

5-2019

# Do Individuals in Developing Countries Care about Personal Health Information Privacy? An Empirical Investigation

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## Recommended Citation

Adu, Ernest K.; Todorova, Nelly; and Mills, Annette, "Do Individuals in Developing Countries Care about Personal Health Information Privacy? An Empirical Investigation" (2019). *CONF-IRM 2019 Proceedings*. 16.  
<https://aisel.aisnet.org/confirm2019/16>

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# Do Individuals in Developing Countries Care about Personal Health Information Privacy? An Empirical Investigation

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## ***Abstract***

As developing countries migrate to electronic healthcare (e-health) systems, emerging case studies suggest concerns are being raised about the privacy and security of personal health information (PHI) (e.g., Bedeley & Palvia, 2014; Willyard, 2010). However, there is lack of consideration of PHI privacy in the development of e-health systems in these countries as developers and policy makers assume that individuals are in greater need of healthcare and may not care about issues such as privacy (Policy Engagement Network [PEN], 2010). To better understand these assumptions and concerns individuals may have about the digitization of their PHI, this study examined individuals' privacy concerns regarding the use of electronic health record (EHR) systems by hospitals for storing and managing PHI. A survey was conducted on a sample of 276 individuals in Ghana, a Sub-Saharan African country. We analysed the dataset using t-test and analysis of variance (ANOVA). Contradicting the assumption underlying e-health systems development, the results demonstrated that whilst individuals are less concerned about the collection of their PHI by hospitals, they are highly concerned about unauthorised secondary use, errors, and unauthorize access regarding their PHI stored in EHR systems. These concerns are especially greater for individuals with high computer experience and those who are extremely concerned about their health. Furthermore, compared with women and older individuals (35 years or older), men and younger individuals (aged 18-24) are more concerned about the collection of their PHI by hospitals. Implications for research and practice are discussed.

## ***Keywords***

Privacy concerns, e-health, personal health information, healthcare, developing countries

## **1. Introduction**

Since the time of the ancient Greeks, personal health information (PHI<sup>1</sup>) has been regarded as sensitive as evident in the Hippocratic Oath taken by physicians in the 5<sup>th</sup> century B.C. (Libert, 2015). Due to the highly sensitive nature of PHI, severe risks (e.g., loss of job or insurance) can result from its compromise. Consequently, individuals are more concerned about the privacy of PHI compared to other types of personal information (Gostin & Nass, 2009).

In developed countries, PHI privacy concerns have heightened with the digital transformation of healthcare and represent a major barrier to the widespread diffusion of electronic

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<sup>1</sup> PHI includes any information a patient may disclose to receive care and the information generated in the treatment process (e.g., lab test results, prescription, etc).

healthcare (e-health) (Angst & Agarwal, 2009; Kenny & Connolly, 2015). These concerns stem from the susceptibility of digitized PHI to loss (e.g., through hacking), especially when shared among the various stakeholders within the healthcare ecosystem, and the ease with which the stakeholders entrusted with the protection of consumers' PHI can carry out opportunistic activities. Lending support to the privacy threat posed to digitized PHI, in a recent study by Ponemon Institute (2016), 90% of 91 health organizations were found to have experienced a data breach with criminal insiders and hackers representing the main sources of breach.

Though e-health is nascent in developing countries (Lewis et al., 2012), a few case studies in some countries (e.g., Ghana) indicate growing PHI privacy concerns among individuals with the introduction of computer systems in support of healthcare (Bedeley & Palvia, 2014; Willyard, 2010). Also, case studies in the traditional paper-based healthcare environment show that some individuals with heavily stigmatized diseases (e.g., HIV/AIDS) hide their infections, and even avoid needed healthcare due to the fear of exposure of their illness (Kwansa, 2013). However, the privacy and security of consumers' PHI remains peripheral in the development of e-health systems in developing countries as developers and policy makers assume that individuals in these countries are so much in need of healthcare that they care little for anything else including PHI privacy (PEN, 2010). Given the recent increase in cybercrimes<sup>2</sup> and abuse of digitized information (e.g., leakage of medical records<sup>3</sup>, sextortion<sup>4</sup>, etc.) in many developing countries, individuals may resist digitization of their PHI when they suspect they are potentially vulnerable to abuse through weak privacy protection in e-health systems. This can thwart the effort to digitize healthcare and address the myriad health problems (e.g., epidemics outbreaks) plaguing these countries.

To challenge the assumptions of developers and policy makers regarding PHI privacy in e-health systems development and to ensure sustained growth of e-health in developing countries, it has become important to understand individuals' concerns about PHI privacy in e-health environments. Building on existing case studies, this study seeks to provide in-depth insights into the facets of PHI privacy concerns among individuals in developing countries. Specifically, the study addresses the following questions:

1. What is the extent of PHI privacy concerns among individuals in developing countries?
2. Does the level of individuals' PHI privacy concerns vary as a function of individual characteristics?

To date, scant research has examined privacy concerns and its antecedents in the healthcare context (Kenny & Connolly, 2015). The findings of the prior studies may not generalize to developing countries as the studies have focused mainly on samples in developed countries (Kenny, 2016). Compared to developed countries, digital divide and gender digital gap still exists in developing countries (International Telecommunication Union [ITU], 2017; Pew Research Center [PRC], 2015). It is therefore likely that privacy concerns of individuals in developing countries may differ from individuals in developed countries who have greater digital experience. This study therefore extends prior research efforts to the understudied e-

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<sup>2</sup> <https://www.serianu.com/downloads/AfricaCyberSecurityReport2016.pdf>

<sup>3</sup> <https://www.technomag.co.zw/2018/04/17/520-000-zim-healthcare-records-leaked/>

<sup>4</sup> <https://www.myjoyonline.com/news/2019/January-21st/sextortion-10-cases-recorded-in-less-than-a-month.php>

health setting of a developing country, in this case, Ghana. The specific e-health setting considered is an electronic health record (EHR) system usage within a hospital<sup>5</sup>.

## **2. Literature Review**

This study draws on the IS empirical studies examining privacy concerns and the factors driving these concerns. Recent systematic reviews of prior studies show individual characteristics such as gender, age, and education as important antecedents to privacy concerns (e.g., Smith et al., 2011). According to Smith et al. (2011), the most influential antecedents of privacy concerns will depend on the context of study. Individual characteristics studied as antecedents to PHI privacy concerns are reviewed in this section.

### **2.1. PHI Privacy Concerns**

Privacy concerns is often defined in the IS privacy literature as individuals' concerns regarding organizational practices related to the collection and use of their personal information (Smith et al., 1996). Adapted to the healthcare context, PHI privacy concerns reflects individuals' concerns regarding healthcare providers' practices related to the collection, storage, and use of their PHI. Smith et al. (1996) developed the Concern for Information Privacy (CFIP) instrument as a measurement for privacy concerns. CFIP consists of four dimensions: collection, errors, secondary use, and unauthorized access. Adapted to the context of this study, the CFIP instrument suggest that individuals with high concern for PHI privacy perceive that: 1) too much of their PHI are being collected and stored by healthcare providers, 2) healthcare providers do not have adequate measures to prevent against errors in PHI, 3) their PHI are used for other purposes without their authorization, and 4) healthcare providers fail to prevent unauthorized access to PHI stored in their computer systems.

CFIP has been used extensively in diverse IS contexts and may be considered the de facto measure of information privacy concerns (Bélanger & Crossler, 2011). Consequently, this study employs the CFIP instrument in assessing PHI privacy concerns of individuals in developing countries.

### **2.2. Demographics and PHI Privacy Concerns**

Despite consumers' heightened concerns about PHI privacy, scant research has focused on understanding these concerns and the factors driving them (Kenny & Connolly, 2015). To date, demographic factors including gender, age, education, and health status have been the often-studied antecedents to PHI privacy concerns.

A number of studies show that gender has no influence on PHI privacy concerns (Ancker et al., 2013; Ermakova et al., 2014; Esmaeilzadeh, 2018). However, for studies that show significant influence, females consistently express greater PHI privacy concerns (Laric et al., 2009; Vodicka et al., 2013; Wilkowska & Ziefle, 2012). Compared to men, women have been found to exhibit greater anxiety in using computer systems (Frenkel, 1990). This possibly

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<sup>5</sup> Health service providers in Ghana are generally referred to as hospitals, and there two major providers in the country: public/government hospitals and privately-owned commercial hospitals. In recent years, the hospitals have introduced e-health systems including EHR systems in support of health services. Existing EHR systems are stand-alone as they have been introduced within individual institutions. In general, as is the case with many developing countries (see Lewis et al., 2012), the e-health field in Ghana is nascent. However, the country is considered as one of the few African countries with the needed infrastructure (e.g., ICT) to implement networked health information systems solution (International Institute of Communication and Development [IICD], 2014). Ghana is thus a suitable context for this study.

explains females' greater PHI privacy concerns as anxiety about computers has positive impact on privacy concerns (Schwaig et al., 2013).

Age seems to exert a relatively consistent influence on PHI privacy concerns. With the exception of a few studies in which insignificant effect was observed (Ermakova et al., 2014; Kordzadeh & Warren, 2014), the majority of studies show that older individuals have higher concerns about PHI privacy than younger individuals (Ancker et al., 2013; Esmailzadeh, 2018; Laric et al., 2009; Wilkowska & Ziefle, 2012). For example, Chen et al. (2001) suggest that young people are less concerned about privacy as they are more risk taking. Additionally, they have less to lose as they are young, less wealthy and have no reputation established.

Empirical tests of the relationship between education and privacy concerns have produced mixed results. In some studies, higher levels of education is associated with increased PHI privacy concerns (Hwang et al., 2012; Papoutsis et al., 2015), whereas in other studies there is a significant negative relationship between education and privacy concerns (Esmailzadeh, 2018; Vodicka et al., 2013). Similar to education, the direction and nature of the influence of health status on privacy concerns is uncertain. Poor health status has been positively related to PHI privacy concerns in some studies (Flynn et al., 2003; Kordzadeh et al., 2016), whereas in other studies poor health status has a significant negative impact on concerns (Esmailzadeh, 2018; Lafky & Horan, 2011; Wilkowska & Ziefle, 2012).

It is obvious from the above review that more research is needed to examine and clarify further the influence of demographic factors on PHI privacy concerns in diverse technological, user, and geographic contexts. This study contributes to this gap by examining the influence of demographic factors in the understudied healthcare context of a developing country. In addition to the often-studied demographic factors, this study also explores the influence of computer experience which has yet to receive considerable attention as an antecedent to PHI privacy concerns. Given the digital divide and gender digital gap in developing countries (ITU, 2017; PRC, 2015), it is likely that concerns about PHI privacy may differ based on computer experience.

### **3. Method and Sample**

Some studies have recommended the need to study CFIP at a more granular level by examining the four dimensions separately in empirical models (e.g., Xu et al., 2012). Following this recommendation, in an attempt to provide a more in-depth understanding of PHI privacy concerns among individuals in developing countries, we explored variations in each of the four dimensions of CFIP based on the individual characteristics considered in this study. Given the exploratory nature of the study, we do not present specific hypotheses regarding the relationship between the demographic factors and the CFIP dimensions.

The sample of the study comprised individuals living in Ghana who receive care from the hospitals in the country. As the main purpose of the study is to explore individual differences regarding PHI privacy concerns, we sought to select a sample that varied in terms of the demographic characteristics considered in the study. Toward this end, similar to Dinev et al. (2016), we recruited individuals from various settings including college campuses, hospitals, business/government organizations, and local neighbourhoods. We distributed hardcopy questionnaires to individuals who volunteered to participate in the study and collected them at a later date.

To ensure survey participants answered the questionnaire with a common understanding of an EHR system, following prior research (e.g., Angst & Agarwal, 2009), a description of an EHR system was provided on the questionnaire. To measure PHI privacy concerns, the 15 items of the CFIP instrument were adapted to the context of this study. Regarding demographic variables, computer experience was measured in terms of the number of years individuals have used computers. Similar to Angst and Agarwal (2006), to measure health status, respondents were asked to rate the state of their health. For health concern, respondents indicated the extent to which they are worried about their health. 7-point Likert-type scales were used to measure the CFIP items, health status, and health concern. The scale anchors are as follows: CFIP (1=strongly disagree, 7=strongly agree), health status (1=very poor, 7=very good), and health concern (1=not at all worried, 7=extremely worried). We conducted a pilot with 24 participants to ensure the survey instructions were adequate and the technological context was well understood.

## 4. Data Analysis and Results

### 4.1. Descriptive Statistics

A total of 276 usable responses were collected and considered for analysis. Table 1 provides the descriptive statistics of the survey respondents. There was little variation among respondents regarding health status; most people rated their health as very good as 230 (83.3%, 2 missing, prefer not to say: 6) responses were on the higher end (i.e., 5 to 7) of the scale. This lack of variation is further confirmed by the mean (5.59) and standard deviation (1.25) values of the responses. Consequently, health status was dropped from further data analysis.

Demographic	Category	Frequency (%)	
Gender	Female	128	(46.4%)
	Male	148	(53.6%)
Age ( <i>Prefer not to say: 2</i> )	18-24 years	63	(22.8%)
	25-34 years	91	(33.0%)
	35-44 years	58	(21.0%)
	45 years and over	62	(22.5%)
Education ( <i>Missing, n=2</i> ) ( <i>Prefer not to say: 6</i> )	Junior High School (JHS) or below	56	(20.3%)
	Senior High School (SHS)	47	(17.0%)
	Some Undergraduate study	62	(22.5%)
	Bachelor or above	103	(37.3%)
Health Concern ( <i>Missing, n=3</i> ) ( <i>Prefer not to say: 9</i> )	Less worried	113	(40.9%)
	Somewhat worried	37	(13.4%)
	Extremely worried	114	(41.3%)
Computer Experience ( <i>Missing, n=1</i> )	None	59	(21.4%)
	Less-experienced	60	(21.7%)
	Fairly experienced	50	(18.1%)
	Highly experienced	106	(38.4%)

Table 1: Profile of Survey Participants

Based on the 7-point Likert scales used in measuring health concern, we considered responses corresponding to the lower end (i.e., 1-3), mid-point (i.e., 4), and higher end (i.e., 5-7) of the scale as respectively representing individuals who are *less worried*, *somewhat worried*, and *extremely worried* about their health. We also classified respondents into four groups based on their computer usage experience: *no usage experience*, *less-experienced*

(less than 3 years of experience), *fairly experienced* (3 to 7 years of experience), and *highly experienced* (over 7 years of experience).

The descriptive statistics of the dimensions of PHI privacy concerns are provided in Table 2. The mean value of the collection dimension was 3.36 (SD=1.66) whilst the mean values for the other three dimensions were 6 or above. This indicates that individuals have less concern regarding the collection of their PHI by hospitals. However, they were highly concerned about secondary use, unauthorized access, and errors regarding their PHI stored in EHR systems. These results are consistent with findings reported in a recent review of empirical studies by (Hong & Thong, 2013) which found that the collection dimension of CFIP has a lower mean in most studies compared to the other three dimensions: errors, secondary use, and authorized access.

#### 4.2. Reliability and Validity of Constructs

We performed confirmatory factor analysis (CFA) to assess the psychometric properties of the CFIP dimensions' scales using the partial least squares structural equation modeling (PLS-SEM) technique. SmartPLS 3.2.7 software package (Ringle et al., 2015) was used. Following the recommendations by Hair Jr et al. (2016), the psychometric properties of the scales were assessed based on internal consistency reliability, convergent validity, and discriminant validity.

In Table 2, the measurement of internal consistency reliability, composite reliability and Cronbach's alpha have values above the threshold value of 0.7 indicating high internal consistency for the measurement items of each of the CFIP dimensions. The factor loadings and average variance extracted (AVE) values in Table 2 also show that guidelines for convergent validity were met being above recommended threshold of 0.70 and 0.50 respectively (Hair Jr et al., 2016).

Dimensions of PHI Privacy Concerns	Items	Loadings	Mean (SD)	CR	CA	AVE
Collection (Mean=3.36, SD=1.66)	Col1	0.88	3.12 (1.86)	0.91	0.87	0.71
	Col2	0.77	3.69 (2.01)			
	Col3	0.90	3.21 (1.94)			
	Col4	0.82	3.41 (2.01)			
Errors (Mean=6.28, SD=0.84)	ER1	0.81	6.19 (1.06)	0.93	0.90	0.76
	ER2	0.88	6.28 (0.97)			
	ER3	0.91	6.27 (0.95)			
	ER4	0.89	6.38 (0.88)			
Secondary Use (Mean=6.01, SD=1.03)	SU1	0.71	5.47 (1.84)	0.81	0.70	0.52
	SU2	0.74	5.84 (1.61)			
	SU3	0.74	5.93 (1.57)			
	SU4	0.69	6.35 (1.12)			
Unauthorized Access (Mean=6.37, SD=0.83)	UA1	0.91	6.44 (0.88)	0.92	0.87	0.79
	UA2	0.87	6.24 (1.07)			
	UA3	0.89	6.42 (0.87)			

**Key:** *SD*: Standard Deviation; *CR*: Composite Reliability; *CA*: Cronbach's Alpha; *AVE*: Average Variance Extracted

Table 2: Confirmatory Factor Analysis Statistics

Discriminant validity was also observed (Table 3) as the square root of the AVE (i.e., the diagonal values) of each CFIP dimension was greater than correlations between the dimension and other dimensions (Barclay et al., 1995).

	COL	ERR	SU	UA
Collection (COL)	<b>0.841</b>			
Errors (ERR)	-0.190	<b>0.873</b>		
Secondary Use (SU)	0.013	0.477	<b>0.719</b>	
Unauthorised Access (UA)	-0.144	0.737	0.479	<b>0.891</b>

(Note: Diagonal elements are square root of AVE)

Table 3: Discriminant Validity

### 4.3. Influence of Individual Characteristics on PHI Privacy Concerns

In response to the second research question posed by the study, we explored the variation in the dimensions of PHI privacy concerns based on the following individual characteristics: gender, age, education, health concern, and computer experience. We used independent *t*-test, and analysis of variance (ANOVA) for this purpose. We followed up the ANOVA results with Bonferroni's post hoc test. The results from ANOVA and *t*-test are provided in Tables 4 through 8. For Bonferroni post hoc test, we show the groups in which significant differences occurred. SPSS 25 was used for performing the *t*-test, ANOVA, and Bonferroni test.

The independent *t*-test results for the influence of gender on PHI privacy concerns are provided in Table 4. A statistically significant difference between males and females was found for the collection dimension only with males expressing higher concerns about the collection of their PHI by hospitals than females. Similarly, from the ANOVA results in Table 5, a statistically significant difference between the age groups was found only in regards to the collection dimension of PHI privacy concerns. Post hoc analysis using Bonferroni test revealed that younger individuals (aged 18-24) expressed higher concerns about the collection of their PHI than older individuals aged 35 years or over. These results contradict the relatively consistent findings in the earlier reviewed studies (e.g., Laric et al., 2009; Esmaeilzadeh, 2018) that females and older individuals have higher concerns about PHI privacy than males and younger individuals, respectively.

Construct	Gender				<i>t</i>	Sig(<.05)
	Female (N=128)		Male (N=148)			
	Mean	SD	Mean	SD		
Collection	3.09	1.63	3.59	1.64	-2.506	<b>0.013</b>
Errors	6.29	0.84	6.27	0.85	0.184	0.854
Secondary Use	5.85	1.13	5.94	1.14	-0.654	0.513
Unauthorized Access	6.35	0.81	6.38	0.86	-0.291	0.771

Table 4: Independent t-test for PHI privacy concerns based on Gender

Surprisingly, concerning the influence of education, the results in Table 6 shows no significant difference between the levels of education regarding any of the dimensions of PHI privacy concerns. Regarding the levels of health concern, however, the ANOVA results in Table 7 revealed a statistically significant difference in terms of the secondary use and unauthorized access dimensions of PHI privacy concerns. Post hoc analysis using Bonferroni test further showed that individuals who are extremely worried about their health have greater concerns regarding secondary use and unauthorized access of their PHI stored in EHR systems. Following the arguments in some past studies (e.g., Flynn et al., 2003), the observed results may be due to individuals who are extremely worried about their health having sensitive health information also which they want protected against exposure.

Construct	Mean (SD)				F	Sig. ( <i>&lt;.05</i> )	Bonferroni test
	A(N=63)	B(N=91)	C(N=58)	D(N=62)			
Collection	3.96(1.53)	3.29(1.55)	2.91(1.48)	3.17(1.85)	4.738	<b>0.003</b>	D,C<A
Errors	6.26(0.82)	6.22(0.90)	6.39(0.74)	6.28(0.88)	0.521	0.668	
Secondary Use	5.75(1.17)	5.88(1.29)	5.95(1.07)	6.01(0.88)	0.616	0.605	
Unauthorized Access	6.28(0.86)	6.38(0.89)	6.49(0.67)	6.29(0.89)	0.840	0.473	

**Key:** A: 18-24; B: 25-34; C: 35-44; D: 45 years or over

Table 5: Differences in PHI privacy concerns based on Age

Construct	Mean (SD)				F	Sig. ( <i>&lt;.05</i> )	Bonferroni test
	A(N=56)	B(N=47)	C(N=62)	D(N=103)			
Collection	3.47(2.14)	3.10(1.78)	3.43(1.53)	3.34(1.38)	0.440	0.724	
Errors	6.10(0.96)	6.39(0.77)	6.38(0.81)	6.26(0.83)	1.390	0.246	
Secondary Use	5.97(1.00)	6.03(0.99)	5.96(1.13)	5.72(1.28)	1.149	0.330	
Unauthorized Access	6.20(0.89)	6.37(0.81)	6.45(0.81)	6.38(0.85)	0.891	0.446	

**Key:** A: JHS or below; B: SHS; C: Some undergraduate study; D: Bachelor or above

Table 6: Differences in PHI privacy concerns based on Education

Construct	Mean (SD)			F	Sig( <i>&lt;.05</i> )	Bonferroni test
	A(N=113)	B(N=37)	C(N=114)			
Collection	3.25(1.67)	2.99(1.57)	3.49(1.61)	1.439	0.239	
Errors	6.19(0.97)	6.20(0.83)	6.39(0.71)	1.757	0.175	
Secondary Use	5.69(1.26)	5.65(1.18)	6.16(0.95)	5.802	<b>0.004</b>	C>B,A
Unauthorized Access	6.24(0.99)	6.13(0.89)	6.55(0.61)	5.525	<b>0.005</b>	C>B,A

**Key:** A: Less worried; B: Somewhat worried; C: Extremely worried

Table 7: Differences in PHI privacy concerns based on Health Concern

The ANOVA results in Table 8 showed a statistically significant difference between levels of computer experience regarding the errors, secondary use and unauthorized access dimensions of PHI privacy concerns. However, the Bonferroni post hoc test did not detect any significant difference between the four computer experience groups regarding errors and secondary use. A further comparison of the groups using *t*-test revealed that the mean of the highly experienced group is significantly different from the mean of each of the other three groups in terms of the errors dimension<sup>6</sup>. This is not surprising as the mean values provided in Table 8 indicate that individuals with high computer experience express greater concerns regarding the errors dimension than the other three groups which all have the same level of concerns. Similarly, regarding secondary use, a comparison of the four groups using a *t*-test found that each of the mean values of the no experience and highly experienced groups was significantly different from the mean values of the less-experienced and fairly experienced groups<sup>7</sup>. As regards unauthorized access, Bonferroni post hoc test found that individuals with greater computer experience have higher concerns about unauthorized access to their PHI than those with either no computer experience or less computer experience.

<sup>6</sup> Comparison of group D against group A, B, and C: A(*t*=2.184, *p*=0.031); B(*t*=2.245 *p*=0.027); C(*t*=2.106, *p*=0.038).

<sup>7</sup> Comparison of group D against group B and C: B(*t*=2.211, *p*=0.028); C(*t*=2.090, *p*=0.038). Comparison of group A against group B and C: B(*t*=2.305, *p*=0.023); C(*t*=2.110, *p*=0.038).

In general, the analysis results show that individuals with greater computer experience are more concerned about the secondary use, errors, and unauthorized access dimensions of PHI privacy concerns. A possible explanation of these findings is that individuals with higher computer experience understand the risks associated with digitizing PHI leading to their greater concerns about privacy.

Construct	Mean (SD)				F	Sig (<.05)	Bonferroni test
	A(N=59)	B(N=60)	C(N=50)	D(N=106)			
Collection	3.29(2.17)	3.68(1.77)	3.44(1.28)	3.18(1.39)	1.190	0.315	
Errors	6.16(0.93)	6.17(0.87)	6.16(0.91)	6.46(0.71)	2.641	<b>0.050</b>	
Secondary Use	6.08(0.90)	5.65(1.13)	5.63(1.25)	6.06(1.16)	3.175	<b>0.025</b>	
Unauthorized Access	6.20(0.86)	6.19(0.87)	6.29(0.97)	6.58(0.69)	3.868	<b>0.010</b>	D>B,A

**Key:** *A: No experience; B: Less-experienced; C: Fairly experienced; D: Highly experienced*

Table 8: Differences in PHI privacy concerns based on Computer Experience

## 5. Implications for Research and Practice

Our findings have implications for research and practice. From the research perspective, this study examined PHI privacy concerns among an understudied population, individuals in a developing country. Additionally, compared to most existing studies which have often used student and tech-savvy samples (e.g., Bélanger & Crossler, 2011; Angst & Agarwal, 2009), this study utilized a diverse sample including individuals with no computer experience and non-students. The results of the study show that the CFIP instrument developed and used in western cultures is applicable to examining individuals' concerns about PHI privacy in developing countries. The study has thus answered the call to extend the boundaries of IS privacy research by utilising non-student samples as well as samples in developing countries (Bélanger & Crossler, 2011).

A number of prior privacy studies in the healthcare context did not use validated measures of privacy concerns (e.g., CFIP) often used in IS privacy literature. For example, some studies used a single item to measure privacy concerns (e.g., Laric et al., 2009; Vodicka et al., 2013; Wilkowska & Ziefle, 2012). Compared to these studies, this study took a multi-dimensional approach, using the CFIP instrument to conceptualise and measure PHI privacy concerns as four dimensions. This has helped improve our understanding of the relative importance of each of the dimensions as well as the variations across the dimensions based on individual characteristics such as age, gender, and computer experience. Our study thus responds to calls to use more comprehensive measures of privacy concerns in the healthcare context in order to gain deeper understanding of individuals' PHI privacy concerns (Kenny & Connolly, 2015).

We examined the influence of computer experience which has not received much attention as an antecedent to PHI privacy concerns. The results of the study show that computer experience strongly influences individuals concerns regarding PHI privacy more than any of the other individual characteristics considered in the study. This finding demonstrates that in developing countries where there is still digital divide, computer experience is a key factor to consider when examining information privacy perceptions and disclosure behaviours.

From a practical viewpoint, our results suggest that relevant stakeholders (e.g., e-health systems developers, healthcare providers, etc.) pay attention to protecting PHI privacy in developing e-health systems. The findings also indicate that governments in developing countries need to enact regulations and policies that ensure that e-health systems adopted by

healthcare providers meet certain standards regarding privacy protection of individuals' PHI. The study also identified the privacy concerns of different groups. This suggests that healthcare stakeholders and providers can help improve perceptions by implementing intervention and education programmes that address the specific concerns of various groups.

## 6. Limitations and Future Research

This study has limitations. First, the findings of the study may generalize to developing countries that share similarities with Ghana such as cultural beliefs regarding privacy, information technology (IT) and educational development. Future studies should also investigate whether our findings generalize to other countries. Second, though we selected a diverse sample for the study, there was sample underrepresentation in some of the comparison groups (e.g., individuals with no or less education, computer experience, etc.). Future studies are encouraged to recruit a larger sample that better reflects the demographic distributions of the population in developing countries. Finally, future research can explore some of the findings of this study further. For instance, while this study highlighted a difference between males and females regarding concerns about PHI collection, it is not clear what may account for this. Future research can also build on the findings of this study by exploring other antecedents to PHI privacy concerns.

## 7. Conclusion

This study examined privacy concerns among individuals in a developing country, Ghana, regarding the use of EHR system by hospitals for the storage and management of PHI. Our results show that although individuals were, in general, less concerned about the collection of their PHI by hospitals there were differences based on gender and age. Compared with data collection, individuals were highly concerned about the other privacy aspects of PHI stored in EHR systems (i.e. secondary use, unauthorised access, errors). Moreover, privacy concerns about PHI stored in EHR systems were greater for individuals with higher computer experience and those who are more concerned about their health. Surprisingly, education had no impact on privacy concerns. Our findings suggest further the need to ensure privacy by design in the development of e-health systems in developing countries.

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