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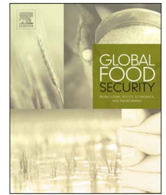

Reprint of "What will it take to accelerate improvements in nutrition outcomes in Odisha? Learning from the past"

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ABSTRACT

The Indian state of Odisha has made significant strides to address health and nutrition in the last 25 years. We used public data, policy and program documents, published literature, and interviews with program and policy decision-makers, development partners, civil society members (n = 29) and community members (n = 45) to analyze these changes. Factors that contributed to scale up of health and nutrition interventions and the food security program included overarching policy support, financing at the national and state level, leadership across sectors from government to civil society and development partners, capacity and stability of tenure of bureaucrats, and state innovations in service delivery interventions. Barriers that may impede further progress include lack of sanitation, low levels of women's education, early marriage in girls, livelihood distress, and uneven progress across social groups.

1. Introduction

The determinants and drivers of child and maternal health and nutrition are multi-faceted, and can be broadly summarized as immediate, underlying and basic (UNICEF, 1990). As a result, the process for analyzing the nutrition problem requires that we not only study these determinants, but also look at the policies and programs associated with them at the immediate and underlying levels where determinants such as feeding and caregiving, and safe and hygienic environment lie (Black et al., 2013; UNICEF, 1990) Enabling factors, such as the economic and political context, are also crucial for such analysis (Gillespie et al., 2013). However, few studies of progress on nutrition have carefully examined factors at multiple levels.

Odisha, an eastern Indian state with high levels of poverty, particularly among marginalized tribal communities, has had to face several difficulties such as widespread social disparities, natural disasters, and fiscal challenges. Improvements in nutrition outcomes in Odisha, however, have been similar to the all-India average, highlighting progress despite exposure to multiple challenges. For example, stunting among children declined steadily over time (Fig. 1). Among children below 3 years, stunting fell from 49% to 44% between 1998–1999 and 2005–2006 (compared with an all- India decline from 51% to 45%). Between 2006 and 2014, stunting declined from 45% to 38% among children under 5 years while the all-India decline was from 48% to 39%. Odisha's rate of decline in stunting is at least three times the decline in other states with similar levels of poverty such as Bihar (Raykar et al., 2015).

The decline in nutrition outcomes, however, has not been uniform in Odisha. In 2013, there were differences in the stunting prevalence between the scheduled tribes (STs) (46.1%) and other populations (25.3%) (Ministry of Women and Child Development, 2015). Similarly, inter-district differences also exist. In 2014-15, compared to coastal districts (e.g. Jagatsinghpur −24%), underweight among children below five years of age is higher in major northern (e.g. Mayurbang – 53.6%) and southern districts (e.g. Rayagada – 53.4%) (Odisha Technical and Management Support Team, 2015).

Although infant mortality rate (IMR) in Odisha is higher than the all India average, it has reduced significantly from 112 per 1000 live births in 1992–93 to 56 in 2013–14 (International Institute for Population Sciences, 1993; Ministry of Women and Child Development, 2015). Furthermore, Odisha has made improvements in delivering nutrition interventions and has been identified as a "positive deviant" in

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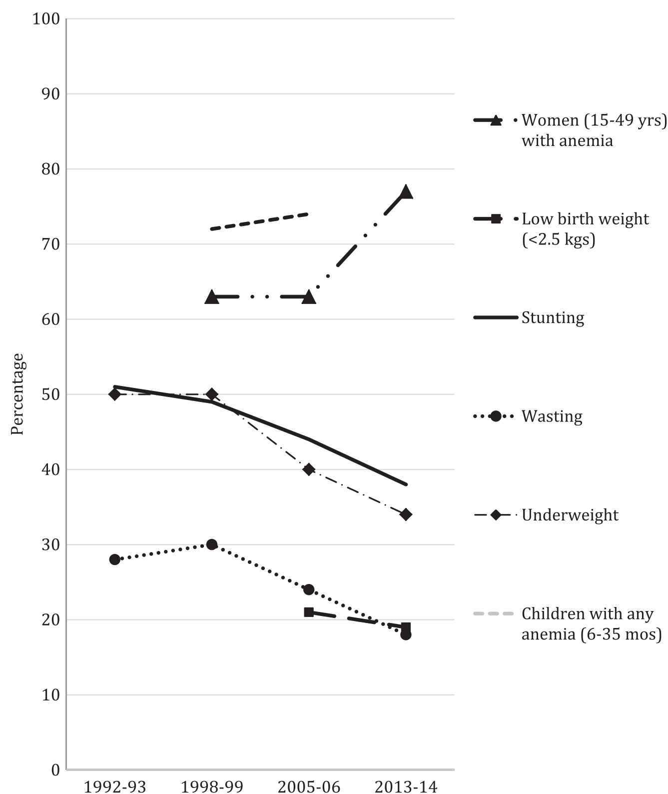

Fig. 1. Trends in nutrition and health outcomes in Odisha among women and children from 1992 to 2014. Stunting, wasting and underweight data are for children < 3 yrs except in 2013–14 when it is for children < 5 yrs. Data sources: Data sources: National Family Health Survey (1, 2 & 3); Rapid Survey on Children (International Institute for Population Sciences, 2005, 1993; Ministry of Women and Child Development, 2015); Clinical, Anthropometry and Biometry Census Survey 2014 (Census of India, 2014) for women's anemia status in 2013–14.

nutrition policy making (Thomas et al., 2015; Cavatorta et al., 2015; Ministry of Women and Child Development, 2015). The time is therefore ripe for a careful analysis of change over the years, to draw on lessons from the past, and examine how to address future challenges.

This study aims to expand the literature on drivers of change in nutrition and health outcomes in Odisha by examining changes in outcomes (e.g. stunting) alongside changes in the multiple determinants of nutrition (e.g. women's body mass index, poverty, sanitation), as well as changes in relevant state policies and programs. More importantly, we attempt to analyze drivers of change in these programs. Overall, drawing on multiple sources of data, we aim to reflect on what has worked and not worked for nutrition in Odisha, making recommendations on what can be done to accelerate further progress. Our analysis is only the second such exercise that examines subnational stories of change; one previous analysis of subnational change in India, in Maharashtra (Haddad et al., 2014), examined change over a shorter time period (12 years). We are not aware of a previous study that has conducted an inquiry on a long timeframe (such as 25 years, as we have done) on multiple dimensions in India. The lessons about what has worked for nutrition in Odisha are potentially transferable to other states in India and possibly even contexts outside of India.

2. Methods

To examine the extent of change in nutrition outcomes and determinants between 1990 and 2015, we developed a timeline of changes in the outcomes, determinants and coverage of policies and programs related to nutrition. This was complemented with interview data from policy stakeholders and community members to shed light on the reasons for change.

2.1. Timeline development

Multiple documents, data sources, and reports (Table 1**)** were used to construct a timeline of change in nutrition outcomes, determinants and program coverage over time. We drew on policy and program documents, civil society reports and the academic literature. Published literature was gathered using two search engines - Google Scholar and PubMed – and a set of specific search terms (Table 2).

Open-ended interviews were conducted with stakeholders from government (n = 16), including the Department of Health and Family Welfare (DHFW), the Department of Women and Child Development (DWCD), and the Department of Food and Civil Supplies, civil society/ NGOs (n = 9), and development partners (n = 4) to further expand understanding of the timeline of policy and program development and to understand the factors that influenced policy/program changes. Interviewees represented individuals who had served in government or had been involved in supporting government across as much of the study period as possible. All interviews were conducted in English and were either audio-recorded or documented via note taking. All transcripts were coded in *NVivo* 10.0 using a code-list based on the interview guide; codes were clustered into thematic areas and summaries were created of each thematic area. These were then used to draw insights on reasons for change in programs and policies.

2.2. Community-level interviews

We conducted semi-structured interviews with women (n = 25) and frontline workers (n = 20) from five villages in Kalahandi district, one of the districts with a high scheduled tribe population. Kalahandi was chosen to inform this study to leverage the authors' existing knowledge of the district (Avula et al., 2015) and its historical background of having received special attention from the state government following 'starvation deaths' (due to malnutrition and prolonged hunger) in 1996. Five villages were randomly selected from a sample of 100 villages from a previous study (Avula et al., 2015). In each village, 3–5 frontline workers (FLWs) were selected for interviews about changes in programs and their experiences in service delivery. Assisted by the FLWs, five women were sampled from each village, such that each one of them had a child who had been born between 1990 and 1995, 1995 and 2000, 2000 and 2005, 2005 and 2010, and 2010 and 2015. Women were interviewed about care and nutrition practices, use of nutrition and health programs for their children, and changes in community over time. Interviews were conducted in the local language, audio recorded, transcribed verbatim and translated into English. All transcripts were coded in *NVivo* 10.0 using a code-list based on the interview guide. In the analysis, thematic areas were organized to capture health and nutrition experiences in the first 1000 days, perceived changes in maternal and child care practices, use of services, and the social context.

3. Results

The results described below draw on a combination of data, literature, and stakeholder perspectives.

3.1. Change in immediate determinants of nutrition, and associated programs

Most immediate determinants of child nutrition improved over time (Fig. 2). Only low body-mass index among women did not improve between 1998 and 2014. Early initiation of breastfeeding increased dramatically over time as did exclusive breastfeeding, especially between 2005-06 and 2013-14. There was a sharp increase in the percentage of children with diarrhea who received Oral Rehydration Salts (OLS). Complementary feeding, both in terms of introduction and diversity, remains a major challenge (Fig. 2). As in the rest of India,

Table 1
Indicators and data sources to track progress of determinants of nutrition.

Determinant	Indicator /Interventions/programs	Data sources
Immediate	*Indicators* 1. Women's body mass index 2. Timely initiation of breastfeeding 3. Exclusive breastfeeding, 4. Timely initiation of complementary feeding 5. Incidence of diarrhea 6. Access to oral rehydration salts *Interventions* 1. Women received/bought iron folic acid supplements during pregnancy 2. Mothers who had 3+ ANC visits for last birth 3. Receipt and use of ICDS supplementary nutrition during pregnancy 4. Births in a health facility 5. Births assisted by a health professional in last three years 6. Receipt and use of ICDS supplementary nutrition during lactation (6 months after birth) 7. Children (12–23 months) fully immunized 8. Children (12–35 months) who received vitamin A dose in the last 6 months 9. Receipt and use of ICDS supplementary nutrition for children	National Family Health Surveys Rapid Survey on Children Annual Health SurveySpecial bulletin on maternal mortality in IndiaClinical Anthropometry and Biometry Census Survey
Underlying and basic	*Indicators* 1. Agricultural productivity of cereals and pulses 2. Monthly per capita food expenditure in rural areas 3. Proportion of people buying rice from PDS 4. Households with access to toilets 5. Households with access to safe drinking water 6. Female literacy 7. Women who received at least secondary education 8. Women married by age 18 9. Women in the workforce 10. Fertility rate 11. Poverty headcount ratio (i.e., percentage of people below the poverty line), based on analysis of the National Sample Survey and Tendulkar Committee Methodology	National Family Health Surveys Consumption Expenditure Surveys of the National Sample Survey Organization Odisha Economic Surveys

Table 2
Desk review search results.

Programs	**Search terms**	**Google scholar sources used (screened)**	**PubMed sources used (screened)**
ICDS	"ICDS"; "ICDS" AND "India"; "ICDS" AND "Odisha"/"Orissa"; "ICDS" AND "Odisha"/"Orissa" and "nutrition"	10 (27)	7 (206)
Mission Shakti	"Mission Shakti"; "Mission Shakti" AND "India"; "Mission Shakti" AND "Odisha"/"Orissa"; "Mission Shakti" AND "Odisha" /"Orissa" AND "nutrition"	6 (21)	0 (21)
NHRM	"NRHM"; "NRHM" AND "India"; "NRHM" AND "Odisha"/"Orissa"; "NRHM" AND "Odisha"/ "Orissa" AND nutrition	1 (10)	3 (188)
PDS	"Public Distribution System"; "Public Distribution System" AND "India"; "Publish Distribution System" AND "Odisha"/"Orissa"; "Public Distribution System" AND "Odisha"/"Orissa" AND "nutrition"	9 (27)	0 (125)
Total		26 (85)	10 (540)

nutrition and health interventions in Odisha are delivered through two national programs: the Integrated Child Development Services (ICDS) and the health/National Health Rural Health Mission (NRHM). The ICDS program delivers its services through village-level centers called the *Anganwadi centers.* Coverage of interventions delivered by both of these programs has improved substantially over time. The political commitment to reducing health inequities and effective implementation of health sector reforms improved the delivery of interventions to all the social groups (Thomas et al., 2015). Improvements are prominent especially in antenatal care, institutional deliveries and assisted births, immunization, vitamin A supplementation, and in ICDS services like food supplementation (Fig. 3**)**. However, despite the increased coverage of ANC, use of iron-folic acid (IFA) supplements decreased over time, especially between 2005 and 2014. Despite statewide improvements, emerging data at the district level in the last decade emphasize variations in performance between districts (e.g. exclusive breastfeeding rates among children in Angul is at 15.9%, compared to 70.9% in Kandhamal (Census of India, 2013).

Malaria continues to be a public health problem in Odisha, with the state contributing to 20% of India's burden of malaria cases in 2010 and the risk continues to be higher in remote, rural, tribal areas due to operational difficulties (NRHM n.d.). However, there has been a decrease in the incidence of malaria from 10.82/1000 to 5.28/1000 between 2003 and 2013 (Pradhan et al., 2016).

3.1.1. *Scaling-up of health and nutrition interventions in Odisha*

Our analysis of the stakeholder interviews, in particular, provides several insights into the factors that contributed to effective scale-up of a set of core health and nutrition interventions (outlined in more detail in (Menon et al., 2016)). Odisha's low ranking on IMR, intense human rights commission monitoring of starvation deaths in districts with a high population of scheduled tribes along with intense media coverage in the 1990s catalyzed actions for scaling-up key health and nutrition interventions, with stated goals to reductions in mortality and fertility rates. Several stakeholders indicated that the chief minister's enabling leadership provided "bureaucratic space" that enabled operations,

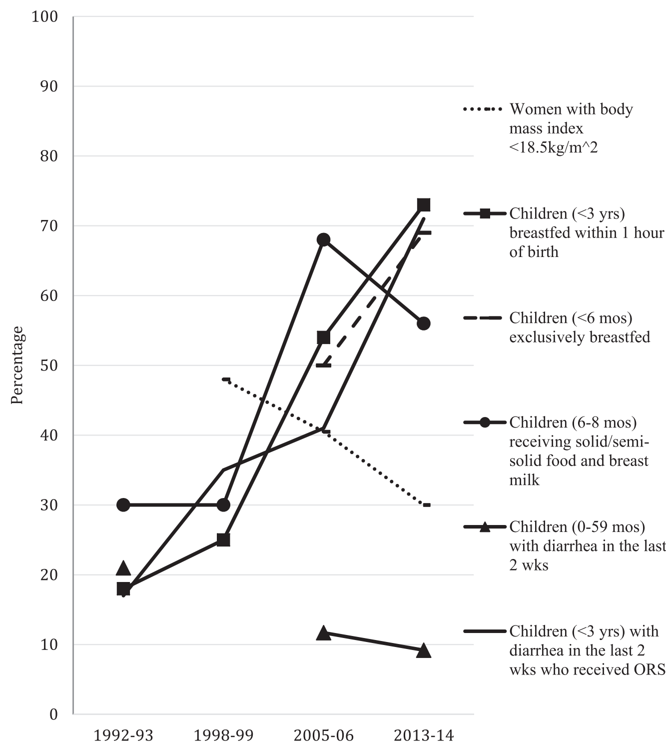

Fig. 2. Trends in determinants of nutrition in Odisha among women and children from 1992 to 2014. Missing connectors between data points indicate unavailable data for that time period. The data for 2013–2014 on children breastfed within 1 h is for children < 2 yrs instead of < 3 yrs; The data for 1992–93 on children with diarrhea in the last two wks is for children < 4 yrs instead of < 3 yrs; The data for 2013–14 on children with diarrhea in the last 2 wks who received ORS is for children < 4 yrs instead < 3yrs. Data sources: National Family Health Survey (1, 2 & 3); Rapid Survey on Children (International Institute for Population Sciences, 2005, 1993; Ministry of Women and Child Development, 2015), Clinical, Anthropometry and Biometry Census Survey 2014 (Census of India, 2014). For women with BMI < 18.5 kg/m^2 in 2013-14 data is from.

innovation, and learning. Appointment of well-qualified bureaucrats and individuals who took ownership of the vision for improving mortality rates facilitated implementation of the programs. An unusual degree of electoral stability for the political party in power (see Box 1) allowed several reforms in health and nutrition programs to continue uninterrupted. Bureaucrats were assured adequate tenure in their positions, allowing them to amass knowledge, and to experiment with, learn from, and take credit for innovations in program implementation. As illustrated by one respondent: "*Political stability has led to administrative stability, and the Chief Minister normally likes to give a tenure to every office be it a secretary or a collector. They are not frequently changed, and this provides an opportunity to dig in and do their work*". Our analysis of the tenure of bureaucrats shows that between 2005 and 2015, a period where several changes took place in the ICDS program, at least three bureaucrats headed the DWCD and each had served for as long as four years. Similar trends of bureaucratic stability were observed in the DHFW as well. One respondent contrasted this trend in Odisha with other states and said, *"in other states, district collector transfers are very fast, but in Odisha you have to plead to be taken out."* Finally, during 2000-06, state-level financial restructuring facilitated fiscal space for social sector programs in Odisha (The World Bank, 2008). In 2004–2005, increased national financing for social sector programs and direct state budget support to Odisha from DFID together helped assure diverse sources of funding to implement national programs, deploy state-level initiatives and innovations, and to strengthen technical support to the health and nutrition programs in Odisha.

Overall, therefore, a combination of changes mandated under the national framework, and state-led innovations and support for convergence between NRHM and ICDS programs, contributed positively to scaling-up. The expansion of the ICDS through additional *Anganwadi centers* **(**Fig. 4**),** hiring of new frontline workers under NRHM and expansion in the number of women's self-help groups together led to greater availability of delivery platforms. Stakeholder interview suggested that training arrangements were strengthened and harmonized, frontline worker and supervisor recruitment was made transparent, and a state policy to hire women as ICDS frontline and supervisory staff was said to have led to greater motivation. Finally, several development partners were noted to have supported the health and ICDS programs. The United Nations Children's Fund (UNICEF), the Department of International Development (DFID), and the United Nations Office of Project Services (UNOPS) provided technical and financial assistance to both programs, the World Bank supported the expansion of ICDS projects in the 1990s, and CARE invested in strengthening health and ICDS delivery systems through its Integrated Nutrition and Health Program (1996–2001 and 2001–2005). From the mid-2000s, the DFID-supported technical support team supported both programs and in-

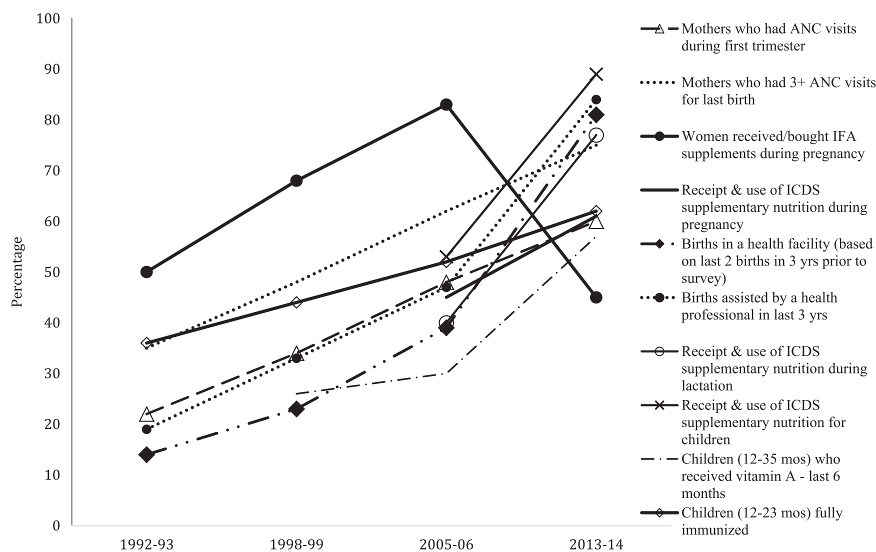

Fig. 3. Trends in nutrition specific interventions in Odisha targeting women and children from 1992 to 2014. Missing connector between data points indicates unavailable data for that time period The data point for the indicator on children receiving vitamin A in the previous 6 mos, for the year 2013–14 has been calculated for children aged 6–59 mos instead of 12–35 mos. Data sources: National Family Health Survey (1, 2 & 3); Rapid Survey on Children (International Institute for Population Sciences, 2005, 1993; Ministry of Women and Child Development, 2015).

Box 1
Stability of politics and strengthening of governance in Odisha.

Odisha has had a stable government over the past decade with the regional party, the Biju Janata Dalhaving served three consecutive terms. Before the rise of the BJD in 2000, the Indian National Congress (INC) alternated power with the Janata Dal, the latter was last in power between 1990 and 1995. During the last period of power for the INC, from 1995 to 2000, the BJP rose to both national and the state-level prominence. In 1998, Janata Dal and BJP together formed a new regional party called *Biju Janata Dal* (BJD), which came to power in 2000. Data from the National Election Study 2004 indicate that a majority of the respondents in Odisha feel that the period of the BJP-BJD coalition saw marked improvements in law and order, condition of roads, drinking water, primary education, and electricity (Misra, 2004). Many attribute the BJP-BJD popularity to the Chief Minister fronting the coalition, Naveen Patnaik (Misra, 2004). In 2009, the BJD broke off its partnership with BJP, formed new allies and went on to further electoral success under Patnaik. The BJD's repeated successes have led to a long period of political stability that has itself has been interpreted as having offered the state the opportunity to innovate around policy and programs that support the social sector. State innovations such as the women's self-help group program, highly subsidized rice in the PDS and the scaled up maternity cash transfer program, and a strong performance in the ICDS, are, in turn, also noted to have been helpful in winning elections. However, the party's tenure in power has not been without controversy, with the state's thrust towards development, including policies favoring land requisition for major extractive industrial projects, having disproportionately dispossessed vulnerable Scheduled Tribe populations from their land and livelihoods (Ambagudia, 2010). Avoiding further cumulative entrenchments of economic disparity amongst the state's excluded poor has previously evaded state developmental efforts on a broad scale (Haan and Dubey, 2005; Misra, 2004), though Patnaik's clean image and popularity has served the BJD well in maintaining political power to date (Misra, 2004).

vested in data and documentation systems. DFID's financial support to the Odisha government for the health and nutrition sector was substantial – 99 million UK pounds over an eight year period between 2008 and 2015, The model of spending included direct budget support to the Odisha government as well as funding to a technical support unit that worked closely with the government (Department for International Development, n.d) Civil Society and NGOs in the state have also been credited with raising people's awareness about health and nutrition program guidelines and for having conducted social audits of ICDS that have been helpful to the state.

Some key innovations over time (see Fig. 4 **for a full set of changes over time**) included the following:

- The launch of the IMR Mission in 2001 to reduce IMR (Department of Health and Family Welfare n.d).
- Malaria chemoprophylaxis during pregnancy introduced under the IMR mission as a strategy to reduce IMR (Department of Health and Family Welfare, 2004)
- The Odisha Health Sector Plan in 2005–2010, which included a fixed day approach to deliver Vitamin A and the Health Equity Strategy (Health and Family Welfare Department n.d)
- Between 2012–2013, long lasting insecticidal nets were distributed in high risk areas in 26 districts; *Mo- Mashari* (my bednet) program was launched for pregnant women (NITI Aayog, 2015).
- A long-standing focus on identifying and providing solutions for moderately and severely malnourished children, started with a campaign in 1991, a positive-deviance focused program in the late 1990 s *"Ami Bhi Paribu"* ("we too can") (Agnihotri, 1999) and continued through to present times with guidelines in 2009 for screening and referral of severely malnourished children under five on a designated day in a month (*Pustikar Diwas*). Stakeholder interviews suggested that more recently, Odisha has also been

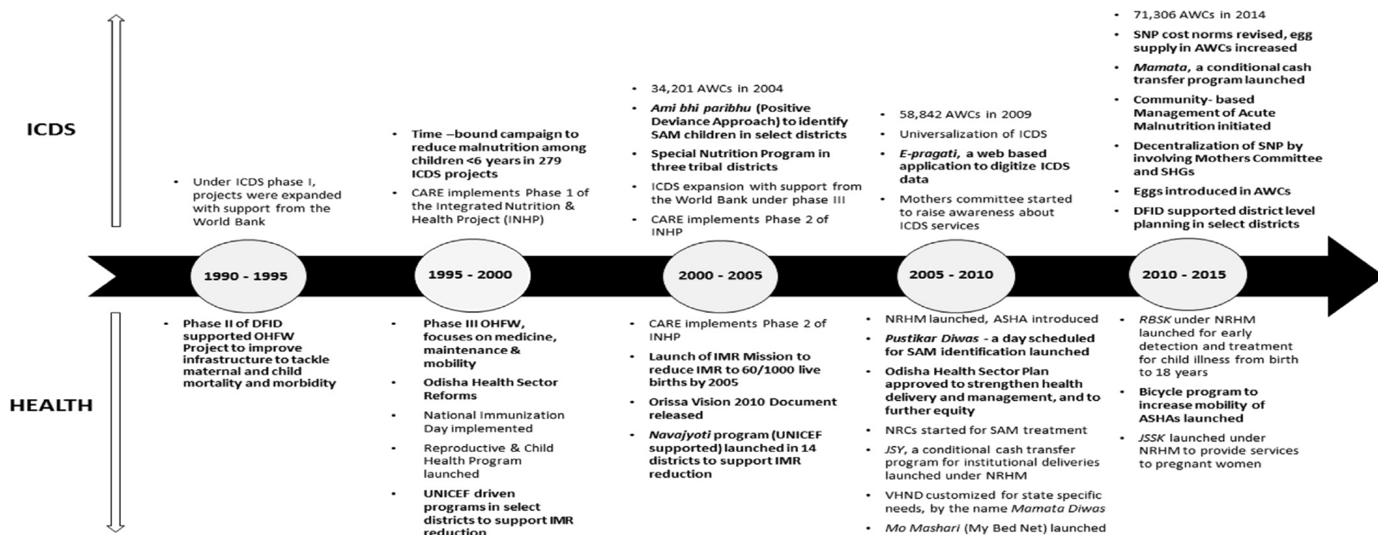

Fig. 4. Timeline of ICDS and health interventions in Odisha from 1990 to 2015. The text in bold indicates state-led initiatives. ICDS (Integrated Child Development Services); SAM (Severe Acute Malnutrition); SNP (Supplementary Nutrition Program); IMR (Infant Mortality Rate); CARE (Cooperative for Assistance and Relief Everywhere); UNICEF (United Nations Children's Fund); DFID (Department for International Development); JSY (Janani Surakshya Yojana); NRHM (National Rural Health Mission); VHND (Village Health Nutrition Day); JSSK (Janani Shishu Suraksha Karyakram); RBSK (Rashtriya Bal Swasthya Karyakram). Data sources: ICDS (Agnihotri, 1999; Agricultural Finance Corporation Limited n.d.; CARE India, n.d.; Department of Women and Child Development, 2013, 2012a, 2012b, 2009; Ministry of Women and Child Development, n.d.; NITI Aayog, 2015; Odisha Technical and Management Support Team, 2012; Planning Commission n.d.; The World Bank, 2006; Women and Child Development Department, n.d.; World Bank, 1990); Health: (Agnihotri, 1999; CARE India, n.d.; Dash and Mishra n.d.; Department of Health and Family Welfare, 2009, Goverment of Odisha and DFID, 2012; Gupta, 2002; Health and Family Welfare Department, 2003; Ministry of Health and Family Welfare, 2013; Technical and Management Support Team, 2015).

experimenting with community-based models for treatment of Severe-Acute malnutrition (SAM).
- Compliance with Supreme Court directives to decentralize food procurement for the supplementary nutrition program under the ICDS by engaging women's self-help groups under Mission *Shakti*. This was facilitated due to the presence of the Mission *Shakti* program in the same department as that of the ICDS.
- The introduction of eggs in *Anganwadi* centers in 2011.
- State-wide scale up of a state led program called *Mamata* ("motherhood") for conditional cash transfer for pregnant and lactating women. The scheme has several conditions such as attending counseling at AWCs and getting the child fully immunized (Women and Child Development Department, n.d.).

Over time, therefore, Odisha has progressed from focusing on reducing maternal and child mortality to a more holistic approach towards maternal health, nutrition and child development. The literature, data, and stakeholder interviews together indicate that although challenges continue to emerge on various fronts, including ongoing deaths related to malnutrition and hunger in remote areas and several health-sector challenges, Odisha has demonstrated significant positive commitment and system-wide actions to scale-up health and nutrition interventions. These changes are well- recognized at the community level as well (Box 2).

3.2. Change in underlying and basic determinants of nutrition and in associated programs

Improvements in the underlying and basic determinants was mixed. Between 1990-91 and 2008-09, cereal and pulse productivity in Odisha increased from 992 kg/hectare to 1249 kg/hectare, primarily driven by the former (Department of Agriculture and Farmers' Empowerment n.d). As in the rest of India, pulse productivity in Odisha has declined since the early 1990s. A key response to challenges related to livelihoods and hunger has been the Public Distribution System (PDS) in Odisha, access to which was scaled-up significantly over the years as is seen in Fig. 5.

Other underlying drivers such as safe drinking water improved between 1991 and 2014 (Fig. 5**),** but adequate sanitation continues to be a problem, with access to toilet facilities at only 17% in 2014 and open defecation rates at 78%. Similarly, although poverty in Odisha declined between 1994 and 2011, it still remains high at 33% (Fig. 5). Also, inequalities within the state persist with large disparities among social groups in several development outcomes such as percentage of women receiving attention during pregnancy, access to education and income (Haan and Dubey, 2005) The per capita net state domestic product, a measure of economic performance, saw a small increase between 1992-93 and 1998-99 from 10,887 INR to 12,898 INR, but saw greater increases in 2004-05, when it stood at 17,650 INR and again in 2013-14, when it went up to 25,891 INR (figures calculated at constant prices (2004-05)) (Government of Odisha, 2014a). Odisha still lags behind the national average and behind several states in the per capita net state domestic product. Furthermore, factors such as women's education, age at marriage, and women's decision-making power that have a direct bearing on maternal child health, remain challenges in Odisha. Female literacy improved over time (from 35% in 1991 to 64% in 2011) as did the proportion of women with secondary school education (from 19% in 1998-99 to 33% in 2011-12) but levels are still low. Nearly a third of women are still married by age 18 (Fig. 5) and less than 50% of women usually participate in household decisions.

In this landscape of challenges related to the underlying and basic determinants of nutrition, we examine the changes in programs and policies below, as well as stakeholder perspectives of possible reasons for the mixed successes.

3.2.1. Agriculture and livelihoods: Challenge areas for Odisha

The State Agriculture Policy (1996), national level policies, and several incentive-based programs have provided the overall policy support for agriculture (Government of Odisha n.d; Agriculture Department n.d.; Agriculture Department, 2014). State-specific actions

Box 2
From the ground up: Community perceptions of change.

Odisha's investments in policies and programs to improve health and nutrition, infrastructure, and the food security program are well reflected in the perspectives of the community. Government support for pregnant and post-partum women and children was perceived to have improved, notably in healthcare and community infrastructure. From no services available in the early 1990s, mothers started to utilize services at the *Anganwadi Center* in the late 1990s. The introduction of ASHAs (FLW under the Health system) in 2005 was seen as the most significant change with regards to receiving support, care and advice at the local level. Provisions/funding have also increased over time for pregnant and post-partum women and their children with various foods coming in via the ICDS and cash incentives via the health system.

A significant shift in the last two decades has been in the primary sources of information, as women have moved from receiving advice exclusively from family members (most notably mothers-in-law), other villagers and local leaders to a combination of family members, FLWs (Anganwadi workers and ASHAs) and doctors. Another major change has been the rise of institutional deliveries. Introduction of the ASHA, incentives for institutional deliveries, greater access to roads, free medical services, and increased awareness were noted to have facilitated demand-generation and access to care.

Changes have been observed in new-born care practices, such as delayed bathing. Breastfeeding practices, however, have not improved. Although the practice of discarding colostrum has become less, prelacteal feeding and use of breastmilk substitutes continues. Although family members continue to be important sources of information, from the late 1990 s, FLWs and television have become important sources of information for child feeding. Complementary foods have been typically introduced close to 6 months with low food variety. In recent years, there is more use of food supplements provided by the government.

For care during illness, the use of home based remedies and traditional healers continued. But use of hospitals and health centers increased in the late 2000s, on account of having access (e.g. roads, vehicles, knowledge) and receiving free medical services. Overall, there exists a general sense of well-being and improvement in the quality of life in villages. Increased access to water and fertilizers has led to an increase in the crop yield but concerns about the health hazards of fertilizers were raised. Government programs such as the Public Distribution System, the National Rural Employment Guarantee Program and the Old Age Pension Program were perceived to have contributed to poverty reduction. Nevertheless, open defecation and general cleanliness in villages were perceived to have not improved. The caste system and threatened access to indigenous varieties of food were seen as impediments to further improvements in the village. Infrastructure, notably roads and drinking water facilities, have improved, though the quality of water remains questionable.

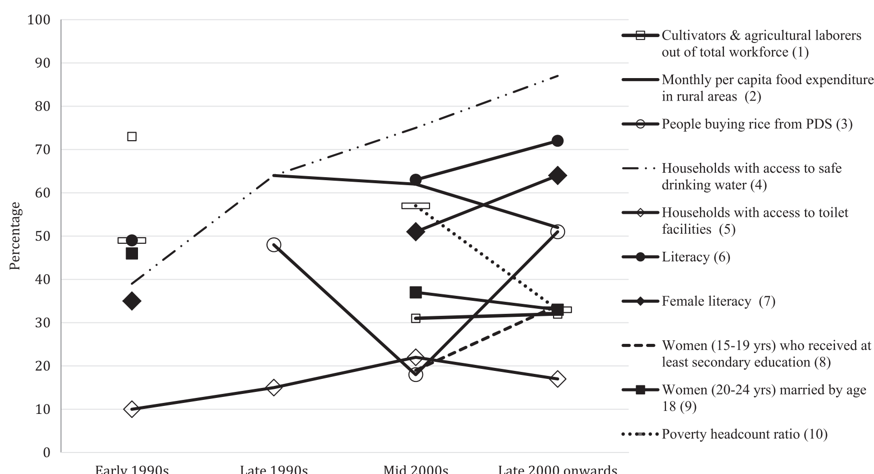

Fig. 5. Trends in coverage of nutrition sensitive indicators in Odisha. Missing connector between data points indicates unavailable data for that time period. Data sources: Odisha Economic Survey 2013-14 (1991, 2001, 2011) [1]; Odisha Economic Survey 2013–14 (2000, 2004–05, 2011) [2], Calculated from Consumption Expenditure Surveys of the National Sample Survey Organization, Rounds 55,61 and 68 (1998–99, 2004–05, 2011) [2 & 8], Odisha Economic Survey 2013–14 (1991, 2001, 2011) [4]; Statistical Abstract India 2003 (1991, 2001, 2011)[5]; Odisha Economic Survey 2014–15 (1991, 2001, 2011)[6], Odisha Economic Survey 2013-14 (1991, 2001, 2011) [7]; National Family Health Surveys (1992–93, 1998–99, 2004–05) and RSOC (2013–14)[9], Odisha Economic Survey (1993-94, 2004–05, 2011) [10].

such as *Pani Panchayats* (1999), a community led collective, and the Orissa Rural Livelihood Program (2007), boosted irrigation in the state (National Portal Content Management Team n.d). These appeared to have supported improvements in crop production. However, even though Odisha won the Government of India's *Krishi Karman* Award for highest agricultural productivity in the country consecutively for 3 years (2013-15), many of our state-level respondents felt that farmers continue to struggle to make a decent living in agriculture due to threatened access to land. It was noted that the lack of land tenure rights and the purchase of land by large corporations is a challenge to agriculture and has likely led to out-migration in the state. Some interviewees noted that scheduled tribe communities who have been historically dependent on forests for livelihoods and on indigenous crops for their livelihood have now become increasingly dependent on the state for food due to increasing loss of access to land and forests. A 2008 UNDP report that examined land reforms in the state (e.g. the 1960 Orissa Land Reforms Act, intended to give land rights to tenants) and land-related legislation and distribution efforts (e.g. the 1974 Land Ceiling Act, the 2006 Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act), came to similar conclusions. Despite these initiatives, it found that landlessness continues, including in areas with high percentage of tribal population. Significant concerns remain with regards to, for example, transfer of agricultural land to non-agricultural land, absence of land records, lack of mandatory consent for the transfer of forested land to non-forest purposes (e.g. mining), shift from food crops to cash and non-food crops and associated decrease in traditional varieties of cereals, millets and pulses (UNDP, 2008). As a last point, interviewees also noted that much job creation in the state has been from services and capital-intensive industries, and that the state should therefore invest in labor-intensive industries as well.

3.2.2. Program for food security: Strengthening the public distribution system

The deaths due to malnutrition and prolonged hunger in the 1990s and early 2000s propelled several actions to improve and streamline the Public Distribution System (PDS), India's primary food security program, under the Orissa Public Distribution System Control Order of 2002, along with the formation of Vigilance Committees to oversee PDS functioning. In addition, the following developments facilitated improvements in the PDS operations:

- In 2003-04, procurement of rice was decentralized; an act intended to reduce transit costs and to ensure maximum price benefits to the farmers (Odisha State Civil Supplies Corporation, n.d.).
- Highly subsidized rice was introduced (INR 2 per kg) in 2008 and again in 2013 (INR 1 per kg) (Wadhwa, 2009).
- PDS supply chain was computerized in 2008 with assistance from DFID (Odisha State Civil Supplies Corporation, n.d.).
- Mobile vans were used to ensure PDS commodities reached remote areas (Government of Odisha, 2004).
- A dedicated committee, assigned by the Supreme Court, submitted a report on leakages in the PDS in the state in 2009, which helped identify gaps for the state to address (Wadhwa, 2009).
- With systems in place, Odisha began implementing the National Food Security Act (2013) in 2014, providing subsidized food grains to almost two thirds of the population (Balani, n.d.; Food Supplies and Consumer Welfare Department n.d; Kumar et al., n.d.)

Odisha's success in the PDS rollout was attributed to several factors that aligned with those identified for scaling up the health and nutrition programs. The starvation deaths recorded in select districts with high proportions of schedule tribe population are said to have spurred initial action to improve food security measures in the state, including universalization of PDS in some of these districts (Khera, 2011). With intent to tackle hunger and the realization that electoral gains might also be won, the functioning of PDS was strengthened and additional subsidies for rice introduced, both with backing from the chief minister. As with health and nutrition provision, the PDS, is also known to have been led by well-qualified and committed bureaucrats. Support from development partners was acknowledged to have helped, especially with the computerization of the supply chain and an attempt to institutionalize the use of biometric PDS entitlement cards in one district. The civil society-led Right to Food Campaign in Odisha was perceived to have strengthened PDS operations via community monitoring and social audits. To make improvements in the implementation of PDS, Odisha is known to have drawn lessons from Chhattisgarh's operational model. Chhattisgarh's success in implementation of PDS has been well documented (Krishnamurthy et al., 2014). A recent study has also found that rice subsidies do not negatively affect dietary diversity in Chhattisgarh (Kishore and Chakrabarti, 2015).

3.2.3. Sanitation: A story of limited change

Odisha operates under the national policy frameworks for drinking water and sanitation programs. For drinking water, the National Rural Drinking Water Program provided the policy guidance for drinking

water supply to the rural areas. Subsequent changes in the national programming guidelines that stipulated the minimum distance of the water source from households and emphasized water quality were taken up in the state, as in the rest of India, leading to positive changes in availability of water (Fig. 5). In the case of sanitation, Odisha focused on implementing programs included in the national framework, such as the Central Rural Sanitation Program (focused on toilet construction), which has been in operation for many decades, and later the Total Sanitation Campaign in 1999 that aimed to focus both on community-led toilet construction and awareness creation. However, the target of 7,056,648 individual household latrines has not been achieved (Government of Odisha, 2014b) and Odisha's efforts on sanitation have yielded limited impacts (Roy, 2012). Unlike health and nutrition programs and the PDS, it appears that state-level innovations and directives were limited in sanitation, as was political leadership. Despite the fact that several development partners (World Bank, UNICEF, DFID, Danish International Development Agency (DANIDA), WaterAid) had played a role in supporting the implementation of sanitation programs, it was noted that the bureaucratic complexity of the positioning of sanitation within a department focused mostly on road infrastructure led to limited impacts.

Neither of the national program approaches are perceived to have been successful because of an overemphasis on building toilets rather than identifying ways to trigger the necessary behavior change. The *Swachh Bharat Abhiyan*, a recent national level initiative, is intended to address existing gaps but little is known about its impact. Under the National Rural Health Mission, the state set up its own Village Health and Sanitation Committee structure, called the *Gaon Kalyan Samiti*, to promote good hygiene and sanitation practices amongst adolescent girls and mothers. This is perceived to be somewhat promising, but there is no evidence of impact. Interviewees indicated that a notable reason for the lack of success was that since sanitation was located under the department of rural development, it always took a back seat to road construction, also located within the department of rural development.

3.2.4. Women and gender: Not enough to address major nutritional drivers

Odisha invested in improving women's status mainly through programs to create and support women's self-help groups (SHGs) and through targeting pregnant and lactating women with cash transfers. In 2001, a program called Mission *Shakti* was launched under DWCD to set up women's self help groups (WSHGs (CARE and Department of Women and Child Development, 2005). The program was deemed generally successful and is known to have exceeded it's target of 200,000 WSHGs by 2008 (CARE and Department of Women and Child Development, 2005). Women in SHGs have primarily invested in small-scale farm and non-farm activities, collaborated with government departments, and managed PDS stores. These SHGs are also thought to have played a key role in health promotion, encouraging institutional deliveries, hygiene and sanitation, and monitoring ICDS program implementation (Patnaik, 2012).

Other state-led initiatives for women and girls include a conditional cash transfer program for maternal and child well-being (*Mamata*), hostels for girls to promote education among girls from scheduled tribe communities, ensuring women's rights through mandating registration of land and home under woman's name along with her spouse. Many respondents felt that the emphasis on women's empowerment programs in the state were led by the DWCD through programs such as Mission *Shakti* and *Mamata.* Here too, the Chief Minister was perceived by interviewees to have been interested in supporting these efforts related to women's empowerment, possibly as a legacy of commitments made by his late father, *Biju Patnaik* (former Chief Minister of Odisha).

Despite these efforts focused on women's financial participation and empowerment, it appears that the main women's status related determinants of nutrition, i.e. early age at marriage and women's secondary education, have not changed substantially over time and have not been explicitly addressed by the state.

3.2.5. The role of improved infrastructure

A final area of development that respondents highlighted in the context of Odisha's development was infrastructure development. Overall, respondents noted that road connectivity has improved in the state due to programs such as *Pradhan Mantri Gram Sadak Yojana,* a central scheme, for all weather rural road connectivity and the *Biju Setu Yojana*, a state level scheme launched to bridge missing links in existing roads. In addition, local governance institutions like the *panchayati raj* institutions have prioritized road connectivity over the past 5 years (2010–2015), and untied funds from the Government of India were used to build concrete roads. However, some respondents expressed skepticism about the motivation for building roads, as roads were built primarily in areas where they were needed for timber or mining industries. *"For the state, building roads is good because expenditure is quick and you can show results"*, said one respondent.

Last, but not least, some respondents highlighted electrification as another key state infrastructural investment across sectors. Odisha first experimented with privatization of generation and distribution of power in the mid-1990s and was the first state selected for power sector reforms. While Odisha's performance has been impressive with regards to power generation (even boasting a power surplus), challenges remain with its distribution. Further improvements are needed in quality (voltage, power cuts) and coverage (i.e., despite infrastructure such as electrification poles being in place, electricity is yet to reach many villages).

In summary, despite efforts to strengthen agriculture, food security and infrastructure, several underlying and basic determinants of nutrition, especially poverty, inequality, livelihood distress accompanied by threatened access to land, sanitation, early marriage and women's education, remain significant challenges in Odisha. These challenges are also well recognized and highlighted in the community-level interviews (Box 2). Policies and programs to address these determinants have not yet delivered significant improvements over time.

4. Discussion

Our study is one of only two studies, the other being the Maharashtra case (Haddad et al., 2014), that explicitly examines state-level changes in nutrition, using multiple data sources and a mix of qualitative and quantitative methods. We find that Odisha's investments, especially in recent years, in the health, ICDS and PDS programs have yielded significant dividends in terms of program coverage and shifts in immediate determinants of nutrition. At the same time, we identify several areas of challenge for nutrition as Odisha looks forward: early marriage and girls' education, sanitation, poverty and livelihoods. We summarize below what has worked, and what has not, and go on to highlight some critical issues for further examination.

What has worked? Over the last 25 years, Odisha has managed to make improvements in most health and nutrition outcomes and immediate determinants of nutrition. This was enabled mostly by the expansion of nutrition-specific interventions and programs and to some extent the Public Distribution System. Odisha has clearly seen high-level support for these programs. Analysis of both the desk review and stakeholder interviews points to several factors that have led to the scale up of these programs. These include a vision for impact, using multiple operational platforms for delivering interventions, diverse catalysts of change including collaborations with committed development partners, diverse pathways for scaling up, gradually building up strategic and operational capacities, adequate financing, enabling policy environment including political and bureaucratic leadership, and a culture of measurement and learning. The goal of reducing infant mortality rates in the mid-90s and 2000s was a significant contributor to scaling up several key actions such as antenatal care, immunization, as was a focus on reducing severe malnutrition. Between 2006 (International Institute for Population Sciences, 2005) and 2014

(Ministry of Women and Child Development, 2015) there has been an increase in the coverage of antenatal care (62% to 75%) and immunization (52% to 62%). Our study also identifies the relevance of factors such as road connectivity, availability of water and state's commitment to gender issues, and political stability. The changes brought about in health and nutrition related policies and programs and certain underlying and basic determinants are well-reflected in the community stories summarized in Box 2. Mothers and frontline workers confirm the changes in the last two decades in care-seeking behaviors, access to care, availability of services, and increased demand for awareness of services. They attribute these changes to overall improvements in the quality of services and incentives for using the services, and improvements in road connectivity and availability of water.

What has not worked? Despite these gains in outcomes, gaps still remain with regards to complementary feeding, screening for severe malnutrition, and iron folate supplementation in pregnancy (which is actually declining). These gaps need be closed to enable full delivery of all critical interventions to all women and children in the state. The trends in the underlying and basic drivers of nutrition improvement are mixed. Gains in agricultural productivity and improvements in the performance of the Public Distribution System are positive for food security, but the access to land and decreased ability to grow traditional crops by schedule tribes are areas of concern. Improvement in women's literacy is positive, as is the political support behind set up of programs like Mission *Shakti* and *Mamata,* but girls' early marriage and secondary education are still big concerns in Odisha. Significant investments have been made to improve infrastructure such as roads and rural electrification but questions have been raised about the quality and coverage of rural electrification. The area of glaring weakness is the extremely low access to improved sanitation, an issue that is very slowly being elevated to high levels of political awareness and commitment. Lower than average performance compared to all India in economic growth, poverty reduction and income inequality is holding back the rate of improvements in nutrition outcomes. Lastly, there are stark disparities in the uptake of nutrition interventions, and in the levels of underlying determinants between different social-economic groups and groups across the state. Closing equity gaps in these underlying factors is critical to improving stubborn nutritional outcomes like stunting (Monteiro et al., 2010; Headey et al., 2015).

In comparing our findings to the analysis of improvements in nutrition in Maharashtra (Haddad et al., 2014), we note that both states had substantial improvements in immediate determinants of nutrition such as immunization, Vitamin A and breastfeeding. The positive performance in ICDS and NRHM in Maharashtra was also attributed to political will and high-level commitment, and a competent bureaucracy to enable action and specific measures to strengthen convergence. However, the rapid stunting declines in Maharashtra are thought to also have been due to improvements in women's empowerment, education and other underlying determinants including sanitation, and overall economic performance across the state.

The findings on strong convergence supporting scale-up of health and ICDS services are apparent both in Odisha and Maharashtra. In Odisha, this stemmed from a long culture of convergence focused on reducing mortality rates, and enabled by state-level directives at multiple levels (Menon et al., 2016) these occurred even in the absence of a nutrition mission (Avula et al., 2015). A similar political and bureaucratic commitment has been observed in addressing malaria in Odisha from 2008 onwards, and the declines in the incidence of malaria have been remarkable (Pradhan et al., 2016) In Maharashtra, strong convergence between the public health department and the ICDS program were a clear directive of the state nutrition mission and monitored by the mission leadership. Contrary to the ubiquitous nature of the mechanism of frequent transfers employed to control bureaucracy in India (Iyer and Mani, 2012) in both Odisha and Maharashtra case studies, our findings of the role of bureaucratic tenure stands out. In both states, mited political interference in bureaucratic transfers, and thus longer tenures, have allowed for ownership and responsibility for actions. In Odisha, the long-standing measures taken to comply with the directions of the National Human Rights Commission and its continued vigilance of tribal districts (National Human Rights Commission n.d) also appear to have laid the foundation for ensuring bureaucratic stability. Finally, actions in both states benefited from significant changes to the national policy framework, and it is important, in this context, to recognize the role of national policy directives and guidelines. In both cases, the roll-out of the NRHM and the universalization of the ICDS, both occurring within years of each other (2005 and 2007), contributed significantly to the availability of delivery platforms for critical health and nutrition interventions.

Our findings on the evolution of nutrition programming in Odisha highlight a key feature that is likely to hold back further progress in addressing stunting. We find that a major focus over the last two decades has been on identifying and treating malnourished children rather than on strengthening preventive actions like infant and young child feeding and prevention of illness. In a context where there is increasing evidence that preventive actions are as important to put in place, it is crucial that Odisha's strategies looking forward include actions across the spectrum from prevention to cure of malnutrition. The current rates of wasting (18%), however, also signal the need for continued investments in strengthening the curative interventions for treating malnourished children.

Another notable feature in our analysis has been the limited use of rigorous evaluation and evidence building even though experiments with programming innovations have expanded in Odisha. More evidence is needed to sustain the legacy of innovations such as the inclusion of eggs, the rollout of the state-wide cash transfers and of the various approaches to address SAM. Several of these interventions carry significant fiscal requirements, and impact evaluations that demonstrate impact unequivocally can contribute significantly to sustained implementation later, even in the face of potential political regime changes.

The reflection of the state-level program investments in the community perspectives on changes in health and nutrition programs is a testament to Odisha's commitment and capability to deliver on these key programs. However, it is now time that Odisha invests in long-term developmental activities that ensure sustainable human well-being beyond short-term relief measures.

Some limitations of this study are worth noting. Our policy-focused findings are based on interviews with state level stakeholders and may not apply to district-specific changes. Several reports and some interviewees have highlighted inter-district disparities in nutrition outcomes, determinants and program performance, a key issue to examine looking forward. We, however, note that several of our state-level interviewees had significant on-the-ground experience as part of their long careers and actively reflected on field experiences. We acknowledge that some of the interviewees were possibly reluctant to speak about program challenges given their links either to the government or to the funding of the programs mentioned. We tried to address this concern by ensuring that we have a range of respondents in the interviews to guard against a one-sided set of perspectives. Another limitation is that the community interviews are from one of the poorest districts of Odisha and do not capture changes in other districts. However, it is promising that positive changes were experienced on the ground even in one of the poorest districts in the state. Finally, we note that because of the lack of availability of individual-level data on nutritional outcomes from any of the recent state-wide surveys, it was not possible to conduct an empirical decomposition analysis of factors contributing to change in nutritional outcomes over time. This will be explored in future research.

5. Conclusions

We conclude that, despite less than favorable circumstances, Odisha

has made substantial progress in terms of scaling up health, nutrition and food security interventions. This success is likely due to the state's commitment to reducing the infant mortality rate, starvation deaths, and food insecurity. Several health, nutrition and food security interventions that were rolled out in Odisha were also well-positioned to deliver political returns. Intervention scale-up was driven by political backing, bureaucratic competence and tenure, operational strengthening, a fiscal turn-around, and support from multiple partners.

As Odisha looks ahead to improving nutrition, creating goals, building on existing technical and system capacities and capitalizing on existing high level support for nutrition is crucial. At the same time, actions will be needed to engage other government departments to ensure that some of the known social determinants are tackled on an urgent basis by strengthening implementation of nutrition sensitive programs – particularly developing strategies for improving sanitation, addressing high levels of early age of marriage among girls, and ensuring both land rights and sustainable livelihoods. Disparities in the uptake of nutrition-specific and nutrition-sensitive interventions between different socio-economic groups and geographic areas need to be monitored and reduced. Our analysis has highlighted these to be the priority areas if Odisha's significant nutrition achievements are to be accelerated in the coming decade. Without significant investments and focused efforts to improve the overall quality of life for adolescents, women, and children in the most deprived areas in the state, Odisha is unlikely to achieve further gains in the nutrition outcomes.

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Declaration of Interest

We confirm that there are no known financial, personal or other conflicts of interest to disclose.

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