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Research Article

Factors Associated with Under-Five Immunization Uptake among Mothers in Ota, Ogun State, Nigeria

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ABSTRACT

The paper examined factors associated with mothers' access to under-five (U5) immunization use in the study area. The study used a 2017 cross-sectional survey on child morbidity and survival data. This study was based on cross-sectional health facility-based survey data, and 1350 pregnant women who attended immunization clinics for their children, during the survey period were interviewed. A multi-stage sampling technique was deployed in the design to select the respondents. The study obtained information from the respondents on demographic characteristics, immunization, and quality of healthcare services. The linear regression results showed that the place of delivery (p = 0.000), who assisted the respondents on the delivery of last child (p = 0.002), who takes care of the child in respondents absence (p = 0.000), birth spacing between last child and present pregnancy (p = 0.000), type of household waste disposal practice (p = 0.000) and knowledge about child preventable diseases (p = 0.000), showed significant to the outcome variable, the immunization standing of last-child, dependent variable for child immunization status. The study recommends health education for stakeholders and retraining for healthcare workers to provide better quality child immunization services in the study area.

Keywords: Under-Five Mortality; Childhood Immunization; Healthcare Workers; Health Facility; Ogun State

INTRODUCTION

Childhood immunization rates in many sub-Saharan African (SSA) countries have stagnated, trailing behind other global regions despite the enormous benefits of immunization [1-3]. Nigeria has one of the worst under-five mortality rates and poorest immunization coverage in SSA. The 80 percent immunization coverage of the 1980s against significant childhood killer diseases has drastically nosedived to the lowest level despite all the available efforts, a point of grave concern and unacceptable [4]. It has been reported that about 60% of non-vaccinated children live in 10 countries, including Nigeria [5-6]. Many reports observed that Nigeria holds a large share of the burden of zero-dose and under-immunized children, with an estimated over 2.3 million [7-9]. This paper examined factors associated with mothers' access to under-five (U5) immunization use in the study area. 08Immunization is crucial for U5 survival and is incidentally low in SSA [1,10]. This could be due to many factors leading to millions of preventable deaths annually [11-16]. Nigeria is not doing well on this front and has very high infant mortality (58 per 1000 live births) and child mortality (132 per 1000 live births)[17,18].

The study provides a contextual appropriate evidence for understanding and improving immunization coverage in Ota and by extension other Local Government Areas in the State. It enhances capacity for evidence-based decision-making and targeted intervention strategies by policy makers tailored to suit rural and semi rural areas leading to achieving immunization targets. The study brings out barriers mitigating the optimal under five immunization coverage in the study communities, adds to current academic literature on immunization and and public health practice. Furthermore, it aligns with national and global priorities aimed at reducing under-five mortality and improving vaccine coverage such as National Immunization Policy and Sustainable Development Goal 3 goals/targets. Ultimately, the investment in this study will yield good returns in terms of improved child health outcomes, strengthen the

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quality of health systems, and reduced burden of vaccine-preventable diseases.

Nigeria's health outcomes or indicators are still unacceptably high, and many of its health facilities are not functional due to a lack of equipment, essential supplies, and qualified staff [19]. Most of the available health facilities lack resources and infrastructure, including cold chain facilities, medicines, deliverable s, and skilled personnel, among other health facilities' necessities [20-24], thereby aggravating the risk for various health problems and leading to inadequate service provision and dismal maternal and child health indices. More worrisome about this depressing performance is the poor funding by the government, which constitutes a massive hiccup in the campaign against immunization coverage. Nigeria has a very low coverage rate of childhood vaccines worldwide and the highest number of children who have not received any vaccines in Africa [14,18], leading to more than 1 in 8 children in Nigeria dying before their fifth birthday [18].

More importantly, there exists concerns and worries among the populace in the study setting as well as other rural and semi rural areas with respect to low immunization levels, which include increase disease outbreaks, rise in child mortality, deepen poverty, and weaken community health systems. For instance, measles outbreaks are strongly linked to low vaccination coverage; which can trigger epidemics particularly in places with poor healthcare system like the study location and Nigeria in general. Again, while vaccine-preventable diseases remain a leading cause of U5 child deaths in low-resource settings, treatment of diseases like measles or other child disease killers can be expensive and these costs can push families further into poverty, considering the fact that in Nigeria healthcare services is mainly through out-of-pocket payment. Further more, when children are not immunized, not only those who cannot be vaccinated would be affected, the whole community becomes vulnerable of disease spread.

The importance of immunization is widely known, yet its coverage in Nigeria has remained very poor despite many programs implemented to improve coverage. Perhaps the factors affecting vaccination and their dynamics are yet to be fully understood, leading to their unhindered influence on the health behavior of women and the immunization status of children in Nigeria [7, 25-26]. Given the above narratives, this study examines factors influencing the use or access to immunization of U5 children by their mothers among the study communities in Ota, Ogun State Nigeria, with a view to up scaling use, strengthening immunization policies and service delivery through evidence-based informed intervention strategy to boost uptake and sustainability of immunization coverage.

MATERIALS AND METHODS

Ado-Odo/Ota (AOO) served as the study location, and it is one of the 20 Local Government Areas (LGAs) in Ogun State, Nigeria. According to the 2006 Nigeria Census figures, AOO has the second-largest total population of 527,242, 14.05% of the state's population [27], and is the industrial base of the state. The study used a 2017 cross-sectional survey on child morbidity and survival data centered on cross-sectional health-facility-based survey data by the Covenant University Public Health and Well-being Research Cluster. One thousand three hundred and fifty pregnant women who attended antenatal care were interviewed during the survey. A multi-stage sampling technique was deployed in the design. In the first stage, 1 LGA was purposely selected from the 20 LGAs in the state. In the second sampling stage, a systematic selection of 12 health facilities, each from the 16 wards in the study area, and where more than one health facility existed in a ward, one was selected randomly[28]. The choice of 12 facilities from the 16 accounted for 75%, a statistically representative of the different characteristics of the health facilities in the LGA. The third sampling stage involved selecting clusters of women who attended immunization clinics for their U5 children. The list of their children's immunization cards/immunization registers served as a sampling frame for the vaccine status of these U5 children. The survey instrument was tested with the stakeholders and validated by healthcare experts. A reliability test was conducted on the items in the questionnaire using Cronbach's Alpha technique, which scored 0.75. The study obtained information from the respondents on demographic and socioeconomic characteristics, health-seeking behaviors, and quality of health services according to the study's objectives. The quantitative data were analyzed with the aid of Statistical Package for the Social Sciences (SPSS).

RESULTS

In Table 1 of the study below, detailed characteristics of mothers (respondents) are presented. It revealed that most respondents were aged 30 or below (62.3%) and this may implied that a substantial proportion had children between 25 and 40. Respondents were mainly Christians (71.5%), and the majority of them had secondary (39.6%) or post-secondary (24.9%) and professional (22.9%) education. On consideration of the occupation, it was revealed that self-employed accounts for the highest (46.4%), followed by public servants (13.5%) and private sector employees (13.1%) respectively. Those not working accounted for 11.3 percent and those trading accounted for 10.3 percent. Nevertheless, those in the farming sector (3.3%) and artisans followed with a negligible proportion (2.1%). Also, the study observed that 29.2 percent of the respondents indicated they live in a home with less than three persons, 43.6 percent reported living in homes with 3-4 persons, and 36.2 percent live in homes with five or more persons. Similarly, only a tiny proportion of the respondents (10.4%) had low environmental cleanliness and personal hygiene compared to the large number (89.6%) that maintained a clean environment and personal hygiene.

Variable	Category	No-1350	Percentage (100.0)
Age (years)	20–24	303	22.4
	25–30	537	39.8

	31–40	477	35.3
	41 and above	33	2.4
Religion	Christianity	965	71.5
	Islam	365	27
	Traditional/Others	20	1.5
Education	No Education	63	4.7
	Primary	107	7.9
	Secondary	535	39.6
	Post-secondary	336	24.9
	Professional	309	22.9
Occupation	Not Working	152	11.3
	Self-employed	626	46.4
	Civil/Public Servant	183	13.5
	Private Sector	177	13.1
	Farming	44	3.3
	Trading	139	10.3
	Artisan	29	2.1
No of Persons living in the House	≤ 3 persons	272	29.2
	3–4 persons	589	43.6
	≥ 5 persons	489	36.2
Maintaining Clean Environment & Personal Hygiene	Yes	1209	89.6
	No	141	10.4

Table 1: Socio-Demographic Characteristics of Mothers of Under-Five Children

Source: Authors' Computation 2026

Information on who assisted in delivering your last child revealed that most respondents (85.2%) were assisted by modern healthcare personnel, and a reasonable proportion affirmed the contrary. While 51.1 percent of the respondents stated that the health facility is far from their homes, 48.9 percent retorted differently. Furthermore, respondents who were delayed for less than 60 minutes before obtaining treatment from health facilities when their children were ill accounted for 44.1 percent, and those who were delayed for 61 to 120 minutes and 121 and above minutes account for 26.1 percent and 29.8 percent, respectively. Concerning childcare practice, a considerable proportion leave the care of their children to their mother/mother-in-law (48.8%) and house help (26.5%). Husbands (15.9%) and daycare centers (8.8%) followed, though daycare attendance attracted a negligible proportion. While 46.4 percent administered oral re-hydration salt (ORS) to their children, 53.6 percent expressed the contrary in the study area. Similarly, 65.9 percent of the respondents attested to the knowledge of child-preventable diseases, and 34.1 percent retorted negatively. While 40.4 percent attested to giving birth to their last child in the government health facility, 37 percent of them gave birth at private clinics. Nevertheless, slightly above one-fifth of the respondents (22.6%) used non-institutional facilities to deliver their children. Water-related ailments showed that the highest proportion of the study population of their children suffered from typhoid (49.1%) and diarrhea (38.7%), respectively. Also, dysentery and cholera ailments were noticed among children of respondents to the tune of 7.3 percent and 5.9 percent, respectively, whereas other related water ailments account for 8 percent. Respondents who spaced their pregnancy for less than 12 months were 36.7 percent, and those between 13 and 24 months were 24.9 percent. Nevertheless, respondents with a birth spacing of 25 months or more accounted for the highest proportion (38.4%).

The immunization status of the last child revealed a worrisome scenario as 58.2 percent of the respondents' children received a complete immunization dosage, and 27.4 percent and 14.4 percent had incomplete and zero doses of immunization, respectively. This means that 41.8 percent of children in the study communities received no vaccine. In the current study, respondents whose children fell ill once, twice, and thrice were 39%, 5.8%, and 28.9%, respectively. However, over one-fourth of the respondents (26.3%) affirmed their children fell sick four times a month. Whereas the cordiality of health workers accounts for 62.8 percent, a substantial proportion (37.2%) confirmed that health workers mistreated them at the time of the survey. Among the study communities, respondents established

that their husbands decided on the place of treatment with an overwhelming proportion (63.3%), followed by the respondents (29%) and a negligible proportion from others (parents, relations, and friends). In the study area, 36.9 percent and 37.9 percent indicated that treatment costs are expensive and moderate, respectively, with only slightly above one–fourth (25.2%) admitting that the price is cheap. Regarding breastfeeding, respondents who breastfed their children between 6 months and 9 months and those in the category of less than 6 months account for the highest proportion (42.8%) and (24.7%) respectively. However, respondents in 10-12 months and 12 months and above categories accounted for 16.4 percent and 16.1 percent, respectively. Likewise, on household waste disposal, it was observed that those that disposed of their waste through government collection and private agency account for the highest (57%), followed by households that practice burying or burning refuse in their compound (29.4%), and least among those that use an unauthorized dumpsite (13.6%).

Variable	Category	No-1350	Percentage (100.0)
Who Assisted in Delivery of Last Child	Modern Personnel	1150	85.2
	Non-Modern Personnel	200	14.8
Distance to Health Facility	Far	690	51.1
	Not Far	660	48.9
Time Needed to Obtain Treatment	< 31 minutes	168	12.4
	31–60 minutes	428	31.7
	61–120 minutes	352	26.1
	≥ 121 minutes	402	29.8
Who Takes Care of Last Child	House Help	358	26.5
	Day-care Center	119	8.8
	Mother/Mother-in-law	659	48.8
	Husband	214	15.9
Ever Used ORS	Yes	626	46.4
	No	724	53.6
Knowledge about Preventable Diseases	Yes	889	65.9
	No	461	34.1
Place of Delivery	PHC/Hospital	546	40.4
	Private Clinic	500	37
	Home	90	6.7
	TBA Place	214	15.9
Water-related Ailments	Typhoid	542	49.1
	Cholera	79	5.9
	Dysentery	98	7.3
	Diarrhea	523	38.7
	Others	108	8
Birth Spacing	< 12 months	495	36.7
	13–24 months	337	24.9
	≥ 25 months	518	38.4
Immunization	Complete	785	58.2
	Not Complete	370	27.4
	No Immunization	195	14.4

Child Fell Sick (Monthly)	Once	526	39
	Twice	78	5.8
	Thrice	390	28.9
	Fourth+	356	26.3
Behavior of Health Workers	Cordial	848	62.8
	Not Cordial	502	37.2
Decision Maker for Treatment	Husband	854	63.3
	Myself	392	29
	Parents	65	4.8
	Others	39	2.9
Cost of Treatment	Expensive	498	36.9
	Moderate	511	37.9
	Cheap	341	25.2
Breastfeeding Duration	< 6 months	333	24.7
	6–9 months	578	42.8
	10–12 months	222	16.4
	≥12 months	217	16.1
Waste Disposal Practice	Government Collection	481	35.6
	Private Collection	289	21.4
	Within Compound	397	29.4
	Burning/Burying	397	29.4
	Unauthorized Dumpsite	183	13.6

Table 2: Maternal and Child Health-Related Characteristics

Source: Authors' Computation 2026

The correlation coefficient (R=0.404) shows a positive correlation between the immunization state of the last child and its predictors on average. The R-squared indicates that the included predictor in the model explains 16.3 percent of the previous child immunization status variance. The adjusted R-squared of 15.9 percent further confirms this result. The ANOVA result (F-statistic =43.557; P-value <0.01) suggests the statistical model is significant at 1 percent, indicating that the model correctly fits the data. This implies that the outcome of the predicted model result is valid, credible, and can be trusted for valuable policy recommendations. Analysis of the estimated coefficient shows that all the predictors significantly impact last immunization status at a 1 percent significance level. Those who take care of the previous child in absence (-0.077; P-value <0.01) and birth spacing between last child and present pregnancy (-0.089; P-value <0.01) indicate a 7.7 and 8.9 percent negative impact on immunization. Consequently, place of delivery of previous child (0.070; P-value<0.01)), who assisted in the last child delivery (0.089; P-value<0.01), type of household waste disposal practice (0.17; P-value<0.01) and knowledge about child preventable disease (0.241; P-value <0.01) all indicate a direct positive impact by enhancing immunization status by 7.0, 8.9, 7.8 and 24.1 percent respectively. However, awareness about preventable child diseases accounted for the highest positive contribution to improved immunization status. This is summarized in Table 3 below.

Model	R	R Square	Adjusted R Square	Std. Error of Estimate	
	0.404	0.163	0.159	0.671	
Model	Sum of Squares	df	Mean Square	F	Sig
Regression	117.635	6	19606	43.557	0
Residual	604.513	1343	0.45	-	-
Total	722.148	1349		-	-

Variable	Unstandardized B	Coefficients Std. Error	Standardized CoefficientsBeta (β)	t	Sig
(Constant)	1.225	0.115	-	10.629	0
Place of delivery of last child	0.07	0.017	0.11	4.121	0
Who assisted in the delivery Of your last child	0.089	0.029	0.082	3.055	0.002
Who takes care of your last Child in your absence	-0.077	0.019	-0.11	-4.132	0
Birth spacing between last Child and present pregnancy	-0.089	0.011	-0.203	-7.912	0
Type of Household waste Disposal practice	0.078	0.017	0.114	4.533	0
Knowledge about the child Preventable diseases	0.241	0.039	0.157	6.169	0
Abbreviations: ANOVA-analysis of variance, Std-standard, Sig-significance					

Table 3: ANOVA of Factors Associated with Immunization Status of the Last Child

DISCUSSION

Immunization protects U5 against childhood illness and is critical for child survival particularly in Nigeria, where health system is poor. However, there exists low immunization coverage among young children in SSA including Nigeria. This study revealed the relationship between selected variables related to immunization of U5 status in the study area. High house density and increased unsanitary conditions lead to high risk of contracting infectious diseases and mortality [29-33]. Also, good environmental sanitation and assistance by a skilled provider are critical to the survival of U5, in the study location, Information on who assisted in delivering your last child revealed that most respondents were assisted by modern healthcare personnel (85.2%) compared to those who could not avail this opportunity. Though this is a welcome development among the study communities, there is a need to bring all mothers under the same practice to accelerate total immunization coverage and ensure a high survival rate for U5 children. Proximity is a vital factor that encourages or discourages women from visiting modern health facilities. Long distances to healthcare facilities are one of the reasons for low patronage, which leads to empathy towards the immunization of children.

Delays at households or health facilities are very dangerous, especially for young children and substantial proportion of respondents obtained treatment for their children after waiting for more than an hour or more (55.9%), which is not good. Household delay in care-seeking during an emergency might be due to cultural/traditional beliefs, health-related, and socioeconomic limitations. The longer time needed to obtain treatment at health facilities attracts adverse health outcomes [34,35]. However, it has been noticed that there is a tendency to explore traditional medicine and self-treatment before turning to the biomedical care system [36], especially if hindrance factors are enormous. A sound health education and healthcare outreaches would be helpful. Another lethal practice is the respondents'act of leaving their children under the care of people outside the immediate family, namely mother/mother-in-law, house help, and daycare center, all of which attracted 84.1 percent. Only 15.9 percent of the child's care was attributed to the husband. While the mother/mother-in-law may not be grand in modern child care, house help, and daycare centers do not take good care of the children, and in most cases, people complain about the high frequency of missing children.

Oral re-hydration solution (ORS) is one of the breakthroughs in arresting child-preventable diseases such as cholera, diarrhea, etc. Incidentally, diarrhoea remains a leading cause of childhood morbidity and mortality in developing countries, including Nigeria, as dehydration caused by diarrhoea is a significant cause of illness and death among young children [18]. ORS knowledge is vital to avoid giving concoctions to children and taking native medicines, which might result in adverse consequences. While it is gratifying that a substantial proportion of the respondents have this knowledge, a vast number (53.6%) are not utilizing this child-saving therapy. Knowledge about the preventive healthcare of U5 aids in equipping the mothers with positive responses in treatment time. Even though a good proportion of the respondents attested to the knowledge of child-preventable diseases, a reasonable number of them (34.1%) retorted negatively. Mothers' use of health facilities is crucial to a child's health status. For instance, in Nigeria, it has been reported that the use of health facilities for delivery (39%) and assistance by a skilled provider of births (43%) were low18. This scenariois dangerous and may be partly due to mothers' practices leading to poor child health care. Similarly, the place of delivery is critical to child survival as skilled health providers are available in

health facilities to manage obstetric complications. Whereas institutional delivery is practiced by a remarkable proportion of respondents (77.4%), slightly above one-fifth do not adhere to orthodox medicine. Even though the number looks small in real terms but in a place with an unsafe healthcare system like Nigeria, the consequences could be massive, as pointed out by an earlier study [37].

The source of water is crucial to water-related ailments that children suffer, particularly in semi-rural or rural areas with scarcity issues. Among the study communities, respondents' children suffered mainly from typhoid (40.1%) and diarrhea (38.7%), respectively. Equally, respondents who spaced their pregnancy for more than 25 months were 38.4 percent and those who went for less than 12 months accounted for 36.7 percent. While the former is commendable, others should be made to see the need to space out their pregnancy for better survival of their children. Even though more than half of the respondents (58.2%) had immunized their last children, incomplete and zero immunization of children by respondents accounted for a substantial proportion (41.8%). Immunization is a lifeline for children; incomplete and zero immunizations are ineffective. The non-adherence to the complete childhood immunization schedule among these communities might be related not only to socioeconomic conditions and cultural and healthcare system characteristics but also due to the health providers' attitudes/practices, according to earlier studies [38-43]. Respondents whose children fell ill thrice or more in a month account for 55.2 percent, compared to mothers whose children fell ill twice or less. This considerable proportion is unacceptable, especially with our dismal healthcare system. The number of times a child falls sick in a month signifies low child healthcare and could be a product of an unclean environment, poor hygiene practices, overcrowding, inadequate waste disposal, or related ailments, among others. The relationship is highly significant and aligns with earlier studies [44-46].

The behavior of health providers attracts or lowers institutional patronage from the public. In addition to care, their human relations go a long way in ascertaining utilization. While 62.8 percent of respondents attest to the cordiality of healthcare providers which is encouraging, a substantial proportion (37.1%) of them stated otherwise. The decision of the child's place of treatment is the first step to the survival of the child. As a patriarchal society, husbands are the head of the family, decide where the child goes for treatment, and pay for the treatment costs. This pattern is not different from the societal scenario as respondents who stated that their husbands decided the treatment place had an overwhelming proportion (63.3%). The cost of treatment is another hurdle at institutional health facilities, whether government or private. This is because access to healthcare services in Nigeria is mainly through out-of-pocket expenditure or cash at the point of service. In the study area, only slightly above one-fourth (25.2%) admitted that the price is cheap. Reducing the cost of modern healthcare is a significant intervention leading to high patronage, aligning with an earlier study [47]. Breastfeeding provides antibodies the baby needs, reduces infection, cost-effective, and ensures mother-child bond. Above all, improved breastfeeding practice can also positively affect birth spacing, contributing to child survival. Regarding breastfeeding, respondents who breastfed their children between 12 months and above accounted for 16.1 percent. A declining incidence of breastfeeding or a less than two-year interval reduces breast milk's nutritional benefits and immunological protection, lowering the child's health status. Though the study observed that a small proportion of the respondents use unauthorized dumpsite to dispose their generated refuse, the harmful effect is more towards contamination and pollution of the environment, especially in a place where environmental sanitation is still at primordial stage.

CONCLUSION

Mortality, including child mortality, has bearing to fertility and determines population growth and size particularly in rural area. The study focuses on drivers of access to immunization for U5 children. Immunization is critical in reducing child mortality and improving survival. It is also a composite index reflecting various communities' environmental, sociocultural, economic, sustainable healthcare systems, and behavioral situations. The condition of epidemic neglect reflects the growing and worsening healthcare system and the gradual reduction of the country's human development index. So, the place of immunization becomes imperative especially in rural settings. The linear regression revealed that the place of delivery ($p = 0.000$), skilled assistance ($p = 0.002$), who takes care of the child in your absence ($p = 0.000$), birth spacing between the last child and present pregnancy ($p = 0.000$), household waste disposal ($p = 0.000$) and knowledge about child preventable diseases ($p = 0.000$), manifest significantly to the immunization of last-child, a dependent variable for child immunization status. The variance analysis (ANOVA) showed a significant relationship between the independent and dependent variables [48] (see Table 3).

The study recommends health education to stakeholders and retraining for healthcare workers for better quality delivery of child immunization services as well as mitigate high zero and under-dose children, leading to enhance overall immunization coverage among communities.

ETHICAL STATEMENTS

The research was approved and sponsored by the Covenant University management and Chairman of Ado-Odo/Ota Local Government Area (LGA) to conduct the study in the selected health facilities. It was all about administering questionnaires to respondents. The study did not involve any activity that caused harm or risk to human life, and there is no involvement of human tissues, saliva, or animal blood. The study team applied standard research ethics, and verbal consent was obtained from all the respondents before they were interviewed. Participant's willingness to withdraw from the study at any time was thoroughly assured, confidentiality of the data supplied was guaranteed, and anonymity of the respondents who participated

in the survey was ensured. The present study deployed verbal consent because the research informants advised that verbal consent be used for the respondents to open up to questions on the research instrument. Also, verbal consent would dowse respondents' minds towards having contrary meanings on the explained motives of the research work. As you know, every responsive survey should consider the nature and peculiarity of its setting.

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AUTHOR CONTRIBUTIONS

DEA was involved in conceptualization, methodology, paper development, data analysis, interpretation, original draft preparation, writing review, and editing. AEA is also involved in conceptualizing, developing the paper/writing the original draft, preparing the literature review, interpreting, and drafting and editing the final paper.

CONFLICT OF INTEREST

The authors have no conflict of interest in this paper.

DATA AVAILABILITY STATEMENT

The data presented in this study are available on request from Covenant University Public Health and Well-being Research Cluster through the corresponding author.

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