expected that the agriculture-related indicators will generally indicate a progressive worsening as one moves from the better areas – NR 2 – to areas of lower inherent potential – NR 3 and NR 4. How well do the indicators fit with these expectations?

In the case of the RA-CA comparison, all indicators, with the exception of four, have the expected relationship. The first two exceptions show that the probability of a household containing either an undernourished child or adult is less in the CAs than in the RAs. The second two exceptions show the CAs to be healthier places to live – especially for children – despite the fact that all the RAs were provided with new health facilities in the early 1980s. Agriculture and livestock income variables, and consumption indicators, show the advantage of living in a resettlement area, while remittance and off-farm income variables indicate some of the disadvantages of living in CAs, with the difficulty of earning a living from smallholdings with a poor resource base. The different nutritional and health outcomes for RAs and CAs thus suggest sets of influences operating at different levels.

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xx On the basis of the income required to purchase a basket of basic food needed by an average person per annum and meet non-food needs (clothing, housing, education, health, transport, etc.).
Why are nutritional and health status worse in RAs, where households have generous land-holdings and preferential access to health and agricultural services? One explanation may lie in settlement patterns and the time allocations of women. Villages in RAs have been laid out in a nucleated pattern so neighbours and their small livestock live in close proximity. Travel time to fields is long in RAs, as are the hours spent in the field. Busy mothers may leave young children at home in the care of siblings or take them to the fields; in neither case are the children likely to be well fed or cared for. In contrast, in the CAs, the fields surround the homestead, travel times are short, and midday meals can be managed easily.

A further explanation may be that official exhortations to be productive have propelled RA households in the direction of producing non-consumable commodities such as cotton and tobacco, leading to high ratios between the areas planted to cash crops and food crops and/or reductions in diversity in the mix of food crops grown. Because of their small land-holdings, CA households tend to market surplus food crops, if they have any, rather than grow crops for market that cannot be consumed. Incomes from agriculture and livestock are generally much higher in RAs than in CAs. Conventional wisdom on the effect of commercialisation of agriculture on nutrition of farm families holds that there should be minimal, if any, adverse effects on nutrition because of the compensating effects of higher cash incomes. This is not the case here.

The study sites span zones of agricultural potential, ranging from fairly high to quite low. In the area of best potential, farming appears dynamic and cash incomes are high because of widespread cultivation of cash crops such as cotton and tobacco and novel crops such as paprika and soya. Across all the years surveyed, however, this area has consistently displayed the lowest nutritional outcomes. In the area of lowest natural potential, agriculture appears stagnant; and no unirrigated farming system produces reliable incomes. Yet it is in this weakly commercialised area that the best nutritional outcomes for children have consistently been found.\textsuperscript{xxi} Furthermore, the probability of finding an

\textsuperscript{xxi} The higher potential areas have higher rainfall, which provides beneficial conditions for certain disease vectors.
undernourished adult in a household is three times higher in the best agro-ecological zone than in the intermediate and low-potential zones.

**DISCUSSION: WE ARE NOT WHAT WE EAT**

In the context of syndemics, this chapter has addressed three main themes: the prevalence of undernutrition and its causes, associations, and paradoxes; the physiology of deprivation and stunting; and the outcomes of an intervention aimed at improving links between agriculture and food systems.

An overview of the intervention reviewed here shows that stunting persists no matter what. In particular, agriculture and food-based approaches fail to reduce stunting significantly. The limited impact on the severity of stunting is insufficient to meet the UN’s Sustainable Development Goals and eliminate the consequences of stunting. Similarly, the effects of nutrition interventions on growth of stunted children in low- and middle-income countries (LMICs) are disappointing. In summarising actions to accelerate progress on nutrition, Haddad et al. (2015) even question the efficacy of nutrition interventions on growth. Previously, Sguassero et al. (2012) meta-analysed community-based supplementary feeding of young children in LMICs and concluded that, despite a scarcity of relevant studies, supplementary feeding has a negligible impact on child growth. Kristjansson et al. (2015) show that socio-economically disadvantaged children, when supplemented, only grew an average of 0.27 cm more over six months than those who were not supplemented. In an analysis of before-and-after studies, they find no evidence of an effect on height. Overall, the data indicates that the net effect of nutrition on height is generally small and significantly smaller than that reported in historic studies (Hermanussen & Wit, 2017).

While multisectoral nutrition interventions in the right environment have potential to improve child health,xxii donor support for nutrition is less than 5 per cent of international health assistance. Global efforts have increased awareness of the need to improve the provision of nutrition

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xxii Two recent evaluations (Nabwera et al., 2017; Barnett et al., 2018), however, call into question the ability of even expensive, long-term, multisectoral interventions to address effectively and sustainably the causal pathways for undernutrition or to eliminate stunting.
services yet, despite these efforts, progress in scaling up policy and programmes is still challenged by poor understanding of the burden of child malnutrition, insufficient scientific evidence, and by weak or non-existent political commitment. The costs of chronic undernutrition to individuals become more apparent with each new report of field research. Less obvious, however, are the costs to the economies of countries that do nothing about alleviating chronic undernutrition.

If children are to escape the life sentence of deprivation imposed by stunting, those involved with implementing nutritional interventions must base their work on sound scientific evidence and work at multiple levels across multiple sectors. Single-channel efforts – particularly those focused on food-related interventions – cannot succeed. Such multisectoral efforts will involve not only decisions about which specific measures to take, where, and in which combinations, but also supporting frameworks shaped by political choices leading to firm commitments. Governments and donor agencies will also have to reshape their thinking about the provision of resources and financing through more complex arrangements and within appropriate time frames.

This chapter takes some steps toward severing the generally assumed link between consumption of a nutritionally adequate diet and the positive outcome of improved nutritional status. Under the environmental conditions where EED (environmental enteric dysfunction, the condition in which food consumed is unable to be fully utilised) arises, the body of the child is simply unable to utilise much of whatever nutrients may be fed to it. This fact suggests that a major rethink is needed about ways to address chronic undernutrition among future generations.

This reconceptualisation demands cross-disciplinary and holistic approaches to formulating interventions to improve nutritional outcomes. Despite the wide prevalence of chronic undernutrition and attempts to address it, past experiences with nutritional interventions have had only marginal impacts (Prendergast & Kelly, 2012). Indeed, EED renders almost obsolete many of the buzzwords – such as hunger and food security – that have been used to motivate development assistance in the past.

Many previous interventions aimed at improving nutritional status
have been designed or implemented in ways that precluded reliable evaluation of their effects. In assessing results, there has been a noticeable focus on indicators rather than outcomes. Synergies among different elements of interventions remain poorly understood. Reviews of complementary feeding programmes, for example, in combination with nutrition education showed mixed effects on HAZ and stunting, both in food-secure and food-insecure populations (Lassi et al., 2013). While some interventions showed significant effects on HAZ from food supplements and nutrition education, the effect on chronic undernutrition was not significant.

Although the potential benefits of strategies to improve the quality and micronutrient density of foods consumed by small children are well recognised, few LICs have clear policies in support of effective strategies to eliminate micronutrient deficiencies (Eilander et al., 2010). A review of multiple micronutrient supplementation efforts showed small benefits on linear growth but little evidence of effects on morbidity outcomes (Allen et al., 2009). Another review of the effect of micronutrient supplementations on cognitive performance concluded that such interventions might be associated with a marginal improvement in one area but not in others (Eilander et al., 2010). In her review of single-target interventions, supplementary feeding, hygiene/sanitation, or water supply, Humphrey (2009) shows that the best outcomes appear capable of addressing only about one-third of the magnitude of the stunting problem. Partial solutions are clearly inadequate.

Suggestively, Spears (2013) has shown that there is a quantitatively important gradient between child height and sanitation that can statistically explain a large fraction of international height differences. This association between sanitation and human capital is robustly stable and appears to possess more explanatory power than the relationship between GDP and child height. This connection clearly points to the significance of environmental factors influencing nutritional outcomes.

Recent work by Skoufias (2016) highlights the need for greater awareness at the operational level of the limitations of an exclusive focus on tackling single dimensions of undernutrition without considering the wider context. He examines the extent to which three key underlying determinants of nutritional status – food security; childcare at the
maternal, household, and community levels; and access to health services and a safe, hygienic environment – on their own and interactively are associated with nutritional outcomes. Skoufias’s analysis underlines the point that the success of sector-specific nutritional interventions may be constrained by a lack of momentum in leveraging the synergies among the three broad clusters of underlying determinants of undernutrition: food security, child care, and environment and health.

In his analysis, Skoufias uses data from Zimbabwe as one example. Although 22 per cent of Zimbabwean children are rated adequate in food, 39 per cent adequate in care, and 10 per cent adequate in environment and health combined, many children (47 per cent) are not adequate in any single component and only very few (17 per cent) are adequate in more than one component (Skoufias, 2016: 34). Thus, the beneficial synergies from multisectoral approaches are not being realised.

Evidence from Zimbabwe, as from most of Africa, shows that EED is a greater problem in rural areas, where small isolated communities must fend for themselves. While the most challenging development intervention – inducing behavioural change – must underlie the elimination of EED, there is great scope for integrated initiatives featuring improvements to sanitation, hygiene, water supply, and feeding and childcare practices. At the same time, training and education for medical and community workers could assist in reducing the burden of EED among children in LICs.

Stunting affects well over a third of all African children. The analysis here suggests that the prevalence of undernutrition in one form or another among rural Zimbabwean children may be as high as 60 per cent – far higher than the 33 per cent for stunting reported in the most recent DHS study (GoZ, 2012) and an incidence that places undernutrition in the realm of a pandemic. This difference is too great to be explained by the use of somewhat different nutritional reference standards and, moreover, the high prevalence rates are disturbingly persistent.

The reviews of wider experience display the same contradictory patterns as does this interrogation of the Zimbabwean experience. At present, we have few examples of success that could be scaled up; what may rather be needed is first to scale down to seek solutions that are effective at the community level, and then to understand exactly what
makes them successful. The vast network of professional organisations that work to end hunger – the UN agencies, the government bodies and NGOs, the academics, and the rock concert organisers – all face a challenging learning curve to harmonise their individual prescriptions for ending undernutrition into effective multisectoral approaches. It is encouraging, however, to note an apparent growing recognition that a common middle ground must be sought between approaches addressing undernutrition incrementally, activity by activity, and those tackling the wider context in a syndemic framework, on the premise that fundamental social change is a prerequisite for any solution to the problem of chronic undernutrition.

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