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The Impact of the Transitions and Maintenance Patterns of Physical Activity and Tobacco Smoking on Labor Market Outcomes in South Africa

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Abstract: (1) Background: Labor market outcomes can be directly or indirectly influenced by the health behavior patterns of the labor force. This study assesses the association between patterns of physical activity and smoking behavior maintenance (and their transitions) and the labor market outcomes of employment participation and formal employment participation. (2) Methods: The sample evaluated in this study comprises adult individuals aged 18 and above from wave 5 of the National Income Dynamics Study (NIDS) survey. Data were analyzed using descriptive statistics, a chi-square test, and bivariate probit regression techniques. (3) Results: The bivariate probit regression results regarding the impact of health behavior transition and maintenance patterns on labor market outcomes show that transitioning to physically active behavior or maintaining physically active behavior increases the likelihood of participating in the labor market and being employed in the formal sector compared to those ceasing to be physically active over time. Surprisingly, both the maintenance and uptake of smoking behavior increases the probability of the occurrence of both labor market outcome variables. (4) Conclusions: These findings have both explicit and implicit implications that can serve to increase labor force participation probability and to promote healthy behavior. There is a need for community-wide campaigns via promotions and media coverage to promote active physical activity among the labor force group. Also, interventions to support individuals who lack extensive social networks is necessary. The results further highlight the importance of education, rural economic development, and good health status for desirable labor market outcomes.

Keywords: health behavior; smoking; physical activity; employment status; formal sector employment; bivariate probit; South Africa

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1. Introduction

Available labor market statistics in South Africa show upsetting trends in the labor participation rate, labor absorption rate, and number of not economically active persons. The number of not economically active persons rose from 9,981,601 persons in 1993 to 16,729,707 in 2022; the labor participation rate hovers between 56.99% in 1993 and 58.04% in 2022; and the labor absorption rate fell from 50.12% in 1993 to 38.39% in 2022 (Quantec Easy Data 2023). These statistics raise concerns, considering their many implications for the country's productivity, economic growth, government revenue and expenditure, and the overall welfare of the population. Several factors, including health-related factors, have been proposed as having direct and indirect influences on the labor market outcomes of a geographical location.

Health behavior (as one of the health-related factors) and labor market outcomes are two socially and economically interconnected features that significantly impact individuals and societies. Health behavior refers to both the actions taken and choices made by individuals regarding their health (Short and Mollborn 2015), two of which are of interest in this study: physical activity and tobacco smoking. On the other hand, labor market outcomes are the results of interaction between the demand and supply of labor in the

labor market, and they often pertain to the economic consequences individuals primarily experience in terms of employment status, earnings or income or wage, and productivity. The relationship between these health behaviors and labor market outcomes is multifaceted and dynamic. Conceptually, focusing on the effect of health behavior on labor market outcomes, the choices that individuals make with respect to health behavior, can have profound direct and indirect labor market implications (Lawana et al. 2020; Larose et al. 2016; Cabane and Lechner 2015; Kavetsos 2011). These choices can either be to transition to a health behavior (transitioning in this context refers to any changes in health behavior, and it can involve quitting or starting a behavior) or maintain a previously existing behavior (e.g., sustenance or the continuous exhibition of a good or bad health behavior), and the resulting effect will be accordingly different.

The direct effect of these choices, for example, could stem from an employer's unwillingness (or some other motivation) to hire individuals who engage in certain health behaviors due to their known and negative effects on business productivity, revenue, and consequences for worker healthcare costs (Larose et al. 2016). Moreover, transitioning from a sedentary lifestyle to a more active one, for example, can potentially result in several positive outcomes. These include heightened energy levels, improved physical health, and potentially better mental well-being. These positive changes could, in turn, contribute to an individual's capability to actively search for and retain employment. This shift in lifestyle might empower individuals with increased stamina, improved concentration, and greater resilience, which could positively influence their overall job performance and ability to thrive in a work environment. Thus, the direct effect of engaging in regular physical activity is seen when an individual looks fitter and more 'presentable', demonstrating an absence of obesity, which indicates a signal of probable good health status to potential employers (Cabane and Lechner 2015; Kavetsos 2011). Likewise, smoking behavior can affect job prospects in situations where some employers may have policies against hiring smokers. In this case, smokers may face discrimination during the hiring process, directly limiting their opportunities in the labor market. The indirect effect of a sedentary lifestyle and smoking behavior is seen through health-related problems such as obesity, respiratory problems, cardiovascular diseases, cancer, and other chronic conditions, leading to more frequent absences from work due to illness, increased absenteeism, reduced physical stamina, increased fatigue, and decreased cognitive function (Seglem et al. 2020; Egan et al. 2021; Jørgensen et al. 2019). These can eventually lead to reduced labor hours and wages, job loss, and an early exit from paid employment (Ots et al. 2020; Bello 2021; Böckerman et al. 2018). Indeed, health behaviors and their exhibition patterns can facilitate or hamper an individual's ability to secure and maintain employment; it can limit their productivity and ultimately hinder their economic prospects. Smoking cessation and a smoke-free lifestyle can lead to improved health, reduced absenteeism, and higher work productivity, ultimately supporting labor market participation.

The conceptual framework above is in line with various theories of the labor market (the neoclassical theory of labor, the theory of health and human capital, dual labor market theory, and labor market discrimination theory). For instance, Becker (2007) extended the human capital theory and argued that health is one of the important determinants of the stock of the human capital of an individual—a perspective related to the health and human capital model. This theory postulates that improvement in health leads to greater labor market participation and productivity—and vice versa. Explaining this view, Smith et al. (2016) noted that health capital impacts healthy time and, subsequently, the labor force supply. Health is an important factor in an individual's decision to supply his or her labor resources because health, as a form of human capital, determines a person's preference between leisure and work when considering the experience of health shocks or not and because it is valued by both employees and employers (Cai 2010; Becker 1964; Grossman 1972). A person's state of health depends on their health behavior. A good health status starts with healthy behavior (World Health Organization 2011), while poor health status is a fallout and outcome of unhealthy behavior (Tian and Tien 2020). It is noted that the

occurrence of health behaviors is dynamic in that they can occur as stand-alone, clustered forms and can also change over time by changing from one form to the other. This suggests that the impact of health behaviors on the labor market varies by the pattern of occurrence of the behavior.

Empirically, some existing studies (Kim et al. 2018; Devaux and Sassi 2015; Airagnes et al. 2019; Lund et al. 2019; Seglem et al. 2020; Egan et al. 2021; Heikkala et al. 2020; Böckerman et al. 2018; Jørgensen et al. 2019) exploring the relationship between health behavior and labor market outcomes are largely from developed countries and focus primarily on the labor market outcome indicators of employment participation, unemployment status, earnings or wages, labor hours, sick leave application and period, absenteeism, productivity, exit from paid employment, and time of retirement. However, these studies have yielded mixed findings, contributing to the uncertainty surrounding this complex issue. While some studies have confirmed that a healthy lifestyle can lead to improved labor market outcomes (Devaux and Sassi 2015; Airagnes et al. 2019; Lund et al. 2019; Seglem et al. 2020; Egan et al. 2021) and thereby argue for positive behavior modification, other studies have found little to no significant impact (Troelstra et al. 2021; Masayuki 2018). This inconsistency in findings may be attributed to methodological limitations, differences in study populations, or unaccounted confounding factors. Likewise, limited research has empirically verified the potential benefits of smoking behavior change on labor market outcomes. In addition, little is known about how health behavior adoption or maintenance may impact other labor market outcome parameters, such as the type of employment (full-time, part-time, and precarious), the location of employment, the sector of employment (formal sector and informal sector) and the industry of employment (government, private, manufacturing, agriculture, or service) as well as position at work. These identified labor market outcome indicators suggest that, beyond being employed or not, other features of labor market outcomes are key determinants of a country's population welfare, economic performance growth, and overall economic well-being. For example, in the case of the sector of employment (formal sector employment or otherwise), formal sector employment refers to jobs that are regulated and registered by the government. On the contrary, informal sector employment refers to a kind of work in which individuals lack formal agreements and social safeguards. Typically, those engaged in informal sector employment possess lower levels of education, face an increased likelihood of poverty, and experience inferior working conditions when contrasted with their counterparts in the formal sector (Deléchat and Medina 2020). The formal sector provides decent working conditions, as workers employed in the sector enjoy job security, legal and social protection, income stability, access to employee benefits, contributions to social welfare, financial inclusion, social mobility, and reduced inequality (Deléchat and Medina 2020, 2021; International Labour Organization 2023), which make it preferred above informal sector employment altogether. Thus, understanding the dynamic intricate interplay between health behavior and labor market outcomes is crucial for individuals, employers, and policymakers. Therefore, the objective of this study is to examine health behavior patterns (i.e., transition [quitting or adoption and maintenance]) and determine how the patterns of health behavior influence the likelihood of gaining employment and getting hired in formal sector employment.

2. Methodology

2.1. Study Design, Data Collection and Participants

This study adopted a cross-sectional research design and a quantitative research method. Wave 5 of the National Income Dynamics Study (NIDS) survey, which was collected by the Southern Africa Labor and Development Research Unit (SALDRU), University of Cape Town, and funded by the office of the president and the Department of Planning, Monitoring and Evaluation of South Africa (Southern Africa Labour and Development Research Unit 2017), was used for this study. Access to the survey was obtained through the DataFirst website (https://www.datafirst.uct.ac.za/, accessed on 13 February 2022). The NIDS survey is a face-to-face longitudinal survey of individuals living in South Africa as

well as their households. A comprehensive description of the dataset used in this study is available at www.nids.uct.ac.za (accessed on 13 February 2022). Information of individuals aged 18 years and above was considered in this study.

2.2. Measurements

2.2.1. Labor Market Outcomes

The labor market outcome in this study was evaluated using employment status and employment in the formal sector. The NIDS survey incorporated questions relating to economic engagement at the individual level. Employment status in the survey was coded using the ILO's definition in order to assign respondents to the specific categories of employed, unemployed but seeking job opportunities, unemployed but discouraged, and not economically active. A respondent was determined to be employed if he or she was economically active and reported having any form of employment at the time of interview, including a primary job, secondary job, self-employed job, paid casual work, or personal agricultural work. In this study, "employment variable" was coded as "one" for being employed, with "zero" given otherwise. The second labor market outcome used in this study was the sector or nature of employment (i.e., formal or informal employment). Following Cichello and Rogan (2017), the variable was derived from the information regarding the deduction of unemployment insurance funds (UIFs) from monthly income, deduction of pension or provident funds from salaries, deduction of medical aid from salaries, and registration of businesses for income tax or VAT. Any respondent whose employment met any one or all of the stated employment criteria was considered to be employed in the formal sector.

2.2.2. Health Behavior Change and Maintenance

As previously stated, this study focuses on smoking and healthy physical activity behaviors. The NIDS asks questions relating to "whether a respondent smokes cigarettes or not" and "how regularly a respondent exercises". If a respondent indicates that he or she engages in exercise either less than once a week, once a week, twice a week, or three or more times a week, such a respondent is allocated a value of "one". Transition variables were derived by comparing the smoking and exercise statuses for the 2012 and 2017 survey periods. Consequently, the transition variable for smoking had 4 categories: (1) never smoked in both periods (maintained (un)healthy behavior status), (2) did not smoke in 2012 but began to smoke in 2017 (initiated smoking behavior), (3) smoked in 2012 but not in 2017 (quit smoking), and (4) smoked in both time periods (maintained smoking behavior). The same pattern of categorization was present for physical inactivity.

2.2.3. Covariates

The vector of covariates included in the econometric modeling were health status (good, poor), mental health (good, poor), sex (male, female), age (18–34 years, 35–64 years, >64 years), marital status (married, otherwise), education level (primary, secondary, matric, certificate and diploma, degree), race (Black, Colored, Asian), place of residence (urban, rural), and province (Western Cape, Eastern Cape, Northern Cape, Free State, KwaZulu Natal, North-West, Gauteng, Mpumalanga, Limpopo).

2.3. Statistical Analyses

Descriptive statistics (frequency, percentages, and tables) were used in the study to summarize respondents' characteristics, profile health behavior changes or maintenance patterns, and determine labor market outcomes. Inferential statistics and econometric models (Chi^2 and bivariate probit) were utilized to investigate the association, relationship, and extent of the effect of health behavior change and maintenance along with other covariates on labor market outcomes. Bivariate Probit estimation technique was utilized to estimate the impact of unhealthy behavior transition on labor market outcomes, which is objective three of this study. Following the human capital theory perspective, this objective

was addressed by understanding the probability that an individual would be employed (and be employed in the formal sector). The use of this technique is consistent with Chen and Hamori (2010) and Opoku et al. (2023), who examined gender differences in labor force participation and formal employment in China and Tanzania, respectively, using bivariate probit analysis. Unlike both of those studies, this study accounts for the effect of smoking behavior on labor participation and formal employment, respectively. A bivariate probit model is a joint model for two binary dependent variables whose disturbances are assumed to be correlated. It generalizes the index function from one latent variable to two latent variables that may be correlated.

Assuming LM_1^* and LM_2^* are two latent variables (that is, variables that are not completely observed), these variables can be incorporated into a binary outcome model as an index of an unobserved propensity for the event of interest to occur. The unobserved latent variables can be defined as

$$LM_1^* = X_1\beta_1 + \epsilon_1 \tag{1}$$

$$LM_2^* = X_2\beta_2 + \epsilon_2 \tag{2}$$

where ϵ_1 and ϵ_2 are joint normal with means zero, variance one, and correlation p.

$$\left\{ \begin{matrix} \epsilon_1 \\ \epsilon_2 \end{matrix} \middle| X \right\} \sim N\left(\begin{bmatrix} 0 \\ 0 \end{bmatrix} \begin{bmatrix} 1 & p \\ p & 1 \end{bmatrix} \right) \tag{3}$$

Then, the bivariate probit model specifies the observed outcomes to be

$$LM_1 = \begin{cases} 1 \; if \; LM_1^* > 0 \\ 0, \; if \; otherwise \end{cases} \tag{4}$$

$$LM_2 = \begin{cases} 1 \; if \; LM_2^* > 0 \\ 0, \; if \; otherwise \end{cases} \tag{5}$$

The bivariate probit model can be written as

$$P(LM_1 = i, \; LM_2 = j) = \infty_2\left(X_1'\beta_1, X_2'\beta_2, p\right) \tag{6}$$

which is given by the following regression model

$$LM_i = \beta_0 + \sum \beta_i X_i + \sum \delta_i Z_i + u_i \tag{7}$$

where the labor market outcomes (LM) is the dependent variable, and it is measured as employment status and sector of employment (formal), u = error term, β_0 = the constant term, β_i = the vector of coefficients, X_i = vectors of smoking and active physical activity change and maintenance variables, and Z_i are the covariates.

3. Results and Discussion

The general characteristics of the respondents (18,718 individuals) are presented in Figure 1 and Tables 1 and 2. They (i.e., Figure 1 and Tables 1 and 2) provide information on health behavior transition patterns, labor market outcomes, and the distribution of labor market outcomes across the demographic characteristics of respondents. According to Figure 1, the majority (80.2%) of the individuals in the sample examined who did not smoke in $year_{t-1}$ remained nonsmokers in $year_t$; that is, they maintained nonsmoking behavior. In terms of physical inactivity, approximately 67.2% never had a change in their physically inactive behavior. The findings in Table 1 show that 6785 persons, equivalent to 36.25% of the sample population, were employed, and 48.39% of those employed were employed in the formal sector.

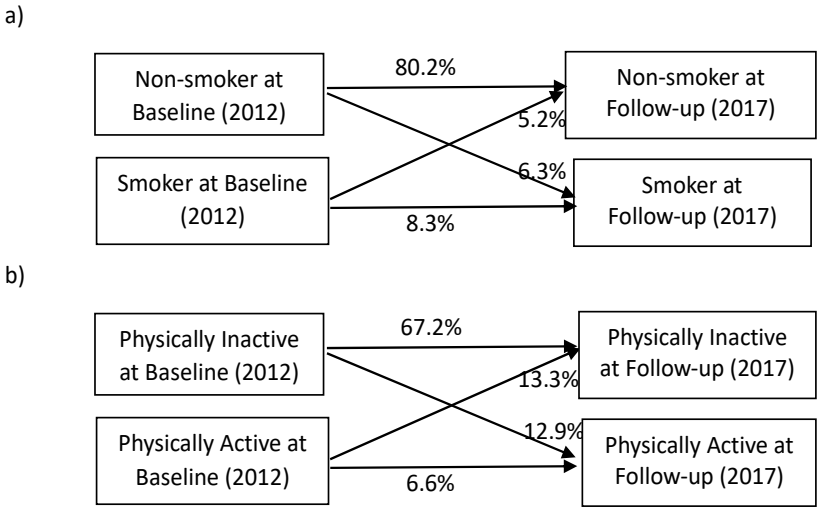

Figure 1. (**a**,**b**) Health behavior transition (maintenance and change) patterns.

Table 1. Distribution of labor market outcomes.

Labor Market Outcome	Freq.	%
Employment/Labor Market Participation Status		
Employed	6785	36.25
Unemployed	11,933	63.75
Total	18,718	100
Sector of Employment (as a proportion of those employed)		
Formal Sector Employed	3283	48.39
Informal Sector Employed	3502	51.61
Total	6785	100

Table 2. Distribution of labor market outcomes across health behavior patterns.

	Employment Status			Formal Sector Employed		Chi^2
	Yes (%)	No (%)		Yes (%)	No (%)	
Health Behavior Transition (Smoking)						
$S_{(0,0)}$	33.25	66.75		48.16	51.84	
$S_{(0,1)}$	55.69	44.31	$p < 0.01$	47.41	52.59	$p < 0.01$
$S_{(1,0)}$	27.82	72.18		39.11	60.89	
$S_{(1,1)}$	55.64	44.36		53.34	46.66	
Health Behavior Transition (Physical Activity)						
$P_{(0,0)}$	28.70	71.30		42.20	57.80	
$P_{(0,1)}$	56.73	43.27	$p < 0.01$	55.24	44.76	$p < 0.01$
$P_{(1,0)}$	40.71	59.29		50.39	49.61	
$P_{(1,1)}$	63.96	36.04		62.18	37.82	

NB: Health behavior transition (smoking): $S_{(0,0)}$ = Not a smoker in both 2012 and 2017; $S_{(0,1)}$ = Not a smoker in 2012 but a smoker in 2017; $S_{(1,0)}$ = Was a smoker in 2012 but not a smoker in 2017; $S_{(1,1)}$ = Was a smoker in both 2012 and 2017. Health behavior transition (physical activity): $P_{(0,0)}$ = physically inactive in both 2012 and 2017; $P_{(0,1)}$ = physically inactive in 2012 but not in 2017; $P_{(1,0)}$ = physically active in 2012 but not in 2017; $P_{(1,1)}$ = physically active in both 2012 and 2017.

Table 2 presents a summary of the distribution of labor market outcomes with respect to the health behavior patterns of transition. Primarily, the result of the simple Pearson

chi-square test for independence reported in Table 2 indicates a significant relationship between each of the health behavior transition patterns and the two labor market outcome indicators considered. Table 3 summarizes the distribution of labor market outcomes with respect to various socioeconomic and demographic characteristics. The result of the simple Pearson chi-square test for independence reported in Table 3 indicates a significant relationship between each of the variables and the two labor market outcome indicators.

Table 3. Distribution of labor market outcomes across sociodemographic characteristics.

	Employment Status			**Formal Sector Employed**		**Chi^2**
	Yes (%)	**No (%)**		**Yes (%)**	**No (%)**	
Gender						
Male	42.81	57.19	$p < 0.00$	49.8	50.12	$p < 0.05$
Female	31.32	68.68		46.1	53.1	
Age						
18–34 Years (young adults)	40.2	59.8	$p < 0.00$	50.6	49.4	$p < 0.01$
35–64 Years (older adults)	40.7	59.3		48.1	51.9	
>64 Years (Elderly)	6.4	93.6		12.1	87.9	
Education Attainment						
No Schooling	6.5	93.5	$p < 0.00$	17.4	82.6	$p < 0.01$
Primary	31.2	68.8		33.1	67	
Secondary	42.7	57.3		41	59.1	
Matric	50.1	49.9		54.3	45.6	
Certificate and Diploma	57.7	42.4		62.1	37.9	
Degree	62.2	37.8		75.5	24.5	
Race						
African	36.9	63.2	$p < 0.00$	46.4	53.6	$p < 0.01$
Colored	42.0	58		57.1	42.9	
Asian/Indian	24.5	75.5		45.6	54.4	
White	17.6	82.4		59.0	50.0	
Place of Residence						
Urban	62.3	37.7	$p < 0.01$	70	30	$p < 0.01$
Rural	47.5	52.5		49.2	50.8	
Province						
WC	42.0	58.0	$p < 0.01$	57.4	42.6	$p < 0.01$
EC	34.2	65.8		40.8	59.2	
NC	40.3	59.2		53.4	46.6	
FS	40.8	59.2		53	47	
KZN	36.2	63.8		40.4	59.6	
NW	34.5	65.5		48.8	51.2	
Gauteng	44.3	55.7		57	43	
Mpumalanga	40.2	59.8		53.4	46.6	
Limpopo	36.9	63.1		33	67	
Outside SA	3.5	96.5		0	0	
Mental Health						
Good	35.6	64.4	$p < 0.00$	49	51	$p < 0.05$
Poor	40.2	59.8		44.9	55.1	
Health Status						
Good	50.9	49.1	$p < 0.00$	52.1	47.9	$p < 0.01$
Poor	12.5	87.5		23.8	76.3	

The results of the bivariate probit regression estimate on the impact of change in health behavior on labor market outcomes are shown in Table 4. The first step in econometric modelling was to test the existence of multicollinearity among the variables originally proposed. The choice of including a variable or not was made by examining the variance inflation factor (VIF) of each of the variables. Any variable(s) that had a VIF that was more than 10 failed the collinearity test and was subsequently excluded from the estimation. The tolerance levels of the included variables are presented in the last column of Table 4. Likewise, the average variance inflation factor (VIF) for each of the models was 1.65, which was less than 10, indicating the non-existence of the problem of multicollinearity. Estimates derived from the bivariate probit models fit the data accurately, looking at the statistical significance of the Wald chi-square statistics ($p < 0.01$) of the estimated models. Equally, the likelihood ratio test of rho that was reported for the models equal to zero rejected the null hypothesis that there was no correlation ($p < 0.01$). This indicates that the two error terms of the employed and formal employment models were indeed correlated, and estimating each model independently using a conventional probit model would yield a biased estimate. In Table 4, it is observed that the effect of smoking and active physical activity uptake and maintenance and other cofounding variables were the same across, in terms of their effects on employment status (columns 1, 3, and 5) and formal employment status (columns 2, 4, and 6). Hence, for clarity, this section discusses the results based on model 3 (in column 5 for employment status and 6 for formal employment participation). Among the variables included in the model, 21 variables were statistically significant at various levels for the employed model, while 22 variables were significant for the formal sector employed model.

Table 4. Bivariate probit regression result.

Variables	Model 1 Smoking Transition Only		Model 2 Physical Activity Transition Only		Model 3 Smoking Transition and Physical Activity Transition		
	(1)	(2)	(3)	(4)	(5)	(6)	
	Employed	Formal	Employed	Formal	Employed	Formal	
	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
Smoking Transition (ref = $S_{(0,0)}$)							
$S_{(0,1)}$	0.126 *	0.010	–	–	0.117 *	0.011	0.821
$S_{(1,0)}$	−0.067	−0.133 **	–	–	−0.064	−0.130 **	0.046
$S_{(1,1)}$	0.219 *	0.204 *	–	–	0.207 *	0.187 *	0.000
Physical Activity Transition (ref = $P_{(0,0)}$)							
$P_{(0,1)}$	-	-	0.212 *	0.247 *	0.203 *	0.241 *	
$P_{(1,0)}$	-	-	0.073 **	0.121 *	0.068 ***	0.113 *	
$P_{(1,1)}$	-	-	0.176 *	0.258 *	0.167 *	0.243 *	
Health Status (Good)	0.901 *	1.064 *	0.896 *	1.041 *	0.864 *	1.022 *	
Poor Mental Health	0.028	0.017	0.037	0.025	0.026	0.017	
Age Square	−0.000 *	−0.000 *	−0.001 *	−0.000 *	−0.000 *	−0.000 *	
Gender	0.341 *	0.268 *	0.347 *	0.241 *	0.310 *	0.221 *	
Married	0.352 *	0.341 *	0.350 *	0.343 *	0.355 *	0.347 *	
Education	0.238 *	0.322 *	0.225 *	0.307 *	0.229 *	0.310 *	
African	0.418 *	0.497 *	0.421 *	0.523 *	0.428 *	0.527 *	
Colored	0.484 *	0.652 *	0.522 *	0.697 *	0.494 *	0.677 *	
Asian	0.149	0.258 **	0.148	0.265 **	0.143	0.267 **	
Urban	0.180 *	0.201 *	0.187 *	0.215 *	0.183 *	0.213 *	

Table 4. *Cont.*

Variables	Model 1 Smoking Transition Only		Model 2 Physical Activity Transition Only		Model 3 Smoking Transition and Physical Activity Transition		
	(1)	(2)	(3)	(4)	(5)	(6)	
	Employed	Formal	Employed	Formal	Employed	Formal	
	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
				Province			
Western Cape	0.321 *	0.558 *	0.317 *	0.556 *	0.311 *	0.553 *	
Eastern Cape	0.118 *	0.220 *	0.118 **	0.223 *	0.114 **	0.221 *	
Northern Cape	0.192 *	0.409 *	0.211 *	0.432 *	0.197 *	0.428 *	
Free State	0.176 *	0.441 *	0.187 *	0.456 *	0.175 *	0.447 *	
KwaZulu-Natal	0.246 *	0.360 *	0.254 *	0.379 *	0.254 *	0.379 *	
North-West	0.220 *	0.459 *	0.234 *	0.471 *	0.224 *	0.468 *	
Gauteng	0.245 *	0.482 *	0.242 *	0.481 *	0.237 *	0.478 *	
Mpumalanga	0.208 *	0.474 *	0.206 *	0.477 *	0.202 *	0.475 *	
Constant	−2.449 *	−3.913 *	−2.458 *	−3.953 *	−2.447 *	−3.945 *	
Rho	0.992		0.995		0.993		
LR test of rho = 0	Chi^2 (1) = 4773.33 prob> Chi^2 = 0.0000		Chi^2 (1) = 4763.23 prob> Chi^2 = 0.0000		Chi^2 (1) = 4746.6 prob> Chi^2 = 0.0000		
Number of obs.	18,718		18,718		18,718		
Wald Chi^2 (42)	5061.32		5105.61		5138.25		
Prob > Chi^2	0.0000		0.0000		0.0000		
Log likelihood	−13,665.83		−13,650.78		−13,627.06		

* $p < 1\%$, ** $p < 5\%$, *** $p < 10\%$. Source: Author's computation from STATA 15.

4. Discussion

First, this study found that smoking behavior transition (change) and maintenance pattern parameters were positive and statistically significant ($p < 0.05$) for new smokers and continuous smokers but negative for those who stopped smoking in the employed estimation in model 3. Also, the parameters were statistically significant and negative for those who stopped smoking but positive for those that maintained smoking behavior in the formal sector employed estimation in the same model. These results indicate that smoking behavior adoption, as well as smoking behavior maintenance, increases the probability of becoming employed by 0.117 and 0.207, whereas quitting smoking behavior reduces the probability of becoming employed and becoming employed in the formal sector, respectively. It is clearly noted that this finding is inconsistent with the vast body of evidence and the overwhelming consensus among researchers (Ots et al. 2020; Virtanen et al. 2018; Hagger-Johnson et al. 2017; Devaux and Sassi 2015; Airagnes et al. 2019; Lund et al. 2019; Seglem et al. 2020; Egan et al. 2021; Heikkala et al. 2020; Böckerman et al. 2018; Jørgensen et al. 2019), in addition to the health fact that smoking is associated with negative health outcomes and has detrimental effects on various aspects of well-being, including labor market participation. Nevertheless, this finding is consistent with studies conducted in Japan by Masayuki (2018) and Larose et al. (2016) in Canada. In the study of Larose et al. (2016), being an occasional and daily smoker increases employment participation for women but reduces their wage rate and annual income. This result clearly shows that labor market discrimination based on personal habits does not exist in South Africa. Rather, factors such as qualifications, skills, experience, and overall fit for the job are more of a priority in the recruiting process than personal habits or

healthy lifestyles. Another plausible reason is that smoking may create opportunities for networking and socializing. Smokers may bond over smoke breaks, potentially leading to informal discussions or connections that could be advantageous for employment. This is also plausible when new smokers or consistent smokers are yet to begin to exhibit the consequences of smoking at work. Apparently, being a smoker might not necessarily influence employment participation but rather productivity and labor incomes, which were not considered in this study. The result that the probability of becoming employed and becoming employed in the formal sector is negative for those who quit smoking could be because of the existing and confirmed health effects of smoking on labor that hinder labor participation or discourage an employer from employing due to potential productivity and higher healthcare implications. In essence, it can be inferred that becoming employed or the need to increase labor participation is not a rational motivation for change in smoking behavior in the context of the South African labor market. Implicitly, the importance and role of social capital and networks (as inferred from smoker networks) for labor market participation can be further deduced from these findings.

The parameters of physical activity transition and maintenance variables were positive and statistically significant ($p < 0.001$) in model 3 in both the employed and formal sector employed result columns, respectively. As seen in Table 3, there was a greater likelihood of being employed due to maintenance (0.207) and the initiation (0.203) of physical activity behavior, compared to no longer being physically active (0.068). A similar trend was observed in the formal sector employment model where the probability of working in the formal sector was higher if one was continuously physically active (0.243), followed by being newly physically active (0.241), and no longer being physically active (0.113). This finding corresponds with this study's earlier stated a priori expectation and previous findings (Kavetsos 2011). Being physically active is a health investment that promotes one's health, improves mental health, and reduces the mortality risk through the reduced risk of a series of major diseases like diabetes and hypertension (Hafner et al. 2019).

The health status parameters were positive and statistically significant in both the employed and formally employed models. The results indicate that good health (excellent, very good, and good) status results in an increased chance of participation in the labor market (0.864) and being hired in the formal sector (1.022), respectively. This result is related to a study by Nwosu and Woolard (2017) and the proposition in this study that good health enables labor supply and getting hired. Good health aids on-the-job training, increases productivity, and reduces employers' loss through employee absenteeism; hence, taken together, all of this motivates an employer to employ individuals with good health status compared to individuals whose health status is poor and unfavorable.

The parameter of age is presented to be negative but statistically significant ($p < 0.01$) in model 3 for both employed status and formal sector employment estimation, in columns 5 and 6, respectively. The result is not unexpected because, as an individual increases in age, productive years increase as well, as do responsibilities and experience, which makes them willing and able to work. However, at some point, the increase in age begins to reduce the chances of becoming employed. This result signifies that, as an individual grows older, they are less likely to be employed and be employed in the formal sector. This is because the energy depletion, associated health problems, and declining marginal productivity at that age could counter the productivity and profitability goal of formal sector occupations. Moreover, 64 is the mandatory retirement age for most formal occupations. This finding is consistent with the a priori expectation of this study and previous empirical findings (Hussain et al. 2016; Lizares and Bautista 2020). The parameter of gender in the three estimated models are shown to be statistically significant ($p < 0.01$), with positive sign. The results in model 3 indicate that, holding other variables fixed, being a male increases an individual's chance of being employed by 0.310 and being employed in the formal sector by 0.221 when compared to being a female. This result, which is consistent with Nwosu and Woolard (2017) and Dunga (2022), suggests that gender bias in employment, which has been properly documented, is still an issue for policy consideration in the South African

context. Moreover, the lower likelihood of female labor force participation can be a result of low educational attainment, poor skill acquisition, and the crowding out of home-front responsibilities that limit their labor supply ability. Apart from low qualifications and possible discrimination, some women may prefer the informal sector because it gives them more opportunity and flexibility to cope with both productive and reproductive responsibilities (Ghebremeskel and Mihreteab 2018).

The parameters of the relationship status (married) of individuals in the three models show statistical significance ($p < 0.01$) and positive signs. These parameters indicate that, holding all other variables constant, being married increases one's chance of being employed and being employed in the formal sector. These results are in line with Some et al. (2016), who found out that being married plays a crucial role in employment seeking and getting employed. Some et al. (2016) argued that married individuals are believed to put more effort into job searches due to their increased financial responsibilities, thereby increasing the chance of getting a job. The coefficients on educational attainment in model 3 (in columns 5 [0.229] and 6 [0.310]) is positive and statistically significant ($p < 0.01$). The result suggests that an increase in education attainment levels improves the likelihood of seeking employment and working as a formal sector employee, respectively. It is clearly seen from the results that the likelihood is higher for those having a degree compared to other educational attainment in both models. This is because higher education is posited to increase a person's skills and productivity. This result is consistent with the study conducted in Tanzania by Opoku et al. (2023) and in South Africa by Lawana et al. (2020).

The parameters of the place of residence (urban) variable in the employed (0.183) and formal sector employed (0.213) columns of model 3 are shown to be both positive and statistically significant ($p < 0.01$). These imply that, holding other variables constant, an individual living in an urban environment would have higher chances of becoming employed and being hired in the formal sector compared to those residing in rural areas. This result is consistent with Kouadio and Gakpa (2020). This is, however, not surprising because of the reality of dualism, which is one of the features of the South African economy, where formal employment opportunities are concentrated in the cities, and informal ones are concentrated in the rural areas (Khan and Hussain 2021). Moreover, Malam (2018), argued that the prevalence of formal employment opportunities in the urban centers is because of closeness to administrative and regulatory offices where compliance with business regulation is important. Regarding the provincial variables, all the provinces demonstrated statistical significance ($p < 0.05$), with a positive sign in the model estimated for being employed. This implies that, holding all other variables constant, individuals residing in the Western Cape (0.311), Eastern Cape (0.114), Northern Cape (0.197), Free State (0.175), KwaZulu Natal (0.254), North-West (0.224), Gauteng (0.237), and Mpumalanga (0.202) provinces have higher probabilities of being employed compared to those residing in the Limpopo province. However, as can be seen, the probability of becoming employed is the highest for the Western Cape province, followed by the KwaZulu-Natal and Gauteng provinces. Similar results were observed in the formal sector employment result in column 6 of model 3, where the probability of getting hired in the formal sector was positive for all provinces. However, the level or extent of probability differs in that it is the highest for the Western Cape province at (0.553). The difference in these levels of formal employment probability is due to the heterogeneity across the provinces in the country with respect to economic activities and opportunities.

5. Conclusions

Understanding the intricate interplay between health behavior dynamics and labor market outcomes is crucial for policymakers, employers, and individuals themselves. This study investigated the relationship between health behavior (smoking and physical activity) changes and maintenance patterns and the labor market outcome of employment status and formal sector employment amidst various cofounding factors. Thus, in line with the focus of this study, it is concluded that active physical activity promotes labor market

participation and employment in the formal sector. An existing smoking status, either as a new smoker or recurrent smoker, promotes employment participation and formal sector employment. Therefore, this study recommends the following measures: First, there is a need for public and private sector-initiated programs and interventions that would encourage physical exercise for labor force groups in order to increase employment chances. Community-wide campaigns, through promotions and media coverage, can be initiated to promote physical activity. Secondly, based on the importance of social networks implicitly deduced as existent among smokers, encouraging and facilitating networking events, job fairs, and online platforms where job seekers can connect with professionals and employers can enhance job referral opportunities. The development of targeted interventions to support individuals who lack extensive social networks is necessary. This could involve providing additional resources for job training, education, and networking opportunities for marginalized groups. Other recommendations include promoting access to quality and affordable healthcare to improve health status and maintain good health through an improved healthcare system and subsidized health insurance by the government. Similarly, the implementation of targeted economic development initiatives in rural areas, such as attracting investment to diversify economic opportunities beyond agriculture and incentives for businesses to establish operations in rural areas, is recommended to reduce pressure on urban job markets. The counterintuitive finding that the maintenance and initiation of smoking behavior were linked to an increased likelihood of both labor market participation and formal employment highlights the need for further empirical investigation into the underlying factors contributing to this relationship. Some limitations were identified in this study; some of these limitations are related to the limited number of health behaviors that were considered, the uncaptured dynamic nature of change in smoking and physical activity behavior, and the measures of outcome variables, as well as the omission of potential variables. The change in health behavior is not a one-off event. It is often a dynamic process over time that is subject to changing circumstances and experiences. Since survey wave 4, which lies between waves 3 and 5, was not considered, the time frame used for transition may not have captured other factors (like relapse) of these changes in smoking and physical activity behaviors. Second, defining and measuring the outcome variables of interest in this study can be complicated, given the number of possible indicators. For example, interesting insights into labor market outcomes might have been obtained from other proxies like private or public sector employment, sick leave application, labor hours, absenteeism, productivity, and exit from paid employment; these, however, were not captured in the survey used for this study. Finally, there are other variables not considered in this study that could influence the impact of changes in health behavior on labor market outcomes.

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References

Airagnes, Guillaume, Cedric Lemogne, Pierre Meneton, Marie Plessz, Marcel Goldberg, Nicolas Hoertel, Yves Roquelaure, Frederic Limosin, and Marie Zins. 2019. Alcohol, tobacco and cannabis use are associated with job loss at follow-up: Findings from the CONSTANCES cohort. *PLoS ONE* 14: e0222361. [CrossRef] [PubMed]

Becker, Gray. 1964. *Human Capital Theory*. New York: Columbia.

Becker, Gary. 2007. Health as human capital: Synthesis and extensions. *Oxford Economic Papers* 59: 379–410. [CrossRef]

Bello, L. Olalekan. 2021. The Alcohol and Tobacco Use and Labour Market Nexus in South Africa. Working Paper 183. Available online: https://www.researchgate.net/publication/360462948_The_alcohol_and_tobacco_use_and_labour_market_nexus_in_South_Africa_SA-TIED_YOUNG_SCHOLARS_PROGRAMME (accessed on 7 December 2023).

Böckerman, Petri, Ari Hyytinen, Jaako Kaprio, and Terhi Maczulskij. 2018. If you drink, don't smoke: Joint associations between risky health behaviors and labor market outcomes. *Social Science & Medicine* 207: 55–63.

Cabane, Charlotte, and Michael Lechner. 2015. Physical activity of adults: A survey of correlates, determinants, and effects. *Jahrbücher für Nationalökonomie und Statistik* 235: 376–402. [CrossRef]

Cai, Lixin. 2010. The relationship between health and labour force participation: Evidence from a panel data simultaneous equation model. *Labour Economics* 17: 77–90. [CrossRef]

Chen, Guifu, and Shigeyuki Hamori. 2010. Bivariate probit analysis of differences between male and female formal employment in urban China. *Journal of Asian Economics* 21: 494–501. [CrossRef]

Cichello, Paul, and Michael Rogan. 2017. *Informal Sector Employment and Poverty in South Africa: Identifying the Contribution of 'Informal' Sources of Income on Aggregate Poverty Measures*. Cape Twon: Southern Africa Labour and Development Research Unit (SALDRU), University of Cape Twon, pp. 1–37.

Deléchat, Corinne, and Leandro Medina. 2020. What Is the Informal Economy? IMF Finance & Development Magazine. Available online: https://www.imf.org/en/Publications/fandd/issues/2020/12/what-is-the-informal-economy-basics (accessed on 5 July 2023).

Deléchat, Corinne, and Leandro Medina. 2021. What Do We Know About the Informal Economy? In *The Global Informal Workforce: Priorities for Inclusive Growth, International Monetary Fund*. Washington, DC: IMF Publications.

Devaux, Marion, and Franco Sassi. 2015. *The Labour Market Impacts of Obesity, Smoking, Alcohol Use and Related Chronic Diseases*. OECD Health Working Papers, No. 86. Paris: OECD Publishing.

Dunga, Hannah Mayamiko. 2022. Household Level and Individual Antecedents of Employment Status in Malawi. *Acta Universitatis Danubius Œconomica* 18: 158–75.

Egan, Kia, Maja B. Jørgensen, Anne I. Christensen, Maja Bramming, Cathrine J. Lau, Ulrik Becker, and Janne S. Tolstrup. 2021. Association between alcohol, socioeconomic position and labour market participation: A prospective cohort study of transitions between work and unemployment. *Scandinavian Journal of Public Health* 49: 197–205. [CrossRef]

Ghebremeskel, F. Ghebregiogis, and H. Tekie Mihreteab. 2018. An Empirical Investigation of the Factors Influencing Formal and Informal Employment in the City of Asmara. *Journal of Economics and Management Sciences* 1: 21. [CrossRef]

Grossman, Michael. 1972. Health Capital and the Demand for Health. *Journal of Political Economy* 80: 223–55. [CrossRef]

Hafner, Marco, Erez Yerushalmi, William D. Phillips, Jack Pollard, Advait Deshpande, Michael Whitmore, Francois Millard, and Christian Van Stolk. 2019. *The Economic Benefits of a More Physically Active Population: An International Analysis*. Santa Monica and Cambridge, UK: RAND Corporation.

Hagger-Johnson, Gareth, Ewan Carr, Emily Murray, Stephen Stansfeld, Nicola Shelton, Mai Stafford, and Jenny Head. 2017. Association between midlife health behaviours and transitions out of employment from midlife to early old age: Wshitehall II cohort study. *BMC Public Health* 17: 1–8. [CrossRef] [PubMed]

Heikkala, Eveliina, Leena Ala-Mursula, Simo Taimela, Markus Paananen, Eeva Vaaramo, Juha Auvinen, and Jaro Karppinen. 2020. Accumulated unhealthy behaviors and psychosocial problems in adolescence are associated with labor market exclusion in early adulthood—A northern Finland birth cohort 1986 study. *BMC Public Health* 20: 1–13. [CrossRef] [PubMed]

Hussain, Mumtaz, Anwar Sofia, and Shaoan Huang. 2016. Socioeconomic and demographic factors affecting labor force participation in Pakistan. *Journal of Sustainable Development* 9: s70–79. [CrossRef]

International Labour Organization [ILO]. 2023. Decent Work for Sustainable Development (DW4SD) Resource Platform: Informal Economy. Available online: https://www.ilo.org/global/topics/dw4sd/themes/informal-economy/lang--en/index.htm (accessed on 5 July 2023).

Jørgensen, M. Baeksgaard, Jacob Pedersen, Lau Thygesen, Cathrine Lau, Anne Christensen, Ulrik Becker, and Janne Tolstrup. 2019. Alcohol consumption and labour market participation: A prospective cohort study of transitions between work, unemployment, sickness absence, and social benefits. *European Journal of Epidemiology* 34: 397–407. [CrossRef] [PubMed]

Kavetsos, Georgios. 2011. The impact of physical activity on employment. *The Journal of Socio-Economics* 40: 775–79.

Khan, Tanveer Ahmed, and Babar Hussain. 2021. Measurement and Determinants of Informal Employment: Evidence from Pakistan. *Pakistan Social Sciences* 5: 309–24. [CrossRef]

Kim, Hwan, Yongseung Han, and Won-Gil Cho. 2018. Empirical relation between unemployment and alcohol beverage consumption in Korea. *International Journal of Economics and Business Research* 16: 1–11. [CrossRef]

Kouadio, Hugues, and Lewis Gakpa. 2020. Micro-determinants of informal employment in Cte dIvoire: The role of socio-demographic factors. *Journal of Economics and International Finance* 12: 95–104.

Larose, Samantha, Koffi Kpelitse, Karen Campbell, Gregory Zaric, and Sisira Sarma. 2016. Does obesity influence labour market outcomes among working-age adults? Evidence from Canadian longitudinal data. *Economics & Human Biology* 20: 26–41.
Lawana, Nozuko, Frederik Booysen, Asrat Tsegaye, Forget Kapingura, and Charles Hongoro. 2020. Lifestyle risk factors, non-communicable diseases and labour force participation in South Africa. *Development Southern Africa* 37: 446–61. [CrossRef]
Lizares, Regina, and Carlos Bautista. 2020. Determinants of labour force participation in the Philippines. *Malaysian Journal of Economic Studies* 57: 305–23. [CrossRef]
Lund, Ingeborg, Inger Moan, and Hilde Edvardsen. 2019. The relative impact of smoking, alcohol use and drug use on general sickness absence among Norwegian employees. *BMC Public Health* 19: 1–8. [CrossRef] [PubMed]
Malam, M. N. 2018. Diplomas and informal jobs in Niger: Lessons from the national survey on employment and the informal sector. *Revue Internationale Des Economistes De Langue Française* 3: 180–201.
Masayuki, Morikawa. 2018. *Smoking, Obesity, and Labor Market Outcomes: Evidence from Japan*. Research Institute of Economy, Trade and Industry (RIETI) Discussion Paper Series, 18-E-023; Tokyo: RIETI.
Nwosu, Chijioke, and Ingrid Woolard. 2017. The impact of health on labour force participation in South Africa. *South African Journal of Economics* 85: 481–90. [CrossRef]
Opoku, Kwadwo, Francisco Mugizi, and Emmanuel Boahen. 2023. Gender Differences in Formal Wage Employment in Urban Tanzania. *Development Southern Africa* 1–21. [CrossRef]
Ots, Patricia, Sander van Zon, Jolinda Schram, Alex Burdorf, Suzan Robroek, Karen Hengel, and Sandra Brouwer. 2020. The influence of unhealthy behaviours on early exit from paid employment among workers with a chronic disease: A prospective study using the Lifelines cohort. *Preventive Medicine* 139: 106228. [CrossRef]
Quantec Easy Data. 2023. RSA Standardised Regional (Quantec). Available online: https://www.easydata.co.za/RSA%20Standardised%20Regional%20Labour-quantec/ (accessed on 15 August 2023).
Seglem, Brobakke, Ragnhild Ørstavik, Fartein Torvik , Espen Røysamb, and M. Vollrath. 2020. Education differences in sickness absence and the role of health behaviors: A prospective twin study. *BMC Public Health* 20: 1–11. [CrossRef] [PubMed]
Short, Susan, and Stefanie Mollborn. 2015. Social determinants and health behaviors: Conceptual frames and empirical advances. *Current Opinion in Psychology* 5: 78–84. [CrossRef]
Smith, William, Sakiko Ikoma, and David Baker. 2016. Education, health, and labor force supply: Broadening human capital for national development in Malawi. *Cogent Education* 3: 1149041. [CrossRef]
Some, Modeste, Naiefa Rashied, and Abieyuwa Ohonba. 2016. The impact of obesity on employment in South Africa. *Studies in Economics and Econometrics* 40: 87–104. [CrossRef]
Southern Africa Labour and Development Research Unit. 2017. *National Income Dynamics Study, Wave 5*. [Dataset]. Version 1.0.0. Pretoria: Department of Planning, Monitoring, and Evaluation [funding agency]. Cape Town: Southern Africa Labour and Development Research Unit [implementer] and DataFirst [distributor]. [CrossRef]
Tian, Wei-Hua, and Joseph Tien. 2020. Health behaviors and health status among middle-aged and older adults with chronic diseases in Taiwan. *International Journal of Environmental Research and Public Health* 17: 7196. [CrossRef] [PubMed]
Troelstra, Sigrid, Cecile Boot, Janneke Harting, Goedele Geuskens, Anton Kunst, and Allard van der Beek. 2021. Associations of sustained smoking and smoking cessation with work-related outcomes: A longitudinal analysis. *International Archives of Occupational and Environmental Health* 94: 529–37. [CrossRef] [PubMed]
Virtanen, Marianna, Jenni Ervasti, Jenny Head, Tuula Oksanen, Paula Salo, Jaana Pentti, Anne Kouvonen, Ari Väänänen, Sakari Suominen, Markku Koskenvuo, and et al. 2018. Lifestyle factors and risk of sickness absence from work: A multicohort study. *The Lancet Public Health* 3: e545–e554. [CrossRef] [PubMed]
World Health Organization. 2011. *Good Health Starts with Healthy Behaviour*. No. WHO/EURO: 2011-4333-44096-62198. Geneva: World Health Organization. Regional Office for Europe.