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The association of caregivers' access to Anganwadi Center services with school readiness of their 5-year old children: A secondary cross-sectional analysis of data from Chhattisgarh, India

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2010

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Abstract

The association of caregivers' access to Anganwadi Center services with school readiness of their 5-year old children: A secondary cross-sectional analysis of data from Chhattisgarh, India

By Swathi Sekar

Background: School readiness is the component of early childhood development that is focused on early childhood education (ECE) and preparing the child for formal schooling. In India, early childhood care and education (ECCE) is almost entirely provided by the Integrated Child Development Services (ICDS) system through a system of Anganwadi Centers (AWCs). Early Childhood Development (ECD) programs with built-in health components, incorporating family-based services and home visiting programs show promise in improving school readiness.

Objective: Explore whether caregiver's access to AWC services is associated with school readiness scores, including literacy and numeracy scores, of children between 5-5.5 years.

Methods: The target population for this analysis consisted of caregivers with children aged 5-5.5 years, resulting in a sample size of 1248. A stratified two stage clustered sampling procedure was used. These data were analyzed in a cross sectional design. Composite scores for the different components of school readiness (numeracy, literacy and adaptive behavior) were created. Nine variables were selected that exemplify various aspects of health services through Anganwadi centers and were combined into a single score for access to services.

Results: Overall school readiness score ranged from 8 to 70 with an average of 43.4. Certain AWC service such as mothers registering their pregnancy, mothers receiving TT vaccinations, and receiving supplementary nutrition showed associations with improved school readiness in the overall score and the adaptive behavior score. Conversely, some services such as those who had a village health and nutrition day organized in their village or mothers who had a health worker visit her home during her pregnancy, were associated with worse school readiness scores.

Discussion: Our data provide evidence to say that caregiver's access to AWC services is associated with school readiness scores of their 5 year old children. However, while some services had a positive association with school readiness, as expected, others had no association or even more surprisingly, a negative association. This could be due to individuals with lower health indicators seeking out these services, or people in the community being unaware of the AWC services.

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Table of Contents

1. Introduction

1.1 Rationale

My work as an intern at CARE encouraged me to pursue this issue area for my thesis project. While working in the Health Equity Unit on the Nutrition Plus team at CARE, I worked on a team to develop e-learning courses focused on integrated early childhood development (ECD) programming in predominantly HIV settings, introducing me to this collaborative and growing field. While working on this project and others at CARE, I was immensely fortunate to be granted access by CARE- India to data estimating health and development indicators of children, attitudes and practices of caregivers to help children achieve their development potential, and capacity of community centers, called Anganwadi Centers (AWCs), to address health, development and educational needs of the community of Chhattisgarh, India. Personally, being of Indian descent and having had many opportunities to spend time in my country of birth, I was aware of and very interested in the critical role AWCs played in the health of the majority of the population of India, those living in rural and impoverished communities. Additionally, I was also hoping to explore school readiness as an outcome, as it is one of the many products of effective ECD, the theme of the work I was doing through my internship at CARE. The initial question I asked when first examining the data was: Is caregiver's socioeconomic status associated with improved school readiness of the child? I then quickly found through literature searches that this question has been examined and it has been found that caregiver's higher SES is indeed associated with improved school readiness. [1] What I could not find much literature on was whether caregivers' access to AWC services, both for their own health and the health of their child, was associated with school readiness. This will be further elaborated on and explained in the following paragraphs.

1.2 Problem Statement

There is a pressing need for additional research on what influences children's school readiness in India. Unlike the United States which conducts national surveys on children's school readiness, the amount of literature and data on school readiness in India is still in its very nascent stages. [2] Additionally, although literature is still presenting different definitions of how school readiness should be measured, more literature is showing that the early years of a child's development are crucial in determining future achievement and school readiness.[3] [4] [5] These early years of a child's development are impacted by not only the child health but the caregiver's health as well. Although research has shown a positive relationship between the caregiver's income and the child's school readiness, there is much less evidence on any potential associations between a caregiver's access to community health resources and their child's school readiness scores. [1]

India is the home to the one of the largest family and community welfare schemes in the world, the Integrated Child Development Services (ICDS) system. Even so, there is very scarce data available on both the impact ICDS is making on ECD and on the current levels of school readiness in India. There is a need for significantly more data on what might be associated with improved school readiness, as to inform what ICDS services for both the child and the caregiver are needed to meet the challenges of school readiness in India. I hope to use this thesis to begin to address some potential associations between caregiver's utilization of ICDS resources and school readiness scores of their children.

1.3. Purpose Statement

The primary purpose of this study is to determine if caregiver's access of specific services provided by the AWC, the functional unit through which ICDS services are distributed, are associated with improved school readiness scores of children aged 5-5.5 years.

Objective 1: Develop a composite measure of caregiver's access to AWC services

Objective 2: Explore whether caregiver's access to AWC services is associated with school readiness scores, including literacy and numeracy scores, of children between 5-5.5 years.

The services that will be explored and used to create the composite measure are the following:

1) Whether the caregiver registered the pregnancy at the AWC
2) Whether the caregiver received TT vaccinations from the AWC
3) Whether the caregiver received any antenatal checkups from an Anganwadi Worker
4) Number of IFA tablets the caregiver received from AWC
5) Whether the caregiver received supplemental nutrition from the AWC
6) Whether a Village Health and Nutrition Day (VHND) was organized at the AWC
7) Whether a health worker visited the home during the pregnancy
8) Whether the child's weight and height was measured at the AWC
9) Whether the child is sent to the AWC

1.4 Acronym List

AWC- Anganwadi Center

AWW- Anganwadi Worker

CARE- Cooperative for Assistance and Relief Everywhere

CDPO- Child Development Project Office

CECED- Center for Early Childhood and Development

ECCE- Early Childhood Care and Education

ECD- Early Childhood Development

ECE- Early Childhood Education

GOI- Government of India

ICDS- Integrated Child Development Services

ICMR- Indian Council of Medical Research

IFA- Iron and Folic Acid

IRB- Institutional Review Board

KAP- Knowledge, Attitudes, and Practice

MDG- Millennium Development Goal

SRPP- School Readiness Promotion Program

TT- Tetanus Toxoid

VHND- Village Health and Nutrition Day

2. Review of the Literature

2.1 Background

School readiness is the component of early childhood development that is focused on early childhood education (ECE) and preparing the child for formal schooling. Breastfeeding of the child, proper hygiene and adequate nutrition of both the child and caregiver have been shown to contribute to improved school readiness. [6] [7] ECE services such as those to address school readiness can be housed in the public or private sector. In India, for instance, early childhood care and education (ECCE) is almost entirely provided by the Integrated Child Development Services (ICDS) system, serving close to 80 million children between 0 to 6 years of age through a system of Anganwadi Centers (AWCs). [8] This chapter will begin with a discussion on the importance of school readiness as a component of early childhood development, followed by the specific roles and responsibilities of ICDS. This section will showcase the role ICDS plays in not just early childhood care and education but maternal health as well. The chapter will also include examples of how other countries are achieving school readiness among their children. Finally, this chapter will close with an explanation of how the research presented in this paper will address some of the gaps in the literature on this topic of school readiness in Chhattisgarh, India.

2.2 School Readiness

School readiness refers to the child's ability to meet the demands of school, such as being comfortable exploring and asking questions, listening to the teacher, playing and working with others and remembering and following rules.[9] Domains of school readiness include physical health and well-being, social competence, emotional maturity, language and cognitive development, communication skills and general knowledge. Many tools have been developed to test for school readiness. These tools might vary in some ways, but all must have questions grouped into the domains mentioned previously and sometimes include scores for interactive

activities that test pre-mathematical, numerical and literacy skills. [10] As will be elaborated on later, school readiness tools will generally touch on all of the components listed above but might also remain focused on the aspect the national, regional or local department of education, school, non-profit, or other stakeholder find most important.[11] For instance, a country's department of education might see reduced scores in mathematics and would, in response, prioritize a numerical skills test to gauge mastery in numerical concepts, in hopes that this could improve math scores in the child's future.

The concept and measurement of school readiness has been the subject of conversations in the fields of education and child development for many years. Although stakeholders in these, and other, fields have slightly different definitions and perspectives on school readiness, a few concepts are generally agreed upon. First of all, school readiness is strongly multi-dimensional and this diversity in perspectives and objectives are central to identifying avenues to conceptualize and measure school readiness. The literature has generally focused on two main classes of child attributes, although this division is arbitrary. The first class of child attributes in determining school readiness covers cognitive capabilities and pre-mathematical and pre-literacy skills such as language competence, familiarity with words, and ability to concentrate. [12] The second class of child attributes is centered on personal attributes such as sociability, engagement with peers, and curiosity. [12]

Early childhood education programs are critical for fostering children's school readiness. The rationale for providing early childhood interventions in a developing nation like India is that good quality early childhood interventions enhance preparedness of children, cognitively, linguistically, socially and emotionally for formal schooling [5]. Evidence shows that the early years of a child's development are crucial in determining future achievement and school readiness. [5], [6] High awareness and usage of community resources, especially those focused on health, as well as heightened knowledge of benefits of early childhood education contribute

to improved school readiness of children [5]. Additionally, good health practices on the part of the mother, such as utilizing access to community health resources, breastfeeding, and maintaining proper hygiene, are associated with higher school readiness scores for their children. [6].

According to many studies, when transition from home to an early childhood education center such as an Anganwadi center, and then to formal primary school is smooth, children do better in primary school years. [13] [14] Some of the necessary requirements for successful transition are cognitive, linguistic abilities, and socio-emotional preparedness which will help later for school adjustment. Adjustment refers to the ability to interact with a peer group freely, ability to remain comfortable without family for a certain period of time, the ability to comprehend language used, follow instructions, and attend to teachers' instructions.[13] Additionally, poor nutrition of the mother affects the child's physical and intellectual development and might therefore create a barrier to achieving school readiness. [15] Undernutrition of the child in the early childhood stage also affects the child's development. Literature has shown that stunting is particularly associated with cognitive development and changes in behavior and temperament. [7] In India, services such as supplementary nutrition are intended to increase nutritional intake for both mothers and children, and increasing school readiness scores. Additionally, home visits, pediatric monitoring, and taking attendance of children in development centers are associated with improved cognitive outcomes, but at a different rate for different birth weight groups. [16] Similarly, prenatal care such as health worker home visits is shown to be associated with decreases in low birth weight births. LBW births are shown to be associated with decreases in cognitive functions. [16]

Studies have shed light on school readiness as a key social issue of national concern. [12] [6] [4] School readiness gaps have been attributed to poor family life and parenting, economic status, lack of home-school connectedness, lack of community resources, and social inequality.

To exemplify this, a study done on American preschoolers showed that increasing maternal schooling by one year raises a child's achievement score in kindergarten, age 5, by roughly 4 points. [17] This study also showed that programs that address parent's socioeconomic resources such as providing more opportunities for income generation narrow school readiness gaps between Whites and Blacks or Whites and Latinos. Granted, India does not hold the same racial and ethnic distinctions. However, it does have an active and ever-present caste system that plays a constant role in the day to day lives of Indians, influencing access to resources. A study conducted in Kerala, India found that women from scheduled casts, scheduled tribes and other backward castes reported a higher prevalence of poor health than women from forward castes. Women with low education had 2.7 increased odds of bad health than those with high education, defined by high school and above. As is shown, many gaps in school readiness levels can in some capacity be attributed to socio-contextual determinants such as economic status and social and ethnic inequality.

Additionally, specific city or community-level examinations affecting children and their unique experience of school readiness are limited. Focusing in on specific communities with distinctive cultural norms, history, and background can begin the process of promoting locally informed best practices and localized early childhood education policy. [18] If early childhood services are indigenously developed, cultural beliefs about childhood can be respected.

While the importance of school readiness for future success has been established, research on the influence of community health resources on contributing to school readiness of the child has been limited. Poverty and income of the caregiver have been studied as risk factors for poor school readiness, yet access to services such as prenatal care and government provided supplemental nutrition in developing countries like India are also critical to the school readiness of the child [3]. While children of all backgrounds and castes gain cognitive and language benefits from high-quality ECD programs, literature shows the advantages appear to be more

important for those from lower SES, as their risk for poor developmental outcomes are higher. [3] [19] Additionally, as it also those who are from lower SES who are disproportionally undernourished, government provided supplemental nutrition is even more critical. [7] By focusing efforts on this particular segment of the population, programming can aim to reduce the cognitive gap, taking an important step towards achieving equitable educational opportunities for all children. School readiness also does not only benefit the child. Families benefit from strategies that are executed through the nuclear family, a key to expanding impact throughout the community. [4]

School readiness can be strengthened through the bolstering of health programs, as one cannot exist without the other. Early Childhood Development (ECD) programs with built-in health components, incorporating family-based services and home visiting programs show promise in improving school readiness. This is greatly due to the trained staff in these integrated programs that can help parents get ongoing care for children. [19] Hence, improving ECD at the community level is a more sustainable and long-term structural programmatic effort as opposed to a one-time quick fix. ECD is not, however, a one-dimensional concept. Rather, effective ECD mobilizes resources and expertise from various segments of the population and levels of influence.

2.3 Early Childhood Development (ECD)

According to the State of the World's Children Report, Early Childhood Development refers to a "comprehensive approach to policies and programs for children from birth to eight years, their parents and caregivers." [20] ECD's primary objective is to protect a child's right to develop his or her full cognitive, emotional, social and physical potential. This is made possible through a series of partnerships between caregivers, community resources and government support. Ultimately, ECD must include community-based services that address health, nutrition, education, sanitation, and economic support and child safety [21].

Development is a pattern of changes that occurs throughout the lifespan. Early childhood, which spans from the prenatal period to eight years of age, is the most rapid period of development in a human life.[22] Children develop as they grow older, bigger, stronger and more mature. Although individual children develop at their own pace, all children move through an identifiable sequence of physical, cognitive, and emotional growth and change. For instance, between birth to 3 months, children begin to smile and track movements with their eyes. Between 4-6 months, they repeat actions and respond when spoken to, between 7-12 months, children identify themselves and say their first meaningful words. The other stages are normally 1-2 years, 2-3.5 years, 3.5-5 years and 5-8 years of age. Each of these stages have their characteristic milestones, yet children will develop at their own pace, reaching these milestones at their unique rate. [23] Early childhood development occurs in several interconnected domains: social, emotional, intellectual, language and motor, with each dependent on and influencing the other. [24] [22] Therefore, programs and goals should be focused on holistic approaches to development, as to address all the interconnected pieces that jointly contribute to the healthy growth of a child.

Programs focused on early childhood are critical in mitigating the effects of poverty, deprivation and disadvantage, creating opportunities to improve life chances for children from underprivileged and marginalized environments. Research around the world has shown that programming for ECD has maximum impact when informed by three tenets of child development. [25] [26] The first tenet states that child development is a continuous and cumulative process. The second says that the child's health, nutrition and psychosocial development are synergistically interrelated and the final tenet states that the child's development takes place within a context and is influenced by that context. These three components of early childhood development imply that programs need to address the entire continuum of development as opposed to focusing on just one stage. This type of holistic

approach addresses the child's total context including social and community level factors such as poverty and disparity. [25] When ECD programming meets these three tenants, research has shown this type of integrated and long-term focused plan for child development leads to improved school readiness. [27] [20]

Researchers have also conducted country comparisons to highlight how participation in early childhood programs influences a child's later development and success in school. [28] According to UNESCO, despite a high demand for ECE, it still remains a privilege for young children in the world's nine high-population countries, including India. [29] Pakistan, also a part of this list, has launched the National Plan of Action for Children as a mechanism to address early childhood education. This plan, categorized in three phases, has made ECE one of the priority areas to be considered in programming. Year 1 focuses on accessibility, years 2 and 3 adding quality to accessibility. This Plan's objective was to showcase the importance of ECE in the context of long-term investment in child development. [29] These plans, through their focus on ECE, are working to achieve improved school readiness on a national level, as school readiness is a positive outcome of having received consistent and integrated ECD services.

A healthy, nurturing and stimulating environment during a child's early years can make a significant impact later in life in the form of improved health indicators and a reduction in health disparities in populations. The World Health Organization Commission on Social Determinants of Health states that a key avenue through which to achieve "good health at low costs" is through policies that address determinants of health based on principles of universality, equitable access and government control. [30] Improving access alone however, will not attain the required change within the population. In conjunction with addressing the determinants of health based on equitable access, the other key piece is coaching and empowerment of families to stimulate a child's integrated development, based on unique interests and needs of the caregiver and child. Several countries have created networks of counselors and program

promoters who organize and deliver ECD programming, with activities that provide family guidance on stimulation of the social, affective, cognitive and motor development of the child, as well as health care and nutrition. For instance, Cuba provides a comprehensive early childhood education (ECE) directed to children aged 6 months to 6 tears age through child care centers and home-based preschool education.[31] The majority of children also participate in a program called Educate Your Child which is designed to empower families to stimulate their child's integrated development, based on the child and family's specific needs and goals. This program includes counseling on healthy pregnancies and interactive games in the home that enhance children's development. Cuba has learned through these programs that simply teaching does not meet the goals of the community, and hence, control over improvement is placed in the hands of the caregivers and families. [31] To provide another example, Vietnam's School Readiness Promotion Program (SRPP), works to raise school readiness for 5 year old children, focusing on the most vulnerable to not succeeding in the formal education environment.[32] The two main components to the program are to one, promote school readiness for disadvantaged children, and two, the national early childhood education policy development and capacity development. As we've established, socioeconomic status plays a role in achieving school readiness so the Vietnam program is working to tackle that issue. Integrated into these two goals of the program are lunch subsidies and salaries and benefits for contract preschool teachers. [32] These programs in Cuba and Vietnam are examples of strong integrated program that address not only ECE but health through counseling and nutrition through lunch subsidies. Lastly, The Integrated Child Development Services (ICDS) is a program within the Government of India that aims to bring holistic development to children in India, focusing on the most marginalized communities. First launched in 1975 in accordance to the National Policy for Children in India, ICDS works to raise the health and nutritional status of mothers of young children, children below 6 years of age, and pregnant and lactating women. The following section will go into further detail on the specific objectives and operations of ICDS.

2.4 Integrated Child Development Services (ICDS)

According to figures of the Indian Ministry of Home Affairs, India has the largest population of children in the world, about 158 million, aged birth to six years. ECCE is provided through public, private or NGO avenues in India. Article 21 of the Indian Constitution recommends free and compulsory education for children up to 14 years. Article 45 notes that early childhood education will be provided at the state level to all children until they complete age six, to prepare children for primary education and to support working mothers. [22]

In India, issues related to early childhood care fall under the jurisdiction of the Ministry of Women and Child Development (WCD), a ministry within the Government of India. It is the WCD Ministry that runs the Integrated Child Development Services (ICDS). Through this scheme, the Government of India provides early childhood services. However, ECE is only one of six objectives of the ICDS. In addition to ECE, the other five aims of the ICDS program are to provide supplementary nutrition, distribute immunizations, provide health check-ups, set up referral services, and provide nutrition and health education. [33] ICDS is the oldest and largest program of the Government of India (GOI) and it is focused on building holistic development of children aged 3-6. In 1974, the Indian government adopted a National Policy for Children and ICDS was launched as a result of this policy in 1975 and exists in all of India's 28 states and 7 Union territories. A Child Development Project Office (CDPO) is located in each community development block in which the ICDS program exists and this office is the basic administrative unit of ICDS. With the launching of ICDS, children up to the age of 8 and expectant and nursing mothers gain access to services such as immunizations, supplemental feeding, health and nutrition checks and education, creating opportunity for a holistic examination of child development. By working with both mothers and children, the ICDS program is acknowledging that maternal health is closely linked with the development of the child. [34] The ICDS program was designed to promote the fundamental rights of young children in India, aiming at playing a

significant role in improving the survival rate, health and nutritional status, and educational outcomes of children. Services are funded by the central and state governments, voluntary NGOs and for-profit organizations. [34]

ICDS is the world's largest and most unique integrated program for childhood development. Table 1 below provides some insight into the organizational structure of ICDS. The Anganwadi worker (AWW) is the basic functionary of ICDS. [34] Although they only receive a small monthly stipend, their required roles and responsibilities are extensive and involved. Their dedication to their work has paved the way for AWWs to form very tight-knit relationships with people in their community, making it possible for them to identify particular people and groups in their village in a quick and efficient manner. The AWW's key functions include providing supplementary nutrition to children below six years of age, nursing and pregnant mothers from the lowest income brackets in the community, immunizations of all children less than six years, providing nutrition and health education to mothers and caregivers, basic health check-ups including antenatal care for expectant mothers, care for newborn babies and education to the children in the 3-5 age groups. Essentially, all of the six components of ICDS are the responsibility of the AWW. At times, however, the AWW does have a helper to contribute time and energy. Generally, one AWW and one helper is assigned to an Anganwadi Center (AWC), which caters to a population of approximately 1000. It is no exaggeration to say that an AWW is one of India's most dedicated and committed public servants. [35]

The ICDS program is however, also seen as having extensive regulations, restricting innovative community-based solution making. [36] This is a gap that could be filled by parents and community health workers who can add value to the system by prioritizing early childhood development. When caregivers and community health workers are included in the early childhood education (ECE) process, emphasis and continuation of school is stimulated. When these key players mobilize and pool their skills, they can work together to present a stronger

and more unified proposal to stakeholders to increase support for ECE in their community. Additionally, to achieve a truly inclusive and effective system, Anganwadi workers need to be valued and supported for their time, energy and commitment. [37] This not only encourages motivated AWWs to continue doing good work but provides the necessary push for the less engaged AWWs to increase their level of involvement [36]. AWCs and AWWs contribute to a strong foundation for successful psychological, physical and social development, improving the child's school readiness [37]. Without the work of the AWW, the caregiver nor the child would have the ability to benefit from community resources, as the resources are managed and distributed by the AWW at the village level.

Table 1: The organizational structure of the ICDS department	**Department/ personnel**	**Role and responsibility**
Central level	Ministry of Human Development Resources/ Ministry of Social Welfare	Budgetary control and direction of the implementation of the program
State level	Directorate, Women and Child Development	Overall control throughout the state
District level	District Women and Child Development Officer	Responsible for all ICDS projects of the district
Block level*	Child Development Project Officer Supervisor (NGO)	Managing ICDS at the block level, mainly responsible for selecting AWs, securing local facilities, ensuring food supplies, flow of health services and reporting to higher authorities
Slum/ village level	Anganwadi worker and helper	See responsibilities listed previously

National Informatics Centre, 2012

Generally speaking, impact evaluations of ICDS are inconsistent and many studies reveal that the preschool education component of ICDS does not receive the necessary attention. [26] The majority of evaluations are focused on staffing at AWCs, supplies that are received for immunizations, and the supplementary nutrition services. Although the education component of AWCs is considered central to their mission, this component is normally not utilized or

evaluated. For instance, in the state of Kashmir, only AWCs providing supplemental nutrition were evaluated for their education services. [38] Evaluations of the ICDS indicate the program has had positive impacts on children's health and nutritional status, although less emphasis has been placed on evaluating the impact ICDS has on school readiness. [39]

As noted, the early years of the child are crucial for life long development. CARE, a leading humanitarian organization fighting global poverty with a special focus on working alongside poor women, has been a key player in ECD initiatives in India. ICDS evaluations indicate positive impacts on children's nutritional status but less emphasis has been placed on evaluating the impact ICDS has on school readiness. CARE is currently working on strengthening the ECD component of ICDS, ensuring the health and psychological development of children below six years of age. Additionally, CARE is working to promote the understanding, skills and capabilities of workers, family and community members to meet the developmental needs of children in this age range. CARE's evaluation work in Chhattisgarh formed the body of data used for this analysis.

2.5 CARE's ECD Programming in India

CARE-India has undertaken ICDS's need to incorporate more pre-school education for children between the ages of 3-6. [40] CARE's Early Childhood Care and Development Project (ECCD) in India aims to adapt and implement the 5x5 integrated model of early childhood development in low-resource settings, representing the five domains of ECD, Health, Nutrition, Care and Development, Rights and Protection and Economic Strengthening across five levels: Individual Child, Family, Anganwadi (Child Care) Center , Community, and National. Health, nutrition, development, rights and protection, and economic strengthening, are equally important to one's ability to reach a healthy and productive adulthood. Children have multiple levels of influence in their lives, such as family and community, and their early experiences with these influences ultimately determine their health and developmental path into adulthood. For this reason,

interventions must address the needs of children in an integrated manner on a variety of levels with multi-sectoral support. [41] Also central to CARE's ECD programming is the development of the Essential Package, which is a comprehensive set of tools to facilitate implementation of the 5 x 5 integrated model, created for program managers and service providers, to address the unique developmental needs of young children, particularly those affected by- or infected with-HIV/AIDS, in an integrated and holistic manner. [41] Ultimately, the collaboration between CARE- US, CARE-India and ICDS providers aims to strengthen the status of early childhood care and development within ICDS.

Prior to implementation of the ECD program in Chhattisgarh, CARE conducted a baseline survey. Some of the general objectives of the survey will now be presented, and the components of the baseline specific to addressing the research question in this paper will be elaborated on in the next chapter. To begin, the baseline intended to estimate the health, nutrition, and cognitive development indicators of children aged 3-3.5 years and 5-5.5 years. Indicators of interest were examined in both of these age groups. Another key objective of the baseline was to examine current levels of knowledge, attitudes and practices (KAP) of the needs and benchmarks that must be attained for children to reach holistic development potential. These levels of KAP were examined for primary caregivers, Anganwadi workers (AWW) and ICDS (Integrated Child Development Services) program managers. This baseline also hoped to determine the level of functioning among Anganwadi Centers (AWCs). To summarize, this baseline survey was geared to address the following key information areas:

- Nutritional status
- Mother/caregiver knowledge and practices on child development
- Kind of preschool education provided by ICDS centers
- Understanding capacity of AWWs in conducting preschool education
- The level of understanding and involvement of leadership of ICDS and factors

which impede or facilitate involvement

The aim of this thesis is to examine the association between caregiver's access to Anganwadi center services and the school readiness scores of their 5 year old children using the baseline data available from CARE's work in Chhattisgarh. This research question incorporates both maternal and child health indicators, as both are the focus of AWCs. As stated previously, there is limited information concerning the work ICDS is doing to address school readiness and this research question will begin to address the work ICDS is doing through AWCs and whether or not this work is impacting school readiness of children in Chhattisgarh.

3. Methodology

3.1 Background to Methodology

This baseline survey was conducted as part of the Early Childhood Care and Development Project (ECCD), implemented by CARE in Chhattisgarh state of India. Janjgir, Korba, and Raigarh districts were selected for the survey. The target population consisted of mothers and caregivers with children aged 3-3.5 years and 5-5.5 years, the children in these age groups, Anganwadi Workers, and ICDS program managers. An intervention is currently being implemented in 31 Anganwadi Centers (AWCs) in the two districts selected as intervention districts. A stratified two stage clustered sampling procedure was used, stratified by intervention, intermediate and control area. Having an intermediate program area is an innovative component of this program, where a partial intervention took place. The first stage consisted of selecting Anganwadi Centers (AWCs) in the intervention and intermediate districts and the second stage centered on recruiting Anganwadi workers, caregivers and children in the area surrounding the AWCs. Study tools used were questionnaires for the mother/caregiver, Anganwadi worker, and ICDS program managers, a school readiness instrument for children aged 5-5.5 years, and an ICMR (Indian Council of Medical Research) developmental screening test instrument for children 3-3.5 years. [42] Monitoring and quality assurance methods were prioritized in training of field workers, collection of data and data processing.

3.2 Study Area and Population

Chhattisgarh is one of the few landlocked states in the Indian subcontinent. The population of Chhattisgarh, according to the 2011 census, is approximately 25.5 million with 12.8 million male and 12.7 female, living in its 16 districts. Chhattisgarh also has the largest concentration of schedule casts and schedule tribes in the country, with migrants from every corner of India. [43] The scheduled castes and scheduled tribes are among the most socially, economically and

educationally disadvantaged groups in India. [44] The state is also the richest in mineral and forest resources, with almost 45% of the state as forest area. Furthermore, Chhattisgarh has an abundance of minerals such as limestone, iron-ore, coal and even diamond. Additionally, the state hosts large industries in aluminum, cement, steel, mining, and power generation. As it is one of the few landlocked territories in India, it succeeds in maintaining amiable relations with neighbors, especially under circumstances that warrant electric power exchange and sharing.

Within Chhattisgarh, two districts, Janjgir, Korba were selected as intervention areas while one, Raigarh, was left as the control area. Within Raigarh, the only blocks that were examined were Kharsia and Sarangarh. Janjgir, Korba and Raigarh were not randomly chosen. Rather, they were selected because of the demographic composition of the districts, with Janjgir and Rajgarh as mostly scheduled cast, while Korba is mostly scheduled tribal, two terms provided by the Government of India to refer to the historically most disadvantaged sub-population.

Mothers and caregivers with children age 3-3.5 years and 5-5.5 years, Anganwadi Workers, and ICDS program managers in the study area were included in this baseline survey. However, for the purposes of this thesis analysis, the population being examined is mothers and caregivers with children age 5-5.5 years as this was the group to whom the school readiness test was administered.

3.3 Sampling Strategy

In selecting the AWCs in the first stage of the two-stage clustered sampling procedure, the complete list of AWCs in both the intervention districts was used as the sampling frame. A systematic random sampling technique was adopted to select 31 intervention AWCs in each district, making a total of 62 AWCs in both the intervention districts. Another 31 AWCs were selected in the intermediate area as well. To select AWCs in the control district, the list of AWCs in the two selected blocks was provided and 36 AWCs were selected in each block through a

systematic random sampling procedure. Furthermore, stratification took place by intervention and control areas to select AWCs in each stratum. This method of stratification by intervention and control areas reduces the bias associated with clustering around Anganwadi Centers. All eligible children aged 3-3.5 years and 5-5.5 years and their caregivers were selected in the second stage of sampling.

Systematic random sampling was employed and resulted in a sample size of 62 AWCs from each intervention and control area. The second stage of sampling resulted in 1248 children between the ages of 5-5.5 years. All eligible children aged 3-3.5 years and 5-5.5 years within the catchment area were covered but the caregivers of children aged 5-5.5 years were the respondents included in this analysis. Therefore, the sample size used in this analysis is 1248.

3.4 Data Collection Tools

Multiple study tools were employed during the execution of this baseline study. Children aged 3-3.5 years were administered an ICMR developmental screening test. Children aged 5-5.5 years were administered a school readiness test. [45] This school readiness instrument is a written test and is primarily focused on cognitive, language and social development in regard to the child's readiness for school. The child must earn more than a zero score on each question to official be designated as school ready. It contains questions that test on numeracy skills such as counting and numbering, literacy skills such as describing photos and drawings, and a separate section focused on adaptive behavior such as sharing, communicating with others, and emotional adjustment when staying away from family. There were two primary tools for collecting data on school readiness. This was firstly, a 10 part activity packet and secondly, a series of 20 questions to assess adaptive behavior. The activity tested both numerical and literacy skills while the adaptive behavior test examined socialization skills, self-help, emotional control and communication.

The tool was developed by the World Bank, India and validated by Ambedkar University in Delhi, India. The university followed a standard procedure for validation. Height and weight measurements were collected on all children in both age to assess nutritional status of the child. A calibrated weighing scale and validated height meter were used to measure weight and height, respectively. Nutritional status was assessed using World Health Organization guidelines. [46] Each child's caregiver was selected for an interview through a structured interview schedule. All questionnaires and study instruments were first prepared in English and after editing, were translated into Hindi. Questionnaires collected demographic data in addition to information on health and nutrition of both the caregiver and child, caregiver's access to community health services, and sanitation questions. All the aforementioned tools were first pilot tested before finalization and released into the field.

3.5 Data Collection Process

All members of the field team staff were trained in one of three waves of training. Training was accomplished jointly by CARE India and a hired contractor, GfK MODE Pvt Ltd. Training consisted of classroom training in interviewing techniques and survey procedures in the field, detailed review of each item in the questionnaire, lectures, demonstrations and mock interviews between participants of the training. Those interviewers responsible for interacting with children were given specialized training on measuring height and weight. The final component of the training included on-site practice, where the trainees were sent to the field to practice completing one or two full interviews. Trainers accompanied the trainees and provided feedback on gaps they observed. Length of the training varied depending on the number of participants. 57 investigators and 15 supervisors were recruited as part of the field team and all participated in the described process. Four of the 72 recruited members of the field team were dropped due to their poor performance during the training. 8 teams were formed out of the remaining 68 field investigators.

Each team consisted of 1 supervisor, 3 investigators and 1 editor, responsible for note-taking, who interviewed caregivers and 3 investigators who interacted with eligible children. Supervisors also conducted interviews in addition to their other responsibilities. Finally, a separate team of 4 investigators revisited all eligible respondents who could not be interviewed during the first wave of interviews for any reason. The field team was managed by one field executive and deputy manager of operations. Training of field teams was done from 1/16/12 through 2/27/12. Field teams were deployed, interviews were conducted and data were collected from 2/9/12 through 3/20/12. As previously mentioned, the training was done in three waves, and hence, those trained in the first wave were able to be deployed to begin data collection before those who participated in waves 2 and 3 of the training.

3.6 Monitoring and quality assurance

CARE staff in Chhattisgarh and New Delhi provided support in monitoring the field work through multiple visits to the field during the data collection period. Additionally, GfK MODE deployed a field coordinator who was in continuous touch with field team members, including field supervisors and the field executive. Continuous monitoring was also done through phone calls when field visits could not be scheduled. Quality of data was assured through a thorough and carefully planned training as detailed previously. A field movement plan was also developed by Gfk MODE and CARE so field visits could be made unannounced. These unexpected field visits were to keep the field team consistently engaged in their work and to ensure quality in deliverables. To aid in a smooth start to the data collection process, CARE staff was present in the field during the initial days of data collection, to be available to help troubleshoot on the spot. Additionally, the supervisor on each team was responsible for back-checking 15-20% of the filled in questionnaires to check for completeness and consistency. There was also a two pass verification process, a data entry quality control method.

3.7 Data Processing

Completed questionnaires were received at the data processing unit in New Delhi where they were entered and the data cleaned and coded. Data were also properly validated by range checks, skip patterns and consistency.

3.8 Ethics

Approval from the Institutional Review Board (IRB) was collected so secondary data analysis could be completed on these data. Additionally, CARE's ethical considerations are central to any work they conduct. CARE follows four principles while conducting any form of research, evaluation, or programming. These are safety of staff and participants, respect for individuals through affirming dignity and allowing all people freedom of individual decision making power, informed consent through information, comprehension and voluntary consent, and finally, confidentiality and privacy of any information revealed to project or research staff.

3.9. Analytical Methodology

These data were analyzed in a cross sectional design. The original data contained 2596 observations and the subset used for this analysis, mothers with children aged 5-5.5 years resulted in a sample size of 1248 observations. Data cleaning consisted of re-coding missing data from a default value of 9 to missing. Additionally, dummy variables were created for nominal categorical variables. For purposes of simplifying analysis, other dichotomous variables were re-coded so that a negative or "no" answer corresponded with a 0 and an affirmative or "yes" response was coded as 1.

The outcome variable, school readiness, was measured by questions testing numeracy, literacy and adaptive behavior. Composite scores for the different components of school readiness were then created. This was done through a summation method, adding the scores of the questions that fell into a specific category of school readiness. Ultimately, composite scores were created

for both numerical and literacy scores through the 10-part activity and composite scores for socialization, self-help, emotional control and communication were created from the adaptive behavior test. Numerical and literacy scores were summed to create a total score from the 10 activities. This score ranged from 0 to 36. Socialization, self-help, emotional control and communication scores were added to create an overall adaptive behaviors score. This score ranged from 0 to 40. The adaptive behavior score and the activities score were added to create an overall total school readiness score. This score ranged from 8-70.

To address the research question of whether caregiver's access to community health services is positively associated with the school readiness scores of their children, nine variables were selected that exemplify various aspects of health services through Anganwadi centers. These variables were examined for individual associations with the school readiness outcome and were also combined into a single score to test for a combined association with school readiness. The nine variables that were finally selected were the following:

1) Whether the caregiver registered the pregnancy at the Anganwadi center (AWC)
2) Whether the caregiver received TT vaccinations from the AWC
3) Whether the caregiver received any antenatal checkups from AWW
4) Number of IFA tablets the caregiver received from AWC
5) Whether the caregiver received supplemental nutrition from the AWC
6) Whether a Village Health and Nutrition Day (VHND) was organized at the AWC
7) Whether a health worker visited the home during the pregnancy
8) Whether the child's weight and height was measured at the AWC
9) Whether the child is sent to the AWC

Many of these indicators were cited in the literature as key components of maternal and child care provided by Anganwadi centers.[47] [48] [40] [49] It is for this reason, and as mentioned previously, that each was selected to check for an association with school readiness scores. It

was hypothesized that access to these services, was associated with higher school readiness and a higher composite “services” score was associated with a higher school readiness score.

Linear regression modeling was primarily used to test this hypothesis. Clustering was taken into consideration when building the sample. The needed sample size was multiplied by a pre-determined 1.5 design effect and then multiplied again by the individual response rate. Assumptions concerning linearity of the relationship between the dependent and independent variables, independence of the error terms, constant variance of the errors, and normality of the residuals were checked and confirmed. As the question on amount of IFA received had more than 2 levels, an ANOVA test was used to determine a significant difference in mean school readiness score between the 3 levels. First, crude associations between total school readiness and the composite services score (including each specific component) were examined. The same was done with the adaptive score specifically. Next, the two school readiness scores were modeled with each component of the services score. Next, associations between each of the two school readiness scores (the total score and the adaptive score specifically) and each component of the services score were examined, controlling for mother’s income, mother’s education, child’s gender and caste. These results are shown in Table 4. The model was validated and checked for collinearity. Diagnostics were run and the model passed internal validation. Interactions between these variables were also checked to see if any would potential modify the effect between the exposure and outcome. No significant interactions were found.

Both the literacy and numerical components of the activity score were analyzed yet it was found that the numerical component did not satisfy the assumptions of linear regression. The error terms were not normally distributed. Therefore, the numerical score was dichotomized at the population median. All values above the median were categorized with a 1 and those below were categorized with a 0. Then, logistic regression as performed using the newly dichotomized numeracy score. Results of both the crude and adjusted models are presented in Table 4.

4. Results

Socio-demographic characteristics of the sample are depicted in Table 2. Mothers' age ranged from below 20 to 49 years, with 94% in the 20-40 range; 35% were illiterate and 25% had completed some schooling (Class 5-7). The majority of women were earning between Rs 2001 and Rs 4000 per month. This converts to approximately 40-80 USD. 53% had male children and 47% had female children. Only 2% were not a part of a scheduled cast, scheduled tribe or other backwards cast. Almost the entire sample (99.1%) was Hindu and 61% lived in a nuclear family household. Table 4 presents percentages of the sample who are utilizing each of the services. Of note, 86% of women said they registered their pregnancy, 84% received supplementary nutrition from the AWC, 72% had an antenatal checkup, and 75% send their child to the AWC.

Table 3 shows descriptive results for school readiness scores for the sample. The overall score ranged from 8 to 70 with an average of 43.4. The numerical score ranged from 0 to 6 with an average of 0.92. The literacy score ranged from 0 to 30 with an average of 14.4 and the Adaptive Behavior score ranged from 0 to 40 with an average of 28.1. As stated previously, the numerical, literacy and adaptive behavior scores were combined to create the overall score. The range is a presentation of how respondents actually scored, not the entire range of possible values. Table 5 reports associations between school readiness scores and Anganwadi services. In unadjusted analyses children whose mothers registered their pregnancy scored 1.84 points higher on total school readiness and 1.73 points higher on adaptive behavior than children whose mothers did not register (p-value for association with total school readiness = 0.03 and p-value for association with adaptive behavior <0.001). Additionally, children whose mothers received TT (Tetanus Toxoid) vaccinations had 2.17 points higher on the adaptive behavior score as compared to children whose mothers did not report receiving TT vaccinations (p-value= 0.021). Children whose mothers received supplementary nutrition had 1.44 points higher on their adaptive behavior score as compared to children whose mothers did not receive

supplementary nutrition from Anganwadi centers. (p-value =0.003). All of these results remained significant in the adjusted analyses as well.

Conversely, children whose village had a Village Health and Nutrition Day (VHND) organized scored 2 points lower on their school readiness scores as compared to children whose village did not have a VHND (p-value<0.001). Similarly, children whose mothers said they had a health worker visit their home during their pregnancy, had their height and weight measured and who went to Anganwadi centers had lower overall school readiness scores as compared to those who did not have access to these services. With the exception of children who went to an Anganwadi Center, associations remained significant after controlling for mother's income, mother's education, child's gender and caste, as shown in Table 5.

The variable signifying the amount of IFA tablets consumed by the caregiver had more than 2 levels and hence was analyzed separately. It was found that, using the category with the correct amount of IFA (90+) as the reference group, the other two categories, those who consumed less than 90 IFA and those who did not consume any IFA, showed a comparatively lower mean school readiness overall score or adaptive score. The results of the composite score show that with an addition of one service, the total school readiness score decreased by 0.38 points (p=0.03) and the adaptive behavior score goes down by 0.35 (p=0.04). Both of these ceased to be significant when adjusted for confounders.

Table 6 shows associations between receipt of services at the Anganwadi Center and literacy. The variables significantly associated with literacy scores were receiving supplementary nutrition, a health worker visiting the home, the child attending the AWC and the composite score of all services. Each was negative signifying that increased access of Anganwadi center services was associated with lower literacy scores.

Table 7 shows results from the associations between numeracy and Anganwadi services. Caregivers who received TT vaccinations had 50% lower odds of their children scoring above the median for numeracy score. Those who received antenatal checkups had 30% reduced odds of their children scoring higher than the median numeracy score. Both of these results remained significant in the adjusted model.

5. Discussion

5.1 Main findings

This paper examined the association between caregiver's access to Anganwadi Center services and the school readiness scores of their children. The only service that was significant in its crude form and then insignificant in its adjusted form was the child going to the Anganwadi center, therefore signifying that the child attending an Anganwadi center was not negatively associated with school readiness in the presence of confounders. After controlling for these confounding variables, mother's income, mother's education, child's gender and caste, parameter estimates did change by 10%, indicating these variables are potential confounders of the relationship between access to community health services and school readiness scores.

The mother registering her pregnancy at the Anganwadi Center showed a strong association with improved school readiness among their five-year old children. This coincided with what is found in the literature, as registering the pregnancy in AWCs has shown to increase access to and communication on antenatal care and general maternal nutrition during pregnancy, in addition to safe means of delivery.[50] Children with mothers who received TT (Tetanus Toxoid) vaccinations scored approximately 2 points higher on their adaptive behavior scores and their overall school readiness scores than children with mothers without TT. Additionally, children whose mothers received supplementary nutrition from their Anganwadi center scored between 1

and 2 points higher on school readiness scores than children with mothers who did not receive supplementary nutrition. The nutritional status of both the mother and child affect the child's early physical and intellectual development. Cross-sectional analysis cannot claim causality between supplemental nutrition and scores, but it does show an association and this association reflects what has been shown in the literature. Supplementary nutrition, intended to increase nutritional intake for both mothers and children, has shown proven improvements in child development. [51] [52]. Additionally, these results suggest that greater access to AWC services in pregnancy may improve children's school readiness. Other studies have also shown that awareness and utilization of AWC services by pregnant and lactating women, such as getting a TT injection, has contributed to improved developmental outcomes of their children. [53]

However, many results deviated from what was expected. Some services such as a village health nutrition day (VHND) and health workers visiting the home during pregnancy were associated with poorer school readiness scores. This could be due to these resources becoming available to families with lower health status to begin with. These families might be more vulnerable and in more desperate need for government services. Villages with lower health indicators might hold a village health nutrition day (VHND) out of necessity. Although VHNDs are expected to be held at all AWCs on a monthly basis, this is not practiced universally.[34]

Additionally, the health worker could have been visiting the home during the pregnancy in response to an emergency. It is unknown through the questionnaire if this visit is routine or if it was to address a specific problem. If it was, indeed to address a problem, then this could explain the reduced school readiness score. What is most surprising, however, are the data that show that a child attending an Anganwadi center has 2 points lower on his or her composite school readiness score as compared to a child who does not attend an Anganwadi center. These data might be showing that AWCs are only being utilized when a family or child is in need

of a health service such as an immunization or supplemental nutrition, rather than on a regular basis with goal of early childhood education (ECE). This is, after all, the component of the ICDS system that has had weaker evaluations as compared to other services.[38] Therefore, these results might indicate a more immediate need for a thorough evaluation of the ECE services provided at AWCs.

Findings from this thesis are not consistent with previous research demonstrating a positive association between receipt of antenatal care and school readiness scores. Some papers have stated that women are not aware of the existence of an AWC in their village. [53] Additionally, they will state that if they attend an AWC and are dissatisfied with a particular service, they will not return. [53] Therefore, it might be likely that only a small piece of the population is utilizing antenatal care services, and those women and their families might already have diminished health status and therefore are not associated with improved school readiness.

Returning to the hypothesis presented in the introduction, we can say that our data provide evidence to say that caregiver's access to AWC services is associated with school readiness scores of their 5 year old children. We cannot, however, say that this association was what was expected with all services. For instance, the association of the composite score of all services with the adjusted model for total school readiness was not positive. As explained previously, certain resources such as registering the pregnancy are associated with improved school readiness and are statistically significant. The numerical score yielded the most negative associations between access to services and readiness scores. As this score is also a component of the overall school readiness score, the negative associations in this score contribute to the negative association between the composite services score and the composite total school readiness score.

5.2 Limitations

This paper would have benefited from advanced multi-level modeling and mediation/path analysis. Not having the time or resources to dedicate to a complete mastery of this analysis method is a significant limitation in this paper. This could also begin to explain some of the more surprising findings such as children attending AWCs not being associated with improved school readiness. Many of the exposures of interest have been shown to be associated with maternal and child nutrition. [54] [49] [55]. Additionally nutrition has been shown to be association with improved school readiness. [56] [57] [58] Path analysis can shed light on nutrition as a key factor in the pathway from exposures at the Anganwadi Center services level and school readiness scores as an outcome. Another limitation of this study is that it was a secondary data-analysis, meaning I was not able to be active in the data collection and organization process. Therefore, I was not able to assess for myself non-response error or any bias in the way questions were asked of respondents. Additionally, a key limitation of cross sectional analysis is the inability to justify causality, as all analysis is done at one time point. Hence, I have been able to make statements on associations between different variables but have not been able to state any causality.

The main limitation of the questionnaire administered to caregivers is that refusals need to be taken into consideration. Caregivers could be uninterested in participating, or completing the questionnaire. This was dealt with by adding an extra 10% to the sample size in the design phase. [59] There are also a few limitations of school readiness instruments. For instance, the school readiness tools are designed with a specific definition of school readiness in mind. So, these tools cannot be used for multiple purposes. This is a limitation of school readiness tools in general. [11] This is why the school readiness tool used in this study was created using the expertise of the Center for Early Childhood Education and Development (CECED), in conjunction with the World Bank.

5.3 Recommendations

A single Anganwadi Worker is expected to conduct home visits, hold meetings in the AWC, provide vaccinations, and provide supplemental nutrition, in addition to many other tasks as needed. One of the key recommendations that has come out of this research is the need to provide added support to AWWs and other staff at the Anganwadi Center level. If the Government of India hopes to improve the caliber of services provided to its citizens, and hopes to change some of the results in this paper relating to certain services being associated with worse school readiness, those carrying out those services need to be better supported. This is one avenue through which to tackle the issue of women in the community not being aware of what is available at AWCs, as stated previously. If AWWs are provided increased access to resources to support their work and increased support, or if a larger number are hired, more women in the community can be better informed about what the centers have to offer. Services such as supplemental nutrition of women in pregnancy and registering of pregnancies have shown to be associated in these data with improved school readiness. If these associations are to be tested in a controlled environment in the future, with the intention of stating causality, AWWs must be respected and adequately compensated for their time and efforts.

Additionally, the ECD and School Readiness components of the ICDS system have not been evaluated as thoroughly as other components of ICDS such as maternal and child nutrition. Making these evaluations a priority would be a further recommendation of this study. ICDS is expected to contribute towards attainment of Millennium Development Goals 1, 2, 4 and 5. 1- eradicating extreme poverty and hunger, 2- achieving universal primary education, 4- reducing child mortality and 5- improving maternal health.[60] As ECD is a key piece of the MDGs, a thorough evaluation of successes and challenges would be of utmost importance.

5.4 Public Health Implications

Close to 27 million children are born in India every year, about 50 every minute. [39] Work focused on early childhood development and school readiness will positively impact the lives of many, if not all, of these children. This paper shows the importance of both maternal and child access to health services in impacting school readiness of children. The ICDS system plays an active role in the health of both the mother and child and yet, the results here show that not all the services provided by ICDS are contributing to improved school readiness. This should change. The community health services through ICDS should be carefully evaluated and changed based on results so all services are in some capacity improving health, whether it is through ECD and school readiness or in another capacity. It is not only the education and development of the child that prepares them for formal schooling. The first 6-8 years of a child's life are impacted by what stimulates the child but also by the mother's health and access to community health services. India has an incredibly promising future, but it will only be achieved if everything is done to keep our caregivers and children healthy. To reach this goal, the health, education, public, and private sectors must all be mobilized. This paper focused on public and government services that can contribute to improved ECE and school readiness, but it is critical to engage all stakeholders, caregivers, community health workers, government sectors, the private sector and NGOs, if we hope to meet our millennium development goals in India and help increase the number of children in who are able to develop to their full potential.

Appendix 1: Tables

Table 2: Demographics		
Demographic Characteristic	**Categories**	**N(%)**
Age of mother	<20 years	7 (0.56%)
	20-29 years	689 (55.2%)
	30-29 years	484 (38.8%)
	40-49 years	68 (5.5%)
Highest grade of education completed by mother	Illiterate	442 (35.4%)
	Class 1-4	162 (13.0%)
	Class 5-7	312 (25.0%)
	Class 8-9	225 (18.0%)
	Class 10-11	61 (4.9%)
	Class 12-13	34 (2.7%)
	Graduate and above	12 (0.96%)
Monthly income	<= Rs.500	28 (2.2%)
	Rs. 501-2000	264 (21.2%)
	Rs. 2001-3000	473 (37.9%)
	Rs. 3001-4000	247 (19.8%)
	Rs. 4001-6000	102 (8.2%)
	Rs. 6000-9000	31 (2.5%)
	> Rs. 9000	36 (2.9%)
Gender of child	Male	664 (53.2%)
	Female	584 (46.8%)
Do you belong to a schedule caste?	Schedule Cast	292 (23.5%)
	Schedule Tribe	314 (25.2%)
	OBC	615 (49.3%)
	Other/higher	27 (2.2%)
Religion	Hindu	1237 (99.1%)
	Muslim	7 (0.56%)
	Sikh	2 (0.16%)
	No Religion	2 (0.16%)
Family type	Nuclear	761 (61.0%)
	Joint	487 (39.0%)

Table 3: School Readiness Score Averages and Ranges

School Readiness Score Type	Mean (SD)	Minimum	Maximum
Overall Score	43.4 (10.4)	8	70
Numerical Score	0.92 (1.4)	0	6
Literacy Score	14.4 (7.0)	0	31
Adaptive Behavior Score	28.1 (6.3)	0	40

Table 4: Percentage of Caregivers With Access to Various AWC Services		
Type of Service	**Categories**	**N (%)**
Registered pregnancy	Yes	1072 (85.9%)
	No	176 (14.1%)
Received TT	Yes	1201 (96.2%)
	No	47 (3.8%)
Total number of IFA during pregnancy consumed	Did not consume	64 (5.9%)
	<90	641 (58.7%)
	>=90	348 (31.9%)
Received supplementary nutrition from AWC	Yes	1051 (84.2%)
	No	197 (15.8%)
Nutrition and health day organized at AWC	Yes	870 (69.7%)
	No	378 (30.3%)
Any health worker visit home during the pregnancy	Yes	770 (61.7%)
	No	478 (38.3%)
Child Goes to AWC	Yes	932 (74.7%)
	No	316 (25.3%)
Received Antenatal Checkup	Yes	893 (71.55%)
	No	355 (28.5%)
Measured weight and height of child	Weight only	713 (57.1%)
	Height only	27 (2.2%)
	Both	235 (18.8%)
	Neither	273 (21.9%)

Table 5: Association of Health Services Access with School Readiness among 5 year olds in Chhattisgarh (N=1248)				
Components of Services Score (Independent Variable)	**Crude Model with School Readiness (Dependent Variable)**		**Adjusted Model**	
	Total School Readiness Score	**Adaptive Behavior Score**	**Total School Readiness Score**	**Adaptive Behavior Score**
	Parameter Estimate +/- SD (P-Value)	**Parameter Estimate +/- SD (P-Value)**	**Parameter Estimate +/- SD (P-Value)**	**Parameter Estimate +/- SD (P-Value)**
Registered Pregnancy	1.84 +/- 0.82 (0.03) *	1.73 +/- 0.54 (<0.001)**	1.5 +/- 0.85 (0.04)*	1.55 +/- 0.73 (0.0025) **
Received TT Vaccination	1.88 +/- 1.03 (0.23)	2.17 +/- 0.74 (0.021) *	1.65 +/- 1.60 (0.30)	1.87 +/- 0.64 (0.03) *
Received Antenatal Checkup	0.01 +/- 0.66 (0.99)	0.51 +/- 0.72 (0.19)	-0.94 +/- 0.67 (0.16)	0.14 +/- 0.44 (0.72)
Received Supplementary Nutrition	0.33 +/- 0.65 (0.68)	1.44 +/- 0.54 (0.003)**	0.579 +/- 0.82 (0.48)	1.48 +/- 0.52 (0.0028) **
Village Health Nutrition Day Organized	-2.1 +/- 0.32 (<0.001)**	-1.7 4 +/- 0.65 (<0.001) **	-1.84 +/- 0.66 (0.0056) **	-1.77 +/- 0.43 (<0.001)**
Health Worker Visited home during pregnancy	-1.64 +/- 0.54 (0.007)**	0.63 +/- 0.54 (0.09)	-1.78 +/- 0.23 (0.0037)**	0.53 +/- 0.83 (0.15)
Measuring Weight and Height	-1.67 +/- 1.3 (0.24)	-0.367 +/- 0.39 (0.67)	-2.29 +/- 1.6 (0.11)	-0.574 +/- 0.84 (0.5)
Child going to AWC	-2.01 +/- 0.43 (0.003) **	-0.34 +/- 0.67 (0.40)	-1.12 +/- 1.1 (0.11)	-0.13 +/- 0.24 (0.7)
How many IFA tablets did you receive	p-value: 0.13	p-value: 0.013*	p-value: 0.035*	p-value: 0.005 **
90+	0 (reference)	0 (reference)	0 (reference)	0 (reference)
<90	-0.805	-0.288	-0.116	-0.03
0	-0.91	-1.4	-1.65	-1.66
Composite Score: All Services	-0.38 +/- 0.18 (0.03) *	0.118 +/- 0.11(0.27)	-0.354 +/- 0.16 (0.044)*	0.108 +/- 0.19 (0.32)
* Significant at 95% level ** Significant at 99% level				

Table 6: Association of Service Access with Literacy Score among 5 year olds in Chhattisgarh (N=1248)		
Components of Services Score (Independent Variable)	**Crude Model with School Readiness (Dependent Variable)**	**Adjusted Model**
	Literacy Activity Score	**Literacy Activity Score**
	Parameter Estimate +/- SD (P-Value)	**Parameter Estimate +/- SD (P-Value)**
Registered Pregnancy	0.08 +/- 0.45 (0.89)	-0.10 +/- 0.55 (0.9)
Received TT Vaccination	-0.74 +/- 0.37 (0.45)	-0.65 +/- 1.05 (0.53)
Received Antenatal Checkup	-0.71 +/- 1.2 (0.09)	-1.20 +/- 0.44 (0.0067) **
Received Supplementary Nutrition	-1.06 +/- 0.38 (0.04) *	-0.91 +/- 0.53 (0.09)
Village Health Nutrition Day Organized	-0.38 +/- 0.56 (0.35)	-0.43 +/- 0.13 (0.3)
Health Worker Visited home during pregnancy	-2.24 +/- 0.48 (<0.001)**	-2.28 +/- 0.22 (<0.001)**
Measuring Weight and Height	-1.66 +/- 0.82 (0.069)	-2.0 +/- 0.59(0.03)*
Child going to AWC	-1.42 +/- 0.22 (0.001) **	-0.93 +/- 0.21 (0.04) *
How many IFA tablets did you receive	p-value: 0.37	p-value : 0.40
90+	0 (reference)	0 (reference)
<90	0.444	0.379
0	0.73	0.62
Composite Score: All Services	-0.5 +/- 0.15(<0.001) **	-0.48 +/- 0.11(<0.001)*
* Significant at 95% level		
** Significant at 99% level		
Adjusted for: mother's income, mother's education, child's gender and caste		

Table 7: Association of Service Access with Numerical Score among 5 year olds in Chhattisgarh (N=1248)		
Components of Services Score (Independent Variable)	**Crude Model with School Readiness (Dependent Variable)**	**Adjusted Model**
	Numerical Activity Score	**Numerical Activity Score**
	Odds Ratio (CI)	**Odds Ratio (CI)**
Registered Pregnancy	1.04 (0.75, 1.4)	1.09 (0.78, 1.5)
Received TT Vaccination	0.513 (0.27, 0.97)*	0.449 (0.221, 0.912) *
Received Antenatal Checkup	0.71 (0.55, 0.91)*	0.737 (0.561, 0.968) *
Received Supplementary Nutrition	0.93 (0.68, 1.3)	0.877 (0.634, 1.21)
Village Health Nutrition Day Organized	0.91 (0.72, 1.2)	0.82 (0.63, 1.1)
Health Worker Visited home during pregnancy	0.98 (0.78, 1.2)	0.951 (0.75, 1.2)
Measuring Weight and Height	0.84 (0.64, 1.1)	0.881 (0.66, 1.2)
Child going to AWC	1.2 (0.96, 1.6)	0.955 (0.72, 1.3)
How many IFA tablets did you receive		
90+	1 (reference)	1 (reference)
<90	1.2 (0.95, 1.5)	1.2 (0.93, 1.5)
0	0.79 (0.55, 1.1)	0.75 (0.51, 1.1)
Composite Score: All Services	1.03 (0.97, 1.1)	1.05 (0.98, 1.13)
* Significant at 95% level		
** Significant at 99% level		
Adjusted for: mother's income, mother's education, child's gender and caste		

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