

## **Roles of Children in the Proliferation of Communicable Diseases in Nigerian Rural Communities: A Designer's Perspective**

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### **Abstract**

*Curbing the spread of communicable diseases (CD) is a collective responsibility of all professionals, designers and behavioural medicine professionals inclusive. The current study examines the connection between attitudes toward communicable diseases and their rate of transmission in rural areas with a view to decrypting suitable persuasive tools for the alleviation of CD prevalence. Children are 'innocent' and this discuss is not disputing this fact. However, the attitude of some children (and their parents) plays key roles in the proliferation of CD which in turn affects them in ways with mild to severe consequences. This paper therefore highlights some ways children are contributing to the proliferation of CD with a view to contributing to the knowledge needed to design effective tools and strategies required to alleviate or contain the outbreaks of CD in the rural areas. This situational review adopted an observatory method in which subjects were directly observed in their natural habitats with only little or no interference except when questions were to be asked or when interventions were necessary. While the study showed that children's roles in CD transmission was mainly behavioural, it revealed Ignorance, False knowledge and Carelessness/carefreeness [IFC] as key factors promoting the risky behaviours that pose threats to public health. This discuss described prevailing situations in public health risk behaviours in selected rural areas in Nigeria with a view to serving as prelude to more detailed (case) studies and user-centred persuasive design conceptions.*

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**Keywords:** *Children, Communicable Diseases, Design, Nigeria, Pattern Recognition, Persuasive Design, Rural Areas.*

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### **1.0 Introduction**

All professions or disciplines: science, medicine, business, technology and design inclusive, have roles to play in keeping humanity safe. There are various threats of bioterrorism, technological mishaps and experimental hazards, response of nature to over-exploitation by man engineered activities and over-explorations, environmental mismanagement and so on. All these and more pose key threats to the health and existence of humanity. Unfortunately, researchers, academics, designers, policy makers and other professionals, especially in the health sector, are in the habit of monitoring the sources of 'major threats' that they sometimes ignore the seemingly minor sources whose contribution or carelessness may portend even graver consequences for public health. Of course, unlike the western world, rural areas in developing States like Nigeria, aside from security threats such as infantry or guerilla terror pressures in the forms of Boko-haram attacks and Fulani herdsmen mishaps, really do not have much to worry about unless regular family life, growing their crops/animals and other related

social and religious obligations/commitments. Before modern theories were established, people attributed diseases to such things as bad or foul smelling air, earthquakes or sin (PKIDs, 2004-2008). There were even cases in the past when a disease outbreak may be considered as a sort of ‘punishment from a deity’ and all that was considered needed was a ‘sacrifice to appease the gods’ ignorant of the fact that such outbreaks might have been due to ignorable threats. One of such minor or ignorable sources of threats to the well-being of humanity is the unchecked attitude of children towards CD or infections especially in the rural areas. Parents in rural areas, especially in farm settlements, were observed in the course of the study to be ‘careless’ enough. How much more careless and carefree then were the children (e.g. Figure 1), who were more vulnerable and apparently less knowledgeable?



**Figure 1:** *Some children in Osi, a rural area in South-Western Nigeria*  
**Source:** *Courtesy of Ogunjemite Idaresit Ponmile (2020)*

From sexually transmitted infections (STI) such as Human Papilloma Virus (HPV), Human Immune Virus (HIV), hepatitis, genital herpes, gonorrheal infection, and chlamydial infection to outbreaks such as coronavirus (SARS-CoV2), Ebola Virus Disease (EVD), H1N1 influenza (swine flu), avian influenza (Bird Flu), tuberculosis, norovirus, measles, scabies, Zika and other viruses, CD have been major threats to the health of the populace (PHI, N/A) especially in the rural areas of developing countries like Nigeria. While children, especially the younger ones, may not be engaged in sexually hazardous activities, they were yet often exposed to such infections via various means including touching, mother-to-child transmission e.g. during child birth or feeding (Adejuyigbe, Orji, Onayade, Makinde, & Anyabolu, 2008), surrogacy or surrogate motherhood (Adejuyigbe, Odebiyi, Aina, & Bamiwuye, 2008), skin-to-skin contact, contact with infected surfaces or organic materials and sexual or other forms of physical abuse and or “abuses by designs” leading to habits or addictions that pose grave health risks to children (Odji, 2019). Some of these diseases have even been known to have higher prevalence amongst children relative to adults (Nagwa, Medhat, Rasha, Emad, & Taghreed, 2019). Infection of children has been predicted to continue (Mammas, Sourvinos, & Spandidos, 2009) despite preventive measures being taken. The question is: Why? And what possible role(s) do children play in this projected, yet avertible, CD prevalence with emphasis on the rural areas? Ways forward cannot be unraveled except causative trends and risk behaviours/attitudes are first credibly unraveled.

CD spread from person to person or from infected animals to persons (i.e. zoonotic diseases such as Ebola and Salmonellosis. HIV for example was originally a zoonotic infection spread to humans in early twentieth century, though it has since metamorphosed to a more distinct human-to-human only disease). The transmission may happen through airborne pathogens such

as viruses or bacteria, or through blood or other bodily fluids. According to the Nigeria Centre for Disease Control, NCDC (2018), Nigeria has been threatened by various infectious outbreaks in different parts of the nation since 2017 including Lassa fever, cholera, yellow fever, monkeypox and cerebrospinal meningitis etc. Although, the country, as well as its neighbouring States like Sierra Leone, Guinea and Liberia (Figure 2), responded effectively to contain these outbreaks, yet early detection, which will allow for the prevention of illnesses and deaths was necessary, a quarter in which Nigeria was yet questionably covering as was evident in the 2020 Coronavirus outbreak that claimed many lives all over the world similar to the 1918 Spanish flu (Influenza) pandemic.



**Figure 2:** Health workers carrying the body of a woman suspected of contracting the Ebola virus in Bomi situated on the outskirts of Monrovia, Liberia

**Source:** Njaguna (2014)

The Ebola epidemic for instance established the realistic damage that a large scale epidemic can generate and drew attention to critical capacity areas that Nigeria as a nation, as well as other West African states, must continually develop so as to be able to protect its citizens, especially children, against malevolent health hazards (NCDC, 2018). Ofcourse, as it is the norm in African politics, the government would claim it is trying its best to mitigate diseases/infections, epidemics or pandemics affecting children negatively. An example is the National Action Plan for Health Security (NAPHS) which is claimed by the Nigerian government to be a comprehensive multi-sectoral plan that integrates multiple work plans, addressing the major gaps identified, and prioritising them by national strategies and risks (NCDC, 2018). However, the results are not reflected in the number of infection cases reported annually (Egwari, 2015). This study therefore pried mildly into efforts currently being implemented in curbing the spread of CD in rural areas and how the rural residents are responding to them. One of the observed strategies the government and NGOs had been employing was CD prevention awareness creations aside from providing basic medical health needs and checkups, but how effective has it been? Is there a recommendable better way of approaching CD prevention awareness creation?

Although there has been claims in previous studies of a possible decline in the prevalence of CD relative to non-communicable diseases (NCD) in Nigeria (Musa & Garbati, 2014), however, inchoate or existing cases of CD such as Ebola, childhood TB (Ogbudebe, et al., 2018), HIV and Covid-19 are posing major threats and rendering the results of previous studies questionable in contemporary times. For example, according to the World Health Organization (WHO), ten million people developed tuberculosis in 2017, 10% of which were children, causing an estimated one million, three hundred thousand deaths among HIV-negative and

three hundred thousand additional deaths from TB- and HIV-co-infected people (Belay & Wubneh, 2020). Hence the need to mitigate the growth rate or rate of transmission especially amongst children because, aside from being a vulnerable group, children can also be major drivers of CD transmissions.

## 1.2 Design and Public Health

Design and Public Health are not estranged. There have been various interdisciplinary studies linking design with health for the purpose of improving public health e.g.: (Euichu, Jung; Joonbin, Im, 2012) proposed a device enabling the interaction required to act as a link among the three factors (child, society (the government or a private company), and a protector) necessary for the effective protection of children against abuses/crimes. Odji (2019), introducing the concept of child abuse via designs, revealed that abuse may emanate from designs, and behaviour may be influenced by the same, and so recommends a conscious query, by appropriate authorities, of persuasive designs and systems with a view to curbing such possible abuses and negative influences where they appear to exist. Alexander Muela (2012) addressed the issue of child abuse and neglect from a multidimensional perspective and so on. There have also been various health-based products and applications linking design with health. While much research emphasis in various disciplines have been placed on child abuse as a public health issue, roles that children themselves may play in the prevalence of the problems have been grossly under-researched. Therefore, this study reviews the roles children (and parents) in rural communities play in the prevalence of CD with a view to providing leverage for designing effective functional persuasive tools and programs (persuasive designs) for possible alleviation, control or prevention of future outbreaks. Persuasive designs are designs intended to influence human behaviour without unnecessary coercion (Odji, 2019). It is the responsibility of a design researcher to decrypt problem patterns so as to create appropriate user-centred design solutions.

## 2.0 METHOD

The study adopted a qualitative approach, covert observation, as well as review of relevant literature. It described the prevalent situations in some rural outskirts in South Western States in Nigeria. The target population included primary school pupils (age = 6 - 11 years) living in rural areas in South Western Nigeria. [The specific communities were not mentioned for administrative and security purposes judging from the prevailing situation in Nigeria]. Data were collected through direct observations and through unstructured interviews. Interactions with the rural dwellers were limited to when it was absolutely necessary to avoid 'hypocritical role playing.' Limited interactions with children were necessary, using the traditional classroom methods, to create CD prevention awareness. Such interactions were however considered unnecessary in areas where government agents or NGO representatives had already conducted such orientations. Residents were observed directly in their natural habitats with minimal interferences. Community leaders and school authorities only saw the research team as interventionists who came to create awareness on the prevention of CD transmission. Observations were carried out over a period of two years (2018-2020). Inferences were also drawn from residents' self-reports and from existing literatures.

### 2.1 Research Questions

1. Are there recognizable patterns in children's roles in the spread of CD?

2. What observable efforts are being employed to contain prevalent CD in rural areas in Nigeria?
3. How are children (and their parents) responding to these measures?

## **2.2 Research objectives**

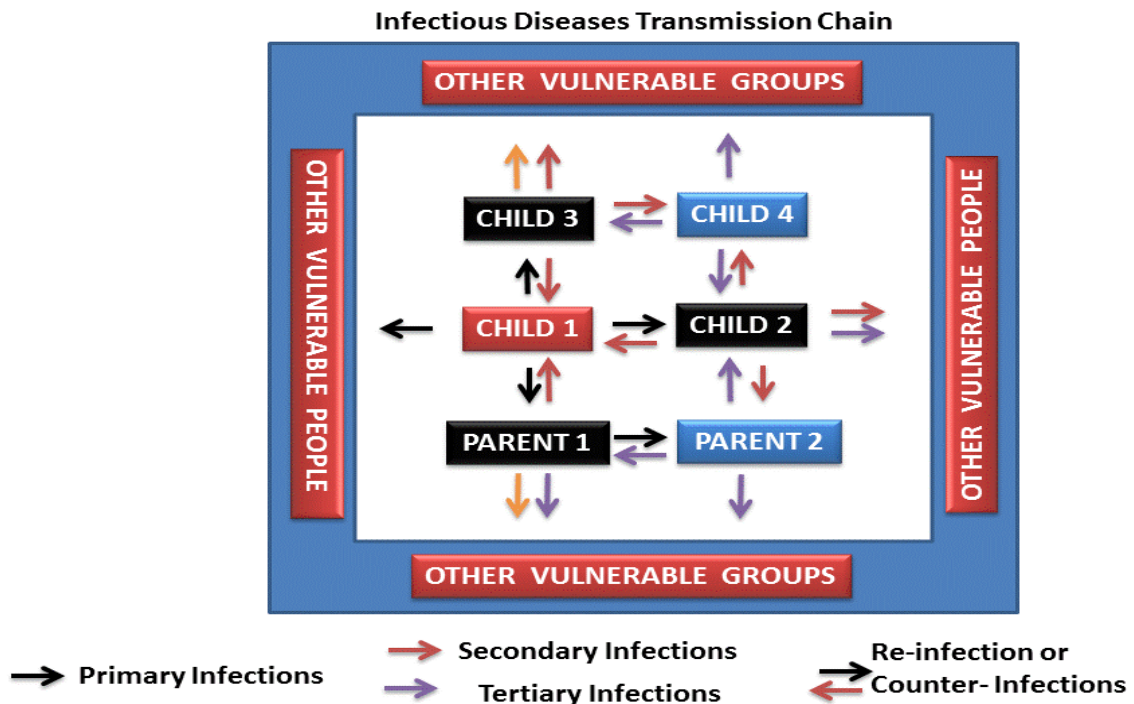
1. To decrypt recognizable patterns in children's roles in the prevalence or transmission of CD in selected rural areas in Nigeria.
2. To highlight the efforts being employed to contain prevalent CD in rural areas in Nigeria.
3. To reveal how children (and their parents) are responding to the measures being taken to curb the spread of CD in selected rural areas in Nigeria and the possible effects.

## **3.0 RESULTS AND DISCUSSION**

Based on observations and mild unstructured interviews (including confidential counseling sections), the results of the study were as discussed below, objective by objective, showing how children partake in the transmission of CD.

**3.1 Objective One:** To decrypt recognizable patterns in children's roles in the prevalence or transmission of CD in selected rural areas in Nigeria.

Four CD transmission patterns were noticeable: children to children, children to adults, adults to children and adults to adults. The role of children may be patterned as shown in Figure 3. As the COVID-19, also known as the Wuhan virus or Coronavirus, outbreak continued to grow (as at April, 2020), comparisons were drawn to influenza. For COVID-19 virus, initial data collected indicated that children were less affected than adults and that clinical attack rates in the 0-19 age group are low (WHO, 2020). Further preliminary data from household transmission studies in Asia however suggested that children were infected more by adults than vice versa. In the case of Influenza, children were important drivers of the influenza virus transmission in the community (WHO, 2020). This accentuates the significance of children as players in the transmission of infectious diseases. Therefore, in order to curb the spread of CD, there was the need to give special cognizance to the roles of rural children. Hence, a feasible pattern of the spread of CD in the study areas was drawn and summarized as shown in Figure 3.



**Figure 3:** The Influence chain of children in Communicable Diseases transmission

*Source: Odji Ebenezer (2020)*

From Figure 3, all it requires for an infection to turn epidemic is for an infected child 1 (an index case) to come to school, the playground, a religious worship centre or the market square and so on where he/she then transmits the infection to a second child/person (case 2: which from Figure 3 can be any of child 2, parent 1 or child 3 and other vulnerable people who might become directly exposed to his/her infection). The CD transmission rate may then become exponential from then on as each new case simply repeats the infection patterns of the index case or a similar pattern. Infected or sick children pose graver risks to public health since they attract greater empathy/sympathy or similar emotional attachments. This is not to mean that sick children should be cared less for; far from it. It however means that appropriate precautions should be taken in cases of infected children, as much as with infected adults, void of undue sentiments. For example, isolation (with proper psychological, parental and medical care) of index cases is an effective means of containing a possible outbreak. However, according to a rural area dweller “*isolating a child (an infected child) was wicked, inhuman and unkind.*” The few rural dwellers interviewed simply saw no essence for isolation. Therefore, such children still interacted with other children freely, some with runny noses, cough (or dry cough), sneezing, itchy/scaly or cracked skin, rashes, conjunctivitis, sore throat and other observable symptoms of CD. Hence, infections such as tinea corporis (ringworm) and measles for example were easily transmitted from a child to another, i.e. in schools or playgrounds, who then each take them home to other vulnerable people including siblings, parents and neighbours, etc. as shown in Figure 3.

The years 2019 and 2020 proved to be most challenging for the world and especially for developing countries like Nigeria with minimal fiscal and technological capacity to cope with or contain pandemics and other health related risks with emphasis on the impact on children. A major danger of some CDs, with reference to Figure 3, is that an infected person may be able to pass it on to someone else before he/she knows they are sick (CDC, 2014). This especially

worked against the NCDC’s efforts to curb the spread of the Coronavirus for example since Nigerians were known for taking things for granted until proven beyond reasonable doubts. Nigerians, in this case, could be described as the proverbial “Doubting Thomas”. This attitude was not unique to Nigeria though. Similar prevalence was noticeable in other African countries. Although, not necessarily completely ignorant of what the preventive measures were, some citizens still engaged in activities that promoted or failed to mitigate the transmission of CD. This negative attitude towards health has been a major Achilles heels that the nation’s health professionals and ministry of health have had to contend with over the years and rural children (and their parents) had their fair roles to play in it, especially with their tendencies to be careless or carefree. The roles children play in the spread or prevalence of CD was reflected in their responses to measures being taken to curb the spread of CD as highlighted in Tables 2 and 3. These roles or responses obviously were not unattached to the parents’ attitudes towards CD.

**3.2 Objective Two:** To highlight the efforts being employed to contain prevalent CD in rural areas in Nigeria and observable results.

Observations revealed that three main categories of interventionists have been working at one time or the other to curb the spread of CD and NCD in rural areas in Nigeria namely:

1. The government sponsored interventionists
2. Non-governmental organizations (NGO) agencies (e.g. Figure 4) and
3. Individual researchers or philanthropists

Some of their efforts are summarily highlighted in Table 1.



**Figure 4:** A member of an NGO during an anti-laser fever awareness creation campaign in Osi, a rural area in South Western Nigeria.

*Source:* Courtesy of Ogunjemite Idaresit Ponmile (2020)

**Table 1:** Observable measures by both NGOs and the Government in stemming the prevalence of CD in rural areas and observable results.

S/N	Attempted measures both by NGOs and Government agents	Observation Actions/interventions	Observable Results/Responses	Possible Risk(s)
1.	<b>Creation of awareness</b> (Both by the	This was done/sponsored by both the Government	1. Many villagers still behaved as they previously did prior to	Continued spread of CD and

	<p>Government health workers and NGOs either jointly or separately) through:</p> <ul style="list-style-type: none"> <li>• Radio</li> <li>• Television</li> <li>• Posters (at local medical centres)</li> <li>• One-on-one or group orientation (e.g. Figure 4)</li> </ul>	<p>(spearheaded e.g. by midwives/nurses) and NGOs (spearheaded e.g. by members/executives of NGOs) in the many of the rural areas understudied.</p>	<p>the orientation/re-orientation/awareness creation.</p> <p>2. Some villagers either did not understand what was taught (remained ignorant), understood but did not agree but wouldn't let the health workers know (choosing ignorance) or simply had a 'wrong understanding' of what was being taught leading to 'false knowledge.'</p> <p>3. Orientations were targeted primarily at parents (adults) and rarely at children who are chief role players in CD transmission/prevalence as shown in Figure 3</p>	<p>prevalence of NCD despite awareness creation efforts.</p>
<p>2.</p>	<p><b>Provision of basic health/tests or direct patient care services</b> by the government. This was especially pronounced in Ondo State for example. NGOs also provided their services.</p>	<p>Basic health/tests services provided by both NGOs (Figure 7) and the government health workers.</p>	<p>Unfortunately, many villagers did not see the essence of visiting the health centres for regular tests/checkups. As a respondent claimed, <i>"It is a waste of money that we do not have."</i></p> <p>Deliberately hiding infections, they mostly reported cases when they were already beyond domestic control.</p>	<p>1. Worsen cases and possibilities of death since cases were not reported or attended to at an early stage.</p> <p>2. Further spread of prevalent CDs.</p>
<p>3.</p>	<p><b>Provision of basic health centres/facilities</b> (by the government)</p>	<p>1. Fortunately, many of the communities/areas understudied had basic health centres (provided by the government e.g. Ondo State). The facilities were not meant only</p>	<p>1. In cases of CD, both for items 2 (above) and 3, multiple transmission patterns would have been engineered already before a case is reported, or before appropriate medical attention is</p>	<p>Further spread of a prevalent CD.</p>



to attend to CD alone but also to NCD and other forms of illnesses. However:

2. Most of the facilities were ill-equipped.
3. There was either no qualified/experienced Medical Doctor stationed there or when there was one or more, they, as observed in some communities, only resumed for duties every two or three days. This meant cases/patients either had to wait until the days they will resume for duties, apply local unorthodox alternatives, and travel to areas where medical services are available or simply die. [Poor access to healthcare]
4. There were also almost no noticeable facilities like ambulances for transporting referred cases to more equipped or modern facilities.
5. However, alternative services were provided by private facilities where available which villagers considered “*expensive*”.
6. Most villagers saw no reason to visit the provided facilities given to a patient, making the rural areas even more unsafe health wise.

		until cases had become 'worse.'	
4.	<b>Enforcement of measures such as social distancing, environmental cleanliness, protective face-mask usage and stay at home curfews.</b>	<p>1. Transmission patterns as shown in Figure 3 was not unique to rural areas alone. The same was noticeable in urban areas.</p> <p>2. However, in cases of epidemics/pandemics such as Covid-19 and Ebola outbreaks, while stringent measures were taken and strictly enforced in the more urbanized areas, enforcement was mild or none-existent in some rural communities as most rural dwellers went about their daily chores/routines as usual.</p>	<p>1. Stay at home orders and government imposed curfews were defiled with almost none-existent consequences in the rural areas.</p> <p>2. Some of the residents in the rural areas yet unreached by the pandemic, at the time of this study, didn't even believe such CDs as Covid-19 or Ebola truly existed. According to a rural resident, "<i>they were all government lies.</i>" This unsafe attitude/mentality was also inherent in the children in the same areas who went about their daily routines and interactions as usual. (This is a common attitude noticeable in various rural areas in Nigeria especially in the North.)</p>
5.	<p><b>Immunization for vaccine-preventable diseases</b> e.g. <i>meningitis, cholera and polio vaccinations.</i></p> <p>Vaccines prevent an estimated 2.5 million deaths among children under 5 five years of age (CDC, 2019).</p>	<p>While some of the rural residents allowed their children to be administered the vaccines, some others had '<i>doubts about the true motives behind the vaccination.</i>' <i>Some resistant rural opinionates have been suspected to have gotten violent in the past</i> (Campbell, 2013).</p>	<p>1. Some children never got vaccinated except for vaccinations administered at birth (for children delivered in certified health facilities).</p> <p>2. A few parents did not even know what vaccination meant.</p> <p>Unvaccinated children are at greater risks of infection and transmission of CD. E.g. Polio from Nigeria was reported to have been transmitted as far as to Indonesia (Campbell, 2013).</p>

				According to the CDC (2019), one child dies every 20 seconds from a disease that could have been prevented by a vaccine.
6.	<b>Contact Tracing</b>	Was not noticeable in the rural areas understudied in the course of the study, although was done in the more urban regions.	.....	Further and easier spread of a prevalent CD.
7.	<b>Quarantine/ Isolation</b>	Was not noticeable in the rural areas understudied.	.....	Further and easier spread of a prevalent CD.

**Source:** *Odji Ebenezer (2020)*

**Objective Three:** To reveal how children and their parents are responding to the measures being taken to curb the spread of CD in selected rural areas in Nigeria and the possible effects.

In attempts to curb the spread of CD amongst children and to other vulnerable groups as shown in Figure 3, professionals have had to contend with factors or situations such as highlighted in Table 2. Children, through schools, were taught each item highlighted in Table 2. Limited interactions with parents were also conducted where possible. Data were collected through observations and through few interactive sessions with the locals.

**Table 2:** Preventive measures based on CDC and NCDC recommendations, prevalent risk behaviours and possible risks or impact on public health.

S/N	Preventive Measure based on CDC (CDC, 2014) and NCDC recommendations	Prevalent Risk Behaviour: <i>What Most Children/parents Preferably did in the Study Area</i>	Possible Risk(s)
1	<b>Social Distancing 1</b> ( <i>protecting self</i> ): Children were told to avoid close contact with people who are sick.	Preferred playing around as roughly and sometimes as loudly as possible with friends, irrespective of their health status. Anything otherwise makes them 'feel sick' or 'deprived of fun'.	Easier and faster spread of CD.

2	<p><b>Do not share sharp objects with others:</b> <i>Children were told not to share sharp objects like razor blades with others.</i></p>	<p>Although few of the children observed this instruction, the majority bluntly did otherwise as necessity arose i.e. in classrooms.</p>	<p>Easier spread of CD.</p>
3	<p><b>Use Protective Face Masks:</b> <i>Children were instructed to always cover their mouths and nose with a tissue when coughing or sneezing. It may prevent those around them from getting sick.</i></p>	<p>Carelessly cough or sneezes freely in your face (not on purpose though; it is just the usual ‘carelessness ‘or ‘carefreeness’ associated with being a child). The use of face masks when sick was not recorded in the course of the study even though there were children who showed symptoms such as coughing and sneezing in schools and in the neighbourhoods.</p>	<p>Easier and faster spread of CD.</p>
4	<p><b>Social Distancing 2 (protecting others):</b> <i>Children and their parents were told that if and when possible, they should stay away from work, school, daycare centers, nursing homes and avoid running errands when you are sick. This will help prevent others from catching illnesses. “When you are sick, keep your distance from others to protect them from getting sick too”.</i></p>	<p>Stays or allowed to stay home, away from school, market, work etc. only when almost completely unable to move, function or carry out normal daily chores or routines. Or when forced to do so by an authority figure e.g. law enforcement agencies, school authorities, employers, etc.</p>	<p>Continued spread of CD.</p>
5	<p><b>No eyes, nose or mouth touching:</b> <i>Children were told that germs are often spread when a person touches something that is contaminated with germs and then touches his or her eyes, nose, or mouth.</i></p>	<p>Some of them will smile at the instruction; touch their noses or faces before they even remembered that you just told them not to do so. Some children showing flu-like symptoms were observed to playfully scrub mucus off their noses to rub on surfaces (e.g. classroom desks), on friends and siblings. As claimed by some children when queried, “they were just playing.”</p>	<p>Increased risk of infection and transmission of CD.</p>
6	<p><b>Keep your hands clean always:</b> <i>Children were told to always wash their hands to help protect them from germs. Or use alcohol-based hand sanitizers. They were told this was especially important before and after</i></p>	<p>The use of hand sanitizers was almost unnoticeable in the study areas amongst the children. They washed their hands mostly only when they were forced to do so by an authority figure e.g. a teacher or parent. And then they playfully go and get the same hands dirty almost immediately.</p>	<p>Easier and faster infection and transmission of CD.</p>

	<i>preparing food, before eating and after using the toilet.</i>		
7	<b>Keep surfaces clean:</b> <i>Children and parents were taught to frequently keep clean and disinfect touched surfaces at home, work or school, especially when someone is sick.</i>	Most parents and children observed took this opinion very lightly. A respondent claimed that, <i>“this is the way we have been living all this while. If it will kill us, we would have been long dead already.”</i>	Easier infection and CD transmission.
8	<b>Get Vaccinated:</b> <i>Children and parents were told that getting vaccinated was one of the best ways to prevent CD. Immunization can drastically reduce your chances of contracting many diseases. Parents were told to keep recommended vaccinations up-to-date.</i>	The average rural parent and child were apprehensive or suspicious of vaccines and those administering it as were the case with the purported Covid-19 and the administered Polio vaccines especially in Northern Nigeria. For example, the idea of a purported Covid-19 vaccine (which as at the time of this study was not even out yet) was greeted with utmost suspicion and apprehension in Nigeria.	Many avoided getting vaccinated and so contribute to the spread of CD.
9	<b>Take your bath regularly and observe other healthy practises/habits:</b> <i>Take your bath immediately and each time you return home.</i>	According to parents, most children will only do this when forced/instructed to do so, sometimes as a condition for getting their meals.	Increased risk of infection.
10	<b>Healthy rest and eating habits:</b> <i>Parents and children were taught to get plenty of sleep, be physically active, manage their stress, drink plenty of water/fluids, and eat nutritious food as recommended by CDC.</i>	Eating habits in the rural areas hardly recorded any alteration. People ate what they had always eaten and merely emphasized what they ate if it tallied with the instructions they were given. Some were observed to even eat fruits without washing them. Some ate, especially roasted meals such as yams and maize, on farms with unwashed hands.	Increased risk of infection.
11	<b>Do not reuse dishes:</b> <i>Children were told to avoid sharing drinking glasses or dining utensils.</i>  (Koo, 2020)	Unfortunately, some rural dwellers observed did not bother washing a dish/cutlery when it was just freshly used i.e. by a sibling/relative. When queried, some of them simply responded with a question, <i>“Was it (the dish/cutlery) not only recently used by my sibling?”</i> This was claimed by a 14 year old and her siblings, 10 years and 8 years old respectively, agreed with her despite the researcher’s intervention.	Easier infection and CD transmission between family members and to other vulnerable people around them.

12	<b>Do not share underclothing, towels or other private wears</b>	No parents commented on this but many of the children confessed to sharing undies, towels, toothbrushes or chewing sticks and other private wears with their siblings irrespective of the risks. As two children claimed, " <i>It is a normal thing,</i> " meaning they saw nothing wrong with the risk behaviour. (The siblings were 7 and 9 years old at the time of study.)	Easier infection and CD transmission.
13	<b>Keep the environment clean to keep out rodents and other carriers</b>	Residents did not have any problem keeping the environment clean from bushes as long as it did not interfere with daily chores. However, many of them were still with the belief that rodents posed no real threats to them or their children's health despite welcoming health campaigns against infections such as Laser fever. Children (most of whom shared their parents'/guardians' opinions about rodents) yet confirmed that rodents were rather helplessly regular companions at their homes.	Easier infection and CD transmission.
14	<b>Do not abuse antibiotics and avoid self-medication:</b>	Villagers mostly thought of the financial implications of consulting a qualified nurse or Doctor [that was even when one was available as some of the rural areas which had basic health centres sometimes do not have qualified health workers on ground at crucial times when their services were needed]. Many villagers considered patronizing a local untrained drug vendor as it was considered cheaper. Some villagers did not just know any better (simply ignorant). Some others believed more in consulting mediums or in unorthodox methods.	While some of the unorthodox methods proved effective in treating few sicknesses like Malaria and other NCD, they were futile in curbing the spread of CD.
15	<b>Disinfect the 'hot infectious areas' in your residence: with emphasis on the kitchen and bathroom — two areas that were prone to having high concentration of viruses, bacteria and other infectious agents.</b>	Although homes in the villages/hamlets/farm settlements hardly had sophisticated structures in which the kitchen and the bathrooms were within the main building as they were separate structures at the rear of the compounds and kitchens were more of cooking spots or sheds (Figures 5 and 6) at the back of the main house with both spots being bear grounded and so were not even considered	Easier and faster infection and CD transmission.

		<p>as needing any disinfection. Villagers even had no idea of how to disinfect such areas. Also, the bathrooms, which were always shared by all members of the families/tenants, who cared to bath in them and not out in the open, were more of playgrounds for children as well who readily splashed bathing water from both their buckets and the ground on one other. Some children even shared bathing materials including soap, sponges and towels.</p>	
16	<p><b>Travel mildly and wisely to limit the spread of an infection:</b> <i>Villagers were told to limit their travels especially to infested areas or when they feel sick.</i></p>	<p>Villagers would rather travel even without a second thought when the needs arose especially for sale or purchase (business) or religious purposes. Children, who were cheap labours or assistance providers, were sometimes taken on such travels. The younger ones were left at home to roam and mingle, sometimes, aimlessly with other children increasing the risks of exposure.</p>	<p>Higher risk of infection and easier and faster CD transmission.</p>
17	<p><b>Avoid sex or sexual activities:</b> <i>Children and parents were told sexual activities such as kissing, etc. would engineer infections and quicker spread of CD</i></p>	<p>Most of the parents did not believe such were taking place nor could ever take place. Although few of the parents looked as though they were denying a truth they knew existed, but for some reasons would rather not divulge. The children on the other hand were too scared to let their parents know what was happening. It was surprising to have discovered that some of the children as young as 10-12 were already aware of sexual activities as some of them claimed adults 'did things to them' like "touching them in their genitals", "kissing them" or even having oral, in-between-thighs or vaginal-contact sexual activities with them telling them not to tell others. Some of these sexual activities took place at school, in the neighbourhood, in the family (incest), etc. A 13 year old, who had been abused by her elder brother since she was about 7/8, claimed that, "when I refused to let my brother touch me, he gets angry with me and keeps grudges." A 9 year, 7 year and a</p>	<p>Easier and faster infection and CD transmission, most of which are treated or attempted to be treated locally. (Death or success data unavailable).</p>

10 year old who were siblings claimed an uncle had in-between-thighs and anal sexual contacts with them almost every month. Sometimes, he begged them while, at other times, he forced them and then begged or threatened them afterwards. Usually, these children were either ignorant or simply scared. Habitually, the assaults began, as could be deduced from the accounts gathered, with the perpetrators touching the victims unethically or making them sit on their laps etc. There were also cases of homosexual/lesbian pedophilic abuses. No wonder then the sight of teenage mothers (Figure 8), some as young as 12years, in the rural areas were not strange. Although not directly sighted, a respondent mentioned the case of an 11 year old mother impregnated by an adult. There was also a reported case of sexual experimentation between a male and a female primary school pupil (Oyo State). They were discovered in an uncompleted building beside the school.

18 **Avoid open field defecation:** Villagers were told that digging small or 'large enough' trenches that could be covered up later after use was an alternative to water closet toilet systems. They were told to avoid open field defecation as that contributes to the spread of CD.

This was a common activity many of the villagers were already used to, especially when they were on their farms. Although two farmers claimed to have dug "open-trenches" for defecation purposes when on their farms, others saw absolutely no essence for such. Urination was done purely indiscriminately. Some homes had 'pit latrines' though. [Further studies may be conducted on how many homes actually had such facilities and how best to make provisions so as to stem the proliferation of CD]

Higher risk of infection and CD transmission, most of which are treated or attempted to be treated locally using local medications or medications sourced from uncertified drug vendors. This risk behaviour is one of the chief aids of polio virus



19	<b>Boil water before you drink it:</b> <i>Both parents and children were told that drinking untreated water/fluids may lead to serious illnesses like Cholera or Hepatitis E. They were told that most cases of these diseases were caused by drinking water contaminated for example by fecal matters. Living in environments with poor sanitation could increase their risks of contracting the diseases and their likes. This, they were told, was especially true in overcrowded areas.</i>	Villagers, especially children did not take this measure really seriously except when someone was actually sick. From observation, few children not only bathed or swam in water sources (where boreholes or wells were not available especially in dry seasons) such as streams and still drank from the same sources before fetching some home for others to use/drink; they often did it in groups. As long as the water 'looked clear', they considered it okay for drinking. As claimed by some of the villagers, "We have been drinking this same water since we were born and we have not died." Some of the villagers not only engaged in open field defecation but also defecated and especially urinated in streams and other similar water sources, especially in farm settlements. Some children did not defecate directly in the water sources. They merely washed themselves up in them afterwards.	infection in Nigeria. Easier infection and CD transmission, most of which were treated or attempted to be treated locally.
20	<b>Do not keep dead bodies at home.</b> Touching and washing of the dead was common practise in some rural areas. This was supported by both culture and religion in some quarters.	Keeping of corpses at home, unfortunately, was common practice in some rural areas, before burials are conducted. Some rural dwellers saw it as "opportunities for closures." Usually, in cases where burial is not conducted immediately or the next day, a local or an auxiliary nurse/health-service provider does the embalming of the body which was then preserved at home until the burial ceremonies are over. Regrettably, person-to-person transmission of pathogens such as the Lassa and Ebola viruses which occur through contact with blood, urine, faeces, vomitus and other body fluids of an infected person, dead or alive, are encouraged through this practise.	Infections such as laser fever (which might have been the cause of death) are further and easily spread to other vulnerable people i.e. those exposed to the body.

Source: *Odji Ebenezer (2020)*

These risk behaviours (Tables 1 and 2) exposed children in the rural areas to greater risks of infections and aid the prevalence of CDs making it more difficult to break such patterns as described in Figure 3.



**Figure 5:** A cooking/storage wooden-shed behind a rural house  
**Source:** Odji Ebenezer (2020)



**Figure 6:** A typical cooking spot at the back of a village house  
**Source:** Courtesy of Ogunjemite Idaresit Ponnile (2020)



**Figure 7:** An NGO health volunteer at work in the rural area  
**Source:** Courtesy of Ogunjemite Idaresit Ponnile (2020)



**Figure 8:** The sights of teenage mothers were not uncommon in some rural areas

**Source:** Odji Ebenezer (2020)

The observations enumerated in this study were largely due to factors that characterize many rural areas in Nigeria including but not limited to such as are enumerated in Utor & Utor (2006), Ghose, Seydou, & Ghosh (2014) and Ogar, Dika, & Atanda (2018): Low level of literacy or high level of illiteracy, poor health-seeking behaviour, increased exposure to risk factors, poor sanitation, strong cultural, tribal and religious adherence and limited educational and economic capacity (poverty). However, what this study considers the greatest challenges compromising the developmental and public health promotion efforts, aiding CD transmission, in the understudied rural areas would include such things as:

- a. Ignorance (lack of appropriate knowledge) -[I],
- b. False knowledge (having and adhering to incorrect knowledge) –[F] and
- c. Carelessness/carefreeness amid unhygienic living conditions –[C].

Such key factors as listed above (herein represented by the acronym [IFC] fuel the prevailing attitude of both parents and especially children in the rural areas. This means that if IFC is alleviated in the rural areas, then the prevalence/transmission of CD will be greatly reduced.

## RECOMMENDATIONS

Based on the results already discussed, this study proposes the following recommendations:

1. Awareness creation targeted specifically at children highlighting the roles they play in CD prevalence in their areas and the roles they can play in curbing the prevalence i.e. helping them see personal reasons to take responsibilities.
2. Stringent enforcement of preventive measures with legal implications i.e. public prosecutions of adult offenders/defaulters in the rural areas. For example, the enforcement of stay home, isolation or social distancing measures will go a long way in breaking observable transmission patterns (e.g. Figure 3) in the rural areas. School authorities should also play active roles in the enforcement drives.
3. Encouragement and sponsorship of research designed to provide a better understanding of trends in the incidence of epidemics/outbreaks.
4. Encouragement of interdisciplinary studies which aid preventive measures.
5. Development and tests of new programs for underserved children and families in rural areas.
6. Identify effective means of replicating active interventions and services with fidelity.
7. Adoption of the preventive approach (as well as investigate the potential impacts of the prevention of CD transmission/ outbreaks) rather than the interventionist approach which has become common placed in many Africa states.

8. Appraise the impact of laws and policies that address prevention and intervention systems and services for CD at the federal, state, and, most significantly, at the local levels.
9. Researchers/interventionists (including independent researchers, academics, NGOs and Government sponsored researchers) should go beyond the traditional/conventional awareness creation methods into persuasive system and design creations to aid attitude/behaviour adjustments in the rural areas without undue coercion. The designs may be focused on breaking such patterns as postulated in Figure 3 and address IFC.

## CONCLUSION

Children are innocent, naturally carefree and lack knowledge required for the prevention or mitigation of CD transmission. Yet, the impact of the roles they play in CD transmission is immense. The risks posed by CD transmission recorded in Tables 1 and 2 may even be higher for asymptomatic infections/conditions especially with incubatory and convalescent carriers. As noticeable from this study, the roles children play in CD prevalence are mostly behavioural which means they can be alleviated or completely mitigated since human behaviours can be influenced. Hence, in addition to current preventive measures, this study strongly recommends the research, sponsorship and creation of effective children-targeted persuasive designs, both at the industry and academic levels, aimed specifically at curbing risky behaviours that pose threats to public health.

## LIMITATIONS OF THE STUDY

The greatest challenge of carrying out behavioural/attitude based studies such as the current one is the tendencies of the subjects to ‘stage play’ or pretend, meaning that they tend to act in ways they consider lawful, pleasing or acceptable to the observer or researcher which lowers the credibility of study outcomes. The unwillingness of the rural areas’ dwellers to participate in the study made it difficult to collect accurate quantitative data. Persuasive designs may be created to alleviate this trend in further studies.

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