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HEALTH LITERACY AND COVID-19 VACCINE UPTAKE AMONG OLDER ADULTS AT THE ASOKORE MAMPONG MUNICIPALITY-GHANA

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ABSTRACT

Adults 60 years and above were the most affected age group by COVID-19 and suffered the most hospitalisations and deaths. This group tend to resist vaccines (Vaccine Hesitancy-VH) due to reasons that include limited health literacy (HL). This could further put the geriatric population at risk of other health-related challenges, including future global pandemics. This study determined health literacy and COVID-19 vaccine uptake among older adults in the Asokore Mampong Municipality.

A cross-sectional study design and a quantitative approach were employed to collect data from the participants using a structured 'All Aspects of Health Literacy Scale' (AAHLS) programmed on the Open Data Kit (ODK). A binary logistic regression analysis was used to determine the relationship and the strength of the relationship between Health Literacy and the uptake of the vaccine. All analyses were performed using STATA software, and a significance level was determined at a p-value<0.05 with a 95% confidence interval.

The Mean age for the study sample was 66.9± 5.3. The fully vaccinated among the study sample were twice (64.12%) as many as those unvaccinated (30.67%). At a significant value of 0.05, the relationship between HL and vaccine uptake was statistically significant (P≤ 0.001: OR; 1.120), suggesting that HL played a crucial role in the COVID-19 vaccine uptake.

In conclusion, Health Literacy influences vaccine uptake and therefore, interventions targeted at improving community acceptance of health services should have health literacy as one of the focal measures to build individual and community resilience to withstand complex health challenges.

Keywords: Health Literacy, Covid-19 vaccine, vaccine hesitancy, older adults, vaccine uptake.

INTRODUCTION

Vaccines, over the years, have proven to be a means of curbing and to some extent, eliminating vaccine-preventable diseases. They are vital in the prevention and control of infectious diseases and are considered a key constituent of primary health care (WHO, 2019). Additionally, they are considered the most important public health milestone of the century and the most effective in achieving herd immunity (Di Chiara *et al.*, 2022). Without vaccines, many infectious conditions would have continuously caused several morbidities and mortalities annually. The success of these vaccines, however, depends largely on their uptake level (Dubé *et al.* 2013). A high uptake level ensures that herd immunity is ensured in a particular population, resulting in a reduction of the risk of transmitting the infection to susceptible individuals in the population.

After the emergence of the COVID-19 pandemic in 2019, there was a need for urgent development of a vaccine to save the world from the havoc being caused by the virus. Many institutions including academia, industry and government, therefore, speedily started making efforts to develop and test a variety of vaccines (Li *et al.* 2020), several COVID-19 vaccines were then developed as a result. Despite the remarkable strides vaccines have made, lack of awareness and acceptability which can lead to vaccine hesitancy, pose a serious threat and the World Health Organisation recognises this phenomenon as one of the top ten (10) threats to global health (WHO, 2019). Vaccine hesitancy is the resistance and or delay in vaccine uptake despite its availability (Shapiro *et al.* 2018). In the case of the COVID-19 vaccine, lack of trust, concerns about side effects and educational levels are some of the reasons why people are hesitant to accept the vaccine (Khairat,*et al.* 2022). The consequences of this phenomenon could further increase the risk level of older adults who were more susceptible to COVID-19 than any other age group and those who remain unvaccinated are more likely to be admitted to the hospital or die from COVID-19 (CDC 2020).

Health Literacy (HL) is considered a robust determinant for the overall health status of young and old in a population (Berkman *et al.* 2011) and it refers to people's knowledge, motivation and competencies to access, understand and use health-related information to make the best health judgments (Sørensen *et al.* 2012). Studies have shown that limited HL leads to riskier health behaviour and poor health choices, resulting in worse health outcomes and higher healthcare costs than people with strong or strengthened HL (Shahid *et al.* 2022; Adejumo, 2023; Cutilli *et al.* 2018). Furthermore, people with poor or limited literacy are less likely to respond to health messages and less likely to use interventional services, which invariably leads to poor health outcomes (Berkman *et al.* 2011).

Among older adults 60 years above, limited health literacy is a huge public health concern because they have an increased need for health-related information to stay proactive for their overall well-being (Manafo *et al.* 2012); the consequences are dire because of poor health choices like incorrect taking of medications, poor management of chronic ailments and low patronage of preventive health services like vaccine uptakes leading to poor health outcomes and even death.

In Ghana, the increase in life expectancy to 64 as of 2018 makes the proportion of older adults one of the highest in sub-Saharan Africa (Gyasi *et al.*2020). Currently, the elderly literacy rate stands at 50.9%. However, ageing and its related effect on mental health, vision, and physical abilities influence their ability to comprehend HL fully. This may, in turn, hurt the acceptance of COVID-19 vaccines.

This study, therefore, seeks to determine the influence health literacy had on the COVID-19 vaccine uptake among older adults 60 years and above

MATERIALS AND METHODS

A cross-sectional study design was used in collecting data from older adults within the Asokore Mampong Municipality at the household level from February 2 to February 16, 2023. Asokore Mampong has urban, peri-urban and rural distributions, representing the Ashanti Region's characteristics.

The study involved older adults of both male and female genders aged 60 years and above who had been residents of the Asokore Mampong municipality since the outbreak of the COVID-19 pandemic. Cochran formulae were used to calculate a sample size of 326 participants using the national COVID-19 uptake rate as reported by the Ghana Health Service in 2022 (GHS, 2022), and a 100% response rate was achieved.

Sample size estimation

The study employed a multi-staged sampling approach using the PMA2020-Ghana sampling methodology in recruiting participants. The PMA2020- Ghana sampling methodology originally sampled 100 Enumeration Areas (EAs) for the national survey of which three (3) EAs located within the Asokore Mampong Municipality were selected. Details on how the 100 EAs were created are published elsewhere (Zimmerman *et al.* 2017). Firstly, Research Assistants listed and mapped households in each of the three EAs to create a sampling frame. Each EA had an approximation of 200 households from which participants were selected. Secondly, a smartphone application known as a 'random number generator' was used to randomly select the households in each EA. Three Research Assistants (RAs) were tasked to collect data from each EA as part of the data collection exercise and households with eligible participants were further recruited. RAs visited selected households and participants who consented to be part of the study were interviewed. In situations where a household had more than one participant, only one was randomly selected and respondents from each household were selected without replacement.

Data Collection Procedure

A structured questionnaire was developed using an adopted tool, 'The All Aspect of Health Literacy Scale (AAHLS)' which was subsequently administered by trained research assistants to eligible and consented respondents. The tool was programmed on a smartphone using a data-collection application known as Open Data Kit (ODK). The three research assistants had a one-day training on how to administer the questionnaire and translate it into the Twi local dialect to maintain consistency in terms of the meaning of each item. Emphasis was laid on adherence to the COVID-19 protocols. Interviews were conducted in a secure environment devoid of public interference in both English and Twi languages.

Data Collection tool

The All Aspects of Health Literacy Scale (AAHLS) is a tool that has been extensively and widely used in assessing the functional, communicative and critical health literacy of a population. It is an easy-to-administer tool with each item having five (5) response options, categorised into the three health literacy components. It has also been shown to have adequate internal reliability of 'Cronbach's alpha = 0.74'(Chinn *et al.*2013) encompassing functional, communicative and critical health literacy.\nMethods\nFollowing consultation with providers and users of primary health care we developed a fourteen-

item self-report scale, which was piloted on 146 participants. The reliability, content and construct validity of the scale was investigated as well as relationships between scores on the scales and participant characteristics.\nResults\nThe overall scale had adequate reliability (Cronbach's alpha=0.74

Data Analysis

Both Descriptive and Inferential statistics were used to present the Data Summary. Categorical variables were summarised in Frequencies and Percentages while Continuous variables were presented in Means and Standard Deviations. A Binary logistic regression analysis was employed to describe the association between health literacy and the COVID-19 vaccine uptake. All statistical analyses were performed at a 95% confidence interval at a p-value of< 0.05 significance level using STATA statistical software version 17.

AAHLS Item categorisation and scoring

The All Aspect of Health Literacy has three categories based on the levels of health literacy: functional health literacy, communicative health literacy and Interactive health literacy. The items were, therefore, categorised under functional with six (6) items, communicative, three (3) items and critical, four (4) items.

The response scale *(*Always, Often, Sometimes, Rarely and Never) of the tool was rated from 1 to 5 with 1 being the lowest and 5 being the highest. We then multiplied the rates (1 or 5) by the number of items to arrive at a score range.

For example, functional health literacy of six (6) items and therefore, the lowest response rate (1) was multiplied by six (6) and the highest rate (5) was multiplied by six (6) to arrive at a final score range of 6-30, communicative health literacy had a score range of 3-15 and critical health literacy had a score range of 4-20. Participants who scored below average were labelled "low, those with an average score were labelled "moderate", and those above average were labelled "high".

Ethical considerations

Ethical approval was sought from the KNUST Committee for Human Research Publications and Ethics with reference CHRPE/AP/383/23. The Asokore Mampong Municipal Health Directorate provided administrative support to enable the commencement of data collection. Consent was sought before questionnaires were administered. The study ensured participants' confidentiality and privacy throughout the study period. Data collected from the field were stored on a cloud-based server protected by a password, which was only accessible to the principal investigator.

RESULTS

Socio-demographic characteristics of the study sample

From Table I below, the Mean ±SD age for the study sample was 66.9± 5.3, with a minimum age of 60 years and a maximum of 85 years. The number of males (49.69%) was marginally less than the number of females (50.31%) in this study. Those currently married were 69.94%, divorced (5.21%), widowed (24.23%) and never married (0.61%). Those with primary education constituted 18.10% of the study participants, middle/JHS were 4.60%, secondary school were 6.75% and tertiary 24.85%. About 38.96% had no form of education and those who attained some form of education other than formal education constituted 6.75%. More than half (55.21%) of the study participants were Christians, Muslims (42.33%) and Traditionalists (2.45%).

Table 1: Demographic characteristics

Variable	Frequency (n=100)	Percent (%)
Age (years)		
Mean ± SD	66.9± 5. 3	
60-69	232	71.17
70-79	84	25.77
Above 80	10	3.07
Gender		
Male	162	49.69
Female	164	50.31
Education		
Primary	59	18.10
Middle/JHS	15	4.60
Secondary	22	6.75
Tertiary	81	24.85
Other	22	6.75
None	127	38.96
Marital Status		
Married	228	69.94
Divorced	17	5.21
Single	2	0.61
Widowed	79	24.23
Religion		
Christian	180	55.21
Islam	138	42.33
Traditional	8	2.45

Response to All Aspects of Health Literacy Scale (AAHLS) items

Table 2 below shows the frequency and percentage distributions of the responses for the AAHLS items. On Functional Health Literacy (FHL), 34.05% of participants indicated 'Always' having problems learning about their medical conditions, whereas a little over half (50.31%) of them need assistance with health information. Unfortunately, only 22(6.75%) always get the needed help, and a significant number among them 103(31.6%), always have challenges understanding their health conditions. In completing medical forms, as many as 60.43% always need help as the majority were never confident to do so.

For Communicative Health Literacy (CHL), the majority of the participants ,constituting 98.16% and 94.17% respectively, indicated their ability to always provide all the information needed by the healthcare

provider and also, ask all their questions. Where they do not understand, 97.24% can ask for clarification. On Critical Health Literacy (CHL), over half of the participants, 55.83% and 59.20% respectively, do not always seek different information on their health condition nor think carefully about the relevance of the information received from their healthcare provider. Nearly equal proportions (61.96% and 62.58% respectively) never make an effort to confirm the trustworthiness of the information received, nor question the healthcare provider's advice [see Table 2 below].

Table 2: AAHLS response

AAHLS Items	Always N (%)	Often N (%)	Sometimes N (%)	Rarely N (%)	Never N (%)
Functional Health Literacy (FHL)					
1. Problems learning about your medical condition	111(34.05)	67(20.55)	67(20.55)	27(8.28)	54(16.56)
2. Need someone to help you when you are given information	164(50.31)	27(8.28)	56(17.18)	23(7.06)	56(17.18)
3. When you need help, can you easily get hold of someone to assist you	22(6.75)	21(6.44)	189(57.98)	41(12.58)	53(16.26)
4. Problem understanding what is told to you about your medical condition	103(31.60)	64(19.63)	98(30.06)	31(9.51)	30(9.20)
5.How confident are you in filling out medical forms by yourself	85(26.07)	15(4.60)	8(2.45)	81(24.85)	137(42.02)
6.Help to fill health related documents	197(60.43)	16(4.91)	52(15.95)	16(4.91)	45(13.80)
Communicative Health Literacy (CHL)					
7. All the information they need to help you.	320(98.16)	4(1.23)	2(0.61)	0	0
8.Ask the questions you need to ask	307(94.17)	12(3.68)	5(1.53)	0	2(0.61)
9. Do you make sure they explain anything that you do not understand?	317(97.24)	8(2.45)	1(0.31)	0	0
Critical Health Literacy (CrHL)					

10.Do you like to find out lots of different information about your health	20(6.13)	9(2.76)	115(35.28)	0	182(55.83)
11.How often do you think carefully about whether health information makes sense in your particular situation	10(3.07)	4(1.23)	91(27.91)	28(8.59)	193(59.20)
12.How often do you try to work out whether information about your health can be trusted	8(2.45)	11(3.37)	64(19.63)	41(12.58)	202(61.96)
13.How often do you question your doctor's or nurse's advice based on your own research	21(6.44)	26(7.98)	62(19.02)	13(3.99)	204(62.58)

Scoring of health literacy status

The response categories were rated from 1 to 5, with 1 being the lowest and 5 being the highest (see AAHLS items 1,2,4 and 6 in Table II above) for items that connote difficulty, "Always" had the lowest response of one (1) and "Never" had the highest response rate of five (5). The reverse was however, true for items that connote positivity (see AAHLS items 3,5,7,8,9,10,11,12 and 13 in Table II above), where the "Always" response had the highest score of five (5) and 'Never' had the lowest score of one (1). The participants' responses were then added to arrive at the health literacy status for the various components (Functional, Communicative and Critical) as presented in Table III below.

For Functional Health Literacy, the minimum score was 6 and the maximum was 30. Therefore, a score within 6-14 was labelled as Low Health Literacy, 15-22 was labelled Moderate Health Literacy and a score of 23 and above was labelled as High Health Literacy. For Communicative Health Literacy, the minimum score was 3 and the maximum was 15. Therefore, a score within a range of 3-7 was labelled as Low, 8-11 as Moderate and 12 and above as 'High Health Literacy'. Critical Health Literacy had a minimum score of 4 and the maximum was 20. So a score of 4-9 was labelled Low Health Literacy, 10-15 as Moderate Health Literacy, and 16 and above as High Health Literacy. Similarly, the Overall Health Literacy had a score range of 13-65. A score of 13-32 represented Low Health Literacy, 33-52 as Moderate Health Literacy and a score of 53 and above represented High Health Literacy.

Health Literacy status of study participants

From Table 3 below, based on the scoring procedure explained above, more than half of the study participants had both low Functional Health Literacy (59.82%) and low Critical Health Literacy (68.71%). However, almost all participants had high Communicative Health Literacy (99.39%). The overall health literacy was found to be 'moderate' with a percentage of 53.37% as indicated in Table 3

Table 3. Health Literacy Status

VARIABLE	Functional F (%)	Communicative F (%)	Critical F (%)	Overall Health Literacy F (%)
Low	195(59.82)	0 (00.00)	224(68.71)	89(27.30)
Moderate	65(19.94)	2(0.61)	83(25.46)	174(53.37)
High	66(20.25)	324(99.39)	19(5.83)	63(19.33)

COVID-19 vaccine uptake of study sample

From Table 4 below, the fully vaccinated participants (64.12%) were a little over twice the unvaccinated (30.67%). Those who remained partially vaccinated were 5.21%.

Table 4. COVID-19 vaccine uptake

Variable	Frequency (n=100)	Percent (%)
Vaccine Uptake		
Fully vaccinated	209	64.12
Partially vaccinated	17	5.21
Not vaccinated	100	30.67

Relationship between health literacy and COVID-19 vaccine uptake.

At a 95% Confidence Interval (CI), the probability value showed a statistically significant relationship (P≤ 0.001) between the participants' overall health literacy and the COVID-19 vaccine uptake. With an OR of 1.120, participants with high health literacy are 1.12 times more likely to take up the vaccines as compared to those with low health literacy. Additionally, for every one-unit increase in health literacy, the odds of COVID-19 vaccine uptake increase by 12%, therefore indicating that improving health literacy may increase the likelihood of COVID-19 vaccine uptake.

Table 5. Relationship between health literacy and COVID-19 vaccine uptake.

Vaccine Uptake	OR	Std. error	z	p>z	95% CI
HEALTH LITERACY	1.120	0.021	5.95	0.000	1.07905,1.162775

DISCUSSION

Health Literacy (HL) plays a significant role in health outcomes and among the geriatric population. It is a determining factor in health decisions, including acceptance of preventive services, ability to manage chronic ailments and following medication regimens that lead to better health and well-being (Berkman *et al.* 2011). However, ageing and its related challenges, as well as the low level of formal education among that age category, make

it difficult for them to comprehend HL as compared to the other age groups, usually leading to poor health choices and outcomes (Amoah, 2019; Amoah *et al.*, 2022). Interventions designed to address decisions towards acceptance of any form of health interventions must have health literacy as one of the major focuses.

This study found that Covid-19 vaccine uptake was high among the older adults age group (64.12%), which is consistent with the Ghana COVID-19 acceptance rate of 66% (Alhassan *et al.* 2021). It is also consistent with a study conducted to examine knowledge and attitudes among older adults regarding COVID-19 vaccine uptake in Ghana, which indicated that about 66% of older adults are the most likely to take the vaccine (Acheampong *et al.* 2021). The high uptake of the COVID-19 vaccine could be due to the evidence that older adults are more susceptible to COVID-19 infection, as they accounted for almost 90% of all COVID-19-related deaths in Ghana (Adu-Gyamfi *et al.* 2022). Even though the global older adults COVID-19 vaccine uptake rate was 77% in 2022, the distribution is different from region to region because of socio-economic standings. For example, a rate of 72% uptake in high-income countries as compared to only 25% in low-income countries as of October 2022 (Duroseau *et al.* 2023).

Similar to the variation in vaccine uptake, the HL also varies from region to region due to geographical and socio-economic differences. For example, a study revealed that high HL varied from country to country, 8.5% in Niger to 63.9% in Namibia (McClintock *et al.* 2019) as compared to 19.33% recorded in this present study in Ghana. The assessment of the participants ' health literacy knowledge showed that Functional and Critical health literacy were low among the older adults but high for the Communicative component. The over-all health literacy was however, moderate. This finding supports several studies including a systematic review by Kobayashi *et al.* (2016) that suggested limited functional health litera-cy is more predominant among older adults (Amoah 2019; Kobayashi *et al.* 2016). It has also been established by Javadzade *et al.* (2012) and a systematic review by Chesser *et al.* (2016) that lower overall health literacy is much common among older adults as compared to the youth and other age groups. (Javadzade *et al.* 2012; Chesser *et al.* 2016). However, the majority of these studies reported on a two-level status of low and high without the mid-point of 'moderate' as reported in this study.

The functional health literacy component revealed that more than half of the participants reported always needing assistance to understand the basic health information given to them like following simple medication regimens, however, only a few (6.75%) found that help. The consequences are dire as this usually leads to poor outcomes (Berkman *et al.* 2011; Shan *et al.* 2023). There seems to be an interplay between health literacy, education and health behaviour, for example, educational attainment has been suggested as a key factor of higher health literacy even though the relationship is not well understood (Shahid *et al.* 2022; Stormacq *et al.* 2019). Conversely, health literacy mediates between educational attainment and health behaviour (Friis *et al.* 2016) and is further established by other studies that lack formal or lower education attainment (illiteracy) has been implicated as one of the profound reasons for the low level of FHL among this age group, as they often present difficulty in performing health-related tasks (Amoah *et al.* 2022; Pellicer-Espinosa *et al.*, 2022) The 38.96% of participants with no form of education and 18.10% with just primary education could be one of the reasons accounting for the low FHL in our study.

Again, the study showed a low level of critical health literacy (CrHL). This is predictable among the age group because CrHL involves a much higher cognitive skill to critically evaluate and examine health-related information and use it for health needs, (Chinn, 2011) unfortunately older adults are less likely to research and find additional information on their health and question their doctors and nurses based on their research as a result of ageing and the related effect on cognitive skills but they are more concerned about the structural determinants like income, social networks, living conditions, health care accessibility and availability than quality health information and healthy lifestyle (Shan *et al.* 2023; de Wit *et al.* 2017) . Our study revealed that 55.83% have never found out different information about their health as compared to only 6.13% who always do that. Furthermore, 62.58% have never asked their health providers questions based on research as compared to just a handful who ask (6.44%). Therefore, the concept of co-learning which has been identified as a means of improving CrHL among older adults involving interactions and sharing health knowledge with family and the community at large, can be adopted to mitigate this challenge (de Wit *et al.* 2017).

Some studies have established the direct and indirect association between HL and health behaviours. For example, it was established in a systematic review that, HL is a predictor of vaccine uptake in the presence of some actors like age, vaccine type and country, but the relationship between the two remains unclear. (Arvanitis *et al.* 2021; Khairat *et al.* 2022). Similarly, the same position was shared in another systematic review that established that, even though health literacy is a predictor of health behaviour, there was no conclusive evidence to suggest that it is a driver of the vaccine decision-making process, intentions and uptake (Siena *et al.* 2022). Conversely, direct associations have also been established high-lighting a strong relation between HL and health behaviours (Suka *et al.*, 2015; Kalanjati *et al.*, 2022).

Results from this study showed an association between health literacy and vaccine uptake, which indicates that health literacy could have influenced the COVID-19 vaccine uptake. ($P \leq 0.001$, OR; 1.120) However, it is not the key determinant of the vaccine uptake and this could further suggest the uptake could be due to the presence of other additional factors.

LIMITATIONS OF THE STUDY

The study was limited in scope and target population. The study population was limited to a sample of the aged population residing in one district without involving the entire region. The studies could not arrive at reasons behind the attainment of the various health literacy levels among participants as well as other possible reasons for the vaccine uptake other than health literacy which could further suggest that the uptake could be due to the presence of other factors.

CONCLUSION

Health literacy is a predictor of health outcomes and this study showed it had an influence on the vaccine uptake and therefore, interventions and programs targeted at improving community acceptance of health services should have health literacy as one of the focal measures to build individual and community resilience to withstand complex health challenges.

RECOMMENDATIONS FOR FURTHER STUDIES

We, therefore, recommend that further studies be undertaken to better understand reasons other than health literacy that

prompted the uptake of the COVID-19 vaccine in Ghana for better policies and interventions to address the phenomenon. Patients can be guided at the facility level to improve at least their functional health literacy level to enable them to manage and follow simple medication regimens.

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Statements & Declaration

We hereby declare that, except for references from other people's work which have been duly acknowledged in the referencing section, this manuscript is our composition and we affirm that neither whole nor part has been presented for publication elsewhere.

Ethical considerations

This study received ethical approval from the Kwame Nkrumah University of Science and Technology Committee for Human Research Publication and Ethics (CHRPE/AP/383/23) on May 25, 2023.

Consent to participate

Informed consent was obtained verbally before participation.

Consent for publication

Not applicables

Competing interest

All authors have no competing interests

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Data Availability Statement

The datasets generated during and/or analysed during the current study are available from the corresponding author upon reasonable request.

REFERENCE

Acheampong, T., Akorsikumah, E.A., Osae-Kwapong, J., Khalid, M., Appiah, A., and John H. Amuasi. J.H. (2021). Examining Vaccine Hesitancy in Sub-Saharan Africa: A Survey of the Knowledge and Attitudes among Adults to Receive COVID-19 Vaccines in Ghana. Vaccines 9 (8): 814. https://doi.org/10.3390/vaccines9080814.

Adejumo, I., (2023). Poor Health Literacy and Its Implications among the General Population. Students4BestEvidence(blog). January9,2023. https://s4be.cochrane.rg/?p=17930&preview=true&preview_id=17930.

Adu-Gyamfi, S., Asante, E. (2022). Sources of Information About COVID-19 Among Older Adults in Ghana, 2019-2021. Journal of Social, Behavioral, and Health Sciences 16 (1): 1–18. https://doi.org/10.5590/JSBHS.2022.16.1.01.

Alhassan, R.K., Aberese-Ako, M., Doegah, P.T., Immurana, M., Dalaba, M. A., Manyeh, A.K., Klu, D., Acquah, E., Ansah, E.K., and Gyapong. M. (2021). COVID-19 Vaccine Hesitancy among the Adult Population in Ghana: Evidence from a Pre-Vaccination Rollout Survey. Tropical Medicine and Health 49 (1): 96. https://doi.org/10.1186/s41182-021-00357-5.

Amoah, P.A. (2019). The Relationship between Functional Health Literacy, Self-Rated Health, and Social Support between Younger and Older Adults in Ghana. International Journal of Environmental

Research and Public Health 16 (17): 3188. https://doi.org/10.3390/ijerph16173188.

Amoah, P.A., Musalia, J., Abrefa Busia, K. (2022). Health Behaviors and Health Literacy: Questing the Role of Weak Social Ties Among Older Persons in Rural and Urban Ghana. FrontiersinPublicHealth10(February). https://doi.org/10.3389/fpubh.2022.777217.

Arvanitis, M., Opsasnick, L., O'Conor, R., Curtis, L.M., Vuyyuru, C., Benavente, J.Y., Bailey, C.S., Jean-Jacques, M., Michael S. Wolf, M.S. (2021). Factors Associated with COVID-19 Vaccine Trust and Hesitancy among Adults with Chronic Conditions.

PreventiveMedicineReports24(July):101484. https://doi.org/10.1016/j.pmedr.2021.101484.

Berkman, N.D., Sheridan, S.L., Donahue, K.E., Halpern, D.J., Crotty, K. (2011). Low Health Literacy and Health Outcomes: An Updated Systematic Review. Annals of Internal Medicine 155 (2): 97–107. https://doi.org/10.7326/0003-4819-155-2-201107190-00005.

CDC. (2020). Coronavirus Disease 2019 (COVID-19)." Centre for Disease Control and Prevention. February 11, 2020. https://www.cdc.gov/coronavirus/2019-ncov/index.html.

Chesser, A., Woods, N.K., Smothers, K., Rogers, N. (2016). Health Literacy and Older Adults: A Systematic Review. Gerontology and Geriatric Medicine 2 (March). https://doi.org/10.1177/2333721416630492.

Chinn, D., (2011). Critical Health Literacy: A Review and Critical Analysis. Social Science & Medicine (1982) 73 (1): 60–67. https://doi.org/10.1016/j.socscimed.2011.04.004.

Chinn, D. and McCarthy, M. (2013). All Aspects of Health Literacy Scale (AAHLS): Developing a Tool to Measure Functional, Communicative and Critical Health Literacy in Primary Healthcare Settings." Patient Education and Counseling 90 (2): 247–53. https://doi.org/10.1016/j.pec.2012.10.019.

"COVID-19 Updates | Ghana." n.d. Accessed June 24, 2024. https://www.ghs.gov.gh/covid19/archive.php.

Cutilli, C.C., Simko,L.C., Colbert, A.M., Bennett, I.M. (2018). Health Literacy, Health Disparities, and Sources of Health Information in U.S. Older Adults. Orthopaedic Nursing 37 (1): 54. https://doi.org/10.1097/NOR.0000000000000418.

Di Chiara. D., Cantarutti, C.A., Costenaro, P., Donà, D., Bonfante, F., Cosma, C., Ferrarese, M. *et al.* 2022. Long-Term Immune Response to SARS-CoV-2 Infection Among Children and Adults After Mild Infection. JAMA Network Open 5 (7): e2221616. https://doi.org/10.1001/jamanetworkopen.2022.21616.

Dubé, E., Laberge, C., Guay, M., Bramadat, P., Roy, R., Julie Bettinger, J. (2013). Vaccine Hesitancy: An Overview. Human Vaccines & Immunotherapeutics 9 (8): 1763–73. https://doi.org/10.4161/hv.24657.

Duroseau, B., Kipshidze, N., & Limaye, R. J. (2023). The impact of delayed access to COVID-19 vaccines in low- and lower-middle-income countries. Frontiers in Public Health, 10, 1087138. https://doi.org/10.3389/fpubh.2022.1087138

Gyasi, R.M., Phillips, D.R. (2020). Aging and the Rising Burden of Noncommunicable Diseases in Sub-Saharan Africa and Other Low- and Middle-Income Countries: A Call for Holistic Action. The Gerontologist 60 (5): 806–11. https://doi.org/10.1093/geront/gnz102.

Javadzade, S.H., Sharifirad, G., Radjati, F., Mostafavi, F., Reisi, M., Akbar Hasanzade, K. (2012). Relationship between Health Literacy, Health Status, and Healthy Behaviors among Older Adults in Isfahan, Iran. Journal of Education and Health Promotion 1:31. https://doi.org/10.4103/2277-9531.100160.

Kalanjati, V.P., Hasanatuludhhiyah, N., d'Arqom, A., Muhammad, A., Marchianti, A.C.N., D Arsyi, D.H., Permana, P.B.D., Putra Susila,I.Y., Pratiwi, O.G., Purwitasari, D. 2022. Health Literacy on COVID-19 and COVID-19 Vaccinations in Indonesia. F1000Research 11:1296. https://doi.org/10.12688/f1000research.125551.2.

Khairat, Saif, Zou, B., Adler-Milstein, J. (2022). Factors and Reasons Associated with Low COVID-19 Vaccine Uptake among Highly Hesitant Communities in the US." American Journal of Infection Control 50 (3): 262–67. https://doi.org/10.1016/j.ajic.2021.12.013.

Kobayashi, L.C., Wardle, J., Wolf, M.S., von Wagner, C. (2016). Aging and Functional Health Literacy: A Systematic Review and Meta-Analysis. The Journals of Gerontology: Series B 71 (3): 445–57. https://doi.org/10.1093/geronb/gbu161.

Li, Y.D., Chi, W.Y., Su, J.H., Louise Ferrall, Chien-Fu Hung, and T.-C. Wu. (2020). Coronavirus Vaccine Development: From SARS and MERS to COVID-19.Journal of Biomedical Science 27 (1): 104. https://doi.org/10.1186/s12929-020-00695-2.

Manafo, E., Wong, S. 2012. Health Literacy Programs for Older Adults: A Systematic Literature Review. Health Education Research 27 (6): 947–60. https://doi.org/10.1093/her/cys067.

McClintock, H.F., Alber, J.M., Schrauben, S.J., Mazzola, C.M. and Wiebe, D.J. (2019) Constructing a measure of health literacy in Sub-Saharan African countries, Health Promotion International, Volume 35, Issue 5, October 2020, Pages 907–915,

Pellicer-Espinosa, I., Díaz-Orueta, U. (2022). Cognitive Screening Instruments for Older Adults with Low Educational and Literacy Levels: A Systematic Review.Journal of Applied Gerontology: The Official Journal of the Southern Gerontological Society 41 (4): 1222–31. https://doi.org/10.1177/07334648211056230.

Shahid, R., Muhammad S., Chu, L.M., Frehlick, R., Ward, H., Pahwa, P. (2022). Impact of Low Health Literacy on Patients' Health Outcomes: A Multicenter Cohort Study. BMC Health Services Research 22 (1): 1148. https://doi.org/10.1186/s12913-022-08527-9.

Shan, Y., Ji, M., Dong, Z., Xing, Z., and Xu. X. (2023). Assessing Patients' Critical Health Literacy and Identifying Associated Factors: Cross-Sectional Study. Journal of Medical Internet Research 25 (April):e43342. https://doi.org/10.2196/43342.

Shapiro, G. K., Tatar, O., Dube, E., Amsel, R., Knauper, B., Naz, A., Perez, S., Rosberger, Z. 2018. The Vaccine Hesitancy Scale: Psychometric Properties and Validation. Vaccine 36 (5): 660–67. https://doi.org/10.1016/j.vaccine.2017.12.043.

Siena, L. M., Isonne, C., Sciurti, A., De Blasiis, M.R., Migliara, G., Marzuillo,C., De Vito, C., Villari, P., Baccolini,.V. 2022. The Association of Health Literacy with Intention to Vaccinate and Vaccination Status: A Systematic Review. Vaccines 10 (11): 1832. https://doi.org/10.3390/vaccines10111832.

Sørensen, K., Van den Broucke, S., Fullam, J., Doyle, G., Pelikan, J., Slonska, Z., Helmut

Brand, H., and (HLS-EU) Consortium Health Literacy Project European. 2012. Health Literacy and Public Health: A Systematic Review and Integration of Definitions and Models. BMC Public Health 12 (1): 80. https://doi.org/10.1186/1471-2458-12-80.

Stormacq, C., Van den Broucke, S., Wosinski, J. (2019). Does Health Literacy Mediate the Relationship between Socioeconomic Status and Health Disparities? Integrative Review. Health Promotion International 34 (5): e1–17. https://doi.org/10.1093/heapro/day062.

Suka, Machi, Takeshi Odajima, Masako Okamoto, Masahiko Sumitani, Ataru Igarashi, Hirono Ishikawa, Makiko Kusama, Michiko Yamamoto, Takeo Nakayama, and Hiroki Sugimori. (2015). Relationship between Health Literacy, Health Information Access, Health Behavior, and Health Status in Japanese People. Patient Education and Counseling 98 (5): 660–68. https://doi.org/10.1016/j.pec.2015.02.013.

"Ten Health Issues WHO Will Tackle This Year." n.d. Accessed June 24, 2024. https://www.who.int/news-room/spotlight/ten-threats-to-global-health-in-2019.

Wit, L., Fenenga, C., Giammarchi, C., di Furia, L., Hutter, I., de Winter, A., and Meijerin, L. (2017). Community-Based Initiatives Improving Critical Health Literacy: A Systematic Review and Meta-Synthesis of Qualitative Evidence. BMC Public Health 18 (1): 40. https://doi.org/10.1186/s12889-017-4570-7.

Zimmerman, L., Olson, H. (2017). PMA2020 Principal Investigators Group, Amy Tsui, and Scott Radloff. 2017. "PMA2020: Rapid Turn-Around Survey Data to Monitor Family Planning Service and Practice in Ten Countries." Studies in Family Planning 48 (3): 293–303. https://doi.org/10.1111/sifp.12031.