

Social Exchange Theory: The Transactional Nature of the Quandary Situation Between Poverty and Adolescents' Sexual Behavior

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ABSTRACT

The paper examines the transactional nature of most adolescents' sexual activities. It affirms that directly or otherwise, adolescents do not just get involved in sexual relationships but are motivated to do so because of financial gain which is supported by the social exchange theory of human social behavior. A total of 768 copies of questionnaire were used to elicit data on adolescents' living conditions and patterns of sexual activities. The SPSS package was used to analyze the data. Variables were cross-tabulated to test for the significance of adolescents' sexual behavior as necessitated by poor conditions of living. The P-values ranging from 0.00 to 0.02 reveals highly significant association between tested variables. The results therefore show high association between the many faces of poverty and adolescents' transactional sexual relationships.

(Keywords: adolescents, poverty, sexual behavior, social exchange, teenagers)

INTRODUCTION

It is difficult to separate adolescents' early sexual debut from poverty because early sexual involvement for monetary gain remains plausible especially among adolescent girls. Findings from past research validate an uncompromising relationship between poor backgrounds and adolescents' sexual matters (Adebola and Adebola, 2015).

Transactional sex as defined by Ranganathan, Heise, Pethfor, Silverwood, Selin, Macphail, Delany-Moretwe, Kahn, Gomez-Olive, Xavier, Hughes, Piwowar-Manning, Laeyendecker and Watts (2016) is non-marital sexual relationship where men and women exchange sex for, or in

anticipation of material possessions or favors (such as money, clothing, transportation, and school fees). It is a common practice in sub-Saharan Africa because of the level of poverty (Longwe, 2015; Eze, 2010; and Okigbo, McCarraher, Chen and Pack, 2014).

Poverty as defined by Olowa (2012) is the lack of access to basic needs/goods which may include but are not limited to adequate food, shelter, education, and health care. According to statistics, the incidence of poverty has greatly increased in Nigeria since 1980 (NBS, 2012). The Nigerian population that were classified as "extremely poor" over the last three decades has consistently increased and are strongest among the most vulnerable group. Poverty has greatly impacted Nigerian youth, children, and mothers much more than the adult male population (Action Aids Nigeria, 2015).

Due to poor conditions of living, parents according to research, put pressure on their daughters to engage in transactional sex with older well-off men in order to meet the needs of the family (Formson and Hilhorst, 2016). Accordingly, Abu and Akerele (2016), opined that some parents also encourage their teens into early sexual intercourse and prostitution, unknowingly, by neglecting their responsibilities towards them. Research has also demonstrated poor living conditions as an integral factor in adolescents' sexual behavior especially in Sub-Saharan Africa (Esiet, 2010 and Luke, Goldberg, Mberu, and Zulu 2011).

Poverty is known to be the key determinant of transactional sexual relationships in many African contexts and young women in Sub-Saharan Africa settings usually engage in transactional sexual relationships with older and richer men for economic reasons (Longwe, 2015). As

enunciated by the Innocenti Digests (2001) a publication of UNICEF, poverty is one of the major factors underpinning early marriage. Accordingly, the report also stated that in Nigeria because of economic difficulties and political instability, age at first marriage is barely raised and the economic hardship is encouraging a rise in early marriage, even among population groups that do not normally practice such.

Adolescents who have parents but live in poverty engage in transactional sex because of the problem they face. They copy their friends whom they see engage in sex for money to make ends meet while some are practically pressured into it by those friends (Juma, Alaii, Bartholomew, Askew and Van den Born, 2013 and Formson and Hihhorst, 2016). Aji, Aji, Ifeadike, Emelumadu, Ubajaka, Nwabueze, Enebene, and Azuike (2013) reported from their findings that adolescents with low parental income were more sexually active than those who reported high or medium parental income. This is consistent with arguments and reports by researchers like Okigbo, McCarragher, Chen and Pack (2014) who attested from their research work that economic hardship encourages girls to become sexually active at an early age for economic reasons. The perceived or real rewards, both financial and material, are also major enticements to engaging in early sex.

Overwhelming poverty predisposes adolescents to high-risk behaviors and push parents to marry off girls. NDHS (2014) affirmed that teenagers in the lowest wealth quintile are more than twice as likely to have started childbearing as those in the middle wealth quintile (43% and 21%, respectively) and almost 10 times as likely as those in the highest quintile. Adolescents are involved in sexual activities with older sexual partners for financial benefits and gifts items. Erulkar and Bello (2007) asserted that married adolescents come from poorer families and have lower level of education compared to the girls who marry after adolescence.

Another point noted by these scholars is that of wide age difference usually between the adolescent bride and her supposed spouse. This extremely wide age gap results in adolescent brides not having power in decision making of any kind including when to have sex, access to safer sex, child spacing, etc.

Abu and Akerele (2006) in their research study in Ibadan affirmed that married parents subject their adolescent children, especially the females, to child labor and make them hawk in market places, streets, and motor parks. In so doing, they expose these adolescents to sexual harassments from older males.

In the same vein, Odimegwu and Adedini (2013) posited that poverty encourages early and risky sexual behaviors as youth engage in such in order to earn some income or to take care of their needs. It is extrapolated from their findings that most students engage in illicit sexual activities in order to get money to pay for their school fees and meet other pressing needs, which their parents or guardian cannot provide. In most cases, students from such poor backgrounds lack the power to negotiate for safer partners, therefore poverty is largely a predictor of risky sexual behaviors.

The above discussed scenario is further supported by Amoran and Fawole (2008) who posited that poverty, inability of parents to monitor their out of school adolescents and parents staying longer hours at work are responsible for adolescent sexual misbehavior. They also affirmed that adolescents from poor homes are likely to be engaged in street hawking and are more likely to live in neighborhoods that will negatively influence them.

According to Udigwe, Adogu, Nwabueze, Adinma, Ubajaka and Onwasigwe (2014) poverty is probably the underlying factor in most adolescents' risky sexual behavior. Poverty leads to lack of education which may reduce earning power and lack of parental monitoring and this may in turn lead to transactional sex and pursuit of multiple sexual partners. They also affirmed from past researches that the economic circumstances in many developing countries have made the transition of young people into healthy adults difficult and may explain why transactional sex is common among female adolescents from such countries.

Pascoe, Langhaug, Marvhu, Hargreaves, Jaffar and Hayes (2015) opined that socio-economic factors act as distal determinant of HIV prevalence because poorer women are often economically dependent on men. The poorer women may have little choice but to adopt behaviors that put them at risk of infection, including transactional and intergenerational sex,

earlier marriage and relationships that expose them to violence and abuse.

SOCIAL EXCHANGE THEORY

Social exchange theory according to Lawler (2001) is conceptualized as a joint activity of two or more actors in which each actor has something the other values. The implicit or explicit task in exchange is to generate benefits for each individual by exchanging behaviors or goods that actors cannot achieve alone. It may also be seen basically as providing an economic metaphor to social relationships.

According to Coleman (1990) and as further explained by Homans (1961), social exchange theory's fundamental principle is that humans in social situations choose behaviors that maximize their likelihood of meeting self-interests in those situations. In taking such a view of human social interactions, social exchange theory includes a number of key assumptions. First, social exchange theory operates on the assumption that individuals are generally rational and engage in calculations of costs and benefits in social exchange. In this respect, they exist as both rational actors and reactors in social exchanges.

Secondly, social exchange theory builds on the assumption that those engaged in interactions are rationally seeking to maximize the profits or benefits to be gained from those situations, especially in terms of meeting basic individual needs. In this respect, social exchange theory assumes that social exchange between or among two or more individuals are efforts by participants to fulfil basic needs.

Thirdly, exchange processes that produce pay-offs or rewards for individuals leads to patterning of social interactions. These patterns of social interaction not only serve individuals' needs but also constrain individuals in how they may ultimately seek to meet those needs. Individuals may seek relationships and interactions that promote their needs but are also the recipients of behaviors from others that are motivated by their desires to meet their own needs.

Social exchange theory is a widely used theoretical perspective that is particularly relevant in understanding sexuality as it is negotiated between two people who have a relationship with each other (Sprencher, 1998).

According to Baumeister and Vohs (2004), a heterosexual community can be analyzed as a market place in which men seek to acquire sex from women by offering other resources in exchange. Negotiation is inevitable because each partner's needs are not identical.

Luke, Golberg, Mberu, and Zulu (2011) opined that transactional sex or the exchange of money and gifts for sexual activities within non-marital relationships has been widely considered a contributing factor to the disproportionate prevalence of HIV/AIDs among young women in Sub-Saharan Africa.

Hunter (2002) argued that three factors collectively lead to transactional sex. The first is the privileged economic position of men; second is the masculine discourses that place a high value on men of having multiple sexual partners while the third by contrast relates to how women themselves engage in transactional sex in order to access power and resources in ways that can both challenge and reproduce patriarchal structures.

MATERIALS AND METHODS

The participants in this study were all secondary school adolescents (n= 768). The sample was 46.6% male and 53.4% female. Participants were between age 10 and 21 years (M=15). 51% of adolescent girls have started menstruation and the median age at first menarche is 14 years while the median age at first sexual intercourse is 15 years. Ten co-educational government schools were selected from five local government areas in Kogi State, Nigeria. Two schools were selected from each of the LGA as represented in Table 1.

The total sample size is determined using table for determining Minimum returned Sample Size for a given population size for Continuous and Categorical data as developed by Barlett, Kotrlik, and Higgins (2001).

Using the margin of error of 0.3 (precision level) at alpha level of 0.05, the number of respondents in each of the school are shown in Table 1.

Table 1: The Research Area by LGA, Selected Communities and Schools.

Local Govt. Area	Community	Schools Secondary	Population	No of Respondents
Kabba\Bunu	Kabba Okebukun	St. Barnabas Sec. School	500	98
		Okebukun Comm. Sec. School	200	78
Ijumu	Iyara Okoro	Iyara Comm. Sec. School	200	78
		Okoro-Gbede High School	200	78
Mopa-Muro	Mopa Illai	ECWA Sec. School Mopa	350	92
		Illai Comm. Sec. School	70	39
Yagba West	Egbe Odo-Eri	Titcombe College	350	92
		Odo Ara Comm. Sec. School	160	68
Yagba East	Isanlu Ejuku	Govt Day Sec. School	320	88
		Community High School	160	70

Source: Researcher's Survey, 2017

Participants were randomly chosen across all classes of secondary school to ensure a proper coverage of all age group. They were then presented with copies of the questionnaire which was divided into four parts. Part A was demographic questions on age, sex, parents' status, religion, class, etc. Section B was questions relating to onset of puberty/menarche and biological transition as experienced and when. This led to part C which bothered on the nature of adolescents' sexual behavior and it causes and part D focused on the consequences/outcome of such behavior.

RESULTS

The 2 by 2 contingency table was used to determine the association between the different needs of adolescents and their engagement in transactional sex to meet those needs.

Table 2 shows the cross tabulation testing the association between number of children and adolescents' engagement in sex because of money or gifts.

The P-value, 0.022 ($\chi^2 = 9.649, df = 3$), which is less than 0.05 and very significant, allows us to reject the hypothesis of no difference (Ho). This implies that there is a strong association between numbers of children in adolescents' family and their engagement in sex for money or gift. This is very symbolic in a poverty-stricken society like Nigeria as verified by earlier research work in different communities in Nigeria. Earlier research works have attested to this situation. For example, Adebola and Adebola (2015) reported an

uncompromising relationship between poverty in the family and adolescents' sexual behavior.

In Table 3, there is confirmation that a strong association exists between adolescents' challenge of not been able to pay school fees and having multiple sexual partners.

The P-value, 0.01 ($\chi^2 = 10.439, df = 1$), which is also less than 0.05 and very highly significant, allows us to reject the null hypothesis indicating a strong association between the 2 variables. The result here is in consonance with scholars like Udigwe, et al. (2014) and Odimegwu and Adedini (2013) who all asserted from their findings that adolescents engaged in transactional sexual relationship in which they are most times subordinates because they use such money to fend for themselves, other family members also pay their school fees.

While reporting on their findings, Pascoe, et al. (2015) posited that young women, who find themselves in such predicament as this, may have little or no power in decision making so they incur greatly the risk of HIV and other sexually transmitted infections.

There is an association between who trains an adolescent and their sexual behavior as shown in Table 4. Adolescents' tutelage was therefore associated with their engagement in sex for money/gift.

The P-value, 0.000 ($\chi^2 = 25.612, df = 5$), which is less than 0.05 and very highly significant, allows a rejection of the null hypothesis (Ho).

Table 2: Number of Children in the Family and Engagement in Sex for Money/Gifts.

No of Children in Adolescents' Family	Engagement in Sex for Money/Gifts		
	Yes	No	Total
1-3	29	188	217
4-5	41	265	306
6-7	12	181	193
8 & above	10	42	52
Total	92	676	768

Source: Researcher's Survey, 2017

Table 3: Adolescents' Lack of School Fees and Multiple Sexual Partners.

Adolescents' Lack of School Fees	Multiple Sex Partners		
	No	Yes	Total
No	371	34	405
Yes	305	58	363
Total	675	92	768

Source: Researcher's Survey, 2017

Table 4: Tutelage and Engagement in Sex for Money/Gifts.

Tutelage	Engagement in Sex for Money/Gifts		
	Yes	No	Total
Both Parents	439	36	475
Father only	50	16	66
Mother only	128	29	157
Guardian	47	9	56
Self	12	2	14
Total	676	92	768

Source: Researcher's Survey, 2017

This implies that there is a strong association between who trains an adolescent and their involvement in sex for money. Many adolescents engage in sex for monetary gain or gifts because whoever is training them does not have enough provision to cater for their personal needs. Abu & Akerele (2006) pointed out that some parents encourage their teens into early sexual intercourse by neglecting their responsibility towards them.

Table 5 is a cross tabulation of adolescents' engagement in sex for money against living in poor unhealthy environment.

The P-value, 0.000 ($\chi^2 = 15.090, df = 1$), is less than 0.05 and therefore allows us to reject the null hypothesis which shows that it is highly

significant. This is corroborated also by past researches. Adolescents who live in unhealthy environment are easily prone to early sexual activities as they desire to live a better life of luxury and comfort. This may push them to early marriage as noted by the research work of Pascoe et al (2015).

Amoran and Fawole (2008) also affirmed that unhealthy environment also harbor neighbors that can negatively influence adolescents in the same neighborhood. Parents from such environment are not usually in control of such children because they are too poor to fend for them. Such poor environment may also affect adolescents' general wellbeing (Sverduk, 2011).

Table 5: Adolescent Poor Environment and Engagement in Sex for Money/Gifts

Living in Poor/Unhealthy Environment	Engagement in Sex for Money/Gift		
	No	Yes	Total
No	306	22	328
Yes	370	70	440
Total	676	92	768

Source: Researcher's Survey, 2017

Table 6: Adolescents' Exposure to Hawking and Multiple Sexual Partners.

Exposure to Hawking and Child Labor	Multiple Sexual Partners		
	No	Yes	Total
No	305	23	328
Yes	371	69	440
Total	676	92	768

Source: Researcher's Survey, 2017

Table 6 shows the cross tabulation of respondents' exposure to the hawking as a girl child having more than one partner.

The P-value, 0.000 ($\chi^2 = 13.395, df = 1$), which is less than 0.05 is very highly significant and therefore allows us to reject the null hypothesis that there is no difference and to accept the alternative hypothesis which agrees that there is an association between adolescents' exposure to the hawking activities and adolescents having more than one sexual partner. It is pathetic in Nigeria today that many families cannot adequately provide for their wards without the children/adolescents contributing their own quota.

A major way that parents have adopted over the years is for young adolescents to be involved in child labor by hawking. While hawking may attract more income to the family as expected, it has grave consequences for such hawking adolescent one of which is introducing them to early sexual debut especially by older men who may use the opportunity to trap innocent girls.

As opined by Abu and Akerele (2006), it is common for poor parents to subject their adolescent children to hawking, especially female ones, which exposes them to sexual harassments from older males and make them become promiscuous if they continue like that. In the same vein, Amoran and Fawole (2008) explains that

children from poor homes are likely to be street hawkers which expose them to early risky sexual behavior.

DISCUSSION AND CONCLUSION

Principally, this work reveals adolescents' involvement in transactional sex in order for them to meet financial needs. The findings are in line with earlier research work that validated the possible reasons for adolescents' engagement in transactional sex. The tested association between variables reveal that higher number of children which results in economic hardship, lack of school fees, poor living environments and hawking are factors in transactional sex.

The need for survival or consumption, material/monetary gain is important reasons for an engagement in transactional sex (Formson and Hilhorst, 2016). Adolescents are also pressured into transactional sex by family members and peers (Okigbo, McCarranher, Chen and Pack, 2014). There are earlier studies in Africa that shows young women exchange sex to get funds to cover education related expenses (Chatterji, Murray, London, and Anglewicz, 2004).

In conclusion, this work as compared to earlier research validates the persistent nature of

transactional sex among adolescents in Africa and Nigeria in particular because of poverty. It is obvious that if changing adolescents' sexual behavior will improve their health and boost the nation's economy, then the economic life of the people must be improved.

REFERENCES

1. Abu, P.B and E.O. Akerele. 2006. "Parental Influence on Adolescents Sexual Behaviour in Ibadan North Local Government Area of Oyo State, Nigeria". *International Journal of African & African American Studies*. V 1.
2. Action Aids Nigeria. 2015. "Corruption and Poverty in Nigeria". www.action.org.nigeria ISSN: 978-978-173-8.
3. Adebola, O.G and F.B. Adebola. 2015. "Family Characteristics: Indices of Adolescents' Sexual Behaviour". *International Journal of Science and Technology*. 6(2): 9-18. DOI: 10.5897/IJSTER2015.0277
4. Adebola, O.G 2014. "Determinants of Adolescents' Sexual Behaviour, Sexual Health and Impact of School-Based Sexuality Education among Okun-Yoruba of Kogi State". (Unpublished doctoral dissertation). Kogi State University: Anyigba, Nigeria.
5. Aji, J, M.O. Aji, C.O. Ifeadike, O.F. Emelumadu, C. Ubajaka, S.A. Nwabueze, U.E. Ebenebe, and E.C. Azuike. 2013. "Adolescent Sexual Behavior and Practices in Nigeria: A Twelve Year Review". *Afrimedical Journal*. 4(1), Jan – June, 2013.
6. Amoran, O.E and O. Fawole. 2008. "Parental Influence on Reproductive Health Behaviour of Youth in Ibadan, Nigeria". *African Journal of Medical Sciences*. 37(2).
7. Bartlett, J.E, J.W. Kotrlik, and C.C. Higgin. 2001. "Organizational Research: Determining Appropriate Sample Size in Survey Research". *Information Technology, Learning and Performance Journal*. 19(1).
8. Baumeister, R.F. and K.D. Vohs. 2004. "Sexual Economics: Sex as Female Resource for Social Exchange in Heterosexual Interactions". *Personality and Social Psychology Review*. 8(4): 339-363.
9. Chatterji, N. Murray, D. London, and P. Anglewicz. 2004. "The Factors Influencing Transactional Sex Among Young Men and Women in 12 Sub-Saharan African Countries". *Policy*.
10. Coleman, J.S. 1990. *Foundations of Social Theory*. Harvard University Press: Cambridge, MA.
11. Ekefre, E.N., S.A. Ekanem, and E.O. Ekpenyong. 2014. "Teenage Pregnancy and Education in Nigeria: A Philo-Sociological Management Strategy". *Journal of Educational and Social Research*. 4(3), May 2014.
12. Erulkar, A.S. and M. Bello. 2007. "The Experience of Married Adolescent Girls in Northern Nigeria". The Population Council Inc.
13. Ezeh, V.U. 2010. "Role of Poverty, Gender & Perception of HIV/AIDs on Students' Sexual Behaviour". (Unpublished Master's dissertation). University of Nigeria: Nsukka, Nigeria.
14. Formson, C. and D. Hilhorst. 2016. "The Many Faces of Transactional Sex: Women's Agency, Livelihoods and Risk Factors in Humanitarian Contexts: A Literature Review". Secure Livelihoods Research Consortium (SLRC): London, UK. www.securelivelihoods.org Working Paper 41.
15. Homans, G. 1961. *Social Behaviour: Its Elementary Forms*. Harcourt Brace Javanorich: Orlando, FL.
16. Hunter, M. 2002. "The Materiality of Everyday Sex: Thinking beyond 'Prostitution'". *African Studies*. 61(1): 99-120.
17. Juma, M., J. Alaii, L.K. Bartholomew, I. Askew, and B. Van den Born. 2013. "Understanding Orphan and non-Orphan Adolescents' Sexual Risks in the Context of Poverty: A Qualitative Study in Nyanza Province, Kenya". *BMC International Health and Human Rights*. 13(32). <http://www.biomedcentral.com/1472-698x/13/32>.
18. Lawler, E.J. 2001. "An Affect Theory of Social Exchange". {Electric Version} *American Journal of Sociology*. 107(2): 321-352.
19. Longwe, M.B. 2015. "The Extent and Risk Factors for Transactional Sex Among Young People in Urban Informal Settlements in Blantyre, Malawi". (Unpublished Master's Dissertation) University of the Witwatersrand: Johannesburg, South Africa.
20. Luke, N., R.E. Goldberg, B.U. Mberu, and E.M. Zulu. 2011. "Social Exchange and Sexual Behaviour in Young Women's Premarital Relationships in Kenya". *J. Marriage Fam*. 73(5): 1048-1064.
21. National Bureau of Statistics. 2012. "The Nigerian Poverty Profile 2010". Abuja, Nigeria.

22. National Population Commission (NPC) [Nigeria] and ICF International. 2014. "Nigeria Demographic and Health Survey 2013". NPC and ICF International: Abuja, Nigeria and Rockville, MD.
23. Odimegwu, C. and S.A. Adedini. 2013. "Do Family Structure and Poverty affect Sexual Risk Behaviours of Undergraduate Students in Nigeria?" *African Journal of Reproductive Health*. 17(4):137-149.
24. Okigbo, C.C., D.R. McCarragher, M. Chen, and A. Pack. 2014. "Risk Factors for Transactional Sex among Young Females in Post-Conflict Liberia". *African Journal of Reproductive Health*. 18(3):133-141.
25. Olowa, O.W. 2012. "Concept, Measurement and Causes of Poverty: Nigeria in Perspective". *American Journal of Economics*. 1(04): 25-36.
26. Pascoe, S.J.S, L.F. Langhaug, W. Mavhu, J. Hargreaves, S. Jaffar, R. Hayes, and F.M. Cowan. 2015. "Poverty, Food Insufficiency and HIV Infection and Sexual Behaviour among Young Rural Zimbabwean Women". 10(1). Doi: 10.1371/journal. Pone. 0115290
27. Ranganathan, M., L. Heise, A. Pethfor, R.L. Silverwood, A. Selin, C. Macphail, S. Delany-Morethoe, K. Kahn, F. Gomez-Olive, J.X. Hughes, J. Piwowar-Manning, O. Laeyendecker, and C. Watts. 2016. "Transactional Sex among Young Women in Rural South Africa: Prevalence, Mediators and Association with HIV Infection". *Journal of the International AIDS Society*. 2016. 19:20749. <http://www.jiasociety.org/index.php/jias/article/view/20749/http://dx>.
28. The Innocenti Digests. 2001. *Early Marriage: Child Spouses*. UNICEF: Florence, Italy.
29. Udigwe, I.B., P.O. Adogu, A.S. Nwabueze, E.D. Adinma, C.F Ubajaka, and C. Onwasigwe. 2014. "Factors Influencing Sexual Behaviour among Female Adolescents in Onitsha, Nigeria". *Open Journal of Obstetrics and Gynecology*. 04(16):8. 1D:51882.
30. Sprencher, S. 1998. "Social Exchange Theory and Sexuality". *The Journal of Sex Research*. 35(1):32-43.
31. Sverduk, A. 2011. "Ill-health and Poverty: A Literature Review on Health in Informal Settlement". International Institute for Environment and Development (IIED). 23(1):123-155.

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