# Health and Safety Measures on Productivity of Construction Workers in Building Sites in Edo State, Nigeria: An Evaluation of The Impact of Covid-19 Pandemic

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## ABSTRACT

Increased construction workers' level of compliance with the COVID-19 pandemic health and safety measures leads to a proportionate increase in their efficiency and productivity on building site. The structural equation model from the path diagram (Fig. 2.1) validates the significant relationship between construction workers' level of compliance with health and safety practices and their productivity on building sites by hypothetically stating that: "a construction worker is expected to efficiently produce at his peak on site, at 69.50% level of compliance with health and safety practices.

Keywords: COVID-19 pandemic, Efficiency, Productivity, Compliance, Building sites

## 1. INTRODUCTION

The health and safety of construction workers on site is paramount to the overall success of any given building project; it's only when workers are in a sound state of mind and are physically healthy that work can go on efficiently (Adeagbo, Dakas & Izam, 2019. Building site is one of the most dangerous and risk prone workplaces where several fatal accidents have been recorded (Abdullahi, Usman & Jarmai, 2022; Gbajobi, *et al.,* 2018; Kukoyi & Smallwood, 2016; Stella & Okeoghene, 2017). Personal Protective Equipment (PPE) has therefore been used by construction workers as a vital protection in ensuring the health and safety of workers on building sites.

Unfortunately, recent research findings reveal that PPE arescarcely worn by quite a sizeable number of construction workers on building sites,while the awareness of and compliance with PPE usage on building sites is still very low (Kukoyi & Smallwood, 2017; Oviawe & Anevberokhai, 2021;Tanko, Ting & Idiake, 2022; Uwadia, *et al.,* 2021). This menace is attributed to lack of commitment to health and safety practices in the construction industry, inadequate engagement of safety officers in construction projects, poor safety culture of construction stakeholders, poor compliance on the part of construction workers, among others (Agwu and Olele, 2014; Ogundipe, *et al.,* 2018)

A careful look at the recent health and safety measures studies' findings above, points to the fact that much emphases were laid on safety practices rather than the health (personal hygiene) aspect.

According to Selleck, Cattani and Hassall (2022) and Stiles, Golightly and Ryan (2020), in recent times, the level of awareness and compliance with health and safety measures in the construction industry significantly increased, which is expected to enable safer working atmosphere, increased efficiency, and higher productivity of construction workers at large. A preliminary survey carried out by the researcher within Auchi metropolis reveals that the higher a construction worker's level of compliance with health and safety practices on building site, the higher his productivity. From the structural equation model below, it is hypothetically deduced that a construction worker is expected to efficiently produce at his peak on site, at 69.50% level of compliance with health and safety practices.

## 2. METHODOLOGY

This paper presents the empirical review as it affects the impact of COVID-19 pandemic health and safety measures on construction workers' productivity on building sites in Etsako West Local Government Area of Edo State Nigeria. The researcher collected the primary data through preliminary survey (direct personal observation, oral interview, telephone conversation) and questionnaire administration while the secondary data were collected from recent journals, published textbooks, magazines, workshop papers, and seminar papers.

The sample size was determined using Taro-Yamane formula while the technique employed in analyzing the data; the data collected were analyzed using regression and structural equation modeling and analysis was carried out using STATA version 24.0. Mathematically, the structural equation model could be stated as follows:

HSP= 1.51WAC ……………….. (i)

CWP = 1.37HSP ………………... (ii)

CWP = 1.44WAC ……………….(iii)

From equation (iii) above, it can be hypothetically inference that a construction worker is expected to efficiently produce at his peak at **69.50%** level of compliance with health and safety practices.

## 3. RESULTS

**Table 1: Summary of Regression Analysis for the relationship between WAC, HSP and CWP as produced by the analysis result (Momodu, 2023)**

```
. regress CWP WAC HSP
```

| Source   | SS         | df  | MS         |
|----------|------------|-----|------------|
| Model    | 29.3416963 | 2   | 14.6708481 |
| Residual | 1.30381392 | 193 | .006755513 |
| Total    | 30.6455102 | 195 | .157156463 |

```
Number of obs =     196
F(  2,   193) = 2171.69
Prob > F       =  0.0000
R-squared      =  0.9575
Adj R-squared =  0.9570
Root MSE       =  .08219
```

| CWP   | Coef.     | Std. Err. | t     | P>\|t\| | [95% Conf. Interval] |          |
|-------|-----------|-----------|-------|---------|----------------------|----------|
| WAC   | .2273163  | .0262646  | 8.65  | 0.000   | .1755138             | .2791188 |
| HSP   | .4236603  | .0336808  | 12.58 | 0.000   | .3572306             | .49009   |
| _cons | 1.086189  | .040638   | 26.73 | 0.000   | 1.006038             | 1.166341 |

*Figure 2.1: Path Diagram showing the structural equation model for the relationship between WAC, HSP and CWP as produced by the analysis result. (Momodu, 2023)*
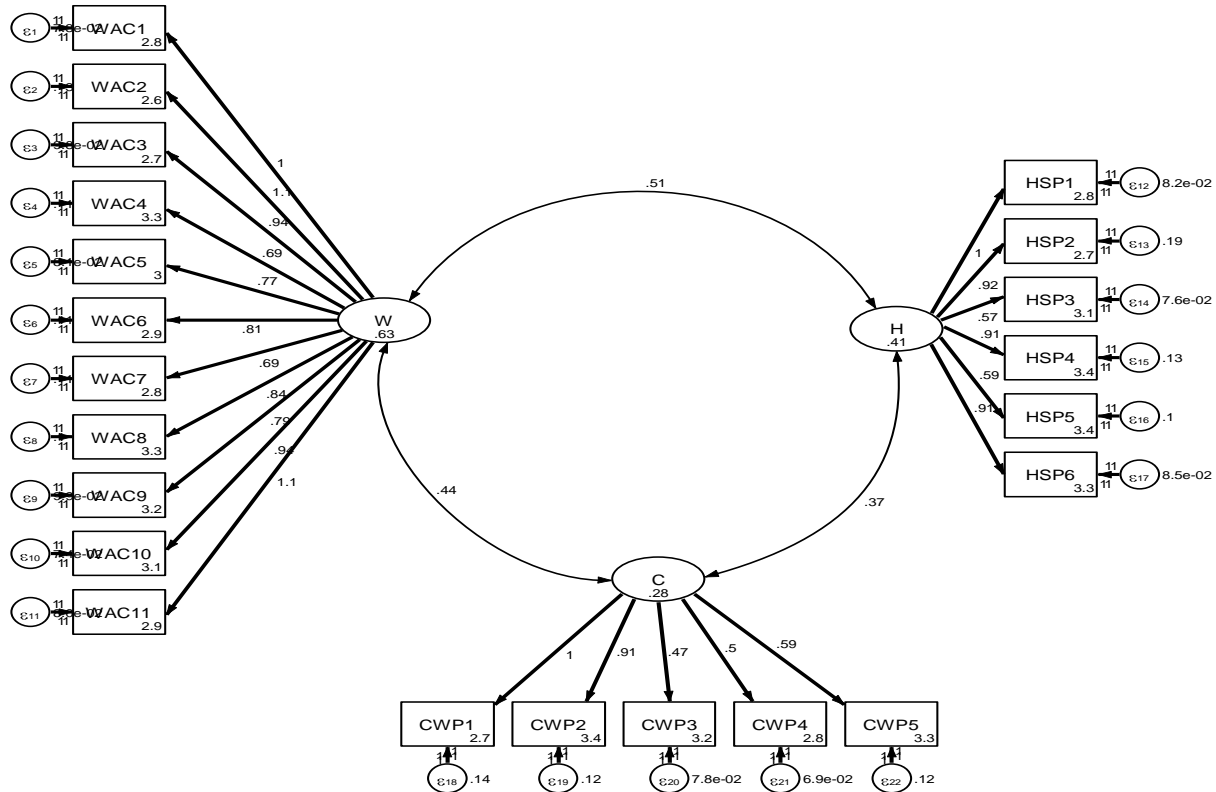
Table 2.1 and Figure 2.1 above show summary of regression analysis and path diagram of the structural equation model developed from the regression analysis. Table 2.1 shows the F-test, $F(2, 193) = 2171.69$, Adj R2 0.9575 revealing relatively high prediction in relationship between WAC, HSP and CWP; with t value of 8.65 for WAC, 12.58 for HSP at obtained cons of 26.78 at p-value $<0.05 = 0.000$ with coefficient of 0.2273 and std err. value of 0.9262 for WAC, where HSP coefficient and std. err value are 0.42366 and 0.03368 respectively; being higher than WAC with the same observable 196 sampled respondents. Decision: since the Adj. R2 contributed predictive value of 96% and p-value $0.000 < 0.05$ level of significance, hence, we can state that there is significant relationship between construction workers' level of compliance with COVID-19 pandemic health and safety practices and their productivity on building sites in Etsako West LGA.

The path diagram reveals that WAC interacts at 0.51 coefficient with HSP, which in turn interacts at 0.37 coefficient with CWP while WAC has interactive coefficient of 0.44 with CWP. Though on individual level, WAC would be having higher interaction with HPS, but its error term has serious effect on the coefficient to the extent that it can minimize its effect as against construction workers' productivity (CWP) in comparison with HSP, but the joint collaboration between the WAC and HSP could have more effect on the CWP when fully implemented.

**Table 2: Summary of Correlation analysis (Momodu, 2023)**

```
. correlate CWP WAC HSP
(obs=196)
```

|      | CWP    | WAC    | HSP    |
|------|--------|--------|--------|
| CWP  | 1.0000 |        |        |
| WAC  | 0.9605 | 1.0000 |        |
| HSP  | 0.9700 | 0.9481 | 1.0000 |

The above table 3.1 shows the summary of correlation analysis between the major independent variables as they are correlated with the dependent variables. From the test, they all showed positive correlation with less collinearity coefficient. However, the variables would be tested using linear regression for statistical significance measuring the extent for predicting the dependent variable.

**Key**: WAC = Level of construction workers' compliance with COVID-19 pandemic health and safety practices on building site in Etsako West Local Government Area

HSP = Effect of COVID-19 pandemic health and safety practices on Construction workers' productivity on building site in Etsako West Local Government

CWP = Construction Workers' Productivity

$H_0$ =     Level of compliance with health and safety practices, after the COVID-19 pandemic does not significantly affect construction workers' productivity on building site in Etsako West Local Government Area.

**Table 3: Summary of Regression Analysis**

```
. regress CWP WAC
```

| Source | SS | df | MS | | |
|--------|-----|-----|-----|---|---|
| Model | 28.2728149 | 1 | 28.2728149 | | |
| Residual | 2.37269532 | 194 | .012230388 | | |
| Total | 30.6455102 | 195 | .157156463 | | |

Number of obs = 196
F( 1, 194) = 2311.69
Prob > F = 0.0000
R-squared = 0.9226
Adj R-squared = 0.9222
Root MSE = .11059

| CWP | Coef. | Std. Err. | t | P>|t| | [95% Conf. Interval] | |
|-----|-------|-----------|---|-------|------|------|
| WAC | .5405278 | .0112423 | 48.08 | 0.000 | .5183551 | .5627006 |
| _cons | 1.484706 | .0342436 | 43.36 | 0.000 | 1.417169 | 1.552244 |

The above table 3.2 shows the summary of regression analysis on the level of compliance with health and safety practices, after COVID-19 pandemic and if it significantly affects construction workers' productivity on building site. The F-test, $F(1, 194)$ =2311.69, Adj R2 0.9222 showing relatively high prediction of level of compliance with health and safety practices, after the COVID-19 pandemic in relation to construction workers productivity (CWP) with t value of 48.08 is obtainable at a constant t terms of 43.36 and p-value <0.05 = 0.000 with coefficient of 0.5405, std err. of 0.01124, from the observation of 196 sampled respondents. Decision: since the Adj. R2 contributed high predictive value of 92% and p-value of 0.000 < 0.05 level of significance, hence, the result revealed that the level of compliance with health and safety practices, after COVID-19 pandemic does significantly affect construction workers' productivity on building sites in Etsako West Local Government Area.

**Table 4: Summary of Regression Analysis**

```
. regress CWP HSP
```

| Source | SS | df | MS | | |
|--------|-----|-----|-----|---|---|
| Model | 28.8356647 | 1 | 28.8356647 | | |
| Residual | 1.8098455 | 194 | .009329101 | | |
| Total | 30.6455102 | 195 | .157156463 | | |

Number of obs = 196
F( 1, 194) = 3090.94
Prob > F = 0.0000
R-squared = 0.9409
Adj R-squared = 0.9406
Root MSE = .09659

| CWP | Coef. | Std. Err. | t | P>|t| | [95% Conf. Interval] | |
|-----|-------|-----------|---|-------|------|------|
| HSP | .700019 | .0125911 | 55.60 | 0.000 | .6751859 | .7248521 |
| _cons | .8944132 | .0400319 | 22.34 | 0.000 | .8154596 | .9733668 |

The above table 3.3 above shows the summary of regression analysis on COVID-19 pandemic health and safety practices and if it significantly affects construction workers' productivity on building site. The F-test, $F(1, 194)$ =3090.94, Adj R2 0.9406 showing relatively high prediction of COVID-19 pandemic health and safety practices (HSP) in relation to construction workers' productivity (CWP) with t value of 55.60 at obtainable constant t terms of 22.34 and p-

value <0.05 = 0.000 with coefficient of 0.7000, std err. of 0.01259, from the observable 196 sampled respondents. Decision: since the Adj. R2 contributed high predictive value of 94% and p-value 0.000 < 0.05 level of significance, hence, we the result revealed that extremely high confidence interval of 72% and state that "COVID-19 pandemic health and safety practices significantly affect construction workers' productivity on building site in Etsako West Local Government Area".

## 4. CONCLUSION

Level of compliance with health and safety practices, after the COVID-19 pandemic does significantly affect construction workers' productivity on building sites in Etsako West Local Government Area. The study found a significant relationship between construction workers' level of compliance with COVID-19 pandemic health and safety practices and construction workers' productivity on building sites in Etsako West Local Government Area.

With reference to Table 1, and corroborated by Oviawe and Anavberokhai (2021), Adebiyi (2006), Oginyi (2010) and Oviawe (2018), construction workers'level of compliance with health and safety practices on building sites is yet to meet expectations.Furthermore, the research findings, supported by the studies of Selleck, *et al.* (2022) and Stiles, *et al.* (2020) showed that increased construction workers' level of compliance with health and safety practices leads to a proportionate increase in their efficiency and productivity on building sites.By and large, the structural equation model from the path diagram (Fig. 2.1) validates the significant relationship between construction workers' level of compliance with health and safety practices and their productivity onbuilding sites by hypothetically stating that:"a construction worker is expected to efficiently produce at his peak on site, at 69.50% level of compliance with health and safety practices".

## 5. RECOMMENDATIONS

For the efficiency and productivity of construction workers to be maximized on site towards a successful completion of any building/construction project, there is need for the COVID-19 pandemic health and safety measures to be sustained by construction workers on building sites. Also, there is a need to increase commitment to health and safety practices in the construction industry. Furthermore, there is need for an adequate engagement of professional health and safety officer(s) on site, improved health and safety culture by construction workers on site, effective implementation of health and safety policies/regulations on site as well as compulsory on-site training and sensitization programme for construction workers.

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