

# The Role of Animal Source Foods in Improving Nutritional Health in Urban Informal Settlements: Identification of Knowledge Gaps and Implementation Barriers

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**Abstract:** Childhood undernutrition is a health crisis in the rapidly expanding informal settlements of low-income countries worldwide. Nearly half of Kenyan children in the Kibera settlement, in Nairobi, were reported to be stunted, indicating low height-for-age. Stunted children are at greater risk for poor cognitive and physical health outcomes in the long-term, problems that tend to be perpetuated in subsequent generations. Animal-source foods (ASF) supply a calorically dense source of micro- and macronutrients, and supplementation with ASF has been shown to improve linear growth and cognition. Correspondingly, increasing consumption of ASF by pregnant women and children has been proposed as a means to disrupt the intergenerational cycle of undernutrition caused by food insecurity. Household surveys indicate that consumption of ASF is low in urban slums, despite the availability of these foods in local markets. Here we review the studies addressing the role of ASF in the diets of the urban poor and identify knowledge gaps relevant to improving nutrition by increasing consumption of ASF. Based predominantly on studies in Kibera and greater Nairobi, these gaps include determining the minimal amount and frequency of dietary ASF to prevent stunting, defining how consumer preferences, markets, and income interact to impede or promote ASF consumption, and understanding the interaction between diet and both clinical and sub-clinical enteric disease on growth outcomes.

**Keywords:** Maternal health, Child malnutrition, Undernutrition, Food security, Informal urban settlements.

## INTRODUCTION

By 2050 it is projected that the human population will reach 9.3 billion, and that nearly 70% of people will live in cities. Developing countries will account for greater than 90% of both the population and urbanization rates. The trend toward urbanization in developing countries has been, and will continue to be swift: in 1970, 25% of the developing world lived in cities, in 2010 this number nearly doubled, and by 2050, a projected 64% will be urbanites [1]. Many cities, particularly those in low-income countries, have not kept pace with this rapid transition, resulting in an expansion of informal settlements (slums). By 2001, slums were home to 43% of the developing world's urban population, with that number reaching 70% in sub-Saharan Africa [2]. Characteristics of slums include inadequate access to safe water, poor sanitation, overcrowding, and low-quality housing. Health outcomes are poor as a result of these unhealthy living conditions, in addition to the lack of health services and nutritional deficiencies [2, 3]. While infrastructure upgrading within the informal settlements will be necessary to match the living conditions of other urban residents, there is an immediate need and opportunity to improve nutrition. Near-term solutions are possible

because food insecurity in the settlements, in both quality and quantity, is often a result of inaccessibility, rather than unavailability [3]. The informal settlements of Nairobi illustrate a situation where poor nutritional health outcomes result from food inaccessibility. While this article focuses on Nairobi, many of the identified barriers and knowledge gaps are common to other cities experiencing rapid urban growth with expansion of informal settlements.

Of the 3.1 million Nairobi residents, approximately 60-70% live in informal settlements [4, 5]. Population growth rates in Nairobi County are 4% annually, and an estimated 75% of the new growth will occur in the slums [5-7]. The population influx, in addition to poverty, substandard living conditions, and lack of social services, presents multiple challenges to meeting sustainable development goals [2, 8]. A persistent and deepening problem is undernutrition; data from a 2008 study by Olack *et al.* in Kibera, Nairobi's largest informal settlement, revealed alarming rates of undernourishment. In that survey, 11.8% of children under five were found to be underweight (low weight-for-age and sex), 47% were stunted (low height-for-age), and 2.6% were wasted (low weight-for-height) [9]. The proportion of children stunted in this study far exceeded that reported in the 2008-09 Kenya Demographic and Health Survey, where stunting rates in the city of Nairobi were 28.5% and national rates were 35.3% [10]. The discordant results suggest a serious underestimation of the problem in the urban

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slums [9]. The indicator in itself implies a chronic food insecurity problem, whereby stunting is a result of “prolonged or recurrent episodes of inadequate nutrition” [11-13]. In contrast, wasting is an indicator of acute weight loss [12, 13].

The ramifications of childhood undernutrition are severe. Inadequate nutrition leads to a number of physical disabilities, impaired cognitive development, and an increased risk of morbidity due to infectious disease [12]. Moreover, WHO estimates that undernutrition underpins more than half of all child deaths worldwide [14]. The long-term consequences of childhood undernutrition extend beyond a shortened stature. Stunted children enter adulthood into a cycle where their babies are small for gestational age, have low birth weight, have poorer responses to vaccines, and are at greater risk for infant mortality- all factors that can perpetuate poor health and development in subsequent generations [15, 16]. Paradoxically, early childhood undernutrition also contributes to the burgeoning problem of overweight and chronic disease [15, 17]. A Kenyan study found that childhood stunting and maternal overweight each increased the odds of overweight/obesity by approximately 70%, revealing that these children do not easily escape the intergenerational cycle of poor health outcomes [18]. Many interrelated factors are associated with child malnutrition, including suboptimal breastfeeding, infectious disease, and inadequate maternal and child intake of total energy, micronutrients, and protein [12, 19-21]. Childhood undernutrition is also negatively associated with individual and societal economic outcomes. Stunted children enroll in school at a later age, if at all, and receive fewer years of formal education [22, 23]. Based on the estimate that each year of schooling increases adult income by 9.7%, the economic consequences for the stunted individual are dire with many remaining in poverty [22]. Conversely, a significant inverse association exists between declining stunting incidence and national economic growth rates [24, 25]; economic growth has been shown to parallel improvements in nutritional health, alongside an increased participation in the labor force by healthier adults [26]. Consequently, it has been proposed that policies and practices that promote childhood nutritional health are integral to long-term economic development.

Food security is “when all people at all times have access to sufficient, safe, and nutritious food to maintain a healthy and active life” [27]. For residents of slums, food security is the exception rather than the

rule. A recent paper by Kamau *et al.* analyzed survey data from Nairobi households for food consumption and expenditure. The results revealed that 44% of households sampled in all of Nairobi were food insecure; when disaggregated by income, 80% of the lowest income quintile were food insecure [28]. As expected, the greatest share of household expenditures for this quintile was for food (49%). A comparison of the findings from 2003 to 2009 indicated that while the average total household expenditure in the lowest quintile increased by 9% (12,841 to 13,979 KSh), the average food expenditure more than doubled (114%; 3,208 KSh to 6,876) [29]. This supports that the modest increase in total household spending, an indicator of income, was insufficient for keeping up with rising food prices during this period.

Would increased consumption of net calories in the form of staple foods (maize, bananas, potatoes, wheat and rice) reduce the rate of child stunting in the urban informal settlements [29]? For nutrition, it is difficult to ascertain the impact of supplementation with energy, protein, or micronutrients alone because increased consumption of protein, for example, is usually accompanied by an increase in energy and micronutrient consumption [20, 30]. Nonetheless, animal-source foods (ASF) have been shown to have a positive impact on physical growth and cognition in otherwise vulnerable Kenyan children [31-35]. A number of observational studies positively associate the consumption of ASF to increased weight gain in pregnancy, increased birth weight and length, postnatal infant growth, linear growth in toddlers, better cognitive outcomes, and improved physical activity levels [20]. ASF constitute a dense, high quality source of protein and energy that readily supplies essential amino acids. Furthermore, meat and milk contain iron, zinc, vitamin A, vitamin B<sub>12</sub>, and calcium- micronutrients that are crucial for proper physical and cognitive development, as well as for maternal health during pregnancy and lactation [15, 20]. The nutrients supplied by ASF are also readily digested and absorbed, as opposed to certain plant-based foods that contain compounds (phytates, oxalates, and tannins) that lower the bioavailability of some micronutrients such as iron and zinc. Conversely, the presence of heme protein in meat improves the absorption of iron and zinc from both ASF and plant foods [19, 20, 36-38]. In high-income countries, the consumption of ASF has been associated with chronic diseases such as cancer, diabetes, and cardiovascular disease. Indeed, ASF are energy dense, and over-consumption of ASF is a

contributing factor related to obesity. In developing countries, the dual problems of undernourishment and obesity increasingly coexist. In the urban slums of Kenya, where stunting is prevalent, 43% of adult females and 17% of males were found to be overweight or obese [39]. As we discuss next, however, the urban poor infrequently consume ASF due to its relatively high cost. While increasing rates of obesity in slums is alarming, this more likely reflects lifestyle changes that result from urban life. These changes include less physical activity, availability of inexpensive ready-to-eat foods, and the substitution of calorically dense foods in place of healthier foods [18, 40-43].

### CONSUMPTION OF ASF IN NAIROBI'S SLUMS

Despite the nutritional benefits of ASF, little is consumed by the urban poor. In 2009, Nairobi households whose income fell in the lowest quintile had an average monthly food budget of 1,362 KSh per adult equivalent and allocated 13% of this to dairy products, and another 15% to meat and eggs (Table 1). Comparatively, the highest income quintile spent 5,014 KSh per adult equivalent per month on food, 17% of this was used to purchase dairy products, and 23% was spent on meat and eggs [29]. A similar 2003 household survey looked more closely at ASF. This report found that all income levels spent the most on beef, followed by chicken, then eggs. However, as expected, great disparities existed between the urban poor and the wealthy in annual consumption of meat. For beef and chicken, consumption for the wealthiest income quintile was 2.5 higher than the poorest quintile

[44]. Consumption of eggs and milk followed a similar trend. Liquid milk was, by far, the most commonly consumed dairy product across all incomes in Nairobi, but proportionally more pasteurized milk and yogurt were consumed as incomes increased [45]. The FAO recommends a minimum of approximately 20 g of animal protein per person per day [46]. Assuming equal access throughout the year, the urban poor consume only 75% of the yearly ASF recommendation, while the wealthy consume 190%.

### BARRIERS TO INCREASING CONSUMPTION OF ANIMAL SOURCE FOODS

In Kenya's urban areas, food is available in both formal and informal marketing sectors, and acquired through cash transactions [29, 44, 45]. Because the market supplies 90% of food to Nairobi's slum population, low purchasing power is the major impediment to procuring ASF [47, 48]. Would policies that effectively reduce the cost of ASF to the urban poor increase consumption and, if so, what level of price reduction would be targeted to promote a desired level of consumption? The price elasticity of demand for a commodity measures how much more of that item will be purchased, and therefore consumed, given a percentage change in the price. Animal-source foods are generally shown to have high, but variable, price elasticities in low-income populations: small decreases in the price of meat and milk result in proportionately larger increases in their purchase. Price elasticities are determined by many factors, including household income, consumer preferences, and the availability and cost of substitutes [49]. The multifactorial price

**Table 1: ASF Expenditure and Consumption in Nairobi<sup>a</sup>**

	Lowest Income Quintile	Highest Income Quintile
Food Budget <sup>b</sup>		
Total Monthly Food Budget (Ksh) <sup>c</sup>	1,362	5,014
% Meat and Eggs (Ksh)	15% (203)	23% (1,170)
% Dairy (Ksh)	13% (176)	17% (856)
ASF Consumption <sup>b</sup>		
Beef and Chicken (kg)	15.3	41.7
Eggs (kg)	4.3	10.7
Dairy (kg)	4.3	9
% Dairy as Pasteurized Milk (kg)	51% (2.2)	70% (6.3)
% Dairy as Yogurt (kg)	0.5% (0.2)	12% (1.1)

<sup>a</sup>Data derived from references [29], [45, 46].

<sup>b</sup>Food budget and consumption values are per adult equivalent.

<sup>c</sup>Ksh = Kenyan shilling.

elasticity, then, varies substantially between and within populations. Using Nairobi household survey data, the demand for dairy and dairy products for the poor was shown to increase by 14.9% for every 10% decrease in price. For beef/beef products and poultry, the same decrease in price results in a 17.7% and 21.2% increase in demand, respectively [50]. Price elasticities often increase as incomes decrease, suggesting that price shocks impact consumption of all foods more for the poor [51]. The 2008 food price crisis, when the national food price index rose rapidly by 70%, was detrimental to the already tenuous food accessibility situation of the urban slums [50]. During the crisis, a 56% increase in the price of milk, for example, resulted in a 33% decrease in the purchase of milk in all of Nairobi [48]. High prices force many into hunger and induce coping strategies that exacerbate poor nutritional health outcomes- decreasing portion sizes, consumption of fewer meals, reduction of food diversity, and the purchase of cheaper foods that are often lower in nutritional value [52]. Given price elasticities, policies that protect the lowest income consumers from rapid food price increases and household economic shocks are likely to have disproportionately beneficial effects on ASF consumption and overall nutrition.

Likewise, if incomes were increased, would Nairobi's urban poor consume more ASF? Indeed, trends in household surveys indicate that consumption of ASF increases with greater income. Income elasticities calculate the impact of different levels of income on the demand of a commodity. Many ASF are broadly characterized as income elastic, but like price elasticities, are multifactorial and highly variable. Expenditure elasticities can be used as a proxy for income elasticities when income data are not available. Musyoka *et al.* (2010) found that in Nairobi, a 10% increase in total food expenditures was shown to result in 14.2% and 11% greater demand for poultry and beef, respectively, for the urban poor. To illustrate the impact of income, the same increase in income for wealthier Nairobi residents results in minimal changes in demand for poultry and beef [50]. These results support the notion that meat is a luxury good and considered inaccessible to those in extreme poverty. Importantly, similar studies in other areas of Kenya reveal different results in income elasticities for meat, as well as preference for different kinds of meat, reflecting the caution that must be applied when extrapolating elasticity results outside of the study population [53, 54]. Nonetheless, the data suggests

that consumption of ASF would increase with increased income. However, with roughly half of slum dwellers having unstable employment, and another quarter economically inactive, passive reliance on increasing incomes alone is unlikely to improve nutritional outcomes in the near-term [55].

Price and income elasticity studies can inform policy-making decisions that would increase consumption of ASF for the urban poor. More comprehensive and current studies are needed to understand how specific policies impact ASF consumption and the overall nutrition of the urban poor. In lieu of policy changes, a number of aid programs are essentially increasing demand of ASF by the urban poor through cash transfer and voucher programs. Cash transfers increase income to food insecure households while vouchers are spent like cash in markets where they are redeemed for food items. The application and outcomes of conditional cash transfers, those when cash transfer is contingent upon actions of the family to meet certain health or education requirements, are promising. These programs are showing increased school enrollment, more use of preventive health systems, and improvement of child health and nutrition [56]. In addition, conditional cash transfer programs in several countries were shown to improve caloric quality through dietary diversity and increased consumption of ASF. Outcomes on indicators of child nutrition have been less consistent, with some programs showing no difference in height-for-age, and others showing a significant difference [56]. A recent analysis of aid programs (non-conditional and voucher programs) in Nairobi's Mathare settlement found that maize, maize meal, and pulses were the most likely foods purchased with transferred cash or vouchers. Because the mean marginal propensity to consume a monthly 1,000 KSh per household cash transfer as food was only 0.32, the authors concluded that consumption needs for slum dwellers extends beyond food [47]. Thus, the urban poor enrolled in this program continue to purchase only basic, low-quality foods. Given the level of poverty and modest cash transfer, this result is unsurprising and underscores the need for 'generous' and 'well-structured' aid programs [56]. In addition, aid programs must be outcome driven so that objective impacts on child malnutrition, such as changes in stunting rates, can be adequately assessed.

Lastly, point-of-sale practices may exclude the urban poor from ASF. Markets where urban consumers purchase foods differ by socioeconomic status. The

poorest consumers rarely shop at large supermarkets for any of their ASF. This channel is frequented more as income increases, particularly for the purchase of eggs and chicken. These patterns pose an interesting cost dynamic, whereby the urban poor spend more per kg on eggs than the wealthy. This discrepancy is likely due to the discount afforded to wealthier consumers by supermarket chains for buying in bulk. Conversely, while the cost of chicken per kg among the income quintiles is fairly similar, the chicken purchased by the poor often comes from smaller retail outlets, where it is sold whole [44]. Because of the greater total cost of buying a whole chicken rather than smaller portions, the urban poor may be unable to regularly purchase this meat. For increasing consumption of ASF in the slums, the channels for obtaining food present a double-edged sword: undivided, or bulk foods, should encourage consumption by virtue of being less expensive per unit, but they also exclude those with limited purchasing power at any given time from routine consumption. Interestingly, consumers in all income quintiles purchase most raw and pasteurized milk from hawkers and dukas (small retail stores), respectively, where prices remain the same irrespective of socioeconomic status. Moreover, hawkers often provide door-to-door services with low prices, making it a convenient avenue across all incomes for the purchase of raw milk [45]. This indicates the potential for marketing and packaging solutions to promote improved access to ASF by the urban poor.

### ADDRESSING KNOWLEDGE GAPS

While there is strong evidence for the role of increased consumption of ASF in promoting maternal and child health, there are multiple gaps in our knowledge regarding the minimal levels of specific ASF required for healthy development in the nutritional and environmental context of crowded urban settlements. In addition, understanding which public policies and private market actions improve or jeopardize food security provide opportunities to implement change. While our discussion focuses on food insecurity in the urban settlements in Nairobi, these questions broadly apply to informal settlements facing poor nutritional health outcomes worldwide.

#### **What are the minimum amounts of ASF that suffice to prevent stunting, and what frequency should they be consumed?**

Few longitudinal studies have been done to answer this question. The Nutrition Collaborative Research

Support Program was an observational study in the 1980's that evaluated the diets of mothers and children in Kenya, Mexico, and Egypt. In one or more of the study sites, there were positive associations between pre-partum intake of ASF and neurobehavioral development of the infant. Positive correlations were also found with infant growth rates and maternal consumption of ASF while breastfeeding [57]. Another 2-year intervention study of Kenyan schoolchildren showed that the addition of a snack with 200-250 mls of milk per school day and a total of 240 kcal improved height in young children (<6 year olds) and already stunted children. The same study showed that the addition of 60-85 grams of red meat and a total addition of 240 kcal improved the children's cognitive and school performance, and increased the time spent doing physical activity at play [31, 32]. While the answer to "how much/how often" to prevent stunting, is quantitatively unknown, it is clear that even small amounts of ASF consumed 5-6 days per week and by pregnant and lactating mothers can improve the physical and cognitive development of her child. Research addressing this question is absolutely necessary for the implementation of cost-effective interventions that aim to improve child health outcomes through increased accessibility to ASF.

#### **How would a decrease in the cost of ASF impact consumption in the urban slums? How would an increase in income (real income or aid income) in the urban slums affect ASF consumption?**

Data analyzed from a 2003 Tegemeo Institute household survey in Nairobi indicates that ASF tend to have high price and income elasticities of demand for the urban poor [50]. Despite disaggregation by income, many household surveys fail to capture the situation facing those living in the informal settlements. First, slum populations are often under-sampled due to lack of legal recognition of informal settlements, deterrence by real or perceived high crime rates, and logistical problems resulting from fluid populations and the absence of household addresses or maps [2, 58]. Secondly, different settlements around Nairobi are ethnically and culturally heterogeneous, factors that impact the consumption of different ASF. Extrapolating data directly from one settlement to another may be poorly representative. Thus, understanding the price and income elasticities of demand for ASF in individual settlements remains an important knowledge gap. This economic data is necessary to inform and measure the impact of targeted policies and interventions that would increase consumption of ASF, such as food subsidy

and cash transfer programs. Such interventions must also be rigorously assessed with anthropometric surveys to determine the health impacts for families living in these environments.

### **What pro-poor point-of-sale marketing and packaging would encourage greater consumption of ASF by the urban poor?**

To increase consumption of ASF in the slums, it must not only be available, it also must be sold in quantities and avenues that make it accessible to those at greatest risk of undernourishment. Research regarding marketing and packaging strategies that aim to increase the purchase of ASF by the urban poor is lacking. This data would be beneficial two-fold; it would likely provide economic incentives for retail shop owners to reconsider how ASF is being sold, and in turn, improve accessibility and consumption of ASF for those living in the informal settlements. Educational interventions using this data should focus on retail shop owners in both informal and formal sectors, with the ultimate goal of improving the nutritional health and economic well-being of the population.

### **What is the contribution of enteric disease to stunting rates in the urban slums? Can ASF alleviate stunting rates despite repeated or constant exposure to pathogens?**

No discussion of childhood stunting in relation to nutrition would be complete without acknowledging the impact of the environment on growth outcomes. Infectious diarrheal disease and malnutrition have a synergistic relationship, whereby malnutrition predisposes a child to diarrhea, and recurrent diarrhea is a risk factor for malnutrition [59-61]. Compounded with dietary inadequacies, children in the slum environment are exposed to a number of pathogens due to the lack of waste management systems, limited access to clean water, and overcrowding. Diarrhea prevalence for children under three years of age in the slums is 20%, with 7% having hemorrhagic diarrhea. The prevalence of diarrhea with blood is more than double the national average, and more than 10 times that of Nairobi as a whole [62].

What is the contribution of diarrhea in the informal settlements to anthropometric measures of malnutrition? Numerous studies have demonstrated that children with repeat episodes of diarrhea are at greater risk for stunting [60, 63-65]. Growth failure is a consequence of energy and micronutrient deficiencies from impaired enteric absorption, inappetence, and

increased catabolism of nutrients. In turn, undernourished children are at greater risk for diarrhea from a weakened immune system and a dysfunctional gut mucosal barrier that protects against pathogens. Clearly, the reciprocal relationship between stunting and episodic diarrhea is difficult to escape in the urban slum environment. The role of subclinical enteric disease, or environmental enteropathy, on stunting rates is also relevant. Environmental enteropathy affects those living in areas with essentially constant exposure to enteric pathogens, and is characterized by chronic intestinal inflammation and blunting of intestinal villi. These pathologic changes result in aberrations in gut immunity and absorptive capacity, changes that may result in growth failure [66, 67]. A 2008 modeling study found that in the 36 countries where the majority of stunted children live, 99% coverage of existing nutritional interventions would result in only 35.5% reduction of stunting prevalence [68]. This model suggests that a significant proportion of stunting results from non-nutritional factors, such as clinical or subclinical enteritis, including environmental enteropathy. Disaggregating the impact of enteric disease on stunting, however, as opposed to the impact of undernutrition or malnutrition, is difficult. In environments of extreme poverty, such as the informal settlements, food insecurity is prevalent and the risk for pathogen exposure is high. Nevertheless, the use of ASF interventions to curb stunting prevalence has shown promise [32, 69, 70]. The number of reports describing such interventions is relatively small, thus ASF interventions were not specifically analyzed as part of 2008 study described above [68]. Moreover, improvements in gut function and intestinal histological changes have been demonstrated in cases of environmental enteropathy after supplementation with vitamin A, zinc, and glutamine, all of which are supplied by ASF [20, 66, 71]. While more evaluation must be done, this leaves open the intriguing possibility that the highly bioavailable nutrients and calories supplied by ASF may improve enteric function despite intense exposure to pathogens.

## **CONCLUSION**

Food insecurity is a chronic problem among the poor living in informal urban settlements and is manifested in persistently high rates of child stunting. The intergenerational and cyclic nature of factors associated with poor child nutritional health outcomes underscores the need for sustainable interventions. Addressing the knowledge gaps highlighted in this review will provide new opportunities to develop,

implement, and assess interventions, including market and policy changes, to enhance nutrition for the food insecure living within urban informal settlements. Despite these knowledge gaps, program managers and policy makers can increase consumption of ASF by implementing evidence-based interventions using current data:

- The urban poor consume inadequate amounts of animal protein due to an inability to pay for these commodities. Beef, chicken, eggs, and unpasteurized milk are the most commonly consumed ASF by poor populations in Nairobi. Thus, interventions and policies should be centered on improving accessibility to these foods, as they are available in markets where the urban poor frequent.
- Programs that aim to incentivize pro-poor marketing and packaging strategies for ASF will increase the purchase of these foods by the urban poor. Such strategies include selling smaller cuts of meat that retain the low cost of undivided, larger quantities. This approach will improve the market accessibility of ASF for those with low purchasing power.
- Econometric data suggests that decreases in the price of ASF disproportionately increases demand. Thus, policies that reduce market barriers for the poor, such as subsidy programs, encourage greater consumption of ASF by effectively reducing their cost. Subsidies also protect consumers from food price shocks that induce coping strategies detrimental to nutritional health. Likewise, policies that decrease the cost of ASF at any point in the food value chain, such as lowering import tariffs or consumer taxes, may positively influence the purchase of these foods by the urban poor.
- Income elasticity studies reveal that increases in household expenditure result in disproportionate increases in demand for ASF. Cash transfer and voucher aid programs can use this data to effectively increase income, resulting in greater consumption of ASF and improved nutritional health outcomes.
- Regulatory policies concerning ASF must be considerate of potential undesirable nutritional health consequences for vulnerable urban populations. The ban on raw milk sales, for

example, in the informal market may exclude the urban poor from consumption of liquid milk due to the increased cost of pasteurized milk. Similarly, policies that ban the use of antimicrobials in food animals may increase the costs of production, and be passed on to the consumer. While policies like these are well intentioned from a food safety standpoint, they may bring the unintended effect of worsening the food insecurity crisis in the urban slums by making ASF less accessible.

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