Wilson, Tusiime; Nguni, Winnie; Rwehumbiza, Deusdedit

Article

The mediating influence of procurement strategy on the relationship between physical distribution and availability of contraceptives in public health facilities

Business management review

Provided in Cooperation with:
University of Dar es Salaam (UDSM)

Reference: Wilson, Tusiime/Nguni, Winnie et. al. (2022). The mediating influence of procurement strategy on the relationship between physical distribution and availability of contraceptives in public health facilities. In: Business management review 25 (1), S. 42 - 59. https://journals.udsm.ac.tz/index.php/bmr/article/download/4934/4202.

This Version is available at:
http://hdl.handle.net/11159/8902

Business Management Review
Volume 25, Issue No. 1
January – June, 2022

ISSN 0856 2253 (Print) & ISSN 2546-213X (Online)

www.journals.udsm.ac.tz/index.php/bmr
The Journal of the University of Dar es Salaam Business School

The Mediating Influence of Procurement Strategy on the Relationship between Physical Distribution and Availability of Contraceptives in Public Health Facilities

Tusiime Wilson[1]
Assistant Lecturer, Department of Procurement and Logistics Management, Makerere University Business School, Kampala, Uganda
Winnie Nguni
Senior Lecturer, Department of Marketing, University of Dar es Salaam, Dar es Salaam, Tanzania
Deusdedit A. Rwehumbiza
Associate Professor, Department of General Management, University of Dar es Salaam Business School, Dar es Salaam, Tanzania

To cite this article: Tusiime, W., Nguni, W., & Rwehumbiza, D. A., (2022). The Mediating Influence of Procurement Strategy on the Relationship between Physical Distribution and Availability of Contraceptives in Public Health Facilities. *Business Management Review, 25*(1), 42–59.

Abstract

This study examines the mediating effect of procurement strategy on the relationship between physical distribution and the availability of contraceptives in Uganda's public health facilities. The study uses data collected from 165 (94.3% response rate) selected public health facilities from south western Uganda using questionnaires. Partial Least Squares Structural Equation Modeling was used for data analysis. The findings show that procurement strategy is of less importance to the availability of contraceptives and does not mediate the relationship between physical distribution and availability of contraceptives in the public health sector. This evidence conflicts the previous scholarly work which considers procurement strategy as a conduit through which physical distribution influences the availability of contraceptives. Furthermore, the results indicate a positive and significant influence of physical distribution on the availability of contraceptives. This therefore implies that given the stochastic nature of demand for contraceptives, there is need for the public health sector to craft well defined physical distribution strategies that are aimed at timely transportation of contraceptives and strategic location of distribution centers to ensure constant availability of contraceptives.

Keywords: Physical distribution, Procurement strategy, Stochasticity, Contraceptives

[1] **Corresponding Author**: *tusiimelicia@gmail.com*

Introduction

The availability of contraceptives in the public health sector plays a key role in the national and human development. Globally, unavailability of contraceptives has been seen as a major contemporary social problem leading to teenage pregnancies and school dropouts (Nara, Banura, & Foster, 2020). Apparently, contraceptives are considered to be a – life-saving intervention for both developed and developing countries, whose availability should be given utmost attention (Ooms, Kibira, Reed, van den Ham, Mantel-Teeuwisse & Buckland-Merrett, 2020; Nara et al., 2020). Chin, Salcedo and Raidoo (2020) explicate that, whereas there are so many people globally who do not seek contraception, their availability, specifically in public health facilities, play a key role in regulating population growth and stimulating economic growth. Although different governments and donor agencies allocate billions of dollars to safeguard constant availability of contraceptives in public health facilities, their availability and specifically in public health facilities still remains a challenge (Kassa, Arowojolu, Odukogbe & Yalew, 2018; Subramanian, 2020).

It is thus believed that a key barrier to improved availability of contraceptives in the public health sector could be related to physical distribution of these contraceptives from suppliers to clients (Pule, 2014; Adjei, Laar, Narh, Abdulai, Newton, Owusu-Agyei & Adjei, 2015). Apparently, physical distribution is seen as a strategic activity in fostering availability of products in public health facilities (Moons, Waeyenbergh & Pintelon, 2019). This is partly because it is able to move health products including contraceptives from suppliers to customers whenever they are needed (Mezmur, Assefa & Alemayehu, 2021). Drawing from the Transaction Cost Economics (TCE), scholars postulate that physical distribution contributes to the availability of health care products through the analysis of clients' demand and subsequently determining the distribution frequency (Williamson, 1981). Besides, Moons et al. (2019) note that procurement strategy acts as a link through which the right products are obtained from the right suppliers and subsequently distributed to the right clients' while using appropriate handling equipment to minimize damage.

Although scholars (Hernandez, Akilimali, Muanda, Glover & Bertrand, 2018; Moons et al., 2019) focuses on how physical distribution impacts the availability of health care products in general, there is an increasing need to examine the elements of physical distribution that influence availability of contraceptives and specifically in the public health sector. This could minimize on the unavailability of contraceptives and improve on regulating population growth. Scholars such as Vledder, Friedman, Sjöblom, Brown and Yadav (2015) and Moons et al. (2019) argue that physical distribution fosters availability of health care products through transportation, location of distribution centers and storage management. Musonda and Gambo (2020) note that availability of a product cannot be sustained without procurement strategy. Besides, Patrucco, Luzzini, Ronchi, Essig, Amann and Glas (2017) note that procurement planning is key in shaping an appropriate procurement strategy that helps in the timely procurement of the required products that are subsequently distributed to the clients. This therefore signifies that procurement strategy plays a key role in the relationship between physical distribution and the availability of contraceptives and specifically in the public health sector. Additionally, it is argued that physical distribution enhances the availability of contraceptives by ensuring that the procured items have been delivered with no damages through proper material handling (Vledder et al., 2015).

Consistent with the transaction cost economics theory (TCE), the stochastic demand for contraceptives in the public health sector can be managed through crafting appropriate procurement strategy that is capable of planning and forecasting of procurement needs (Chenini, Iqbal, Qurrahtulain, Husain Mahmood & Aldehayyat, 2020). This subsequently leads to crafting of appropriate distribution schedules that are capable of distributing contraceptives from the point of origin to the point of consumption. Besides, scholars, such as Mukasa, Ali, Farron and Van de Weerdt (2017) and Moons et al. (2019), reveal that, given the stochasticity of demand for contraceptives, developing an appropriate procurement strategy is a link through which the routing and scheduling of deliveries are determined. Subsequently, this enhances the availability of products in the public health sector through proper procurement planning and forecasting. Thus, procurement strategy could have a mediating effect on the relationship between physical distribution and the availability of contraceptives specifically in a developing economy's public sector (Foerstl, Franke & Zimmermann, 2016; Patrucco et al., 2017). However, to date less effort is visible to assess the mediating effect of procurement strategy on the relationship between physical distribution on the availability of contraceptives in the public health sector. Therefore, the study contributes to the extensive literature on the mediating influence of procurement strategy on the relationship between physical distribution and availability of contraceptives in a developing country's context. Thus, the study used the Transaction Cost Economics (TCE) to better understand the mediating influence of the procurement strategy on the relationship between physical distribution and availability of contraceptives.

This paper starts with literature review focusing on physical distribution, availability of contraceptives and procurement strategy. Then the methodology used, findings and discussion sections are also presented. Finally, it presents the conclusions and implications of the study as well as areas for further research.

Literature Review

Physical Distribution and Availability of Contraceptives

Physical distribution involves a group of interdependent parties involved in the process of distributing products or services so that they are ready for use by users with indicators of product availability, delivery time and place (Vledder et al., 2015; Sankhyayan and Dasguta, 2019). From the public health sector perspective, physical distribution involves various activities such as transportation, point-of-sale location and warehouse management that directly affect the availability of health care products including contraceptives from the suppliers to the users with the sole aim of minimizing the implications of unavailability (Babazadeh, Hernandez, Anglewicz & Bertrand, 2021). Existing literature indicates a positive relationship between physical distribution and product availability (Mezmur et al., 2021). It is through physical distribution that health care products are transported from the point of origin to the point of consumption, thus making them available for the clients. In agreement, given the nature of demand for contraceptives in the public health sector, making contraceptives available to clients requires a well – organized distribution system that ensures on time delivery of contraceptives to clients (Mukasa et al., 2017; Thaci & Foster, 2018).

Using the transaction cost economics theory (TCE), Williamson (1981), argue that organisations intending to improve performance and realise optimisation in transactions,

require to focus on three dimensions: 1) Asset specificity; 2) uncertainty of customer demand and 3) ordering frequency. Moreover, given the fact that the demand for contraceptives is stochastic in nature, there is a need to determine their ordering and distribution frequencies to improve their availability in public health facilities (Daff, Seck, Belkhayat & Sutton, 2014; Ooms et al., 2020). Subsequently, dimensions such as vehicle assignment (*Asset Specificity*) and routing could be critical in the distribution of contraceptives. Additionally, although extant literature such as Adjei et al. (2015) and Mezmur et al. (2021) indicate that specifying appropriate assets suitable for the distribution of goods is key in enhancing availability of products in the health sector, it might not be relevant in a developing economy's context, given the scarce resources to acquire these assets as well as limited skilled personnel in maintenance and repair. In most cases routing and scheduling is done at the central level and sometimes characterized by inadequate vehicles thereby affecting on time delivery. Additionally, public health facilities lack sufficient man power to constantly analyse the uncertainty of customer demands due to the ever-changing tastes and preferences. This therefore signifies that although some scholars such as Williamson (1981) and Babazadeh et al. (2020) note that asset specificity is paramount in promoting availability of products in the public health sector, it is relevant for developing countries like Uganda due to limited resources to acquire these assets and limited skilled man power to specify the most appropriate assets.

Besides, Moons et al. (2019), Ageron, Benzidia and Bourlakis (2018) note that determination of distribution frequencies and designing of the appropriate distribution networks is an engine to safeguarding the availability of products in public health facilities. Moreover, scholars such as Kraiselburd and Yadav (2013) also argue that to avoid inefficiencies in owning and operating the distribution activities, more especially in the transportation of health care products, it is imperative to obtain a well-managed fleet of vehicles as well as remunerating the various distributors. Macha et al. (2012) and Moons et al. (2019) identifies transportation and location of the distribution centres as major elements in ensuring a sustainable distribution of health care products including contraceptives. The public health sector needs to own specific assets such as vehicles that are appropriate for the job at hand. Similarly, although Vledder et al. (2015), among other things, emphasized the need to have a cost-effective transportation means that can distribute contraceptives from the point of origin to the point of consumption, the public health sector aims at saving people's lives and thus sustaining timely transportation of contraceptives should be given utmost attention. More or less similar results are reported by Mukasa et al. (2017) and McCool-Myers (2019). In a typical health care system, improving the distribution of contraceptives to rural areas and areas outside the capital regions through training of village health teams (VHTs) could improve contraceptives availability in these areas (Hernandez et al., 2018). Yet, less literature is visible on how physical distribution influences availability of contraceptives and specifically in the public health sector (Moons et al., 2019). Based on this discussion, the following hypothesis is worth testing: -

H1: Physical distribution has a positive influence on the availability of contraceptives

Mediation Influence of Procurement Strategy

One of the most crucial characteristics of a mature public health facility intending to ensure constant availability of health products to their clients, is the ability to formulate the

procurement strategy, carefully considering several contingent factors as well as strategy components, content and process (Patrucco et al., 2017; Musonda & Gambo, 2020). Furthermore, Hesping and Schiele (2015) and Patrucco et al. (2017) reveal that an organization's procurement strategy presents a blue print of how an organization carries out its procurement planning activities and determines an appropriate procurement structure that minimizes stockout situations. Chenini et al. (2020) argue that an organisation's procurement strategy is a key determinant of the development of procurement plans and coordinating the procurement structure that subsequently influences the availability of products.

The distribution networks that are used in the distribution and transportation of products from the suppliers to the final users, greatly influence the procurement strategy and subsequently leads to product availability (Moons et al., 2019). Vledder et al. (2015) asserts a typical health system needs to develop multi-level distribution systems, with numerous distribution levels, in order to maintain a steady supply of contraceptives. Similarly, much as Ageron et al. (2018) indicate that timely distribution of contraceptives in public health is dependent on the available stock that is procured by the procurement departments, a number of public health facilities are sometimes not fully represented in the planning process due to centralization procurement structure that is dominant in the public sector. Extant literature indicates that procurement strategy has a significant influence on designing and coordinating distribution networks by organizations intending to maintain product availability (Ageron et al., 2018). Network designing of physical distribution depends highly on the procured items and reliable suppliers (Kritchanchai, Hoeur & Engelseth, 2018). Thus, there is a need for the public health sector to involve the procurement departments / personnel from all the public facilities in the distribution planning process in order to safeguard constant availability of contraceptives to their clients.

The choice of the purchasing strategy chosen is essential in the designing of the distribution networks (Subramanian, 2020). Vledder et al. (2015), prostrates that the distribution network designed by an organisation has an impact on purchase volumes, thereby affecting the availability of these products to clients. Furthermore, Patrucco et al. (2017) and Chin et al. (2020) argue that, since the demand for contraceptives in the public health sector is highly stochastic in nature, it is important to opt for a purchasing strategy that aims at sustaining suppliers of contraceptives, so that designers of the distribution networks are guided in decision making. This would subsequently enable the facility to minimise the supply vulnerability of contraceptives, maximise the buying power and to bargain for better deals aimed at a consistent supply while, at the same time, corresponding with the external resources (Nara et al., 2020).

Yanamandra (2018), Moons et al. (2019) and Chenini et al. (2020), argue that public health products are always affected by stochastic demands, coupled with bullwhip effects, physical distribution challenges and unreliable procurement strategies. These challenges, therefore, might require obtaining suppliers with specific assets, for instance, vehicles used in the distribution process, material handling equipment and storage facilities that enables the public health facility to observe volume assurance, safety of stock and back-up plans that would enable the public health facility or the government to search for alternative suppliers in an emergency (Williamson, 1981). In agreement, Park & Kim (2003) indicate that the procurement strategy adopted by an organisation has an influence on designing and

coordinating of distribution networks aimed at consistent supply of products in public health facilities. Consistent with transaction cost economics (TCE) (Coase, 1937; Williamson, 1981), due to the stochastic nature of customers' demand in the public health sector, there is an important need for the public health facilities to monitor the ordering frequency of contraceptives of clients and also obtain suppliers who own specific assets that are sufficient to ensure maximum distribution of contraceptives at minimum transportation costs.

Patrucco et al. (2017) and Mackintosh et al. (2018) identified procurement strategy as a critical antecedent in safeguarding optimal stock of items that subsequently enhance the availability of products in the public health sector. The stochasticity of demand for contraceptives that is predominant in the public health sector impacts their availability in the various facilities and therefore important to employ procurement professionals and constantly involve them in the planning process. Consistent with transaction cost economics (TCE), the stochastic demand for contraceptives in the public health sector can be managed through creating appropriate procurement strategy that is capable of consistently analyzing and forecasting procurement needs for the clients (Musonda & Gambo, 2020; Chenini et al., 2020). Furthermore, previous scholars, such as Mukasa et al. (2017) and Moons et al. (2019), argue that organizations' procurement strategy influences the acquisition of the right products demanded by the clients, thereby, influencing the design of the distribution networks that enhance the availability of contraceptives. This, therefore, signifies that the procurement strategy could have a mediating effect on the relationship between physical distribution and the availability of contraceptives in the public health sector. The study, therefore, tests the following hypothesis:

H2: Procurement strategy mediates the relationship between physical distribution and the availability of contraceptives.

Methodology

This study was explanatory research since it sought to explain the mediating influence of procurement strategy in the relationship between physical distribution and availability of contraceptives in Uganda's public health sector. It was conducted between December 2020 and March 2021. Through survey, 165 questionnaires from public health facilities in South Western Uganda were collected. South Western Uganda was chosen for this study because of its highest population density of 300 persons/km^2, besides being one of the regions with the highest teenage pregnancies (Prada et al., 2016). The region comprises of eight hospitals and 314 public health centers, all totaling to a population of 322 public health facilities in the south western region. The sample size of the study was 175 that was determined using Krejcie & Morgan table of 1970.

The study employed a multi-stage sampling design. The public health facilities in South Western Uganda were stratified into hospitals, health centre IVs, health centre IIIs and health centre IIs. A stratified random sampling procedure is a probability sampling procedure in which the population is divided into several relevant strata, and a random sample is drawn from each stratum (Saunders, Lewis & Thornhill, 2009). It is assumed that the strata are internally homogeneous, which is typical of the public health facilities in Uganda's public health sector. Since districts have different numbers of the respective units, probability proportional to size (PPS) was used to ensure a proportionate distribution of the sample.

Simple random sampling was used to select a health unit based on random numbers generated in the range according to the health units on the list obtained from the ministry of health. The public health facilities were entered in the excel package which was used to generate random numbers. At the health facility, an officer responsible for managing both procurement activities and physical distribution of contraceptives was given a questionnaire to provide complete information regarding this study from the five districts, i.e. Kabale, Kanungu, Kisoro, Rukungiri and Ntugamo districts. Alongside a formal letter requesting logistics personnel of these public health facilities, the questionnaires were either handed to the participants or emailed. This enabled participants to allocate ample time to fill the questionnaire and also a platform for more clarity whenever there was a need. The sample size of this study includes 110 health center IIs, 37 health center IIIs, 14 health center IVs and 4 hospitals.

Table I: Measurement Scales with their Outer Loadings

Construct / Indicator	**Outer loadings**
Procurement Strategy	
We have a procurement unit responsible for procurement planning	0.813
Our procurement plans are based on the forecasted needs	0.911
Our procurement plans take into account current stock levels	0.893
Our procurement plans take into account clients' consumption rates	0.896
Our procurement plans take into account the required lead times of suppliers	0.896
The procurement unit /person monitors suppliers' performance to control stock out situations	0.898
Our procurement plans take into account losses and adjustments	0.812
Our procurement plans are developed annually and reviewed frequently	0.727
Physical Distribution	
Our vehicles deliver contraceptives to our distributors on time	0.782
Our health facility uses trucks with sufficient capacity to deliver the required quantities of contraceptives	0.812
Our health trucks are properly maintained and rarely breakdown	0.861
Our transport office is always equipped with the right information regarding the ordered quantities	0.827
Our drivers are well remunerated to motivate them deliver contraceptives on time	0.842
Our vehicles are used effectively for routine and emergency deliveries of contraceptives to our clients	0.763
Contraceptives Availability	
We have community - based distributors for contraceptives in our community	0.854
Our distributors for contraceptives are always sent to vulnerable areas that have no distribution centres	0.855
Our health facility often changes distribution centres to make sure that they avail contraceptives to our clients	0.892

Measures

Indicators for both independent and dependent variables were established based on theoretical and empirical literature (Klarner et al., 2013). Following Tehseen et al. (2017) all the variables were captured using multi-item indicators. The indicators of procurement strategy were adapted from Kumar, Ozdamar and Ng (2005), Patrucco et al. (2017) and Chenini et al. (2020). Indicators of physical distribution were adapted from Bienstock, Mentzer and Bird (1997) and Moons et al. (2019). The indicators of contraceptives availability were adapted from Nara et al. (2020) and were adjusted to suit the context of the study. Table I shows a list of the items used.

Analysis and Results

The study first examined whether there is a significant difference in the availability of contraceptives among the public health facilities using ANOVA. The study started the analysis with ANOVA to ascertain whether there are significant differences in the availability of contraceptives and be able to decide on whether to make the subsequent analysis based on each strata or make a general analysis. Results in Table II, indicate that health centers are significantly different from each other in relation to availability of contraceptives.

Table II: ANOVA Results

	β	t	p
(Constant)		21.728	0
h1	-0.453	-2.444	0.016
h2	-0.262	-1.571	0.118
h3	-0.031	-0.275	0.783
h4	0.095	1.128	0.261

Notes: *h1 = Health center IIs, h2= Health center IIIs, h3= Health center IVs, h4 = Hospitals*

The study further tested for the magnitude of the differences in the availability of contraceptives among the four strata that make up the public health facilities in the region. This was done with the help of a linear regression model as shown in Table III.

Table III: Linear Regression Results (testing for the magnitude of the difference)

	β	t	p
(Constant)		21.728	.000
h1	-.453	-2.444	.016
h2	-.262	-1.571	.118
h3	-.031	-.275	.783
h4	.095	1.128	.261

Notes: *h1 = Health center IIs, h2= Health center IIIs, h3= Health center IVs, h4 = Hospitals*

Results indicate that higher health centers (IIIs, IVs and hospitals) had insignificant effect on availability of contraceptives. Hospitals have greater chances of having contraceptives compared to others (coefficient positive) but the effect is not significant (p= 0.261). Based on the above results, since the magnitude in the differences in the availability of contraceptives

are insignificant, the subsequent analysis is based on health center IIs. This is be because health center IIs are many as compared to the rest of the health facilities.

To test the study hypotheses, the study used partial least squares – structural equation modelling output (PLS-SEM) with the help of the SmartPls software version 3.2.8. PLS-SEM has been used in this study because it has been proved an ideal tool in making proper interpretations of the results and thus simplifying decision making (Awang, Afthanorhan & Asri, 2015). According to Hair, Ringle and Sarstedt (2013), there are two outputs of PLS-SEM: 1) the Measurement model output that assess the validity and reliability of the study constructs and 2) the structural model that assesses the model quality and the bootstrap results indicating the hypothesized relationships.

Assessment of the Reflective Measurement Model

The measurement model of this study consisted of three variables: physical distribution, procurement strategy and availability of contraceptives. Each of the variables was measured by multiple indicators. All the variables had reflective measurement models, as indicated by the arrows pointing from the variables to the indicators. Besides, given the fact that the indicators in this study are the manifestations of the constructs and at the same time have the same antecedents and consequences, then it adopts the reflective measurement model (Jarvis, MacKenzie & Podsakoff, 2003).

Numerous scholars (Hair, Sarstedt, Hopkins, Kuppelwieser, 2014; Ringle, Sarstedt, Mitchell & Gudergan, 2020) have suggested a criterion for evaluating and accepting the validity and reliability of the measurement model. In this explanatory study, indicator reliability was achieved with the outer loadings being at least 0.7 and the average variance extracted (AVE) being 0.5 minimum as indicated in Table IV respectively (Hair et al., 2013).

The internal consistency reliability is traditionally checked using Cronbach's alpha. However, scholars such as (Sarstedt et al., 2014; Ringle, Da Silva & Bido, 2015) argue that Cronbach's alpha is not suitable for PLS-SEM because it is sensitive to several items in the scale, and the measure is also found to generate severe underestimations when applied to PLS path models and suggested composite reliability since its more reliable, with its coefficients higher than those of Cronbach's alpha. Composite reliability values of > 0.70, shows that there is internal consistency of the instrument (Hair et al., 2014; Hair et al., 2013; Ringle et al., 2020). This study therefore used composite reliability to test for the internal consistency of the instrument as illustrated in Table IV and was met.

Table IV: Assessment of Construct Reliability

Constructs	Composite Reliability	AVE
Contraceptives Availability	0.879	0.709
Distribution	0.922	0.664
Procurement	0.935	0.727

Assessment of Construct Validity

To test discriminant validity of this study, the Heterotrait-Monotrait (HTMT) ratio of correlation was used. According to Henseler et al. (2015), HTMT is more ideal in testing discriminant validity because it provides less biased estimations of the correlations among the latent variables as compared to Fornell & Lacker (1981) criterion. To discriminate between two variables, the HTMT ratio should be significantly smaller than 1 (Hair et al., 2019). Scholars such as (Chin, 1998; Henseler et al., 2015) further reveal that when the HTMT ratio is 0.85 and above, there is an HTMT problem. There are three criteria used in assessing discriminant validity using HTMT (Henseler et al., 2015; Sarstedt et al., 2014; Hair et al., 2019). These are; the first one and the most conservative HTMT value ($HTMT_{0.85}$), the second one is the liberal HTMT critical value ($HTMT_{0.90}$) and the third one is the $HTMT_{Inference}$, which is below the value of 1 criterion for bootstrapping. $HTMT_{Inference}$ should indicate discriminant validity between all construct measures.

The constructs are therefore empirically distinct from each other when the HTMT ratios of the correlations are much smaller than 1. Table V shows that the constructs of this study are empirically distinct from each other since the highest value of 0.473 is much smaller than the most conservative HTMT critical value of 0.85 and also the bootstrapping routine results show that the upper confidence interval limits are below 1.

Table V: HTMT results

Latent Variable	Contraceptives Availability	Physical Distribution	Procurement Strategy
Contraceptives Availability			
Physical distribution	**0.473** $CI_{0.9}$([0.254, 0.589])		
Procurement Strategy	**0.179** $CI_{0.9}$ ([0.317,0.124])	**0.373** $CI_{0.9}$([0.176,0.520])	

Assessment of the Structural Model

This study first tested for collinearity issues among the reflective indicators since high correlations are not desired between items in reflective measurement models before the assessment of the full model using the variance inflation factor (VIF). The VIF quantifies the severity of collinearity problems. According to Henseler et al. (2015), it is important to examine the PLS path model for collinearity issues to ensure that it does not bias the regression results. The accepted standard is that VIF values should be below 3 (Hair et al., 2019). During the VIF analysis, availability of contraceptives was considered as dependent variable while physical distribution and procurement strategy are served as independent variables. The VIF results, summarized in Table VI, suggest that there are no indications of collinearity issues between each set of independent variables since the VIF values are less than 3.

The study also assessed the common method bias (CMB) using the variance inflation factor (VIF). According to Hair et al. (2019), there are no common method bias (CMB) issues

between each set of independent variables if VIF values are below 3. Table VI indicates that there are no CMB issues.

Table VI. Common method bias results

Independent variable	Dependent variable	CMB Problem
Physical distribution	2.347	No
Information flow	1.284	No
Procurement strategy	2.814	No

An assessment of the structural model is the second step in PLS-SEM after the measurement model and involves running a bootstrapping procedure of 5,000 replications (Ali, Rasoolimanesh, Sarstedt, Ringle & Ryu, 2018; Ringle et al., 2020). Normally, this generates standard errors and t-statistics that are used to assess significance testing of the path coefficients. The first step is to assess the quality of the model, an analysis of the direct relationships between physical distribution and availability of contraceptives thus testing hypotheses H1. Finally, an assessment of the full model involving the assessment of the mediation effect to test H2.

Table VII presents the results of the structural model estimation and evaluation of the relationships among procurement strategy, physical distribution and contraceptives availability in a developing country's context. The criterion for assessing a PLS structural model (Awang et al., 2015), for instance the coefficient of determination R^2 for the direct relationship between physical distribution and procurement strategy (without mediation) has a medium value of 0.193, then the R^2 for the indirect relationship between physical distribution and contraceptives availability (with mediation) is 0.349 which is large. Both values are above the acceptable thresholds hence signifying the model's predictive validity (Chin, 1998; Ringle et al., 2020). This analysis reveals that physical distribution and procurement explain only 34.9 % of total variations in the availability of contraceptives in public health facilities. The remaining 65.1 % is explained by other factors outside our study. Consistent with these findings the results from the structural model through the blindfolding procedure show that the Q^2 values of procurement are 0.093 (without mediation) and 0.155 (with mediation), which are all above zero, thus indicating the predictive accuracy of the PLS path model (Henseler et al., 2015). This therefore, indicates that the hypothesized relationships (H1 and H2) have practical and significant importance in informing availability of contraceptives in the sector.

H2 tested whether procurement strategy mediates the relationship between physical distribution and the availability of contraceptives. The bootstrapping results in Table 7, indicate that the indirect effect (PD → PD → AC) is non-significant H2 [(β = -0.037, $p > 0.05$, CI (0.142; 0.043)]. Whereas the confidence intervals [0.142; 0.043] after bootstrapping analysis do not bestride a 0 in between, the P-values are non-significant thus indicating non-existence of mediation effects (Hayes & Scharkow, 2013; Gannon et al., 2020). In addition, the direct relationship between physical distribution and procurement strategy is significant [(β = 0.237, $p < 0.05$, CI (0.002; 0.404)]. Similarly, the direct relationship between physical distribution and availability of contraceptives as indicated in Table VII, is also significant and

positive. According to Zhao, Lynch and Chen (2010), this kind of result suggests non-existence of mediation but the variables need to be retained as they have a direct contribution to the availability of contraceptives.

Table VII: Evaluation of the structural model

No.	Paths	β	t	p
1	Physical distribution -> Contraceptive Availability	0.444	5.327	0.000
2	Physical distribution -> Procurement strategy	0.237	1.955	0.025
3	P/Distribution -> P/strategy -> C/Availability (Mediation)	-0.038	0.813	0.416
		Q^2	R^2	
4	Contraceptives Availability	0.225	0.402	
5	Procurement Strategy	0.096	0.240	

Notes: *The cross-validated redundancy measure, Q^2 was derived from the blindfolding procedure; R^2= Coefficient of determination*.

This study also extended the results of PLS-SEM by also taking into account the performance of each construct in explaining availability of contraceptives. This was done by the use of the Importance Performance Map Analysis (IPMA). The Importance Performance Map Analysis (IPMA) was used to evaluate the predecessor variables (Physical distribution and Procurement strategy) that had a relatively high importance to the target variable (Availability of contraceptives) but which achieved a relatively low performance. These kinds of variables have a great value to those public health facilities seeking to enhance availability of contraceptives, but have limited resources (Moons et al., 2019; Subramanian, 2020).

Table 8, displays the IPMA results for the predecessor variables of availability of contraceptives. The results reveal that physical distribution is of considerable importance (0.443) in availability of contraceptives in the public health sector. This is followed by procurement strategy (mediator) (0.099). These are the predecessor variables with a direct relationship to availability of contraceptives. The results indicate that a one-unit increase in physical distribution increases availability of contraceptives by 0.443. Hence, managerial actions should prioritize improving the performance of physical distribution which, according to Ringle and Sarstedt (2016), can be done by focusing efforts on the predecessor variables of physical distribution with the strongest impact on availability of contraceptives in the public health sector.

Table VIII: IPMA results for predecessor variables of availability of contraceptives

Variable	Importance	Performance
Availability of Contraceptives		77.632
Physical distribution	0.443	60.165
Procurement strategy	0.099	59.684

Discussion

The results of the study reveal that there is a positive and significant influence of physical distribution on the availability of contraceptives in the public health sector. This means that an increase in the physical distribution of contraceptives is associated with an increase in their availability in public health facilities. This signifies that when physical distribution for contraceptives is properly managed through proper maintenance of distribution vehicles, use of vehicles with sufficient capacity to satisfy the clients' demand, obtaining the right information regarding clients' requirements, remunerating drivers and keeping a budget for vehicle repair and maintenance leads to the availability of contraceptives in the public health facilities (Kraiselburd & Yadav, 2013; Moons et al., 2019). The study findings contradict those of Ageron et al. (2018), who asserts that decentralising distribution is more appropriate in the distribution of health care products, including contraceptives, than centralised distribution that is pre-dominant in Uganda's public health sector. The centralisation of physical distribution for contraceptives enables stakeholders to formulate effective delivery strategies and measurement of delivery services. This leads to improved availability of contraceptives through improved planning, coordination and communication in the delivery process.

This finding of the study is in agreement with the Transaction Cost Economics (TCE) (Coase, 1937; Williamson, 1981), which argues that organizations should critically analyse the ordering frequency of an item, the uncertainty of customers' demands and asset specificity if they are to ensure consistent product availability. The findings of the study reveal that an analysis of the ordering frequency of a product improves the designing of accurate distribution networks, which eventually lead to the timely distribution of contraceptives (Vledder et al., 2015). The public health sector normally faces the challenge of unavailability of contraceptives due to the ever-changing customer requirement, eventually leading to increased transaction costs, such as switching and transport costs (Thaci & Foster, 2018). Some clients initially ask for long term contraceptives, such as IUDs and implants, but after a short period of time they go back to ask for a change to the short-term ones such as emergency pills and condoms (Mukasa et al., 2017). This, therefore, calls for a critical analysis of the uncertainty of demand and ordering frequency to ensure that the distributed contraceptives favor the needs of the customers.

Although scholars such as Adjei et al. (2015), Foerstl et al. (2016), Thaci and Foster (2018) and Mackintosh et al. (2018) indicate a strong link of the procurement strategy on the relationship between physical distribution and availability of health care products including contraceptives, this study establishes that procurement strategy is of less importance when it comes to availability of contraceptive and does not mediate the relationship between distribution and the availability of contraceptives in the public health sector. This means that the procurement strategy is not a channel through which distribution associates with the availability of contraceptives in Uganda's public health sector. It also signifies that possessing a strong procurement strategy by public health facilities does not necessarily enhance the availability of the right contraceptives. The government, donors and NGOs that procure contraceptives on behalf of some of the public health facilities have their own transportation means and manage their own specific budgets for fleet management. This has been majorly attributed by the centralization of the procurement activities on behalf of these facilities more especially health centers.

Conclusion

This study assessed the mediating effect of the procurement strategy on the relationship between physical distribution and the availability of contraceptives in Uganda's public health sector. Although scholars (Foerstl et al., 2016; Thaci and Foster, 2018; Moons et al., 2019) indicate a strong linkage of procurement strategy in the relationship between physical distribution and availability of products, this study found out that it is not the case with Uganda's public health sector. Based on the results and the importance performance map of the study, it can be concluded that procurement strategy is of less importance in availability of contraceptives and also does not mediate the relationship between physical distribution and the availability of contraceptives in the public health sector. This is mainly attributed to the centralization of the procurement activities in the sector. Besides, the stochasticity nature of demand for contraceptives makes procurement planning complex and increases distribution costs, such as transportation and facilitations for distributors. The suppliers of these contraceptives i.e the government, the donors and non-governmental organizations rarely involve the procurement units at the facility level in their procurement planning activities and this could be the lead cause of increased stocks of the most preferred contraceptives in many public health facilities. This therefore implies that there is need for the public health sector to advocate for the decentralization structure that is capable of incorporating the user specifications in their procurement planning and minimize unavailability of contraceptives. The government and other stakeholders should also increase resources in terms of remunerations for the distributors as well as increasing capacity building for the distributors so that contraceptives are brought closer to clients.

Concerning areas for further research, future research may consider examining the influence of other logistical activities such as storage, material handling and patients flow on availability of contraceptives in the public health sector. It might be very interesting to carry out a similar study but using a qualitative approach since this was a quantitative approach. Finally, this study was carried out in a developing country's context, future research can concentrate on comparing the availability of contraceptives in a developing economy's context versus the developed economy.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

References

Adjei, K. K., Laar, A. K., Narh, C. T., Abdulai, M. A., Newton, S., Owusu-Agyei, S., & Adjei, S. (2015). A comparative study on the availability of modern contraceptives in public and private health facilities in a peri-urban community in Ghana. *Reproductive Health*, *12*(1), 1-8.

Ageron, B., Benzidia, S., & Bourlakis, M. (2018, January). Healthcare logistics and supply chain–issues and future challenges. *Supply Chain Forum: An International Journal*, *19*(1), 1-3.

Ali, F., Rasoolimanesh, S. M., Sarstedt, M., Ringle, C. M., & Ryu, K. (2018). An assessment of the use of partial least squares structural equation modeling (PLS-SEM) in hospitality research. *International Journal of Contemporary Hospitality Management*, *30*(1), 514-538.

Apiyo, R. O., & Mburu, D. K. (2014). Factors affecting procurement planning in county governments in Kenya: a case study of Nairobi City County. *International Journal of Economics, Commerce and Management*, *2*(11), 1-34.

Awang, Z., Afthanorhan, A., & Asri, M. A. M. (2015). Parametric and non-parametric approach in structural equation modeling (SEM): The application of bootstrapping, *Modern Applied Science*, *9*(9), 58-67.

Babazadeh, S., Hernandez, J., Anglewicz, P., & Bertrand, J. T. (2020). The Relationship Between Spatial Access and Modern Contraceptive Use: Is Proximity to a Healthcare Facility a Determinant of Use Among Women in Kinshasa, DRC? *Gates Open Research*, *5*(3), 1-23.

Bienstock, C. C., Mentzer, J. T., & Bird, M. M. (1997). Measuring physical distribution service quality. *Journal of the Academy of Marketing Science*, *25*(1), 31-44.

Chenini, A., Iqbal, J., Qurrahtulain, K., Husain Mahmood, M. A., & Aldehayyat, J. S. (2020). Strategic procurement, supplier integration, and speed-to-market: The mediating role of procurement lead-time performance and manufacturing performance. *Journal of Public Affairs, 21*(3), 1-10.

Chin, J., Salcedo, J., & Raidoo, S. (2020). Over-the-counter availability of levonorgestrel emergency contraception in pharmacies on Oahu. *Pharmacy*, *8*(1), 1-9.

Chin, W. W. (1998). The partial least squares approach to structural equation modeling. *Modern methods for business research*, *295*(2), 295-336.

Daff, B. M., Seck, C., Belkhayat, H., & Sutton, P. (2014). Informed push distribution of contraceptives in Senegal reduces stock outs and improves quality of family planning services. *Global Health: Science and Practice*, *2*(2), 245-252.

Foerstl, K., Franke, H., & Zimmermann, F. (2016). Mediation effects in the 'purchasing and supply management (PSM) practice–performance link': Findings from a meta analytical structural equation model. *Journal of Purchasing and Supply Management*, *22*(4), 351-366.

Fornell, C. and Larcker, D.F. (1981), "Evaluating structural equation models with unobservable variables and measurement error", *Journal of Marketing Research*, *18*(1), 39-50.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2013). Partial least squares structural equation modeling: Rigorous applications, better results and higher acceptance. *Long Range Planning*, *46*(1-2), 1-12.

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, *31*(1), 2–24.

Hair, J.F, Sarstedt, M., Hopkins, L., Kuppelwieser, V.G. (2014) "Partial least squares structural equation modeling (PLS-SEM): An emerging tool in business research", *European Business Review, 26*(2), 106-121.

Hernandez, J. H., Akilimali, P. Z., Muanda, M. F., Glover, A. L., & Bertrand, J. T. (2018). Evolution of a large-scale community-based contraceptive distribution program in kinshasa, DRC based on process evaluation. *Global Health: Science and Practice*, *6*(4), 657-667.

Henseler, J, Ringle, C.M., Sarsted, M. (2015), A new criterion for assessing discriminant validity in variance-based structural equation modeling, Journal *of the Academy of Marketing Science*, *43*(1), 54–13.

Hernandez, J. H., Akilimali, P. Z., Muanda, M. F., Glover, A. L., & Bertrand, J. T. (2018). Evolution of a large-scale community-based contraceptive distribution program in Kinshasa, DRC based on process evaluation. *Global Health: Science and Practice*, *6*(4), 657-667.

Hesping, F. H., & Schiele, H. (2015). Purchasing strategy development: A multi-level review. *Journal of Purchasing and Supply Management*, *21*(2), 138-150.

Jarvis, C. B., MacKenzie, S. B., & Podsakoff, P. M. (2003). A critical review of construct indicators and measurement model misspecification in marketing and consumer research. *Journal of Consumer Research*, *30*(2), 199-218.

Kassa, G. M., Arowojolu, A. O., Odukogbe, A. A., & Yalew, A. W. (2018). Prevalence and determinants of adolescent pregnancy in Africa: a systematic review and meta-analysis. *Reproductive Health*, *15*(1), 1-17.

Klarner, P., Sarstedt, M., Hoeck, M., & Ringle, C. M. (2013). Disentangling the effects of team competences, team adaptability, and client communication on the performance of management consulting teams. *Long Range Planning*, *46*(3), 258-286.

Kraiselburd, S., &Yadav, P. (2013). Supply chains and global health: an imperative for bringing operations management scholarship into action. *Production and Operations Management*, *22*(2), 377-381.

Kritchanchai, D., Hoeur, S., & Engelseth, P. (2018). Develop a strategy for improving healthcare logistics performance. *Supply Chain Forum: An International Journal*, *19*(1), 55-69.

Kumar, A., Ozdamar, L., & Ng, C. P. (2005). Procurement performance measurement system in the health care industry. *International Journal of Health Care Quality Assurance*, *18*(2), 152-166.

Macha, J., Harris, B., Garshong, B., Ataguba, J. E., Akazili, J., Kuwawenaruwa, A., & Borghi, J. (2012). Factors influencing the burden of health care financing and the distribution of health care benefits in Ghana, Tanzania and South Africa. *Health Policy and Planning*, *27*(1), 46-54.

Mackintosh, M., Tibandebage, P., Njeru, M. K., Kungu, J. K., Israel, C., & Mujinja, P.G. (2018). Rethinking health sector procurement as developmental linkages in East Africa. *Social Science & Medicine*, *200*, 182-189.

McCool-Myers, M. (2019). Implementing condom distribution programs in the United States: Qualitative insights from program planners. *Evaluation and program planning*, *74*, 20-26.

Mezmur, H., Assefa, N., & Alemayehu, T. (2021). Teenage Pregnancy and Its Associated Factors in Eastern Ethiopia: A Community-Based Study. *International Journal of Women's Health*, *13*, 267-278.

Moons, K., Waeyenbergh, G., & Pintelon, L. (2019). Measuring the logistics performance of internal hospital supply chains–a literature study. *Omega*, *82*, 205-217.

Mukasa, B., Ali, M., Farron, M., & Van de Weerdt, R. (2017). Contraception supply chain challenges: a review of evidence from low-and middle-income countries. *The European Journal of Contraception & Reproductive Health Care*, *22*(5), 384-390.

Musonda, I., & Gambo, N. (2020). Mediation effect of partnership on procurement strategy factors influencing sustainable smart housing development, Nigeria. *Built Environment Project and Asset Management, 11*(3), 454-467.

Nara, R., Banura, A., & Foster, A. M. (2020). Assessing the availability and accessibility of emergency contraceptive pills in Uganda: A multi- methods study with Congolese refugees. *Contraception*, *101*(2), 112-116.

Ooms, G. I., Kibira, D., Reed, T., van den Ham, H. A., Mantel-Teeuwisse, A. K., & Buckland- Merrett, G. (2020). Access to sexual and reproductive health commodities in East and Southern Africa: a cross-country comparison of availability, affordability and stock-outs in Kenya, Tanzania, Uganda and Zambia. *BMC Public Health*, *20*(1), 1-14.

Park, C. H., & Kim, Y. G. (2003). Identifying key factors affecting consumer purchase behavior in an online shopping context. *International Journal of Retail & Distribution Management*, *31*(1), 16-29.

Patrucco, A. S., Luzzini, D., Ronchi, S., Essig, M., Amann, M., & Glas, A. H. (2017). Designing a public procurement strategy: lessons from local governments. *Public Money & Management*, *37*(4), 269-276.

Prada, E., Atuyambe, L. M., Blades, N. M., Bukenya, J. N., Orach, C. G., & Bankole, A. (2016). Incidence of induced abortion in Uganda, 2013: new estimates since 2003. *PloSone*, *11*(11), 1-19.

Pule, S. (2014). Supply chain information management and service delivery in public health sector organizations: A case study on national medical stores of uganda. *International Journal of Supply Chain Management*, *3*(3), 136-147.

Ringle, C. M., Sarstedt, M., Mitchell, R., & Gudergan, S. P. (2020). Partial least squares structural equation modeling in HRM research. *The International Journal of Human Resource Management*, *31*(12), 1617-1643.

Ringle, C. M., & Sarstedt, M. (2016). Gain More Insight from Your PLS-SEM Results: The Importance-Performance. *Industrial Management and Data Systems*, *116*(9), 1865–1886.

Ringle, C., Da Silva, D., & Bido, D. (2015). Structural equation modeling with the SmartPLS. Bido, D., da Silva, D., & Ringle, C. (2014). Structural Equation Modeling with the Smartpls. *Brazilian Journal of Marketing, 13*(2), 56-73.

Sarstedt, M., Ringle, C. M., Smith, D., Reams, R., & Hair Jr, J. F. (2014). Partial least squares structural equation modeling (PLS-SEM): A useful tool for family business researchers. *Journal of Family Business Strategy*, *5*(1), 105-115.

Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research Methods for Business Students*. Pearson Education Limited (5th Ed). London: Pearson Education Limited.

Subramanian, L. (2020). Enabling health supply chains for improved well-being. *Supply Chain Forum: An International Journal, 21*(4), 229-236.

Tehseen, S., Ramayah, T., & Sajilan, S. (2017). Testing and controlling for common method variance: A review of available methods. *Journal of Management Sciences*, *4*(2), 142-168.

Thaci, J., & Foster, A. M. (2018). Emergency contraception in Albania: a multimethods qualitative study of awareness, knowledge, attitudes and practices. *Contraception*, *98*(2), 110-114.

Vledder, M., Friedman, J., Sjöblom, M., Brown, T., &Yadav, P. (2015). *Optimal supply chain structure for distributing essential drugs in low-income countries: results from a randomized experiment*. Ross School of Business. Available at: https://ssrn.com/abstract=2585671.

Williamson, O. E. (1981). The economics of organization: The transaction cost approach. *American Journal of Sociology, 87*(3), 548-577.

Yanamandra, R. (2018). Development of an integrated healthcare supply chain model. *Supply Chain Forum: An International Journal, 19*(2), 111-121.

Zhao, X., Lynch, J. G. and Chen, Q. (2010), Reconsidering Baron and Kenny: Myths and Truths about Mediation Analysis, *Journal of Consumer Research, 37*(3), 197 -206.