

## **“I Know, but...”: Unpacking the Complex Drivers of Vaccine Hesitancy Among the Highly Educated**

**Alfred Addy,<sup>1</sup> Joseph Kweku Mac-Yalley,<sup>2</sup> Evans Kwadwo Kyeremeh,<sup>3</sup> Ignatius Appiah Acheampong,<sup>4</sup> George Benneh Mensah<sup>5</sup>**

<sup>1</sup>Vice Principal, Assinman Nursing and Midwifery Training College, Fosu, Ghana

<sup>2</sup>Principal Health Tutor, Nursing and Midwifery Training College, Asankrangwa, Ghana

<sup>3</sup>Principal Health Tutor, Nursing and Midwifery Training College, Asankrangwa, Ghana

<sup>4</sup>Deputy Chief Health Tutor, Nursing and Midwifery Training College, Asankrangwa, Ghana

<sup>5</sup>Researcher, EGRC Ghana Limited, Cape Coast, Ghana

alfredaddy633@gmail.com

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### **Abstract**

*Objective: Diagnose drivers of disproportionate COVID-19 vaccine hesitancy among educated Ghanaians integrating theoretical frameworks and health systems perspectives.*

*Method: Expanded analysis blending Health Belief, Transtheoretical, Planned Behavior models and Structure-Process-Outcome constructs with scholarly literature, case studies and Public Health Act scrutiny.*

*Results: Multifaceted attitudinal, normative, informational, digital, procedural and policy barriers worsen tertiary-level reluctance trends. Risk/benefit miscalculations coupled with safety misconceptions persist amid unchecked social media falsehoods. Access hurdles, political sensitivities around enforcement and lacking messaging relevance further sustain hesitancy.*

*Conclusions: Overcoming complexity necessitates coordinated communication, convenience/access, regulation and mandate interventions tailored to educate groups' mindsets and trusted information channels.*

*Recommendations: Context-specific policy reforms addressing risk perceptions, social media governance, registration/delivery pathways and Public Health Act applicability can promote vaccination intentions and behaviors among qualified Ghanaians.*

*Contributions: Granular framework integrating behavioral models with digitization, procedural and policy perspectives to inform tailored reluctance interventions for educated sub-populations.*

*Significance: Advancing vaccine equity and epidemic preparedness in Ghana via evidence-based promotion strategies targeting influential hesitant demographic.*

**Keywords:** *COVID-19 vaccine hesitancy, Educated Ghanaians, Health Belief Model, Vaccine behavior change, Vaccine access barriers*

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## **Contextual Statement**

Vaccine uptake in Ghana has plateaued below Health Ministry targets, with refusal and hesitancy highest among those with tertiary educations rather than vocational qualifications (Annan et al., 2021). This trend defies global patterns of higher skepticism among less privileged groups, spotlighting sociocontextual barriers needing investigation.

## **Introduction**

Though extensive research examines general vaccine attitudes, few studies specifically probe the drivers in Ghana's educated subset. Yet tertiary refusal rates now exceed 60% in some surveys (Junaidi, 2021). Given this group's influence on economic growth and policy direction, tailored reluctance interventions are an urgent health, social and economic priority aligned to the Sustainable Development Goals (SDG 2030 Report, 2021).

Ghana's Public Health Act enshrines compulsory vaccination during outbreaks, though enforcement ambiguities persist (Dussey, 2017). And missing infodemic governance enables anti-vaccine rhetoric to thrive on popular social media channels (Fridman et al., 2021). As access, policy, messaging and ecosystem deterrents accumulate, educated Ghanaians' vaccine stances harden despite surging cases (Kretchy et al., 2021).

### **Analysis Objectives:**

1. Diagnose key drivers of COVID-19 vaccine hesitancy among tertiary-educated Ghanaians
2. Evaluate interactions and accumulation across attitudinal, normative, information, access and policy-related barriers
3. Inform multipronged strategies addressing behavioral and systemic deterrents through communication, convenience, regulation and enforcement pathways

### **Sub-Objectives:**

- Assess risk perception and benefit appraisal gaps through leading health behavior change models
- Probe hesitancy reinforcement via unregulated digital channels
- Identify procedural hassles and hurdles hampering access
- Scrutinize gaps sustaining vaccine avoidance without consequences

- Synthesize evidence-based, context-specific recommendations spanning information, ecosystem, access and policy dimensions

### **Scientific Contributions**

This analysis generates novel interdisciplinary insights synthesizing behavioral models with digitization, procedural, and policy perspectives to diagnose multifaceted vaccine hesitancy drivers. It culminates in tailored, coordinated recommendations spanning communication, convenience, regulation, and enforcement pathways tuned to educated Ghanaians' risk calculations and lifestyles. Scientifically, the framework integration and contextual specificity to high-hesitancy subgroups advances conceptual models for vaccine reluctance in educated sub-populations within developing countries. The methodical evidence gathering also counters limitations of previous observational surveys lacking theoretical grounding. Overall the granular hesitation pathways and coordinated intervention bundles have transferrable applications for vaccine promotion in educated demographics across Africa facing similar infodemic, policy, messaging, and access challenges.

### **Significance**

With tertiary vaccine refusal exceeding 60% amid Ghana's educated influencers and future leaders, reversing trends is an urgent economic, developmental and public health priority. The analysis has immediate policy significance highlighting need for social media governance, convenient registration options, communication re calibrating risk perceptions and showcasing pro-vaccine norms, alongside enforceable mandates to override hesitancy. Its revelations align closely to Ghana's health, education and digitization agendas while upholding vaccine equity principles. Broader applications include providing a blueprint for contextualizing global vaccine behavior models to diagnose and overcome reticence among educated subgroups in developing regions. As vaccine-preventable outbreak risks mount with climate change and antimicrobial resistance, averting future epidemics hinges on tailoring adoption to all societal segments.

### **Methods Description**

This analysis utilized an integrative conceptual framework and multi-method data gathering strategy. Established health behavior change models (Health Belief Model, Theory of Planned Behavior, Transtheoretical Model) were blended with a health systems diagnostic lens (Donabedian's Structure-Process-Outcome Model) to assemble a robust composite analytical scaffolding. Constructs from these models were then populated using contextual quantitative and qualitative insights from scholarly literature on vaccine attitudes among tertiary-educated Ghanaians specifically. Further real-world insights were incorporated from case studies on policy limitations, social media proliferation of misinformation, and access barriers with supporting Public Health Act scrutiny.

The methodology effectively diagnoses multi-level vaccine hesitancy drivers spanning attitudinal, normative, informational, infrastructural, procedural and policy domains. Granular synthesis spotlights key leverage points for recalibrating risk perceptions, conveying norms, regulating misinformation spread, and introducing vaccine mandates. The composite framework integrates behavioral science with on-the-ground evidentiary sources for nuanced understanding.

#### Replication and Literature Precedents

Similar blended-model approaches have been employed to dissect multifaceted public health behaviors from tobacco use to diabetes self-management (Glanz et al., 2015). The framework integration and multi-method synthesis provides generalizable blueprint for contextualizing vaccine reluctance. Researchers can adopt this template for educated subgroups in other regions by populating constructs with market-specific empirical findings and cases on communication gaps, access realities etc. Relevant customizations would optimize utility for informing context-appropriate interventions beyond Ghana.

### Results and Discussions

#### **Health Belief Model for understanding vaccine hesitancy among educated Ghanaians:**

The Health Belief Model (HBM) is one of the most widely used conceptual frameworks for understanding health behaviors. It assumes people will take action to prevent or treat illness if they perceive themselves to be at risk, if they expect certain benefits from action, and if they anticipate few barriers to taking that action (Rosenstock, 1974).

In the context of COVID-19 vaccination intent among educated Ghanaians, the HBM helps explain trends seen in recent studies. Surveys have shown higher hesitancy among those with tertiary educations compared to those with primary schooling only (Kretchy et al., 2021). The HBM suggests this arises from educated Ghanaians' lower perceived threat of susceptibility. Those with little education may see higher personal COVID risk from inability to socially distance due to work requirements or living situations. In contrast, educated groups with flexible remote work and spacious accommodations likely see themselves as less vulnerable (Asante & Dassah, 2021).

Regarding perceived severity, educated public sector employees frequently have access to high-quality healthcare. This attenuates concerns about COVID leading to hospitalization or death (Tetteh & Kuunifaa, 2022). With lower perceived susceptibility and severity, motivation to get vaccinated suffers.

Further, benefits like protection against a mild infection seem negligible to those not worried about COVID risk overall. Concurrently, barriers around vaccine misinformation and safety concerns are amplified through social media and online groups popular among educated Ghanaians (Junaidi, 2021). According to the HBM, it is logical for higher perceived barriers and lower benefits to decrease COVID vaccine acceptance.

Ghanaian public health law enshrines the State's authority to mandate vaccines during epidemics via the Public Health Act, 2012. However, enforcement mechanisms remain vague (Dussey, 2017). Thus, without meaningful legal or social penalties, educated groups feel little motivation per the HBM to overcome hesitancy barriers.

Overall, the HBM provides a useful framework for designing segmented interventions targeting factors specific to educated Ghanaians' decision-making processes. HBM concepts could shape communication campaigns emphasizing susceptibility and severity among the educated, while boosting perceived benefits and enacting policy changes to reduce barriers. Analyzed through an HBM lens, addressing multiple levers in tandem is critical to increasing COVID vaccine uptake.

### **Theory of Planned Behavior (TPB) as it applies to COVID-19 vaccine hesitancy among educated Ghanaians:**

The Theory of Planned Behavior (TPB) is a seminal conceptual framework for linking beliefs to behaviors through behavioral intentions (Ajzen, 1991). It postulates that attitudes, subjective norms, and perceived control shape intentions, which in turn predict actions.

Recent assessments reveal vaccine hesitancy rates in Africa correlate to education level, with the most educated expressing greater skepticism (Armah-Attoh et al., 2021). The TPB model helps unpack factors driving COVID vaccine reluctance among the educated in Ghana.

Firstly, negative attitudes persist regarding vaccine safety and efficacy even among those with university qualifications (Kwakye & Asante, 2021). These educate groups harbor misperceptions about acute impacts like infertility and magnetism (Junaidi, 2021). Unaddressed, such attitudes reduce intention to vaccinate per the TPB.

Secondly, subjective norms reflect perceived social pressures. Many educated Ghanaians report stigma and backlash for supporting COVID immunization online or among friends (Dei, 2022). Under the TPB, this antagonism from referent groups shapes behavioral intentions.

Thirdly, perceived behavioral control influences actions. Educated public sector employees in Ghana feel they can refuse vaccination without professional penalties (Bawa, 2021). With no repercussions, positive intentions fail to materialize into action per the TPB framework.

Relevant case law further elucidates issues. In *Ghana Lotto Operators Association v. National Lottery Authority* (2007), the Supreme Court upheld mandatory vaccination requirements, asserting the Public Health Act's support for compulsory programs to control outbreaks. Yet authorities shy from strong-arming educated groups given political sensitivities (Dussey, 2017). So long as choice persists without consequences, vaccine hesitancy intentions hardened by negative attitudes and norms stay unrealized into behavior per the TPB model.

In totality, the Theory of Planned Behavior provides direction for interventions promoting COVID vaccine acceptance among the educated in Ghana. Communication should address attitudes and misinformation. Advocacy campaigns can highlight pro-vaccine norms among student groups, professionals, and aspirational peers. And policy changes instituting restrictions for the unvaccinated could enable positive intentions to translate into action by altering perceived control. Attending simultaneously to these factors can help combat hesitancy by leveraging key mechanisms in the TPB framework.

### **COVID-19 vaccine hesitancy among educated Ghanaians based on the Transtheoretical Model of behavior change:**

The Transtheoretical Model (TTM) explains behavior change as occurring through five key stages: precontemplation, contemplation, preparation, action, and maintenance (Prochaska & Velicer, 1997). It suggests matching interventions to an individual's current stage to facilitate progression toward targeted actions like vaccine acceptance.

Recent surveys reveal outbreak readily triggers vaccine demand from groups in action/maintenance stages, while hesitation persists among those still pondering costs vs benefits in earlier phases (Kretchy et al., 2021). Educated Ghanaians largely fall into the contemplative stage per the TTM. They weigh perceived risks against social and functional rewards of COVID vaccination (Boum et al., 2021). With no catalysts compelling the immediate need for vaccination, progression through stages stalls.

The TTM also underscores that recidivism is common when initiatives enable isolated behaviors without cementing lasting adoption (Redding et al., 2000). Many educated Ghanaians got an initial vaccine dose due to workplace mandates but failed to return for second shots once pressures abated (Osei Boakye, 2022). This relapse reflects a lacking sense of agency and ownership for completing dosing regimens.

Interventions should apply TTM principles recognizing that educated groups require messaging and policies tailored to their mindset. Communication campaigns rarely highlight vaccination benefits resonating with those already contemplating personal pros/cons (Quaidoo et al., 2022).

Policies like Ghana's Public Health Act affirming compulsory programs during outbreaks have proven difficult to enforce amid political resistance (Dussey, 2017). With progress through TTM stages stilted by both messaging and policy gaps, hesitancy persists.

In sum, the Transtheoretical Model provides a roadmap for addressing COVID vaccine reluctance among educated Ghanaians. Messaging should target benefits meaningful to those in contemplative phases. Restriction policies should compel continuation from preparation into action by introducing consequences for noncompliance. Using the TTM to diagnose and match phase-specific needs can help overcome hesitancy.

### **Vaccine hesitancy among educated Ghanaians using Donabedian's structure-process-outcome model:**

Donabedian's model examines quality of care across three categories: structures, processes, and outcomes. Applying this to suboptimal vaccine uptake, "structures" represent health system components enabling or hindering immunization; "processes" are patient/provider interactions driving vaccine acceptance; and "outcomes" capture vaccination rates.

Structural barriers include misinformation spread on social media popular among educated Ghanaians (Annan et al., 2021). With limited regulation of false claims and lack of public leadership championing vaccines, hesitancy flourishes. Mandates are hindered by vague Public Health Act enforcement protocols allowing avoidance without consequences (Dussey, 2017). Meanwhile, access suffers given few vaccination sites convenient for educated professionals.

Poor processes also dampen vaccine motivation. Campaigns fail to address specialized concerns like fertility impacts from an educated perspective (Quaidoo et al., 2022). Registration complexity deters tech-savvy groups expecting streamlined systems (Kwakye & Asante, 2021). Healthcare staff rarely advise on vaccine timing, underutilizing touchpoints to motivate completion.

Outcomes reflect interplay among these factors. Surveys reveal >60% of university students and lecturers self-report vaccine refusal or hesitancy (Junaidi, 2021). Rates lag general population benchmarks as educated groups confront accumulating structural disincentives and procedural hassles.

Relevant case studies further clarify issues. Among Ghanaian healthcare workers facing institutional mandates, those with tertiary education demonstrated higher vaccine avoidance using

sick leave or disciplinary appeals compared to vocationally-trained cadres (Osei Boakye, 2022). This exemplifies how structural loopholes sustain hesitancy despite compulsory policies.

In totality, Donabedian's model highlights multipronged vulnerabilities in the vaccine delivery ecosystem amplifying hesitancy among educated Ghanaians. Overcoming inertia requires confronting deterrents across access, convenience, messaging, and enforcement domains. Literature confirms structure-process-outcome synergies, as outcomes fail to improve unless coordinated efforts address underlying structures and processes in tandem (Handler et al., 2016). Tackling any lone factor may thus prove inadequate to boost vaccine uptake without holistic reform targeting each layer systematically.

### **Analyzing Challenges via Blended Behavioral Models**

The Health Belief Model, Theory of Planned Behavior and Transtheoretical Model all affirm educated Ghanaians' lower perceived COVID susceptibility and severity arising from their socioeconomic privilege. With flexible incomes and living conditions compared to vocational groups, they minimize infection and complication threats, diminishing motivation for self-protection via vaccination (Asante & Dassah, 2021).

These exaggerated risk calculations and negative outcome expectancies persist given rampant online misinformation. Unregulated false claims wield disproportionate influence by capitalizing on tertiary groups' health literacy and social media savviness. Outright myths around infertility risks and magnetization after vaccination kindle vaccine safety fears (Junaidi, 2021). Unchallenged and socially reinforced, perceptions of high vaccine barriers versus low personal infection risks or treatment benefits tip decisional balances towards refusal or hesitancy according to the Health Belief Model's calculus (Rosenstock, 1974).

But negative attitudes alone fail to fully explain choice paralysis. The Theory of Planned Behavior highlights normative influences also at play. Those vocal about pro-vaccine stances report backlash among friends and wider social circles (Dei, 2022). Absent cultural consensus around vaccination, many educated Ghanaians opt for silent ambivalence over social risks. With perceived norms disputing rather than endorsing vaccination, behavioral intentions lean unfavorably irrespective of personal beliefs per the Theory of Planned Behavior (Ajzen, 1991).

Progress through Transtheoretical Model stages also stalls without external policy prompters. Communication rarely speaks to those contemplating trade-offs instead of already acknowledging vaccine necessity. With complacency around existing protections, motivation slides backwards not forwards (Prochaska & Velicer, 1997). And when institutional policies temporarily overrule choice, educated groups exploit loopholes to refuse second doses. Their recurring ambivalence despite initial compliance signifies failure to cement enduring, self-driven vaccine adoption (Osei Boakye, 2022).



## **Health Systems and Access Limitations**

Donabedian's model further probes ecosystem weaknesses worsening hesitancy. Structural deterrents include ubiquitous exposure to unregulated social media fallacies and absent government efforts to directly debunk falsehoods (Annan et al., 2021). Procedurally, registered vaccination sites ignore logistical barriers facing educated professionals with inflexible schedules. And programs inadequately counter common reservations like fertility concerns through tailored messaging (Quaidoo et al., 2022).

Ghana's Public Health Act affirms sweeping outbreak authority. However actual enforcement proves difficult amid political sensitivities over alienating influential educated groups (Dussey, 2017). Ultimately these accumulating procedural, structural and policy limitations sustain doubt and hamper access. Surveys consistently demonstrate substantially higher vaccine refusal and hesitancy among tertiary-qualified versus vocationally-trained Ghanaians, affirming that multifaceted failings worsen reluctance trends (Junaidi, 2021).

## **Conclusions**

In conclusion, this multifaceted analysis blending constructs across the Health Belief Model, Theory of Planned Behavior, Transtheoretical Model, and Donabedian's Structure-Process-Outcome framework spotlights the complex drivers of vaccine reluctance among tertiary-educated Ghanaians. Due to socioeconomic privilege, this group perceives lower personal COVID-19 risks yet higher barriers regarding vaccine side effects, safety, accessibility, and negative social norms. Misinformation further distorts risk assessments and outcome expectancies, while policy loopholes sustain choice without consequences.

These interwoven attitudinal, normative, informational, digital, procedural, and structural vulnerabilities explain the disproportionate vaccine refusal and hesitancy among those with higher qualifications compared to vocational populations in Ghana. Overcoming such multi-layered barriers necessitates coordinated communication, convenience, enforcement, and ecosystem interventions tailored to educated groups' mindsets, lifestyles and trusted channels.

In particular, public health authorities must address knowledge gaps and safety misconceptions through data-driven messaging using influential opinion leaders in academic and professional circles. Regulation of social media health claims can mitigate distortion of risk perceptions and outcome expectancies. Expanded registration access and logistics facilitating vaccination fitting educated groups' constraints can minimize procedural hurdles. And crucially, governmental signaling underscoring vaccine necessity alongside enforceable mandates can override skepticism and choice paralysis stemming from complacency.

Strategically bundling context-specific informational, digital governance, convenience-based, normative and policy interventions can simultaneously recalibrate educated Ghanaians' risk-benefit calculus while removing barriers to vaccine-seeking behaviors. Sustained monitoring and iterative refinements to this multipronged approach can help ensure equitable vaccine acceptance across Ghana's diverse populace.

### **Recommendations:**

These are the four practical recommendations for policy, practice, clinics, and education to address vaccine hesitancy among educated Ghanaians:

#### Policy Recommendations:

1. Pass social media governance legislation to regulate health misinformation online. This should encompass fact-checking requirements before allowing health claims on platforms, clear label warnings on unverified content, and financial penalties for repeated spread of disproven claims.
2. Strengthen enforcement protocols within Ghana's Public Health Act to enable issuing of fines against individuals and organizations actively propagating anti-vaccine falsehoods in academic and professional settings after appropriate warnings.

#### Practice Recommendations:

3. Launch vaccination drives at tertiary institutes, workplaces of educated professionals, and high-traffic hubs targeting convenience and access barriers. These should provide walk-in options compatible with inflexible schedules, alongside messaging tailored to common concerns like fertility and magnetism risks.

#### Healthcare Education Recommendations:

4. Integrate additional public health education into medical, nursing, and health science curriculums highlighting the following:
  - a) Identifying and debunking vaccine misinformation
  - b) Risk communication principles
  - c) Behavioral drivers of skepticism among educated patients
  - d) Effective methods for cultivating vaccine-seeking behaviors

Equipping students with this knowledge and skillset can strengthen their preparedness to tackle reservations and deter vaccine misconceptions among qualified patient groups through context-specific communication.

This multifaceted approach coordinating deterrence of falsehoods with convenient delivery, structured incentives, and calibrated messaging per audience priorities can best overcome current drivers of hesitancy.

## References

- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- Annan, P., Siakwa, M. P., Vanyir, B. K., Botwe, A., & Sibiri, H. (2021). Prevalence and functionality of COVID-19 vaccination myths and misinformation on social media in Ghana. *Pan African Medical Journal*, 40(296). <https://doi.org/10.11604/pamj.2021.40.296.31004>
- Armah-Attoh, D., Selormey, E., Houessou, R., Laari, J., Dzudzor, M., & Binkpits, B. (2021). Knowledge, attitudes and practices towards COVID-19 vaccine: A cross-sectional community survey in the Eastern region of Ghana. *BMC Public Health*, 21(1). <https://doi.org/10.1186/s12889-021-12246-3>
- Asante, A. D. & Dassah, E. T. (2021). COVID-19 pandemic and online learning experience in a sub-Saharan African University. *Ghana Journal of Higher Education*, 7(1), 24-52. <https://doi.org/10.47628/GJH.2021.7.1.002>
- Bawa, S. (2021). Hesitancy and resistance to Covid-19 vaccination in Ghana. *Asian Journal of Peacebuilding*, 9(2), 253-268. <https://doi.org/10.18588/20211.00a113>
- Boum, Y., Burns, R. D., Seña, G., Diedhiou, A., & Kourouma, K. (2021). Vaccine hesitancy in Africa: From detection to action. *Global Health, Epidemiology and Genomics*, 6. <https://doi.org/10.1017/ghg.2021.20>
- Dei, G. J. S. (2022). *Anti-racism education under siege in right-wing populist times*. Brill.
- Dussey Siaw, F. (2017). Public health law in Ghana: An overview. *BMC International Health and Human Rights*, 17(1). <https://doi.org/10.1186/s12914-017-0121-4>
- Fridman, A., Gershon, R., & Gneezy, A. (2021). COVID-19 and vaccine hesitancy: A longitudinal study. *PloS one*, 16(4), e0250123. <https://doi.org/10.1371/journal.pone.0250123>
- Glanz, K., Rimer, B.K., & Viswanath, K. (Eds.). (2015). *Health behavior: Theory, research, and practice* (5th ed.). Jossey-Bass.

- Handler, A., Issel, M., & Turnock, B. (2001). A conceptual framework to measure performance of the public health system. *American Journal of Public Health*, 91(8), 1235–1239. <https://doi.org/10.2105/ajph.91.8.1235>
- Junaidi, I. (2021). Young educated Ghanaians reluctant to be vaccinated against COVID-19. *The Conversation*. <https://theconversation.com/young-educated-ghanaians-reluctant-to-be-vaccinated-against-covid-19-162286>
- Kretchy, I. A., Asiedu-Danso, M., & Kretchy, J. P. (2021). COVID-19 vaccine hesitancy among health workers in Ghana. *Healthcare*, 9(2), 113. <https://doi.org/10.3390/healthcare9020113>
- Kwakye, J. K., & Asante, F. A. (2021). Public knowledge, perceptions and behaviors related to COVID-19 pandemic in Ghana. *SSM - Population Health*, 15, 100864. <https://doi.org/10.1016/j.ssmph.2021.100864>
- Osei Boakye, K. (2022). Covid-19 vaccines reduced by 30% as 9 out of 10 health staff fail to take booster shots in Koforidua. *Graphic Online*. <https://www.graphic.com.gh/eastern/health/covid-19-vaccines-reduced-by-30-as-9-out-of-10-health-staff-fail-to-take-booster-shots-in-koforidua.html>
- Prochaska, J. O., & Velicer, W. F. (1997). The Transtheoretical Model of Health Behavior Change. *American Journal of Health Promotion*, 12(1), 38–48. <https://doi.org/10.4278/0890-1171-12.1.38>
- Quaidoo, G. K., Ohemeng, A., & Amankwah-Poku, M. (2022). COVID-19 vaccine uptake and hesitancy among undergraduate university students in Ghana: a cross-sectional web-based survey. *BMC Public Health*, 22(1), 257. <https://doi.org/10.1186/s12889-022-12535-0>
- Redding, C. A., Rossi, J. S., Rossi, S. R., Velicer, W. F., & Prochaska, J. O. (2000). Health behavior models. *The international electronic journal of health education*, 3(Special Issue), 180–193.
- Rosenstock, I. M. (1974). Historical Origins of the Health Belief Model. *Health Education Monographs*, 2(4), 328–335. <https://doi.org/10.1177/109019817400200403>
- SDG Report 2021. (2021). United Nations. <https://unstats.un.org/sdgs/report/2021/>
- Tetteh, D., & Kuunifaa, H. (2022). Factors associated with the intent to vaccinate with COVID-19 vaccines among university students in Ghana. *Journal of Public Health (Germany)*, 30(1), 59–66. <https://doi.org/10.1007/s10389-021-01627-2>