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In sickness and health? Examining the co-occurrence and concordance of healthy lifestyle behaviours among spouses in Namibia

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ABSTRACT

Objectives: This study examines the extent to which healthy lifestyle behaviours co-occur in individuals. We also explore within-couples concordance in healthy lifestyle behaviours in Namibia.
Study design: Cross-sectional study.
Methods: We used data from 910 couples (1820 individuals) who were interviewed in the Namibia Demographic and Health Survey conducted in 2013. We assessed five different healthy lifestyle behaviours (alcohol non-consumption, non-cigarette smoking, healthy diet, physical exercise, and normal body mass index). An individual healthy lifestyle index (HLI) was derived by summing values across the five behaviours, with a binary indicator categorising each individual's lifestyle behaviour as 'healthy' (HLI $\geq$ 3) or 'unhealthy' (HLI < 3). Multivariate logistic regression models were fitted to explore the association between binary indicators of men's and their female partner's healthy lifestyles.
Results: About 48% of men and 57% of women had at least three co-occurring healthy lifestyle behaviours. A third of couples were concordant in reporting a healthy lifestyle (HLI $\geq$ 3), while 27% were concordant in reporting an unhealthy lifestyle (HLI < 3). In multivariate analysis, Namibian men were almost twice (aOR, 1.90; 95%CI, 1.43–2.52) as likely to have a healthy lifestyle if their female partner also had a healthy lifestyle, compared with those who had a female partner who had an unhealthy lifestyle, after adjusting for relevant individual, partner and household characteristics.
Conclusion: The observed co-occurrence of healthy lifestyle behaviours and spousal concordance suggests it may be beneficial to consider couples a target for intervention when aiming to promote healthy behaviours and reduce cardiovascular diseases in Namibia.

Introduction

Non-communicable diseases (NCDs) such as cardiovascular diseases (CVD), cancers, chronic respiratory diseases, and diabetes kill 41 million people annually, accounting for approximately 74% of global deaths.[1] In Sub-Saharan Africa, NCDs accounted for around 37% of deaths in 2019, rising from 24% in 2000.[2] Most NCDs result from a combination of genetic, physiological and environmental factors.[3] Lifestyle behaviours such as tobacco use, physical inactivity, unhealthy diet and the harmful use of alcohol have been found to co-occur in individuals, increasing the risk of NCDs.[3–8] In addition, multiple studies have shown a gender difference in the prevalence of lifestyle behaviours and CVD risk across the world, such that men have a significantly higher risk of developing CVD and are more likely to smoke, consume alcohol and eat unhealthy diets compared with women.[9,10]

Collaborative, multisectoral approaches could help identify and promote preventative interventions that reduce individual NCD risk and healthcare burden. Understanding the co-occurrence of modifiable behaviours may be more beneficial in improving overall health and well-being than targeting single risk factors alone, given evidence of a synergistic effect whereby combinations of health risk behaviours are more detrimental to health than their individual cumulative effects.[7] Studies have also indicated that understanding

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spousal concordance in modifiable behaviours offers a chance for behaviour change and subsequent NCD risk reduction.[11] Couples have been found to influence each other's health, with interventions targeting couples found to be potentially more effective than individual interventions alone when promoting and maintaining behavioural change.[11] Among retired Japanese couples, poor spousal self-rated health status was positively associated with poor individual self-rated health status.[12] There is also evidence of spousal concordance in cardiovascular health in Korea[13] and hypertension in the United States, China, England and India.[14] Similarly, there is a significant positive correlation in blood pressure, cholesterol levels and triglycerides among newly married couples in China.[15] In Namibia, having a partner with hypertension was positively associated with having hypertension among married Namibian adults, and hypertensive men and women were more likely to be in control of their hypertension if their partner also had controlled hypertension.[16]

Attempts to unravel pathways for spousal concordance in healthy lifestyle have suggested that assortative mating based on similar lifestyle risk factors at the time of union may partially explain the shared cardiovascular risk profile of newlyweds, with assortative mating theory referring to the idea that individuals are more likely to marry people who share similar characteristics (such as demographics, attitudes, and behaviours) than those who do not.[17] Other aspects of relationship dynamics (such as shared resources, social control and interdependence) may also potentially shape spousal concordance in healthy lifestyle behaviours over the course of the relationship.[17,18]

Despite increasing evidence of spousal concordance as an opportunity to promote healthy behaviours and reduce NCDs risk, limited data availability has hindered scholarship in Sub-Saharan Africa. To the best of our knowledge, the 2013 Namibian demographic and health survey is the only survey to have collected data on all five HLI components of interest in this study among couples in Sub-Saharan Africa. As a result, we focus on Namibia as a prism for understanding the co-occurrence and spousal concordance in healthy lifestyles primarily because the country has one of the highest rates of deaths attributable to CVDs. In 2017, Namibia's age-standardised total CVD death rate was 17.7%, compared with South Africa (16.1%) and Mozambique (11.6%).[19] The prevalence of obesity (BMI $\geq$ 30 kg/m^2) was also higher in Namibia (17%) compared with global figures (13%).[19] Namibia does not have a national health insurance scheme — the vast majority of the population is uninsured and relies on the public sector to provide health coverage.[20] Health care is also provided through the private sector from private medical aid funds; this type of coverage is unaffordable for the majority of the country's residents.[20]

The National Multisectoral Strategic Plan for Prevention and Control of Non-Communicable Diseases in Namibia, recognises the control and prevention of NCDs as a major development priority for the country.[21] In this study, we aim to inform the national plan by exploring patterns of co-occurrence in healthy lifestyles among individual spousal partners. We also assess spousal concordance in healthy lifestyles in Namibia. The study also explores differences in levels of concordance in couples' healthy lifestyle behaviours by the duration of union. As such, we attempt to estimate concordance in recent versus established couples, thereby supporting or refuting assortative mating theory.[17]

Methods

Study design

The study utilises data from the most recent Namibia Demographic and Health Survey (NDHS), conducted in Namibia in 2013. The NDHS is a cross-sectional study that gathered demographic and health information of individuals and households across Namibia. The survey employed a stratified sampling technique using the preliminary frame of the 2011 Namibia Population and Housing Census.[20,22] A total of 11,004 households were selected for sampling, of which 9849 were interviewed, with a household response rate of 97%.[20] Response rates for individual interviews were 92% and 85% for women and men, respectively.[20] A total of 1249 heterosexual couples (2498 individuals) were identified in the data. Our analysis excludes couples who were visitors in the selected household (n = 38) and couples with missing values (or who reported *"don't know"*) for any of the modifiable behaviours (n = 280) and socio-economic characteristics (n = 21). Our final analytical sample comprises 910 couples (1820 individuals) who were usual residents in the selected household and had complete data for all relevant characteristics.

Measures

We assessed individuals' healthy lifestyle status based on their self-reported responses to each of the five components of a healthy lifestyle index (HLI), including alcohol non-consumption, non-smoking cigarettes, exercise, healthy diet, and normal body mass index. We created this HLI based on healthy lifestyle behaviours measured in the 2013 NDHS, similar to the approach taken in other studies where groups of health behaviours were combined into a composite health index.[23–30] Aside from being the most popular measures of healthy lifestyle in the literature, these measures have also been shown to be associated with reduced risk of cardiovascular diseases and mortality.[31] Indicators were created for each HLI component as follows:

- ***Alcohol consumption:*** this indicator was coded as 'healthy' (1) for each individual if they had not consumed an alcoholic drink during the preceding two weeks, and 'unhealthy' (0) if otherwise.
- ***Smoking:*** this indicator was coded as 'healthy' (1) if individuals reported not currently smoking cigarettes and 'unhealthy' (0) if they reported currently smoking cigarettes.
- ***Diet:*** this indicator was coded as 'healthy' (1) if individuals reported that they consumed either fruits or vegetables at least seven days a week on a typical week and 'unhealthy' (0) if they consumed fruits and vegetables less than seven days in a week.
- ***Physical activity:*** this indicator was coded as 'healthy' (1) if individuals reported having been involved in an exercise, causing an increase in heart rate for 10 min at least once in the past week and 'unhealthy' (0) if otherwise.
- ***Body mass index (BMI):*** this indicator was coded as 'healthy' (1) if individuals had a normal body weight for their height (18.5 < BMI < 25.0) and 'unhealthy' (0) if they were found to be underweight (BMI < 18.5), overweight (25 $\leq$ BMI <30.0) or obese (BMI $\geq$ 30.0).

Additional rationale for the 'healthy' vs 'unhealthy' classification of each component is available in supplementary material S1. A total HLI score was derived for each individual by summing the values across the five component indicators. Individuals (both male and female partners) were considered to have a healthy lifestyle overall if they had an HLI score of $\geq$ 3 and an unhealthy lifestyle if they had an HLI score of < 3. In deciding a suitable threshold, we assessed the distribution of the data and evidence from the literature. On initial review of the data, it was clear that very few men and women in the sample were classed as healthy for all five HLI components (~2% of men and women) and about 14% of men and 19% of women were classed as healthy on at least four HLI

components, which meant that only 3% of couples concordant in reporting an HLI $\geq$ 4, providing limited statistical power to assess the association between partner's healthy lifestyle behaviours through logistic regression models. This binary indicator of a healthy lifestyle subsequently became our primary outcome of interest. Accordingly, we use the term co-occurrence to imply the occurrence of multiple healthy lifestyle behaviours in individual partners and concordance within a couple to imply both partners have three or more healthy lifestyle behaviours.

Individual and partner characteristics such as highest educational attainment and age at the time of the survey were considered for inclusion in the models.[27,30,32] Shared couple characteristics such as health insurance coverage, spousal age difference and couple's current employment status were also constructed from individual (male and female) reports and were included in the models. Shared household characteristics such as place of residence and household wealth were also considered for inclusion.[27,30,32]

Statistical analysis

All data analyses and visualisation were performed using R (4.3.0)/RStudio.[33] Descriptive statistics were used to describe the sociodemographic characteristics of individuals and couples included in the analysis. The men's survey weights were used to adjust for the survey design.[34] We use the **UpSetR (v1.4.0)** package in R to visualise the co-occurrence of healthy behaviours in male and female partners separately.[35] We also examined patterns of concordance in specific HLI components between partners and in those with a healthy vs unhealthy lifestyle overall. Statistically significant differences in the distribution of individual healthy lifestyle behaviours within couples were assessed using Chi-squared tests.

Rather than specify separate models for men's and women's healthy lifestyles as dependent variables, we fitted logistic regression models for the man's outcome and considered the female partner's HLI $\geq$ 3 indicator as the primary independent variable of interest. This is mainly because we had the same sociodemographic information for both partners such that considering the individual's and partners' characteristics, as well as couples' level characteristics, in one model resulted in the estimate of our primary association of interest being identical whether we chose the male or female HLI $\geq$ 3 indicator as the outcome. Secondly, there is increasing evidence that men have a higher CVD risk compared with women.[9,10] As a result, understanding how men's healthy lifestyles are associated with their partner's lifestyle could offer a promising opportunity for improving men's health.

Three models were specified to assess the relationship between men and women's healthy lifestyles while adjusting for relevant characteristics. The woman's healthy lifestyle was first considered in a univariable model (model 1). Subsequently, each control variable was considered together with the woman's healthy lifestyle in a bivariable model (Model 2). The likelihood ratio test was used to evaluate whether the inclusion of each of the relevant characteristics contributed significantly to the model. Factors with a statistically significant likelihood ratio test in the bivariable model were further considered in the final multivariable model (Model 3).

We also sought to understand whether couples in recent unions would be more concordant on healthy lifestyle behaviours than more established couples (assortative mating). To assess this, we fitted a separate binary logistic regression model among couples where both partners reported being in their first union. A joint variable was created to represent categories defined by duration of first union (0–2 years and 3+years) and the female partner's healthy lifestyle status. The model also controlled for the characteristics identified as important in model 3 of our primary analysis.

Results

Descriptive profile of couples

The descriptive characteristics of couples are presented in Table 1. More than half of men (69%) and women (53%) were aged 35 years or older. About two-thirds of men and women had at least secondary education. Close to 90% of men and women were in their first union. In more than two-thirds of couples, the male partner was at least two years older than his wife. About 19% of the couples were both not working or working without pay, whilst 38% of the couples were both working for pay at the time of the survey. Health insurance coverage was very low, as about 61% of the couples were uninsured. About a third of the couples resided in rural areas (39%), and nearly half resided in the richest or second richest household wealth quintiles.

Patterns of co-occurrence of lifestyle behaviours in individuals

Patterns of co-occurrence of modifiable risk factors are presented in Figs. 1 and 2 for women and men respectively. These figures show that only 2% of men and 2% of women in the sample were classed as healthy for all five HLI components. The proportions who had a BMI within the normal range, were non-smokers, and did not consume

Table 1
Descriptive characteristics of couples (n = 910).

Group	Woman	Man	Couples
Age groups			
15–24	126 (14.2%)	44 (5.1%)	–
25–34	291 (32.7%)	246 (27.8%)	–
35–49	347 (37.3%)	395 (42.4%)	–
50+	146 (15.8%)	225 (24.8%)	–
Spousal age difference			
She's older	–	–	119 (11.3%)
Within 1 year	–	–	154 (16.8%)
He's older (2–5)	–	–	292 (33.7%)
He's older (6+)	–	–	345 (38.2%)
Highest educational attainment			
Higher	80 (10.9%)	93 (12.0%)	–
No education	93 (8.6%)	133 (13.0%)	–
Primary	243 (25.8%)	226 (23.5%)	–
Secondary	494 (54.6%)	458 (51.5%)	–
Number of unions			
Once	794 (87.7%)	810 (90.3%)	–
More than once	116 (12.3%)	100 (9.7%)	–
Duration of union among couples in first union[a]			
0–2	–	–	113 (17.2%)
3–5	–	–	113 (17.5%)
6+	–	–	495 (65.3%)
Current employment			
Both working/paid	–	–	348 (38.2%)
Only woman is working/paid	–	–	72 (8.7%)
Only man is working/paid	–	–	325 (34.1%)
Both not working/unpaid	–	–	165 (19.0%)
Covered by a health insurance			
Both are insured	–	–	185 (20.4%)
Only woman is insured	–	–	53 (7.5%)
Only man is insured	–	–	107 (11.2%)
Both not insured	–	–	565 (60.9%)
Place of residence			
Rural	–	–	403 (38.9%)
Urban	–	–	507 (61.1%)
Household wealth quintiles			
Poorest	–	–	142 (16.0%)
Poorer	–	–	153 (17.9%)
Middle	–	–	182 (18.4%)
Richer	–	–	194 (21.3%)
Richest	–	–	239 (26.4%)

Note: Ns are unweighted, while %s are weighted using men's weights.
[a] Where both partners reported that they were in their first union, n = 721.

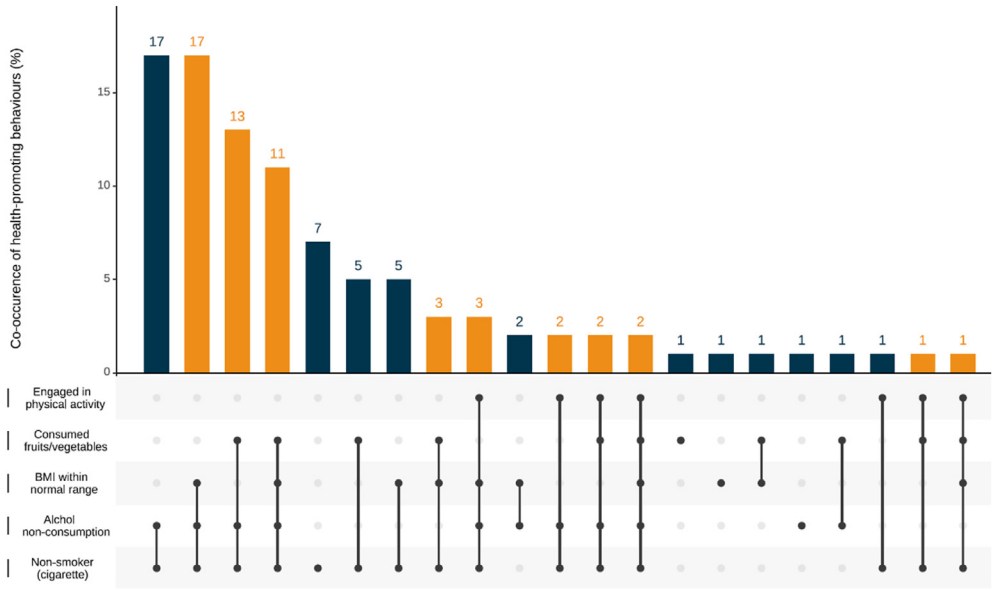

Fig. 1. Patterns of co-occurrence of healthy lifestyle behaviours in female partners. Note: The x-axis represents the different healthy lifestyle behaviour combinations possible across the five behaviours considered; Nine healthy lifestyle behaviour combinations with values < 0.5 are not shown; HLI score ≥ 3 sets are shaded in orange. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article).

alcohol were also similar across gender, 18% of men and 17% of women. Figs. 1 and 2 also highlight some gender differences in the co-occurrence of healthy lifestyle behaviours. About 11% of women and 5% of men were classed as healthy for all HLI components except physical activity (HLI = 4). Around 13% of women were also found to be healthy with respect to diet, alcohol consumption and cigarette smoking (HLI = 3) compared with only about 4% of men. Similarly, about 17% of women were non-cigarette smokers and did not consume alcohol (HLI = 2) compared with 10% of men. About 5% of women, compared to 11% of men, had a normal BMI and were non-cigarette smokers (HLI = 2).

Spousal concordance in healthy lifestyle

Table 2 shows statistically significant differences in the distribution of individual healthy lifestyle behaviours within couples. The majority (72%) of couples were concordant in reporting they did not smoke, and about 46% of couples had not consumed any alcoholic drinks in the two weeks prior to the survey. In contrast, 68% of couples reported that neither of them had engaged in physical exercise; 45% of couples reported that neither consumed fruits or vegetables seven times a week; and only 27% of couples had both partners with a normal BMI. Amongst couples who were discordant in specific health behaviours, more women than men were likely to be the only healthy partner with respect to fruit consumption (27% vs 13%), cigarette non-smoking (19% vs 3%), and alcohol non-consumption (27% vs 12%), but this was not the case with respect to normal BMI (15% vs 26%).

The associations between men and their partner's healthy lifestyles are presented in Table 3. At the univariable level, men were almost twice (OR, 1.82; 95%CI, 1.40–2.38) as likely to have a healthy lifestyle (HLI ≥ 3) if their female partner had a healthy lifestyle than

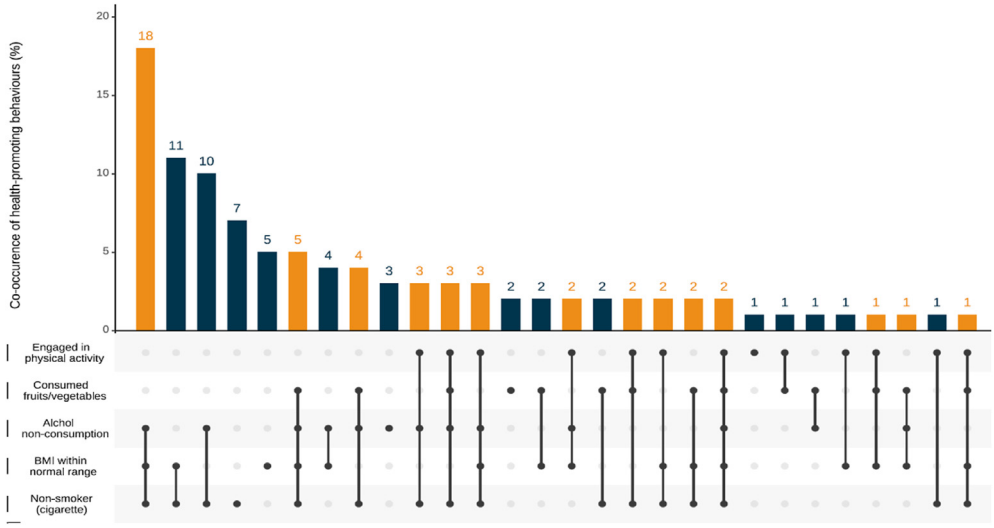

Fig. 2. Patterns of co-occurrence of health lifestyle behaviours in male partners. Note: The x-axis represents the different healthy lifestyle behaviour combinations possible across the five behaviours considered; Three healthy lifestyle behaviour combinations with values < 0.5 are not shown; HLI score ≥ 3 sets are shaded in orange. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article).

Table 2
Spousal concordance in specific health behaviours and having a healthy lifestyle (≥index ≥ 3).

Total HLI/HLI Components	Neither	Woman only	Man only	Both	X^2 *P*-value
Consumed fruits/veg at least 7 times a week	440 (45.3%)	232 (26.5%)	98 (12.5%)	140 (15.7%)	*< 0.001*
Non-smoker (cigarette)	56 (6%)	196 (19.1%)	32 (2.9%)	626 (72%)	*< 0.001*
Alcohol non-consumption	128 (15.5%)	231 (26.5%)	91 (12.2%)	460 (45.8%)	*< 0.001*
BMI within normal range	259 (27.4%)	134 (14.5%)	257 (26%)	260 (32.1%)	*< 0.001*
Engaged in physical activity	622 (68.4%)	81 (9.7%)	174 (18.3%)	33 (3.6%)	*0.211*
Healthy Lifestyle Index ≥3	244 (26.5%)	237 (25.7%)	155 (16.5%)	274 (31.3%)	*< 0.001*

if their female partner did not have a healthy lifestyle. The size of this association increased slightly (OR, 1.90; 95%CI, 1.43–2.52) after adjustment for other relevant individual, partner, and couple-level characteristics (Model 3).

Our secondary analysis focusing on the 721 couples who were both in their first union examined whether an interaction of women's lifestyle behaviour and duration of union was associated with the man's healthy lifestyle behaviour. The results presented in

Table 3
Multivariate logistic regression models of the odds of a male partner having a healthy lifestyle (HLI ≥ 3), $n = 910$.

Characteristic	Man's HLI ≥ 3, aOR (95% CI)		
	Model 1	Model 2	Model 3
Healthy lifestyle (F)			
Unhealthy	Reference		Reference
Healthy	**1.82 (1.40–2.38)**		**1.90 (1.43–2.52)**
Age groups (F)			
15–24		Reference[a]	Reference
25–34		0.78 (0.50–1.19)	0.89 (0.57–1.39)
35–49		0.65 (0.43–1.00)	0.75 (0.48–1.17)
50+		**0.39 (0.24–0.64)**	**0.43 (0.25–0.72)**
Highest educational attainment (F)			
No education		1.36 (0.74–2.50)	
Primary		1.10 (0.66–1.85)	
Secondary		1.17 (0.73–1.90)	
Highest		Reference	
Age groups (M)			
15–24		Reference	
25–34		0.83 (0.43–1.60)	
35–49		0.65 (0.34–1.23)	
50+		0.59 (0.30–1.13)	
Highest educational attainment (M)			
No education		0.92 (0.53–1.57)	
Primary		1.01 (0.62–1.65)	
Secondary		0.88 (0.56–1.38)	
Highest		Reference	
Spousal age gap			
She's older		Reference	
Within 1 year		1.15 (0.70–1.90)	
He's older (2–5)		1.40 (0.91–2.19)	
He's older (6+)		**1.66 (1.08–2.57)**	
Couple's current employment status			
Both are working/paid		Reference[a]	Reference
Only woman is working/paid		0.72 (0.42–1.22)	0.85 (0.48–1.49)
Only man is working/paid		**1.60 (1.17–2.18)**	**1.47 (1.04–2.08)**
Both are not working/unpaid		**1.50 (1.03–2.19)**	**1.59 (1.01–2.51)**
Couple's health insurance coverage			
Both are insured		Reference[a]	Reference
Only woman is insured		**1.01 (0.53–1.88)**	1.15 (0.59–2.25)
Only man is insured		**2.10 (1.29–3.44)**	**1.80 (1.01–3.25)**
Both not insured		**1.41 (1.01–1.99)**	1.16 (0.70–1.93)
Household Wealth			
Poorest		Reference[a]	Reference
Poorer		1.50 (0.97–2.33)	1.37 (0.87–2.18)
Poorest		0.83 (0.53–1.30)	0.68 (0.41–1.12)
Richer		0.79 (0.53–1.20)	0.95 (0.62–1.46)
Richest		0.79 (0.53–1.16)	1.24 (0.74–2.08)
Place of Residence			
Rural		Reference[a]	Reference
Urban		**0.74 (0.57–0.97)**	0.73 (0.52–1.03)

Abbreviations: M, male partner's characteristics; F, female partner's characteristics; aOR, adjusted odds ratio; CI, confidence intervals; HLI, healthy lifestyle index. Bolded cells depict OR estimates and 95% CIs that are statistically significant i.e. do not include 1.0, compared to the reference category.
Model 1 (univariable model) included the man's healthy lifestyle (outcome variable) and the woman's healthy lifestyle (explanatory variable).
Model 2 (bivariable model) included the man's healthy lifestyle (outcome variable) and the woman's healthy lifestyle (explanatory variable).
Model 3 (multivariable model) included the man's healthy lifestyle (outcome variable), the woman's healthy lifestyle (explanatory variable) and each of the control variables.
[a] Likelihood ratio test indicating the control variable contributed significantly ($P < 0.05$) to the univariable model.

Table 4 showed no significant difference in men's lifestyle behaviour between those who are in their first two years of marriage and the female partner has an unhealthy behaviour (aOR, 0.89; 95%CI, 0.38–2.10) compared to those with a similar duration of first marriage and the female partner has a healthy lifestyle behaviour after adjustment with relevant characteristics. We also found no significant difference in men's lifestyle behaviour between those whose female partner has a healthy lifestyle behaviour and are in their first two years of marriage (aOR, 0.85; 95%CI, 0.48–1.47) compared to those with a partner with a similar lifestyle behaviour but have been in a union for three or more years.

Discussion

Although a large and growing body of literature have examined and highlighted spousal concordance as an opportunity to promote healthy behaviours and reduce NCDs risk, these studies are largely concentrated in the Global North, in part due to limited available dataset to study the same in African populations. This study thus fills an important gap in the literature as it is one of the first to explore patterns of co-occurrence and concordance in healthy lifestyles in an African population. Our analysis showed a significant association in spousal concordance for all HLI components except physical activity. With respect to couples with differing behaviours, non-smoking and non-consumption of alcohol were seen more in women, with physical activity and a normal BMI seen more in men. This gendered pattern of healthy lifestyle behaviours has also been found in previous studies. Tseole and Vermaak[36] argue that masculine identity contributes to harmful tobacco and alcohol use among Lesotho men, whilst the perception of physical activity as 'unfeminine' has been found to undermine women's participation in physical activity in Sub-Saharan Africa.[37]

Our study also demonstrated that men in Namibia were about twice as likely to have a healthy lifestyle if their female partner also had a healthy lifestyle, compared with having a female partner who did not have a healthy lifestyle. These findings are consistent with previous literature in other study populations across Latin America, China, England, India, Japan, Korea and the United states suggesting a similar positive association in healthy behaviours among couples.[13,14,17,38–41] Health behaviour concordance between spouses may result from several processes linked to existing theories such as assortative mating, shared environment among others.[17,42,43] For example, a study of Himba pastoralists living in northern Namibia show that individuals tend to pair up with similarly desirable individuals.[44] We note however that recent first unions have similar concordance to more established first union couples which suggests assortative mating is likely although it is possible that shared environment shapes relationship dynamics within a short union duration limiting our ability to entirely separate effect of assortative mating.

There are a few limitations to our study. Firstly, although the 2013 NDHS uses standard and validated scales and interviewers were adequately trained,[20] all the components of the HLI were self-reported. As a result, these items are subject to recall and social desirability bias – for example, the stigma associated with women smoking cigarettes in Namibia may have led to under-reporting of cigarette smoking among women,[45] and there is a potential for misclassification bias. Furthermore, 'healthy' lifestyle behaviours may be thought of as existing within a spectrum – whilst the decision to dichotomise lifestyle behaviours ('healthy/unhealthy' definitions) at the component level and overall, within the study was intended to benefit public health policy and guided by the literature where possible, classifying individuals at a threshold of three (HLI $\geq$ 3) is likely to introduce some information or classification bias. However, on initial review of the data, it was clear that very few men and women in the sample were classed as healthy for all five HLI components [we report 2% of men and 2% of women in the results] and about 14% of men and 19% of women were classed as healthy on at least four HLI components, which meant that only 3% of couples concordant in reporting an HLI $\geq$ 4, providing limited statistical power to assess the association between partner's healthy lifestyle behaviours through logistic regression models.

Although our findings are consistent with reports from couple's studies in other regions of the world, it is possible that our findings may not be generalizable beyond the Namibian context, in part because prevailing gender norms and relationship dynamics may differ across contexts and influence spousal concordance of lifestyle behaviours.[36,37,46–48] As a result, we urge caution in generalising these findings beyond the Namibian context, especially because prevailing gender norms and relationship dynamics could differ significantly across contexts and ultimately shape spousal concordance of lifestyle behaviours.

As we were limited by the data collected in the original 2013 NDHS, our HLI measure does not fully capture the range of health behaviours that could reduce cardiovascular risks such as stress and sleep deprivation.[49,50] Similarly, our healthy diet assessment was based only on reported vegetable and fruit intake because no additional dietary questions were asked in the NDHS.[20] Despite this, the reported data demonstrates different dietary choices between individuals and allows classification of healthier vs less healthy diet behaviours even though these may mask heterogeneity in other dietary choices. Our study findings should therefore be interpreted with caution. Lastly, due to the cross-sectional nature of our data, we are unable to infer any causal relationship between men and women's healthy lifestyle.

Despite these limitations, our study is one of the first to evaluate the co-occurrence of health behaviours and concordance among couples in a Sub-Saharan African country. As a result, we anticipate our study will be followed by several others evaluating concordance in health behaviours among couples in Namibia and other countries across the region. Such studies could provide a nuanced understanding of the inter-relationships in spouses healthy lifestyle and provide an avenue for couples focused behavioural intervention to improve health outcomes in these settings.

Conclusion

Our study offers one of the first evidence of spousal concordance in lifestyle behaviours in an African population. Using a nationally representative data, our study has demonstrated that Namibian

Table 4
Exploring the odds of a male partner having a healthy lifestyle (HLI $\geq$ 3) across groups defined by duration of union and female partner's healthy lifestyle status among couples who were both in their first union, $n = 721$.

Characteristics	Man's HLI ≥3, aOR (95% CI)	
	Model 1	Model 2
Duration of first union: Lifestyle behaviour		
0–2 years & healthy	Reference	Reference
0–2 years & unhealthy	0.93 (0.41–2.15)	0.89 (0.38–2.10)
3+ years & healthy	0.75 (0.45–1.22)	0.85 (0.48–1.47)
3+ years & unhealthy	**0.43 (0.26–0.70)**	**0.48 (0.27–0.86)**

Abbreviations: M, male partner's characteristics; F, female partner's characteristics; aOR, adjusted odds ratio; CI, confidence intervals; HLI, healthy lifestyle index. Bolded cells depict OR estimates and 95% CIs that are statistically significant i.e. do not include 1.0, compared to the reference category.
Model 1 (univariable model) included the man's healthy lifestyle (outcome variable) and the woman's healthy lifestyle (explanatory variable).
Model 2 (bivariable model) included the man's healthy lifestyle (outcome variable) and the woman's healthy lifestyle (explanatory variable).

men are around twice as likely to have a healthy lifestyle if their female partner also has a healthy lifestyle, compared with having a female partner who does not have a healthy lifestyle.

In recognition that the prevention and control of NCDs is a major development priority in Namibia, these findings have important implications for the development of context-specific couples focused behavioural intervention to improve lifestyle behaviours among adults and couples in Namibia.

Author statements

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Ethical approval

This study utilised publicly accessible secondary data obtained from the Demographic and Health Survey (DHS) website (https://dhsprogram.com/data/available-datasets.cfm). The DHS is deidentified publicly available datasets which are entirely anonymous and does not contain any personal, confidential, or identifying information or characteristics of the respondents. Ethical approval for secondary data analysis/research was granted by the University of Southampton (ERGO ID 74083).

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Competing interests

None.

Author credit statement

All authors collaborated to develop the study design. AD and EO analysed the data under guidance from NM. AD wrote the first draft of the manuscript. All authors provided substantive feedback on the manuscript and have read and approved the final version.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.puhe.2024.06.031.

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