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Women's Sexual Autonomy Index in Indonesia : A Principal Component Analysis (PCA) Method

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Abstract

Many studies have shown that women's sexual autonomy has an important impact on sexual and reproductive health such as sexually transmitted infections (STIs) including HIV/AIDS, fertility, neonate and infant mortality, parity, contraceptive use, and domestic violence. Although there are many known benefits of women's sexual autonomy on various reproductive and sexual health issues, national-scale research in Indonesia on the distribution of women's sexual autonomy and what are the components of the sexual autonomy index has not been conducted. This study aims to determine the index of women's sexual autonomy and its composite factors. The research was a quantitative study using secondary data from the 2017 Indonesian Demographic and Health Survey (IDHS) with a cross sectional approach. The population in this study were women in union (married/cohabiting) aged 15 - 49 years in Indonesia, while the sample was women in union who were respondents in the 2017 IDHS who had complete data totalling 28,673 respondents from 34 provinces in Indonesia. We used Principal Component Analysis (PCA) to determine the sexual autonomy index and frequency distribution to see the proportion of each composite factors. The results showed that there were 2 components and 4 factors identified with an initial eigenvalue of 0.5974 which means that the amount of variance that can be explained by the new components formed is 59.794% while the rest is explained by other components that are not studied. Conclusion: PCA test results showed that there were 2 components which are a summary of the 4 variables analyzed. Further research is needed on other independent variables that affect women's sexual autonomy and its correlation to sexual health and reproductions outcomes.

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Introduction

Sexually Transmitted Infection (STI) is a disease caused by infection from bacteria, viruses, or other microorganisms that are transmitted from one person to another through blood, semen, vaginal fluids, or other body fluids through oral, anal, or genital sexual intercourse (National Cancer Institute, 2011). Quoting from WHO (WHO, 2022a) nearly one million pregnant women were infected with *syphilis* in 2016 which caused 200,000 pregnancy disorders including neonatal deaths and stillbirth. HPV infection causes cervical cancer of which an estimated 570,000 new cases occurred in 2018, and 311,000 deaths from cervical cancer

each year. Hepatitis B caused 820,000 deaths in 2019, most of which led to cirrhosis and *hepatocellular* cancer. *Gonorrhoea* and chlamydia are the main causes of *pelvic inflammatory disease* (PID) and infertility in women. Research (Fu et al., 2022) shows that from 1990 to 2019 the incidence of the top 5 STI diseases (syphilis, chlamydia, gonococcal, thricomoniasis, and genital herpes) experienced a significant increase of 58.15%. From the same data, it can be seen that the majority of sufferers are aged 30-34 years. Based on the highest incidence of STIs in 2019, Indonesia is third after China and India.

One of the strategic directions to overcome the problem of STIs has been prepared by WHO (WHO, 2022b) with the aim that the incidence of STIs can be reduced by 90% by 2030. The direction of the strategy consists of 5 aspects, namely: delivering high-quality, evidence-based, and community-centered services; optimization of systems, sectors, and cooperation for impact; based on data in determining decisions in action; increase community and civil society empowerment; and drive innovation for impact. In accordance with the direction of strategy number 4 on increasing community empowerment, women and adolescent girls groups are one of the concerns of WHO. This is because they have a high risk related to gender inequality and violence issues, and are vulnerable to sexual biological risks, one of which is STIs.

Sexual autonomy refers to women's role in decision-making related to when, with whom, and how sexual relations are performed as well as the ability of these women to negotiate safer sex (Adu et al., 2023; Crissman et al., 2012; Viswan et al., 2017). This includes the ability to refuse to have sex and ask couples to use condoms before sex (Memiah et al., 2019). Lack or absence of sexual autonomy increases the risk of reproductive and sexual losses such as STIs (Adu et al., 2022; Osuafor & Mturi, 2014; Willie et al., 2018), unwanted pregnancy, violence, and sexual coercion (Memiah et al., 2019; Montgomery et al., 2008). Therefore, more research is needed to understand women's sexual autonomy using several approaches.

Previous research on sexual autonomy has been conducted in several countries. Most of these studies link sexual autonomy as an independent variable to various women's reproductive and sexual health issues such as HIV infection (Ogbodo, 2023), cervical cancer screening (Midaksa et al., 2022; Tiruneh et al., 2017), parity (Adu et al., 2023), contraceptive use (Viswan et al., 2017), domestic violence (Aboagye et al., 2022; Ibitoye &; Ajagunna, 2021), neonatal and infant mortality (Memiah et al., 2019), and fertility (Forty et al., 2022). As far as the knowledge of researchers, Indonesia has only one national-scale study focusing on the relationship between women's empowerment, individual factors, and partner factors (sociodemographics) with the ability to negotiate safer sex (Putra et al., 2021). Although there are many known benefits of women's sexual autonomy on various reproductive and sexual health issues, national-scale research in Indonesia on the distribution of women's sexual autonomy and what are the components of the sexual autonomy index has not been conducted. Based on this, we wanted to know what are the factors of the women's sexual autonomy and how their distribution in Indonesia using IDHS data in 2017.

Methods

Data, Population, and Samples

This study used an analytical observational design with a *cross sectional* approach. The data used is secondary data from the 2017 Indonesian Health Demographic Survey (IDHS). IDHS is one of the 5-year, national-scale and representative routine surveys organized by BKKBN, BPS, Ministry of Health in collaboration with USAID and ICF International. Data was collected from 34 provinces from July – September 2017. The sampling technique in this survey was *multistage random sampling* using 1970 census blocks covering 49,250 households.

The population in this study was women age aged 15-49 years married/living together (in union) who were respondents to the 2017 IDHS amounting to 34,086, while the sample used was respondents to the 2017 IDHS women in union aged 15-49 years who had complete data of 23,294 respondents.

Research Variables

The variable studied was the female sexual autonomy index measured using 4 factors that had "yes" and "no" answer choices, while for respondents who answered "don't know" elimination was carried out. The selection of these variable factors refers to previous research on women's sexual autonomy (Aboagye et al., 2022; Jesmin & Cready, 2016; Memiah et al., 2019; Midaksa et al., 2022; Solanke et al., 2022). The constituent factors of women's sexual autonomy variables were tested for construct validity *using Principal Component Analysis* (PCA), while to see their reliability using *Cronbach's Alpha* value. This is done because sexual autonomy is a composite variable of several factors. The four factors in question are:

a. If you do not want sexual intercourse, could you say no to husband/partner
b. Can you ask your husband/partner to use condom
c. Reason for not having sex: husband has STI

d. Reason for not having sex: husband has other women

Principal Component Analysis (PCA)

Principal Component Analysis in factor analysis basically aims to simplify the observed variables by reducing their dimensions. This is done by eliminating the correlation between independent variables through the transformation of the original independent variable to a new variable that is not correlated at all or commonly called the principal component. The PCA result component will be a new independent variable free from multicollinearity (Purba, Mardaus, 2021). The main difference between PCA and other factor analysis techniques is that PCA will try to explain the variation in correlation between variables to the maximum in its first component (Ariawan, 2006).

Results

Table 1.
Descriptive Factors of Women's Sexual Autonomy

Variabel	Jumlah	
	N	%
If you do not want sexual intercourse, could you say no to husband/partner		
No	8899	38.2
Yes	14395	61.8
Can you ask your husband/partner to use condom		
No	16758	71.9
Yes	6536	28.1
Reason for not having sex: husband has STI		
No	2531	10.9
Yes	20763	89.1
Reason for not having sex: husband has other women		
No	3413	14.7
Yes	19881	85.3
Total	23294	100

Whether or not factor analysis is feasible can be done by looking at Kaiser-Meyer-Olkin's (KMO) measure of adequacy and Bartlett's Test of Spericity. If the KMO value ranges from 0.5 to 1, then factor analysis is feasible. In the other hand, if the KMO value is below 0.5 then factor analysis is not feasible. From table 1 below it can be seen that the KMO value is 0.531, so factor analysis is feasible. The KMO test is used to see if there is multicollinearity among the variables to be tested.

Bartlett's Test is a statistical test to test whether the independent variables involved are correlated. Factor analysis can be performed if the value of Bartlett's test of Sphericity has a significance value of < 0.05. In Table 2 below it can be seen that the Chi-Square value is 2200.833, with a free degree of 6, and a p-value (sig) of 0.000. Because the p-value (0.000) < 0.05, it can be concluded that there is a correlation between the independent variables tested

Table 2.
KMO and Bartlett's Test from 4 Factors of Women's Sexual Autonomy

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.531
Bartlett's Test of Sphericity	Approx. Chi-Square	2200.833
	df	6
	Sig	0.000

Table 3.
Anti Image Matrices From 4 Factors of Women's Sexual Autonomy

Anti-image Matrices

		If you do not want sexual intercourse, could you say no to husband/partner	Can you ask your husband/partner to use condom	Reason for not having sex: husband has STI	Reason for not having sex: husband has other women
Anti-image Covariance	If you do not want sexual intercourse, could you say no to husband/partner	.963	-.171	.004	-.058
	Can you ask your husband/partner to use condom	-.171	.955	-.094	-.028
	Reason for not having sex: husband has STI	.004	-.094	.949	-.190
	Reason for not having sex: husband has other women	-.058	-.028	-.190	.953
Anti-image Correlation	If you do not want sexual intercourse, could you say no to husband/partner	**.524**[a]	-.179	.004	-.061
	Can you ask your husband/partner to use condom	-.179	**.537**[a]	-.099	-.030
	Reason for not having sex: husband has STI	.004	-.099	**.525**[a]	-.199
	Reason for not having sex: husband has other women	-.061	-.030	-.199	**.535**[a]

a. Measures of Sampling Adequacy(MSA)

In addition to KMO and Bartlett'S Test values, factor analysis can be continued or not seen from the Measure of Sampling Adequacy (MSA) value. In table 3 above, it can be seen that the correlation number is marked a (diagonal direction from top left to bottom right). Numbers range from 0 to 1, with the following criteria:

1. MSA = 1, the variable can be predicted without error by other variables.
2. MSA > 0.5, variables can still be predicted and can be analyzed further.
3. MSA < 0.5, variables cannot be predicted and cannot be analyzed further, or excluded from other variables.

By looking at the MSA number criteria above, all MSA numbers have values above 0.5 which means, factor analysis can continue.

Table 4.
Communalities From 4 Factors of Women's Sexual Autonomy

Communalities

		Initial	Extraction
a.	If you do not want sexual intercourse, could you say no to husband/partner	1.000	.631
b.	Can you ask your husband/partner to use condom	1.000	.565
c.	Reason for not having sex: husband has STI	1.000	.613
d.	Reason for not having sex: husband has other women	1.000	.582

Extraction Method: Principal Component Analysis.

Communalities indicate how much variance can be explained by the factors extracted (factors formed). The variable a is magnitude 0.631. This means that about 63.1% of the variance of variable a can

be explained by the factors formed. Variable b is 0.565, this means that 56.5% of the variance of variable b can be explained by the factors formed. Likewise for other variables. An extraction value of > 0.50 indicates that all factors can explain the variables of female sexual autonomy. The greater the value of communalities means the stronger the relationship with the factors formed.

Table 5.
Total Variance Explained

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
a	1.332	33.290	33.290	1.332	33.290	33.290	1.209	30.225	30.225
b	1.060	26.504	59.794	1.060	26.504	59.794	1.183	29.569	59.794
c	.850	21.255	81.048						
d	.758	18.952	100.000						
Extraction Method: Principal Component Analysis.									

If there are 4 factors involved, then there will be 4 factors (also called components) proposed in the factor analysis. Each factor represents the variables analyzed. The ability of each factor to represent the analyzed variables is indicated by the magnitude of the variance described, called the eigenvalue. The variance in question is the variance of variables that have been standardized. With standardization, the average value of each variable becomes zero and its variance becomes one. Since the variance of each variable is one, then the total variance is 4 because in this case there are 4 independent variables. Eigenvalues indicate the relative importance of each factor in calculating the variance of the three variables analyzed. The arrangement of eigenvalues is always sorted from largest to smallest, with the criterion that the number of eigenvalues below 1 is not used in calculating the number of factors formed. From table 4 above it can be seen that there are 2 factors formed (factor 1 and factor 2), because of two factors, the number of eigenvalues has a value above 1. As for the other 2 factors, the eigenvalues number is below 1. From the initial eigenvalues column in the cumulative sub-column, it can be seen that the reduction of 4 variables to 2 factors can explain 33.290% of variances, while the division of 2 factors explains 59.794% of variances. It can also be said that the magnitude of variance that can be explained by the new factor formed is 59.794% while the rest is explained by other factors that are not studied.

If the Total Variance Table (Table 5) explains the basis for the number of factors obtained by calculating numbers, the Scree Plot shows this with a graph like figure 1:

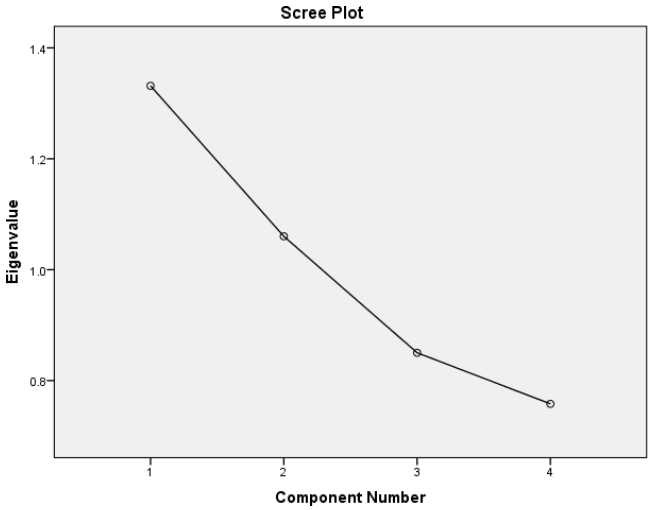

Figure 1. Scree Plot

Table 6.
Total Variance Explained

Component Matrix[a]			
		Component	
		1	2
a.	If you do not want sexual intercourse, could you say no to husband/partner	.506	.612
b.	Can you ask your husband/partner to use condom	.593	.462
c.	Reason for not having sex: husband has STI	.607	-.494
d.	Reason for not having sex: husband has other women	.596	-.477
Extraction Method: Principal Component Analysis.			
a. 2 components extracted.			

Table 6 contains factor loading (correlation values) between the analysis variables and the factors formed. Based on the table above, it can be seen that there are 2 factors formed from 4 variables. This shows that two factors are the most optimal number to reduce the 4 independent variables.

Table 7.
Total Variance Explained

Rotated Component Matrix[a]			
		Component	
		1	2
a.	If you do not want sexual intercourse, could you say no to husband/partner	-.037	**.794**
b.	Can you ask your husband/partner to use condom	.128	**.741**
c.	Reason for not having sex: husband has STI	**.782**	.042
d.	Reason for not having sex: husband has other women	**.762**	.048
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.[a]			
a. Rotation converged in 3 iterations.			

Table 7 above shows the number of factors that appear as well as the correlation between items and factors. We know that there are 2 factors that arise, namely component 1 and component 2. In the lines of items "a" and "b", it can be seen that the item has a large correlation with component 2 compared to component 1 so that item a is included in component 2. So it can be seen that items "c" and "d" enter component 1 and items a and b enter component 2.

Table 8.
Total Variance Explained

Component Transformation Matrix		
Component	1	2
1	.740	.672
2	-.672	.740
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.		

Table 8 shows that in component 1 the correlation value is 0.740 and component 2 the value is 0.740. Since it is more than 0.50, these two factors can be concluded to be worthy of summarizing the four items analyzed

Discussion

Autonomy in the current context implies the right to refuse sexual contact and the right to seek it from a willing partner. Specifically, this has implications for bodily integrity, internal capacity for moderately mature and rational choices and external freedom from impermissible pressures and constraints (Berger, 2001). Human rights in sexual and reproductive health are central to health, well-being, and development in human life. The aggregate gains in sexual and reproductive health and rights over the past two decades have been widely researched. However, stark gaps remain across and within regions, with many countries showing progress among households in the top wealth quintile, while progress remains flat or marginal among poorer households. It highlights the inequalities inherent in development models that continue to leave many behind and underscores the nearly impossible to realize health for all and universal access to sexual and reproductive rights without sustained attention to strengthening the reach, completeness, and quality of health systems (ICPD, 2014). WHO defines sexual autonomy as the ability and control to make decisions regarding one's sexual life related to the individual's personality and social ethics (WHO, 2015). In the context of public health, sexual autonomy becomes a concept related to law and ethics within the scope of human rights issues (Willie et al., 2023).

This study produced 4 variables that can be used as an index of sexual autonomy. Variable items a (refusing a partner to have sexual intercourse) and b (asking the husband/partner to use a condom) correlate with women's sexual autonomy. This supports research by (Willie et al., 2023) which states that asking partners to wear condoms and refuse to have sex is one factor of sexual assertiveness. Research from Korea also shows the same thing that the question of whether it can refuse to have sexual intercourse is an factor of the measurement of sexual autonomy in college students with a correlation value of 0.695 (Chang, 2002).

The use of condoms is one way to prevent sexually transmitted infections including HIV / AIDS. Research shows that women who lack sexual autonomy will be more susceptible to STIs than women who have higher sexual autonomy (Adu et al., 2022). However, the study found that most women (71.9%) were unable to ask their partners or husbands to use condoms. This can happen due to stigma about HIV and condoms where some people assume that if a man has a condom it is assumed to be a customer of sex workers and if a woman has a condom she will be considered a sex worker, naughty woman and porn (Dewi et al., 2019). Of course, this stigma is not the only reason women cannot ask their partners to use condoms. Research from 2 countries in Africa states that women's ability to refuse to have sex and ask their partners to wear condoms is influenced by many factors such as education level, faith / religion, family economic level, attitudes towards wife beating, and knowledge about HIV transmission (Feyisetan &; Oyediran, 2020).

Research Limitations

The study was limited to variables available in the DHS data set for analysis. The 2017 data may be old, but this data is the last IDHS data in Indonesia. The *cross-sectional* nature of the data limits the causal relationship between individual characteristics and sexual autonomy. In addition, DHS data collection is carried out by means of interviews and sexual questions are considered quite sensitive. This can allow respondents to feel embarrassed in answering questions according to actual conditions. Despite these limitations, this study is one of the few that provides an empirical study about sexual autonomy among women in Indonesia.

Conclusion

From the results of the PCA test, 2 factors are a summary of the 4 factors analyzed, namely: 1. Factors (Component 1): variables c and d, and 2. Factors (component 2): a and b. The positive correlation shown by each variable shows that the higher the value of these variables, the greater the value of the female sexual autonomy index. Further research is needed on other independent variables that affect women's sexual autonomy and its correlation to sexual health/reproduction health

Patents

Not applicable.

Author Contributions

Conceptualization, P.L. and B; methodology, P.L and B; Performed data analysis, P.L; resources, P.L; data curation, P.L; writing—original draft preparation, P.L ; writing—review and editing, P.L and B; supervision, B. All authors have read and agreed to the published version of the manuscript

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Institutional Review Board Statement

The DHS reports that ethical clearances were obtained from ICF Institutional Review Board (IRB). A well as the Ethics Boards of partner organisations of the various countries such as the Ministries of Health. The DHS follows the standards for ensuring the protection of respondents' privacy. Since this was a secondary analysis, no further ethical approval was required because the datasets are available for download in the public domain on the following website : www.dhsprogram.com. The authors sought permission to use the data and authorization was granted by MEASURE DHS to download and analyse the Indonesian women's data set.

Conflicts of Interest:

The authors declare no conflict of interest.

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